

ENHANCING FOREST RESILIENCE AND THE ROLE OF FORESTS IN DEALING WITH CLIMATE CHANGE

A policy statement approved by resolution
of the National Association of State Foresters



INTRODUCTION

Eighty percent of Americans say that government should be actively working to mitigate the effects of climate change.¹ Increasing carbon storage and decreasing the use of fossil fuels are key to that endeavor. Forests and forest products are uniquely positioned to do both.

The National Association of State Foresters (NASF) represents the directors of forestry agencies in all 50 states, eight U.S. territories, and the District of Columbia. These agencies protect and help manage over 500 million acres of forest across the U.S., hand-in-hand with local governments, individuals, and families. These agencies also provide management capacity on federal lands and actively work to support the forest products industry.

In this document, state foresters recommend several changes to federal policy and funding priorities that would improve the capacity of America's forests and forest products to sequester carbon, produce renewable fuels, and mitigate the effects of climate change.

BACKGROUND

Though there is no clear political consensus around the issue of climate change, the scientific basis for this phenomenon is well established.² The effects are already being felt and projected to be more impactful in the future.³ They include glacial melting around the globe, rising sea levels, and significant deviations from historic weather patterns. Increasing carbon storage and decreasing the use of fossil fuels are widely touted solutions to the effects of climate change.⁴

It is estimated that total forest carbon storage in the U.S. (including wood products) is 58.7 billion tons.⁵ Each year, forests and harvested forest products capture between 600 and 700 million tons of greenhouse gas equivalents, offsetting roughly 12% of U.S. annual greenhouse gas emissions.⁶ However, since 1990 for a variety of reasons, the annual net increase of carbon in standing forests has declined by nearly 10%.

It is also important to note that a changing climate represents a threat to forest health. In some regions it increases the likelihood of sustained drought. In other areas there have been more frequent, longer duration floods. Changing weather patterns can also introduce new pathogens and invasive species. More active management with a strong focus on forest resilience will be an ongoing need.

¹ Poll released by ABC News, Stanford University and Resources for the Future on July 16, 2018.

² J. Cook, et al, "[Consensus on consensus: a synthesis of consensus estimates on human-caused global warming](https://doi.org/10.1088/1748-9326/11/4/048002)," *Environmental Research Letters* Vol. 11 No. 4, (13 April 2016); DOI:10.1088/1748-9326/11/4/048002

Quotation from page 6: "The number of papers rejecting AGW [Anthropogenic, or human-caused, Global Warming] is a miniscule proportion of the published research, with the percentage slightly decreasing over time. Among papers expressing a position on AGW, an overwhelming percentage (97.2% based on self-ratings, 97.1% based on abstract ratings) endorses the scientific consensus on AGW."

³ IPCC, 2018: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)].

⁴ *An IPCC Special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems – Summary for Policy Makers*. Intergovernmental Panel on Climate Change, 2020.

⁵ *Integrating forests and wood products in climate change strategies*. UN-FAO Forestry Paper 177, 2016.

⁶ *EPA Inventory of US Greenhouse Gas Emissions and Sinks; Chapter 6*. EPA 430-R-20-002

State forestry agencies are uniquely positioned to promote increased forest carbon sequestration and ensure greater forest resilience. As reflected in most state Forest Action Plans, a variety of efforts are underway, some of which are partly supported by federal programs. Adequately funding these programs and structuring them in a manner that places a high priority on the role of forests will aid states in helping the nation achieve climate change-related objectives.

Wood products represent another source of stored carbon and have the potential to lessen fossil fuel consumption through substitution. In addition, increasing the utilization of wood bolsters markets for standing timber, in turn incentivizing landowners to retain and sustainably manage their woodlands.

RECOMMENDATIONS

Increasing Carbon Storage in Forests

The area of forested acres in the U.S. had been increasing for several decades, but has now leveled off and stands at over 800 million acres. Population growth has increased development and corresponding land conversion, but the greater threat to forests nationwide is poor management and health. From 1976 to 2016, the annual mortality of standing timber in the U.S. more than doubled due to over maturity and increases in wildfire, insect infestations, and disease.⁷ Trees that are dead or declining rapidly, actually become carbon emitters.

Active management of federal, state, and private forests is critical in creating and maintaining conditions in the nation's forest that are resilient to these threats, thereby better ensuring that forests can create carbon solutions rather than contribute to carbon emissions. Management strategies focused on resilience include promoting species and age class diversity, actively managing for optimal forest health and creating or retaining suitable pathways for species migration.

Young, vigorously growing stands accumulate carbon more rapidly than older stands. For example, in a typical maple/beech/birch forest, a stand can add over 2 metric tons per hectare per year between the ages of 15 and 35. Older stands of all forest types are responsible for accumulating and retaining a substantial volume of carbon and are an important element in diverse landscapes, but in a typical maple/beech/birch forest, for instance, trees over 95 years of age will add less than an additional 1 ton per hectare per year.⁸

To optimize the accumulation of forest carbon and improve forest resilience in the face of increasing threats, greater federal funding for focused state-federal cooperative programs is imperative. These programs serve to both improve the condition of forests and make wood

⁷ USFS General Technical Report WO-97 *Forest Resources of the United States, 2017*, by S. Oswalt, et al, March 2017

⁸ USFS General Technical Report NE-343. *Methods for Calculating Forest Ecosystem and Harvested Carbon with Standard Estimates for Forest Types of the United States*, by Smith et al, April 2006

available for forest product utilization. Readily available raw material promotes the presence of forest industry. At the same time, the markets these industries provide encourage landowners to maintain and manage their woodlands. Some examples follow.

Tree Planting: Nearly all federal programs available to forest landowners support tree planting, but greater funding priority should be given to tree planting activities given the carbon sequestration potential of young trees. Forests in the U.S. sequester between 600 and 700 million metric tons of greenhouse gas equivalents every year, but one analysis showed that an additional 50 million tons per year could be mitigated by reforestation approximately 19 million acres.⁹

Depending on the forest type, reforestation requires anywhere from 300 to 800 seedlings per acre. At an average of 500 seedlings per acre, planting 19 million acres would require 9.5 billion seedlings. State-owned tree nurseries would have to increase their annual production of seedlings by more than 550% each year for ten years to produce 9.5 billion seedlings.¹⁰ Private nurseries could certainly help, but they are typically growing for contracts with planting dates two years into the future. A substantial increase in tree planting would necessitate careful planning (including climate-change informed species selection), advance notice, and funding assistance.

Carbon Sequestration Payments to Landowners: There are examples of landowners receiving payment for carbon sequestration around the country. Additionally, some states have passed, or are considering passing, legislation that would incentivize carbon sequestration activities. Most agree, though, that without some national pricing mechanism for carbon emissions a broader opportunity for landowners will be slow to develop. Passing federal legislation, such as for a carbon tax or a cap on carbon emissions, will be politically difficult. A more viable alternative would be to amend the above-mentioned landowner payment programs to include a higher priority on carbon sequestration.

Increasing Carbon Storage in Forest Products

The U.S. produces over 100 million cubic meters of lumber, plywood, and oriented strand board per year.¹¹ A cubic meter of wood contains about 1 ton of carbon dioxide.¹² Despite the 2020 coronavirus pandemic, annual housing starts are projected to increase from about 1.4 million to over 2 million by 2028.¹³ A typical 2,400 square foot home stores roughly 28 ½ tons of carbon dioxide.¹⁴ In addition, life cycle assessments have shown that greenhouse gas emissions from the manufacture of wood products can be less than that of concrete or steel.

⁹ *Potential for Additional Carbon Sequestration Through Regeneration of Non-Stocked Forest Land in the United States*, V.A. Sample, Journal of Forestry, December, 2016.

¹⁰ *National Survey of State Operated Tree Seedling Nurseries and Tree Improvement Programs*, National Association of State Foresters, September 2017

¹¹ USFS Research Note FPL-RN-0348 *US Forest Products Annual Market Review and Prospects, 2013-2017*, J. Howard, et al, July 2017

¹² *Wood construction battles climate change through carbon storage*. New Release, Metsawood, 2015.

¹³ *Construction and Housing Starts Outlook for 2019 to 2028*. National Association of Realtors. May, 2019.

¹⁴ *Wood Products and Carbon Sequestration*. Sustainable Building Series #6. Canadian Wood Council @ www.cwc.ca

Programs and emerging markets that promote even greater use of wood products not only increase carbon storage, they have the added benefit of bolstering markets for raw materials. Strong markets encourage the retention and sustainable management of forests and woodlands. Following are examples.

USFS Forest Products Programs: The USFS supports several efforts that promote wood utilization. These include the **Forest Products Research Lab**, the **Wood Education and Research Center**, **Wood Innovation Grants**, and the **Mass Timber University Grant Program**. These are all valuable efforts that should be retained and built upon.

USDA National Institute of Food and Agriculture (NIFA): A number of universities around the country include forest products technical assistance within their extension programs. These are partially funded by NIFA under the **Renewable Resources Extension Act Program**. Continued funding of this program will also ensure that information gained through forest product research and development efforts is effectively transferred to end users.

Mass Timber Construction: Mass timber is a category of wood building materials that includes products like mass plywood panels (MPP) and cross-laminated timber (CLT). CLT rivals steel in strength and fire resistance and is lighter in weight than concrete.¹⁵ Additional benefits include carbon storage and reduced CO₂ emissions during construction.¹⁶ Though the use of mass timber construction materials continues to grow, local building codes have not always kept up with the technology. Proposed revisions to the **International Building Code (I-Code)** (to take effect in 2021) should change that, as I-Code has been adopted by all 50 states. If government purchasing policy favored mass timber construction, it could yield even greater carbon storage and greenhouse gas reduction benefits.

Increasing the Use of Forest Biomass for Energy

The mitigating effects of forest biomass energy on climate change hinge primarily on forest sustainability, which can be measured with a landscape-level analysis of net carbon sinks and emissions.¹⁷ Biomass made from wood residues and low-quality standing timber is generally accepted as a “climate-friendly” fuel.¹⁸ When forests that provide biomass for fuels are managed effectively over time they can be a sustainable form of renewable energy.¹⁹

Several different energy applications are emerging as the most feasible. Using **Industrial Pellets** to generate electricity is widely practiced in other countries. **Torrefaction** is a process that uses heat to turn wood into a coal-like substance and is being tested in at least one demonstration

¹⁵ *Advanced Wood Products Manufacturing Study for Cross-laminated Timber Acceleration in Oregon and Southwest Washington*. Pacific Northwest Manufacturing Partnership. 2017

¹⁶ *Emerging Markets for Wood and Their Positive Impact on Forest Resource Management*. NASF 2018-01

¹⁷ *Opportunities Ahead for Expanding Forests and Harnessing Bioenergy*. A. Bartuska, D. Wear and R. Bonnie. Resources for the Future. March 11, 2020

¹⁸ *Is Energy from Woody Biomass Positive for the Climate?* IEA Bioenergy. January 2018

¹⁹ *Forest Carbon Accounting Considerations in US Bioenergy Policy* Reid A. Miner, et al, Journal of Forestry, November 2014

project in Oregon. There have also been demonstration projects around the country working on **Cellulosic Biofuels**, with jet fuel emerging as one long-term use.²⁰

In the absence of nationwide policy that favors the use of renewable energy, some states have adopted their own, disparate standards. Without a federal renewable energy standard for woody biomass harvested from sustainably managed forests, markets for biomass will be slow to develop.

Placing Greater Emphasis on Climate Change in Federal Program Implementation

USFS Forest Legacy (FLP): With the Great American Outdoors Act (GAOA) signed into law, the Land and Water Conservation Fund (LWCF) will receive permanent annual funding at the full authorized level, nearly doubling historical appropriations for the LWCF. The Forest Legacy Program should receive significant increased funding levels commensurate with the increased funding provided to the LWCF by the GAOA. This state-federal program has protected nearly 2 ½ million acres of working forests through fee title or permanent easement acquisition. Increased priority should be placed on projects that can demonstrate an increase in carbon sequestration.

USFS Forest Stewardship Program (FSP): Providing private non-industrial landowners with technical assistance is at the core of most state forestry programs and FSP offers a supplemental funding source for this function. Over 10 million non-industrial landowners control 38% of the country's forests and woodlands, yet less than a fourth of those owners list timber production as an objective.²¹ This statistic suggests that most of these lands are not actively managed to maintain health and vigor and are more prone to over maturity. Being able to put more technical assistance on the ground is a long-standing need that increased FSP funding could help meet.

USFS Urban and Community Forestry Program (UCFP): Trees in cities and towns not only sequester carbon, they also lower energy production. Studies suggest that urban and community tree resources can save energy costs of up to \$5.4 billion annually.²² Like most state/federal cooperative programs, though, maintaining federal funding is an ongoing challenge and should be given higher priority.

USFS Research and Development (R&D): Managing a forest is a long-term endeavor that benefits from an understanding of how forest ecosystems function in order to satisfy diverse societal needs. Understanding the role that forests and forest products play in carbon sequestration and emission is critical to the advancement of climate change policy. This includes data generated by the Forest Inventory and Analysis Program, research on forest threats and tree growth, development of more efficient remote sensing techniques, and

²⁰ *Emerging Markets for Wood and Their Positive Impact on Forest Resource Management*. NASF 2018-01

²¹ USFS General Technical Report WO-97 *Forest Resources of the United States, 2017*, by S. Oswald, et al, March 2017

²² USFS General Technical Report WO-97 *Forest Resources of the United States, 2017*, by S. Oswald, et al, March 2017

research on new and emerging wood products, including biofuels. Budgets for these efforts need to remain a priority.

Federal Lands: NASF has an adopted position paper with recommendations for increasing the pace and scale of active forest management on federal lands.²³ Though some of these recommendations have been reflected in new federal policy, the need for more management on these lands is substantial and additional policy changes as recommended in the paper would help.

NRCS Healthy Forests Reserve Program (HFRP): The HFRP has helped landowners restore, enhance, and protect forestland resources on private lands through easements and financial assistance. The program aims to aid in the recovery of endangered and threatened species, improve plant and animal biodiversity, and enhance carbon sequestration. Originally authorized in the Healthy Forest Restoration Act of 2003, HFRP is authorized to pay landowners up to 100% of the fair market value of the easement.

HFRP provided landowners with 10-year restoration agreements and 30-year or permanent easements for specific conservation actions. Permanent funding was eliminated in 2014 and the last actual allocation was 2016. Though the Regional Conservation Partnership Program has been using HFRP authorities for some projects, it is unclear whether that will continue based on 2018 Farm Bill language. Reviving this program would give landowners the ability to capture the value of carbon sequestered in actively managed forests. As part of the Conservation Title, HFRP should be enhanced with substantial mandatory funding to serve as the leading national program for forest conservation easements.

NRCS Agricultural Conservation Easement Program (ACEP): ACEP has an annual mandatory funding allocation of \$450 million. The program's purpose is to maintain wetlands and agricultural lands through the purchase of easements from willing landowners. NRCS will pay up to 50% of the fair market value of the easement. NRCS can pay up to 75% where the lands involve grasslands of special environmental significance. Lands do not qualify if they are over two-thirds forested.

ACEP was intended to combine and take the place of several past NRCS easement programs. Unfortunately, HFRP was not one of those. Revisions that would capture the authorities of HFRP and eliminate the limitation on forested acreage would better serve climate change objectives.

NRCS Conservation Reserve Program (CRP): CRP offers an annual payment to landowners who take highly erodible lands out of agricultural production. Various land cover types, including trees, are eligible for the program. The 2018 Farm Bill increased the overall cap on program acres, but hardwood tree planting projects are not eligible for "Continuous Sign-up." That means they are not automatically enrolled and must compete against other projects in the

²³ *Preferred Reforms to Federal Forest Land Policy*, National Association of State Foresters, adopted February 9, 2016.

“General Sign-up” process. The ranking criteria for “General Sign-up” include air quality improvement, but criteria do not mention carbon sequestration explicitly. A continued increase in the acreage cap, relaxing the maximum on rental payments, and placing greater priority on tree planting would result in increased carbon storage.

NRCS Environmental Quality Incentives Program (EQIP): This program helps landowners pay for conservation practices, such as tree planting and timber stand improvement (two practices that serve to increase carbon sequestration). Importantly, the program also pays for prescribed fire, which helps manage forest resources for greater resilience. EQIP dollars allocated to forestry practices in 2019 amounted to about \$133 million – just 10% of total EQIP funding in 2019. If combatting global warming is a national priority, EQIP should play a larger role.

NRCS Conservation Stewardship Program (CSP): By acreage, CSP is the largest working lands conservation program in the country. It provides landowners a yearly payment for implementing enhanced conservation practices that go beyond basic conservation standards. Landowners must compete to enter the program and are more competitive if they implement a “bundle” of enhancement practices. Under current regulation, forest landowners only have one bundle option: a set of enhancements aimed at improved wildlife habitat. Enhancement E612A involves converting cropland to trees for water quality protection. This practice would also increase carbon sequestration, but with the greatest volumes being sequestered 10 years following planting. A bundle of enhancements should be constructed around extending contracts for tree plantings and optimizing carbon uptake in standing timber. This could be constructed in a manner that also improves water quality and wildlife habitat.

NRCS Regional Conservation Partnership Program (RCP): RCP funds a wide diversity of partner-implemented projects. The 2018 Farm Bill gave RCP a large boost in permanent funding, but as with most NRCS programs, carbon sequestration is not among the “critical conservation concerns” that receive priority funding. This needs to be made a clear program objective.

CONCLUSION

State foresters have important roles to play in climate change mitigation.

One role is advocating for the inclusion of forests and forest products in federal climate change policy and programming. Unlike other agricultural activities that many federal programs support, forestry is a long-term endeavor with long-lasting carbon benefits.

There are many existing federal programs that could enhance the role of forests as carbon sinks given additional funding and higher prioritization. These programs serve to increase carbon storage by improving the condition of our forests, expanding forest footprints, and making wood available for forest product utilization. Forest products also have value as carbon sinks and have demonstrative climate benefits when compared to other construction materials and energy sources.

Another role, central to their agencies' missions, is being active stewards of America's forests. The efficacy of forests, forest products, and woody biomass in addressing climate change depends on forest sustainability. Without active management, forests are less resilient to climate change and less effective at sequestering carbon.