



Future Forestry and Forest Management in the Real AZ Corridor

Sector Profile



Introduction

Future Forestry and Forest Management is one of the four sectors identified by the **Real AZ Development Council** as having strong economic development potential in the **Real AZ Corridor**.

Northern Arizona is home to the largest contiguous ponderosa pine forest in North America, with more than 2.4 million acres of pines in the Apache-Sitgreaves, Coconino, Kaibab and Tonto national forests. This vast forest region is part of an ecosystem that historically depended on the natural thinning effects of low-intensity, surface fires to keep seedling and sapling growth in check and to maintain forest health.



A variety of factors have changed the forest ecosystem in northern Arizona since the late 1800's, including heavy grazing by livestock which removed grasses that once fueled beneficial, low-intensity fires. Population migration also brought aggressive fire suppression to the region, which further interrupted the historic -- and necessary -- fire cycles. Arizona forests became overstocked with small diameter trees, creating a 'ladder fuel' situation which has placed millions of acres at risk for catastrophic fires, according to experts. Cycles of insects, disease and wildfires are becoming larger and more frequent and are a danger to the ponderosa pine and pinyon-juniper forest ecosystems, and to the people, wildlife, resources and structures that exist within and near them.

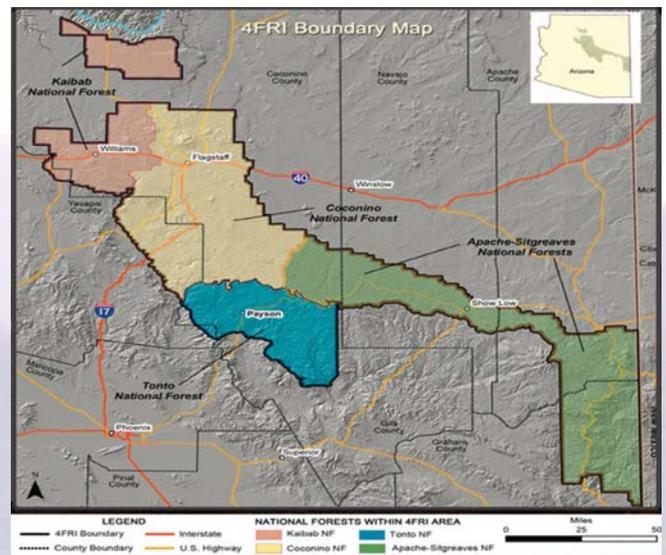
The result has been devastating, large-scale wildfires encouraged by overgrown conditions and excess fuel. More than one million total acres were consumed by just two wildfires: the Rodeo-Chediski Fire in 2002 (468,000 acres) and the Wallow Fire in 2011 (538,000 acres).



Experts recognize that thinning and prescribed burning reduce the build-up of excess fuels and restore forests to a more natural, healthy state. Efforts to reduce heavy tree density (potentially 20 to 40 trees today for every one tree present in pre-settlement times) have been hampered by factors including a lack of funds, diminishing infrastructure and the need to develop profitable uses for large-volume, small diameter lumber and biomass into high-value products. The 2004 **White Mountain Stewardship Project (WMSP)**, a large-scale forest management initiative which served as a model for the more recent **Four Forest Restoration Initiative (4FRI)**, demonstrated that there is both a need for larger-scale forest management and the potential to bring sizable, beneficial industry back into the national forests. WMSP is proving that forest management is viable and can be profitable.

The work of forest thinning is labor and equipment intensive. Since the 1980's, much of northern Arizona's forest-based workforce and infrastructure has been diminished, as lumber harvesting was stopped in many areas. New investment in workforce and infrastructure will be needed to make forest management work.

The federal government approved 4FRI in February of 2011 to help restore more than a million acres of forest through large-scale small timber management and the reintroduction of industry into the forests. It is a collaborative effort of



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government, private and special interests that is expected to produce opportunities for sustainable forest industries and environmentally-minded harvesting operations in northern Arizona. The first 4FRI contract was awarded by the U.S. Forest Service (USFS) in April 2012. It went to Montana-based Pioneer Forest Products, which is expected to thin and process small diameter trees from 300,000 acres over a 10-year period.

The awarding of this and other 4FRI contracts is expected to create significant interest, activity and investment throughout the **Real AZ Corridor** by local, regional and national interests. The 4FRI contract award to Pioneer Forest Products is expected to create more than 700 related permanent jobs in the Corridor, including 200-plus loggers, 75 drivers, 380 mill operators and 80 biomass plant workers. A wood processing mill is planned for Winslow. An additional 364 short-term (24-month) jobs are expected to be created through the construction of that facility.

Biomass is a related sector with significant development potential. Woody biomass includes the limbs, tops, needles, leaves and other woody parts of trees that are the by-products of forest management (thinning). Woody biomass utilization markets include the sale or use of biomass to produce bio-energy and a range of bio-based products including lumber, composites, paper and pulp, furniture, ethanol and other liquids and energy feedstocks.



Biomass generated by the White Mountain Stewardship Project was used to provide raw materials for the former Catalyst Paper Plant in Snowflake (which was Arizona's only 100% recycled paper plant until it closed in 2012), and is still being used to develop and supply wood products industries and fuel (wood) chip processors. Larger-scale timber management will create new and expanded opportunities for biomass utilization throughout northeastern Arizona.

The emergence and expansion of biomass-related industries will occur as the forest management industry expands in the **Real AZ Corridor**. The sector has the potential to provide new jobs and income through related industries, to decrease energy costs by substituting woody biomass for other fuels and to stabilize tourism by mitigating the danger of massive wildfires. Financial markets currently exist for air pollution offsets, renewable energy credits and carbon sequestration credits, which can become a source of supporting income for forest management companies and for public and private land owners. Growing short-rotation woody plants for harvest can also produce biomass and carbon offset credits.

White Mountain Stewardship Project Provides Model

The Apache-Sitgreaves National Forests implemented the nation's first large-scale thinning contract in 2004, with the creation of the **White Mountain Stewardship Project (WMSP)**. The 10-year contract was created to thin 150,000 forest acres. The lead contractor, **Future Forest LLC**, has treated nearly 60,000 acres to date as the contract enters its final year. Both the Wallow Fire and the economic impacts of recession disrupted the evolution of the forest products industry in the White Mountains region.

The project has successfully demonstrated the value of partnership to harvesting, processing and identifying new markets and uses for the outputs from large-scale thinning.

Future Forest LLC works with experienced loggers, WB Contracting and Forest Energy, a wood pellet plant in Show Low, to process 5,000 to 25,000 acres a year. Capacity to process thinning output is expected to increase significantly when a new



saw mill in Eagar becomes fully operational. The mill reportedly will have the capacity to process up to 3.5 million board feet annually. Much of its inputs will come from trees that died in the 2012 Wallow Fire.

WMSP has also provided valuable data and benchmarks that were used to develop the 4FRI model. The project area contains topography and vegetation that is comparable to the rest of the region and its in-progress mechanical thinning operation provides a working example of potential 4FRI workforce needs.

The *2012 White Mountain Stewardship Economic Assessment* concluded that 308 FTE employees were directly employed by the Forestry Cluster (sector) last year. An additional seven part-time and 32 seasonal workers were also employed. Skills are typically acquired through on the job training, due to the high cost of equipment and the need for 'hands on' operational experience.

Developing Wood Products Markets

Lumber produced through the harvesting of small diameter trees can be challenging to work with. Small diameter ponderosa pine is dense, has numerous limbs and a high frequency of knots. Warping, splitting and other irregularities can occur through drying and result in considerable waste. The wood, however, is suitable for a number of value-added

products and can be utilized as a component in moldings, cargo pallets, posts and furniture. Long poles and round wood can also be used for deck banisters, rustic furniture, siding, sheds and outdoor shelters.

Woody biomass is an organic by-product that is derived from trees and woody plants, including limbs, tops, needles, leaves, and other woody parts. It is renewable, can be re-grown and harvested, sold and utilized to produce bio-energy and a range of bio-based products including lumber, composites, paper and pulp, furniture, housing components, round wood, chemicals and energy feedstocks. Biomass creates energy when it is burned, converted to gas or fermented for transportation fuels. Although some carbon and methane gases are released into the air when utilizing biomass energy, the growth of new biomass crops captures nearly equivalent amounts of emissions, making biomass a carbon-neutral source of renewable energy.



Biomass from forest residue and waste from sawmills can be used to produce methane gas, transportation fuels such as ethanol and bio-diesel, electrical generation and thermal heat. Converting biomass to thermal heat is a highly efficient (90%) use of forest product.

The outputs of forest thinning are extremely sensitive to the cost of harvesting, transporting, and processing the material. Wood products companies that are located nearby and that can, either together or separately, utilize every component of the tree are necessary to create market efficiency. Related products can include shavings and animal bedding, oriented strand board (OSB) and biomass heating pellets. OSB is an ideal use for large volumes of small diameter ponderosa pine. Peeled logs are cut to the desired length and further sliced into thin wafers. The wafers are coated with a resin and oriented multi-directionally to create a thick mat. Heat and pressure are applied to compress the mat into a board with a set thickness, which is then trimmed to a desired dimension. OSB has widespread construction applications. Converting biomass into wood pellets or chips that are burned in stoves or small plants to produce thermal heat can also utilize large volumes of material. A ton of pellet fuel can produce approximately 16.5 million Btu of thermal energy (heat).

Market Outlook

Other emerging biomass and wood products markets exist. The global forestry sector has been in search of ways to diversify the industry for decades, given the shift away from paper (printing) markets. Replacing fossil fuels with bio-fuels and replacing fossil fuel plastics with biomass-based plastics is creating new markets for forest output. Los Angeles-based Rentech, Inc. planned to build a bio-fuels plant in North Ontario, Canada to use forest waste and 'unmerchantable' trees to make renewable jet fuel and naphtha, a chemical feedstock. The company withdrew its plans in February 2013 but continues to market the technology.

A Montreal-based facility, CelluForce, opened in 2011 and is extracting nano-crystalline cellulose (NCC) from wood pulp fiber to create a strong and durable material that has applications in iridescent films, pigments, high-durability varnishes and bio-plastics, among other uses. NCC is also being used in flexible electronic displays, to create computer components and by the U.S. Army to produce lightweight body armor and ballistic glass. The U.S. National Science Foundation predicts that NCC could become a \$600 billion industry by 2020. The U.S. Forest Service opened a smaller-scale NCC factory in Madison, Wisconsin in July 2012

4FRI Creates New Market Opportunities

The success of the White Mountain Stewardship Project, the evolution of wood products markets, increasing teamwork by a variety of interests and a growing sense of urgency have all worked together to make the Four Forest Restoration Initiative (4FRI) a reality.

4FRI is a partnership between the U.S. Forest Service (USFS) and a large group of public and private stakeholders that is working together to plan and implement restoration treatments on one million acres of ponderosa pines in the Apache-Sitgreaves, Coconino, Kaibab and Tonto national forests in order to restore forest health and reduce the risk of catastrophic wildfires. The goal is to treat 50,000 acres per year for 20 years and to produce benefits which include wildfire mitigation, protection of watersheds, better management of wildlife, enhanced recreation, energy production through the utilization of biomass, and the creation of jobs and new manufacturing wood products and wood by-products.



In April 2012, the USFS announced its selection of Pioneer Forest Products as winner of the first 4FRI contract award. The contract will result in 300,000 acres of restoration-based

thinning over 10 years, improving forest health, reducing the risk from wildfire to communities, creating jobs, and improving local economies. It is the largest stewardship contract in USFS history.

In March 2013, the USFS released a *Draft Environmental Impact Statement* (DEIS) on plans to utilize mechanical thinning and controlled burns to restore one million acres of dense, overcrowded forest in the Coconino and Kaibab National Forests to more healthy conditions. These areas lie outside, but are contiguous, to the **Real AZ Corridor** and the DEIS is another significant milestone for 4FRI. The decade-long 4FRI project is expected to generate 1,674 jobs and \$77.6 million in labor-related income annually, much of it through the successful construction and operation of a wood processing mill that is expected to be built in nearby Winslow. 4FRI will have a significant and sustainable impact on the entire region for many years to come.

The Pioneer Forest Products 4FRI Contract

The 4FRI contract awarded to Pioneer Forest Products by the USFS in 2012 is expected to create more than 700 related permanent jobs in the **Real AZ Corridor**, including 200-plus loggers, 75 drivers, 380 mill operators and 80 biomass plant workers. A wood processing mill is planned for a 500-acre parcel located in Winslow. An additional 364 short-term (24-month) jobs will be created through the construction of that facility.

Specifically, Pioneer Forest Products plans to build a plant near Winslow, where ponderosa pine logs as small as five inches in diameter and eight feet long will be converted into non-commodity, high-value lumber and other products. The company will utilize a three-phase process that is designed to maximize job creation in the region. Phase I processes will include saw milling and drying. Phase II tasks will include recutting dried boards and finger-jointing them to form panels of various grades and sizes. During Phase III, the panels will be processed into consumer-ready products such as laminate wood panels, doors and door frames, window frames, furniture, cabinetry and specialty components. Pioneer projected that it will create 905 combined direct, indirect and induced jobs in the **Real AZ Corridor**. Approximately 364 of those jobs are expected to be created during the construction phase.

Mill waste created by Pioneer operations will have significant value. The company has said that it will use 'slash' (green waste) generated by forest operations and mixed with dry planer chips and sawdust from the mill to fire the facility's drying kiln. Nearly 40% of the slash will be used as feedstock for a bio-diesel plant that will be built nearby and operated by Pioneer's biomass



partner, Western Energy Solutions/Concord Blue USA. That facility is expected to create 80 jobs and have the capacity to produce 30 million gallons of biofuel a year.

Pioneer continues to seek financing to build the mill and the bio-diesel plant. The company has said that it will sell the wood generated from the 15,000 acres worth of projects slated for the first year of its thinning operations to existing mills while it works to build its own facility.

The total economic benefit of Pioneer's operations to Coconino and Navajo counties, at full operation, is projected to be \$157 million annually, with \$47 million in labor income and \$4.5 million in business taxes. The total annual tax benefit to local, state and federal entities is estimated at \$12.7 million.

Forestry Sector Impact on Regional Employment

Future Forestry/Forest Management is a significant sector in the **Real AZ Corridor**. The 2012 White Mountain Stewardship Economic Assessment concluded that 308 FTE (full-time equivalent) employees were employed by the sector in 2012 through operations related to the White Mountain Stewardship Project (WMSP). An additional 136.8 FTE employees were supported in the White Mountain region through a multiplier effect, resulting in 444.9 FTE employees who were directly or indirectly tied to the sector. Of that number, 69.1% were employed due to the harvesting or processing operations of Future Forest LLC. An additional 7 part-time and 32 seasonal workers were also employed. Twelve firms are engaged in the sector in some way. Together, they spent \$18.4 million in the White Mountain region in 2012.

According to the report, the degree of interrelationship between sector employment with Future Forest LLC operations suggests that much of this economic impact would not exist without WMSP in place. This is especially likely given that non-farm employment in Navajo and Apache counties decreased during the recession years of 2008 to 2011.

The workforce required by the Pioneer Forest Products 4FRI contract will be involved in the operation of mill equipment, harvesting, trucking, electrical and general maintenance, research, human resources, administration, product promotion and sales. The USFS has administrative personnel in place to cover contract needs. Private workforce needs will be met by drawing from the region's existing base of unemployed construction workers and heavy equipment operators, many of whom have transferable skills; bringing in trained work crews

from other states to fill interim needs while production 'steps up'; and recruiting and training a sustainable regional workforce to support full, ongoing operations.

Specialized training in forestry basics, mapping, OSHA regulations, ecology basics and similar content areas would provide candidates with a competitive advantage for 4FRI employment. Local educational facilities including Northland Pioneer College are ideally suited to providing such training and have demonstrated a willingness to develop new programs to fulfill emerging workforce needs.

Related Industries and Sectors

Large-scale mechanized thinning and its related operations will create an increasing need for equipment sales, maintenance and parts; trucking services; fuel and vehicle maintenance services; and all of the indirect services that typically accompany employment and population growth. The further development of the regional wood products industry will similarly create needs for materials, supplies, packaging, transportation and energy.

The cultivation, harvesting and conversion of woody biomass into energy, bio-fuel and other products is directly related to the Diversified Energy Sector, which is another **Real AZ Corridor** Growth Sector. It also draws from the technologies that are at work in the Corridor's fourth Growth Sector, Algae & Other Biosciences. Growth in any of these inter-related sectors is expected to produce synergistic benefits to the others.

Biomass utilization also produces carbon offset credits, which can be utilized to mitigate emissions from fossil fuel energy production, increasing manufacturing growth and/or impacts from increasing operations and transportation volume related to other key growth sectors, including Potash Mining. Financial markets that trade in carbon credits are still in their infancy, but are expected to become another area of significant growth in the **Real AZ Corridor**.

Forest management and biomass utilization are also key to wildfire mitigation, which is vital to encouraging tourism throughout the region. The forests and waterways of the **Real AZ Corridor** are important assets and resources which attract employers and residents, fuel key economic sectors, support significant year-round tourism and provide the Corridor with a competitive advantage over other regions in Arizona and the Southwest.

Resources

Compiled from existing secondary resources and reports, including:

- 2011 White Mountain Stewardship Project Economic Assessment, August 2012.
- Arizona Industries of the Future Forestry Action Plan, Arizona Forestry Action Plan Steering Committee, 2003
- Regional Economic Impacts of Pioneer Associates, LTD, by Yeon-Su Kim of Northern Arizona University.
- Workforce Needs of the Four Forest Restoration Initiative Project: An Analysis, Northern Arizona University Ecological Restoration Institute, 2012
- 4FRI website, <http://www.4fri.org/>
- Forest Energy website <http://www.forestenergy.com/>
- Future Forest LLC website, <http://www.futureforest.info/>



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