Forest Carbon - Forest Management - Climate Change Solutions

A Position of the New England Society of American Foresters

Adopted by the New England SAF Executive Committee on June 15, 2022. This position statement will expire in 2027, unless, after subsequent review, it is further extended by the New England SAF Executive Committee.

Purpose

To discuss the important connection of carbon to forests in New England and provide insight to the science surrounding forest carbon, climate change and associated forest management strategies that provide for conserving carbon on the landscape. These concepts are discussed and documented in recent policy positions nationally (Society of American Foresters [SAF] 2020) and regionally (Yankee Division of the New England Society of American Foresters [YDSAF] 2020).

Scope

This position statement describes how the forests of New England are connected to the region culturally and economically and are extraordinary carbon sinks and through wise stewardship and management approaches can provide resilience to anticipated climate change.

Position

It is the position of the New England Society of American Foresters (NESAF) that balanced and tactical, science-based forest management conducted on private and public forest ownerships throughout New England will:

(1) Establish and maintain value in forests and forest ownership fostering the economic conditions to keep forests as forests and thusly,

(2) mitigate greenhouse gas (GHG) emissions through the sequestration of atmospheric carbon in resilient, well-managed forests (trees and soil), producing wood-based products to replace both non-renewable materials and fossil fuel based energy sources; and

(3) provide the conditions for diverse resilient forest landscapes that are capable of adapting to future climate patterns and provide resistance to disturbance driven by climate change.

Issue

New England's forests have long provided its residents a myriad of ecosystem services: wood, soil and water protection, and wildlife habitat. Recently, carbon storage and sequestration have gained recognition as additional ecosystem services. Through photosynthesis, carbon is sequestered by living trees within forests and once sequestered, stored in those trees and the soils that support them. Climate and landscape variables create a range of conditions that result in differing rates and time horizons of the process. For example, sequestration can take place at high rates, particularly in young regrowing forests (Pugh et al 2019), while older forests with complex conditions can accumulate and store large amounts of biomass (carbon) (Keeton et al. 2007, Keeton et al. 2011). Policy makers are urged to support processes or activities that reduce CO_2 emissions or remove (sequester) CO_2 from the atmosphere. Examples are implementing sustainable forest management and using biobased energy and materials in place of carbon intensive products (IPCC, 2014).

The forests of the eastern United States including New England face significant threats to loss of carbon sequestration and storage capacity potential from forest cover loss. Keeping forests as forests in a rapidly urbanizing Northeast is the most important contribution that can be made in relation to carbon storage, sequestration and mitigating climate change (Woodall et al 2015).

Carbon is also stored in the long lived products (flooring, furniture, structural timber) that are harvested from forests. Utilizing locally sourced wood products as opposed to importing wood products can significantly reduce New England's "carbon footprint" (Berlik et al 2002, Ashton et al. 2012). Additionally, long lived forest products produced in New England have the potential to replace steel, concrete, and plastics which are fossil fuel, carbon intensive produced building products (Oliver et al 2014). This replacement potential will likely increase given the acceptance of wood-based construction materials such as "mass timber".

There are abundant opportunities to replace fossil fuel use for energy by using low grade woody biomass from New England's forests - approximately 61% of the harvested wood in the region is used or otherwise available for energy production (Burrill, et al 2021, Smith et al 2006). The use of domestic forest biomass for energy has the potential to advance the reduction of life cycle carbon emissions compared to the continued use of nonrenewable fossil fuel. It also can help with local and national energy security and improve employment in domestic rural economic sectors. (Society of American Foresters 2019, Kukrety et al 2015)

Different forest management approaches can have different carbon results. In general, passive management, which precludes harvesting, will result in higher carbon accumulation, while managing for young forest habitat can maximize annual sequestration (Catanzaro and D'Amato, 2019). However, tradeoffs exist between these management approaches that extend beyond immediate carbon accounting. Passive management systems, for instance, may not be best adapted for providing other critical ecosystem benefits: resilience from disturbance, diversity of habitat, regional water supply management, or regional wood products markets. A landscape approach that simultaneously manages for multiple forest structures (young and old trees) can increase carbon storage while providing the many other benefits afforded to us by managed forests (Nunery and Keeton 2010). In a landscape approach to forest management it is important to use a variety of approaches that capture carbon as well as store carbon to maintain the strength of the region's carbon sink while also meeting other ecological objectives. (Littlefield and D'Amato 2022, Massachusetts Department of Conservation and Recreation Bureau of Forestry). In New England, managing for reserves is appropriate in some locations when balanced by sustainable timber harvesting in other areas and the outcome best serves the full spectrum of human needs over time. Meeting these objectives will require a full suite of conservation strategies working together, including both sustainable harvesting and reserve-based management (Foster et al. 2017).

Background

Keeping forests as forests is of paramount importance to continuing carbon sequestration and providing a buffer to climate change impacts. Preventing the conversion of forests to non-forest uses will reduce GHG emissions (Canadell and Raupuch 2008). Between 1990 and 2010 over 28,000 acres of New England forests were converted to some type of non-forest each year. Converting a forest to non-forest land use eliminates most of the carbon storage and all of the forest's capacity to store and sequester carbon in the future (Catanzaro and D'Amato 2019).

The New England region is vast and its forests and their management vary significantly throughout the region. As the New England climate changes, so must the approaches to forest management be judicious so that landscapes are resilient to disturbance created by climate change. There are strategies to use our region's forests as a natural climate solution, sequestering CO_2 and storing carbon.

Natural Disturbance Regimes - Forest Management Provides Resilience to Climate Change

The specific forestry tools appropriate to New England are a function of our unique ecosystem components including climate, soils, species, and disturbance history. Our forests range from the typically moist, spruce-fir and northern hardwood types in northern New England subject to infrequent major disturbance of near 400 years, to the oak-hickory and pine hemlock forests of southern New England which have a disturbance cycle of perhaps less than 100 years (Seymour et al 2002, Lorimer and White 2003). These variables all contribute to a "profile" of carbon sequestration and storage and need to be considered when arriving at management strategies.

Forest management that replicates small canopy disturbances, which are common in northern New England, has the advantage of maintaining complex forest structures and maintaining stored carbon on site. Larger canopy disturbances, historically more common in the southern part of our region may sacrifice stored carbon but will have high carbon uptake rates (Nunery and Keeton 2010) and provide much needed early successional wildlife habitat. Balancing both these different strategies across the New England landscape is important in providing a variety of size and age classes, key components of higher biodiversity.

Because climate changes are affecting the natural disturbance regimes (Evans and Perschel 2009), foresters and resource professionals have sought to integrate this complexity into management decisions to enhance forest resilience. A system of evaluating options, strategies, and approaches to forest resilience and carbon management has been developed for forest managers (Janowiak et al 2014, Ontl, et al 2020) Examples of real world projects in New England where foresters have integrated climate considerations, promoting ecosystem resiliency, and carbon stock management are documented through the Climate Change Response Network (Northern Institute of Applied Climate Science 2022).

Wood as an Alternative

The wood products industry has been a fabric of New England for 400 years. In 2011 the forest based economy in the northern part of our region (including New York) contributed 33.1 billion dollars and 177 thousand jobs. Likewise, in 2013, the southern New England (MA, CT and RI) states produced an estimated $5.8 billion dollars in gross regional output and provided employment to approximately 28,525 individuals (Northeast State Foresters Association 2013, 2015).

In New England, high quality lumber, timbers, furniture, cabinets, flooring, plywood, and pallets are produced (Irland and Kingsley 2014) all of which store significant amounts of carbon for long periods of time (Janowiak et al 2017). Average annual harvests in our region as of 2019 resulted in long lived products that store nearly 3.7 million tons of carbon annually. The carbon stored in these wood products harvested from New England's forests is approximately equivalent to the annual CO2 emissions of 2.7 million automobiles (Burrill, et al 2021, Smith et al 2006, US EPA 2021). There is now great interest and momentum in "mass timber" which uses large wood components in building structures replacing concrete and steel (Struck, 2019). The University of Massachusetts is home to the Olver Design Building, the largest and most technologically advanced academic contemporary wood structure in the US. This mass timber building has sequestered 2,000 tons of CO_2 from the atmosphere within the 70,000 cubic feet of wood in the structure (University of Massachusetts 2019). Using wood products, such as those produced with sustainable forestry in New England, in place of concrete and steel, can offset up to 31% of global CO_2 emissions (Oliver et al 2014).

Wood as an alternative source of energy for heat and power in New England is significant. New England businesses, schools, hospitals, public buildings and homes use low grade wood products including traditional firewood for heat and power. Wood as a fuel source provides approximately 2% of the electrical power in New England (ISO New England 2021). Portions of the wood harvested annually in New England is already used to generate heat and electricity so that 4.2 million tons of carbon per year do not have to be emitted from other sources, including fossil fuels (Burrill, et al 2021, Smith et al 2006)

Summary

The New England SAF advocates for keeping forests as forests as a natural carbon sink. These forests are managed by foresters with techniques that provide resilient forest structures and recognize regional disturbance regimes that are changing due to climate change. Many forest management approaches, including passive and active, can produce positive carbon benefits. Locally produced forest products that offset fossil fuel emissions and store sequestered carbon for long periods of time are recognized as part of the solution to excessive atmospheric carbon and resulting climate change.

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