CARBON CANOPY

LESSONS FROM NEARLY A DECADE OF DEVELOPING FOREST CARBON PROJECTS IN SOUTHERN APPALACHIA

DOGWOOD ALLIANCE

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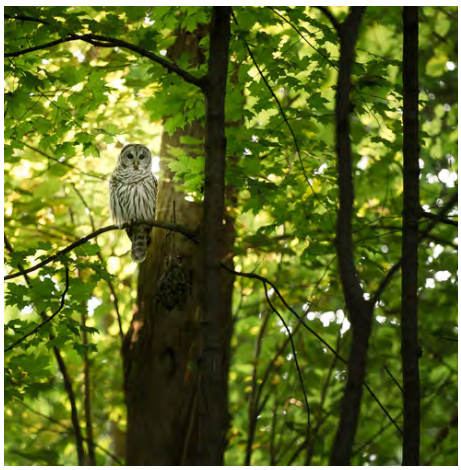
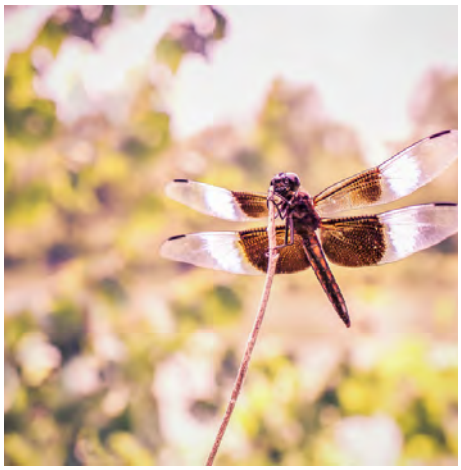




EXECUTIVE SUMMARY

The world faces an unprecedented threat today caused by rising levels of carbon in the atmosphere. Scientists predict that if swift action is not taken, melting glaciers and rising sea levels will put entire communities underwater as well as catalyze more intensive hurricanes that put coastal communities at continuous risk. Recent reports indicate that our society has a small window of opportunity – several decades – to avoid serious and irreversible damage to civilization as we know it. Nothing short of a unified global effort involving a variety of strategic initiatives at the global, national, regional and local levels will be sufficient to address what has become perhaps the most critical environmental issue of our time.

Because of the role the world's forests play in moderating climate and specifically, sequestering carbon, efforts aimed at conserving forests are a critical part of the solution. On the other hand, because the loss or degradation of forests releases carbon, actions that destroy or degrade forests exacerbate the problem. The forests of the Southern US -- the most biologically diverse temperate forests in the world -- are under tremendous pressure from urbanization as well as industrial logging. The Southern US is not only the largest producer of wood products in the world, but is also the fastest growing region in the US.

In a region where 90% of the forests are privately owned, private landowners play a central role in managing the region's forests. A growing number of conservationists, large consumers of paper products as well as large paper companies recognize that providing landowners with a financial incentive to keep their forests in forests (and not sell them to development) while managing them to a high environmental standard will ultimately be necessary if we are to achieve a long-term conservation vision for the South's forests.

Carbon Canopy, launched in 2007, was a ground-breaking project involving diverse stakeholders working to advance forest conservation in the South. Large producers and consumers of forest products, conservation organizations, foresters and landowners worked together to test whether forest carbon markets could provide enough of a financial incentive for landowners to expand forest conservation, improve forestry practices and certify their forests to the high standards of Forest Stewardship Council (FSC) certification. The goals of the project were to increase carbon storage in forests, create a market incentive for landowners to expand conservation, reduce the ecological footprint in the sourcing areas of major wood products companies, and expand the amount of forests certified to the high standards of FSC.

A primary focus for the project was to assess whether carbon markets could be leveraged to provide private landowners in the Southern US with enough revenue to incentivize improved forest management practices and cover the costs of certifying their forest to the high standards of Forest Stewardship Council (FSC). Particular focus was directed on leveraging voluntary purchases of carbon credits from large companies that consume and produce wood products as a way to offset their footprint on forests and to actively support improved forest conservation in their supply chains.

Together, we worked for nearly a decade to explore the use of the carbon market, specifically California's regulatory offset program, as an economic driver for landowners to adopt ecologically sustainable management practices and Forest Stewardship Council certification. We screened over 10 potential projects, collected data on five, and successfully brought one project on 9,700 acres through verification and credit issuance for a large landowner. This landowner, The Forestland Group, is FSC certified and provides pulp and logs to local mills in the southern Appalachians. This project was one of the very first projects to meet the rigorous standards for improved forest management projects under the standards developed by the State of California. Projects under 2,600 acres were simply not viable given a market price of $10-12 a ton.

Throughout the course of this project, many valuable lessons were learned that helped further advance the goals of the collaboration and shape the strategy amongst the various stakeholders for improving conservation in this region of the world. In addition, the lessons learned will also hopefully inform future development in the field of forest carbon markets.

KEY FINDINGS INCLUDE:

The Value of Forest Carbon Isn't Fully Recognized by Policies or Markets

One of the most important lessons learned is that currently, neither markets nor our current economic system fully recognize the value of forest carbon in

mitigating climate change. While current prices are sufficient to encourage some large landowners under for carbon, prices are still too low to drive conservation at the scale necessary to mitigate climate change. Until there is sufficient voluntary of regulatory accountability for carbon emissions and adequate policies that support forest carbon management, there will not be a strong enough financial incentive for most private landowners to shift traditional management practices and expand forest conservation.

Costs are Prohibitive for Most Landowners

The costs of doing these projects are prohibitive for most small landowners. Carbon Canopy helped participating landowners cover the costs of project development. While this is acceptable in the early stages of market development, for carbon markets to flourish at a meaningful scale, significant capital will be required. Even if carbon prices were high enough to cover the costs and produce sufficient revenue, landowners would still have to cover significant, up-front costs, which is a financial barrier for many landowners. Tax incentives, low interest loans and cost share programs would go a long way in supporting landowners to integrate carbon management and better conservation into their management plans.

Landowners Need Technical Support for Project Development

Landowners need a lot of technical support to develop carbon projects. From collecting carbon data to modeling to ensuring projects meet market standards, carbon projects require a high degree of technical expertise, which is not yet mainstream in the forestry profession. Most private and state forestry agencies have little to no training in how to write a forest carbon management plan or otherwise assist landowners in selling carbon. Shifting this will require developing new technical skills across the forestry sector.

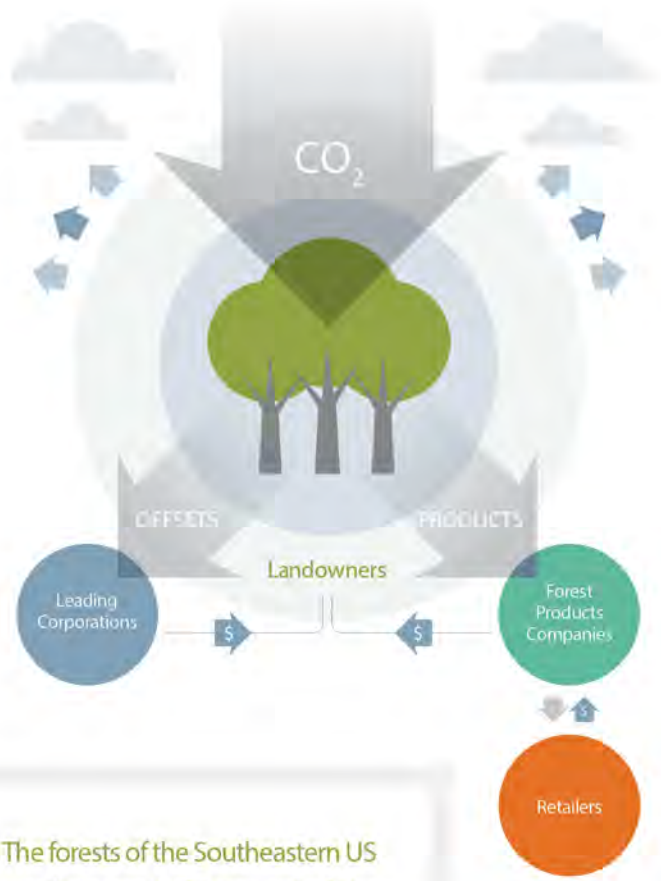
Other Programs Outside of the Current Offset Model Need to Be Developed

Cap and trade policies where forests are used to offset emissions from large coal plants or from fossil fuel combustion are highly controversial. Carbon Canopy recognized some of the problems with this approach early on and focused its projects on leveraging the voluntary market, working with companies who had adopted leadership-level forest protection policies or were otherwise known as corporate environmental leaders. Our original intent was to engage companies with a significant footprint in the forest, to purchase forest offsets as a way to offset their company's impacts on forests. Securing voluntary commitments to purchase offsets from large consumers and producers of wood products proved more challenging than originally planned, though a few of our Carbon Canopy partners including Staples and Interface were willing to purchase some of the offsets from The Forestland Group project. These companies are helping to pave the way. More corporate leadership in this space is needed and policy alternatives to the California Cap and Trade system are worth exploring.

The Power of Collaboration

While we did not bring as many projects to fruition as we had originally hoped, we forged enduring relationships and partnerships among an array of organizations that do not traditionally work together – retail corporations, environmental NGOs, certification bodies, wood and paper products manufacturers, and private landowners. We all learned from each other what it takes to create the economic and social conditions for improved forest management. The partnerships are still active and this project will inform each organization's work and the collective endeavor for years to come.

We learned a tremendous amount about the complexities of carbon project development, the lessons of which are detailed in the sections below.



The forests of the Southeastern US produce nearly 20 percent of the world's wood and paper products.

Landowners get income from the sale of carbon offsets and from the sale of FSC-certified wood.	
Forest products companies expand their wood basket of FSC-certified wood, which allows them to grow their businesses.	
Retailers achieve their sustainable supply chain commitments to FSC-certified wood and are able to serve the growing green marketplace.	
Leading corporations with climate commitments are able to purchase high-quality California Air Resources Board offsets to achieve their climate goals.	
We all benefit from clean air, clean water and protection of habit.	

Our conclusion is that the California carbon market as it stands today can certainly be an important financial incentive for medium to large landowners in the southern Appalachians and potentially throughout the U.S. South. For the projects we screened in the southern Appalachians, we found that they need to be on at least 2,600 acres of well-stocked forest at a price of $11.50/credit in order to be financially viable.

Another factor that affects viability of projects is the Common Practice Indicator, or the average carbon stocking on non-federal lands in the eco-region in which a project is being developed. This stocking level helps determine the baseline and ultimately the amount of surplus carbon a project may have to sell in its early years. The southern Appalachians in general have higher average stocking rates than other regions of the south. However, the California Air Resources Board recently revised its calculations of the Common Practice Indicator for all forest regions of the U.S. Average stocking levels are now anywhere from 5 to 19 metric tonnes of CO2e per acre higher in Appalachian assessment areas than when we conducted our pilot explorations. These new numbers will make developing projects more difficult in the region, especially for smaller holdings. Other regions of the south with more active management and faster growth rates such as the Piedmont, coastal plain and southern Arkansas may be more fruitful than the southern Appalachians.

As the California market matures, and adopts 2030 emission reduction requirements, the price should increase to the point where projects become more financially attractive either for smaller landowners or for larger landowners who need to make trade-offs with keeping more trees standing for carbon versus selling them as pulp or lumber products. Our financial modeling showed that a price point of at least $20/offset credit (which represents one metric ton of CO2 equivalent) would increase the security and attractiveness of projects for non-industrial owners, which is nearly double current price. However, given the complexity and cost of project development, we do not see this market as ever being a tool for very small landowners (e.g., less than 1,000 acres). In addition, serious concerns about the validity of using forests to offset fossil fuel emissions vs using forests to offset emissions from the forest products sector remain.

The California carbon market would also become more attractive if some of the complexities of the protocol were streamlined (see discussion below) and if the final approval stage were made more certain. Having to go through two additional rounds of technical review and approval (third party registry review and California Air Resources review) after successfully achieving third-party verification is cumbersome and expensive, and can drive away potential project proponents who do not have the tolerance for that level of process and uncertainty. The most recent version of the protocol, which we have not used, contains additional elements that can make verification more complicated and expensive. Carbon Canopy chose to develop projects under the California standards because of their rigor. Finding ways to streamline the process without sacrificing the credibility of the standards will be important.

While the voluntary buyer aspect of Carbon Canopy was important, using the regulated market ensured that there was an adequate enforcement mechanism for both buyers and sellers. There were points at which the economic position of our voluntary buyers was such that purchasing credits at the volume and price we had hoped was not possible so credit sales were made to regulated businesses in California. This underscores an important point. While more purely voluntary protocols and markets exist, the price for credits are generally lower than regulated markets, and demand is less predictable. Using a regulated market (and California's is the only one that exits with predictable offset demand in the U.S. as of this writing) rather than developing a program purely on voluntary demand provides participating landowners more assurance of being able to sell credits into the future. However, concerns that forest offsets should not be used to avoid reductions in fossil fuel use remain.

As of the writing of this report, there were eight registered offset projects in the Southern United States. It should be noted that while there remain barriers to the use of forest carbon markets, it still may become the most well-developed ecosystem service market available to forest landowners in the U.S. South. Some opportunities exist through Endangered Species Act and Clean Water Act mitigation banking, but the amount of land which meets the criteria for developing these types of projects remain limited, and they are also expensive and cumbersome to develop (DOI, 2013). While some reviews of payment programs for U.S. forestland owners cite relatively large amounts of payments in aggregate (e.g., Mercer et al. 2011), the spatial scale of lands conserved or restored under available programs remains small and well below the goals of Carbon Canopy.

The economic opportunity for landowners to manage for carbon remains significant, as the world begins to recognize the valuable role forests play in mitigating climate change. A robust carbon forest market has the potential to ensure that forests are managed for ecological resilience, for climate mitigation, and as a truly sustainable source of forest products and jobs. This is the next step in the evolution of land management and the forest products industry in the United States. As a result of the work of the Carbon Canopy, future work in this space may have a much

greater chance for success.

It is also important to note that there were three tangible ripple effects that can find their origins connected to the Carbon Canopy project:

1. The Forestland Group went on to carry the principles of forest rigorous carbon management forward in a large landowner context and expanded their forest carbon management efforts from 9,700 acres to 240,000 acres in the Southern Appalachians,

2. The Rainforest Alliance, Staples, Domtar and others formed a new collaboration – the Appalachian Woodlands Alliance – which is focused on supporting small landowners in their efforts to improve forest management practices in the Southern Appalachians, and

3. Dogwood Alliance formed a diverse and unique collaborative of institutions to focus on wetland forest conservation across a span of 14 states and 35 million acres. As of the close of 2016, there are now approximately 25 organizations and agencies that are committed to advancing large landscape conservation outcomes through the Wetland Forest Initiative. This collective work will result in newly restored wetland forests, new preserves and public lands, new voluntary conservation easements on private lands, and enhanced management practices in the working forest.

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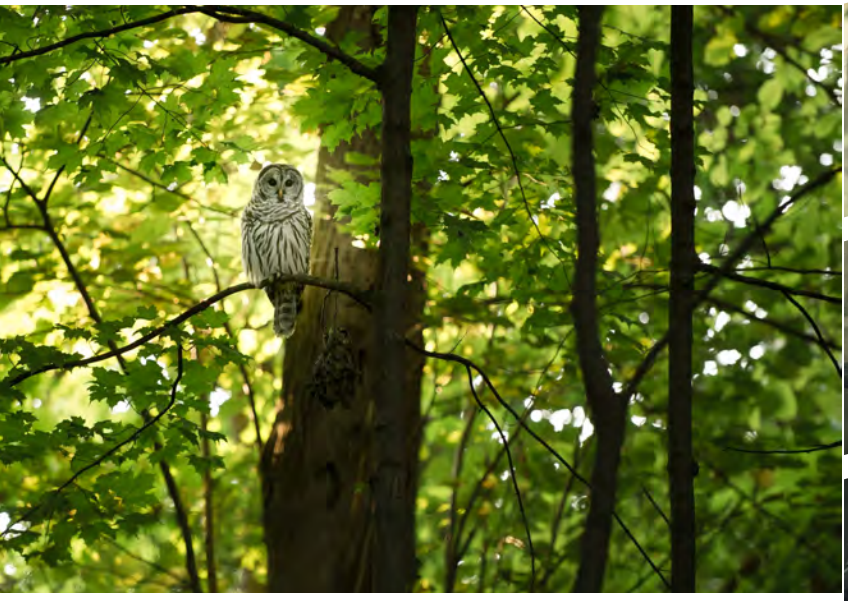
Photo Credit: Ken Lane



1. HISTORY AND GOALS OF CARBON CANOPY

The Southern US is home to the most biologically diverse forests in North America, yet this one region produces more paper and wood products than any other country in the world. Although they comprise just 2 percent of the planet's total forest cover, southern forests produce 17 percent of the world's pulpwood for paper and paper-related products and 8 percent of the its industrial timber.

The Southern US is home to the most biologically diverse forests, but produces more paper and wood products than any other region in the world.

Pressure from the intense demand for paper and wood products has led to large scale-clear-cutting and the conversion of natural forests to plantations. In fact, over 40 million acres of natural forests have been replaced by plantations – representing nearly 20% of Southern forests. These practices that significantly degrade forests and threaten many important ecosystem services provided by forests including carbon storage and biodiversity protection.

Carbon Canopy is a unique collaboration born out of efforts to reverse the economic drivers of destructive forestry practices. The project originated from a market campaign spearheaded by the Dogwood Alliance, targeting Staples to pressure them to adopt sustainable paper sourcing policies and practices. Staples was, and still is, one of the largest buyers of office paper in the world, and the majority of that paper was produced from trees harvested in the U.S. South. At the time, the company had no sustainable paper sourcing policy. Rather than continue an adversarial relationship, the two organizations initiated a dialogue. From these discussions emerged the realization that forming partnerships involving as many actors as possible along the supply chain would be a powerful way to ensure that forests are managed for ecological resilience, climate mitigation, and as a truly sustainable source of forest products and jobs.

The Dogwood Alliance and Staples convened the first meeting of potential collaborators in 2007. By that time, Staples and other large corporate consumers of paper and wood products originating from southern forests had committed to increase the amount of products they purchase that are certified by the Forest Stewardship Council, the most robust certification system for sustainable forest management in existence today. This and other shifts in the marketplace prompted large paper producers to begin working towards improving their fiber sourcing to meet customer demand for FSC products. This, in turn, had resulted in the growth of FSC certified forests across North America. Yet, while FSC-certified forests in the United States grew from 9 million to 23 million acres between 2003 and 2007, only 16 percent of this was in the South—just under 4 million acres or 2 percent of southern forests. This low penetration was largely due to the fact that many southern landowners do not have access to viable roadmaps or sufficient economic incentives to help them conserve, restore, manage and certify working forests to a high environmental standard.

While FSC-certified forests in the US grew from 9 million to 23 million acres between 2003 and 2007, only 16% of this was in the South, just under 4 million acres or 2% of Southern forests.

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Carbon Canopy was formally launched in 2008 with the goal to create financial incentives for forest landowners to adopt ecologically sustainable management practices and a more robust supply of sustainably sourced paper and other forest products. These practices include: managing for older, species rich, and structurally complex forests rather than short rotations and large clear-cuts; restoring pine plantations to native hardwood forests, ending the practice of converting native hardwoods to pine plantations, and increasing the protection of high conservation value forests. The multi-stakeholder working group included: Staples,

Home Depot, Coca-Cola, Domtar, Columbia Forest Products, Interface, The Forestland Group, Pacific Forest Trust, Rainforest Alliance, the World Resources Institute, National Woodland Owners Association, FSC, and Environmental Defense.

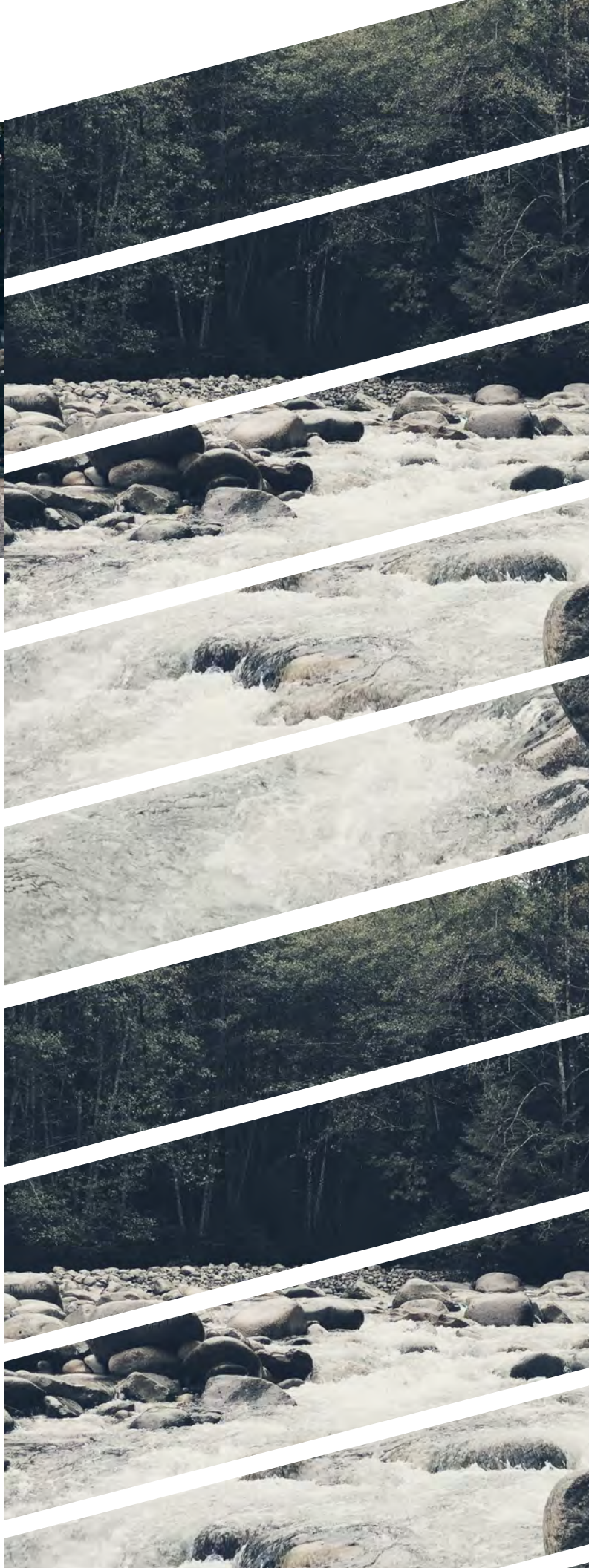
While FSC certification was seen as the primary tool for assessing and certifying whether landowners were meeting these goals, certification did not by itself provide a large enough price premium for forest products. Other income streams were needed. Therefore, the group decided to leverage the emerging forest carbon market as the first driver of new financial incentives for ecological stewardship. However, we also wanted to explore other potential ecosystem service markets, if they developed, such as water and biodiversity.

Carbon Canopy set a long-term goal of catalyzing the sustainable stewardship of 20 percent of forests in the U.S. South, which amounts to 40 million acres. Based on funder interest, we chose to work in the southern Appalachians first. This is due to the high biodiversity value forests in the area, and the strength of relationships that already existed among project partners. In the near term, the goal was to bring five forest carbon projects in this region through to completion, and have voluntary corporate partners involved in the paper supply chain be the primary purchasers of those credits at a price that made it worthwhile for landowners to engage in the desired practices for the long-term.

Carbon Canopy set a goal of catalyzing the sustainable stewardship of 20% of forests in the US South. That's 40 million acres.

By exploring the viability of the forest carbon market, Carbon Canopy sought to test the assumption that ecosystem service payments could leverage change in forest management at a meaningful scale. Another objective was to learn more about what forest landowners, especially small landowners needed to feel comfortable considering carbon projects and how to make financing project development self-sustaining.

CARBON CANOPY



2. CARBON MARKETPLACE PERSPECTIVE

Why use the California Forest Offset Protocol?

Carbon Canopy chose to use California's regulatory offset program rather than a strictly voluntary program like the Verified Carbon Standard or American Carbon Registry. When Carbon Canopy began, the California system was still voluntary (run by the Climate Action Reserve) but was clearly in the process of becoming a formal regulated market under the 2006 California Global Warming Solutions Act, or AB32. We went this route for three reasons. First, the California forest offset protocol is the most rigorous in the nation. Any company buying these credits would be able to easily defend the authenticity of the emission reductions represented by a California Air Resources Board offset credit (known as an Air Resources Board Offset Credit, or ARBOC).

Second, while we worked to build a large volume of voluntary demand from our corporate project partners and other companies, we did not want landowners to be left completely dependent on the vagaries of the voluntary offset market. Prices in the voluntary market tend to be weaker than regulatory markets, and the volume of demand can be fickle (Forest Trends, 2010). One aspect of well-accepted, rigorous protocols (both voluntary and regulatory) is a 100-year permanence requirement. This means that the amount of carbon in the forest that underpins the offsets being verified and sold needs to stay on the ground for 100 years after each year that offsets are issued. By having landowners develop projects under the ARB protocol, they have a guaranteed set of regulated buyers for at least as long as the cap and trade program is authorized.

We only recommended projects move forward when financial projections based on sale of credits into the foreseeable future of California's regulated carbon market showed sufficient income to cover costs of project maintenance and allow a discounted positive cash flow above that. Thus, using a regulatory market provides back-up buyers for the times that voluntary demand through Carbon Canopy is less than project supply, and provides for several years of planned demand into the future, beyond what the Carbon Canopy program could commit to.

Price Projections

Being able to assess the financial viability of potential projects depends in large part on an accurate projection of future carbon offset prices. Price projections also shaped our understanding of the number and types of projects we could reasonably expect to achieve under Carbon Canopy.

Offset price data we used to assess projects came from current trades, analyst projection of future prices based both on market supply and demand and statutory price floors in the California Cap and Trade regulations, and on voluntary price bids we received from participating companies.

Early in the launch of the California Cap and Trade system, actual emission allowance prices were somewhat volatile, and at times high, trading well above the auction floor price. In addition, market analysts looking at projected offset supply and demand predicted robust price growth through 2020.

Figure 1: History of Emission Allowance Prices in California's Cap and Trade System.

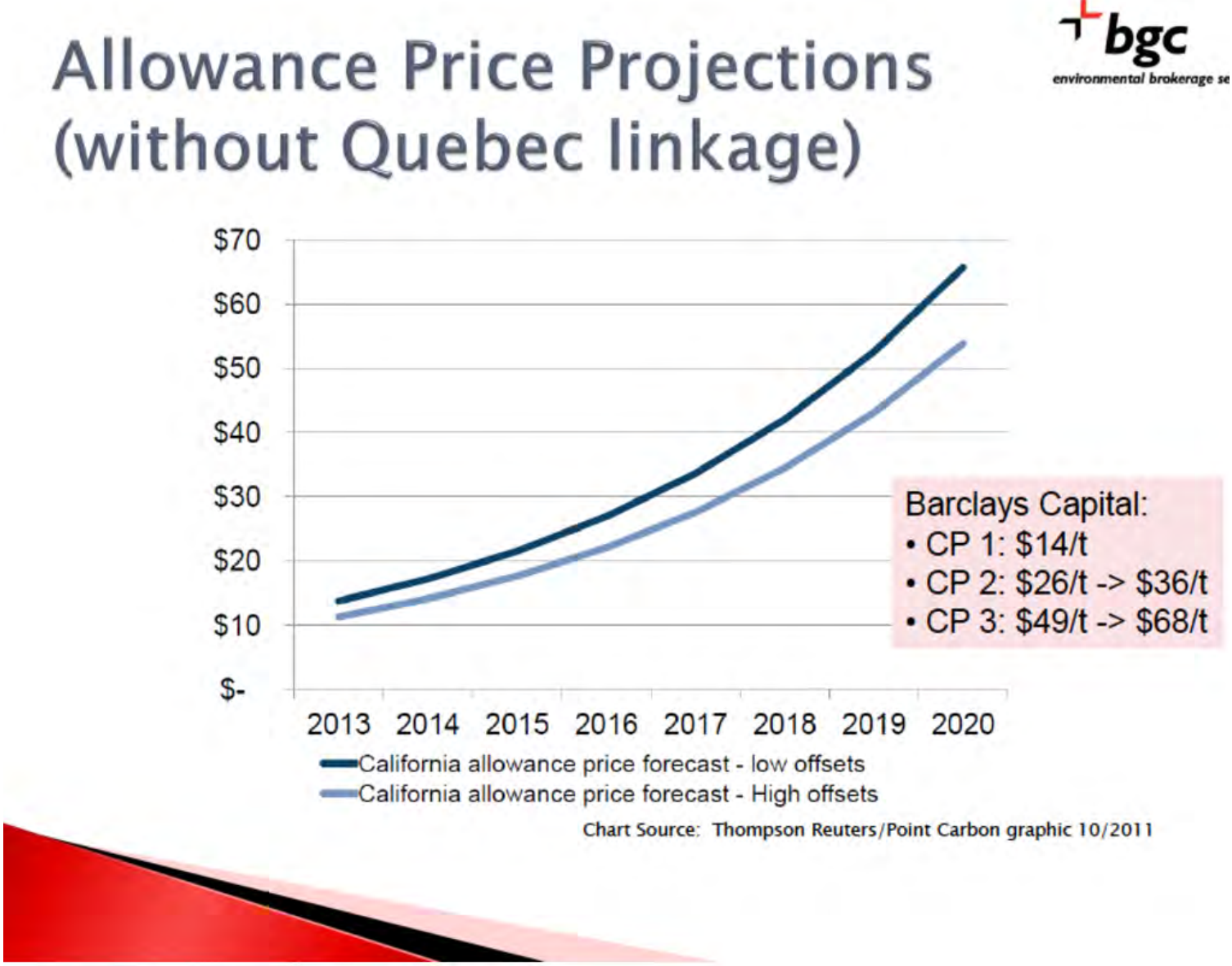


Figure 2. Emission Allowance Projection by Thompson Reuters Point Carbon from 2011. Slide from a presentation posted on the Climate Action Reserve website.

While we were always much more conservative, and never assumed the high-end prices in our financial analyses, price projections anywhere over $20/credit did lead us to expect substantial interest from southern landowners in California offset projects. As an explanatory note, these two figures refer to emission allowance prices. Offset price usually trails emission allowance price by between 10 and 20 percent. This is by design because offset credits are a cost containment mechanism to keep the overall cost of complying with the cap and trade requirements as low as possible.

By late 2013, the projection of emission allowance demand softened substantially and price projections dropped 66% from previous analyses (Lyons, 2013). Forecasts shifted to stating that prices would likely track the regulatory floor price for auction permits closely because of an oversupply of emission allowances relative to demand. This was partially attributed to lower energy demand as California was recovering from the recession and to success of complementary programs in reducing use of fossil fuels.

As of the writing of this report (Fall 2017), ARBOCs are selling for around $10/credit and emission allowances are trading for $12.95. (Note that both offset and emission allowance credits are in units of metric tonnes of CO2 equivalents). The average price from the 2011 projection above is about $23/emission allowance, which would translate into an offset price of $18.50-$19.50/offset credit.

3. EVOLUTION OF LANDOWNER OUTREACH AND PROJECT SCREENING

Finding willing landowners was a fundamental requirement for our plans to pilot forest carbon opportunities across the region. There are a small number of larger ownership entities in the southern Appalachians, but most forestland is owned by small, non-industrial owners. This pattern posed many challenges, both in outreach and in project development.

The Carbon Canopy partnership was built with the intent of leveraging existing programs, companies and organizations to reach out to landowners across the Southern Appalachians to engage them about the potential opportunity for forest carbon projects to help bring new revenue to landowners. At its founding, Carbon Canopy intentionally sought to partner with organizations with an on the ground presence.

Among our partners and across the region there is a strong stewardship ethic and a community of conservation minded foresters, landowners and institutions. Our strategy was to build off the existing assets in our group and seek to work with other organizations and programs across the region with efforts reaching private forest landowners. Therefore our efforts would not require duplicating existing efforts or "competing" for landowner attention.

Among our partners are a number of organizations that directly engage with landowners as part of their business model, program efforts or purpose:

Rainforest Alliance

The Rainforest Alliance is a third-party certification organization that offers certification services for Forest Stewardship Council (FSC) forest management and carbon projects. At the beginning of the project, Carbon Canopy partnered with the Rainforest Alliance TREES program. The TREES program was working the American Hardwood Flooring Association to advance FCS certification with private landowners across the same region.

Domtar

Domtar is a large paper manufacturer with plants throughout the south. They are FSC chain of custody certified and have a commitment to sustainable practices throughout their supply chain and production practices.

Throughout the entire Carbon Canopy project, we worked with Domtar to engage with their team of procurement foresters at their integrated pulp and paper mill in Kingsport, Tennessee.

NATIONAL NWOA .net WOODLAND OWNERS "Independent by Nature"

Early on in the project, NWOA formally joined the Carbon Canopy with the intent to use the project as a tool to educate their membership about the nascent forest carbon market and the FSC system. The Association extensively covered the forest carbon opportunity and the Carbon Canopy in their National Woodlands magazine and helped locate potentially interested landowners. The president of NWOA offered his properties for test cases for carbon project development.

columbia FOREST PRODUCTS™

Throughout the entire Carbon Canopy project, we worked with Columbia Forest Products as a key partner to engage with their Appalachian Timber Manager and procurement foresters for their mills in Old Fort, North Carolina and Craigsville, West Virginia. Through their team of region procurement foresters, CFP has regular and ongoing engagement with landowners across the region as well as maintaining an FSC Group Certificate across the region with approximately 140,000 enrolled acres.

FOREST STEWARDS

Forest Stewards is a not-for-profit consulting foresters organization working out of Western Carolina University and serves private landowners across the region. As they were working with clients on forest management plans, restoration initiatives and logging jobs they also presented information about Carbon Canopy and the California forest carbon protocol.

Additional outreach efforts

Outside of our partners, we recognized that there were other important institutional landowners including land trusts that represented a significant land base and an important constituency for educating landowners across the region. By educating land trusts about forest carbon opportunities we would leverage their own ongoing outreach to landowners in their service areas. Because of this opportunity to piggyback on top of the important work of land trusts across the region we worked hard to engage them. We were able to conduct numerous face-to-face meetings with land trusts across the region. In addition Carbon Canopy also presented several times at the Southeast Regional Land Trust Rally in Georgia and Tennessee.

Project screening

As we engaged with landowners to assess interest in developing carbon projects, we needed a means to screen whether potential projects met eligibility requirements and were likely to be financially viable prior to investing significant resources into actual project development. We developed a basic presentation about the elements of the CAR/ARB protocol so landowners could quickly assess whether their situation was compatible with protocol requirements, and whether they were willing to make the required commitments. We also made clear that Carbon Canopy would finance project development for the initial projects.

The core elements of project screening that emerged from the structure of the protocol and nature of forests in the southern Appalachians were as follows:

1. Does your land have binding legal obligations beyond stream-side BMPs (best management practices), such as a conservation easement or other deed restrictions limiting harvest?
2. How many acres do you own and on which you are interested in developing a carbon project?
3. What proportion of your potential project acreage has been harvested in the last 30 years and what proportion is mature forest?
4. If the financial projections are favorable for a project on your land, are you willing to commit to the minimum 100-year project length?

We had a general sense going in that projects with fewer than 1,000 acres of mature forest were not likely to be financially viable, or worth the risk to landowners for long commitment periods. It was also clear that if the majority of a property had been heavily harvested in the past 30 years, it was not likely to have enough stored carbon at the outset to be worthwhile. Beyond that, it was not clear from the outset, how to determine whether a project could be viable without

collecting inventory data. Collecting inventory data to the level of accuracy required by the protocol is expensive, thus being able to make early determinations of project viability saves money and time. Given that philanthropic dollars were supporting early project development, we wanted to use this funding as efficiently as possible. The technical consultants that were versed in the protocol had experience in west coast forests of California, Oregon, and Washington, but did not have the local expertise with Appalachian hardwood forests to be able to assess potential project viability with just coarse, aggregated data.

Projects with fewer than 1,000 acres of were not likely to be financially viable.

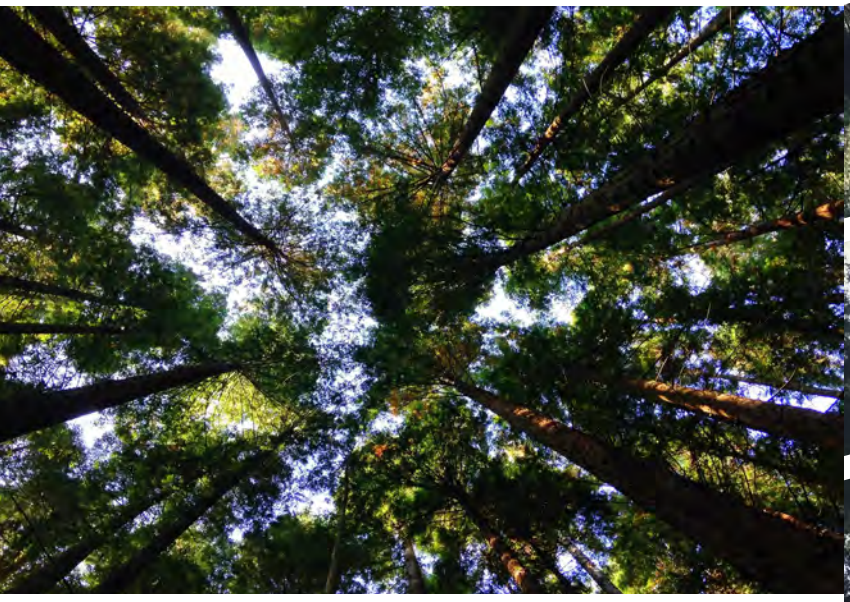
The starting legal constraints and willingness to commit for 100 years were the most significant early screens for assessing landowner eligibility and willingness. For example, there were several land trusts that were interested in developing projects on existing fee holdings. However, many of these lands were purchased with state funds in North Carolina that set aside wide riparian buffers that could not be harvested. For many of these properties, the proportion of total land in legally restricted buffers made it unlikely that there was enough "additionality", or timber that would otherwise be available for harvest and thus count as carbon that would be sequestered in a project scenario versus the business as usual, or baseline situation.

Conversely, we heard from the procurement foresters for Columbia Forest Products and Domtar that many of their sourcing landowners, who did not have legal constraints on their lands, could not see their way to committing their properties, and their heirs, to a 100-year requirement for maintaining high carbon stocks. [We speculated that had the offset market price been substantially higher (see below for a fuller discussion on the role of price dynamics in the market), this decision may have been easier for at least some landowners.]

As we gained interest in developing projects from landowners in the region and began collecting and analyzing inventory data and conducting preliminary modeling, we were able to hone our sense of the minimum size and stocking density required to make a project viable. By 2011, we had two potential projects for which inventory data was collected, which allowed more detailed and accurate analyses of potential project viability. One project of 1,400 acres had a very willing landowner but at then current prices and a combination of low site quality and not quite mature enough forest made this project non-viable. A second project of 2,600 acres generated ample offset credits to be securely viable. These two projects gave the technical team a much better idea of how to screen lands for their potential viability prior to investing in collection of inventory data.

Based on this experience, we developed a two-tiered data collection approach when a potential project area had met basic screening criteria but was still in an ambiguous category – e.g., less than 2,000 acres or a mix of younger and older forest stands. This approach involved designing the full inventory as if the project was going to move ahead, but only collecting data at a portion of the plots. In this way, data could be analyzed with the understanding that the margin of error was larger than allowed by the protocol, but not so large that we could not gain an adequate picture of carbon stocking to determine if it was worthwhile to spend additional resources. If analysis of this preliminary inventory data yielded carbon stocking rates enough above the common practice indicator to yield a surplus of credits after taking into account project maintenance costs, we recommended to the landowner to continue to the next phase.

Additional lessons on the impact of relatively slow growth rates combined with harvested wood products deductions are described below. The cost of verification also played into decisions that fed back into later project screening. This is also discussed in a subsequent section.



4. PROJECT DEVELOPMENT AND PILOT PROJECTS

There are several steps to project development:

- Inventory design and data collection
- Inventory data processing
- Calculation of starting carbon stocks
- Development of the baseline scenario
- Baseline modeling
- Data checks on baseline modeling
- Calculations of primary & secondary harvested wood products deductions
- Calculation of emission reductions
- Documentation of all modeling & calculation steps
- Documentation of how protocol has been addressed
- Completion of listing & offset project data reports

The following section provides brief descriptions of each pilot project and any specific lessons learned about project development while working through each pilot. Subsequent sections will draw out general lessons that are most useful for landowners or non-profits interested in using the California forest carbon protocol and market as a means to finance conservation and ecologically sustainable forest management.

Of all the potential projects we screened, we proceeded with inventory data collection on five of these, conducted modeling of the baseline and future growth and credit yield on three, started the verification process with two, and successfully completed one project through third party verification, third-party registry review, ARB review and approval, and credit sale. We learned valuable lessons from all five of these exercises.

We successfully completed one project through third party verification, third-party registry review, ARB review and approval, and credit sale.

CHARLES TAYLOR BALSAM MOUNTAIN

This project originated from outreach conducted by Columbia Forest Products. Former Congressman Charles Taylor owned a little over 3,000 acres in Haywood County, North Carolina near the Blue Ridge Parkway. The forest was located in the Blue Ridge Northern Hardwoods ecological assessment area and was important for rare plant communities at the higher elevation and because of the watershed protection services it provided to a local municipality. It was also important given the prominence of Congressman Taylor in the forest landowner community and due to the large amount of acreage he owned in the area. This property was part of Columbia Forest Products group FSC certificate thus CFP's foresters were familiar with the terrain and species composition. Forest Stewards was brought in to develop the FSC management plan and conduct the carbon inventory. Pacific Forest Trust provided technical assistance in protocol interpretation, calculation of carbon stocks and future credit projections, and financial analysis.

After site analysis, it was determined that some of the property should be removed from the proposed project area because it was too steep and inoperable, thus would not be harvested under a baseline scenario. It would also impossible to establish plots in these acres to measure trees for carbon content. Therefore total project acreage was reduced to 2,600 acres.

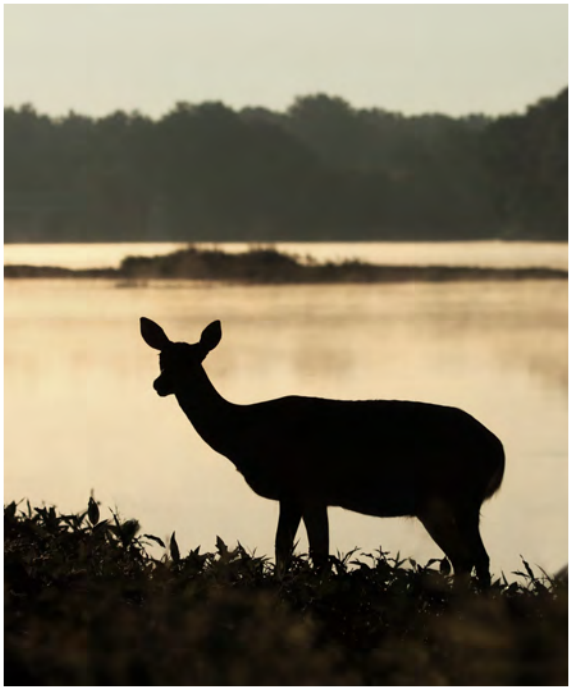
After inventory data collection and analysis and projection of potential credit generation, it was determined that the project area could provide ample credits to pay for long-term project maintenance costs and a discounted net financial benefit over 30 years of over $1 million. We recommended to Mr. Taylor that he proceed with the project.

This projection was made without full modeling of future growth and yield, and full baseline projections, both of which allow for a more accurate assessment of how growth will change over time and required deductions for carbon in harvested wood products affect final credit yields. After having gone through full project modeling on two other projects, we likely overestimated credit yield in our early assessments. However, this project would still likely have been viable.

The landowner ultimately decided to sell the property to the federal government to make the land part of the Blue Ridge Parkway National Park, which rendered the project ineligible (the ARB protocol does not allow carbon projects on federal lands). This decision was driven by estate tax concerns rather than any inherent concern over the viability of the carbon market. While the important conservation features of this land were ultimately preserved, Carbon Canopy missed the opportunity to provide a blend of FSC certified forest products and go through the full process of carbon project development and credit sales to corporate partners.

The exercise allowed project technical consultants (Pacific Forest Trust and Forest Stewards) to work through the beginning stages of project development, conducting inventory data collection in the area. allowing knowledge transfer to local foresters on inventory design for carbon projects, biomass and carbon calculations for Appalachian tree species, calculation of the Common Practice Indicator and minimum baseline, and more accurate cost estimates for conducting inventory data collection in the area.

The landowner ultimately decided to sell the property to the federal government to make the land part of the Blue Ridge Parkway National Park.



PINE MOUNTAIN

This project came into Carbon Canopy consideration through National Woodland Owner Association President Keith Argow. Mr. Argow was an enthusiastic supporter of the goals of the Carbon Canopy program and wanted to use a recently purchased piece of property as a test case of the carbon market for small non-industrial landowners. The project area was located in southwestern Virginia near Kentucky on the Appalachian Plateau. The forest was comprised of 1,400 acres of montane oak hickory and cove forests plus an area of recently harvested young growth. While this project looked like it may have been marginal from the start, at this point in the Carbon Canopy program, we were having difficulty recruiting smaller, non-industrial owners (we had a large timberland owner who was in full project development, see below). Thus, we saw this as an opportunity to take a potential project all the way

through from full inventory data collection to modeling the baseline and project scenarios and going through all credit calculation steps with accurate data and growth projections.

This landowner also served as a good illustration of a situation in which the carbon market could change the potential outcome of long-term management. In the absence of alternative sources of income, the forestland could otherwise be more intensively harvested for pulp and biomass markets than would support native biodiversity and recovery of the forest for a mix of pulp and mature, high value hardwood species such as yellow poplar for hardwood veneer.

After all inventory data collection, modeling, and financial analysis, this project did not appear to be financially viable enough for us to recommend that the landowner proceed. Low growth rates were the primary driving factor for making this project non-viable. We also examined the possibility of an avoided conversion project. This could have been a viable pathway in terms of having adequate carbon stocks to produce adequate credit flow. However, the lands were located in an area in which development pressures were too low to be able to support a contention that the property would be converted to non-forest uses. Detailed lessons learned from going through this exercise are contained in Appendix A.

This landowner served as a good illustration of a situation in which the carbon market could change the potential outcome of long-term management.

FORESTLAND GROUP VIRGINIA HIGHLANDS

This project served as an anchor from the start of Carbon Canopy and was ultimately the only project that made it through full development, verification, credit issuance and sale. The Forestland Group is a Timber Investment Management Organization based in Raleigh, North Carolina. The company was an early partner in Carbon Canopy because it owned substantial acreage in the southern Appalachians, and because they are committed to FSC certification throughout their U.S. holdings.

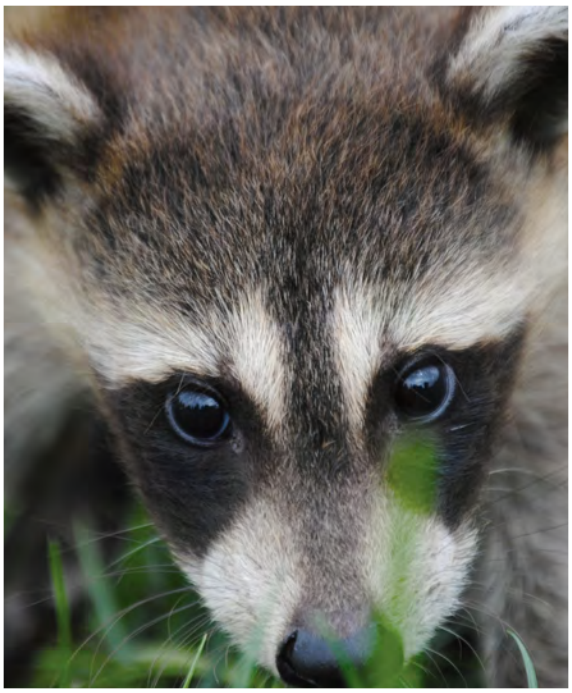
The Forestland Group originally considered its entire 113,000-acre Virginia Highlands ownership in southwest Virginia for carbon project development. We used timber cruise data from the property to develop preliminary financial pro formas to test assumptions about costs, credit generation, and income generation for projects at this large scale.

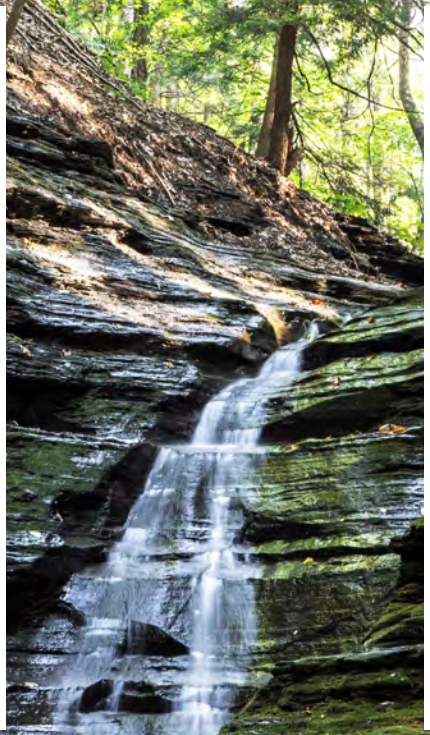
As TFG prepared for project development internally, they decided to try project development on this property for a smaller subset of the Virginia Highlands holdings. This was in large part due to concerns about underlying mineral rights on the property, and whether the owners of those rights would exercise them to extract coal. They identified an area of roughly 12,000 acres where the likelihood of coal field development was low. This area was eventually decided upon for full project development. It had similar enough tree size and density stocking to the larger property, and the area was large enough that we were confident it be financially viable so a decision to move forward with formal project development was made early in 2013. Upon further GIS and field review, the total forest acres in the project area ended up being 9,753 acres. The forest within the project area consists of Cove, oak hickory, and northern hardwood types with over 30 tree species.

Full inventory data was collected in the spring of 2013. Baseline modeling and credit calculations occurred in during the summer and fall of 2013. The project was large enough and had mature enough forest to easily be financially viable. Listing documentation was developed in the late fall of 2013 and submitted to CAR (as the third party registry to ARB) in early January of 2014. Field verification began in March and was completed in late April. Desk review of modeling and all other legal requirements of the protocol occurred over the next several months. Verification was completed, with a positive verification statement issued in late November of 2014. The project produced 156,174 credits (after the buffer pool contribution) for the initial reporting period.

The project was large enough and had mature enough forest to easily be financially viable.

Because this was the only project that made it all the way through the process, much of the rest of this paper is based on what we learned during its development and completion. The fact that this project went to completion helped illustrate that at least for larger holdings, producing FSC certified paper and wood products could be combined with carbon credits to create a secure and positive financial flow from ecologically sustainable management. The project also provided the opportunity for companies purchasing the credits to mitigate their climate impact in a rigorous manner with several other benefits to biological diversity, water quality, and local employment.





BALSAM MOUNTAIN PRESERVE

This project originated through our outreach to the land trust community. It was located close to the Charles Taylor property in the Blue Ridge Mountains in North Carolina. This project area was part of a high-end real estate development that also allowed timber management. In the absence of the project, more intensive timber management and/or more clearing for development could have occurred to help financially with the cost of the purchasing and maintaining the property. This project encompassed 2,736 acres of diverse mid to high elevation montane forest. Initial data collection, using the two-step approach, indicated enough carbon stocking to proceed with full project development. The project produced 30,800 credits for the initial verification period.

We proceeded with inventory data collection, baseline modeling, credit projections, and

submission of listing documentation. Verification began in early spring of 2014. During project development, the ownership situation started to change. The owners of the forestland and development wanted to sell the property to the homeowner's board who oversaw management of the land, the Balsam Mountain Preserve. This would include taking over responsibilities for managing the carbon project. Ultimately, the two parties could not come to agreement over credit splitting and the Balsam Mountain Preserve was hesitant to take on the 100-year commitment. Several factors contributed to this hesitancy, including higher than projected verification costs (see section on verification below), a temporary lull in offset prices, and lack of adequate commitment of voluntary purchase of from our corporate partners. Staples, the major voluntary buyer, had just suffered less than robust growth and could not purchase the volume of credits that had been expected. While the lower than expected prices were not likely to persist, the timing caused the project owners to suspend verification and effectively end project development.

While this was a disappointing result for Carbon Canopy, the project still has the opportunity to be viable in the future if prices become even marginally more robust so the owners feel the risk of long-term carrying costs are sufficiently reduced. This project also illustrated how projects in the region that are not large (e.g., 4,000 acres or larger) are susceptible to uncertainties that arise during later stages of project development and verification which increase cost or decrease projected credit yield because growth rates are slow and the common practice indicator is high relative to starting stocks even with relatively mature forest cover.

CRUMMIES CREEK WEST VIRGINIA

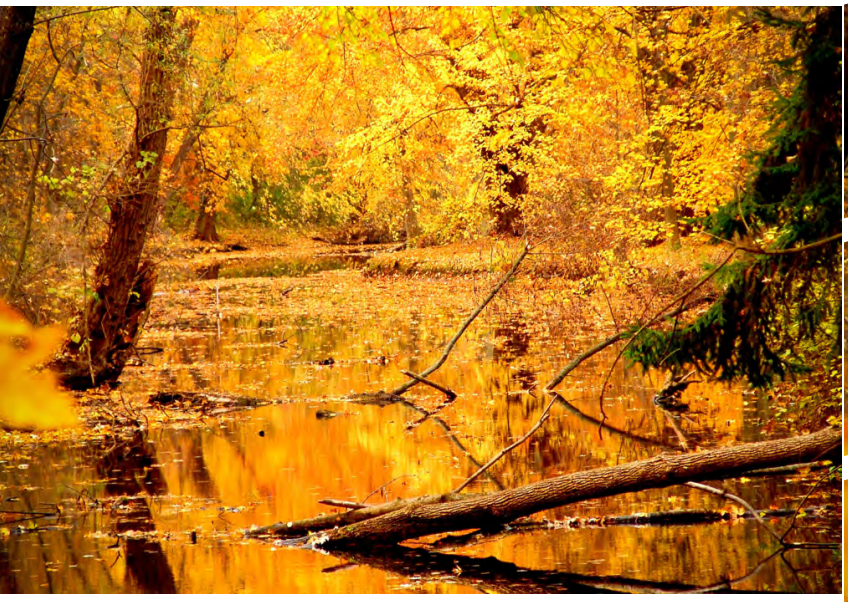
This was a second potential small landowners project on properties owned by Keith Argow. The potential project was comprised of 2,000 acres of scattered parcels spread over five counties in mountainous portions of West Virginia. Mr. Argow felt that these lands were more productive and had a higher starting carbon stocking than his lands in Virginia so wanted to test the ability of these acres to pan out for carbon. We received an NRCS grant to cover inventory data and part of project development costs to further knowledge of using carbon markets for non-industrial forest landowners.

Full inventory data was collected in fall of 2013. Project stocks calculations, growth and yield modeling, and financial projections were conducted in spring of 2014. This project did yield a fairly robust initial credit yield (52,000 credits) and net positive

financial outcome. In fact, this project had a higher credit yield and safer profit margins than the Balsam Mountain project in North Carolina. The overriding factor in the decision making of the owner however was that he had made several prior investments in improved timber quality. Growth rates were not robust enough and project size was not large enough to do both commercial timber harvest and manage the property for carbon credits. At prices in the current carbon market, having to make a choice between managing for carbon or managing for timber income forced a decision to manage for timber, which yielded a discounted net present value of three times as much income as managing for carbon credits.

Going through this project experience cemented the conclusion that at least in the Appalachians, the combination of the baseline Common Practice Indicator being high relative to other regions, which makes the margin between the baseline and starting stocks small and slow growth rates (between 0.5% and 1.5% biomass accumulation per year) makes carbon projects very challenging for small forest landowners while carbon market prices remain below $15/credit.

Carbon projects are very challenging for small forest landowners while carbon market prices remain below $15/credit.



5. CARBON PROJECT FIELD DATA

Inventory Documentation

The protocol requires that the design of and implementation of inventory data collection are clearly documented in a separate inventory methodology document.
Our inventory procedures document was considered complete and adequate during verification when it included the following items:

Offset project boundary (which carbon pools are being measured)
General inventory design
Inventory sampling methodology
Stratification
Inventory updates
Modeling (how inventory data interfaces with the model)
Quality assurance and quality control procedures
Measurement standards
Data measurement and quality assurance
Volume and biomass calculations
Confidence deduction calculation
How future changes will be handled (change log)

Protocol Requirements for Accuracy

- The ARB protocol requires a high level of statistical rigor. The sampling error for all carbon pools combined needs to be between 5 and 20% at a 90 percent confidence interval. If the sampling error is greater than 5%, the amount of on-site carbon stocks are reduced by the percentage error above 5%. For example, if the error rate is 7.2%, then measured on-site carbon is reduced by 2.2%, which ultimately results in fewer available credits. An error rate greater than 20% disqualifies a project.

- The three projects that conducted full inventories all achieved error rates below 5%. The Virginia Highlands Project has 603 plots over the 9,753 acre project area. Balsam Mount had 173 plots over 2,736 acres. Crummies Creek had 209 plots over 2,250 acres. This number of plots is one reason why field inventories for ARB projects are a large cost driver of project development.

The three projects that conducted full inventories all achieved error rates below 5%.

Inventory Design Considerations

After going through field verification on two projects, several design features emerged as important to reducing potential for error. First, height measurements are difficult in hardwood forests. Inventory measurements need to be taken during leaf-off (November through April) to ensure the most accurate measurements possible. This also means that verification needs to occur during the same time period so that repeat measurements are taking during similar conditions to avoid discrepancies between results from project staff and verifiers.

Second, the biomass equations used for different species require different height measurements – some require total height and other require merchantable height (or height to a 4 inch top). We found that it is best to measure each species with the height needed as per biomass equations. If total height is needed for modeling purposes even if just merchantable height is needed for biomass calculations, then measuring both heights is advisable. Trying to use regressions to obtain height can introduce error as verifiers compare plot results. Even though it increases the initial cost of inventory, it is worth it to minimize the potential for error up front rather than having to pay for second or third verification field visits.

Another potential area of error comes from trees on the boundary of plots. Inventory foresters need to take care, especially when using variable radius plots, to ensure that trees are accurately marked in or out of the plot. Given the nature of sequential sampling, one boundary tree error can cause a plot to fail re-measurement accuracy, and failure of as few as two or three plots can cause the need for a second site visit. Getting accurate boundary tree measurements will usually require a team of two people to measure each plot. But again, the savings from potential additional field verification visits outweigh the costs.

The issue of frequency of re-inventory needs to be considered carefully. The protocol allows 12 years between re-measurement of plots. However, field verification needs to occur every six years. The potential for natural disturbance and tree death can cause plot measurements to become inaccurate, even over the course of one year. While modeling that takes mortality into account can potentially predict the number of trees lost, this does not necessarily match what occurs at the plot scale. Based on our experience, we recommend re-measuring plots every six years, right before each field verification.

Finally, plots need to be established as permanently as possible. We used large orange plastic stakes for plot

centers. We had several plot center stakes pulled out by bears, which required adding in more plots to the sequential sampling schedule. On large projects, this can cause field verifiers to run out of time and need to re-schedule a subsequent visit. On small projects, it can cause failure of an entire stratum if there are not enough plots to re-measure. Re-establishing plot centers during field verification is difficult. We recommend using metal rebar to mark plot centers and painting the top a bright color for easy re-location.

Field verification must occur every six years.

Forest Type Diversity

Forests in the southern Appalachians have high species diversity. Management heterogeneity (variation in tree size and density within and between stands) can add to the complexity of project areas from an inventory design perspective. Stratifying the project by vegetation and structure type helps improve statistical accuracy of plot measurements by allowing plot data to be compared within strata (Shivers and Borders, 1996). We found that stratification was not a common forest inventory approach in the U.S. South.

Another area in which forest type diversity affects offset projects is in modeling the baseline and calculating carbon stocks. These areas are addressed in subsequent sections.

6. KEY OVERARCHING LESSONS ON PROJECT DEVELOPMENT

There are several key overarching lessons from going through all these steps on the Virginia Highlands process. First and foremost, clear and thorough documentation of every step of project development is critical. Just filling out the Offset Project Data Reports is not sufficient documentation. For carbon stock calculations, this means showing equations for each species and processes for calculations in a manner that verifiers can repeat all the steps.

Baseline development and modeling needs to be documented in a baseline modeling plan as per the protocol. This document is an opportunity to put in as much detail as possible to justify all the assumptions made in both constructing the baseline scenario and carrying out those assumptions in whatever growth and yield model is used. The more justifications with solid reasoning and evidence to back them up, the fewer opportunities there will be for the verifiers to find non-conformance items. All baseline modeling outputs and procedures to arrive at the outputs also need to be documented so that verifiers can independently repeat

the modeling and arrive at the same results. The initial verification is the only verification in which the baseline gets examined for the entire 25-year crediting period, which is why this portion of the documentation gets so much scrutiny.

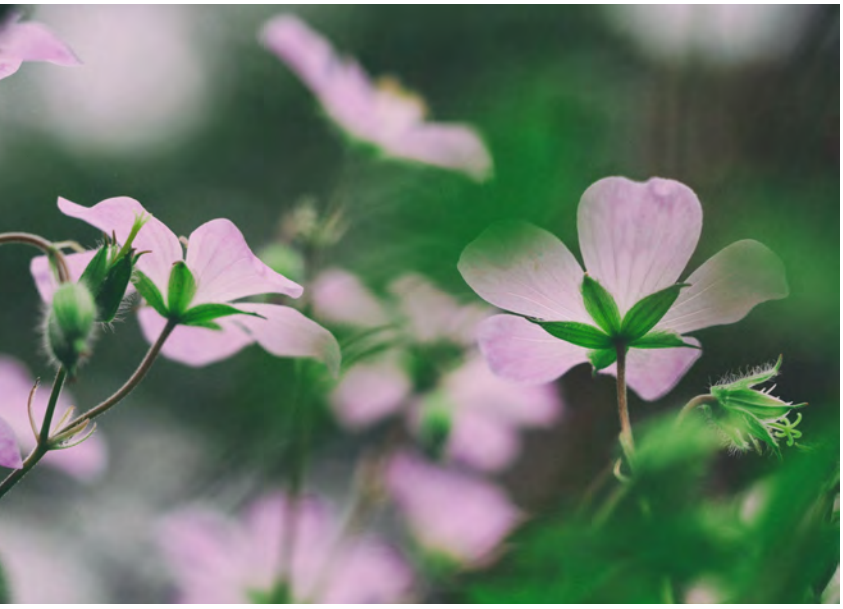
A second key lesson is that given the complexity of baseline modeling, it is advisable to have a second modeler run through the process and results to check for errors prior to submitting documentation for verification. Errors can be something as small as accidentally setting a parameter incorrectly or inconsistently rounding a calculation factor to a different decimal place. For large projects with several stand types and tree species, having to re-run the baseline scenario, compile all the tree list data, and re-run carbon calculations can take substantial amounts of time (at least a week in the case of the Highlands project). This is expensive both in terms of consultant time, and if errors are found during verification, having to address multiple non-conformance items (NCRs) involved with mistakes or lack of clarity in the baseline. Having to go through two or three rounds of addressing non-conformance items can add substantial cost to the verification process.

Third, we recommend that from the beginning of project development, the technical lead develop a check-list of all protocol requirements, and that each item have a list of back-up documentation for how that item has been addressed. For example, the natural forest management requirements are numerous, including the need to show tree species diversity, adequate snags and down woody debris, third party certification, and age-class distribution. A spreadsheet detailing how each item is met and with references to data that demonstrates achievement of the requirements allows for systematic and efficient review during verification, in addition to being an organizational tool for project developers as they go through project development in preparation for verification.

Fourth, make sure to check all biomass equations prior to running carbon stock calculations. As mentioned above, forests in the Appalachians and other areas of the South are species rich. There were several species for which there were no equations listed on the ARB-approved documentation. We initially chose equations from the literature that most closely matched the species in question, based on best professional judgment. However, ARB had a different set of equations in mind (not published on their website) and after checking our methods with them, they had us change equations. Again, this took more time and money than necessary had they published more specific direction on their website, and had we cleared our choices from the start.

A final lesson is that every place where equations are used to calculate any aspect of necessary steps in the protocol, these equations need to be approved by ARB. While there are places in the protocol where this may not be explicit or the language is ambiguous, we learned that ARB attorneys interpret the State of California's Administrative Procedures Act to require public comment and ARB approval of any calculation methodology in the protocol, even if more technically correct equations are available and the protocol does not appear to specify a particular equation.

ARB approved all equations used for calculating protocol steps.



7. VERIFICATION

We learned that verification of forest offset projects through California's regulatory system is an exercise in expecting the unexpected. After having gone through verification of projects in the voluntary pre-cursor to ARB through the Climate Action Reserve, we initially expected the regulatory process to be more predictable. However, the level of scrutiny that the program receives from outside groups who are skeptical of forest-based offsets and offsets in general has created pressures on ARB to ensure that every detail of project verification is examined intensely. This has lead to unexpected delays and cost increases. Because ARB scrutinizes every detail of a project, verifiers in turn scrub every aspect of project development and documentation in order to avoid last minute surprises during ARB's final review.

In addition, given that forests are complex systems and that the protocol requirements are not entirely explicit in every aspect of instructions, there is room for differences in interpretation in how to carry out the requirements. We learned that ARB is reluctant to issue specific guidance on areas of vagueness due to concern over potential legal action. From the project developer's perspective however, lack of published

guidance can cause verifiers and technical consultants to re-discover issues that may have already been settled between ARB and other verifiers and project developers, leading to unnecessary delays and increases in the costs of project development and verification. Every unplanned hour that verifiers spend trying to sort through ambiguities or uncertainties that arise in the course of applying the protocol to site-specific situations leads to increased costs for the project developer.

Both the Virginia Highlands and Balsam Mountain projects were projected to cost twice the original estimated contract amount to get through verification. The author has had a subsequent similar experience with a project in a different region of the country, despite the verifiers indicating this project had fewer issues than any they had previously worked on.

The scrutiny the project received from parties skeptical of offets ensured that ARB intensely examined every detail.

Many of the particular lessons learned with regard to verification are captured in prior sections on inventory data collection, project documentation, and baseline modeling. The overarching lesson is that in order to keep verification costs to a minimum, being as clear and precise and overly cautious as possible in all aspects of project development and documentation leads to the fewest issues. Also staying in close communication with the verifiers when there are uncertainties helps reduce

problems later. An important point in verification where this applies is after the first full review of the project has been completed and the Non-Conformance Report (NCR) is issued. We highly recommend that project developers go over each item with the verifiers to ensure that both sides understand the nature of the issue before time is spent addressing them. Then, asking the verifiers to go over draft responses can help reduce

BOTH VIRGINIA HIGHLANDS & BALSAM MOUNTAIN WERE PROJECTED TO COST TWICE THE ORIGINAL ESTIMATE

the need for subsequent rounds of NCRs, or at least reduce the number of outstanding items on a second round of NCRs.

It is also important to get guidance and approval through the verifier from ARB if there are any questions or uncertainties. Hoping that they won't notice or will give the technical consultants or verifiers the benefit of the doubt in using best professional judgment will more likely than not end up becoming an issue that has to be resolved later anyway, and can require re-running models and re-doing documentation. And there still could be an issue that ARB finds during final review of the project that leads to additional time and work to achieve credit issuance. Expecting this and budgeting for it will lead to fewer sleepless nights.

8. CREDIT ISSUANCE

Once a project has received a positive verification statement, the third party registry with whom the project was originally listed (Climate Action Reserve or the American Carbon Registry) has to review the project documentation as per the cap and trade regulations. Our experience was with the Climate Action Reserve. They reviewed the Virginia Highlands project and issued Registry Offset Credits in a timely manner – within 30 days.

Once Registry Offset Credits have been issued, the project operator needs to submit a "Request for Issuance" form and the main project documentation (listing form, original and final Offset Project Data reports) in hardcopy and electronically to ARB for final review and approval of ARBOCs. This process is supposed to take no more than 45 days. However, if ARB has questions or finds issues on which they want follow-up, credit issuance can take much longer than that. This process took six months for the Virginia Highlands project. The author was involved in another project in a different region of the country in which took three and half months.

For the purposes of entering into credit sales contracts, it is important to know going in that credit issuance timelines can be uncertain. If a credit buyer needs delivery by a certain date, the project owner/seller should include language in the sales contract that allows for the unpredictability at this tail end of the project development process.

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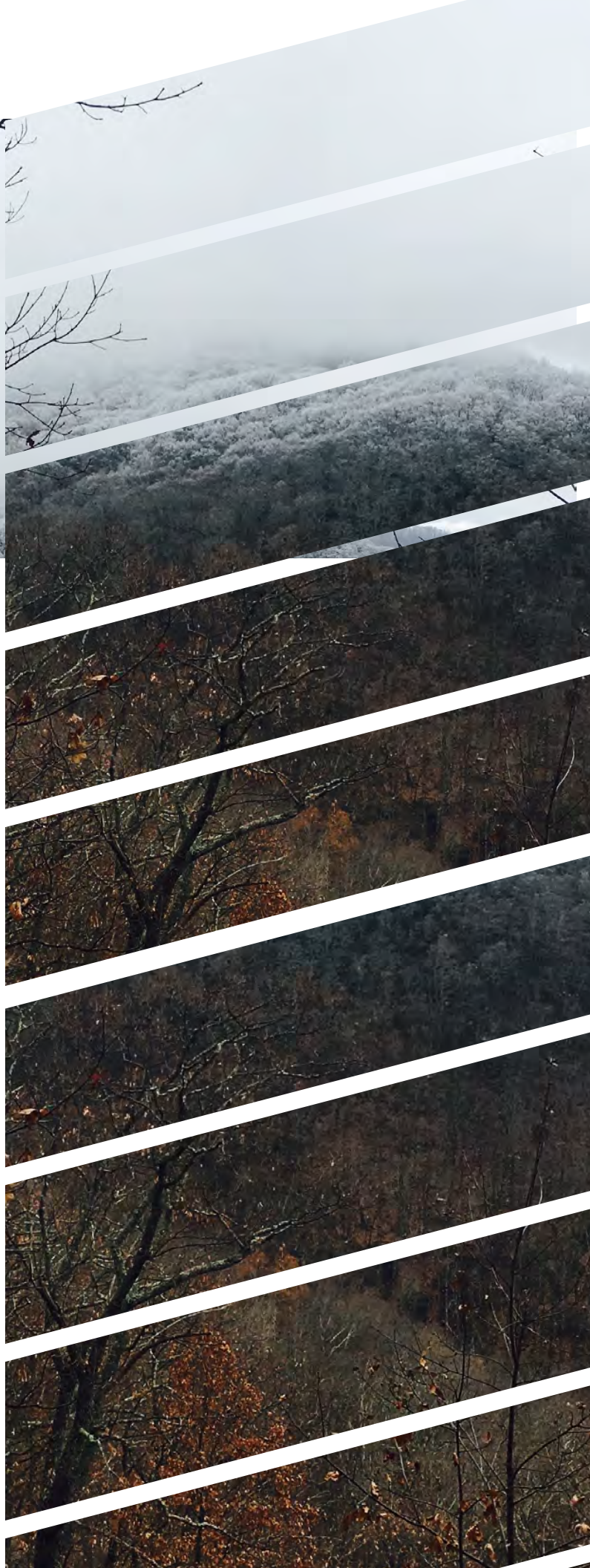


9. FSC AND CARBON PROJECTS

Forest Stewardship Council certification is a key pillar of the overall Carbon Canopy project, as described in the beginning of this paper. Joining FSC with California Carbon Offset projects also created some project development efficiencies. This is due to the large degree of overlap between FSC certification criteria and the natural forest management requirements of the protocol. Managing for native tree species, managing for a diversity of native species reflective of local ecosystem types, limiting salvage logging, and leaving adequate standing and lying dead wood are all requirements of the ARB protocol that FSC certified forests easily meet given the requirements of certification. Therefore the Carbon Canopy purpose of increasing flow of FSC certified fiber in the South helped participating landowners meet a rigorous part of the ARB protocol.

In addition, there is a requirement that all projects employing even-aged commercial management (clear-cuts) have all of their ownership in a certification system that explicitly ensures that harvest levels are perpetually sustainable. While FSC is one of three

THE CARBON CANOPY PURPOSE OF INCREASING FLOW OF FSC CERTIFIED FIBER IN THE SOUTH HELPED PARTICIPATING LANDOWNERS MEET A RIGOROUS PART OF THE ARB PROTOCOL

certifications allowed, the fact that Carbon Canopy projects had to also provide FSC fiber allowed for all of our projects to easily meet the certification/sustainable harvest requirement.

We also hoped that there may be some cost savings by having verification teams look at both FSC certification and carbon verification at the same time. However, after having gone through the carbon verification process, the demands of the protocol are such that it is unlikely, and perhaps inadvisable to try to accomplish both certification and verification by the same team at the same time. Too much work, and too much different work required by each standard make this efficiency unattainable at this point in time.

10. FINANCIAL FEASIBILITY AND RISK

Based on detailed financial analyses of actual project development and verification cost data and modeling results, we are able to arrive at some general guidelines on financial feasibility of forest carbon offset project development in the southern Appalachians under California's regulatory market. There are three major limiting factors that emerged: 1) the high cost of project development and verification; 2) high minimum baselines compared to starting stocks based on the region's Common Practice Indicators; and 3) relatively slow rates of annual biomass accumulation.

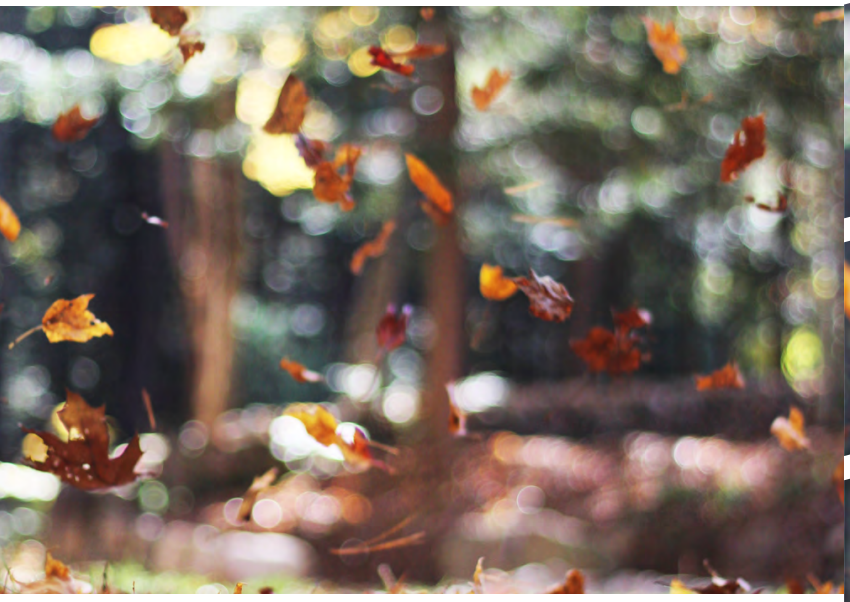
Prices of $10/ton (current market price) require project sizes of at least 2,600 acres to safely cover long-term carrying costs and have a net positive revenue stream at a 5% discount rate. At $20/credit, projects of 1,000-1,500 acres are feasible, depending in site productivity. Because the California cap and trade regulation has a statutory price floor that increases by 5% per year, the current offset price of $10 per credit (metric ton of CO2e) is unlikely to drop much below the level.

Current market conditions allow for projects on larger

THE CURRENT STATUS OF THE CARBON MARKET & THE COMPLEXITY AND EXPENSE OF PROJECTS CREATE BARRIERS TO ENTRY FOR OWNERSHIPS SMALLER THAN 2,500 ACRES

industrial or timber investment properties to be easily feasible. Considerations for these owners are much more about whether financial goals with timber management can also be met. For our large landowner partner, The Forestland Group, a project on a subset of ownership on a property that was being restored over time to high timber stocking, made financial sense and fit with the philosophy of the company (sustainable management under FSC certification).

Once prices clear the threshold of covering project development and maintenance costs and return a net positive cash flow, then other considerations of larger financial goals and opportunity costs of other ways of generating revenue on a given property become dominant decision factors for landowners. However, given that a large proportion of the ownership base in the U.S. South in general and the southern Appalachian region in particular, consists of smaller non-industrial landowners, it is clear that the current status of the carbon market, and the high complexity and expense of project development create significant barrier to entry for ownerships smaller than 2,500 acres.



11. LOOKING AHEAD

The California carbon market overall has proven to be stable and resilient to legal challenges. From the perspective of a regulatory approach to reducing greenhouse gas emissions, the fact that prices have stayed just slightly above the auction floor price and have not had large fluctuations are signs of success for the early years of implementation. While this price range has not induced as many forest carbon offset projects as have been needed to meet offset demand, the overall health of the market has not suffered.

There have been on-going discussions about extending the cap and trade program to at least 2030, if not 2050. Governor Brown issued an executive order in 2015, which calls for reductions of GHG emissions to 40% below 1990 levels by 2030. This reduction goal was codified as a legal requirement through the passage of SB32 in September 2016. While the reduction requirement now has legal force, the law does not specify how those goals will be met so there is still some uncertainty about the future of the cap and trade market. However, ARB is also in the process of updating its scoping plan (the official plan by which meets its overall GHG reduction goals, including all relevant mechanisms, including cap and trade). If these

goals are incorporated into a formal regulatory cap, the demand for offsets will increase significantly, and the price should rise accordingly. If this state of affairs comes to pass, the feasibility of using California's carbon market to drive sustainable forestry in the U.S. South should increase from where it is today. Market participation would also improve if project development became somewhat less burdensome and unpredictable from a regulatory perspective. In addition, if the use of remote sensing techniques such as Lidar and the use of drone technology to measure carbon stocks eventually replaced on-the-ground plot measurements, project development and long-term maintenance costs would decrease significantly, making what are now marginal projects much more attractive.

If the use of remote sensing & drone technology replaced on-the-ground plot measurements, project development & maintenance costs would dramatically decrease.

If prices stay below $20/offset credit, and the complexity of project development and verification stay as they currently are, it will likely be necessary to create other mechanisms to incentivize forest landowners, especially smaller non-industrial owners, to undertake long-term commitments to ecologically sustainable forestry at scale. Such mechanisms could include federal programs through USDA that reward landowners for increasing carbon stocks, but that do not rely on offsetting so that a 100-year commitment was not necessary to start. The long commitment periods are important when some portion of fossil fuel reductions are being replaced with forest offsets because carbon dioxide can be re-emitted from biological systems. If benefits were trying to be achieved outside of a regulatory cap, then commitments of 40 or 50 years would be more appropriate and may appeal to a larger number of landowners. While accountability would still be important, the need for the level of rigor in inventory data collection and verification would not be as stringent and there should cost less, thus smaller owners could participate.

Financing new federal programs are difficult. However, justifications can be made for allocating funds to forest conservation and carbon stock enhancement through looking at the social cost of carbon, which the amount of damages to society per ton of CO2 pollution. There are costs that are currently externalized in the absence of a nation-wide cap and trade program or carbon tax. Until such time as a national carbon price exists, the federal government can still justify spending money to reduce CO2 levels if the cost of doing is equal to or less than the damages caused by GHG emissions. Alternatively, smaller incremental steps, such a tax per barrel of oil could a revenue source to cover forest conservation programs.

Another approach would be to create state-based working forest conservation easement programs that have carbon performance standards. Such a program requires a stable, predictable pool of state-based funding for purchase of easements and a land trust community willing to steward easements that have more complicated forest management requirements than is typical. There is a robust community of land trusts in the Appalachians that could serve this function, and gain the capacity to administer working forest conservation easements if they did not already have it. The funding could come from several sources, including

any eventual price on carbon, fees on conversion of forest to non-forest land uses, and/or a partnership with federal agencies and programs.

An example of an easement requirement that would result in carbon gains over time would be to limit harvest to some percentage less than annual biomass accumulation. Area-based limits could also be used. In addition, other elements important to conservation, and in line with FSC standards, including FSC standards themselves, can also be incorporated into easement terms to protect biological diversity and water quality.

The advantage of using easements rather carbon offsets for securing carbon sequestration long-term would be the lower transaction and carrying costs of projects. Monitoring would still be important, but as with the federal program example above, if the program is structured in a manner to complement rather than substitute for fossil fuel reductions, the need for the level of precision and rigor in terms of quantifying the tons of CO2e on an annual basis would be lower. Gains in forest carbon could therefore be made at a lower cost overtime. The use of a conservation easement would secure these gains, or at least the land base on which they can be made (in the event of unintentional natural forest loss) permanently.

EPILOGUE: HOW CARBON CANOPY LED TO NEW AND BIGGER ENDEAVORS

PROOF OF CONCEPT LEADS TO 240,000 NEW ACRES MANAGED FOR FOREST CARBON

While the market pricing of carbon wasn't sufficient for small landowners to balance managing forests both for ecosystem service and product markets, there is sufficient opportunity for larger landowners to move in this direction. In fact, leveraging the proof of concept that arose out of the successful 9,700 pilot project, The Forestland Group went on to carry the principles of forest rigorous carbon management forward. Utilizing the principles of permanence and additionality when it comes to managing forests for carbon across a 100 year time frame, the Forestland Group has expanded their forest carbon management efforts across 240,000 acres in the Southern Appalachians. The offset credits generated through this work are continuing to be certified and sold through the California Air Resources Board. In an ideal world, these carbon offsets would be purchased by companies sourcing wood products from the region so that a closed-loop market process leads to continually expanding forest carbon management. It is uncertain whether these offsets will be acquired in this manner or whether they will be purchased to offset emissions from fossil fuel use. Nevertheless, the improved management on the land is a meaningful accomplishment and hopefully this approach will be adopted to more large-scale and commercial landowners in the region and become the new normal.

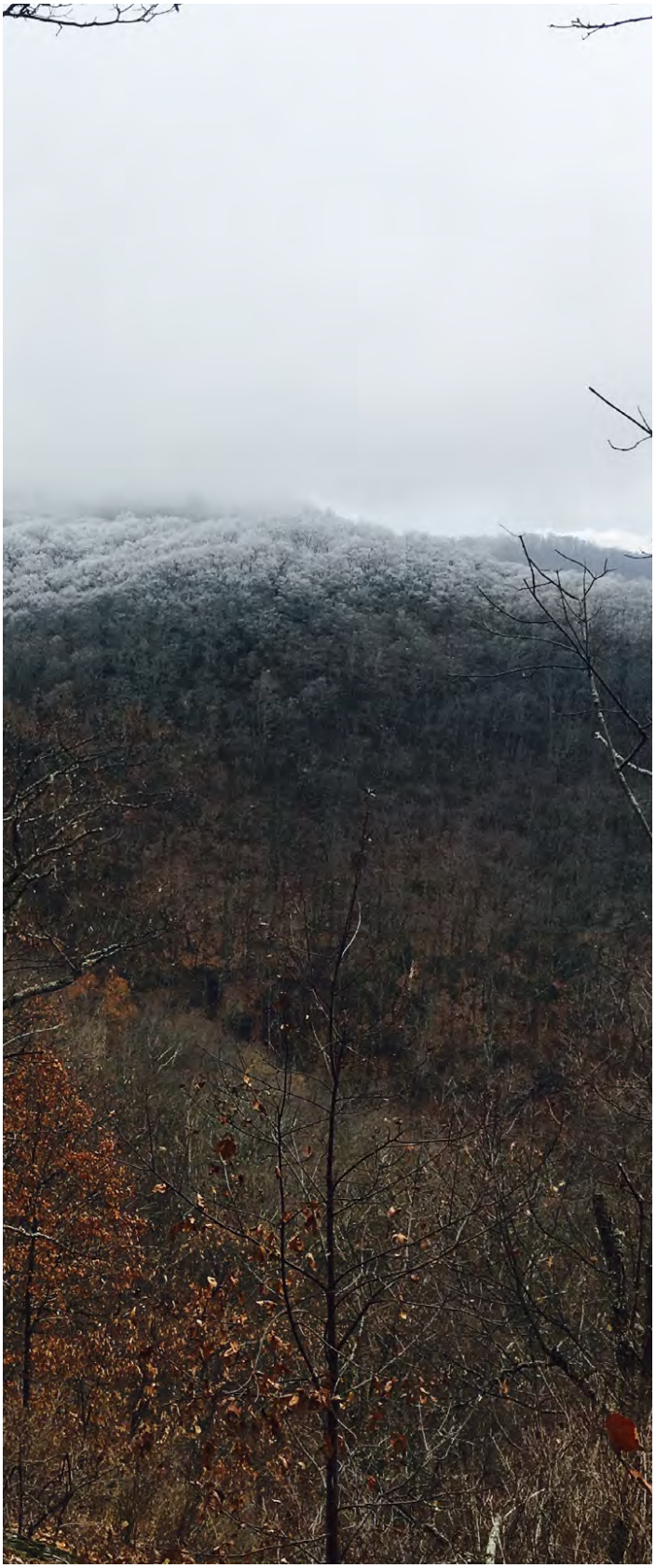
The Forestland Group has expanded their forest carbon management efforts across 240,000 acres in the Southern Appalachians.

LEARNINGS SPUR DOGWOOD TO CATALYZE WETLAND FOREST INITIATIVE

The Carbon Canopy Project was a collaborative project that piloted unique and innovative approaches to forest carbon management. As described earlier, project successes paved the way for nearly a quarter million acres to be rigorously managed for carbon benefits. While this outcome is very encouraging, the challenge remains that carbon markets aren't valuing forests at the right levels for small landowners. This verity led Dogwood to explore the possibility of advancing large landscape-level conservation focused on bottomland hardwood forests (wetland forests) in the Southeast.

Wetland Forests in the South span over 35 million acres across 14 states and less than 10% are in some form of protected status. This forest type protects communities from major storm events, sequesters vast amounts of carbon, provides critical habitat for a wide range of species and for activities such as hunting and fishing, and has important cultural and historical significance for regional tribes and African-American communities.

Dogwood Alliance is carrying learnings from the Carbon Canopy process and once again formed a diverse and unique collaborative of associations, organizations, agencies, and tribes that represent diverse environmental, economic, and social concerns. As of the close of 2016, there are now approximately 25 organizations and agencies that are committed to conserving, restoring, and improving forests through the Wetland Forest Initiative. This collective work will result in newly restored wetland forests, new preserves and public lands, new voluntary conservation easements on private lands, and enhanced management practices in the working forest.



APPALACHIAN WOODLANDS ALLIANCE TAKES SHAPE

The same commitment to stewardship, landowner engagement and sustainability leadership that brought together the Rainforest Alliance, Domtar, Columbia Forest Products and Staples to work with the Dogwood Alliance in the Carbon Canopy effort to bring new financial benefit to landowners through forest carbon offsets has resulted in a recent project known as the Appalachian Woodlands Alliance (AWA).

The AWA partners share a deep commitment to advancing sustainable management of the region's forests, backed up by significant efforts to engage woodlands owners and procure responsibly managed timber. Indeed, the lessons learned during the Carbon Canopy project have also greatly informed the AWA's focus on practical tools and models that provide value to woodlands owners, the forest products industry and the marketplace.

Whereas Carbon Canopy focused on developing new revenue streams for small private landowners through forest carbon offsets, the AWA looks to engage more woodland owners in sustainable forest management by advancing regional conservation values through strategic on-the-ground forest management practices. The AWA will create new tools for improving forest management certification and assurance to support local economies and the forest products industry. Building new tools to showcase a sustainable supply chain supports existing marketplace efforts to recognize good forest management.

The Appalachian Woodlands Alliance (AWA) is a partnership between Rainforest Alliance and forest products leaders Avery Dennison, Columbia Forest Products, Domtar, Evergreen Packaging, Kimberly-Clark, Staples, and the US Forest Service. Working with private landowners in the Southern and Central Appalachians, this project—launched in 2015—aims to improve the productivity and health of forests in the southeastern US by fostering sustainable practices and market recognition.

APPENDIX: DETAILED LESSONS FROM PINE MOUNTAIN PROJECT

The primary reasons for the lack of viability of an Improved Forest Management project are that: 1) The growth rate on the Pine Mountain forestlands was lower than preliminary estimates. Based on local advice, we modeled a 2% annual carbon accumulation rate for the first 30 years. After more research into soil type and growth rates from published data and FVS modeling, it was determined that actual biomass accumulation ranged from 1.7% at the high end to 0.5% at the low end for years in which harvest did not take place. This amounts to less than 2 tons of CO2 per acre per year; 2) taking into account carbon in harvested wood products in the baseline versus project scenarios and the discount for secondary effects

(assuming that some harvest that would not take place under the project would be shifted elsewhere) took a higher percentage of credits from the project than we originally anticipated.

The harvested wood products effect is especially large when a project starts below the Common Practice Indicator for the property because a heavy harvest is required to keep the baseline low over the 100-year modeling period. When we excluded the young stands, and modeled a project of 1,000 acres, the starting stocks on the project area exceeded the Common Practice Indicator and yielded a surplus of approximately 15,000 offset credits the first year. However, the low growth rates could not overcome the effects of harvested wood products in subsequent years because there is still not much available commercially mature timber to harvest on the property in the project scenario.

The combination of slow growth, large credit discounts from harvested wood products, and the small property size combined to make the revenue generating potential of the project lower than we think is prudent to be able to pay for the long-term carrying costs of a carbon project.

We also examined the potential for an avoided conversion project. In this project type, the impact of harvested wood products carbon would be much lower because of the different way the baseline is calculated. Avoided conversion baselines use the actual area subject to conversion to non-forest use under an approved development plan, or the amount of de-forestation assumed under default assumptions in the protocol in the absence of an approved plan. Because there would be very little merchantable timber coming off the property in the first ten years, when clearing for development would occur under a baseline scenario, there is no carbon stored in long-lived wood products in the baseline. The limitation for this project type on Pine Mountain, however, is that the land was not deemed suitable for residential development by a local appraiser. Southwestern Virginia is economically depressed due to a downturn in coal mining activity and due to the general lack of vigor in the housing market. In addition, the appraiser determined that the presence of gas wells and lines would make residential development unattractive.

The preliminary assessment of value did identify the property as usable for increased development as a recreational site to cater to hunters and those accessing the near-by Pine Mountain Trail. However, we determined that it is unlikely the amount of forest needed to be cleared to make a viable avoided conversion carbon project (about 320 acres) would occur as a result of developing the property for hunting cabins and bird forage (i.e., there needs to be a realistic scenario that is being avoided in which forest would be permanently cleared for an alternative use). Given the lack of a realistic development scenario on the property, we concluded that the avoided conversion route was also not feasible at this time.

After this assessment was completed, we learned from TNC that it would be difficult to put a qualified conservation easement on this property due to the fact that underlying gas resources are not owned by Dr. Argow.

This experience changed our perspective on project selection and are instructive for other landowners considering carbon projects in the region:

Project sites that have slow growth rates (i.e., below 2 metric tons CO2e per acre per year) would need much larger acreages to make up the volume of credits generated to overcome the discounts from wood products calculations – likely on the order of at least 4,000 acres. For initial screening in the next two years, we should not pursue projects that have both slow growth rates and start below the Common Practice Indicator, regardless of size.

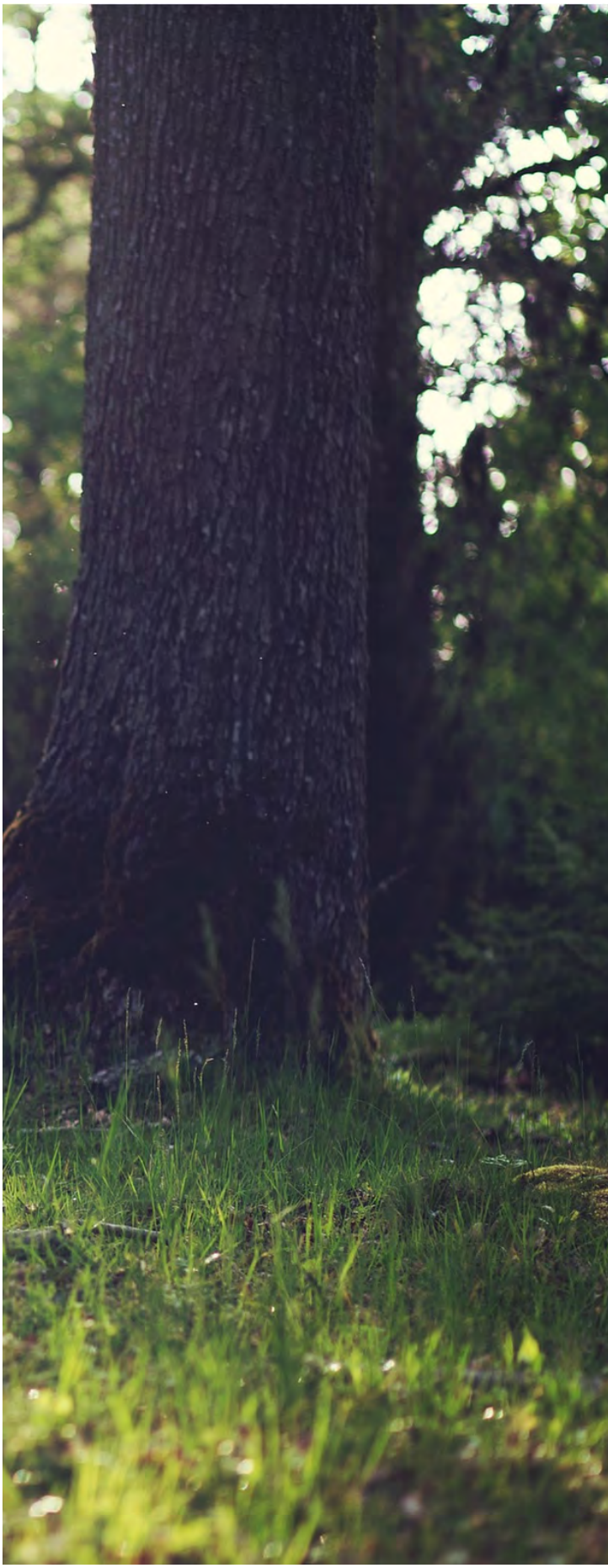
2 We should conduct more thorough initial research on site quality to estimate initial growth rates rather than relying on local qualitative assessments. This is partly due to the fact that most people estimate growth of merchantable timber, while the generation of carbon credits is based on biomass accumulation of all parts of the tree, which tends to occur at a slower overall rate.

3 Projects that start below the Common Practice Indicator would need either large acreages or fast growth rates, or both, to be viable – so projects in excess of 4,000 acres or with annual biomass accumulation rates in excess of 2 mTons CO_2e per acre per year, and likely no smaller than 2,000 acres.

4 While we are still in pilot phase, we should ideally target projects that are above the Common Practice Indicator and that have reasonable size, at least 2,000 acres.

5 Having projects with modest amounts of timber harvest on a regular basis as part of the project activity will help offset the impact of harvested wood products calculations, whose effects are largest when there are high harvest levels in the baseline and low harvest levels in the project.

6 Avoided conversion projects can be very advantageous compared to Improved Forest Management projects in some situations. We should look for pilot projects in areas in which both the housing market and local zoning laws support and allow for residential development at a density of 1 house per 10 acres or higher.



LIGHTER TOUCH LOGGING & GOOD FORESTRY:

A WALK & TALK IN THE WOODS WITH COLUMBIA FOREST PRODUCTS & DOGWOOD ALLIANCE

VALUING & MANAGING CARBON ON THE LANDSCAPE:

A WALK & TALK IN THE WOODS WITH THE FORESTLAND GROUP & DOGWOOD ALLIANCE

UNIQUE PARTNERSHIPS = GREAT FOREST PROTECTION

A CONVERSATION WITH MARK BUCKLEY ABOUT THE PARTNERSHIP BETWEEN DOGWOOD ALLIANCE & STAPLES

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