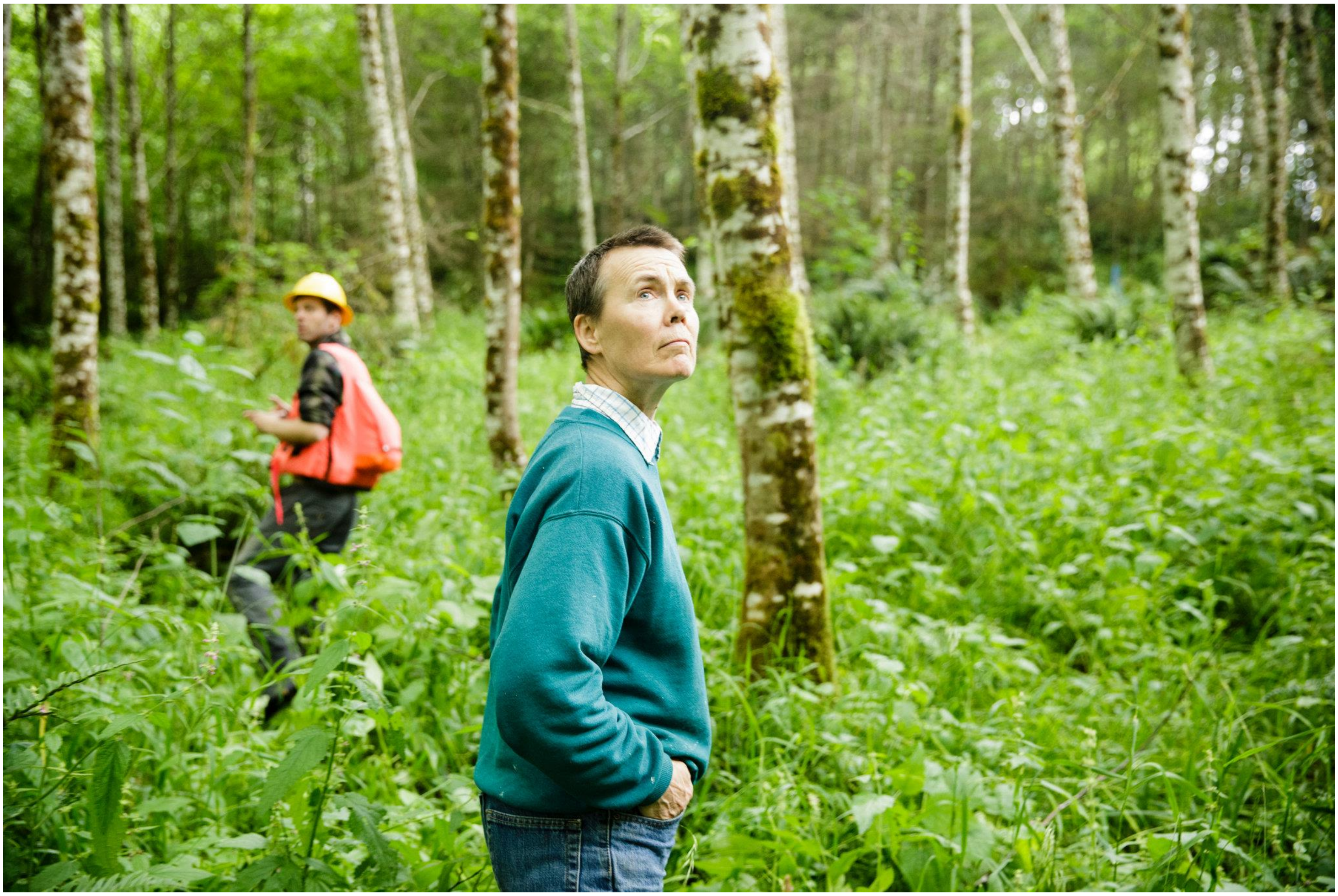
PINCHOT INSTITUTE FOR CONSERVATION

CIG GRANT REPORT



Forest Health-Human Health Initiative Pilot and Replication

Principal Investigator: Brian Kittler
Project Period: 9/30/2014 – 3/30/2017
Grant Number: 69-3A75-14-258
Date of Submission: 6/30/2017
Deliverables Articulated in the Grant Agreement:

- One complete aggregated carbon credit project involving approximately 20-25 EQIP eligible landowners. That credits will be ready for sale to a credit purchaser or sold if a purchaser is secured during the grant.
- New timber and carbon stock inventories and carbon credit assessments for approximately 20-25 EQIP eligible landowners.
- Revised landowner and American Carbon Registry contract templates.
- An agreement with a carbon purchaser.
- A detailed strategic plan and refined business model for Initiative scale up across the U.S.
- A publicly available report detailing the pilot program.

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Cover photo credit: *Eve Lonnquist examining trees on her property with Logan Sander, a consulting forester hired by the Pinchot Institute for Conservation to complete a forest carbon inventory on her property.* Credit Leah Nash for The New York Times. https://www.nytimes.com/2016/09/27/science/private-forests-global-warming.html

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The mission of the Pinchot Institute is to strengthen forest conservation thought, policy, and action by developing innovative, practical, and broadly-supported solutions to conservation challenges and opportunities. We accomplish this through nonpartisan research, education, and technical assistance on key issues influencing the future of conservation and sustainable natural resource management. Please visit www.pinchot.org.

Executive Summary

The main goal of this project was to investigate ways to make the carbon market a viable opportunity for family forests owners as market protocols were not developed with small forest landowners in mind. Our hypothesis has been that market access barriers can be overcome with creativity and innovation. To test this hypothesis, project work centered on three core activities: (1) implement a pilot project involving multiple family forest owners, (2) through trial and error, establish a template for replication across Oregon and Washington, and (3) foster collaboration and innovation among partner organizations in working lands conservation. All of these core objectives have been or have nearly been achieved although some of the steps we have taken varied from those articulated in our proposed approach.

Through this pilot we have completed 30 initial forest carbon assessments in Northwest, Oregon and subsequently worked with eight of these landowners to inventory forest carbon stocks on 2,038 acres across their eight properties. Of this, six properties representing 1,120 acres will proceed with verification. Net carbon crediting for these six properties is estimated to amount to 384,763 carbon credits (Metric tons CO_2e) over the course of 20 years assuming grow only forest management. If transacted, this would amount to a total carbon payment to these six landowners of $2,941,866 over this same time period.

By implementing this pilot project we have identified numerous factors influencing landowner ability and willingness to participate. These include: that all of the transaction costs involved in the entire project lifespan need to be made clear for landowners and the need for strategies for reducing these costs, especially those costs well-out into the future (i.e. monitoring) need to be identified; tradeoff analysis needs to be made available to landowners to help them assess the tradeoffs between carbon and timber income and the impacts to other forest management objectives; landowner succession planning needs to include discussions of long-term conservation options including forest carbon projects.

Other factors influencing project viability include: that the carbon market is skewed towards larger projects which produce large volumes of offsets and achieve economies of scale capable of internalizing transaction costs to a large degree; this is not the case with family forestland, so scaling carbon markets to family forestland will require outside investment to subsidize the cost of initial project development (inventory, verification, modelling, etc.) as well as the out-year (years 5 – 125) expenses of monitoring, re-verification, and re-inventory; timing carbon credit development with initiation of easements is a unique opportunity provides more returns to landowners; some transaction costs (monitoring and inventory) could qualify as new NRCS conservation practices under the EQIP and CSP programs; technology and innovation in inventory design can help reduce transaction costs; if private investment schemes are to be used to spur on projects with small landowners, the number of extra "deductions" needs to be minimized; the California compliance market does not allow for true aggregation, but as more jurisdictions join the market, a discussion around allowing aggregation should be reintroduced and some of the work products of this project can inform these policy discussions.

Introduction

PROJECT GOALS

The overarching goal of this project was to investigate innovative mechanisms for engaging family forest owners in the market for improved forest management (IFM) forest carbon offsets. Related goals of the project as proposed included:

(1) **Completing initial carbon offset project feasibility assessments** with 20 - 25 EQIP eligible landowners on an estimated 3,500 acres in Northwest Oregon;
(2) To move a group of these landowners down the project development pipeline **completing forest carbon inventories**;
(3) If a project is viable, having landowners **contract with a forest carbon offset project developer** with the objective being to have the first credits ready for sale at the end of the project;
(4) **Testing an innovative "conservation for health care" incentive model** whereby family forest owners are able to address family medical expenses not through timber liquidation or land sale, but rather with new income from carbon credits;
(5) **Negotiate with a carbon purchaser** to advance towards a transaction;
(6) **Evaluate the pilot and position successful aspects for scale up**.

PROJECT SCOPE

When this CIG project was conceived the American Carbon Registry (ACR) had recently approved a new improved forest management (IFM) carbon offset methodology in the voluntary carbon market which was designed largely as a means to engage family forest owners in the carbon offset market.[1] The team that wrote this carbon project included representatives from L&C Carbon, a carbon offset project developer with linkages to the American Forest Foundation and the American Tree Farm System, and a subsidiary of the Oregon Small Woodlands Association known as Woodlands Carbon Company which would serve as a carbon aggregator of multiple family forest owners.

Woodlands Carbon has previously completed a forest carbon offset sale with a group of landowners using their own carbon offset protocol. The protocol that was used was not rigorous when compared to any of the established protocols in the market today, and the credit sale price was quite low. When the Pinchot Institute started conversations with Woodlands Carbon Company there was a mutual recognition that using a different protocol was necessary going forward and Woodlands Carbon had identified the ACR methodology as a preferred approach. Likewise, the Pinchot Institute's prior forest carbon work, which included development of a preliminary carbon aggregation pro forma, suggested a voluntary project via an ACR aggregation could prove a viable way of engaging smaller acreage family forest owners in the carbon offset market.

Aspects of the ACR offset methodology that were most appealing from the perspective of engaging family forest owners in carbon offset projects was the shorter time commitment of 20-year crediting periods and 40 year project periods, as opposed to the +100 year time commitment of the compliance market which was seen as inhibiting non-industrial forest owner participation.

[1] http://americancarbonregistry.org/carbon-accounting/standards-methodologies/improved-forest-management-ifm-methodology-for-non-federal-u-s-forestlands

With L&C Carbon being a project team member when we submitted our grant proposal, and with this project originally being built around the voluntary carbon market, we set out to complete two tasks necessary for using the ACR protocol. ***Task 1*** was to design and obtain approval of an approach to aggregate multiple forest landowners into a single ACR offset project. The Pinchot Institute worked with L&C Carbon and Woodlands Carbon Company to produce a proposed aggregation model. This was reviewed by regional carbon experts prior to be submission to ACR and then was subsequently approved by ACR after their own review. The approved aggregation model and inventory design document is attached as **Appendix A**.

While awaiting ACR approval of the aggregation model, we simultaneously worked with Woodlands Carbon to revise their landowner contract template to incorporate the ACR carbon offset methodology (***Task 2***). This contract template went through legal review by an attorney with expertise in forest related law. The final revised contract is included as **Appendix B**. These first two tasks were completed early on in the project to set the stage for the remaining activities needed to complete an aggregated carbon offset project using the voluntary ACR protocol. Such a project would need to be transacted with a buyer willing to purchase voluntary ACR IFM credits—a new commodity with no sales track record. At the time voluntary carbon offsets (also referred to as credits) were selling for between $2 and $4 per credit. Our working hypothesis was that charismatic carbon—credits from family forests could demand a significantly higher price.

In the early stages of the project the Pinchot Institute had also begun revising a pro forma forest carbon offset model we had previously developed. We adjusted this model based on updated forest carbon offset estimates developed in conjunction with Woodlands Carbon and L&C Carbon and a refined set of assumptions. Our initial revised feasibility modelling work which is included as **Appendix C** informed the strategic direction of this project. We determined that to make a carbon aggregation viable, a carbon offset price of roughly $15/ton, would be necessary and that, moreover; addressing risks associated with grouping landowner inventory into a single aggregation as proposed to ACR (see appendix A) would necessitate the establishment of a carbon cooperative as the legal entity selling the carbon. We prepared a proposed structure of this cooperative (see **Appendix D**) for Woodlands Carbon Company and presented the results of our updated analysis which articulated the significant challenges associated with an aggregated carbon project. A partner organization also prepared and a proposal to ACR for use of a programmatic aggregation approach which theoretically would allow new landowners to join an aggregation project without needing to revisit the baseline with the addition of each new landowner. The details of this proposal are also included in Appendix D.

As work on the first two tasks was underway, Pinchot Institute staff completed strategic outreach and initial carbon feasibility assessments for landowners in Northwest Oregon (***Task 3***). A key focus was engaging landowners we had spoken with prior to initiating the pilot. To lead our landowner engagement and technical assistance efforts we hired a forester named Benjamin Hayes who is also a 5th generation Oregon landowner in the project area.

Ben connected with over 30 landowners across a two-county area to discuss the specifics of our offering (an initial carbon assessment—see example in **Appendix E**, carbon inventory, and a path towards the carbon market). We took a 'circuit rider' approach to this engagement in the first few months, consisting of in-person site visits, conversations in cafes and at kitchen tables, or out walking the land with the landowner. We also made connections through landowner associations and social networks such as Oregon Small Woodlands Association meetings, and the Oregon Woodland Cooperative, both important landowner networks within the project area. Presenting at these events and in numerous other forums, such as the annual well-attended Tree School put on by Oregon State University Extension, we were able to solicit significant interest in the project.

Based on this outreach work we received a wide range of responses and levels of interest. Initially we targeted lands over 100 acres which appeared to be well stocked based on satellite imagery. Assessing the social and demographic attributes of landowners, which has proved to be just as important as the biophysical characteristics of the land, has been more difficult to initially assess. In a few instances, we did engage some landowners under 100 acres who we determined to have sufficient carbon stocks, because they expressed significant interest. Ultimately, we narrowed our list to eight landowners—representing 2,038 total acres—each of which received carbon inventories on their land.

It is worth noting that when we started with a list of 35 prospective landowners identified through our initial project feasibility work. As we began the pilot two years later, we discovered that 5 of our original 35 prime prospects had passed away with their lands being quickly harvested and/or sold. Two additional properties were up for sale due to death and divorce. This is anecdotal evidence from within our project area of the challenges facing family owned forests, and one of the main conservation challenges this project is attempting to address (see background section).

Task 4 focused on the demand side of the carbon market and involved outreach to carbon buyers. The aim was to secure a carbon credit offtake agreement with a carbon purchaser for credits from the pilot project. We have pursued multiple paths toward bringing family forest carbon to market, including:

- <u>Non-profit market innovator purchase</u>. Developing either California Air Resources Board (ARB) compliance-grade carbon offsets or voluntary offsets (either using ACR's IFM methodology or a similar one from the Verified Carbon Standard) to be sold to a non-profit organization whose mission it is to advance market-based emission reductions and to spur growth in the carbon market. We targeted two entities based in Portland, Oregon who have purchased and/or invested in land-based emission reduction activities. First, We presented the project to the President of the Bonneville Environmental Foundation. While this did not yield a carbon purchase agreement, it did end result in one of our staff being appointed to Oregon's Global Warming Commission's Forestry Taskforce.

  At the beginning of the project we had already been in discussions with The Climate Trust about a carbon purchase and have worked closely with their forestry staff in regards to some aspects of our pilot project, e.g. selection of a project developer. At the time, they had a track record of purchasing offsets from the voluntary and compliance markets. During our pilot period, The Climate Trust launched their Climate Investment Fund which is being supported via two Conservation Innovation Grants.

  The Climate Trust and those entities investing in their Fund are looking for 80% of the projects they invest in to be compliance-grade (i.e. ARB) offsets. After receiving a spreadsheet model representation of their Fund's investment preforms we integrated our project pro forma and revenue forecast for a compliance-grade carbon credit transaction involving multiple family forest owners into their Climate Investment Fund model (see **Appendix F**).

  Based on the structure of the Climate Trust's fund and most significantly the return expectations of their investor, an ARB project of our scale does not pencil out. The

Climate Trust's Fund is structured to pay for half of the credits from a crediting period in year 1. This upfront payment may be enticing for landowners at or close to their carbon baseline because they would not otherwise be receiving a large upfront payment. For landowners with high carbon stocks relative to baseline, as is the case for most of the landowners in our pilot project, this makes less sense. The Climate Trust's Fund also likely makes sense for larger projects, while our pilot project is focused on finding ways to unlock carbon markets for the smaller family forest owner. However, the most significant challenges in partnering with The Climate Trust's investment fund is the 50:50 revenue sharing requirement after initial development costs are recouped. As shown in **Appendix H**, this is not feasible for our pilot. Given the significant opportunity costs associated with carbon credits versus timber harvesting, as well as the substantial time commitment of carbon project contracts (up to 125 years in an ARB project) there is simply not a lot of room for extra "deductions" beyond those immediately necessary to quantify carbon credits (e.g. buffer pool contributions, risk allocation). Unless The Climate Trust is able to modify the terms of their investment fund to be more appealing for family forestland, we believe the fund will be limited to investing in large projects with close to baseline stocking at initiation and with very low development costs.

- Voluntary purchase by a company—bilateral transactions. The Institute also pursued sale of offsets to corporations motivated by risk mitigation, corporate social responsibility, or other factors. To help refine our pitch to companies, the Institute hired a contractor with a background in corporate partnerships with the World Wildlife Fund. This contractor worked with us on our pitch deck, email messaging, and overall framing of the pilot project, which was aided by several high-profile media stories, including one on the cover of the New York Times (see **appendix G).**

  Initially, we pursued the health care industry given the tie back to the forest carbon for health care incentive model being tested via the Forest Health-Human Health Initiative. This concept partially relied upon an assumption that the health sector would be interested in offsetting their carbon footprint. The Institute reached out to numerous companies but our inquiry yielded littler interest. We presented to Providence Health Systems and Kaiser Permanente both in Portland, as well as Oregon and Pfizer in New York City. Timing was an issue. During the course of our project it became clear that the various major mergers which upended the health insurance market vastly limited the appetite for companies to initiate a new corporate social responsibility program.

  The Institute also completed outreach to a number of large companies with a presence in the Pacific Northwest and/or known interest in carbon offsets—these included solicitations via fact sheet, emails, and/or presentations via webex or in person to corporate social responsibility and environmental officers from: Intel, Staples, Daimler, Alaska Airlines, Gunderson International, Nike, and the Adidas Group (see pitch-deck to Adidas in **appendix H**). We also discussed our pilot project with representatives from two carbon brokerage companies that routinely work with large corporations, Natural Capital Partners (formerly the Carbon Neutral Company) and Native Energy. Both of these entities communicated to us that the voluntary carbon offset projects they broker with larger companies tend to sell carbon credits for $4 to $8, well below the price point we deemed necessary to make a grouped IFM project feasible.

Despite all of these efforts, we were unsuccessful in our attempts to sell a charismatic carbon project to an individual company.

- <u>ARB compliance offsets sold over the compliance market</u>. Lastly, the Institute has taken steps towards developing and transacting ARB compliance-grade carbon offsets for sale through California's cap-and-trade driven market for compliance offsets. This option is presently being pursued by the carbon credit project developer we have worked with on this pilot, ecoPartners LLC, which runs the Forest Carbon Works program. A number of the participating landowners are moving forward in this process to have their credits verified this summer and transacted through ecoPartners' Forest Carbon Works platform. An example of the landowner information package presented to landowners considering this opportunity is included as **Appendix I**. The compliance option has a higher price point for credits and is generally a more rigorous offset.

Task 5 was to move the pilot toward completion of a transaction. This included: Analyzing inventory data; Completing initial forest carbon credit modelling to determine carbon credit yield potential under either a voluntary project or an ARB compliance project assuming a grow-only project scenario; Completing project pro forma and carbon credit forecasts for both an aggregated forest carbon offset project in the voluntary carbon market and batch verified carbon offsets with multiple family forest owners in the ARB compliance market; Meeting with each forest owner to review the inventory data and project pro forma and address questions related to requirements of participation.

The last item under this task as proposed was to distribute ATreeM™ card accounts to each pilot landowner. The intention was that in the event this pilot is transacted, carbon credit revenue could be placed on these cards and used for family medical expenses. While the health care component of the original Forest Health-Human Health Initiative concept was of interest to some landowners we discovered that for the group most interested in developing a carbon credit project on their property, this was not a primary interest. Because of this the Institute decided to forego development of the ATreeM™ card as a work product and instead identified a health-savings account (HSA) as a viable alternative. HSAs offer people under 65 years old the ability to tax exempt deposit of up to $5,500/year into an HSA, people over 65 are allowed $7,500/year.

In the event that the pilot moved towards an aggregated voluntary project with Woodlands Carbon, ***Task 6*** intended to complete additional project scenario modelling and initial project verification. At this point, as we determined an aggregated voluntary project infeasible and have shifted into a set of batch verified ARB compliance projects. Verification is set to begin in August 2017. As of now it appears that the investor will pay the initial year one payment to landowners before verification is finalized.

Task 7 is an evaluation of the results of the pilot project to inform the revision of our initial Forest Health-Human Health Initiative business model including a plan for scale-up. The Institute has completed a revised pro forma business analysis based on our analysis of voluntary aggregations of multiple family forest owners and also batch verified compliance-grade offsets. The Pinchot Institute has also gone a step further than plan development and is deploying a program for scale-up through an RCPP project focused on leveraging EQIP financial and technical assistance funding to complete initial carbon assessments and carbon inventories across a 14 county area. We are directly applying lessons learned in the pilot to this broader, landscape scale project.

HOW THE PROJECT WAS FUNDED

This project was funded by a mix of grants secured by the Pinchot Institute. These included support from the Kelley Family Foundation and Meyer Memorial Trust which provided matching funds to the CIG grant. The Pinchot Institute has also benefited greatly from the contributions of partners at Ecotrust who helped us develop the initial carbon assessment tool. Woodlands Carbon cooperated with us for the first phased of the project as we assessed transitioning their initial forest carbon program into an ACR aggregation. We leveraged the intellectual property of ecoPartners LLC to evaluate both a voluntary transaction and a compliance-grade project.

Background

CONSERVATION PROBLEM ADDRESSED

U.S. forests provide an important carbon sink, annually sequestering the equivalent of 11% of U.S. GHG emissions from all sectors. Harvested wood products also store the equivalent of 4% of all emissions. Yet U.S. forest carbon sinks are showing signs of decline due to deforestation and degradation (2010 RPA Assessment; Wear and Coulston 2015).

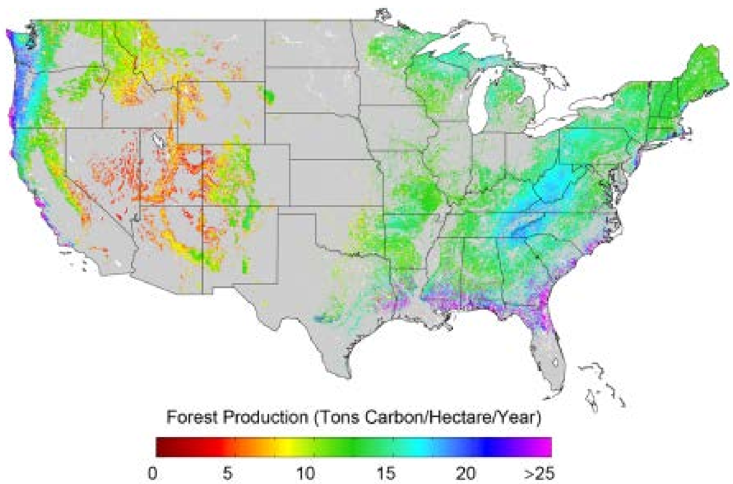

Figure 1. Carbon sequestration in forests of the U.S.

The coming years will bring increasing pressure on forests in the U.S. as climate change, intergenerational transfer, and a challenging economic environment present barriers to optimal management. The USDA Forest Service forecasts a nationwide loss of forest land equal to the size of Maine by 2050. Further fragmentation of remaining forests will be considerably larger than this (Tidwell, 2013).

Family forestland is a very important component of U.S. forests and the national forest carbon sink. Much of the forest degradation in the U.S. occurs as a result of decisions faced by family forest owners who collectively own the largest slice of America's forests. Consider that only about 10% have a written forest management plan, only about 4% participate in cost-share programs such as those offered through EQIP, less than 20% are receiving any advice from trained natural resource professionals, only about 1% have certified their forests, and very few have a plan for their estate that includes care of their forest after they pass it on to the next generation (Butler, 2014).

A massive intergenerational transition in forestland ownership is underway, exposing these private forests and the public benefits they provide to elevated risk. Often when a landowner passes away their heirs have no choice other than to harvest significant volumes of timber in order to pay inheritance taxes (Dickinson et al. 2012; Greene et al. 2003). Likewise, as landowners encounter financial burdens (i.e. medical expenses, college tuition, taxes) carbon stocks are often exchanged for cash through liquidation harvests, land sale, or conversion to other land uses. Land and timber are the largest assets most family forest owners have—nationwide 70% of family forest owners have a combined household income of $100,000 per year or less (Butler, 2008). While fewer than a quarter of family landowners list timber harvesting among their primary ownership objectives, more than 63% end up harvesting (Butler, 2008). When a forest is effectively a family savings account, emotional attachments to forest and land may not be enough to keep parcels intact when personal financial crisis hits. Thus, personal finances present a strong socio-economic factor contributing to the vulnerability and degradation of forest land and forest carbon stocks in the U.S.

This is seen in the data for the region in which this project has taken place. Oregon's Coast Range is underperforming with regards to forest carbon storage in comparison to the ecological potential. Coast Range forests store an average of 179 metric tons CO_2e/acre in above ground biomass across all ownership types, but are capable of storing as much as 421 metric tons CO_2e/acre. Yet, private non-industrial forests in this ecoregion are on average storing only 118 metric tons CO_2e/acre in above ground biomass.

Strategies to encourage sustainable forest management and conservation of forest carbon stocks with family forest owners include encouraging forest stewardship planning, conservation easements, and estate planning. Rates of engagement in all of these strategies are rather low on the whole. Developing and opening up ecosystem service markets for family forest owners is another approach which can complement other strategies. To date, rates of participation in ecosystem service markets are incredibly low among family forest owners.

OVERVIEW OF THE CARBON MARKET

Markets for ecosystem services (e.g. provision of clean water, flood control, habitat banks, etc.) have emerged as a promising conservation incentive. Not only do these markets widen the pool of potential conservation participants, they promise improved cost-effectiveness in achieving conservation outcomes.

For forestland, carbon crediting or offsets is the most well established market for ecosystem services. In forestry, carbon credits can be developed through three project types: (1) reducing deforestation (also known as avoided conversion), (2) increasing reforestation (or afforestation), and (3) improving forest management (IFM). This project focuses on IFM and encouraging a mix of three strategies for improving carbon storage on family forestland: extending forest rotation lengths, selective harvesting and expanding reserve areas—to expand carbon stocking.

The market for carbon credits is divided into two segments, with demand coming both from companies regulated to reduce their greenhouse gas (GHG) emissions (*the compliance market*) and from entities (companies, governments, institutions, and individuals) choosing to voluntarily reduce their emissions (*the voluntary market*). While there are several ways to reduce emissions, improved energy efficiency or non-emitting renewable energy technologies for instance, carbon credits are used when reductions cannot be achieved in a more cost-effective manner or at all.

In 2015, the North American market for forest carbon credits included $11.3 million in sales through the voluntary market and approximately $63 million through the compliance markets. At present the largest source of demand is from companies regulated under California's cap and trade program (Ecosystem Marketplace, 2016). Moreover, the California compliance market offers a relatively steady market with a predictable credit price escalation year-to-year.

The voluntary market is largely dependent on voluntary purchases from companies motivated by internal carbon pricing schemes (e.g. Microsoft's internal corporate carbon tax) and by corporate social responsibility and sustainability initiatives. California credits have traded at around $10/metric ton CO_2e (equivalent to 1 carbon credit) for the last few years (currently $11 – $12.50 per ton depending on project risk), whereas the voluntary market averages $4 - $6 per metric ton CO_2e. Some buyers also pursue carbon credits with a charismatic nature, offering co-benefits to the buyer or to society more broadly. Lastly, the methodologies for developing forest carbon credits vary in these two market segments with the California methodology generally regarded as more rigorous in requiring more significant conservation commitments by landowners.

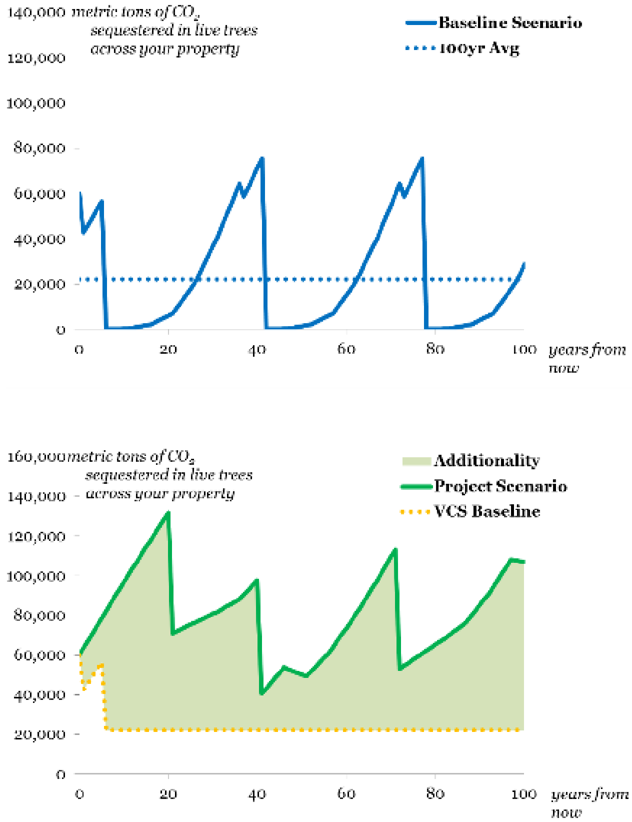

Figure 2. Example carbon fluctuation for a 40 year harvest rotatio compared to regional baseline (top graph) and project scenario compared to baseline average (bottom graph).

In both the voluntary and compliance markets, credits are based on a comparison between a "business as usual" or “baseline” and a project scenario. This comparison is used to determine whether carbon “additionality” exists. Defining the baseline is a little different in each market’s carbon credit methodology, (ACR vs. VCS. vs. ARB) for instance, ACR and VCS calculate the baseline largely to quantify what the carbon stocking of the forest would be at year one if the landowner was purely motivated to maximize the net-present value of timber. In Western Oregon this translates to an even aged (clear cut) rotation length of 40 years (see Figure 2).

Similarly, ARB defines the baseline using regional forest inventory and analysis (FIA) forest inventory data. Calculating credits also includes the following deductions from the total inventoried above ground carbon stocks: secondary effects (e.g. leakage), confidence deduction (depends on sampling intensity and variability of inventory), and a risk buffer. Family forest owners gain additionality by having well-managed forests with carbon stocks in excess of the regional average, or thought of another way, having older forests than most industrial forestland in the region.

Another indicator of additionality is if the landowner is voluntarily retaining more standing trees when management actions are taken than the legal maximum allowed for removal. An example of this would be if a landowner voluntarily retained wider riparian buffers in excess of state legal requirements for water quality protection.

Most family forest owners do not reject this type of forest management outright, and many value the co-benefits, such as wildlife habitat, aesthetics, and ease of recreation, which come with this style of forest management. Moreover, income from carbon credits can help landowners moderate the effects of fluctuating timber markets on revenue and produce annual income to complement episodic flushes from timber harvests. This approach more directly integrates and aligns the annual costs of forestland ownership with revenue from beneficial conservation practices that produce the mature mixed-age forests many desire. However, despite nearly 50% of family forest owners in Oregon expressing some interest in carbon credits (Thompson and Hansen, 2013) extremely few are presently participating in markets (Miller et al., 2015).

The overall newness of the market is one reason for this, as is program complexity, high transaction costs (e.g. carbon inventory and certification), and high opportunity costs in the form of foregone returns from timber harvests demonstrated on neighboring industrial timberlands (Di Tommaso, 2015; Khanal and Grebner, 2014; Thomson and Hanson, 2013). The deal is squeezed on both ends of the transaction. To date, all of the revenue associated with forest carbon credit projects in North America has been dedicated to very large projects on lands owned by forestland investment groups or conservation organizations. A lack of accessible and strategically-directed informational resources is another major barrier. Moreover, the primary technical advisors, agency and consulting foresters that interact with landowners, often lack more than a passing familiarity with the potential for carbon management and how to access markets. In general, foresters are unlikely to promote tools they have not directly experienced or are skeptical of due to perceived risk and conflicts with more traditional models of timber production.

Methods

The main goal for this project was to investigate viable, cost effective avenues for family forest owners to enter carbon markets. Our hypothesis has been that market access barriers can be overcome with creativity and innovation. To test this hypothesis this project centered on three activities: (1) implementing a pilot project involving multiple family forest owners, (2) through trial and error, establish a template for replication across Oregon and Washington, and (3) foster collaboration and innovation among partner organizations in working lands conservation.

The most significant changes between what was done and what was originally proposed relate to the carbon credit project design. Mid-way through the project we shifted from a focus on the voluntary market and true landowner aggregation, (i.e. treating multiple landowners and their inventory as a single credit project), to a compliance market project with pseudo aggregation (i.e. treating each landowner and their inventory as separate credit projects). Reasons for this switch are discussed in the introduction and in the findings section of this report.

We selected our project location due to our prior work in the region and because it is one of the most productive timber regions of the country. These forests have significant carbon sequestration and storage capacity (see Figure 1). Moreover, the structure of Oregon's forest laws results in a relatively low baseline meaning most landowners already have significant additionality with significant potential for increase if harvest rotations are pushed past 40 years. These factors make the coastal range of Oregon a desirable location for this test.

In early 2016 we solicited a request for qualifications (RFQ) for carbon inventory design, inventory data collection, and initial carbon credit modelling and support with analyzing transaction options. We asked applicants to design an inventory of sufficient accuracy to qualify participating landowners to develop carbon credits for the voluntary or compliance market. We also asked the winning applicant to work with the Pinchot Institute in data collection and analysis and to model carbon credit yield in both an aggregated project design and in the compliance market. We received four RFQ responses from four leading carbon project development firms, ultimately selecting a firm called Ecological Carbon Offset Partners, known simply as ecoPartners.

We chose to work with ecoPartners because they share our mission in trying to unlock carbon markets for family forest owners and have developed an innovative approach to carbon project design. They also have an extensive track record as developers and verifiers of IFM projects in the compliance and voluntary markets. Using a highly sophisticated statistical approach, they have combined a carbon inventory sampling design with the use of a smart-phone based measurement program. In theory, this combination allows for significantly less time spent in the field and the use of non-technical field techs, both of which help lower cost of forest carbon inventories. Likewise, the data collection system is designed to contain costs in the verification process because all of the data is digitally stored as images with affiliated data used to calculate biomass and carbon volumes. Verification and inventory are the two largest transaction costs involved in IFM carbon offset projects. Typically installing inventory plots takes significant time and must be completed by trained foresters or field techs at significant costs.

Inventory design was completed by ecoPartners (see **Appendix J**. for a conceptual overview of this inventory design). The inventory was carried out by two separate field crews managed by the Pinchot Institute; a forester and field tech with significant field experience on six properties and a four person crew from the Student Conservation Association (SCA) with little field experience or forestry knowledge on two properties. Our objective was to see if non-skilled labor could do the inventory cruising for us, which proved to be the case.

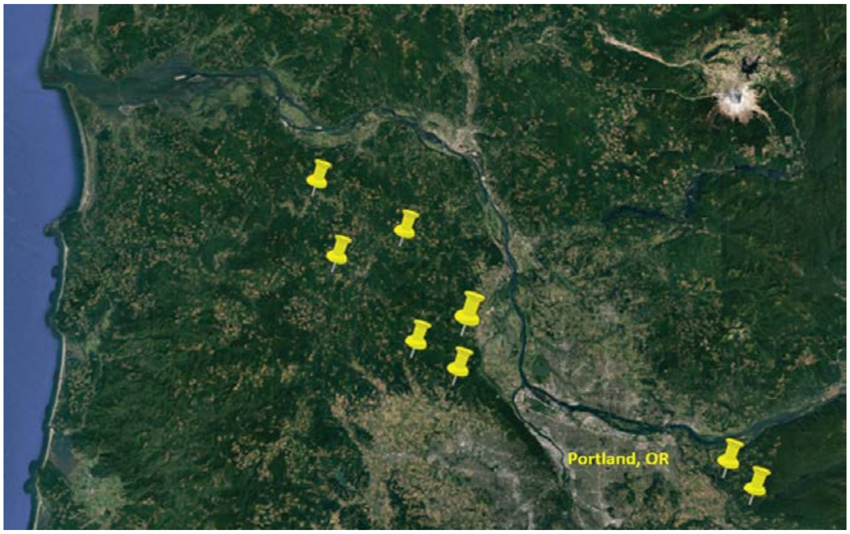

Figure 3. Location of participating landowners in pilot pool.

In this project the inventory process proceeded as follows:

(1) Stands within each forest were delineated using existing or newly created spatial data for each property;

(2) Inventory plots were allocated to the various stands at a density of approximately two plots per acre.

(3) A plot grid (see Figure 4 and Appendix K) was uploaded to the forest carbon measurement devices used by timber cruisers for field measurements.

(4) Forest carbon data were collected via photography and laser range finder using ecoPartners' inventory device—a modified smart phone running a specialized data collection and processing application, affixed with a laser range finder (see Figure 5). The laser measures distances in the forest and the phone runs an application which tells the user what measurement to take and how to take them. Diameter at Breast Height (DBH) is collected using a standard diameter tape for all trees within 30 feet of plot center; photographed and collected data on each tree included species, height, DBH, and additional notes as necessary.

(5) After field data collection, data were uploaded to a server for processing and analysis.

(6) For each inventory plot, analysts recreated each tree in a simulated forest environment on a computer. A series of equations are applied to the raw data and the total carbon volume for each tree in each inventory plot is established in a format that can be manipulated in a modelling environment to forecast out-year growth and carbon accretion. ARB tree volume, biomass, and carbon calculations are applied. Analysts review data collected in the field and order it in a manner that will facilitate

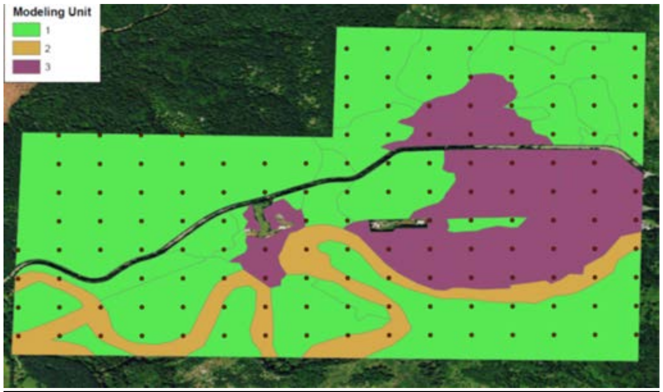

Figure 4. Example inventory design plot grid.

verification. Quality control occurs at this time to ensure that sufficient data was collected at each point and that the results are reasonable and accurate. Using field-collected and processed data, carbon is calculated for each tree; using proximity information from each point, density and statistical weighting of each tree is determined to arrive at stand- and property-level carbon estimates.

(7) Forest growth and yield modeling was applied using the Forest Vegetation Simulator (FVS) to forecast forest growth and volume expansion 100 years.

(8) Post-processing the inventory data were organized into stand tables that include trees per acre in each stand organized by tree species, average tree dimeter per species in each stand, average basal area (ft^2/acre) in each stand, estimated timber volume per species in each stand (MBF/species/stand), and total above ground carbon (metric ton CO_2e/acre). See **Appendix K** for individual landowner stand tables.

Figure 5. SCA field tech measuring forest carbon with ecoPartners' inventory tool.

Based on the inventory data collected we modelled carbon credits and developed a carbon credit pro forma that incorporates all associated transaction costs over a 20 year period (see **Appendix L**). This was done both to determine feasibility as: (1) a true aggregation approach using the American Carbon Registry carbon credit protocol and/or the verified carbon standard protocol, and (2) batch verification approach under the California Compliance Market. The batch verification approach again showed promise whereas the aggregation project did not prove economically viable. As a project in the compliance market, the projected net carbon credits received by the eight landowners (1,963 acres) is shown in table 1. Landowner specific carbon inventory and credit projections are included in **Appendix K**.

Table 1. Landowner net crediting[2] and estimated carbon payment.

	Years 1 - 5	Years 6 - 10	Years 11 - 15	Years 16 - 20	TOTAL
Keasey Net Crediting (MT CO2e)	74,586	32,111	31,363	29,330	167,389
Keasey Carbon Payment	$ 264,924	$ 297,695	$ 343,396	$ 391,798	$ 1,297,813
Lonnquist Net Crediting (MT CO2e)	15,826	7,635	7,742	7,719	38,923
Lonnquist Carbon Payment	$ 55,691	$ 70,258	$ 86,224	$ 100,615	$ 312,787
Merten Net Crediting (MT CO2e)	18,569	556	556	2,454	22,136
Merten Carbon Payment	$ 60,051	$ 16,549	$ 14,942	$ 22,688	$ 114,230
Richens Net Crediting (MT CO2e)	7,810	18,751	19,879	20,978	67,418
Richens Carbon Payment	$ 36,650	$ 154,342	$ 224,530	$ 267,768	$ 683,290
Russell Net Crediting (MT CO2e)	83,500	35,762	38,893	40,432	198,587
Russell Carbon Payment	$ 296,623	$ 341,966	$ 434,122	$ 518,915	$ 1,591,626
Hanschu Net Crediting (MT CO2e)	61,597	14,195	13,910	13,393	103,095
Hanschu Carbon Payment	$ 210,450	$ 150,535	$ 153,951	$ 176,902	$ 691,839
Stewart Net Crediting (MT CO2e)	38,103	5,665	5,566	5,331	54,664
Stewart Carbon Payment	$ 127,617	$ 69,000	$ 61,433	$ 70,555	$ 328,605
Christensen Net Crediting (MT CO2e)	23,882	3,540	3,479	3,332	34,233
Christensen Carbon Payment	$ 79,479	$ 43,170	$ 38,395	$ 44,097	$ 205,141

Landowner stand tables were formatted and included in an information packet containing the inventory data, carbon credit projections, rules of the carbon market, proposed carbon development timelines, and a sample carbon offset contract (See **Appendix I**). Each landowner received this packet prior to in person meetings with the Pinchot Institute. Meetings were used to review inventory data, discuss the rules of the carbon market, and help landowners evaluate tradeoffs between developing carbon credits on their property vs. not doing so. In some instances multiple meetings and conference calls were held with landowners. Landowners willing to move forward with the carbon credit development process were asked to sign a letter of intent.

As explained in the introduction, our efforts on the carbon purchaser side of the transaction have shifted to focusing on the compliance market. A compliance carbon purchaser is considering investing in this project and ecoPartners has taken over the project development process going forward.

[2] Net crediting = modelled grow-only; credits transacted in the compliance market under contract with FCW; deductions accounted for leakage and buffer pool; verification expense included; forecasted price escalation included ($9.56 - $17/Ton CO_2e); cost of out-year monitoring and inventory not included.

Discussion of quality assurance

The most significant data collection process was in the design and the implementation of forest carbon inventories. Inventory design was completed by ecoPartner's PhD biometrician who has detailed knowledge and experience with development of forest carbon projects, carbon inventory, and as a verifier of carbon projects. The inventory was sampled to meet the statistical requirements of the ARB carbon protocol, ±10% error at the 90% confidence interval. The sampling design used an "occupancy plot" approach which is best thought of as a modified fixed radius plot (see overview in **appendix J**). The sampling design is a new approach which was developed at University of California Berkeley. The approach is undergoing peer review in a refereed scientific journal now and ecoPartners has reviewed the approach with a number of carbon project verifiers.

This inventory method is designed to measure forest carbon and not for other forest attributes. We experienced difficulty explaining this to landowner who tend to think of things in terms of board foot volume, form factor, timber grade, etc., versus total above ground carbon. The inventory did produce board foot volume figures which have significantly more uncertainty than the estimates for above ground carbon. To account for uncertainty in the sampling design and inventory we increased sample size to 150-200 plots per landowner. This is more inventory plots than was necessary, but we felt this to be a best practice for carbon inventory. This limited our margin of error to about +/-9.76% at the 90% confidence level for above ground carbon estimates across the entire pilot pool of landowners. The measurement system used to gather tree height and diameter at breast height measurements has been directly compared to traditional measurements, generating a 2% difference on DBH and a 4% difference on height, which is within the constraints of carbon protocols.

Findings

Note that many of the findings discussed here are also communicated in a recent presentation to the Yale Center for Business and the Environment.

CARBON PROJECT STRUCTURE – AGGREGATION

Aggregation is difficult. Treating multiple landowner's carbon stocks as a single carbon credit project is conceptually possible but faces a set of challenges. The compliance market does not allow for true aggregation. So we began this project assuming that we would use the ACR voluntary IFM methodology. Early on in this project we worked with Woodlands Carbon Company to develop a landowner aggregation model for approval by ACR. This was for a simple one-off aggregation. We also worked with Ecotrust to develop and gain approval for a programmatic aggregation model in ACR that would allow for asynchronous enrollment by landowners. Conceptually, aggregation could have worked and provided some efficiency in the inventory. ACR did approve the use of this approach (See **Appendix A**). This was not pursued further due to further financial analysis (see **Appendix C**) and conversations with landowners with whom we completed inventories.

In addition to the challenging financial aspects of aggregated voluntary carbon, landowners expressed a reluctance to be joined to others due to risk exposure. The only path forward that we potentially identified with a true aggregation is through a legally established cooperative driven forward by landowners (see **Appendix D**). In the summer of 2015 we revised our initial pro forma based on the costs of developing and managing an aggregation project. We determined that a carbon price of $15 per carbon credit was needed for an ACR aggregation to be economically viable.

The ARB batch verification paired with inventory innovation and USDA EQIP subsidy shows promise but also has challenges (more restrictive, longer commitments, out-year transaction costs).

FAMILY FOREST CARBON AND OUTSIDE INVESTMENT

Partnership with The Climate Trust's investment fund was deemed problematic due to the 50:50 revenue sharing agreement required after initial investments from project development are recovered. As shown in appendix H, this is not feasible for our pilot. With family forestland there simply is not a lot of room for extra "deductions" from carbon market revenues.

CARBON OFFSET PROJECT LENGTH

Voluntary market projects were initially pursued to the shorter time commitment required of landowners. We believed landowners would be unwilling to consider a +100 year time commitment as required in the compliance market. While this is largely true, we also discovered that even a 40-year time commitment had the same effect in reducing the number of interested landowners. We did ultimately learn that for many landowners, the 40 year timeframe of ACR and the longer term profile of the California market essentially had the same effect, specifically that the contract would stay with the land long past the landowners themselves in either instance. Many landowners are reticent to make decisions that could potentially financially constrain their heirs.

CARBON INVENTORY

Inventory cost through our process was $14.25 per acre, slightly better than what we expected ($15/acre) with standard inventory methods. If the approach passes verification, future costs could be further reduced by decreasing sampling density and using less expensive labor. On pilot properties we included more plots than would likely be needed due to the inventory approach not having been previously deployed in a commercial setting.

While cost savings may not appear dramatic, we believe over-sampling, glitches in the experimental data collection method, and premium labor costs resulted in an inflated cost of initial pilot inventories and that in the future, costs could further be improved. An additional advantage to this method of systematized data collection is that each inventory plot and each plot tree is digitally recorded and georeferenced, making 3rd party field verification and auditing of data records and data collection methods simple to audit. Inventories are scheduled to begin verification in August 2017.

FACTORS INFLUENCING LANDOWNER PARTICIPATION

In this project, the factors that influenced landowner participation included:

- *Project structure—aggregation vs. no aggregation.* Our work suggests that aggregation will only be feasible under a cooperative structure (see Appendix D) like Oregon Woodland Cooperative. Some landowners preferred having their own individual project because they perceive it to offer greater control.
- *Transaction costs*—the costs of multiple inventory and verifications over a crediting period (i.e. 5 over a 25 year period in ARB), project development fees, uncertainty and risk deductions, registry fees, etc. all reduce the "take home pay" for landowners participating in carbon credit projects. Because this is an offset allowing someone else to pollute these costs are viewed as necessary within the offset market, although this is debated. In this project, the carbon buyer is requiring CCO3s, which are carbon credits that are initially verified more than once. This increases the cost of bringing a project to market. In our project, paying for the carbon inventory with EQIP funds was a very important incentive for landowners to participate. Landowners were discouraged from participating when out-year transaction costs, especially the cost of monitoring carbon credits for 100 years, were unclear.
- *Opportunity costs*—many of the landowners in our project areas, especially those with larger acreages, are financially motivated by timber market opportunities which generally provide a much greater return than carbon offsets in current market structure and pricing. Landowners interested in the ability to continue managing their forest under an IFM credit project were concerned about their ability to do so. This reflects both a desire to care for their forest, but also a desire to commercially harvest timber.
- *Carbon price*—this is the largest factor in discouraging landowner participation. For many the price is just too low to make the deal economically attractive. When working with multiple forest landowners in either a carbon aggregation or a batch verification that maintains segmented individual projects but coordinates inventories and verifications, we found that the viability of both models is sensitive to the price of carbon. This is because internal project expenses (inventory, verification, monitoring, development fees, modelling) were all assumed to be paid for with credit proceeds in the out-years.
- *Market structure and requirements*—few landowners are willing to consider a multi-decade commitment such as a +100 year proposition that is an ARB offset project. Aggregation, while a novel approach, is limited to the voluntary market which typically fetches significantly lower prices for carbon credits and has higher deductions from net crediting to account for project risk.
- *Conservation values*—landowners with a long-term plan for their land that includes emphasizing conservation of biological diversity and promoting forest diversity through ecological forestry typically find the prospects of long-term protection appealing. Carbon credits are a great fit for this sort of landowner and aligned with their interests other protection mechanisms, e.g. easements.

- *Ownership issues and succession plans*—the structure of land ownership is an important factor for some. In multiple instances we learned after engaging with a landowner for several months that it was actually their children who owned the majority share in the property, but we had not even met the kids who lived far away. In other instances families owned the land as a trust with seven individuals all of whom wanted to see the land exist as forest far into the future. Another issue we observed was disagreement between siblings about how to manage the property.

THE FOREST CARBON FOR HEALTH CARE INCENTIVE MODEL

This project tested a forest carbon for health care concept. We found that while landowners intuitively recognize potential financial risk exposure due to risk of medical related expenses, this understanding is not enough to replace their interest in a cash payment. For some, the HSA option is of interest due in part to its ability shelter carbon related income from taxation. Healthcare will remain an important issue affecting land stewardship and conservation due to its direct impact on personal finances.

CARBON AND TIMBER OPTIMIZATION ANALYSIS IS VITAL FOR MANY

One issue that we are encountering with some of the landowners in our pilot group is that they could benefit greatly from additional analysis related to out-year trade-offs between carbon credit revenue and timber income revenue. This would help them analyze tradeoffs and feel more confident regarding long-term carbon agreements.

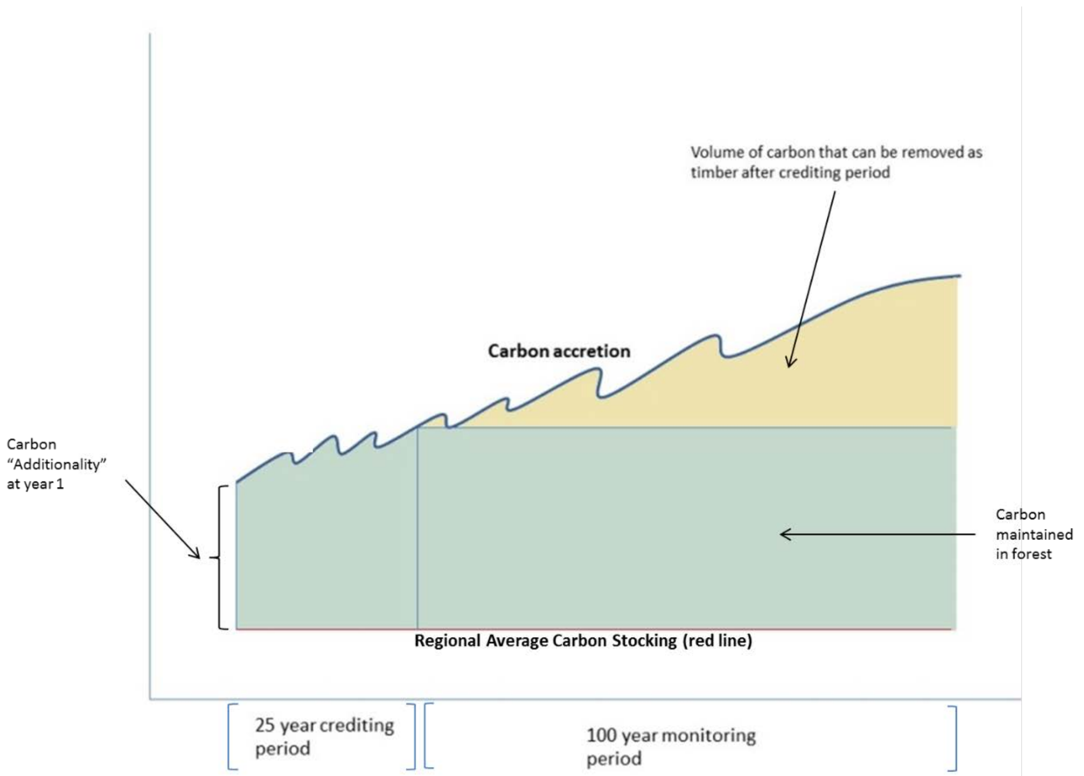

Figure 6. Conceptual diagram of timber and carbon income optimization.

Figure 6 displays carbon accumulation during the 25 years of an ABB IFM project that the landowner is then responsible for maintaining for 100 years. Beginning in year 26 and thereafter forest growth can be harvested as timber and could become an important part of a project's overall financial prospectus. This sort of model supported analysis is something for which most landowners are not receiving assistance. For the landowners in our pilot pool, we have provided some initial assistance to develop carbon management plans that do articulate this sort of optimization trade-off analysis. We recognize that this capacity will be very important for some landowners considering locking the next generation into maintaining a minimum level of carbon volume on the property.

Conclusions and recommendations

Specific recommendations are shown in bold text in this section.

STATUS OF THE PILOT PROJECT

At this time, six of the eight landowners involved in the pilot are moving forward to pursue a compliance market opportunity. These six landowners will proceed with verification this year. ecoPartners' investment partner will reportedly make year one payments to landowners in November before initial verification is complete. Interestingly, for both families electing not to move forward, we learned that the land is owned by both the parents in a minority share with the children owning most of the interest in the land. The parents made this change so that when they pass there will not be a question about their assets and tax status of the land. Also, in both cases the next generation is less connected to the land. Unfortunately both of these parcels are larger in acreage with high carbon stocks.

PUBLIC INVESTMENT IN FAMILY FOREST CARBON OFFSET PROJECTS

The compliance offset market was not designed with small forest ownerships in mind. The market is skewed towards larger projects which produce large volumes of offsets and achieve economies of scale that can reduce the financial drag transaction costs have on developing credit projects. Most IFM offset projects in the compliance market are over 10,000 acres in size with one notable exception of a 500 acre project in Washington State. Our project is trying to drive to even smaller scales. To do this, there needs to be some outside investment to subsidize the cost of initial project development (inventory, verification, modelling, etc.) as well as the out-year expenses of monitoring, re-verification, and re-inventory. Large projects can internalize these expenses to a large degree because they produce a large initial flush of credits in year one which is used to offset initial development expenses and amortize out year costs. Smaller projects do not have this luxury.

Due to the fact that family forests provide numerous benefits to society including carbon storage, the Federal government could serve in part as the outside investor to help get carbon projects with family forests off the ground. **The Pinchot Institute recommends that some transaction costs (monitoring and inventory) could qualify as new NRCS conservation practices under the EQIP and CSP programs.** As we advance an RCPP project in Western Washington and Oregon we will further establish the concept of NRCS investing in early stage project development via EQIP. **If private investment schemes are to be used to spur on projects with small landowners, the number of extra "deductions" needs to be minimized.**

CARBON PROJECT STRUCTURE – AGGREGATION

The California compliance market does not allow for true aggregation. As more jurisdictions join the market, the Pinchot Institute recommends that a discussion around allowing aggregation should be reintroduced. Some of the work products (**Appendix A**) of this project can and will inform these policy discussions. we began this project assuming that we would use the ACR voluntary IFM methodology. **The Pinchot Institute recommends undertaking a survey of existing landowner associations and cooperatives across the country to solicit feedback on the carbon cooperative concept presented in Appendix D**.

FACTORS INFLUENCING LANDOWNER PARTICIPATION

- **All of the transaction costs involved in the entire project lifespan need to be made clear for landowners and clear strategies for reducing these costs, especially the costs well-out into the future (i.e. monitoring) need to be identified.**

- **Tradeoff analysis needs to be made available to landowners to help them assess the tradeoffs between carbon and timber income and the impacts to other forest management objectives.**
- **A strategy worth pursuing further is timing the initiation of easements with carbon credit projects. If they can be times at the same time this reduces the risk profile of the project, resulting in up to 12% more credits for the landowner. The Healthy Forest Reserve Program (HFRP) should be introduced in areas where landowners are expressing interest in carbon and long-term conservation. Timing carbon credit development with HFRP easements is a unique opportunity that the Pinchot Institute is now exploring in Washington State via two previously unrelated RCPP projects.**
- **Landowner succession planning needs to include discussions of long-term conservation options including forest carbon projects.**
- **In addition to finding creative ways to help landowners access carbon markets in their present form, we recommend future policy discussions revisit the concept of a forest carbon incentive program[3] as another means to encourage stewardship and carbon conservation with private non-industrial forest owners.**

THE FOREST CARBON FOR HEALTH CARE INCENTIVE MODEL

Healthcare will remain an important issue affecting land stewardship and conservation due to its direct impact on personal finances. The complexity of the carbon market does not currently lend itself to addressing this problem. **The Pinchot Institute recommends further exploration of other options such as working conservation easements in exchange for long-term care.**

[3] http://www.pinchot.org/uploads/download?fileId=1589

Appendices

Appendix A. ACR aggregation model and inventory design.

See files attached to PDF

Appendix B. Woodlands Carbon contract template for and ACR aggregation.

See file attached to PDF

Appendix C. Initial ACR aggregation pro forma.

See file attached to PDF

Appendix D. Proposed ACR aggregation cooperative business structure.

See file attached to PDF

Appendix E. Initial forest carbon assessment example.

See file attached to PDF

Appendix F. Analysis of TCT's climate investment fund with family forestland credits.

See file attached to PDF

Appendix G. Media on the pilot project.

- January 11, 2016 National Public Radio's Marketplace: http://www.marketplace.org/2016/01/06/world/familyforests
- January 15, 2016 Ecotrust in collaboration with the Pinchot Institute published a story on their blog https://ecotrust.org/helpingsmalllandownersbreakintocarbonmarkets/
- On March 21, 2016 Sustainable Business Oregon published an article: http://www.bizjournals.com/portland/blog/sbo/2016/04/carbonmarketopportunitiescouldbenefitoregons.html
- On September 29, 2016 the New York Times published a story *How Small Forests Can Help Save the Planet* on the cover of the Science Times, below the fold on the front page of the print edition. http://www.nytimes.com/2016/09/27/science/privateforestsglobalwarming.html
- October 13, 2016 the Hillsboro Tribune published an article http://portlandtribune.com/ht/117hillsborotribunenews/327275206336seetheforestthroughthetrees
- On January 20, 2017 The Climate Trust and Ecosystem Marketplace published an article on the project: http://www.ecosystemmarketplace.com/articles/how-us-land-owners-can-tap-carbon-markets-in-trump-era/

Appendix H. Sample carbon buyer pitch deck—Adidas Group.

See file attached to PDF

Appendix I. Sample of landowner information packet as presented.

See file attached to PDF

Appendix J. Overview of ecoPartners inventory sampling methodology.

See file attached to PDF

Appendix K. Landowner profiles.

See files attached_Stand maps and stand tables for each landowner

Appendix L. Compliance and voluntary market project pro forma for eight landowners.

See file attached to PDF

For Technology Review Criteria

We suggest that NRCS create a practice code for forest carbon inventory that aligns with the protocol requirements of the California Air Resources Board Improved Forest Management protocol and the voluntary market. (see https://www.arb.ca.gov/cc/capandtrade/protocols/usforest/forestprotocol2015.pdf and Appendix A.) The use of the CSP program to monitor carbon stocks during the monitoring period of carbon offset projects is also desirable. The use of the HFRP program as a mechanisms to initiate carbon offset projects with landowners should be evaluated.