Written Testimony of the National Association of State Foresters (NASF)
Joe Fox, Arkansas State Forester and NASF President

Submitted to the Senate Committee on Agriculture, Nutrition and Forestry
Hearing on "Federal, State, and Private Forestlands: Opportunities for Addressing Climate Change" May 20th, 2021

The National Association of State Foresters (NASF) is pleased to provide written testimony to the Senate Committee on Agriculture, Nutrition and Forestry for this important hearing on "*Federal, State, and Private Forestlands: Opportunities for Addressing Climate Change*". Thank you, Chairwoman Stabenow, Ranking Member Boozman, and members of the committee, for holding this hearing today and for the opportunity to testify on behalf of NASF.

NASF represents the directors of the forestry agencies in all 50 states, eight U.S. territories, and the District of Columbia. State foresters deliver technical and financial assistance to private landowners for the conservation of more than two-thirds of the nation's forests. They also partner with federal land management agencies through cooperative agreements and Good Neighbor Authority to manage national forests and grasslands. All state forestry agencies share a common mission to protect America's forests and most have statutory responsibilities to provide wildland fire protection on all lands, public and private.

America's trees and forests are a strategic national resource with vast potential as solutions for climate change, public health, and economic challenges. Wildland fire is a national crisis – bold action is needed to sustain forests, protect public safety, and prevent the conversion of forests from carbon sinks to carbon emission sources. **Active forest management, supported by forest markets, combined with coordinated wildfire prevention, mitigation, and suppression efforts can substantially mitigate the effects of climate change. 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. When forests are actively managed they provide a number of public benefits, including clean air and water, enhanced wildlife habitat, carbon sequestration, recreational opportunities, watershed protection, timber production, and support to rural communities.**

Addressing Climate Change Requires Collaboration

For more than a century, state forestry agencies have partnered with the U.S. Department of Agriculture's (USDA) Forest Service (Forest Service) to deliver professional forest management and wildfire protection across complex, multi-jurisdictional landscapes with a holistic "all lands, all hands" approach. Meaningful, landscape-scale forest restoration doesn't happen without collaboration across ownership boundaries. From Forest Service technicians to certified

professional foresters and municipal arborists, to state field foresters and private landowners, together we can work across all land ownerships – federal, tribal, state, and private – to mitigate the most pressing threats America's forests face, including climate change.

Over 30 states have formalized their commitments to greater collaboration with the Forest Service and other federal agencies with Shared Stewardship Agreements. State forestry agencies have played a vital role in ensuring the success of the collaborative shared stewardship framework by coordinating key partners and facilitating active forest management across all ownerships, including federal lands. State-based approaches to shared stewardship enhance outcomes through shared decision-making and shared priority-setting.

State forestry agencies are uniquely positioned to promote forest carbon sequestration efforts and ensure greater forest resilience. As reflected in state Forest Action Plans, a variety of climate-focused efforts are underway, some with support from federal grants and 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.

Since 2008, states have gathered partners together to develop Forest Action Plans, which prioritize strategies, areas, and actions for all forested land – federal, state, private, urban, and rural. In 2020, all states revised their Forest Action Plans. Supporting the work outlined in Forest Action Plans not only helps address immediate forest management needs nationwide, it provides economic support to rural communities across the country.

Twenty-five states are members of the U.S. Climate Alliance, which centers collaborative work around 12 key priorities, including "*Natural and Working Lands*," which offers up state Forest Action Plans as a solution for maintaining forest resilience in a changing climate.

Through NASF, state foresters are actively engaged with America's only forest sector coalition working to advance climate change solutions: the Forest Climate Working Group (FCWG). The FCWG provides policy makers with innovative, science-based ways to leverage forests and forest products as natural climate solutions.

Enhancing Forest Resilience and the Role of Forests in Addressing Climate Change

Eighty percent of Americans say the 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. In this testimony, NASF will highlight state foresters' efforts to address climate change, and recommend several changes to federal policy and funding priorities that would improve the capacity of America's forests to sequester carbon, produce renewable fuels and forest products, and mitigate the effects of climate change.

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

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.

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.

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 threats to forests nationwide are 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.

---

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

[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

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

Active management of federal, state, and private forests is critical to creating and maintaining forests that are resilient to these threats and remain carbon solutions rather than carbon sources. 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 years. 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] Net accumulation of carbon in forests should be evaluated at the right spatial and temporal scale, as stored carbon can increase within a management regime that includes harvest.

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 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.

Increasing Carbon Storage in Forest Products

The U.S. produces over 100 million cubic meters of lumber, plywood, and oriented strand board per year.[9] A cubic meter of wood contains about 1 ton of carbon dioxide.[10] Despite the 2020 coronavirus pandemic, annual housing starts are projected to increase from about 1.4 million to over 2 million by 2028.[11] A typical 2,400 square foot home stores roughly 28 ½ tons of carbon dioxide.[12] 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.

Keeping private forests working is essential to securing the economic, environmental, and social benefits trees provide to society at large. **In order to retain and properly care for their forests, landowners need sources of revenue.**

Markets for wood provide that source of revenue and are critical to maintaining the health and sustainability of forests in the U.S. They enable the sustainable, carefully planned harvest of trees to optimize stand density and create age class and species diversity – characteristics that are

[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
[9] USFS Research Note FPL-RN-0348 *US Forest Products Annual Market Review and Prospects, 2013-2017*, J. Howard, et al, July 2017
[10] Wood construction battles climate change through carbon storage. News Release, Metsawood, 2015
[11] Construction and Housing Starts Outlook for 2019 to 2028. National Association of Realtors. May, 2019
[12] Wood Products and Carbon Sequestration. Sustainable Building Series #6. Canadian Wood Council @ www.cwc.ca

critically important to enhancing wildlife habitat, forest resilience, and balanced harvest cycles. Timber harvest transfers carbon off the forest ecosystem and stores it in wood products like lumber. Residues from harvested wood can be used as an energy source like wood pellets. With good, scientific based forest management, the forest remains forest—it recovers and regrows—resulting in the uptake of carbon from the atmosphere once again. When we use wood products or bioenergy in place of fossil fuels, we avoid the permanent release of fossil fuel-based carbon into the atmosphere, also known as the substitution effect.

Benefitting economically from forests does not diminish the environmental and social value of forests; in fact, it is key to supporting the delivery of environmental and social benefits. **The readily available raw material that sustains the forest industry is produced by landowners who maintain and manage their woodlands in perpetuity.**

Within this view, NASF also believes that the institutions and enterprises that provide forest management expertise are equally critical to ensuring sustainability. Wood should be harvested in a carefully planned manner using best management practices that embody sound science, represent community values, continue to provide important environmental benefits, and reflect responsible economics. Research and teaching institutions, private landowners, natural resource agencies, consulting foresters, forest owning/managing businesses, natural resource related non-profits, and certification bodies all play an important role that must evolve and grow as demand for wood may well increase when new uses emerge.

The complexity of America's forest resources and patterns of land ownership require flexible, state-defined approaches to forest-based solutions that achieve national outcomes. State forestry best management practices are a shining example of state-based solutions achieving national outcomes for water quality.

Addressing Climate Change on Private Lands

State forestry agencies employ roughly 7,850 trained foresters and provide more than 270,000 technical assists to private landowners annually. The Forest Service State and Private Forestry (S&PF) mission area provides vital support to deliver these services, which contribute to the socioeconomic and environmental health of rural and urban areas. S&PF programs provide a significant return on the federal investment by leveraging the boots-on-the-ground and financial resources of state agencies to deliver assistance to forest landowners, tribes, and communities. However, private landowners face barriers – including unforeseen costs and insufficient technical assistance – that can prevent them from taking necessary management action. As population growth and urbanization increase nationwide, private forest lands are threatened by land use conversion and development. Now more than ever, it is critical that we maintain our privately owned forest lands in a condition that supports the health, prosperity, security, and well-being of all Americans. **An extremely effective tool for encouraging private forest landowners to voluntarily adopt forestry practices that address climate change is through technical assistance that equips landowners with the unbiased, science-based information they need to sustainably manage their forests now and into the future. The best way to provide for**

increased technical assistance to landowners is by increasing funding and support for the programs that accomplish this work.

Addressing Climate Change in Urban and Community Forests

The S&PF Urban and Community Forestry Program is delivered in close partnership with state foresters and leverages existing local efforts that have helped thousands of communities and towns manage, maintain, and improve canopy cover and green spaces.

Urban forests are important climate solutions and are proven to be effective at achieving energy savings, improved air quality, neighborhood stability, aesthetic value, reduced noise and urban heat island effect, and improved quality of life in municipalities and communities around the country.

Urban trees and forests provide a wide array of social, economic, and environmental benefits to people living in urban areas. Today, more than 83 percent of the nation's population lives in urban areas; yet, urban and community forests face serious threats, such as development and urbanization, invasive pests and diseases, and wildfire in the wildland urban interface (WUI). Trees in cities and towns not only sequester carbon, they also reduce energy consumption. Studies suggest that urban and community tree resources can save up to $5.4 billion annually in energy costs.[13]

The Role of Active Management: Economic, Environmental, and Social Benefits to Society

Approximately one-third – or nearly 800 million acres – of the U.S. is forested. Of those acres, 56% are privately owned. More precisely, 38% (299 million acres) of privately owned forested acres are owned by families or individuals and 18% (149 million acres) are owned by larger timber-owning/managing businesses. Of the remaining forested acreage in the U.S., 33% (265 million acres) is held in public trust by the federal government and 11% (87 million acres) is owned by state or local governments.[14]

Of the estimated 12 to 13 billion cubic feet of wood removed from U.S. forests annually, 90% is derived from privately owned lands[15], most of which (57%) are owned by families or individuals.[16] The total volume of removed wood peaked nearly four decades ago in 1986 at nearly 20 billion cubic feet, while the standing volume of timber in the U.S. continues to increase: since the 1950s, total volumes have grown by over 50%.[17]

[13] USFS General Technical Report WO-97 *Forest Resources of the United States, 2017*, by S. Oswalt, et al, March 2017
[14] *Research Supporting the Loss of Family Forests Across the United States: Section II*, Butler et al, Family Forest Research Center, May 2014
[15] *Forest Resources of the United States, 2012: A Technical Document Supporting the Forest Service Update of the 2010 RPA Assessment*. GTR WO-90, October 2014. S Oswalt, et. al.
[16] Estimated from personal correspondence provided by Dr. Brett Butler, US Forest Service Family Forest Research Center. January 2016
[17] 2012 RPA Board Foot Tables, US Forest Service.

Standing volumes increase as trees grow from seedling to sapling to pole to sawtimber. With increases in volume often comes increases in stand density, which leads to greater competition for water and nutrients among trees within a given stand. Competition naturally thins a stand to some extent, but not enough to prevent overall tree growth from stagnating due to overcrowding. This over-crowded condition creates stress in a tree, making them more vulnerable to disease and pest infestation. Stands that are over-crowded or too densely stocked (or what foresters call "overstocked") also increase the likelihood of more destructive wildfires.

High standing timber volumes can create significant problems. From 2008 to 2012, 40 million acres of trees were killed by insects and diseases[18] exacerbated by overstocking. It is also projected that the total carbon sequestered in U.S. forests will begin to decline by 2040 due in part due to an increase in the relative age of standing timber.[19]

The quality and quantity of water resources are also affected by standing timber volumes. According to an American Forest Foundation report, 40% of the forested land in 11 western states most critical to protecting water supplies is at high risk of extreme wildfire due to insufficient management.[20] Additionally, where harvesting is limited, a stand's age class distribution becomes skewed toward mature timber, negatively impacting wildlife species that are dependent on early successional, brush-dominated, high sun exposure habitat created with harvest.

High standing timber volumes in U.S. forests also present opportunities. Timber in the U.S.is a critical natural resource that provides the nation with wood and paper products and directly supports over 3 million jobs.[21] It's estimated that 53% of the lower 48 states' drinking water originates from forests[22] and about 15% of the nation's annual carbon emissions are offset each year by the additional carbon stored in U.S. forests and wood products.[23] Recreational opportunities, wildlife habitat, and scenic landscapes are also important public benefits derived from forests.

Historically, natural forest disturbances like floods, high wind events, and lightning-caused fire have maintained forest stand densities and volumes at healthier levels. Human flood control has sharply curtailed the influence of water and human settlements have necessitated greater wildfire suppression. In lieu of natural disturbances, the best method available for controlling stand density and balancing age classes is careful and planned tree removal (or what foresters call "active management").

[18] USDA Forest Service. 2013. *Major Forest Insect and Disease Conditions in the United States – 2012*. FS-1023, Washington DC.
[19] USDA Forest Service. 2012. *Future of America's Forests and Rangelands – Forest Service 2010 Resources Planning Act Assessment*. GTR WO-87, Washington, DC.
[20] Western Water Threatened by Fire. American Forest Foundation. 2016
[21] Forest Resources of the US – 2007, Smith et al, GTR WO-78
[22] Private Forests, Housing Growth and America's Water Supply: A Report from the Forests on the Edge, Forests to Faucet Project. RMRS-GTR-327, September 2014. M. Mockrin et. al.
[23] US Environmental Protection Agency. 2013. *Inventory of US greenhouse gas emissions and sinks: 1990 – 2011*. EPA 430-R-13- 001, Washington, DC.

The Value of Commercial Harvest: Strong Timber Markets Create Opportunities

According to the research, landowners equipped with trusted forestry advice are 13% to 17% more likely to harvest timber. And landowners who have harvested timber are more likely to have improved wildlife habitat on their land.[24]

Commercial harvests make long-term forest sustainability possible. Strong timber markets create opportunities for landowners, public and private, to provide the economic, environmental, and social benefits that we all depend on.[25] Yet, their desired outcomes – wildlife habitat, forest health, tree species diversity, wildfire risk reduction – are often best accomplished through tree removal. Where tree removal generates revenue, more of these activities can be accomplished.

Businesses owning timberland want to realize a competitive rate of return on their investment. Diverse, robust markets are an absolute necessity for achieving this objective. Where competitive returns are not achievable, there is pressure for those lands to be converted to other uses. Virtually all of the largest landowners are certified to either the Sustainable Forestry Initiative standard or the Forest Stewardship Council standard. Both certification programs require land management activities that provide for environmental protections and social accountability.

NASF supports federal budget and policy changes that accelerate the scope and scale of active management on federal lands in order to restore forest health, reduce wildfire risk, and enhance contributions to local economies. Even though there is broad support for greater active management, federal land managers in some regions are challenged by a lack of markets.

Without markets, commercial harvests are not feasible. Markets for biomass (woody material that needs to be removed from forests, but is not marketable timber) have always been lacking, but increasingly, markets for timber harvested from public lands are also becoming more scarce. This greatly limits the extent to which active management can be implemented since most forest management activities generate costs that require revenue to offset.

Emerging Markets: Opportunities for Sustainable Commercial Harvests

Emerging markets for wood can serve to complement traditional forest products, thus expanding wood demand and offering landowners more opportunities for active management through commercial harvests. Following are brief descriptions of several promising new uses for wood that have the potential to ultimately result in the improved management of the nation's forests. Demand for these new products is driven by a number of factors that likely will become even more prominent in the future. These include:

- Subsidized power production in Europe where government policy is focused on eliminating coal-fired operations over a period of time.

[24] Evaluation of the Effectiveness and Reach of the Educational Programs and Technical Assistance Activities of the U.S. Forest Service, Forest Stewardship Program. Technical Report. June 2013. B Butler et. al.
[25] Family Forest Ownerships of the United States, 2013: Findings from the USDA Forest Service National Woodland Owner's Survey. Journal of Forestry. 2016. B Butler et. al.

- Environmental concerns over the longevity of plastics and their continued accumulation in oceans and landfills.
- A desire for building materials that effectively sequester carbon and often generate a smaller carbon footprint during manufacture and use.
- Desires to reduce dependence on fossil fuels in favor of renewable sources to meet transportation needs.

Wood Pellets Production

The production of densified wood pellets, particularly for energy generation, has grown dramatically in response to public policy objectives to lower dependence on fossil fuels. A small percentage of pellets are used for wood fired heating. Currently there are 87 operating manufacturing facilities in the U.S. with more under construction. Annual production capacity is just short of 12 million tons. In February of 2018, facilities purchased about 1 million tons of feed stock. About 18% of the feedstock would be characterized as pulpwood or roundwood and the remaining represented some form of residual material, like sawdust from a sawmill. About 80% of the pellet production is exported.[26]

Theoretically, if feedstock purchases were in the neighborhood of 15 million tons per year that would be the equivalent wood usage of approximately 10 large capacity papermills. Unfortunately, between 2005 and 2012, the U.S. lost 15 pulp mills.[27]

Cellulosic Biofuels

The U.S. uses over 133 billion gallons of gasoline, 42 billion gallons of diesel, and 22 billion gallons of jet fuel every year. Though gasoline consumption is expected to decline over time because of the increasing presence of electric vehicles, the demand for jet fuel is expected to increase and the demand for diesel is projected to remain consistent because of its use in trains and large vehicles. It has been estimated that 1 billion tons of sustainably grown biomass could produce enough fuel to replace 25% to 30% of U.S. demand.

Currently, cellulosic biomass feedstock costs outcompete average crude oil costs, but refining costs are substantially higher. As a result, there are only a limited number of operational facilities that can economically refine cellulose, hemicellulose, and lignin into fuel. It is presumed at this point that successful wood-based processes will focus on jet fuels and the incidental production of marketable by-product chemicals.[28]

Biochar

A by-product from the production of biofuels manufactured through pyrolysis, biochar is a very fine charcoal-like material used to improve soil characteristics. Pyrolysis involves heating wood to extremely high temperatures without oxygen, (as the presence of oxygen would cause wood to burn) converting it into mostly pure carbon. The best biochar is produced at temperatures above

[26] Monthly Densified Biomass Fuels Report. U.S. Energy Information Administration. May 2018
[27] The Forestry Source. Society of American Foresters. Smith & Guldin. January 2012
[28] Presentation by Josh Schaidle, National Renewable Energy Laboratory, to NASF. February 2017

350 degrees centigrade. As a soil amendment, it lowers acidity and tightly binds undesirable metals so that they are not taken up by plants or leached from the soil. It can also increase soil porosity in tight clays or reduce porosity in soils that drain too quickly, such as sand, and creates a favorable medium for the production of micro-organisms that are beneficial to trees.

Importantly, biochar is principally carbon that is near permanently stored. As such its greatest potential may be its use for long-term carbon sequestration.[29] Because biochar is nearly pure carbon, micro-organisms in soil aren't able to break it down further. On the other hand, wood or some other organic material incorporated into soil would be broken down by micro-organisms into other compounds, including carbon dioxide, which can be released back into the air.

Where readily available, biochar has developed market value. Reclamation of oil drilling sites and as a soil amendment for high-value crop operations are common uses. Current research is focused on mobile kilns that can be used on site during management activities to utilize low value timber.[30]

Torrefaction

Torrefaction is also a pyrolysis process (conducted at lower temperatures than biochar) that makes wood into a product similar to coal. It is more practical than coal, however, in that it is easier to grind, simplifying storage and eliminating moisture uptake issues. Though the weight loss in the process is 30%, the energy loss is only 10%. Its energy profile is improved by the fact that torrefaction generates a combustible gas that can be recirculated back into the system and burned to provide heat.[31]

Torrefaction has the potential to produce a renewable source of fuel for gasification processes used to make biofuels. Analysis has shown that it could also be a more economical alternative for the densified pellet market in places where that market is still developing.[32]

Mass Timber

Mass timber is a category of mostly engineered wood building materials that can be used as floors, walls, ceilings, and beams. These products include LVL, Glulam, NailLam, Mass Plywood Panels (MPP) and cross-laminated timber (CLT). CLT is produced in large panels by assembling successive layers of boards perpendicular to one another. The result is a product that rivals steel in strength and fire resistance and is lighter in weight than concrete. As such, CLT and other mass timber products can replace concrete and steel in tall structures.[33] Additional benefits include carbon storage and reduced CO2 emissions during construction. Though more commonly produced and utilized in Europe since the late 1990s, it has recently gained traction in the U.S. wood products industry, with manufacturing facilities starting up across the country. Building

[29] Biochar: A Home Gardener's Primer. Washington State University Extension Fact Sheet FS147E
[30] Presentation by Darren McAvoy, Utah State Biomass Resources Group, to NASF. February 2017
[31] Biomass Technology Group website www.btgworld.com
[32] Renewable and Sustainable Energy Reviews. W. Chen et. al. Volume 44, pp847 – 866. February 2015
[33] Advanced Wood Products Manufacturing Study for Cross-laminated Timber Acceleration in Oregon and Southwest Washington. Pacific Northwest Manufacturing Partnership. 2017

codes across the U.S. have been updated (in 2015, 2018, and 2021) to allow for mass timber buildings taller than 85 feet.

While widespread use of mass timber is good news for timber producing regions of the country, it also promises some distinctive benefits for builders, communities, and the environment. Builders, pressured by persistent labor shortages, are finding a wider pool of workers able to safely install mass timber panels. They also report significant labor savings and more efficient and safe job sites. Construction times are reduced by "just-in-time" delivery to job sites and quick installation of panels.

Communities also experience less noise and dislocation during construction of mass timber buildings, and by avoiding the usual stockpile of dimension lumber on site, fire risks are reduced. The positive environmental attributes of mass timber buildings include a low energy intensity during manufacturing, superior energy efficiency in mass timber structures, and better management of a renewable resource.

Nanotechnology

There are two different categories of cellulose nanomaterials produced through different processes: cellulose nanocrystals and cellulose nanofibrils. The processes produce microscopically small particles that can be assembled into materials with highly desirable properties. They are lightweight, strong, stable, and stiff. Potential applications include use as a material in paint, coatings, adhesives, lightweight packaging, cell phone manufacturing, composites, and wound covering hydrogels.[34] Adding nanocrystals to concrete mixes can also reduce the volume of cement needed by 15% because of the final material's added strength.

NASF Policy Recommendations for Addressing Climate Change by Enhancing Carbon Sequestration in Forests and Forest Products

Forest management is more than carbon management. **Forest managers must consider a site's attributes and its potential for any number of co-benefits, including carbon sequestration, water filtration and absorption, clean air, wildlife habitat, recreational opportunities, and wood production.**

Particularly as market capacity grows for forest carbon, it is essential that reforestation and forest management efforts are recognized for what they are: comprehensive environmental solutions with tremendous promise for climate change mitigation and adaption. **Forest management should continue to strive for balanced species and age class diversity – which means a balance of old- and young-growth.**

Carbon in excess (for instance, when a forest is too densely stocked with trees) can increase the risk of catastrophic wildfire and pest infestations. **Reducing the utilization of forest thinnings, prescribed burns, and harvests in a bid to maintain standing carbon would also undermine**

[34] Cellulose Nanomaterials – A Path Towards Commercialization Workshop Report. USDA Forest Service. August 2014

forest markets (which are necessary to keeping forests working and as forests) and the well-being of local economies and schools supported by timber revenues.

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:

Forest Service, Forest Products Programs: The Forest Service 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.[35] Additional benefits include carbon storage and reduced CO2 emissions during construction.[36] Though the use of mass timber construction materials continues to grow, local building codes have not always kept up with the technology. Revisions to the **International Building Code (I-Code)** 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.[37] Biomass made from wood residues and low-quality standing timber is generally accepted as a "climate-friendly" fuel.[38] When forests that provide biomass for fuels are managed effectively over time they can be a sustainable form of renewable energy.[39] In the absence of nationwide policy that favors the use of renewable energy, some states have adopted their own,

[35] Advanced Wood Products Manufacturing Study for Cross-laminated Timber Acceleration in Oregon and Southwest Washington. Pacific Northwest Manufacturing Partnership. 2017
[36] Emerging Markets for Wood and Their Positive Impact on Forest Resource Management. NASF 2018-01
[37] Opportunities Ahead for Expanding Forests and Harnessing Bioenergy. A. Bartuska, D. Wear and R. Bonnie. Resources for the Future. March 11, 2020
[38] Is Energy from Woody Biomass Positive for the Climate? IEA Bioenergy. January 2018
[39] Forest Carbon Accounting Considerations in US Bioenergy Policy Reid A. Miner, et al, Journal of Forestry, November 2014

disparate standards. Without a federal renewable energy standard for woody biomass harvested from sustainably managed forests, markets for biomass will be slow to develop.

NASF Policy Recommendations for Responding to America's Wildfire Emergency: Accelerate Implementation of the National Cohesive Wildland Fire Management Strategy

Increase Active Forest Management

Substantial increases in active forest management and fuel treatments across all landscapes and ownership boundaries are needed in the areas at greatest risk for unwanted wildfire. Wildfires in the West may be top of mind, but managing wildfire is a national challenge. Without an increase in coordinated forest management, wildfires will continue to pose a threat to the nation's forests, destroy our cherished communities, and irrevocably alter American landscapes. The scale of wildfires and their community impacts far outpace current efforts to prevent them and mitigate the damage they cause. **Fire threats are best addressed by a holistic all-lands approach to wildfire response and proactive forest management across federal, state, and private lands.**

Fully Implement the Wildfire Funding Fix

In 2018, Congress passed the "wildfire funding fix" to end the practice of "fire borrowing" and to free up hundreds of millions of dollars to increase the pace and scale of restoration projects. Although the "wildfire funding fix" has been implemented with a new cap adjusted suppression and reserve account, additional funding for mitigating restoration work has not materialized in the Forest Service budget. The commonly held expectation was that additional Forest Service mitigation funding would flow into non-suppression programs such as Hazardous Fuels, State and Volunteer Fire Assistance, and S&PF programs, like Forest Health and Forest Stewardship, all of which experienced severe budget shortfalls due to "fire borrowing." **Building a plan for full implementation of the "wildfire funding fix" will be a critical first step in addressing the wildfire emergency.**

Commit to Sustained Investment in Wildfire Mitigation

Wildfires in America are an emergency and should be treated like one. Funding the normal budget line items of the Forest Service and the Department of the Interior each year will not solve – and has not solved – the problem. An off-budget solution that provides reliable funding each year to the Forest Service, the Department to the Interior, and state forestry agencies for the implementation of the highest priority risk-reduction projects is essential to fighting wildfires before they start. **Increased collaboration between federal and state agencies, non-government organizations, local communities, and private landowners – bolstered by a sustained and unprecedented federal investment over the next ten years – is needed to make the difference.**

Build Capacity to Support Cohesive Strategy Partners

Collaboration and coordination have already increased as a result of strong partnerships between state forestry agencies, the Forest Service, and conservation partners, but additional resources are needed to truly push this work forward at the pace and scale necessary to protect Americans and their communities. Building workforce capacity in federal and state agencies, as well as among partner organizations, will need to be a key focus going forward. Making these significant investments in state forestry agencies to support wildfire mitigation projects will not only reduce risk, but create jobs in rural America at a time when they're needed most. In revising their Forest Action Plans, states have used the most up-to-date information to identify priority areas for this work. **The need and priority planning are there; the last pieces of this puzzle are the dollars to get the work completed.**

Increase Support for S&PF Wildfire Programs

Increased support for the State Fire Assistance and Volunteer Fire Assistance (SFA/VFA) programs has proven to significantly increase the amount of hazardous fuels acres treated and improve wildfire response capacity for state, local, and volunteer departments across the country. Attacking fires when they are small is the key to reducing fatalities, injuries, loss of homes, and cutting federal fire-fighting costs. **Bolstering support for both of these key programs should be included as part of any national strategy.**

Empower the Wildland Fire Leadership Council to Convene Cohesive Strategy Partners

The Wildland Fire Leadership Council (WFLC) should serve as the convening body for the broad group of partners vital to the National Cohesive Wildfire Management Strategy's (Cohesive Strategy) success. Convened by WFLC, these partners can explore increasing the capacity and involvement of non-governmental organizations and building a larger coalition to support this work at the national scale. Wildfire management is inherently a partnership effort between federal, state, local, and volunteer agencies and departments.

Increase the Use of Prescribed Fire

There is an immediate need for the return of low intensity fire to our landscapes. The appropriate use of prescribed fire makes our forests and communities more resilient to natural and necessary fire cycles. Increasing the use of prescribed burning depends on partnerships among the U.S. and state environmental protection agencies and a shared understanding that small smoke emissions from prescribed fire pose less risk to human health than mega-emissions from uncontrolled wildfire. **The National Prescribed Fire Act offers a legislative solution to increase the use of prescribed fire.**

Increase the Pace and Scale of Cross-boundary Work

Additional funding for Good Neighbor Authority (GNA) projects is needed to support improved federal forest health. GNA projects are proven to increase the pace and scale of critical forest treatments, support cross-boundary projects and coordination, and provide job opportunities for rural communities. State forestry agencies could hire temporary employees to conduct GNA work that benefits federal lands without supplanting vacant Forest Service positions.

NASF Policy Recommendations for Placing Greater Emphasis on Climate Change in Federal Program Implementation

Tree Planting, Reforestation, and Afforestation on Public and Private Lands

When especially damaging disturbance events interrupt a forest's natural cycle—as in the case of uncharacteristically severe wildfire wiping out entire stands and the seed source—tree planting may be important to boost the forests' regrowth. As of 2019, the Forest Service identified about 1.3 million acres of national forests where planting trees and encouraging natural regeneration are needed. High-severity wildfires contributed to roughly 80 percent of these acres. Currently, there is more than a 20-year backlog of National Forest System lands in need of reforestation treatments. This inability of a forest to naturally recover challenges our efforts to maintain a whole suite of benefits that forests provide, including carbon storage.

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 reforesting approximately 8 million acres.[40]

Depending on the forest type, reforestation requires anywhere from 300 to 800 seedlings per acre. At an average of 500 seedlings per acre, planting 8 million acres would require 4 billion seedlings.[41] **State-owned tree nurseries would have to increase their annual production of seedlings by 400% over ten years to produce 4 billion seedlings**. **USDA should establish long term seedling purchase agreements with state-owned tree nurseries to meet reforestation needs.**

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.**

---

40 *Potential for Additional Carbon Sequestration Through Regeneration of Non-Stocked Forest Land in the United States,* V.A. Sample, Journal of Forestry, December, 2016.
41 *National Survey of State Operated Tree Seedling Nurseries and Tree Improvement Programs,* National Association of State Foresters.

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

Strengthen the Forest Inventory and Analysis (FIA) Program (FCWG Policy Platform)

The FIA program is the only source of forest data and analysis that is national in scope. It informs decision-making in the forestry sector, shapes wildfire protection strategies, serves as the basis for assessing urban tree canopy, and helps land managers analyze the effects of forest fragmentation on economies and ecosystems. Increasingly, FIA is relied on to provide data on the state of the nation's largest carbon sink – our forests – making it an essential component of decision-making for climate change mitigation and adaptation strategy. However, the demands for information on forest carbon are becoming more varied and at scales that outstrip the current funding-constrained capabilities of the program.

State forestry agencies contribute over $5 million annually to FIA implementation and look forward to serving as key implementing partners in the necessary growth and expansion of the program.

Strengthen the Role of Resources Planning Act (RPA) Assessments

RPA Assessments and supporting technical reports produced by the Forest Service RPA research team constitute a trove of valuable scientific information presently underutilized by stakeholders interested in forests, carbon, and climate. Additionally, stakeholder engagement with the RPA Assessments has been lacking in recent years. In order to enhance utilization and strengthen the applicability of RPA Assessments in policy making, NASF recommends Forest Service leadership prioritize engagement with external stakeholders to help direct more timely and responsive RPA research efforts on forest carbon projections and respond to specific policy-relevant questions from interested stakeholders. An additional $3.5 million to the Forest Service Research and Development mission area would further accelerate forest carbon-related research and capacity for carbon modeling.

Forest Stewardship Program (FSP)

FSP is the most extensive family forest-owner assistance program in the country and is delivered in partnership with state forestry agencies, cooperative extension services, certified foresters, conservation districts, and other partners. FSP equips private forest landowners with the unbiased,

science-based information they need to sustainably manage their forests now and into the future, helping to keep forests as forests. In addition to delivering technical assistance directly to forestland owners, the FSP often serves as a gateway to other landowner cost-share assistance programming, like the USDA Environmental Quality Incentives Program, state programs, and partner programs, that can help landowners keep their forests working and intact.

Today, there are nearly 24 million acres nationwide managed with Forest Stewardship Plans. From 2019 to 2020, the total acreage covered by current Forest Stewardship Plans increased by nearly half a million acres. Forest Stewardship Plans provide guidance for family forest landowners to keep their land healthy and productive and often serve as management roadmaps for several generations. Forestland owners that have management plans are almost three times more likely to meet their management objectives compared to those without management plans. The FSP helps landowners to reach their management objectives while tying those objectives to the state's Forest Action Plan. Increased federal funding for FSP will allow state forestry agencies to ramp up outreach efforts and provide additional technical assistance to landowners to ensure that private forestland acres are maintained.

Providing private non-industrial landowners with technical assistance is at the core of most state forestry assistance 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 only a small portion of these currently access technical and financial services through state and federal agencies or other partners. This suggests that most of these lands are not actively managed to maintain health and vigor and are more prone to over maturity, and thus their carbon benefits are not being maximized. **Being able to put more technical assistance on the ground through the nationwide network of state agency foresters is a long-standing need that increased FSP funding could help meet.**

Forest Legacy Program (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. **FLP should receive increased funding levels commensurate with the increased funding provided to the LWCF by the GAOA.** This state-federal program has protected nearly 2.5 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. **USDA Forest Service should increase funding to states to increase greatly needed capacity at the state level to administer the program which would increase project implementation and program success.**

Environmental Quality Incentives Program (EQIP)

EQIP helps landowners pay for conservation practices, such as tree planting and timber stand improvement, which both 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 the effects of climate change is a national priority, funding forestry practices within EQIP should play a larger role.**

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 new bundle of enhancements should include contract extensions for tree planting and optimal carbon uptake in standing timber. This bundle could be constructed to also improve water quality and wildlife habitat.**

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 forested acreage, are eligible for the program. The 2018 Farm Bill increased the overall cap on program acres, but sign-ups have not reached that upper level. The ranking criteria for "General Sign-up" include air quality improvement, but do not mention carbon sequestration explicitly. **Greater carbon storage could be achieved by increasing the CRP acreage cap, increasing rental payments, placing greater priority on tree planting, and revising current restrictions that discourage the planting and maintenance of tree cover.**

Regional Conservation Partnership Program (RCPP)

RCPP funds a wide diversity of partner-implemented projects. The 2018 Farm Bill gave RCPP 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. **Carbon sequestration needs to be made a clear program objective.**

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 include 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, the Healthy Forests Reserve Program (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 Healthy Forests Reserve Program (HFRP)

The HFRP helps 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 allocation was made in 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.

Conclusion

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

One role is advocating for the inclusion of forests, active forest management, 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.

Markets for wood are critical to maintaining the health and sustainability of forests in the U.S. They enable the economic, carefully planned harvest of trees to control stand density and create forests that have a more balanced diversity of age classes, which is important to wildlife habitat diversity, forest resilience and providing a more even flow of sustainable wood fiber for harvesting. As harvest levels continue to decline nationally, and high volumes of standing timber pose forest health problems, it is important to support the research and development of emerging wood markets and institutions that support science-based sustainable management.

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.

Addendum

The following legislative proposals address climate change and are supported by NASF:

The REPLANT Act

i. Removes the current $30 million funding cap and directs all wood product tariffs to refill the Reforestation Trust Fund – which would quadruple the amount of available funding to $123 million per year on average. The bill only uses funds that are already being collected – it does not change the list of products, increase the tariffs, or use taxpayer funds.

ii. The bill also directs the Forest Service to develop a 10-year plan and cost estimate to address the backlog of replanting needs on national forest land by 2031. It also prioritizes land in need of reforestation due to natural disasters that are unlikely to naturally regrow on their own.

The Growing Climate Solutions Act

i. Establish a certification program at USDA to help solve technical entry barriers to farmer and forest landowner participation in carbon credit markets.

ii. Establishes A Greenhouse Gas Technical Assistance Provider and Third-Party Verifier Certification Program through which USDA will be able to provide transparency, legitimacy, and informal endorsement of third-party verifiers and technical service providers that help private landowners generate carbon credits through a variety of agriculture and forestry related practices. The USDA certification program will ensure that these assistance providers have agriculture and forestry expertise, which is lacking in the current marketplace.

NASF Recommendation: Include state forestry agencies as officially recognized by USDA to serve as third party verifiers.

The Rural Forests Markets Act

i. Establish the Rural Forest Market Investment Program that offers guaranteed loans up to $150 million (total for the fund, not each loan) for nonprofits and companies to help small and family forest owners create and sell forest credits for storing carbon or providing other environmental benefits.

ii. Provide a climate solution by encouraging forestland owners to adopt voluntary land management practices that draw carbon out of the air and stores it in forests.

iii. Create new revenue streams for small-scale, family forest owners by making it possible to generate innovative credits they can sell in established environmental marketplaces.

iv. Invest in rural communities by reducing the financial risk to private investors who can contribute the upfront financing that makes these projects possible.

NASF Recommendation: Include state forestry agencies as eligible entities to receive these loans.

The Trillion Trees and Natural Carbon Storage Act

i. Creates the International Forest Foundation, a nonprofit organization, to encourage and accept donations in support of international reforestation, restoration, and deforestation prevention efforts.

ii. Authorizes $10 million for USDA Forest Nursery Revival programs to ensure that the supply of seeds and saplings allows for increased domestic planting.

iii. Engages America's allies in conservation by authorizing the Secretary of State and USAID to increase their forest management cooperation efforts with other nations in order to better promote reforestation and sustainable land use management abroad.

iv. Amends existing international conservation programs to explicitly include carbon sequestration and forest management among the list of approved technical assistance categories.

x. Makes it easier for private landowners to participate in carbon credit markets by authorizing USDA to provide loan guarantees for related projects.

xi. Requires that USDA establish objectives for increasing the net carbon stock of American forests, grasslands, wetlands, and coastal blue carbon habitats.

The Outdoor Restoration Partnerships Act

i. Establish an Outdoor Restoration Fund to dramatically increase support for local collaborative efforts to restore forests and watersheds, reduce wildfire risk, clean up public lands, enhance wildlife habitat, remove invasive species, and expand outdoor access. The bill establishes an advisory council of local leaders, industry, and national experts to administer grants, coordinate with existing regional efforts, and provide oversight.

ii. Empower local leaders by making $20 billion directly available to state and local governments, tribes, special districts, and non-profits to hire individuals who can plan, implement, and monitor restoration and resilience projects. Empowering local leaders that have an ability to bring diverse voices to the table is the path for progress in the West.

iii. Partner with states to invest $40 billion in restoration and resilience projects across public and private land, in coordination with governors. This partnership will ensure that federal agencies are willing and able to support state and local efforts to reduce wildfire risk, restore watersheds, and improve wildlife habitat. Tackling the backlog of restoration and resilience projects across the country will sustain our economy and way of life.