Forest Investment Associates

Forest Sustainability Report

2020

A message from Marc Walley, President of Forest Investment Associates

This report is Forest Investment Associates inaugural Forest Sustainability Report. As such, we have chosen to focus on those areas that are primary to the concepts of forest sustainability – forest productivity and active forest management. In our evolving society, increased emphasis on sustainable businesses and sustainable environments create new and evolving opportunities for the conservation and management of our societal goods and services – chief among those are our natural resources. Forest Investment Associates is a firm primarily made up of professional foresters focused on managing our forests in a sustainable and productive manner. We learn early in our professional forestry education that sustainable forest management provides goods and services we need today without endangering or reducing the availability of those goods and services for future generations. The forest management plans enacted by FIA on behalf of our investors adhere to these basic forest sustainability principles.

It is an exciting and challenging time to be managing forest assets. Forests are a unique, natural path to enhancing environmental quality while simultaneously improving the quality of our lives by providing the goods and service demanded by a global economy. From moderating the effects of climate change and ensuring adequate clean air and water, to providing wildlife habitat, rural jobs and sustainable building products, forests can truly be a "natural solution" to help solve numerous problems we face today. As new, emerging markets develop for a variety of goods and services produced by sustainably managed forests, forest owners, managers, and society will increasingly continue to benefit from carbon markets, water rights, and other goods and services associated with forests.

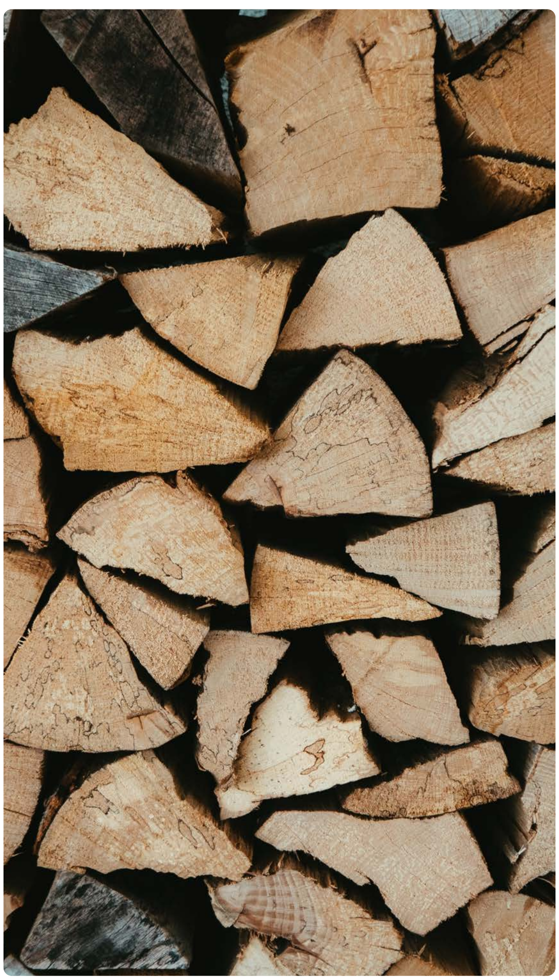
I hope that this Sustainability Report explains how we at FIA look at our responsibility for sustainable forest management and the importance of sound forest science in that effort. We look forward to addressing any questions you may have.

Best Regards,
Marc Walley
President, Forest Investment Associates

The Science of Forest Sustainability

Since its inception in 1986, Forest Investment Associates (FIA) has managed investors' timberland assets in a sustainable manner. Over those 34 years FIA foresters have applied basic forest management concepts that ensure long-term sustainability using modern forest regulation and planning concepts. These concepts, originally developed in Germany in the mid-1800s, define the ideas of long-term sustainable forests that provide a range of goods and services in perpetuity.

As foresters, we are educated in our professional forestry curricula on both the concepts and specific techniques of sustained yield, forest planning and regulation, and generally considering long planning horizons in the business planning processes. Additionally, as foresters we have the opportunity to work with an inherently sustainable, growing resource – trees. Hence, we have focused our 2019 Sustainability Report on the science involved in forest sustainability. As environmental concerns have continued to grow around climate change, air and water quality, suitable wildlife habitat, and endangered and rare species and ecosystems, the underlying forest and ecosystem science provides a framework to address these concerns. At FIA, basic concepts like forest productivity, best forest management practices, and good stewardship principles interact to help formulate forest management plans that provide strong risk adjusted returns for our investors while protecting and enhancing our environmental, social, and governance missions.



A primary focus at FIA involves forest productivity – growing trees faster, with better characteristics. It helps enhance investor returns while also providing additional flexibility to manage rare ecosystems in their natural state. Increasing growth in planted forests helps reduce pressure on natural forests, wetlands, and other naturally occurring ecosystems. Hence, we make every effort to identify appropriate areas for different degrees of intensive forest management across the landscapes we manage. To develop and execute these forest plans, FIA foresters utilize the underlying science associated with forest productivity and the interactions between silviculture treatments employed and the desired outputs from properly managed forests – clean air and water, wildlife habitat, carbon sequestration, and the production of renewable consumer goods and building materials. Increases in forest productivity are the engine that makes this strategy a reality in FIA managed forests.

The Evolution of Forest Plantation Productivity

A forester in 1960 could little imagine the productivity of today's plantations.

Forest plantation productivity saw a remarkable transformation in the last six decades. Productivity rates for commercial plantations in many important tree growing regions of the world doubled or tripled. These advances are akin to the large productivity improvements of agricultural crops associated with the "Green Revolution".

Plantation productivity increases are important. They result in greater yields per unit area and increase revenue streams. They meet societal wood demands from a smaller land base. They augment the carbon footprint benefits from plantations.

Prior to 1960, many of the lands supporting today's highly productive plantations were in marginal agricultural production or livestock grazing. Others were covered by forests that developed naturally following agricultural or grazing abandonment. Some lands were never in agriculture and covered with naturally occurring forests. Many of these forests experienced periodic harvests that resulted in reduced productivity and quality (high grading). These periodic harvests often did not favor regeneration of desirable species.

Since 1960, landowners in diverse regions established plantations on a large scale. Today, plantations of pine in the U.S. South, conifer in the Pacific Northwest, and eucalypts in Brazil cover approximately 40, 8 and 12 million acres (16, 3, and 5 million hectares), respectively. In comparison, the land area of the State of Georgia totals 38 million acres. Landowners often chose to establish plantations due to their increased economic efficiency as compared to other land uses or natural forests.

The evolution of pine plantation productivity in the U.S. South from 1960 to 2020 is illustrative of a trend repeated in other important commercial forest regions. We highlight major productivity trends for pine in the U.S. South and the principal factors contributing to productivity increases. We then identify productivity trends in the Pacific Northwest and in Brazil. Finally, we identify expected areas for improving future productivity.

Plantation productivity can be expressed in different ways. It is often expressed as stem volume or weight per unit area.

A tree's volume is determined by its tree height, girth and stem form. A tree's weight is determined by its volume and weight per unit volume (specific gravity). The number of stems per unit area for different size classes determines yield in volume or weight per unit area at a given age. Yield in volume or weight per unit area is useful for productivity comparisons provided plantation age is held constant. A commonly used plantation productivity measure is mean annual increment (MAI) of stem volume or weight. In this case, the term "increment" is equivalent to the term "productivity". The MAI is calculated as the amount of stem volume or weight per unit area for the period from planting through final harvest (the rotation) divided by the number of years in the rotation. MAI simply represents the average growth rate (increment) of the stand of trees. Although not a direct measure, the relationship between tree height and age is often positively correlated with productivity and used as a site productivity indicator. This concept is commonly known to foresters as site index . . . the height of the tallest trees in the stand at some selected index age. Height has been used because it is has low correlation with the number of trees or stocking in many instances thus making height less influenced by other factors.

Pine plantations in the U.S. South established in each successive decade since the 1960s show a "step" increase in yield (Figure 1). Total yield per acre almost tripled from 1960 to 2010. The number of years to reach economic maturity also declined markedly (Fox et al. 2007a).

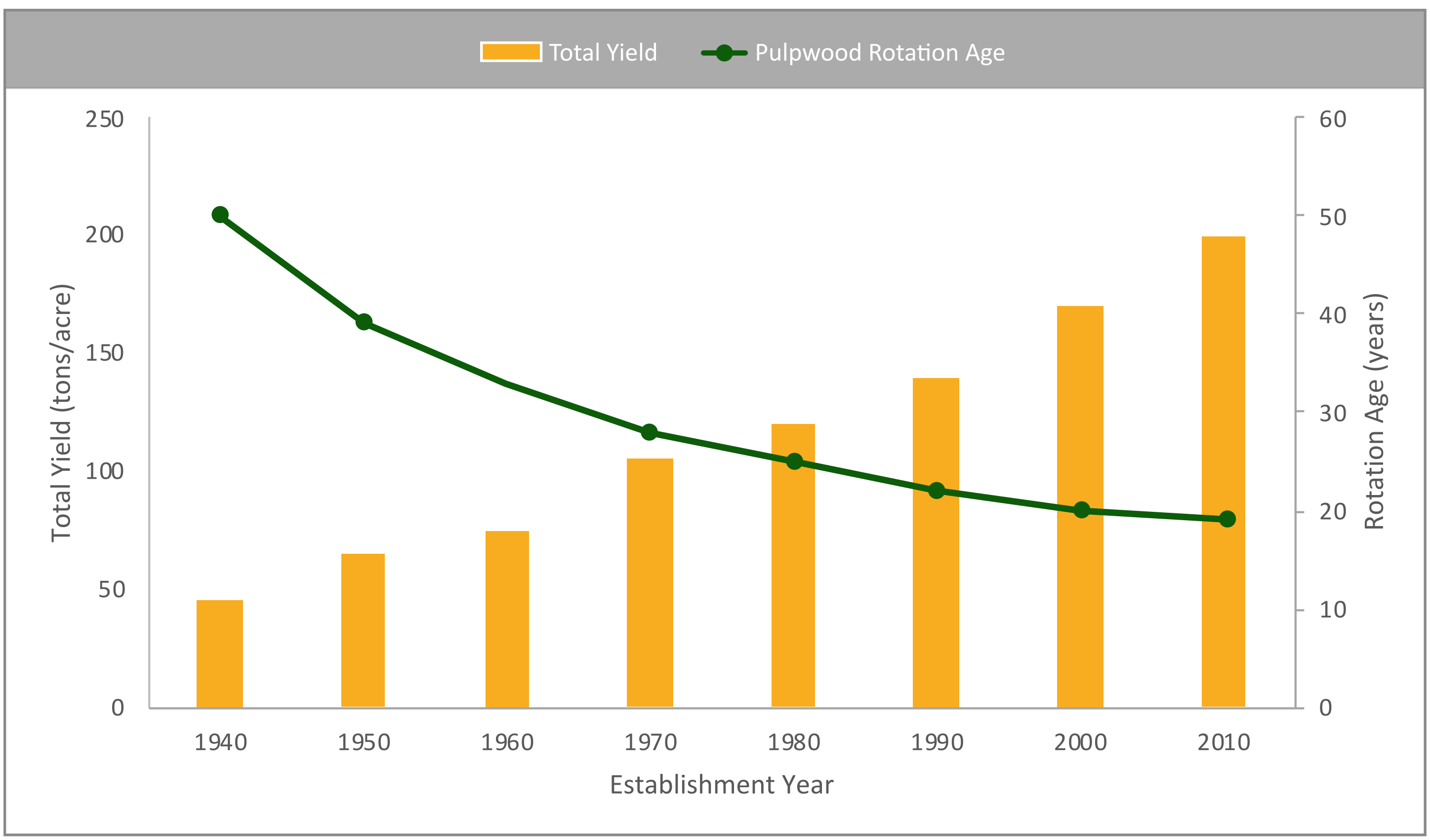


Figure 1. Trends in total yield and rotation age for southern pine plantations (Adapted from Fox et al. 2004)

Let's contrast plantations established in the 1960's with those recently established. Height of planted, upper canopy trees in typical 1960s loblolly pine plantations averaged 55 to 65 feet at 25 years of age. Average age 25 heights were as low as 40 feet on very poor-quality sites and as high as 75 feet on exceptionally high quality sites. Mean annual increment for most plantations was in the 2 to 4 green tons per acre per year range. This contrasts sharply with recently established plantations having tree heights averaging from 70 to 85 feet and, in exceptional cases, exceeding 100 feet at age 25 years. Mean annual increment for many recently established, well-managed plantations where markets reward productivity ranges from 6 to 10 green tons per acre per year.

For 1960 plantations, preparing the site prior to planting may have included some treatments such as burning, land clearing, or herbicide application which were moderately effective in facilitating planting and improving conditions for seedling survival. Seedlings planted had no genetic improvement and, in some cases, were not the best species for the planting location. Seedling survival was variable and, in some instances, low due to factors including significant competing vegetation, pests and challenging soil conditions. The planted pine often grew in the presence of significant competition from grasses for several years following establishment and trees and shrubs throughout the rotation. On many sites, the ability of the trees to grow was limited by nutrient deficiencies. Throughout much of the region, a substantial number of trees would be infected by a fungal pathogen, fusiform rust, which caused mortality and lowered the value of surviving trees. Many plantations developed with too few trees per acre due to mortality or with too many trees per acre because of high numbers planted or that naturally regenerated.

Most recent plantations are established following the final harvest of a managed forest stand, often a plantation. In some instances, the prior stand improved properties of soils degraded during earlier periods of agricultural production or grazing with poor conservation practices. Sites are prepared prior to planting to achieve good quality planting and conditions that promote high seedling survival and subsequent growth. Where surface soils are saturated, seedlings are planted on raised beds, formed by special tillage implements, so that the seedling roots are in a more favorable aerobic environment. Tillage is also done where soil conditions strongly limit root growth due to compacted soils. Competing vegetation is controlled using appropriate, approved herbicides, mechanical techniques, and/or prescribed fire. The pine species planted is carefully selected based on site specific factors. Seedlings planted are genetically improved for productivity and, where applicable, for fusiform rust resistance and are of size and condition promoting survival and early growth. The number of trees planted per acre and subsequent thinning, where appropriate, provide desired individual tree spacing and growth during the rotation. Site specific fertilization improves productivity and value. Appropriate genotypes and silvicultural practices reduce risks of lost productivity due to pests and environmental conditions.

A primary factor driving plantation productivity increases is the continuous application of improving knowledge and technology. Research findings and knowledge from experiences with operational plantations are applied, enabling increasing plantation productivity. Research

cooperatives between the commercial forest sector and universities have been instrumental in many technology advances. The pooled resources, scientific and technical expertise, and longevity of these cooperative efforts allow long-term, regional, multi-million-dollar research efforts on plantation productivity.

The increase in plantation productivity resulted from many factors, some of the most important being matching species and genotypes to specific environments, improvement of tree genetics, optimizing the number of trees per acre, enhancing availability of light, nutrients, and moisture to trees and minimizing losses to pests and other environmental hazards.

Significant improvements in the characterization of the sites where plantations are grown allows for better assignment of management actions and site conditions. Soil properties have profound impacts on species suitability, the need for tillage and fertilization, and type and abundance of competing vegetation (Fisher and Garbett 1980; Morris and Lowery 1988). Many areas supporting plantations have detailed soil maps, often developed in the 1970s and 1980s, specifically for pine plantation management. Forest managers base many decisions, at least in part, on this detailed site characterization.

Improved assignment of species with site conditions and silvicultural practices contributed greatly to productivity improvements. Slash pine was planted on many sites where loblolly pine is more productive (Shiver et al. 2000). As we have improved our knowledge and ability to improve growing conditions, even more sites previously planted with slash pine are now recognized as more productive when planted with loblolly pine (Shiver 2004; Zhao and Kane 2012).

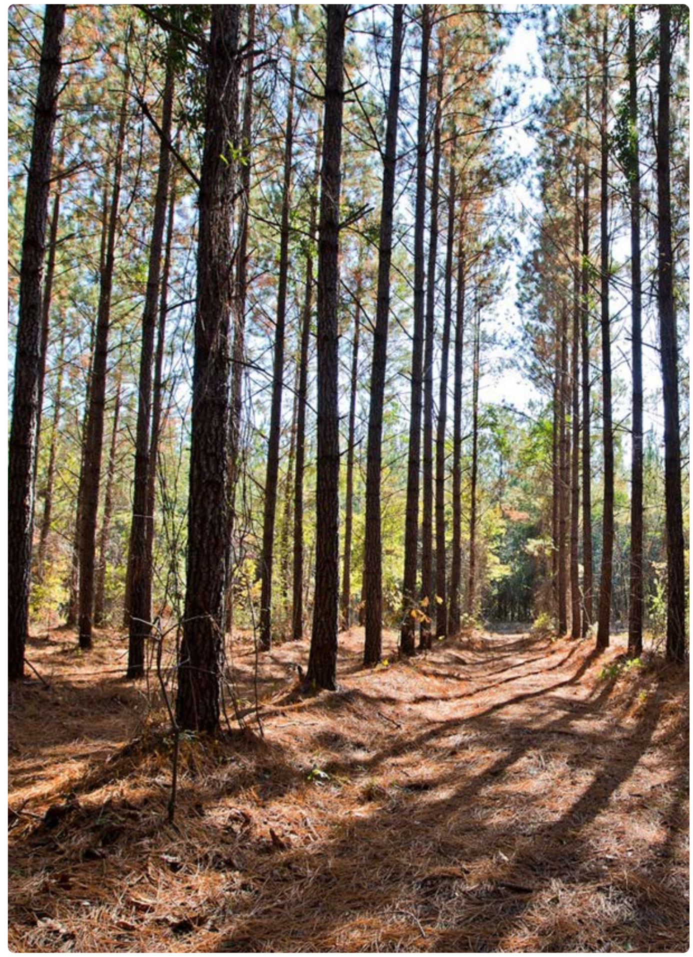
Genetic improvement of loblolly pine and slash pine has led to substantial benefits in plantation performance. Forest geneticists' efforts, which began in the South in the 1950s, focused on growth rate, resistance to fusiform rust, and stem straightness. These efforts resulted in marked improvements in these traits. Advanced improvement programs with loblolly pine are currently in their fourth cycle. Estimated gains are substantial. For example, at age 6 years, the volume gain was 48% for open-pollinated families from third cycle selections in the Coastal Plain breeding population of the North Carolina State University Tree Improvement Program compared to trees without improvement (McKeand 2019). Many fusiform rust resistant genotypes are now available and show low infection levels when planted on land formerly in plantations with high rust levels.

Changes in the methods for developing and deploying improved genotypes have resulted in marked productivity increases (McKeand 2019). Initially, individual plantations with improved genotypes were established with seedlings resulting from seed from a mix of "mother trees" resulting from uncontrolled pollination in a seed orchard. Later, seedlings from seed from only one "mother" and uncontrolled pollination were typically used. This "family block system" allowed for planting specific families with particularly good performance generally on specific sites. This approach provided greater gains in productivity as compared to the mixed deployment. Since 2008, an increasing percentage of plantations have been established with seedlings from purposeful controlled crosses of two specific parents with desired traits. This approach results in substantial improvements in productivity, quality and fusiform rust resistance. Relatively modest acreages of clonal loblolly pine plantations are growing and continue to be evaluated.

Foresters continuously refined site-specific approaches to optimize the number of seedlings planted per acre and the number of trees per acre as a plantation grows and develops. A central tenet is to create and maintain conditions and resources where trees have room to grow, but none to waste. Planting density, thinning timing and intensity, and final harvest timing significantly impact overall productivity and yield of specific products such as pulpwood and sawtimber (Baldwin et al. 2000; Zhao et al. 2011; Amateis and Burkhart 2012). Productivity and yield of valuable products have been enhanced by improved density management approaches.

Major strides in increasing plantation productivity result from managing environmental conditions that drive growth. Tillage during site preparation, such as bedding on sites with seasonably high water tables and, in less common instances, subsoiling soils with cemented or compacted subsurface zones, alleviates conditions negatively impacting seedling survival and growth (Gent et al. 1986; Morris and Lowery 1988).

Reducing competing vegetation contributes greatly to productivity of most plantations. Competing grasses, other



herbaceous plants, shrubs, and trees reduce the availability of soil moisture and nutrients, and in some cases, light, for planted trees. Reduced grass competition during the growing season following planting strongly benefits productivity as does reduced shrub and tree competition throughout the rotation cycle (Creighton et al. 1987; Miller et al. 2003; Zhao et al. 2009a) For most plantations, foresters effectively manage competing vegetation applying approved, environmentally compatible herbicides one or two times during the rotation cycle (Shepard et al. 2004).

Fertilization contributed markedly to increases in southern pine plantation productivity. Loblolly and slash pine, while efficient and conservative nutrient users, respond markedly to fertilization under certain conditions. Prior to the 1970s, natural pine stands and early plantations on many coastal plain soils exhibited slow growth rates due to phosphorus deficiencies and poor soil drainage, with taller trees averaging only 45 to 50 feet in height at age 25 years. Bedding and phosphorus fertilization at planting resulted in plantations with the taller trees averaging about 70 feet and more at age 25, the majority of this productivity increase due to fertilization (Gent et al. 1986). Many sites with these soils have been fertilized with phosphorus several times with the effect of much greater pine plantation productivity. As dramatic as this productivity gain from phosphorus fertilization on deficient sites is, fertilization with nitrogen has been a more widespread opportunity to improve growth (Fox et al. 2007b). Plant available nitrogen supply limits pine plantation growth on most sites from the time that tree crowns touch each other through final harvest. Fertilization with nitrogen, with smaller amounts of phosphorus, to extensive plantation acreage began in the 1990s and continues today on a site specific basis (Albaugh et al. 2019)

Advances in pest management practices are implemented to reduce losses from pests. The reduction in fusiform rust infections due to planting resistant trees is a remarkable success (McKeand 2019). Risks from southern pine beetle are much reduced by managing stand density and competing vegetation (Nowak et al. 2015). Similarly, effective techniques are used by foresters to reduce risks from other pests such as annosum root rot and pine tip moth.

Forest managers employ regimes over the rotation, which integrate the practices discussed above, to enhance productivity in an efficient and holistic manner. The productivity improvements achieved are illustrated by results from several studies impactful to plantation forestry in the U.S. South. One such study was with improved first-generation slash pine planted in 1980 at 545 trees per acre in the Lower Coastal Plain. Through age 26 on 14 locations, average productivity was almost double (5.8 green tons per acre per year) on the most intensively managed stands (site prepared by chopping, burning, and bedding, fertilized at ages 1, 12, and 17, and treated with herbicides to control all competing vegetation until crown closure) as compared to that (3 green tons per acre per year) on stands planted with no site preparation or subsequent silvicultural treatments (Zhao et al 2009b).

In one study in loblolly pine plantations planted at 545 trees per acre in 1986, the impacts of increasing levels of competition control on productivity through age 21 years at 19 locations in the Piedmont and Upper Coastal Plain Regions were quantified The mean annual increment increased from 4.5 green tons per acre per year for plantations site prepared with only prescribed burning, to 6.5 green tons per acre per year for plantations site prepared by herbicide application and prescribed burning, to 7.2 green tons per acre per year where competitors were controlled throughout the rotation (Zhao 2009a).

In another study, loblolly pine planted in the Lower Coastal Plain with a fast growing first generation family at 600 trees per acre in 1996 at 14 locations averaged 9 green tons per acre per year when grown with low levels of competing vegetation, pest infestations and nutrient limitations due to effective vegetation, pest, and nutrient management practices (Zhao et al. 2011).

Loblolly pine productivity of up to 15 green tons per acre per year through age 12 is documented (Borders and Bailey 2001), highlighting the biological potential of plantations in the U.S. South. The high performing plantations were planted with a fast growing, first-generation family at 680 trees per acre in the Lower Coastal Plain and received repeated weed control and annual fertilization to maintain a competition free, nutrient rich environment.

Importantly, improvements have occurred in quality as well as in productivity. The quality improvements result from both tree improvement efforts and silvicultural practices. Many improved genotypes have improved quality traits such as fewer stem defects (forking, crook, fusiform rust cankers). Silvicultural treatments such as thinning, vegetation management and fertilization promote more rapid development of trees into higher product classes.

Multiple technology advances have contributed to productivity gains. Improved resource inventories and more sophisticated decision support tools aid foresters in developing site specific regimes including those for economically efficient, high-productivity plantations (D'Amato et al. 2018). Technology developments continue to improve the consistent, high quality implementation of productivity enhancing silviculture practices.

The U.S. South Isn't the Only Example of Managed Forests' Sustainability and Productivity Gains

Dramatic productivity improvements are not unique to pine plantations in the U.S. South. The productivity gains in different regions with different species typically share common factors driving productivity such as species selection, genetic improvement and deployment of improved genotypes, properly matching species with site, optimizing plantation density, reducing competing vegetation, providing limited nutrients, and reducing losses to pests and other risks. While many factors are common, region and species-specific conditions lead, in some cases, to distinct approaches and practices.

Staying in the U.S., Douglas-fir stands in the Pacific Northwest increased markedly with more intensive management (Talbert and Marshall 2005). Mean annual increment of stands harvested in the early 2000s, containing a mix of older, naturally regenerated stands and early plantations, averaged slightly over 190 ft3 per acre per year.

The mean annual increment of intensively managed plantations established in the mid-2000s was expected to be between 240 and 310 ft3 per acre per year. The intensive management regime included planting with genetically improved stock, effective control of competing vegetation, full stocking and no thinning, and multiple nitrogen (urea) fertilizations.

While commonality of techniques used to achieve productivity gains exists globally, the results do not. Important climatic variables drive potential productivity and carrying capacity of forests which integrates into the results of forest plantation productivity. While some softwood systems are well regarded in the management and sophistication of their forest industry (e.g. Scandinavian softwood growers), variables such as average degree days, precipitation, and soil quality exert powerful drivers of final growth rates. Average Brazilian growth rates in softwood plantations are roughly triple that of in the U.S. and a whopping 6x of the extensively, but properly managed forest plantations, in Scandinavia (Figure 1).

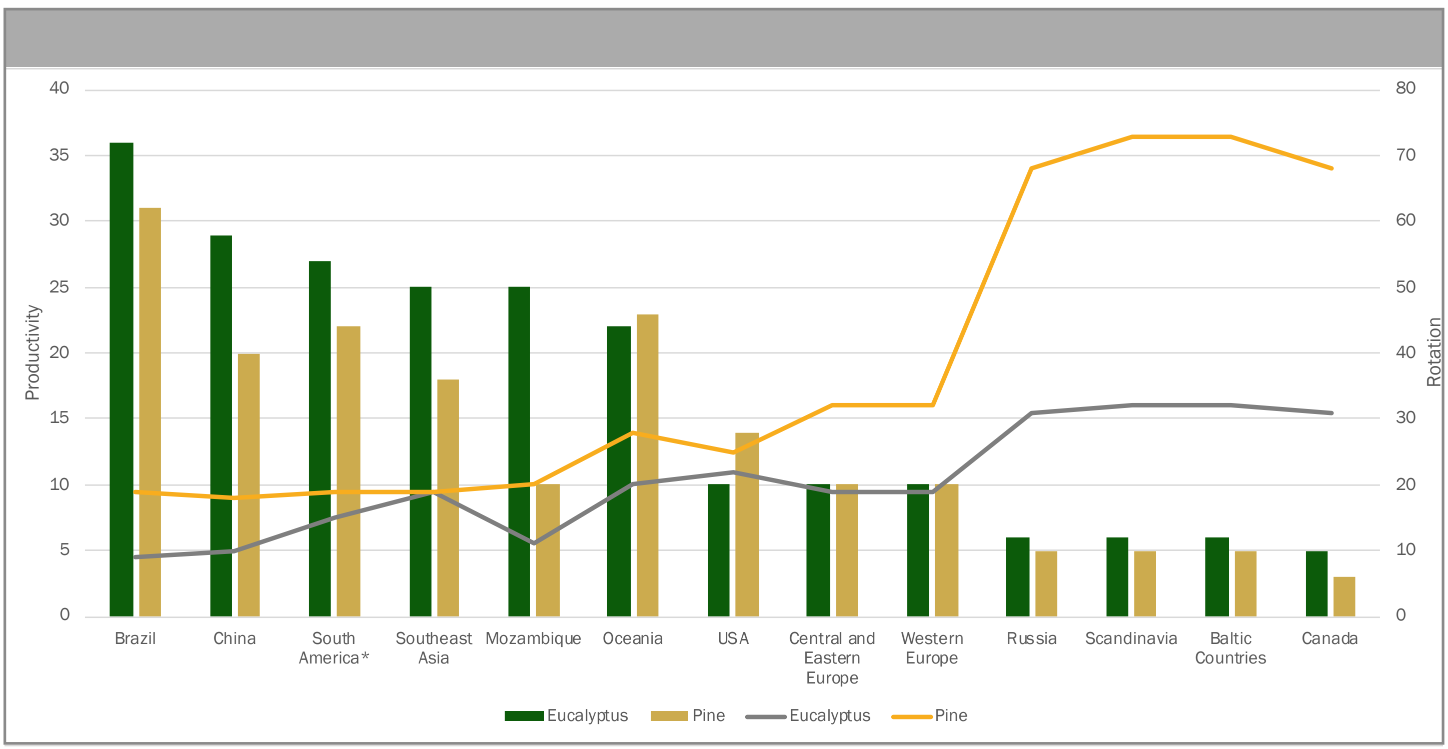


Figure 1. Summary of average productivity and rotation lengths in several forest systems

In another example, Brazilian foresters witnessed incredible increases in eucalyptus plantation productivity in their country. Plantations established in the 1960s often grew at 10 to 20 m3 per hectare per year (Stape et al. 2004; 2010) while those recently established can average 40 m3 per hectare per year in certain regions, with up to 60 m3 per hectare per year (Gonclaves et al. 2013). Improved genetics, through species and provenance introduction and selection, tree improvement including hybridization, and clonal deployment, contributed greatly to productivity increases. The development of numerous species, hybrids and clones has allowed very productive plantations on sites with diverse climatic and soil conditions. Important silvicultural practices target conservation of organic matter and harvest residues, competition control as well as site and species-specific density management and fertilization (Gonclaves et al. 2013).

In effect, wood fiber production in a country such as Brazil takes half the land to produce the same volume of raw material. This is an important driver to landscape level considerations of conservation and environmental protection while meeting society's need for wood, sustainably. Furthermore, when these intensively cultured plantations are compared to growth rates in natural forests, the amount of land required in the latter to supply a similar amount of wood fiber can be an order of magnitude more. When soil is conserved, these intensively managed plantations are sustainable (Powers, 1999)

The Role of Forest Management in Protecting Water Quality

Why Forest Lands Produce High Quality Water

Forested landscapes contribute to high water quality and more consistent, less volatile flows over time. Unlike cityscapes or even agricultural landscapes, forests have a unique ability to improve water quality and quantity. This has not always been the case . . . as forestry best management practices (BMPs) have evolved through better science and understanding of the impacts of forest operations. Below we briefly review the science behind forestry BMPs and their impact on water quality and quantity.

Forested hillslopes act as reservoirs to hold rainwater and release it slowly to streams after it has been filtered through soil and rock. Forest topsoils are protected by litter layers and feature high organic matter, creating conditions favorable for an abundant and diverse micro and macro soil fauna.

Furthermore, forest root systems are extensive and relatively deep compared to agricultural lands and grasslands. These biological conditions create low-density topsoils with high macroporosity and high saturated hydraulic conductivities (Price et al. 2010). Such soils feature high infiltration rates rarely exceeded by rainfall rates such that most rainfall reaches streams by subsurface routes (Figure 1) featuring rapid nutrient uptake, cycling, and contaminant sorption processes (Neary et al. 2009). Because of the dominance of subsurface flow processes, peak flows are moderated and baseflows are prolonged (Price et al. 2011).

The water quality of streams draining forest lands is generally good to excellent (Binkley and MacDonald 1994; Frick et al., 1998, Embry and Frans 2003), and forests continue to

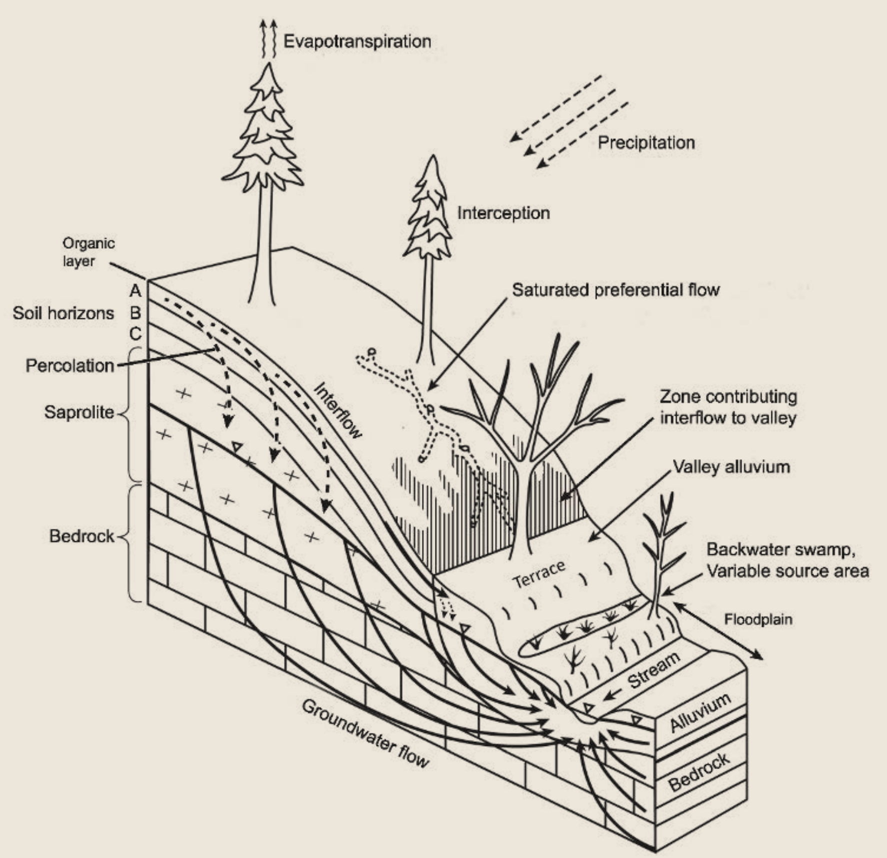


Figure 1. Cross-section of a typical forested hillslope over weathered bedrock showing hydrologic processes and flow paths. Most rainwater reaches streams by long subsurface routes. Only near-channel areas with proximal water tables produce overland flow during storms because of soil saturation.

be the best commercial land use in terms of producing high quality water. Conversion of forest lands to agricultural, residential, or commercial uses necessarily entails alteration of hydrologic processes, specifically increasing peak flows, and some degradation of water quality. Even low levels of agricultural activity and rural residential development are associated with significant water quality changes (Webster et al. 2012, Jackson et al. 2017, Webster et al. 2019). For these reasons, policies that encourage the maintenance of forest land are beneficial to the environment. Therefore, the World Resources Institute has argued for investing in forested landscapes for water quality protection (Gartner et al. 2013).

Effects of Harvest, Yarding, Hauling, and Planting on Water Quality

Harvest and planting of trees inevitably alters watershed hydrology, streamflows, and ecological processes affecting water quality, but the type and scale of effects depend on management practices. Harvest and site preparation equipment can expose bare soils. Without the physical protection of litter layers, bare soils often form crusts during rainfall, and such crusts greatly reduce infiltration rates. Surface runoff is common from bare soils, and surface runoff mobilizes soil particles and transports them to streams. Roads and log landings are surfaced with compacted native soil and sometimes covered with gravel, whereas skid trails and fire breaks are characterized by compacted native soils. Surface runoff is common from roads, landings, skid trails, and fire breaks due to low infiltration rates. Road runoff typically carries high amounts of fine sediment and is often collected in roadside ditches and transported to streams. In small basins, road runoff can substantially increase peak flows and volumes (Wemple et al. 1996). Forest roads, landings, and skid trails have been repeatedly identified as the dominant sources of sediment from silvicultural operations (e.g. Hoover 1952; Megahan and Kidd 1972; Rivenbark and Jackson 2004, Lang et al. 2015).

Before the Best Management Practice (BMP) era, the timber industry, land managers, and scientists had recognized that unconstrained harvest, yarding, and transport caused unacceptable water quality problems, particularly with respect to high sediment inputs to streams (e.g. Ward and Jackson 2004), increases in maximum stream temperatures due to lack of shade (e.g. Hewlett and Fortson 1982), and many-fold increases in nitrogen concentrations with concerns for downstream eutrophication (Likens et al. 1970). The major water quality concerns for silviculture are: 1) increased sediment loads due to surface erosion, road runoff, and landslides, 2) increased nitrogen loads due to interrupted nutrient cycling and fertilizer washoff (e.g. Likens et al. 1970), 3) stream temperature increases from inadequate channel shading, 4) decreased woody debris recruitment from inadequate SMZs, and 5) pesticide runoff from intensively managed plantations (e.g. Tatum et al. 2017). Excess sediment is detrimental to fish spawning, foraging, and energy regulation. Excess nitrogen contributes to estuarine eutrophication. Wood debris increases habitat complexity, provides cover for fish, and provides substrate for the growth of algae and invertebrates. If harvest and site preparation maintain organic litter layers, avoid soil compaction, disperse road runoff, and maintain vegetated buffers along streams and wetlands, hydrologic and water quality effects of forestry can be minimal and often below levels of detectability (Cristan et al. 2016; Warrington et al. 2017). Conversely, if harvest and site preparation activities create large areas of bare soils, gouge ruts up and down slopes, concentrate road runoff and deliver it to streams, and extend operations to stream banks, hydrologic and water quality effects can be large (e.g. McBroom 2008; Rivenbark and Jackson 2004).

Hydrologic Effects of Forest Management

Timber management can increase and decrease streamflows over a rotation, with the net effect depending on the mix of stand ages in a watershed. Clear-cutting a forest has the effect of reducing canopy interception and transpiration for several years until crown closure of the new plantation, with a resulting increase in recharge, a rise in water tables, and an increase in streamflows (Bosch and Hewlett 1982; Andreassian 2004). Because of the higher water tables, runoff from saturated soils (variable source areas, Figure 1) may also increase, causing a rise in stormflows. However, data on water table responses to timber harvest are very limited in the scientific literature. Most of the direct observations on higher water tables come from visual observations of toeslope seeps forming after harvest (e.g. Terrell et al. 2010). If road runoff is well-connected to streams, it may also contribute to increased stormflows (Wemple et al. 1996; Wemple and Jones 2003). Late in the rotation, if basal area and leaf area are high, then high productivity may increase evapotranspiration and reduce streamflows (Perry and Jones 2017). In-between these two extremes, evapotranspiration is roughly the same as the pre-harvest condition. These later-rotation effects of streamflows are complicated, and they depend on forest type and are mediated by climate conditions (Kelly et al. 2016). Thus, effect of timber management on streamflows in larger basins depends on the mix of stand ages and management practices in the watershed.

The Importance of BMPs

BMPs are modifications to silvicultural operations that have been guided by scientific research and operational experience with the intent of reducing water quality effects of forest management. The ideas behind BMPs came from consideration of foresters' experiences combined with results and observations from scientific studies conducted mostly at the Forest Service experimental watersheds in the 1950s, 60s, and 70s (e.g. Lieberman and Hoover 1948, Hewlett and Douglas 1968, Reinhart and Eschner 1962). The impetus for getting serious about BMP development and implementation came from the Clean Water Act (CWA), which set in motion a continuous feedback loop of BMP implementation, scientific assessments, and refinement. Consequently, BMPs have evolved through time (Edwards and Stuart 2002), with revisions reflecting not only new scientific evidence and operational experience but also changing economic, social, and political influences (Jackson 2014). BMPs appropriately vary from state-to-state due to the spatial variation in topography, geology, soils, forest types, stream conditions, and forestry practices. Striking a balance among technological, economic, and institutional considerations is a socio/political undertaking reflecting local values (Jackson 2014). While BMP specifics vary among regulatory programs, forestry BMPs all share the following basic recommendations: 1) minimize soil compaction and bare ground, 2) separate bare ground from surface waters, 3) separate pesticide applications from surface waters, 4) inhibit hydraulic connections between bare ground and surface waters, 5) provide a forested buffer around streams, 6) avoid road placement, road runoff dispersion, and harvest in landslide prone areas, and 7) engineer stable road surfaces and stream crossings (Olszewski and Jackson 2006).

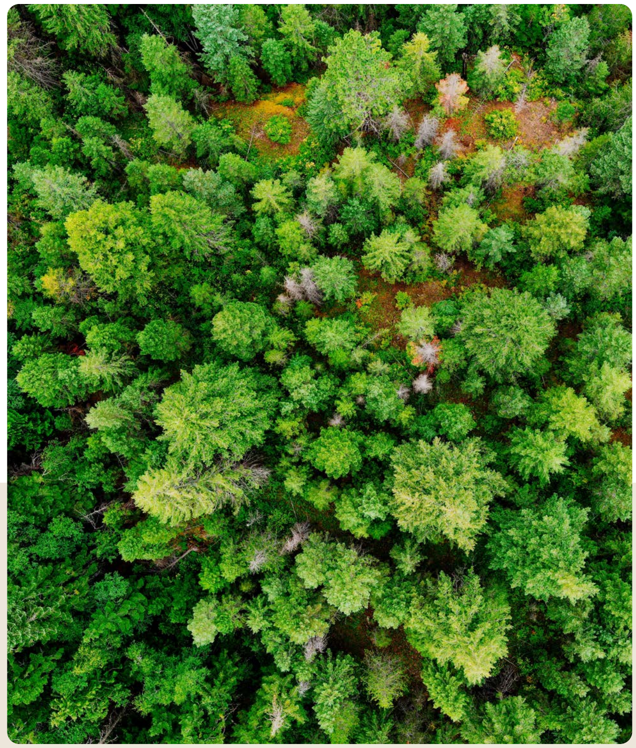
The BMP effectiveness literature is extensive, and reviews of this literature demonstrate that effectiveness is high (e.g. Anderson and Lockaby 2011, Cristan et al. 2016; Edwards et al. 2016; Warrington et al. 2017). Forestry BMPs are focused on reducing silvicultural effects upon stream sediment, nutrients, water temperature increases, and wood loading. It is assumed that by minimizing these changes to water

quality, BMPs will also minimize changes to aquatic ecosystems. Relative to logger's choice, forest practices with BMPs has greatly reduced water quality effects of forest operations, down to small fractions of their previous levels (e.g. McBroom et al. 2008, Fraser and Jackson 2010, Hatten et al. 2018). Evidence indicates that the improvements to water quality resulting from BMP implementation are protective of sensitive aquatic organisms (e.g. Bateman et al. 2016, 2018). From a social/regulatory perspective, the forest industry has embraced BMPs, requiring BMP training of their contractors, incorporating BMPs into corporate policies, and participating in BMP effectiveness studies (NCASI 2009). In short, forestry BMPs are a water quality success story.

Despite the documented success of forestry BMPs, BMP science and policy will continue to evolve. Answering the question about whether BMPs are good enough requires either valuing or stating relative preferences for water quality conditions or biological states, and these preferences have distributions among the relevant populations of stakeholders. Given the human dimensions of this question, there will never be complete agreement about whether BMPs are good enough and there will always be differences in BMP goals and requirements among regulatory jurisdictions. Consequently, we can expect changes to BMPs in the future. For example, BMPs might evolve to address wildlife issues more explicitly as has been done in the State of Florida (Stephens and Roach 2019).

UN PRI Sustainable Development Goals

Forest Investment Associates is a signatory on the UN-PRI Sustainable Development Goals. These goals help guide investment managers in developing and assessing investment opportunities and guiding current investments. Of the 17 SDGs identified by UN-PRI, 7 are directly applicable to forests and forest-based investments from our perspective. FIA continues to refine its forest management practices and develop key performance indicators to further align with these Sustainable Development Goals.



3 GOOD HEALTH AND WELL-BEING

Forests have been linked to increased health and happiness for centuries. Recent academic literature has documented increases in health, exercise, and well-being from living in and around forests.

6 CLEAN WATER AND SANITATION

Sustainably managed forests provide clean and plentiful water. Many forested ecosystems are excellent at filtering and purifying water that has been degraded through agricultural or urban practices.

7 AFFORDABLE AND CLEAN ENERGY

Wood biomass, primarily in the form of wood pellets, provides an affordable, renewable energy source. In some parts of the world, wood biomass has become a primary fuel for generating electricity while providing solutions to climate change through reduced carbon emissions.

8 DECENT WORK AND ECONOMIC GROWTH

Timberland investments provide vitally important rural job opportunities and contribute to the rural economy throughout the world. In many important timberland investment regions around the globe, the forest industry is the largest employer in these areas.

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Properly managed forests are an inherently sustainable and renewable resource. Forest-based investments are driven primarily by biological growth of the trees – a responsible, value adding strategy of production.

13 CLIMATE ACTION

Forests and building with wood provide one of the few ways to sequester large amounts of carbon. Trees are one of just a few opportunities available to capture and keep carbon out of our earth's atmosphere.

15 LIFE ON LAND

Forests provide a wide array of benefits to society – recreation opportunities, jobs and economic prosperity, and clean air and water. They are important to supporting a society's quality of life.

Forest Investment Associates at a Glance

FIA is a Timberland Investment Management Organization (TIMO) that invests client capital in forestland and manages it on their behalf. Founded in 1986, FIA is a pioneer in forestland investment, managing over two million acres of forestland in North and South America. While FIA's early investment footprint was the U.S. south, today we manage forestland in all the primary timber growing regions in the U.S. and are active in South America – primarily Brazil and Chile. Headquartered in Atlanta Georgia, FIA is a majority employee-owned firm with 53 dedicated employees located in 8 offices in North and South America. A few key statistics include:

- We currently manage **21** separately managed accounts and four closed-end comingled funds
- FIA has **4.7 billion dollars** of forestland assets under management
- We have over **158 million** tCO_2e of carbon sequestered in our forests around the globe

- FIA managed forests provide recreational opportunities, clean air and water, wildlife habitat, and rural jobs in the areas where we operate
- We engage in, and support a range of research and technology projects and efforts that contribute to the sustainable management of our forests
- FIA has planted over **400 million trees** since starting to manage forestland in 1986

- We work hard at improving forest productivity through the utilization of intensive forest management practices
- FIA is a client-focused firm striving to provide excellent customer service on forestland investments
- We are a forester-centric firm with approximately half of our **53 employees** having professional forestry degrees.

Research at Forest Investment Associates

FIA has been and continues to be active in the forestry research and development sector around the globe. As an early TIMO participant in academic / industry forestry research cooperatives, FIA funds research at many Universities around the globe. These long-term relationships have produced the knowledge and technology to greatly improve forest productivity in plantations as well as the naturally regenerated hardwood forests we manage in North and South America. Additionally, where appropriate FIA has funded specific proprietary research that has also contributed to our ability to increase forest productivity and client returns. We view these activities as part of the forest sustainability puzzle . . . to apply the correct technology across the landscape to increase productivity and sustainability.

Conservation – an important part of forestland management at FIA

Forests are the natural habitat for many species of plants and animals. As part of our forest management plans, FIA foresters work hard to create, maintain, and increase the quality of our forests for the benefit of the naturally intrinsic plant and animal communities that live in them. In other cases, we engage in efforts to understand how new exotic species or native species that have become more abundant impact these ecosystems. Below are a few examples of conservation projects that contribute to our forest management plans.

Impacts of coyote (*Canis latrans*) abundance.

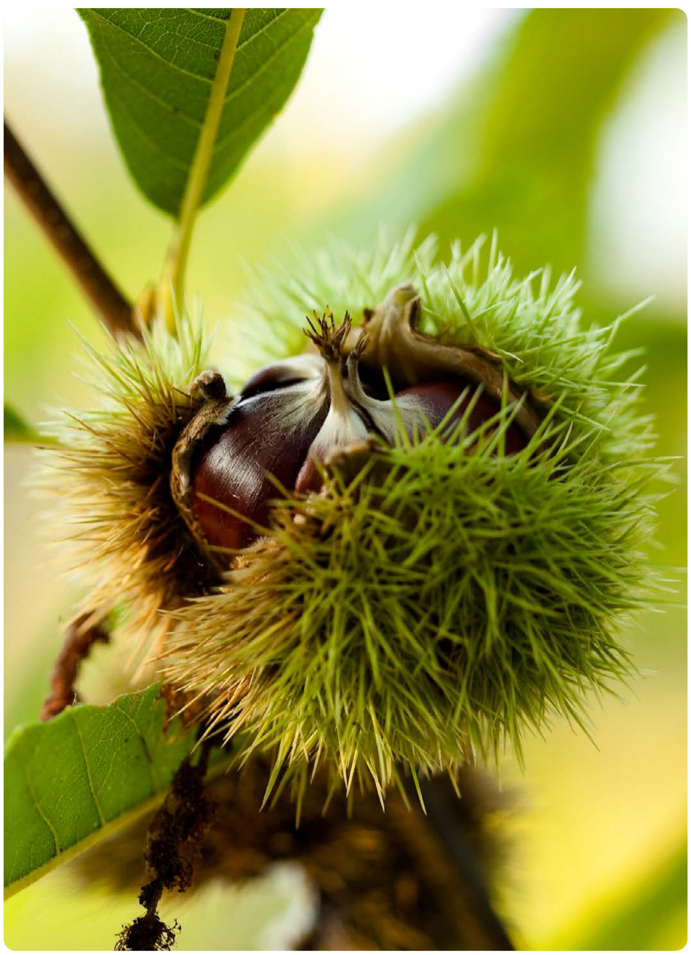
Researchers from the University of Georgia, funded by the SCDNR, are looking for private landowners around the Liberty Hill area of upstate South Carolina willing to allow land access for a coyote population study. The project will use coyote scat, collected along gravel/dirt roads, to estimate coyote abundance. Researchers are sampling around 50 miles of gravel/dirt roads every three days. DNA from the scat samples will be used to estimate coyote numbers across the Liberty Hill region. This research studies coyote populations across a large geographic area to better understand variations in coyote numbers in South Carolina.

Managed Forests for Birds – a large, multi-institutional avian conservation study

Throughout 2019, we continued to work with American Bird Conservancy, Sustainable Forestry Initiative and 11 other SFI program participants, National Council for Air and Stream Improvement, and Avian Research and Conservation Institute in our Managed Forests for Birds partnership. Highlights include completion of 518 breeding bird survey points conducted by scientists and volunteers in NC, FL, AL and MS that documented a great diversity of bird species – over 86 different species - using sustainably managed forests and demonstrating the value of forests managed to both the Forest Management and Fiber Sourcing SFI standards. Ten bird species of conservation concern that have been the focus of the partnership were detected including Swallow-tailed Kite, Northern Bobwhite, Wood Thrush and Prairie Warbler. In addition to adding important data that improves our understanding of the biodiversity supported by sustainably managed forests, the surveys serve as important outreach and communication mechanisms, particularly the volunteer-conducted avicaching surveys that direct birders to managed forest areas not typically visited by recreational observers. Other activities include development of population estimates for focal bird species across the Southeastern U.S., testing of data layers and other tools that can inform management decisions, and a second printing of the guide, Bird Friendly Forests: Opportunities for Private Forest Owners in the Southeastern United States.

Insect communities and their importance in plant pollination

FIA is cooperating in a multi-institution research study to help answer questions of how do attributes of forest structure and composition within stands relate to characteristics of wild insect pollinator communities. The project has two central objectives: 1) document populations and communities of wild insect pollinators in various ages of working forests; and 2) correlate measures of stand-level structure and composition with insect pollinator populations and communities. This is a multi-site, multi-year study that has provided substantial data to address the impacts of working forests on these pollinator communities.



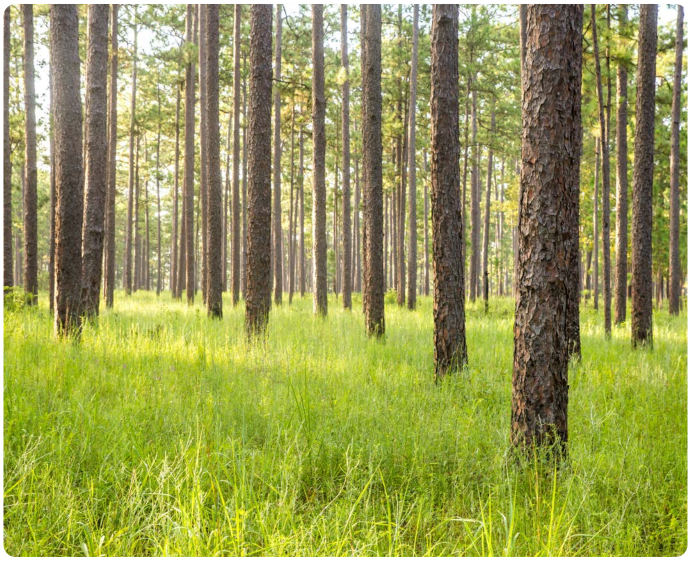
The development and reintroduction of the American Chestnut (*Castanea dentata*)

FIA has worked with several organizations in the development of a blight resistant American Chestnut to use in the reintroduction of this important species. The American Chestnut was a major component of natural forests in the eastern U.S. until the introduction of the Chestnut blight around 1900. Over the next 40 years, almost all mature American Chestnuts succumbed to the disease. Today, through breeding and gene insertion techniques several resistant strains of the American Chestnut have been developed. FIA foresters have participated in the out-planting and monitoring of these test plantings. From our Northeast forests down through the Appalachians into Georgia, we have participated in American Chestnut reintroduction projects and continue to monitor results.

Recovery of Longleaf Pine (*Pinus palustris*) ecosystem

For many year FIA foresters have worked to recover longleaf pine ecosystems throughout the south. Originally covering over 90 million acres in the lower southern U.S., the Longleaf Pine ecotype was a dominant part of the landscape. Today, about 4 million acres of this forest type survive. FIA has been an active supporter of the Longleaf Alliance and other Longleaf Pine restoration projects. We manage many sites around the south where the Longleaf Pine ecosystem has been reserved, recovered, and saved for future generations.

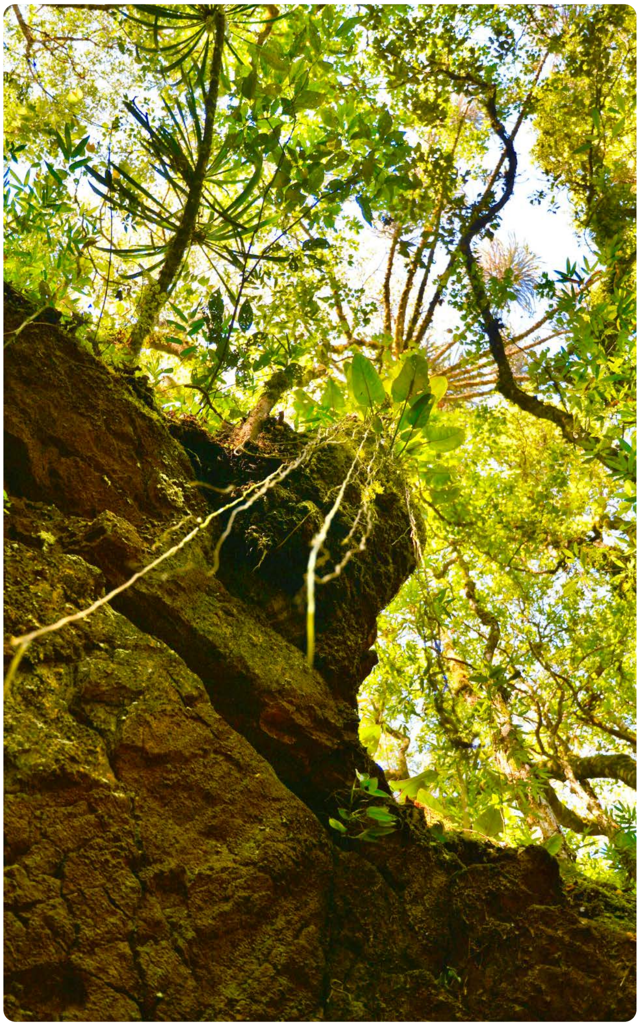
These projects, along with many others are a primary focus for Forest Investment Associates' Environmental, Social, and Governance (ESG) efforts. As a firm, we continue to identify and participate in projects that contribute to the importance of working forests. A mixture of forest management techniques and intensities allow FIA foresters the flexibility to pursue a wide array of objectives across the forested landscape. In some cases, these objectives lean toward intensively managed plantations and maximizing client returns while in other cases are more focused on creating and maintaining rare ecosystems that contribute to objectives like species diversity, clean and plentiful water, or carbon sequestration. Our view is one that weaves together these differing forest management objectives into a cohesive, socially responsible forest management philosophy.



FIA's Environmental Stewardship Extends Across the World

On behalf of its clients, FIA manages sustainable timberland properties in the Brazilian state of Paraná. An area protected as a Private Reserve of Natural Heritage ("PRNH") is a part of this operational footprint. The PRNH was officially registered on April 20, 2010 under prior management and named after one of the first foresters responsible for the area (Leon Steir Von Linsingen). The main objective of the PRNH's Management Plan is **the protection of natural resources** and to promote research and restoration of the natural area to maintain proper ecological function.

Private Reserve of Natural Heritage



Name: Leon Steir Von Linsingen

Location: Guarapuava, Paraná in the Environmentally Protected Serra da Esperança region ("EP Serra")

Total PRNH area: 1,169 acres

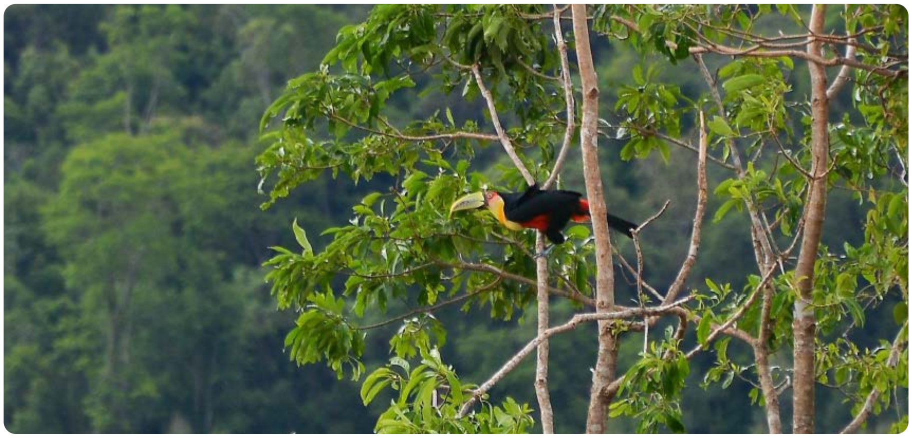
Biome: Atlantic Forest ("Mata Atlantica")

Ecosystem: Ombrófila Mista Forest

Wildlife: based on secondary and primary level data from the EP Serra region and PRNH studies

- 23 species of fishes
- 9 families of amphibians
- 42 species of reptiles
- 295 bird species with 115 registered during field work conducted in the EP Serra
- 21 species of mammals registered

In 2009, the Environmental Institute of Paraná ("EIP") created the State Roadmap for PRNH, which aims to guide and facilitate the development of Management Plans for these important conservation areas. FIA has worked with stakeholders across the landscape as we execute on the Management Plan to ensure this important area is available for generations to come. Managing conservation areas in this way provides a landscape level solution to meeting society's need for wood fiber since sensitive areas such as the Leon Steir Von Linsingen PRNH are conserved while timber production is focused on more intensively managed areas of the landscape.



Carbon Sequestration and Carbon Markets

Over the past ten years, FIA has continued to expand its carbon monitoring and carbon market participation. On behalf of clients, we have engaged in selling carbon credits on the California Climate Exchange and continually evaluate new carbon opportunities as they arise. FIA works with several carbon offset originator firms to meet our environmental finance objectives. We have taken a careful and measured approach to the carbon offset projects at FIA and believe that these programs must be properly integrated into the range of forest management objectives for any forest. Some forests have far greater carbon opportunities than others.

Much of our initial work in this area has involved simply quantifying carbon stocks and how they are changing in FIA managed forests. Our forest management information system now treats carbon stocks in the same way as primary forest products that are grown on our clients' properties. We report carbon stocks quarterly just as we do forest inventories.

Increasingly, forest carbon is one of the few ways to economically combat increasing CO2 levels in the earth's atmosphere. Today, many firms are interested in quantifying their carbon footprint. Investment firms are interested in assembling carbon budgets that reflect their underlying investments. Forestland investments are particularly interested in these activities due to the large amounts of ways to positively contribute to carbon sequestration – particularly if "down-stream" carbon stock impacts are quantified. Wood-based building products represent one of the few opportunities to utilize a renewable carbon-based product that is low cost and requires low amounts of energy to produce. When compared to concrete or steel in the building process, wood is clearly the environmentally friendly option. As emphasis on firm-level carbon footprints becomes increasingly important, forestland investments provide exciting alternatives to "move the carbon needle" quickly and efficiently.

Currently FIA managed forests around the globe sequester over 150 million tonnes of CO2 equivalents. The growth alone on these forests sequesters enough carbon annually to offset approximately 2 million cars or build about 158,000 houses. Young, fast growing plantations contribute the most carbon while older, mature forests do little for increasing carbon stocks. Below are the carbon stock estimates by operating region for FIA managed forests.

Carbon offset markets will continue to expand and evolve to reflect the importance of forest-based carbon in meeting a global carbon objective and climate solution. FIA plans to continue to carefully track and participate in carbon offset markets where reasonable certainty exists and prices are compelling. It is unclear at the present time how quickly carbon credit prices may change in the near-term.

	Acres	tCO2e
US South	1,464,145	129,291,155
US Northeast	174,077	14,205,941
US PNW	210,461	12,297,481
Brazil	159,472	1,755,722
Chile	63,505	535,857
TOTAL		158,086,157

Firm Governance

Over the past several years FIA has worked hard to further improve our corporate governance. Forest Investment Associates management structure functions through four key committees and our Board of Directors. The Executive Committee runs the day-to-day business and is comprised of leaders of our six functional teams. These teams include the Client Relations and Business Development Team headed by Scott Bond, the Real Estate Transaction Team headed by Andrew Boutwell, the Portfolio Management Team headed by Mike Clutter, the International Team headed by Mike Cerchiaro, the Client Accounting Team headed by Sam Grice and the Administrative Team headed by Christina Purcell. The Investment Committee oversees major client investment decisions with emphasis on acquisitions and dispositions of portfolio investments. The Executive and Investment Committee are chaired by FIA's President, Marc Walley. We have recently added two other committees - the Stewardship Committee to oversee ESG, UNPRI and sustainability aspects of our business; and the Risk Management Committee to monitor risk within our business environment. The Board of Directors is comprised of five members, four current employees and our past President, Michael Kelly, who is Chairman. Across the FIA governance spectrum, we aspire to be inclusive in our decision-making structure and believe that the best decisions made are those that are reached by broad consensus.

FIA is a majority employee-owned firm. We strive to limit the maximum ownership of any single employee to 10% of the firm. We have eight limited partners that own 30% of FIA but have no voting rights or management control. FIA has developed an equity succession plan that allows older / retiring employees to transact shares with younger / newer employees in such a way as to further facilitate broad employee ownership.

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