



PAYMENTS FOR FOREST CARBON

By Alexandra Kosiba. Illustrations by Erick Ingraham.

*This article is the last in a four-part series that focuses on forest carbon. A companion series, beginning this spring, will focus on climate change impacts and adaptation in forests. Alexandra Kosiba, a forest ecologist and tree physiologist, is an assistant professor of forestry at the University of Vermont Extension. She leads the Vermont Forest Carbon Inventory project and provides educational presentations for the **Securing Northeast Forest Carbon Program**, a federally funded collaboration among state foresters in New England and New York. To learn more about the program, go to northeastforestcarbon.org. To read the first three articles in this series, go to northernwoodlands.org/magazine/forest-carbon.*

Many forest landowners are interested in managing their forests for carbon benefits, yet few are able to do so without considering the financial consequences. To address this need, there are emerging opportunities for landowners to be compensated for the carbon sequestered and stored by their forests. Options include selling a forest's carbon benefits in a carbon offset market, as well as with more traditional programs that pay landowners to implement specific carbon beneficial practices that are not based on selling offsets. Because carbon offset markets are novel, complex, and often confusing, most of this article is devoted to explaining how they work.

Carbon offset markets are also subject to ongoing debate. Most of this discussion centers around whether carbon offset markets are achieving their intended goal of climate change mitigation by reducing and stabilizing the levels of heat-trapping greenhouse gases in the atmosphere. Therefore, it's important to distinguish between the financial opportunity that can help landowners keep land forested and subsidize both conservation and forest stewardship efforts, and the less proven value of offsets as tools to directly reduce global emissions.

If none of the current options work for you right now or are not available where you live, keep in mind that new opportunities for being paid for the carbon your forest sequesters and stores are rapidly developing. Any landowner who commits to keeping their forest as forest, manages their forest sustainably, and harvests durable wood products that store carbon and help to reduce our dependency on more carbon-intensive materials is helping to mitigate climate change, regardless of whether they are getting paid directly to do so.

WHAT ARE CARBON OFFSETS?

Carbon offsets, or carbon credits, are designed as a market-based approach to climate change mitigation. They are based on the idea that greenhouse gas emissions at one location can be balanced out, or offset, by carbon sequestration and storage in another location. In this framework, a carbon offset buyer (typically a

company, although it could be an individual) who is responsible for greenhouse gas emissions pays someone else to keep that same amount of greenhouse gases out of the atmosphere. This includes actions that avoid emissions by keeping carbon stored, as well as actions that promote the sequestration of additional carbon from the atmosphere.

A single carbon offset is a certificate that represents the reduction or removal of one metric ton of CO₂, or the equivalent amount of other greenhouse gases, for a set amount of time. The buyer can use this certificate as a "license" to produce one metric ton of emissions. By purchasing offsets, the buyer seeks to counteract their own emissions. If the number of offsets purchased is equal to the amount of emissions, the buyer can claim to have "net zero" emissions.

HOW ARE CARBON OFFSETS BOUGHT AND SOLD?

Carbon offsets are transacted in *carbon offset markets*. There are two types of carbon markets: compliance (or regulatory) and voluntary. *Compliance carbon markets* are created by governments as part of a regulatory regime that requires certain greenhouse gas emitters, such as power plants and factories, to reduce their emissions over time. Emitters have the option of purchasing a percentage of required emissions reductions as offsets from certified projects. Over time, the percentage that is eligible to be offset decreases to force emitters to make enduring shifts away from fossil fuel usage. One example of a compliance carbon market is California's Cap-and-Trade program.

In contrast, the *voluntary carbon market* is unregulated. Anyone can purchase offsets in the voluntary market and because participation is not legally mandated, entities can choose what percentage of their emissions they offset, and there is no requirement for emitters to reduce emissions over time. In the Northeast, most forest landowners interested in selling forest carbon offsets will do so in the voluntary market. This is because California's compliance market restricts where offsets may be generated, and currently the Northeast does not have a compliance market that includes forest-based offsets.

HOW ARE CARBON OFFSETS GENERATED?

Carbon offsets can be generated by reducing emissions or increasing sequestration from a variety of sources. For example, carbon offsets may be generated by a landowner through the growth of trees, by delaying a planned timber harvest, or by planting trees in an un-used field. Offsets can also be generated in other ways, for example, by reducing methane emissions from manure pits on a dairy farm. Each of these is an example of an individual *carbon offset project*.

Calculating and verifying the number of offsets generated by a project is complex, labor intensive, and costly. As such, a landowner can't typically do it on their own. Instead, a landowner contracts with a *carbon offset developer*, which is a company that oversees the documentation, accounting, verification, marketing, and selling of carbon offsets generated from a carbon offset project. In doing so, the carbon offset developer bears the financial risk of the project.

Because of the complexity and cost of creating a carbon offset project, until recently, entry for forest landowners has been limited to large parcels (greater than 2,500 acres). But some carbon offset developers have created carbon offset programs that allow landowners with smaller parcels to enroll. Two examples available in the Northeast are the Family Forest Carbon Program (developed by American Forest Foundation and The Nature Conservancy) and the Conserve Program (developed by Forest Carbon Works). To reduce associated costs, these programs differ from traditional carbon offset projects in that enrolled parcels and their generated offsets are combined, or pooled.

Regardless of which developer you work with, landowners wishing to sell forest carbon offsets are required to manage their forests within specific guidelines for the length of the contract. Some developers disallow any tree harvesting, while others allow active management, but stipulate the amount of wood volume that's permissible to be harvested.

HOW ARE THE NUMBER OF CARBON OFFSETS QUANTIFIED?

Because carbon offsets are purchased by another entity to compensate for emissions made elsewhere, it is important that offsets represent a *real* carbon benefit that can be measured, that this carbon benefit be additional to what would have occurred otherwise, and that the benefit last for a set amount of time. How to reliably quantify the carbon benefit of a forest and management activities therein is one of the greatest challenges of carbon offset methodologies.

A crucial element of a carbon offset project is establishing the *baseline*, which is the forest's carbon storage potential in the absence of its enrollment in a carbon offset market. The baseline can be estimated several ways depending on the specific protocol used by the carbon offset developer, and may be referred to as the business-as-usual scenario or common practice. For example, some developers estimate the baseline as the carbon storage potential of the forest if the landowner harvested the maximum amount allowable by law. Other developers estimate the baseline from the average carbon storage in nearby forest-monitoring plots. Because these forest plots are presumed to be managed differently than forests enrolled to sell carbon offsets, measurements of their stored carbon can serve as the baseline.

To generate offsets, the enrolled parcel must store more carbon over a certain time interval compared to the baseline – this is called *additionality*. Thus, the baseline is critical in determining the number of carbon offsets generated by the forest, and consequently, the quantity of emissions that can be compensated by the offset buyer.

The baseline is not the only determinant of an offset project's carbon benefit. To ensure that the carbon project provides a sustained benefit, many carbon offset developers require landowners to sign a long-term contract. The length of this contract varies by the developer's methodology and the type of market. In the voluntary market, the length of the contract may be 10, 20, or 40 years, while in compliance markets, the length often exceeds 100 years. In addition, periodic monitoring of the forest's carbon storage may be required. In most cases, the developer oversees this monitoring.

However, there are a couple of factors that can reduce the intended carbon benefit. Natural disturbances, such as hurricanes, fires, and insects, can cause tree mortality and reductions in carbon storage. To account for these losses, developers may require that enrolled parcels allocate a portion of generated offsets to a *buffer pool*. This buffer pool acts as a reserve of carbon offsets that the developer retains as insurance to compensate for unforeseen carbon losses.

Leakage is another issue that can result in a reduced carbon benefit of enrolled parcels. Leakage occurs when reductions in timber harvesting in enrolled parcels results in increases in harvesting elsewhere to meet market demands. As described in the third article in this series, the intended carbon benefit of the forest can be negated if the same amount of wood is harvested from somewhere else. Developers have specific protocols they use to determine the leakage deduction depending on the amount of harvest reductions incurred.

Taken together, the total number of offsets generated from a forest is determined by the additionality relative to the baseline, minus deductions for the buffer pool and to compensate for

leakage. To provide a level of oversight for these quantifications, carbon offset developers often seek to have their protocols approved by organizations such as the American Carbon Registry or the Climate Action Reserve. While it is not obligatory to have this approval to sell offsets in the voluntary market, developers that have verified protocols usually have greater credibility and appeal to buyers.

HOW MUCH REVENUE CAN A LANDOWNER MAKE SELLING FOREST CARBON OFFSETS?

The amount of compensation a landowner can receive from selling forest carbon offsets varies. Landowner revenue has ranged from \$5 to \$25 per acre per year for forest projects that have occurred in New England (and perhaps more; sale prices in the voluntary market are often not publicly disclosed).

An important factor determining the revenue is the sale price of an offset. Compliance markets typically set the price of an offset, and periodically increase the price to incentivize transitions away from fossil fuels. In contrast, the sale price of an offset in the voluntary market varies considerably depending on demand, the reputation of the developer, and marketing. The developer allocates a portion of the revenue from selling these offsets to the landowner(s) and retains a portion, which typically ranges from 20 to 50 percent.

Because the total number of offsets generated from a forest depends on its size, larger parcels typically yield higher total revenue. Site and forest factors also affect the additionality, as certain forest types and locations may generate more revenue than

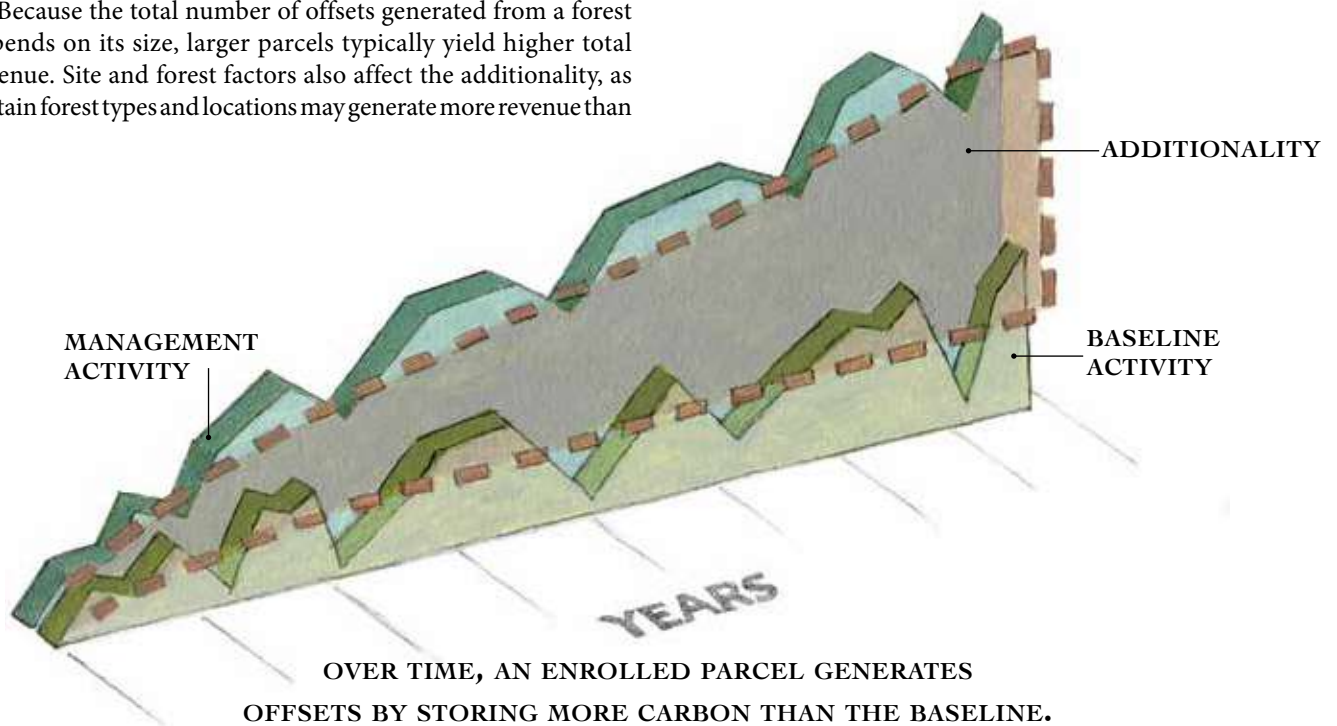
others. Some of the newer programs for smaller parcels combine multiple enrollees to ensure uniform per-acre payments.

Carbon offset developers also have different payment schedules. Payments may occur regularly over time, begin with an upfront payment and smaller payments at specified intervals, or only occur at the end of the contract. For some contracts, the landowner may incur financial penalties if the requirements are not fulfilled.

WHAT ARE THE BENEFITS OF SELLING FOREST CARBON OFFSETS? WHAT ARE THE CONCERNS?

Because selling carbon offsets typically requires long-term commitments from landowners, enrollment can prevent deforestation and conversion of the forest into other land use types, which not only maintains the forest's carbon benefit but also the other important ecosystem services that the forest provides, such as wildlife habitat and flood prevention. Further, the revenue generated from selling carbon offsets can help landowners pay taxes and fund stewardship-related activities, including land conservation and restoration.

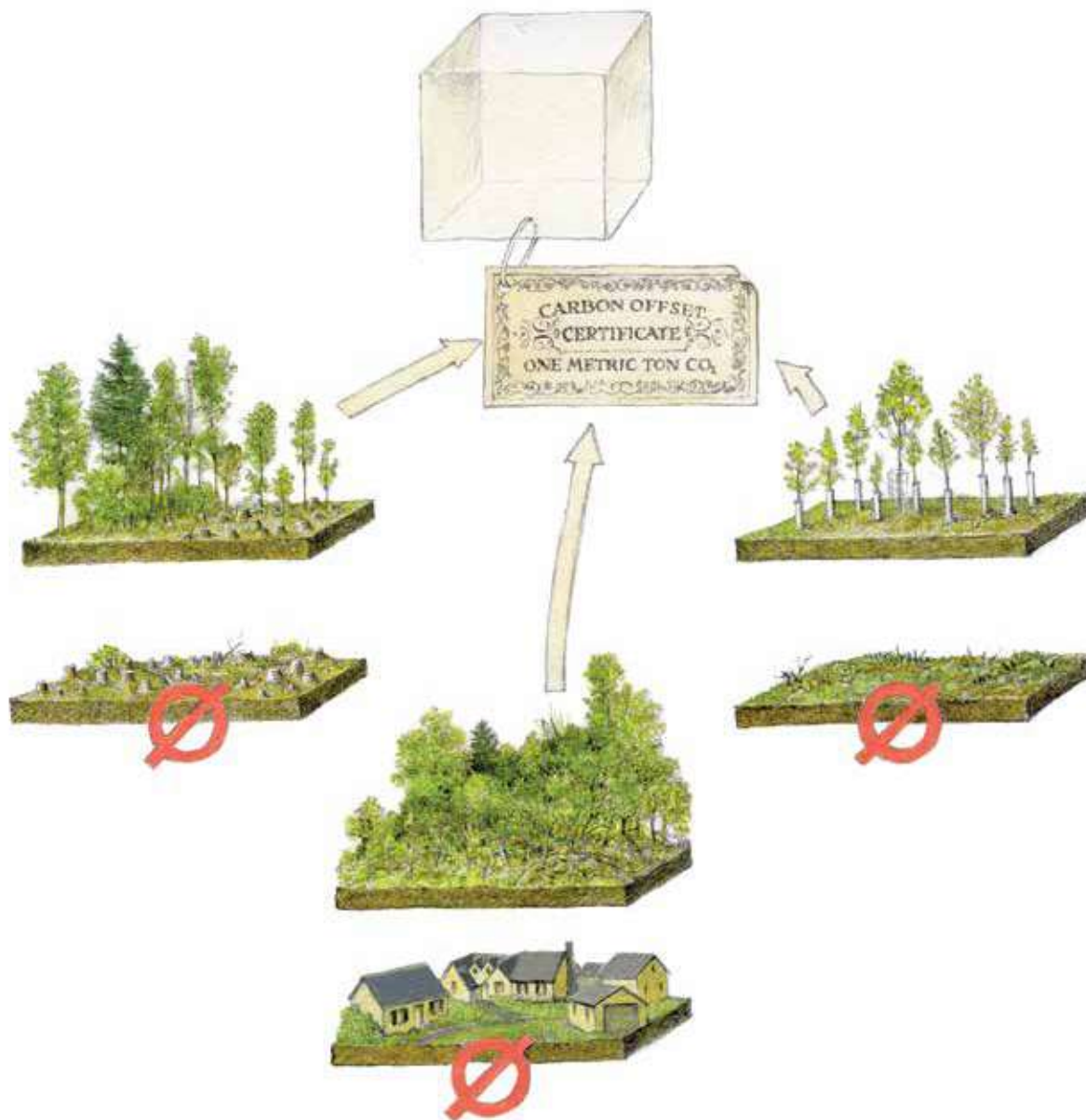
However, whether carbon offsets mitigate climate change by reducing net emissions is more difficult to determine and



depends on several factors. The first issue is that verification of a forest's actual carbon benefit poses a significant challenge. Part of this challenge is due to the "counterfactual" nature of offsets, in other words, the necessity of speculating about what would have happened without the parcel being enrolled in a carbon offset market. There's no way to truly know how much carbon would have been emitted or not sequestered in that other reality,

and thus, there's no perfect way to compute the additionality. Because offsets are used to cancel out emissions made elsewhere, an overestimation of carbon benefits can inadvertently increase emissions into the atmosphere.

There is also debate about whether the different ways offsets can be generated – by avoiding emissions (keeping carbon stored) and by increasing sequestration (absorbing more



**ADJUSTING FOREST MANAGEMENT TO SEQUESTER AND STORE MORE CARBON,
PREVENTING FOREST LOSS, AND PLANTING TREES IN OPEN FIELDS ARE
ALL POSSIBLE WAYS TO GENERATE CARBON OFFSETS.**

carbon) – provide the same climate change mitigation benefit. For instance, in an emissions avoidance project in which a landowner agrees to delay a timber harvest, the carbon benefit is assessed based on the counterfactual of an earlier harvest. That benefit is inherently more difficult to confirm as compared to a project that increases sequestration, such as tree planting. It may be impossible to prove that the landowner would in fact have conducted the early timber harvest, while the newly planted trees are clear evidence of a measurable change in management.

An emerging concern of carbon offset markets revolves around accurately addressing leakage. Again, and as described in the third article in this series, the benefit to the atmosphere of reducing wood harvests in one area may be negated if the same amount of wood is harvested from somewhere else, or if people use more carbon-costly materials as a substitution for wood. Worse, that “somewhere else” may have less rigorous environmental protections and require longer transportation distances leading to greater overall emissions. Quantifying and verifying leakage is a challenging task, but as global demand for wood continues to rise, it’s probable that reductions in timber harvesting in certain areas will be countered by increased harvesting elsewhere.

There is also growing concern regarding the permanence of carbon stored within forests, given the threat of ongoing climate change. Natural disturbances – which are likely to become more frequent and severe as temperatures continue to rise – can cause forests to shift from carbon sinks to sources of carbon emissions. To date, some carbon offset projects in western states have not met their carbon targets because of catastrophic fire. While the buffer pool is intended to account for these natural disasters, an increase in disturbances may require the pool to be much larger.

A concern that is limited to the voluntary market is how to ensure that offset buyers make strides to reduce emissions over time and use offsets to cancel out only those emissions they cannot avoid right now. Otherwise, some worry that carbon offsets can give emitters a perpetual “license to pollute.” To address this concern, some carbon offset developers require offset buyers to show a decarbonization plan that outlines a path to emissions reductions.

WHAT ARE KEY CONSIDERATIONS TO MAKE BEFORE ENROLLING IN AN OFFSET PROGRAM?

Before signing a contract to sell carbon offsets, it is critical to understand the terms of the contract and implications for your

land. Important practical considerations are the length of the contract, stipulations about early termination, responsibilities for long-term monitoring costs, and contingencies if the parcel fails to meet the expected carbon benefits. Some contracts remain with the land if the parcel is sold, while for others the landowner may face penalties when they sell enrolled land. It is advisable to consult with a lawyer before agreeing to the contract terms, and landowners may also want to talk to an accountant because revenue from carbon sales is currently taxed as income¹.

Another important consideration to be aware of before enrolling is whether the parcel has any legal encumbrances that mandate or restrict certain activities. Changes in forest management may invalidate eligibility in other forest programs, such as state tax equity programs (often referred to as current use). Each state has different requirements to maintain eligibility, and there can be significant financial penalties if you are determined to be out of compliance. Carbon offset developers may not be well versed in state-specific requirements, so if in doubt, reach out to a service or county forester in your state. Third-party forest certifications, such as Sustainable Forestry Initiative (SFI), Forest Stewardship Council (FSC), and American Tree Farm System, are usually compatible with selling carbon offsets. Parcels with a conservation easement may or may not be allowed to enroll. Because easement contracts vary considerably, landowners will need to show the easement to the offset developer.

In terms of evaluating the positive impact of selling carbon offsets, you may want to ask if the protocol used by the developer is verified by a credible third-party organization, as described above, as this demonstrates that their methods have been evaluated and approved by other experts. You may also be interested in asking the developer which types of entities are able to purchase the offsets they sell, and whether the developer requires those entities to commit to emissions reductions over time.

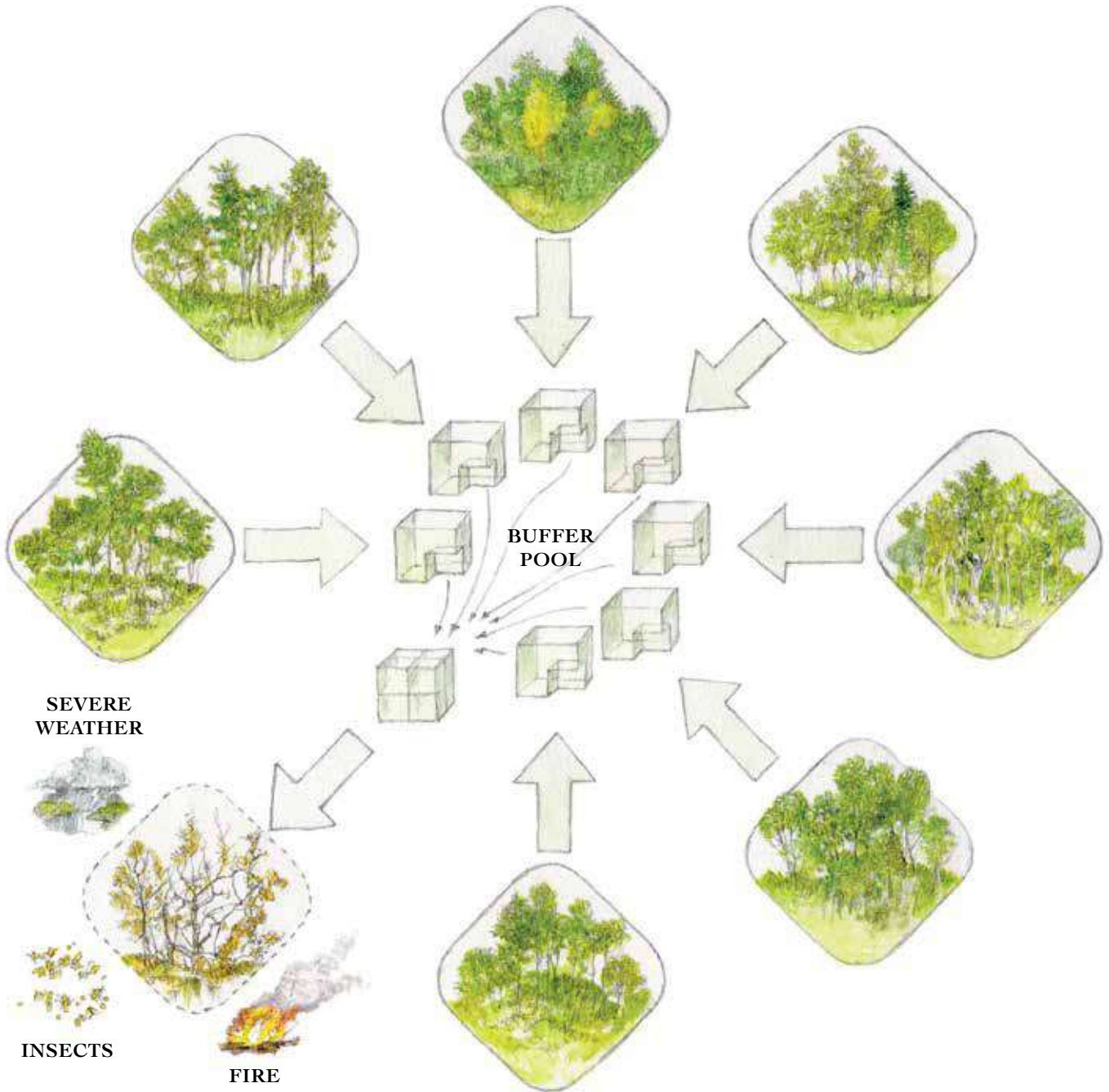
WHAT ARE GOOD SOURCES OF INFORMATION ABOUT CARBON PAYMENT PROGRAMS?

If you are interested in exploring whether selling carbon offsets is a good fit for you and your land, a recommended initial step is to take advantage of the growing number of resources and information geared for landowners by local forest landowner groups, state extension services, state and federal governments, and universities. For example, the Securing Northeast Forest Carbon project² is a regional collaboration that provides information on

¹ Cushing, T. *Tax Dimensions of Forest Carbon Contracts*. University of Florida Extension Forest Business & Economics.

² Visit northeastforestcarbon.org

³ For a list of current program developers, see northeastforestcarbon.org/forest-carbon-financial-markets



ALL ENROLLED FORESTS CONTRIBUTE TO THE BUFFER POOL,
WHICH COMPENSATES FOR UNEXPECTED CARBON LOSSES IN INDIVIDUAL FORESTS.

forest carbon science and payment opportunities. It may also be helpful to consult with a professional forester who can assist you in defining objectives for your land, identifying any legal restrictions, and evaluating the current state of your forest.

The next step is to reach out to different carbon offset developers,³ which will help you determine whether your land qualifies for enrollment and if proceeding is financially viable. Typically, this process is either free or involves a nominal fee, and it does not necessitate a commitment. It's important to note that developers may have eligibility criteria tied to factors such as parcel size, forest type, tree density, accessibility, and preexisting legal encumbrances that limit harvesting or land clearing. Consequently, not all forest parcels will be eligible for enrollment.

ARE THERE OTHER OPTIONS FOR LANDOWNERS TO FUND FOREST CARBON PRACTICES?

Practice-based programs offer a separate option from selling carbon offsets. In these programs, landowners can receive payments for implementing specific actions that are likely to provide enhanced carbon benefits. Because practice-based programs do not sell offsets to generate revenue, many of the concerns about carbon offset markets do not apply. Instead, these programs are designed to compensate the landowner for the cost associated with implementing a management action. One important consideration is that if the land is already enrolled in a practice-based program specifically for carbon, the land will likely not be eligible to also sell carbon in an offset market because it would be difficult to demonstrate additionality.

Practice-based programs have been available to landowners for many decades, usually offered through federal and state governments. The most notable are the Environmental Quality Incentives Program (EQIP) and Conservation Stewardship Program (CSP) administered by the Natural Resources Conservation Service (NRCS). Under these programs, landowners can receive technical and financial assistance for a variety of forest stand improvement actions, from controlling invasive species to enhancing wildlife habitat.

Recently, the list of NRCS practices has been updated to include those intended to increase forest carbon storage.⁴ Under this practice, landowners follow specified active management techniques designed to maintain or increase carbon storage over the 10-year contract period⁵. Currently, the annual per-acre

payment for this practice is about the same amount a landowner might be paid to sell carbon in an offset market.

For landowners interested in practice-based programs, the next step is to reach out to a professional forester or to your state forestry office. You can inquire about the availability of state-funded initiatives or get in touch with your local Natural Resources Conservation Service (NRCS) office.

THE FUTURE OF FOREST CARBON

The options available for landowners to be paid for the carbon benefits their forest provides will no doubt change over time. Carbon offset markets are under immense scrutiny, and our understanding of the science of forest carbon continues to advance. With recent federal legislation to fund climate-focused forest stewardship, practice-based incentives for landowners will continue to grow.

Although carbon offset markets still have considerable distance to go before they can prove their value as a means to keeping greenhouse gases out of the atmosphere, the revenue generated from selling offsets can help landowners fund activities related to maintaining the health and integrity of their forests by subsidizing stewardship-related activities. There's also little doubt that large carbon offset markets have the potential for unintended consequences, for example, by transferring timber harvesting activity away from the Northeast. As noted in the first article in this series, the carbon cycle does not end at the forest's edge.

Forests by themselves cannot solve the climate crisis. This crisis requires us to be thoughtful about the impacts of our resource needs, to consider how we can sustainably harvest local wood to meet our growing housing demands, and to reduce our dependence on more carbon-intensive materials. We also have the opportunity, through thoughtful forest management, to promote the long-term resilience of our forest ecosystems to climate change and other stressors. Above all, it's critical that we pursue ways to reduce overall emissions, recognizing that there is no way to grow our way out of this problem.

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⁴ For more information on NRCS "climate-smart" practices, see <https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/climate/climate-smart-mitigation-activities>. Refer to the subsection Forest Stand Improvement (code 666).

⁵ https://www.nrcs.usda.gov/sites/default/files/2022-11/E666H_July_2022.pdf