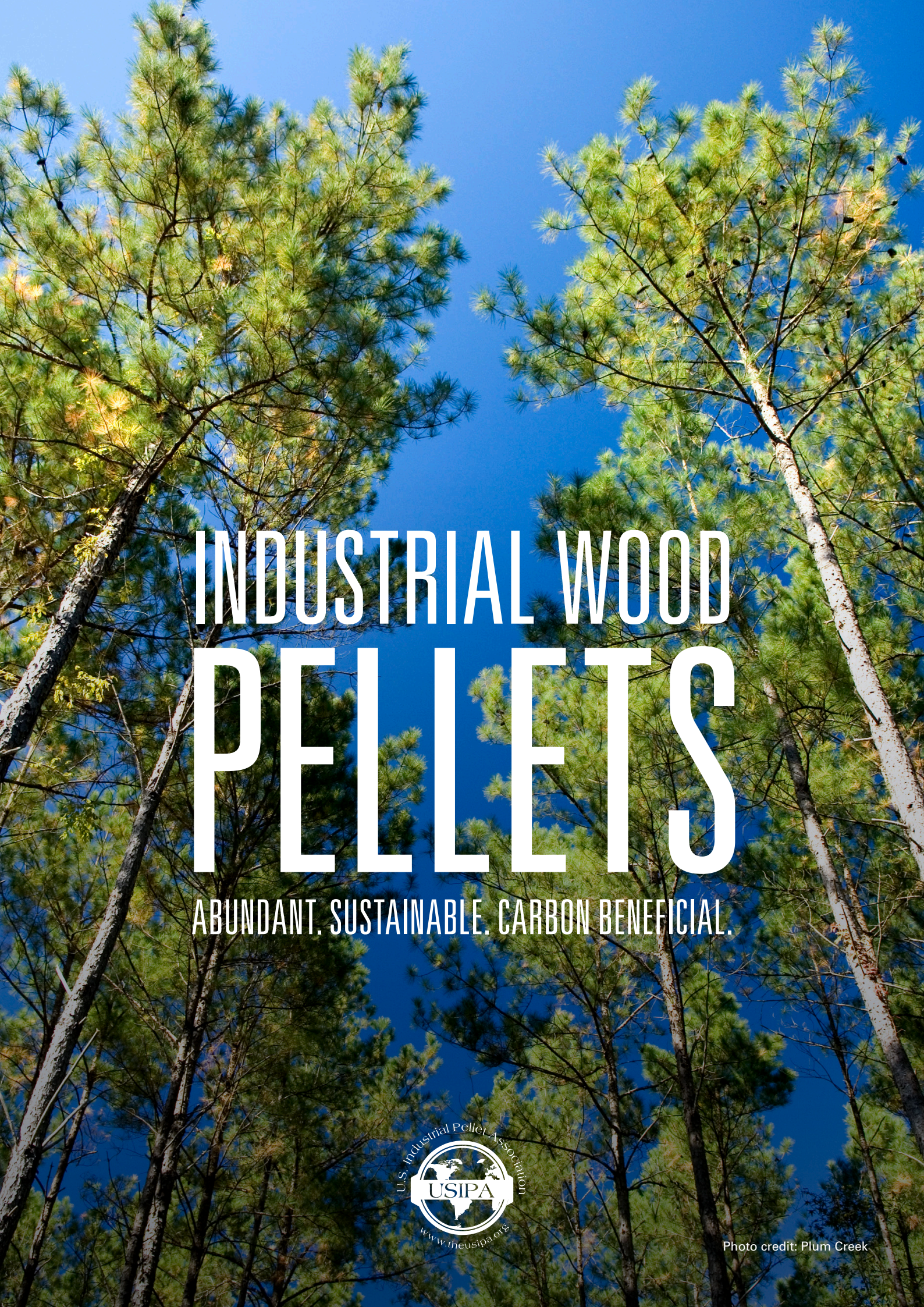

INDUSTRIAL WOOD
PELLETS
ABUNDANT. SUSTAINABLE. CARBON BENEFICIAL.
U.S. Industrial Pellet Association
USIPA
www.theusipa.org
Photo credit: Plum Creek

U.S. FORESTS ARE GROWING

The United States helps meet the world's demand for renewable, carbon beneficial wood pellets through a strong and growing forestscape that is protected by rigorous federal and state laws, contractual obligations, independent sustainability certifications and third party audits.

A Growing Resource for Our Future

The United States has more than 751 million acres of forest—accounting for 37.6% of its landmass—that supports a quarter of the world's forest production.

The total acreage devoted to U.S. forests has barely changed over the last century. Despite rapid population growth and increased demand for timber, the number of trees in U.S. forests has increased every year for more than 50 years. So has the amount of carbon these forests remove from the atmosphere.

Unlike Europe, private landowners control 56% of all U.S. forests, and 86% of those in the southeast, which accounts for most of the U.S. pellets produced for export to Europe. The net volume of trees per acre in that region has increased 94% since 1953.

USIPA members are guided by a culture that values sound forest management practices that produce forestry products while safeguarding environmental values and maintaining healthy growing stands that capture carbon from the atmosphere. A robust industrial wood pellet market helps ensure the removal of more greenhouse gases.

U.S. forests are protected by a combination of statues, regulations, and certification programs that ensure best management practices are in place to reduce environmental impact. Stiff civil and criminal penalties help ensure that wood for industrial wood pellets, along with other forestry products, is harvested sustainably. These protections include but are not limited to:

FEDERAL LAWS AND REGULATIONS

- Clean Water Act
- Clean Air Act
- Endangered Species Act
- Migratory Bird Treaty Act
- Coastal Zone Management Act
- Lacey Act

STATE LAWS AND REGULATIONS

- Water Quality Management
- Established Forest Industry Best Management Practices
- Wetlands Protection
- Zoning and Landscaping Ordinances

INTERNATIONAL CERTIFICATIONS

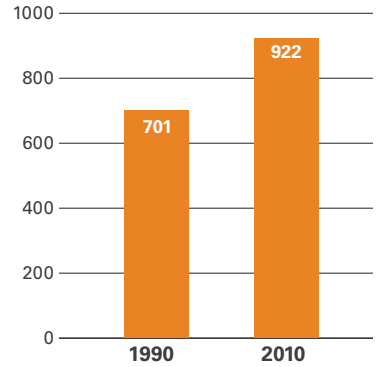
FSC · SUSTAINABLE FORESTRY INITIATIVE · PEFC · GGL green gold label

A Carbon Beneficial Cycle

Landowners and producers work together to harvest wood in a sustainable manner. Thinning and rotational harvesting are common practices that contribute to a continuous cycle of new growth. This creates the opportunity for younger

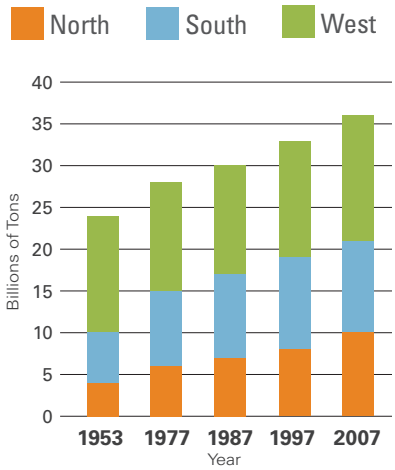
With **751 MILLION ACRES** of forest, European demand for industrial wood pellets will not affect net forest growth in the United States.

Increased forest-related CO2 sequestration in the U.S. from 1990 to 2010



Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2010, 2012, Table 7-1

Growing forest acres for U.S., all species, public and private ownership of timberlands



US Forest Service (RPA Assessment) Smith et al. 2009

trees to sequester more carbon dioxide than those they replace. Even though most reforestation in the southeastern United States occurs naturally, many landowners replant trees. Unmanaged forests can become net carbon emitters because of fire and infestation.

Sustainable Practices are an Integral Part of the Industry

The environment factors into every decision USIPA members make about the sourcing of wood fiber for biomass.

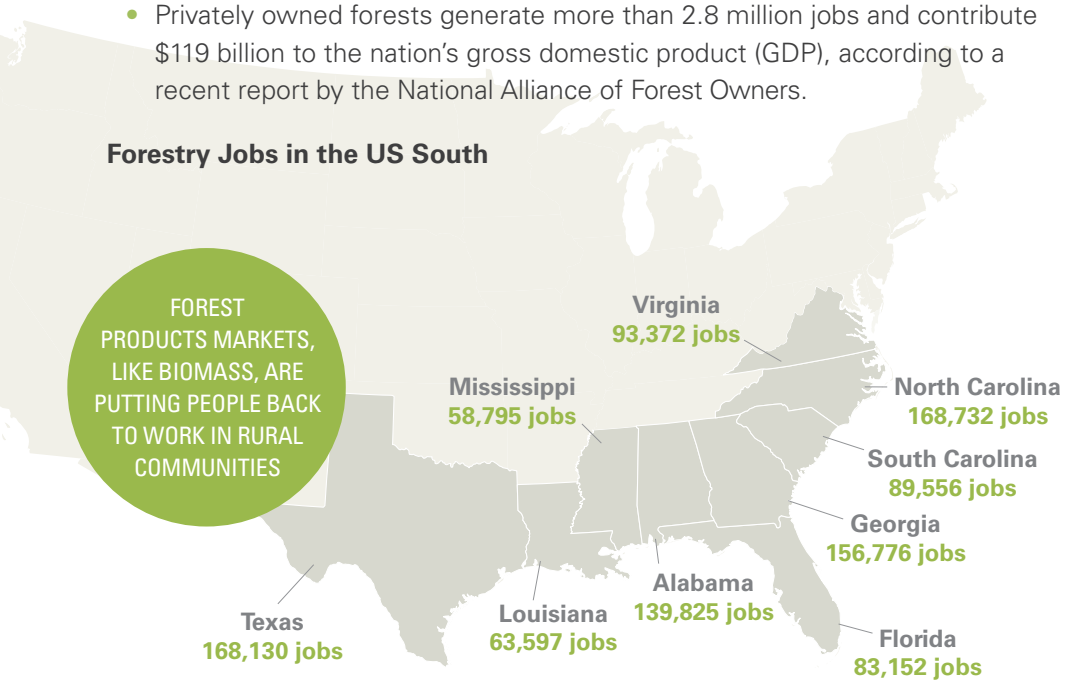
- Harvesting is concentrated in the southern United States, which has a short timber rotation because trees naturally regenerate and grow quickly in the region's warm, moist climate.
- Loblolly pine, the dominant softwood, has a high rate of carbon absorption that begins to drop after year 15. That is when the first harvest takes place in a typical forest management program.
- Producers reduce transportation-related emissions by sourcing from nearby forests, usually within 50 to 75 miles of their production facilities.
- Most pellet plants are located near ports that serve ships bound for Europe.

Industrial Wood Pellet Markets are Contributing to the Revival of the Forest Products Industry

Working forests require markets, including energy markets for low-quality wood fiber. These new markets for wood fiber create powerful incentives to maintain forests for generations to come.

- According to the U.S. Forest Service, 25% of all forest sector mills in the U.S. South have closed since 2005 and the demand for forest products has decreased since the economic downturn.
- 87% of forests in the southeast are owned by small forest owners. Timber markets, now made stronger with the biomass-to-energy market, provide economic incentives to ensure that landowners keep their forests well maintained, and do not sell or convert their land to other uses.
- Privately owned forests generate more than 2.8 million jobs and contribute $119 billion to the nation's gross domestic product (GDP), according to a recent report by the National Alliance of Forest Owners.

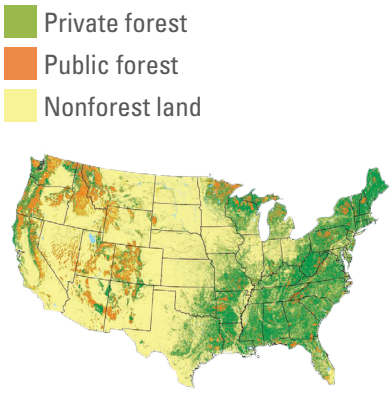
Forestry Jobs in the US South



"IN THE LAST 20 YEARS ALONE, FOREST LANDOWNERS HAVE PLANTED MORE THAN 4.4 BILLION TREES."

— Alabama Gov. Robert Bentley

Forest Ownership in the United States (2006)



Forest area – USGS National Land Cover Database 2001; Ownership – CBI Protected Areas Database, Version 4.0; State and counties – ESRI Data & Maps 2006

"[WOODY BIOMASS] PROVIDES A RELIABLE ENERGY SOURCE WHILE PROVIDING OPPORTUNITY FOR MY STATE, AMONG OTHERS IN THE SOUTHEASTERN U.S., TO PUT PEOPLE BACK TO WORK."

— Georgia Gov. Nathan Deal

WOOD FIBER SOURCES

USIPA members are committed to sustainable sourcing practices for the wood fiber that serves as the raw material for the renewable, carbon-beneficial industrial wood pellets they produce for their customers.

Industrial wood pellet producers turn low-value wood fiber into pellets. The most common sources are forest residues, thinnings, tree tops and limbs, and low-quality wood that is unwanted by other industries.

"WOOD BIOENERGY PROJECTS POSE NO NEGATIVE IMPACT [TO FOREST SUPPLY] AT A REGIONAL LEVEL."

— Independent report commissioned by the National Alliance of Forest Owners

What Goes into Typical Wood Pellet

MILL RESIDUES

Mill residues include bark and sawdust that would otherwise go to waste, either on the forest floor or at a mill.

TOPS & LIMBS

Treetops and limbs are unusable byproducts of sawtimber harvesting that cannot be turned into lumber.

THINNINGS

Thinnings are smaller, weaker or deformed trees that commercial foresters remove on a regular schedule to allow remaining trees to grow for higher value sawtimber.

LOW-QUALITY WOOD

Low-quality wood does not meet the standards for processing as lumber because it is undersized, misshapen or has other negative characteristics like rot or infestation.

WOOD PELLETS

U.S. forests are not being clear-cut for industrial wood pellets. This renewable energy is sourced from byproducts of other forest industries. Pellet producers make full use of what others leave behind.

Producers avoid using sawtimber for industrial wood pellets because it costs five to six times more than waste and pulpwood. It is not economical to use sawtimber for wood pellets.

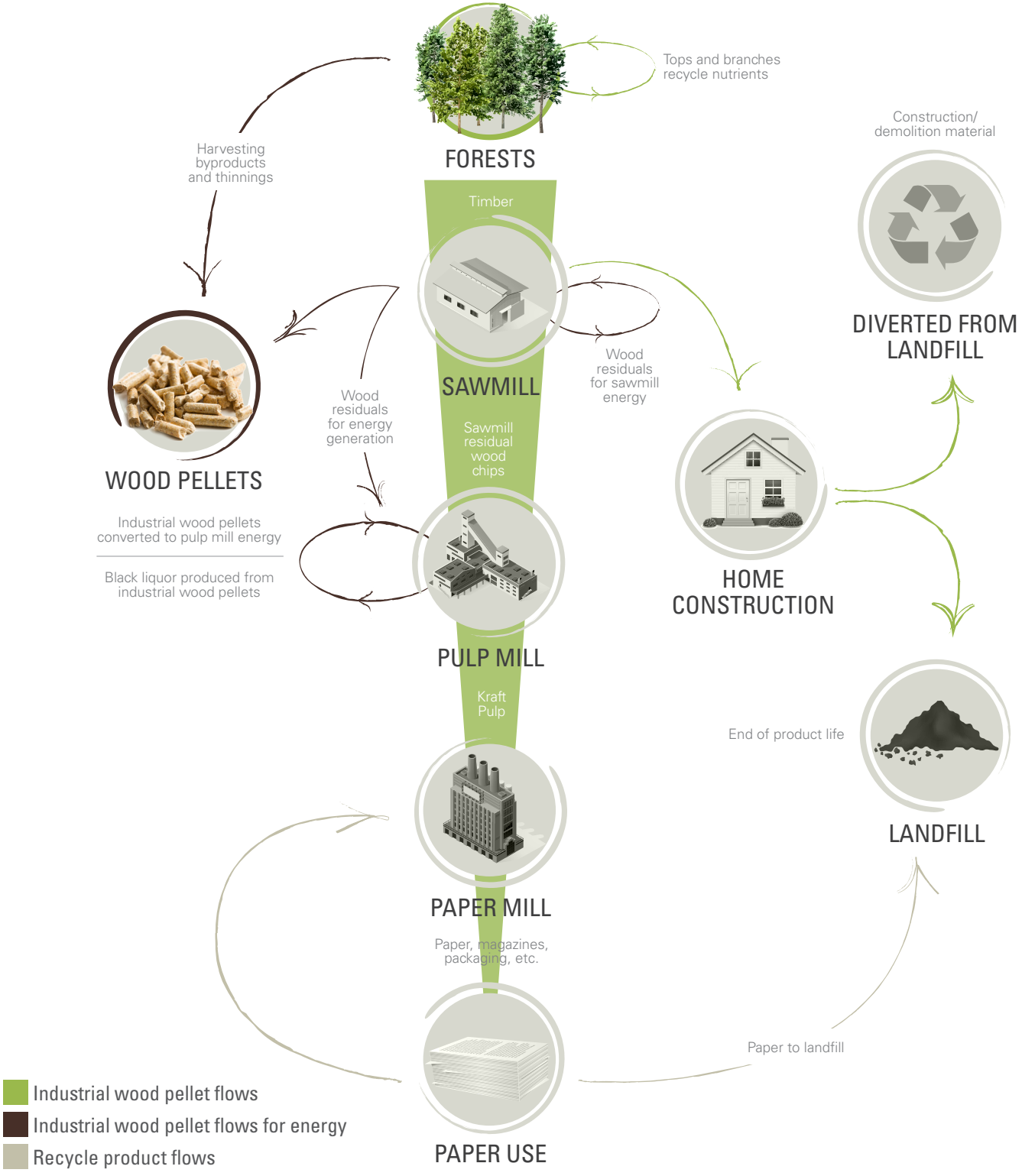
Pellet producers avoid using sawtimber.

FOREST PRODUCTS CHAIN

While industrial wood pellets are a vital part of the energy mix, they still only account for a tiny portion of the products that the U.S. forest industry produces each year. The vast majority of harvested wood goes into other forest products. Because USIPA members use the lowest quality wood fiber, these environmentally responsible businesses make it more profitable for landowners to maintain their forests by creating new demand for thinnings, residues, low-grade logs and other byproducts that would go to waste.

IN 2023 DEMAND FOR PULPWOOD AND LOGGING RESIDUE WOOD USE FROM VIABLE BIOENERGY APPLICATIONS COULD BE 4% OF THE TOTAL WOOD USE OF THE FORESTRY SECTOR.

— Analysis of U.S. wood bioenergy markets conducted for NAFO



MYTH VS. FACT

The Truth about the Environmental Benefits of Industrial Wood Pellets

Wood pellets and other forms of sustainably produced biomass represent a move toward greener power sources, offering a carbon beneficial option for progressive utilities that seek to reduce their reliance on fossil fuels while still providing consistent energy to meet customer demands.

Myth: *"The United States lacks adequate protections for its timberland."*

Fact: The U.S. leads the world in sustainable forest practices. Thanks to these practices, forest volumes have been increasing for the past 60 years. A comprehensive framework of laws, regulations and best practices developed over decades governs the activities of forest owners and professional foresters. Many landowners choose to exceed basic protections by adhering to the standards set by internationally recognized organizations such as the Forest Stewardship Council (FSC), Programme for the Endorsement of Forest Certification (PEFC), and other groups devoted to protecting woodlands.

As a direct result of these protections, forest cover and carbon sequestration are steadily increasing in the United States. Current forest cover is within 1% of where it was 100 years ago. Forest carbon sequestration in the United States has increased 31% since 1990, jumping to 922 million metric tons in 2010.

Softwoods are the predominant species in the parts of the United States that supply wood fiber to the industrial wood pellet industry. Loblolly pine, for example, grows fast in the warm, moist environment found in the southern United States and reaches its peak CO_2 absorption during year 15. That is about the time when forests are thinned to allow higher value sawtimber to keep growing. These thinnings are just one of the feedstocks used by the pellet industry.

Myth: *"Burning industrial wood pellets is worse for the environment than coal."*

Fact: Industrial wood pellets are much better for the environment than coal or any of the fossil fuels that legacy power plants use to produce electricity. In fact, according to the UK Environment Agency, switching to wood pellets from coal has been shown to reduce carbon emissions between 74 – 90%.

Studies by the National Renewable Energy Lab (NREL), U.S. Environmental Protection Agency (EPA) and National Council for Air and Stream Improvement (NCASI) have shown that co-firing industrial wood pellets alongside coal reduces emissions of air pollutants like ash, nitrogen, sulfur, mercury and other pollutants that are harmful to the environment. Wood pellets also have lower concentrations than coal of trace metals including

arsenic, beryllium, cadmium and lead. Burning wood pellets releases less of these harmful elements and metals into the atmosphere than fossil fuels.

An analysis described in the *Journal of Forestry* "found that the global warming potential for a cradle-to-grave analysis was greater for coal than for woody biomass." (Journal of Forestry, October/November 2011)

By using wood pellets, European utilities are relying less on coal and other fossil fuels that emit carbon that was sequestered deep in the earth. That is a win for the environment.

Myth: *"Industrial wood pellet companies clear-cut forests and rely on whole trees to produce pellets."*

Fact: Industrial wood pellet producers rely on low-quality wood or forestry remnants to produce pellets. Forests are never harvested just to produce industrial wood pellets. They are a byproduct of other industries and create value out of forest materials that frequently lack other markets, including:

Forest Thinnings

- Many landowners engage in thinning, a common best-management practice that is akin to weeding a garden or maintaining cropland.
- Thinning clears out the smaller (and sometime less healthy) trees to ensure the remaining trees receive enough sunlight and nutrients from the soil to promote growth.
- The material that foresters remove from the forest during thinning is typically not suitable for use as lumber because of size, condition or shape. USIPA members create a market for this wood fiber, preventing it from going to waste and providing additional revenue to landowners.
- The U.S. Department of Agriculture Forest Service recognizes thinning as an acceptable practice that keeps forests healthy.

Wood fiber that lacks a local market, that other industries leave behind or that cannot be used for lumber because of shape or size

- The economics of the forest industry encourage landowners to grow large trees that yield the highest value products, such as lumber for homes or furniture. When a landowner decides to harvest all or part of their forests, they do so to sell the trees that are usable for lumber because of the high value of this fiber. These trees are the "money maker" for the forest owner.
- The specifications for lumber require that harvested trees be a certain length and radius and that they be free of disease and deformity. Tops and limbs and rotten or deformed trees cannot be used to make lumber and are considered waste.
- These waste products are left on the forest floor to rot, or are sold to other industries if one exists in the marketplace. Most of USIPA's members have located their plants in an area where mills or paper manufacturers do

not exist, or have closed, thereby creating a market for the leftover products that may otherwise be left behind in the forest, leading to decay and increased chance of forest fires and disease.

Myth: *"Alternatives to wood pellets are readily available."*

Fact: Of the many forms of renewable energy, industrial wood pellets stand alone as a reliable source of baseload power generation that can be scaled to meet demand from consumers.

Wind and solar projects are a viable long-term solution, but they are capital intensive and can take years to bring online. Industrial wood pellets are available today. By converting furnaces at existing plants, utilities can reduce carbon emissions and wean themselves off coal with relative ease and efficiency not always possible with other renewable energy sources. As an added bonus, wood pellet costs are stable and help keep rates low for consumers because there is no need for costly infrastructure improvements.

Over the long haul, industrial wood pellets are a complementary technology and its use is intended to work alongside other energy sources like wind or solar to both balance the grid and help countries reduce greenhouse gas emissions.

Myth: *"The wood pellet industry is creating incentives for landowners to cut down trees."*

Fact: Industrial wood pellets are driving the conservation of forested land across the southern United States. This industry is creating economic incentives for the private landowners, who control most of the region's forests to maintain wooded areas instead of converting them for other uses, such as agriculture or development.

In the southern United States, which produces most of the pellets that the U.S. exports to Europe, the net volume of trees per acre has nearly doubled over the last half-century. Net forest growth in that region has also exceeded removals on a consistent and long-term basis.

Despite lower demand for forest products during the economic downturn, European demand for industrial wood pellets is giving private landowners an incentive to maintain healthy, working forests.

When existing markets for their products are strong, or when new markets like industrial wood pellets emerge, they provide forest owners with the means to keep their land forested by investing in tree planting and other sustainable practices that make forests economically competitive with other uses.

CARBON ACCOUNTING

The Environmental Benefits of Industrial Wood Pellets

Wood pellets contribute to the fight against climate change by displacing fossil fuels and promoting balance in the natural carbon cycle.

The benefits of reducing the world's reliance on fossil fuels have been well-documented. Life-cycle assessments based on realistic scenarios and reasonable assumptions show that any increase in greenhouse gas emissions from industrial wood pellets is far outweighed by the carbon savings that these systems produce over time.

U.S. FORESTS AND ASSOCIATED INDUSTRIES CURRENTLY PROVIDE THE LARGEST ANNUAL REDUCTION OF CO_2 EMISSIONS OF ANY LAND USE IN OUR NATION.

— U.S. Forest Service report

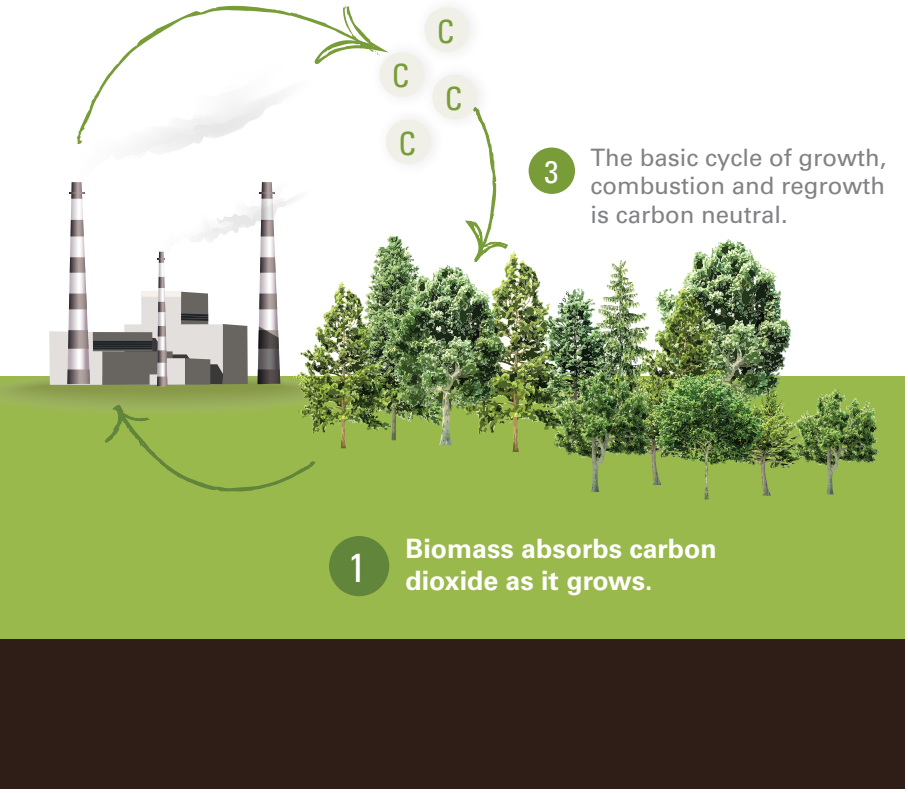
Forests & The Natural Carbon Cycle

CO_2 molecules are the same, regardless of where they come from. But burning fossil fuels to produce electricity releases carbon that would have remained sequestered in the ground for millions of years. It is a one-way process that adds greenhouse gases to the atmosphere and fuels climate change.

Wood pellets, on the other hand, are part of a natural process known as the biogenic carbon cycle. Trees absorb CO_2 as they grow. That same CO_2 is released during the

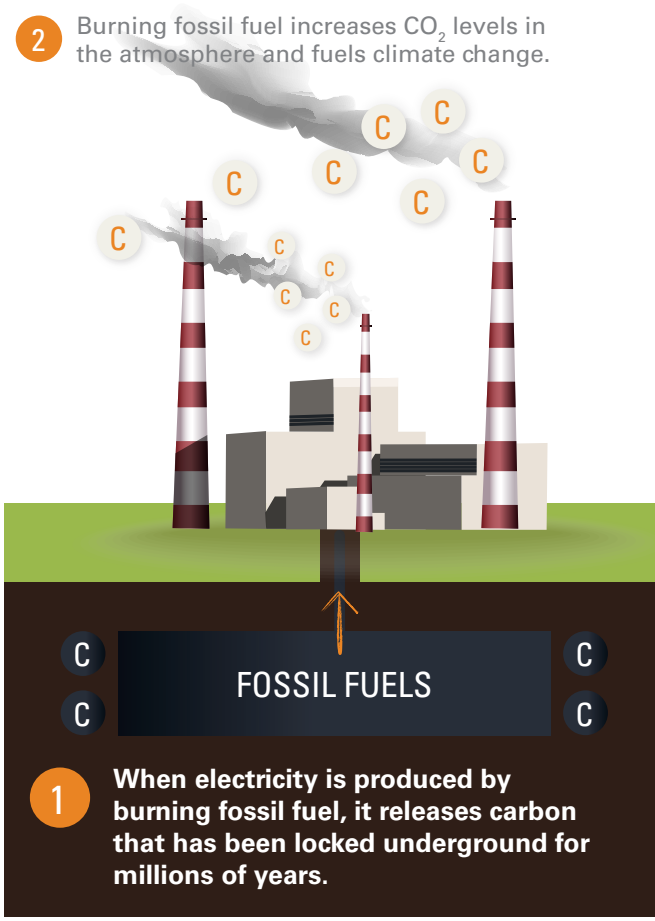
Woody Biomass: Part of a Natural Carbon Cycle

2 When wood pellets burn they simply release the same CO_2 they absorbed in the forest.



Fossil Fuels: Adding Carbon to the Atmosphere

2 Burning fossil fuel increases CO_2 levels in the atmosphere and fuels climate change.



combustion process and an equivalent amount — or even more — is removed from the atmosphere as the forest regenerates itself.

When the carbon cycle is balanced, the use of wood pellets does not result in a net increase in atmospheric CO_2 levels. In fact, as land owners continue to plant trees and increase inventories in response to demand, the industry is expected to have a positive impact on greenhouse gas levels over the long term.

Forest Sustainability & Carbon Balance

Carbon accounting is the process for estimating the addition or subtraction of CO_2 in the atmosphere. There is a growing body of research incorporating established carbon methodologies which shows that industrial wood pellets are beneficial for the environment when compared to fossil fuels.

U.S. CO_2 EMISSIONS SEQUESTERED IN FORESTS AND ASSOCIATED WOOD PRODUCTS IN 2011

The central finding of a peer-reviewed report prepared for USIPA is that when realistic assumptions based on standard industry practices in the southeast are applied, replacing coal with wood pellets delivers substantial carbon savings over time (European Biomass Association et al., 2013). Further, there is a critical difference between a small and temporary "carbon debt," when one might exist, and the permanent reductions that come from using wood pellets instead of fossil fuels that release carbon into the atmosphere that would otherwise remain sequestered in the Earth.

The USIPA report shows that some earlier carbon-accounting studies that focused on industrial wood pellets incorporated modeling assumptions that do not correspond with actual industry practices. Those findings were influenced by unrealistic assumptions about wood sources and production levels, as well as choices about how long it takes the forest to regrow and reabsorb carbon that is released during combustion. These studies also failed to account for the environmental efficiencies that industrial wood pellets industry has introduced into its supply chain.

Given the impact of these variables on study conclusions, it is essential for policymakers and other interested parties to exercise great care in interpreting such research.

Realistic Models Show Benefits of Industrial Wood Pellets

When based on current industry practice, model results show zero or very short time periods before net greenhouse gas reductions are achieved.

In fact, even studies widely reported to have determined the existence of carbon debts and long carbon payback periods acknowledge near-term carbon benefits to use of wood residues and logging wastes in energy generation (Manomet 2010, Agostini et al. 2013).

Because wood pellets are sourced largely from forest byproducts or sawmill residues, their use which introduces no, or only small, changes in the amount of carbon stored in U.S. forests.

Given that annual net growth in the forests of the southern United States far exceeds total removals, carbon stocks are clearly not declining due to industrial wood pellet uses.

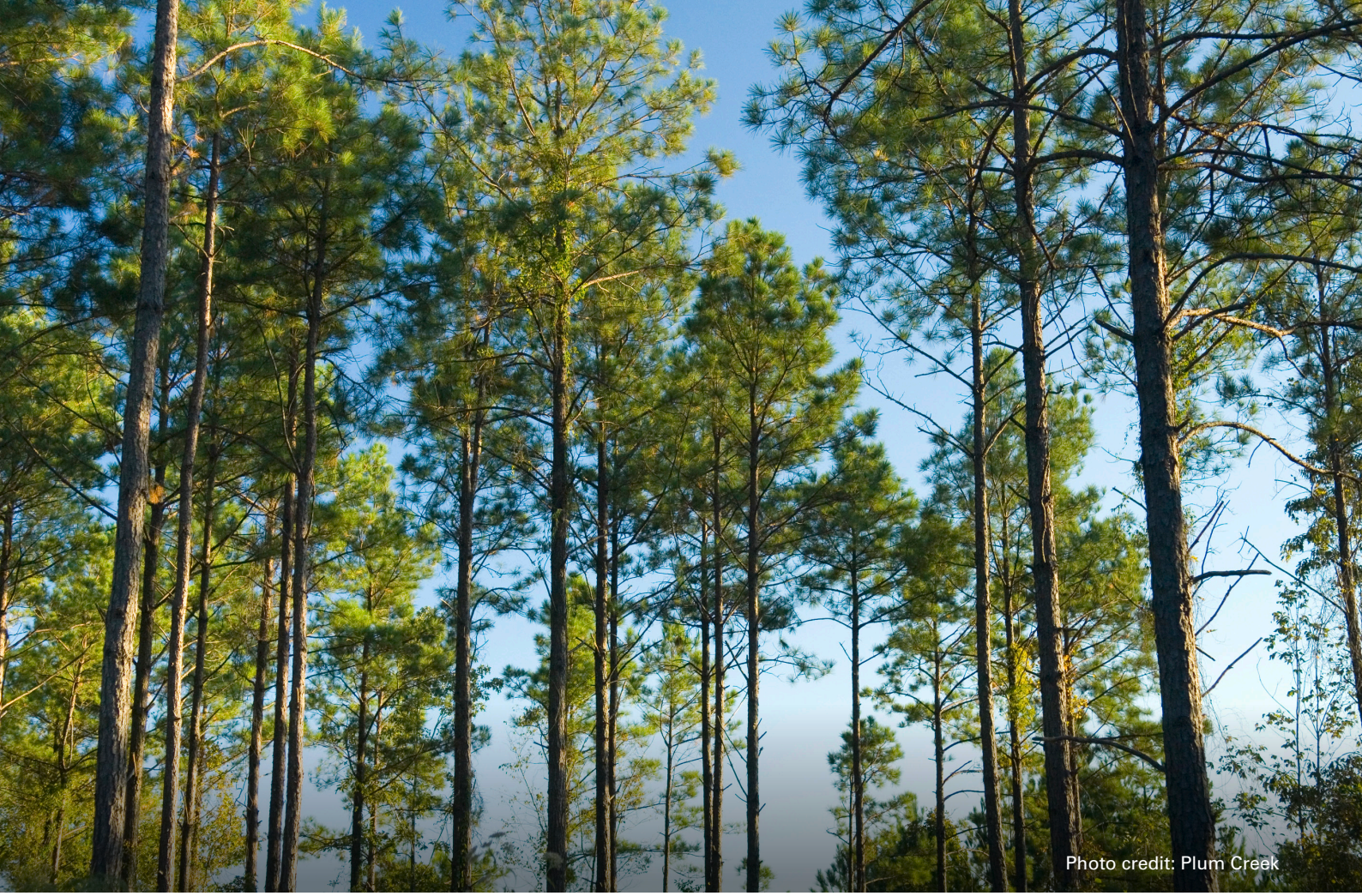


Photo credit: Plum Creek

INDUSTRIAL WOOD PELLETS: THE SUSTAINABLE ALTERNATIVE TO FOSSIL FUELS

USIPA members are environmentalists who rely on sustainable forest management practices to produce carbon beneficial wood pellets that help Europe meet its commitments to reduce carbon emissions as part of the global fight against climate change.

Wood pellets are a vital part of the energy mix and provide needed baseload renewable power to Europe. They are good for the environment and carbon beneficial when compared to fossil fuels. Foresters and producers work together to maximize the benefits to U.S. forests while ensuring that emissions remain low during sourcing, production and transport.

Wood Pellets are Good for the Environment

Sustainably produced wood pellets deliver real carbon savings when compared to fossil fuels.

Replacing coal with industrial wood pellets has been shown to reduce emissions of carbon dioxide, sulphur oxides and nitrogen oxides. For example, the U.K. Environment Agency found that switching to industrial wood pellets from coal can reduce carbon emissions 74 – 90%.

Industrial wood pellets are low in sulfur, chlorine and nitrogen. They also have lower concentrations than coal of trace metals including arsenic, beryllium, cadmium, lead and mercury. Industrial wood pellets release much less of these elements into the atmosphere.

When complete replacement is not possible, co-firing industrial wood pellets alongside coal reduces emissions of pollutants such as ash, nitrogen, sulfur, mercury and other polluntants that are harmful to the environment, according to studies by the U.S. Environmental Protection Agency and other government scientists.

Industrial Wood Pellets are an Essential Part of the Energy Mix

As part of its climate-change commitments, Europe set ambitious goals for the reduction of carbon emissions. Because wind and solar projects are time and capital intensive, this goal can only be met if the combination of renewable energy sources includes wood pellets.

Industrial wood pellets from the southern United States are already helping Europe develop a low-carbon economy that meets its renewable energy targets. This complementary technology will help utilities balance the grid as they increase their reliance on solar and wind energy. Industrial wood pellets can be quickly deployed to fill gaps in supply, and easily adjusted to meet daily fluctuations in energy demand.

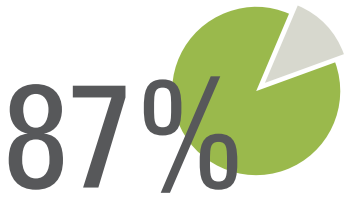
Wood pellets are the only readily available source of renewable energy that is capable of providing consistent energy to meet demand. This renewable resource can also be used in the same furnaces that currently fire coal with minimal investment, enabling utilities to use existing infrastructure without having to spend billions on new technologies and new facilities.

This reduces emissions while keeping electric rates low — and stable — for consumers.

Sustainability is an Integral Part of the Industrial Wood Pellet Industry

With more than 751 million acres of forest, the United States has abundant wood-fiber resources and a long tradition of sustainable forest management.

U.S. forests are protected by a combination of statutes, regulations, certification programs and best practices that are designed to ensure they continue to grow and sequester carbon for years to come.



87%

OF FORESTS IN THE SOUTHEAST U.S. ARE OWNED BY SMALL FOREST OWNERS.

"TIMBER HARVESTING IS COMPLETED IN A WAY THAT IS COMPATIBLE WITH THE **PROTECTION OF WILDLIFE, PLANTS, SOIL AND WATER QUALITY.**"

— Jim Karels, Director of the Florida Forest Service

The Industrial Wood Pellet Market is Contributing to the Growth of Forests that Capture Carbon

- The net volume of trees per acre has increased in all regions of the U.S. for more than 50 years, and the total acreage of forestland is within one percent of what it was 100 years ago.
- Only a small percentage of harvested wood enters the industrial wood pellet supply chain. In 2014, forest removals for wood pellets represented less than 3% of removals across all forest products industries and only 0.08% of total forest inventory in the US South.

Sustainable Practices Maintain Healthy Forests

Industrial wood pellet producers meet the same high standards as every other industry that relies on U.S. forests. The common forest management practices of thinning and sustainable rotational harvesting means there is a continuous cycle of new growth in the forest.

Thinning of forests clears out the smaller, and often less healthy, trees to ensure the remaining trees get the necessary sunlight and soil nutrients, and that new growth continues to occur.

Industrial Wood Pellets Create Jobs

The last decade has been hard on companies and workers that rely on forests. One in four mills in the American South has closed since 2005, and the economic downturn impacted operations at those that remained open. More than 322,805 full-time jobs were lost between 2005 and 2013, according to The American Forest Foundation.

The increased demand for wood pellets from energy producers is stabilizing the industry. It provides powerful economic incentives for landowners to maintain their forests instead of converting their land to other uses, such as residential or commercial development.

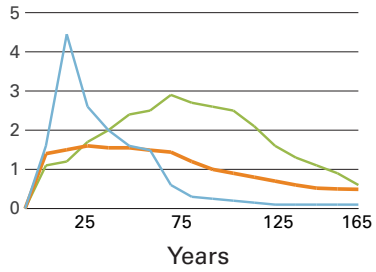
From an economic standpoint, pellet producers must preserve the forests for their own survival. Depleting forests does not support future business success for landowners or forest-product companies.

"Wood pellets, in particular, have given new life to logging companies and foresters throughout the U.S. At the same time, they have helped the E.U. reach its clean energy goals. That's a situation that benefits both sides of our relationship."

— Rep. John Barrow, U.S. House of Representatives, Committee on Energy & Commerce

U.S. FORESTS SEQUESTER A SUBSTANTIAL AMOUNT OF CARBON, WITH ANYWHERE FROM 58 – 84 MILLION GRAMS PER HECTARE THOUGHT TO BE STORED IN THE NATION'S WOODED AREAS.

Carbon sequestration rates for three regions/species combinations (annual carbon uptake tons/acres/year)

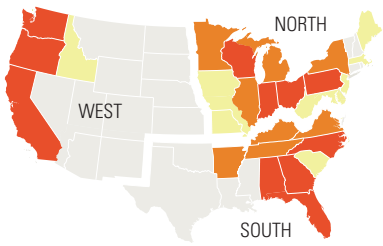


- Black Walnut, Northern Plains States
- Loblolly Pine, Southern Plains States
- Ponderosa Pine, Mountain States

Richards, Moulton, and Birdsey (1993) via Consortium for Research on Enhancing Carbon Sequestration in Terrestrial Ecosystems (CSiTE)

Absolute full-time job losses since 2005 in all wood sectors (294,000 jobs lost)

- 10,001 - 22,000 jobs
- 5,001 - 10,000 jobs
- 3,000 - 5,000 jobs
- Less than 3,000 jobs



Guldin and Smith, 2012