



NATIONAL ASSOCIATION OF STATE FORESTERS

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Dear Fellow State Foresters:

Mitigating the effects of climate change is one of the greatest policy challenges facing our country and the world today. Policies and programs are being developed at every level to regulate and/or incentivize climate-smart decision making. Forests, which are responsible for absorbing approximately 12% of U.S. carbon emissions annually, are a critical piece of these policy conversations.

Private landowners own 60% of the nation's forests. Their forests have significant potential to be a carbon solution, not only in the eyes of state foresters, but to policymakers, NGOs, and private corporations. State managed forests also have potential, particularly as a model for forest carbon management.

Because our primary mission is to ensure the nation's state and private forests are healthy and remain intact, we are on the frontline of the forest carbon issue.

Keeping forests as forests—and accruing carbon benefits—necessitates thoughtful management to mitigate insect, disease, and wildfire threats. State forestry agencies deliver technical and financial assistance to landowners so that they may understand their management options and meet their own management objectives. The option of managing for carbon requires additional expertise at the state forestry agency level to best serve landowners and our nation's forests.

The NASF recently published a policy paper on climate change, "[Enhancing Forest Resilience and the Role of Forests in Dealing with Climate Change](#)," which offers recommendations for increasing carbon storage, improving forest biomass utilization, and mitigating the effects of climate change with federal forestry programs.

This document is meant to supplement that paper and serve as a practical, educational resource for your agency staffs. It also includes recommendations for state forestry agencies as they assist forest landowners in both understanding their carbon market options and including carbon in their management goals.

It is broken down into three sections:



Section 1: NASF Policy Recommendations on State Engagement in Forest Carbon Activities

To watch this section instead of reading it, click here for a presentation by Rachel Reyna, Pennsylvania Bureau of Forestry

In early 2021, NASF stood up a Forest Carbon Markets Working Group to advise the NASF on forest carbon market policy. The working group's membership included state forestry agency technical experts from across the country, as well as NASF and regional state forestry association staff. It developed the following general recommendations based on current mandates and information:



i. State forestry agencies should build on what they currently do best: providing landowner education, information, and technical assistance.

- Include information about carbon markets in landowner education and technical assistance activities and provide staff and landowners with additional training to accomplish this.
- Develop publications and other communication tools to strengthen employee understanding of carbon sequestration and carbon markets.
- Provide localized information about regional carbon storage demand and supply to assist landowners in price negotiations.

ii. Private industry is already conducting carbon project marketing, development, verification, and monitoring. NASF's hopes to see this industry grow and become fully sustainable in the long term. To this end, state forestry agencies should:

- Cooperate with these entities and seek to align their goals and objectives for promoting a healthy and sustainable forest resource.
- Be familiar with the credentials of businesses operating in local carbon markets and capable of advising landowners about those markets.
- In some cases,
 - Fill in while the industry matures by:
 - Aggregating land ownerships to create scale.
 - Preparing carbon project management plans.
 - Implementing existing protocols for verification of carbon additionality.



- Monitoring projects.
 - Assisting with pilot programs, like those led by the American Forest Foundation and The Nature Conservancy.
- Take on a permanent role if necessary to allow landowners access to carbon markets.
- Significant expansion of state forestry's role will require additional funding. Additional state revenue could be available as a service fee paid for by the project where private industry is unable to meet landowner needs.

iii. State forestry agencies' communications should reinforce:

- The social, environmental, and economic benefits of forests.
- The value of urban and community tree programs.
- The carbon benefits of harvested wood products (HWP).
- The carbon benefits of wildfire and pest risk reduction.
- The need for active forest management to realize multiple benefits.
- The need for greater standardization and simplification of carbon market development and requirements.

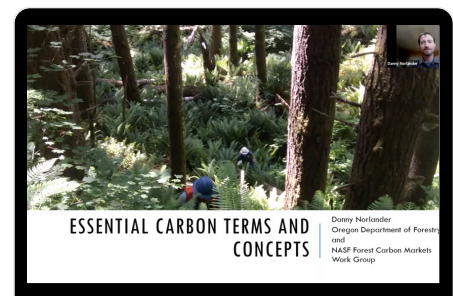


[Learn more about the nuances of carbon messaging with this video presentation by Whitney Forman-Cook, NASF](#)

Section 2: Key Terms and Concepts for State Agency Engagement in Carbon Market Conversations

[Click here for a video summary of this section by Danny Norlander, Oregon Department of Forestry](#)

In 2008, the Southern Group of State Foresters (SGSF) produced a report, "[Key Issues for Forest Carbon Sequestration Projects in the Southern United States](#)," in part to inform a national dialogue on current carbon legislation. In the 13 years since, a federal carbon market has not materialized and a proliferation of market opportunities has filled the void.



This section aims to provide state forestry agencies with a primer on forest carbon markets, including key terms and concepts, that will be helpful in fielding future market opportunities, particularly for private forest owners.



I. Carbon Offsets

Carbon offsets are any activity that compensates for the emission of greenhouse gases (GHGs). Forestry activities that represent climate solutions may be eligible for carbon credits. They include forest conservation, reforestation or afforestation, and improving forest management (see eligible activities section below). Carbon offset projects are issued carbon credits for the amount of carbon dioxide equivalent (CO₂e) the project provides. Typically, one carbon credit is issued for one metric ton of CO₂e.

II. Regulatory vs. Voluntary Markets

There are two distinct types of carbon markets; voluntary and regulatory markets. When discussions of forest carbon markets began decades ago, it was envisioned that a national regulated marketplace would be erected and serve as the go-to for project inclusion. It never materialized, and as a result, both regulatory and voluntary market options (all at sub-national levels) exist for landowners. Regulatory (a.k.a. compliance) markets exist where laws or regulations are enacted that limit or cap the quantity of GHGs corporations can emit. In the U.S., there are two regulatory markets: the California Cap and Trade Program and the Regional Greenhouse Gas Initiative (RGGI), which includes a number of states in the East. There are also international compliance markets that recognize offsets generated in the U.S.

In the place of a national regulatory market, voluntary markets have grown. These voluntary markets are variable in price, conditions, duration, and other aspects. Corporations, in particular, have been very interested in demonstrating social responsibility by purchasing offsets for their emissions through voluntary markets. An increased focus on climate change will enhance this interest and lead to continued increases in voluntary market opportunities in the future.

III. Protocols and Standards

Protocols and standards define how forest carbon offsets must be developed in order to be legitimately exchanged. These “rules of the game” help provide consistency and credibility for carbon projects by addressing many of the key requirements listed below.

A. Registries and Exchanges

Carbon registries and exchanges operate as a marketplace for carbon credits. Before a carbon credit can be registered for sale, an independent third party must verify that an approved protocol was followed to measure the amount of CO₂e. Upon successful verification, carbon credits are issued and tracked with a unique serial number to prevent double counting. This ensures that ownership, tenure, and use rights are legally documented and undisputed.

Project developers and/or carbon exchanges generally require landowners to enter into contracts before transactions can occur. These legally binding documents clearly define the delivery of carbon credits and include protections for both the buyer and seller. Important considerations include contract duration, credit issuance (ex. annually), requirements for strict adherence to any protocol(s), and penalties for contract violations. Contracts will most likely incorporate provisions on other concepts discussed in this section.



B. Eligible Activities

All forest carbon markets must define eligibility for carbon credit generation. Project developers, technical assistance providers, and landowners must be aware of which activities are eligible for participation in programs they are exploring. Identifying eligible activities in the development of any forest carbon program is essential to landowner participation and, ultimately, securing environmental benefits. Maintaining eligibility as a carbon credit producer depends on a forest's management. Eligible activities could include:

- **Planting trees on open lands**, including urban landscapes and acreage previously forested, can increase carbon stocks in both tree biomass and soils. These methods are widely recognized by many current forest carbon programs.
- **Sustainable forest management** can provide quantifiable increases in carbon stocks through wildfire, insect, and disease mitigation.
- Carbon is sequestered in **harvested wood products** (HWPs), such as dimensional lumber, and as such, can be included as an eligible activity. Greater utilization of wood products also has the ability to replace more energy intensive building materials, such as steel, plastic, and concrete, leading to less overall GHG emissions.
- Markets can also recognize the climate benefit of activities that **prevent forestland conversion** (i.e. keeping forests as forests), which can be incentivized in the development of a proper Business As Usual (BAU) case, discussed later.

C. Carbon Pools

Central to any forest carbon marketing program is identifying the various carbon pools associated with the forestry offset project. For landowners to profitably participate in carbon markets, it is exceedingly important to identify the appropriate carbon pools required by the market and the inventory costs associated with each pool. The upfront inventory costs to enter the market are a major consideration. Dividing the project into various pools is important because of the need to utilize various inventory processes that are pool-specific.

Carbon accounting with pools helps eliminate de minimis pools for certain project types, optional pool reporting, and utilizing cost-effective inventory processes that are pool specific. Carbon pools generally include aboveground live biomass, below-ground live biomass, dead biomass, soils, litter, and HWPs. Deciding on which carbon pool to account for depends on the nature of the forestry offset project being implemented.

As a rule, carbon pools that are expected to significantly change over the life of the project should be quantified and reported. Generally, carbon pools that are not expected to change over the life of the project won't be measured to avoid the costs associated with inventory, reporting, and verification.

D. Measurement and Monitoring

The method used to quantify forest carbon offsets is of critical importance. Any quantification method employed should balance precision and accuracy with cost



effectiveness, so landowner participation is not deterred. Quantification methods can rely on forest inventories, growth and yield models, and reference tables (like the Energy Information Administration's 1605b guidelines).

Forest inventories, based on statistically sound designs can be used to accurately measure the amount of carbon stocks in a forest. Measuring all trees on a stand is simply not practical and cost effective, and would severely limit landowner participation. Establishing plots that can be referenced in perpetuity is necessary to ensuring that qualified auditors are able to take accurate measurements year after year.

Approved growth and yield models can also help predict change in carbon stocks with accuracy, as long as reasonable true-up intervals are utilized. Accounting for the carbon in HWPs, either through monitoring or modeling, is important for a full picture of the carbon benefits of a landowner's management regime.

E. Baselines and Additionality

In order to generate marketable GHG emissions reductions, a project must sequester carbon that is in addition to what would have occurred in the absence of the project. "Additionality" is shorthand for this condition; it refers to a project's ability to sequester additional carbon over a baseline. Historically, nearly all markets for certified forest carbon offsets have required some documentation of additionality. However, stakeholders are now considering whether to recognize "early adopters" of carbon-beneficial activities that may have been performed prior to being monetized for carbon.

Establishing additionality is a critical step in determining the validity of a project, since credible carbon (i.e. carbon eligible for offset markets) is utilized to offset emissions generated elsewhere. Determining project additionality is often a controversial issue due to the difficulty in establishing baselines.

Protocols for establishing baselines utilize one of two approaches. The first approach, "business-as-usual (BAU)," compares increases in actual forest carbon stocks to reference levels of carbon stocks unaffected by project activities. The reference case is projected into the future in order to measure actual forest carbon sequestered over time. The BAU baseline sets a performance standard that projects must exceed in order to generate credible carbon. A BAU baseline may be either project-specific (i.e. a reference case is formulated for a particular tract of forestland) or ecosystem-specific, in which project carbon stocks are compared to regional estimates of carbon sequestration for particular ownerships, age classes, and species composition.

It is important to consider that BAU baselines, when applied to forest projects on private lands, are confounded by several important ecological, political, and socio-economic factors unique to land use. In order to prove carbon sequestration that "would have happened anyway," a landowner must establish a projection of carbon stocks many years (often decades) into the future; incorporating myriad assumptions about future impacts, market demand for forest outputs, forest laws, tax policy, and payments for other ecosystem services. Developing a baseline that successfully integrates these factors can result in dubious



baselines. Most notably, non-industrial private forests in the U.S. are under increasing threat of conversion and development. How to incorporate the effects of land-use pressures into development of BAU baselines is a difficult and subjective process to consider.

The second baseline approach, “base-year,” compares project-specific measurements of carbon stocks from one period to the next. The year in which the initial measurement of carbon is made provides the reference—or the “base year”—to which future carbon stocks are compared. Increases in carbon storage over the base year are considered credible carbon. The base-year approach does not rely on complex assumptions about landowner intentions, market forces, or policy. Instead, only one assumption is made: all forest carbon stock changes (both increases and decreases) are the result of management actions undertaken by the landowner. Carbon stocks are measured at one point in time, then again at another point in time using the same methodology. Increases in carbon stocks are awarded as credible carbon, while decreases are compensated for per the contract.

F. Permanence

Permanence addresses the degree to which sequestered carbon is “permanently” removed from the atmosphere. The working definition of permanence, like additionality, is central to the controversy surrounding forestry offset projects. After all, “permanent” can be defined as equal to the duration of the contract.

Long-term atmospheric carbon removals and accumulated carbon storage reversals can be caused by natural disasters such as wildfire, hurricanes, or insect and disease, or even over maturation, which leads to deterioration and death. An insurance or risk-pooling mechanism is almost always put in place to offset these losses, should they occur. Examples of such mechanisms include:

- **Buffer pools**, which can hedge risk by placing a percentage of issued credits into a savings account.
- **Insurance**, which can ensure payment to the landowner or the credit purchaser. As with any risk-based transaction, insurance can be purchased whereby if the carbon project is all, or partially, destroyed the landowner may still be able to receive some payment, and/or the purchaser able to recover some part of what was paid.
- **Like-kind pools**, in which forestland managed for carbon sequestration serves as a replacement reserve for projects that generate and sell carbon credits.
- **Biological risk management**, which could include forest management activities that reduce the risk of wildfire, pests, and disease.

To encourage the typical private forest landowner’s participation in any carbon market, balancing concerns over carbon sequestration permanence with logistical and economic feasibility is key. Short-term contracts are more attractive to private landowners entering the market space and long-term contracts or conservation easements are likely to deter them.



G. Leakage

Leakage occurs when a carbon sequestration project causes unintended increases or decreases in GHG emissions elsewhere. Leakage may have impacts at a regional, national, or international level, making the quantification of this secondary effect difficult or impossible. There are different types of leakage, including:

- **Internal leakage**, which occurs when activities undertaken on a portion of a forest ownership result in changes in GHG emissions on a different portion of the same ownership (ex. a landowner reduces harvesting in one area while increasing harvesting in another area).
- **External leakage**, which occurs when one forest owner's carbon sequestration activities result in another landowner changing their behavior in a way that increases GHG emissions.
- **Market leakage**, a type of external leakage, which occurs when a forest project reduces the availability of a good, thereby transferring market demand to other forests.
- **Activity-shifting leakage**, which occurs when a project does not replace a land-use activity, but displaces it to another location.
- **Positive leakage**, which occurs when one landowner's activities have a positive impact on carbon sequestration in other forests.

There is general agreement that internal leakage can be addressed by the landowner's reporting of all harvests, plantings, mortality, and growth across his or her total acreage. However, this approach may be difficult to implement practically in instances when the landowner owns forestland in multiple counties or states.

Determining the direct impacts of one landowner's decisions on other landowners, or broader market impacts, is exceedingly complex. As a result, some programs choose to ignore external sources of leakage. Those programs that have adopted methodologies for estimating leakage are not consistent with one another or rely on limited data sets.

H. Verification

Verification is critical to determining the validity of forest-based offset projects. This aspect provides additional protection to the buyer and seller to ensure that any carbon credit transacted follows all rules, protocols, and standards. Qualifications of the verifying organization, methods used, and frequency in which verification takes place must be documented to enhance the legitimacy of these projects. There are a number of ways verification can be conducted in terms of methods and frequency, but the importance of independent, third party organizations in providing this service is paramount. Generally, on- and off-site verification is conducted at project origination, project completion, and during specified intervals throughout the project.



I. Aggregation

It is widely recognized that the transaction costs of entering a carbon market are very high and present significant financial barriers to smaller landowner participation. Research suggests that 5,000 acres is the smallest acreage at which carbon projects are economically feasible. With "aggregation," an entity with sufficient upfront capital will set up contracts for multiple landowners and one buyer, thereby reducing the transaction costs for the individual landowners. Aggregation can boost landowner participation and help realize greater landscape-scale benefits, but including "an aggregator" can also add time and complexity to forest carbon project development.

J. Co-benefits, Stacking, and Bundling

The activities associated with increasing carbon stocks frequently have co-benefits, such as protecting water quality or quantity and enhancing biodiversity. In limited circumstances, additional payments may be available to a landowner through stacking (or bundling) the total suite of environmental services being provided.

Section 3: Synopsis of Current Forest Carbon Market and Program Options

This section aims to provide state forestry agencies with a status update on U.S. forest carbon crediting markets and programs. It was compiled by NASF with help from its member agencies in early 2021, and while not comprehensive, we hope it gives state forestry agencies the platform to share and collaborate with one another in this space.

Current state forestry activities across the country related to forest carbon are best described as varied and often exploratory. A framework exists for achieving reductions in carbon emissions in California and the Northeast and Mid-Atlantic, but most states have no substantive program to recruit or assist landowners in selling carbon offsets.

Almost universally, though, state forestry agencies have played supporting roles to other organizations in the forest carbon market space. A few states were involved early on in carbon market development, but stepped back when organized carbon exchanges failed to sustain themselves. A few others have been involved in registering state-owned lands in carbon markets.

In addition to the regulatory markets for forest carbon offset credits in California and the Northeast and Mid-Atlantic, there are a number of voluntary forest carbon markets. Nearly all of the forest carbon offsets in the U.S. are enrolled in one of the three primary carbon registries: the [Climate Action Reserve Registry](#), the [American Carbon Registry](#), and the [Verra Registry System](#).

Two of the most prominent NGOs working in the forest carbon space are American Forest Foundation (AFF) and The Nature Conservancy (TNC). State forestry agencies report working



with both of these organizations around the country in various forest carbon capacities. AFF and TNC have teamed up to start the [Family Forest Carbon Program](#), in which the NGOs serve as aggregators in a voluntary market to improve landowner participation. Other national NGOs reported to be working in the forest carbon space are Ducks Unlimited and the National Audubon Society.

A number of states have been working with an organization called [NCX](#) (short for the Natural Capital Exchange). NCX is working to create its own marketplace for connecting interested buyers and sellers of forest carbon and other ecosystem services. It is also focused on helping address market barriers for small landowners, both public and private.

States also report working with a number of other for-profit carbon project developers, including [TerraCarbon](#), [Finite Carbon](#), and [ACRE Investment Management L.L.C.](#), which includes [Green Trees](#).



[Learn more about carbon project developers and programs with this video presentation by Jeremy Klass, New Mexico State Forestry Division](#)

Some states have taken on active roles in carbon project development on private lands:

In Hawaii, a "grouped" reforestation carbon project is being developed through the Division of Forestry and Wildlife (DOFAW). Once DOFAW is officially certified they will be able to enroll other similar reforestation projects (including both public and private lands) across the State of Hawaii every time there is a verification completed (i.e. issuance of credits, at a minimum frequency of 5 years). DOFAW is certifying its forest carbon project with Verra through their Verified Carbon Standard and Climate, Community and Biodiversity standards.

In Virginia, as part of the [Healthy Watersheds Forest Retention Program](#) for the Chesapeake Bay, the State Forestry Agency is working with two localities to develop the legal documents and framework to begin landscape scale aggregation of carbon as a proxy for forestland retention and water quality improvement and achievement of TMDL goals in the Chesapeake Bay Watershed Implementation Plan.

Some states, like Michigan and Tennessee, are investigating and have even enrolled state forest lands in carbon offset programs. Other states have resources and/or authorities which are vestiges of previous policy interest in forest carbon and which are not in current use, but could prove integral in future policy developments:

[Learn more about how state forestry agencies can get involved in carbon markets with this video presentation by Heather Slayton, Tennessee Division of Forestry](#)





Some states have resources and/or authorities which are vestiges of previous policy interest in forest carbon that are not in current use, but could prove helpful in the future.

The Oregon Department of Forestry has the statutory authority to create a carbon offset program which would be available specifically for forest carbon, but which has never been created.

The [Georgia Carbon Registry](#) was established in the mid-2000s, as interest in carbon markets was first beginning. The Warnell School of Forestry at UGA helped create carbon sequestration tables, and Georgia Forestry Commission provided initial training for consulting foresters that wanted to inventory projects. However, as markets interest has waned, the information has become out of date and the registry never got much use.

Carbon credit programs are not solely focused in rural areas. City forest carbon credits is a partnership between the City of Austin and [TreeFolks](#) to generate carbon credits to enhance urban tree canopy. And while forest carbon market projects are not generally on federal land, the [National Forest Foundation](#) has enrolled a tree planting program on federal land in a carbon registry.

NASF is working to keep state foresters and their staffs fully informed on this quickly evolving topic. If you would like more information, or have questions about the resources provided here, please reach out to NASF staff.

Ultimately, we would like to facilitate a network of state forestry staff that could meet periodically and share information on forest carbon markets. Individuals interested in participating in this network can send their name and contact information to [Marvin Brown](#) by the end of August. He will organize the network's first virtual meeting for after the NASF Annual Meeting in early September.

Sincerely,

Forrest Boe

**CHAIR, NASF FOREST RESOURCE MANAGEMENT COMMITTEE
STATE FORESTER OF MINNESOTA**