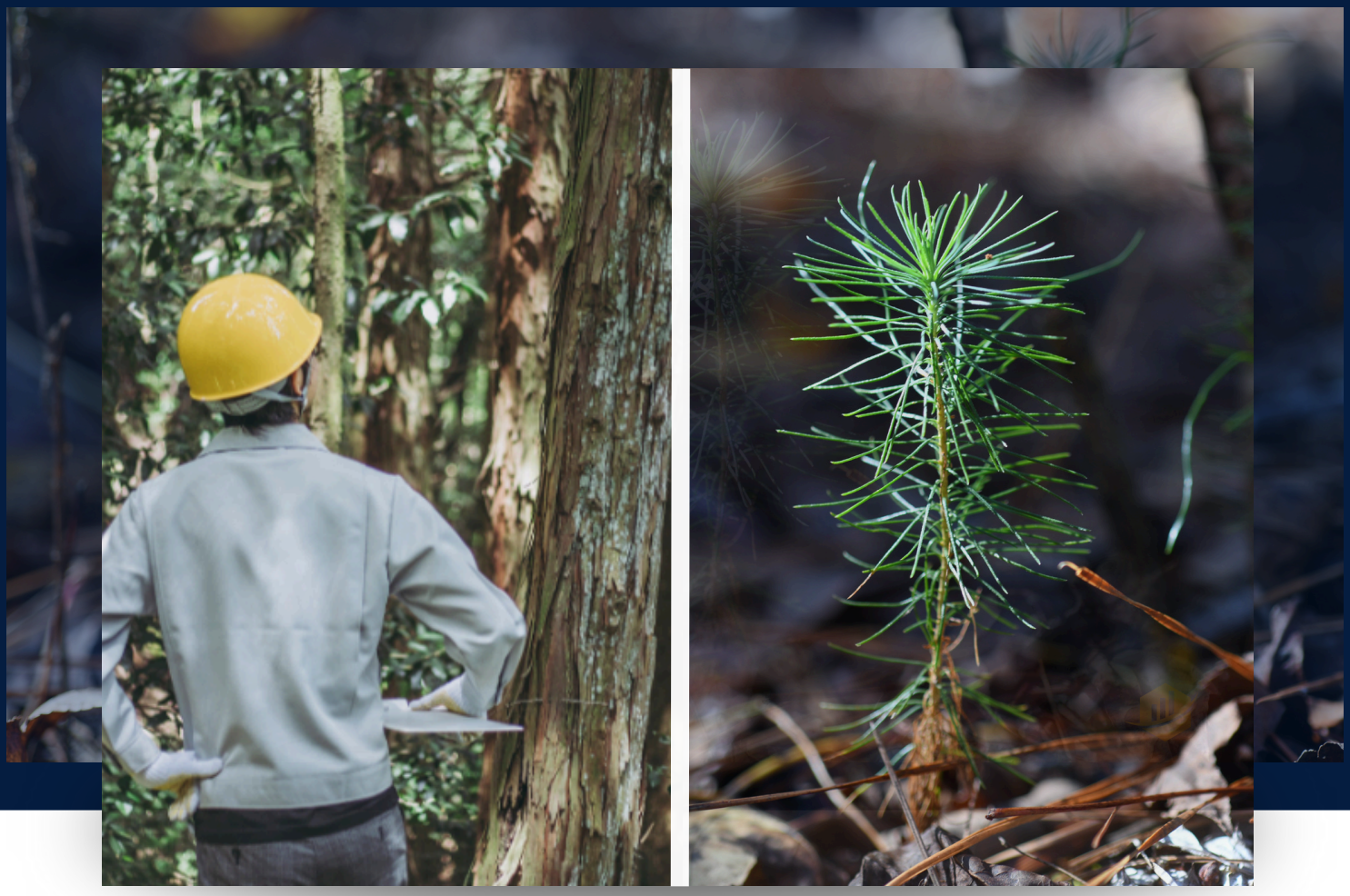

COLLABORATING ON CARBON

To understand downstream impacts and the future of US forest carbon markets

NOVEMBER 2024

Project Partners

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The United States Endowment for Forestry and Communities, Inc. (the "Endowment") is a not-for-profit corporation that works collaboratively with partners in the public and private sectors to advance systemic, transformative and sustainable change for the health and vitality of the nation's working forests and forest-reliant communities.

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- **Heather Slayton**, TN Department of Agriculture Division of Forestry
- **Brian Hughett,** TN Department of Agriculture Division of Forestry
- **Melissa Kreye**, Penn State
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- **Adam Taylor,** University of Tennessee
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- **Teal Edelen**, U.S. Endowment for Forestry and Communities

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Executive Summary

The *Collaborating on Carbon* project was designed to be a starting point for open dialogue about what is working within U.S. forest carbon markets, to assess existing and potential concerns, and to identify what innovations are needed to enhance benefits and minimize risks. Benefits and risks were considered in the context of the three pillars of sustainability: economic, ecological, and social values. From an economic perspective, considerations included potential impacts on access to raw materials for traditional forest-based economic activities and the diverse products that forests provide throughout homes and businesses. From an ecological perspective, forest biology, associated climate mitigation capacities and risks, and biodiversity were considered. Finally, from a social and cultural perspective, the project team considered the potential effects of carbon markets on the needs and values of local communities, employment and household incomes, state and local tax revenues, and associated quality of life considerations.

The project was completed between October 2023 and August 2024 and consisted of four distinct phases:

- **a concept paper,**
- **a stakeholder survey,**
- **a pilot mapping tool, and**
- **a workshop**

From the initial design of the project and concept paper development to the final discussions at and following the workshop, several themes and patterns emerged in the project.

Key Project Findings:

- **Skepticism about carbon markets**, especially amongst landowners and forest managers. Carbon markets are not well understood, and landowners and forest managers worry about greenwashing and negative impacts.
- **Concern that forest carbon markets do not leave space for forest management** and that the requirements of the current standards and protocols reduce the ability of foresters and other professionals to make decisions based upon a variety of objectives.
- **Communication gaps** between landowners and project developers, as well as between land managers and carbon buyers. Conversations about forestry and discussions about forest carbon markets are not happening in the same spaces.

From these common themes and the activities throughout the project, a number of recommendations emerged.

Project Recommendations:

- Develop a **scoring system** for carbon projects based upon established forest priorities
- **Increase interaction** between carbon market participants and forest sector representatives
- **Integrate social/cultural, economic, and ecological considerations** into carbon projects through an impact analysis process that balances goals for optimized or maximized carbon benefits
- **Develop a mitigation banking model** in forest carbon markets
- Continue to **encourage innovation**
- **Hold focus groups** with relevant stakeholders to gauge additional perspectives
- **Continue development and improvement of publicly available mapping tools** to visualize and explore relevant geographic data related to forest carbon markets**.**

The world of carbon continues to evolve. There is continued debate over the role and credibility of offsetting, and strong concern amongst forest owners and managers about the ecological, economic, and social impacts that forest carbon markets could have on their landscapes and communities. Carbon markets may be relatively new, but they exist within established historical patterns of valuing ecosystem services and face similar challenges with balancing interests and trade-offs. Carbon markets benefit when they recognize interconnections and natural complexities and resist the tendency to allow for a singular management focus on carbon outcomes. More innovations and tools are needed to accomplish this, including collaboration amongst project developers and across methodologies to create efficiency.

More information about the project phases, themes, and recommendations is detailed in the full report below.

Additional findings and details from the project can be found in the appendices.

Project Overview

The *Collaborating on Carbon* project was designed to broaden awareness for pursuing multi-attribute objectives on forest landscapes to encourage consideration and integration of complementary approaches across large ecological and jurisdictional landscapes. Key objectives included sharing of knowledge and perceptions, strengthening connections, and supporting critical thinking among key stakeholders and market actors regarding the potential for expanding markets for forest carbon offsets to materially disrupt raw material availability and supply to domestic forest products manufacturing sectors, as well as impact biodiversity and forest dependent communities. The project also aimed to provide space and momentum to spur research, increase understanding of potential downstream impacts, and initiate development of integrated, multi-dimensional strategies for optimizing benefits from natural climate solutions, and buffering or otherwise mitigating potential negative outcomes to communities.

The project completed four distinct phases as described below:

- After the project launched in October 2023, the first phase was development of a **concept paper** released in January 2024, outlining current trends and value-based relationships in the US forest carbon offset market. Cross-dimensional dynamics of evolving offset markets focused on potential implications for biodiversity, domestic forest product industries, landowners, governments and communities, especially relating to the economic health of rural communities. Before being released, a draft of the concept paper was shared with sector experts and their input was applied to finalizing the paper and also informed the development of the next project phase. Those responses can be found in the appendix.

- A **stakeholder survey** conducted from February 2024 to May 2024, assessing perceptions of forest carbon markets and potential benefits and risks the markets could present. The survey was distributed to a targeted list of experts and interested parties (including people that had self-identified as having an interest in the project when it was announced). The survey was also made publicly available through websites, social media, and e-newsletter. Survey findings can be found in the appendix.

- An interactive **pilot mapping tool** was developed by the Spatial Informatics Group, using publicly accessible data to create a visual representation of the geospatial relationships existing among key values and resource uses. Layers included within the mapping tool include political and environmental boundaries, forest and market conditions, biodiversity and ecosystem services, and socioeconomic conditions (i.e., layers addressing economic, environmental, and social sustainability). A Mapping User interface guide and Data Dictionary were also developed to support the mapping tool. More detail can be found in the appendix.

- **A workshop** was held at Montgomery Bell State Park in June 2024, in partnership with the Tennessee Division of Forestry. The two day workshop included a field tour, presentations and panels, small group discussions, and opportunities for virtual participation. Around 40 people participated in the workshop in-person and 25 participated online. Feedback and ideas from workshop participants can be found in the appendix.

Left: *Workshop field tour attendees*
Right*: The market insights panel at the workshop. From left to right: Nan Pond, Adam Taylor, Trisha Johnson, Claire Getty and Melissa Kreye.*

Left: *Workshop field tour attendees*
Right*: Small group discussions*

Key Project Findings:

- **Skepticism of carbon markets, especially amongst landowners and forest managers.**

Carbon markets are not well understood, information is inconsistently communicated, and it is difficult to make comparisons between alternatives. Especially amongst those not currently involved with carbon markets, there is a lack of trust in the markets, with particular concerns around greenwashing and negative impacts from markets. The distrust is also evidenced in media articles and academic debates and amplified in the competing opinions expressed by carbon market participants, competitors, and experts. While differences are to be expected and are healthy in an emerging and entrepreneurial market, there is lack of clarity even around the basics of what qualifies as a quality offset and how landowners will benefit from these market opportunities.

- **Concern that forest carbon markets do not leave space for forest management and that the requirements of the current standards and protocols reduce the ability of foresters and other professionals to make decisions based upon a variety of objectives.**

Existing carbon market opportunities are narrowly focused on trying to keep carbon stored in the forest by emphasizing a strategy of reduced or delayed direct removal of carbon through harvesting activities. This focus underestimates the role and impact of disturbance ecology in North America's forests and devalues the role of wood product markets in sustainable forest management. History has shown that prioritizing a singular management objective can lead to one-size-fits-all silviculture and ignores or even does harm to the diverse ecological, social, and economic complexities of forests and neighboring communities.

- **Communication gaps between landowners and project developers, as well as between land managers and carbon buyers.**

Conversations about forestry and discussions about carbon markets are not happening in the same spaces or through the same channels. There is a lack of awareness of existing systems, practices, and opportunities across the various potential collaborators, as well as policy makers. A small number of individuals and organizations exist with the potential to provide bridging opportunities and more may be needed. Improved communications between decision makers from multiple sectors at all levels would increase trust and allow leaders to accurately assess developments.

Project Recommendations:

- **Develop a evaluation system for carbon projects based upon established forest priorities**

There are a number of existing resources that define forest sustainability priorities in the US. These include national level priorities, such as the Forest Service's Four Threats (fuel and fires, invasive species, loss of open space, unmanaged recreation[1]), as well as state-level priorities identified in each state's Forest Action Plan[2] and other materials. An evaluation or scoring system that connects carbon projects to shared values, considering national values and emphasizing local/regional needs could help align emerging markets with existing knowledge of forest and community needs, risks, and priorities.

- **Increase interaction between carbon market participants and forest sector representatives**

It is unlikely that carbon market participants and buyers are going to be able to attend a wide range of forest sector meetings at the national, state, or local level and come up to speed on all things forestry in the US. Instead, it will be necessary for forest sector representatives and experts to go to them. People and organizations with ideas about how to collaborate and improve carbon market outcomes for forests, markets, and communities can engage with carbon market influencers, including project developers and offset buyers, in carbon-centric innovation spaces (i.e., Climate Week NYC, VERGE, COP29/UNFCCC). There may also be more opportunities to increase targeted consultation with forestry experts during project and methodology development.

- **Integrate social/cultural, economic, and ecological considerations into carbon projects through an impact analysis process that balances goals for optimized or maximized carbon benefits**

There is established practice to require or expect social, environmental, and economic impact analysis of projects that have the potential for significant impact or for which alternative approaches should be considered. Examples include the National Environmental Policy Act (NEPA) process for federal actions, state level EAW and EIS processes, and the evaluations included within third-party certification programs and public planning processes. Cumulative impact analysis models have been used in communities impacted by environmental and social health considerations. A similar approach could be adopted in this context, considering cumulative economic, social and environmental impacts of carbon projects in the broader picture of other community considerations. It is reasonable to require that carbon projects consider alternatives and conduct an analysis of social, economic, and ecological impacts. VERRA's Climate, Community, and Biodiversity standard is a model for adding ecological considerations

1 https://www.fs.usda.gov/projects-policies/four-threats/index.shtml

2 https://www.stateforesters.org/forest-action-plans/

(including the need for active management to meet habitat needs) to carbon project development and has contributed to providing high-integrity offset goals and addressing trade-offs. The pilot mapping tool from this project demonstrated that social/cultural, environmental, and economic data can be layered and analyzed together in real time. With further collaboration, this type of system can be continuously improved to provide a consistent and standardized approach to impact analysis. Such an approach could be developed at various scales (local, state, regional, national) and be made widely accessible.

- **Develop a mitigation banking model in forest carbon markets**

Mitigation banking is an established system for enabling investment in natural resources. Most familiar as a tool for water resources, wetland mitigation banking is "... the restoration, creation, enhancement and, in exceptional circumstances, preservation[3] of wetlands and/or other aquatic resources expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources." Mitigation banking is authorized within federal regulatory structures and allows for "credits" which are available for use by the bank sponsor or by other parties to compensate for adverse impacts (i.e., "debits"). A lack of clear federal regulation around carbon, as well as a lack of a clear unified voice from carbon market developers and standard setters are key differences, however given the many decades of experience with mitigation banking, there are well proven best practices and structures for their establishment, use, and operation. The RIBITS website (https://ribits.ops.usace.army.mil) tracks mitigation banks[4] and provides public access to comprehensive information. The total value of operating mitigation banks in the US is estimated to be over $100 billion and includes about $1 billion in annual credit trades and sales. There are many elements of the mitigation banking model that could be applied to forest carbon markets.

- **Continue to encourage innovation.**

Technological innovations continue, and the carbon market has benefited from the leadership of the tech sector. There is a need for additional innovation to develop approaches that create more opportunities in the marketplace. Innovations can include reducing barriers to participation, such as offering shorter contract lengths, providing higher and guaranteed payments, and ensuring clear communications about process and benefits to effectively engage with landowners. Future efforts can also identify any potential interactions between existing government incentive programs, such as current use tax programs, with carbon markets. These actions may also be critical for scaling engagement and ensuring alignment between carbon programs and other values. Entirely different approaches to what is currently available in the marketplace should also be considered. For example, considering the potential for approaches where landowners are automatically provided annual payments or tax benefits for ecosystem services based upon non-invasive monitoring systems (i.e., standard satellite imagery).

3 https://www.epa.gov/cwa-404/federal-guidance-establishment-use-and-operation-mitigation-banks-0

4 http://www.easillc.com/mitigation-banking/

- **Hold focus groups with relevant stakeholders to gauge additional perspectives**

The feedback received on the concept paper, survey responses, and discussions at the workshop all highlighted the diversity of viewpoints and provided insights into pathways forward for more effective engagement and positive outcomes. A follow-up to this project could be to develop focus groups with specific stakeholders and gain greater insight into perspectives and interests. For example, many people engaged in sustainable forest management expressed resentment of the term "Improved Forest Management" (IFM) to describe management actions to maximize carbon benefits. It may be beneficial to engage in focus group discussions about how messaging about forest carbon markets could be better aligned with landowners' sense of pride and accomplishment in their existing commitments to sustainability.

- **Continue development and improvement of publicly available mapping tools to visualize and explore relevant geographic data related to forest carbon markets.**

Phase III of this project involved the development of a pilot mapping tool, highlighting data layers of interest related to forest carbon markets, biodiversity, forest products, and carbon storage. The feedback received at the workshop reinforced the usefulness of easily accessible, publicly available, and comprehensive geographic information related to key metrics of interest. Further development of the tool could include selectable environmental boundaries, prioritizing carbon quantification within the tool, and collaboration with other maps, tools, and sources of relevant data.

Additional Considerations:

- **Insetting**

In 2022, the World Economic Forum characterized carbon insetting as "doing more good rather than doing less bad within a value chain".[5] With insetting (as compared to offsetting), companies make investments to improve their suppliers' carbon footprint. Rather than pay for carbon offsets that may be unrelated to a company's operations, the insetting concept brings decarbonization spending into the company's supply chain relationships. Carbon insetting (sometimes referred to as "scope 3 reduction") actions can include the implementation of nature-based solutions such as reforestation, agroforestry, renewable energy, and regenerative agriculture. Insetting has gained interest as companies prioritize tackling the carbon emissions of their suppliers and steer away from the controversies in the voluntary carbon market. The strategy of insetting could be strategic for the forest and wood products sectors as a collaborative approach to climate mitigation through strengthened customer relationships and identifying investment opportunities that deliver emissions reductions.

5 https://www.weforum.org/agenda/2022/03/carbon-insetting-vs-offsetting-an-explainer/

- **Wood Vaults:**

The "wood vault"[6] methodology continues to gain traction.[7] This carbon offset methodology involves burying biomass when markets don't exist for the materials and thereby avoids the outcome of the material decomposing or being burned. It can clearly be shown that burying biomass is a better carbon emissions outcome in some situations, and with proper design, the material can remain preserved for future utilization. However, it is also ethically challenging to accept this as a desirable climate mitigation strategy when that material could be part of an immediate and urgent effort to transition to more renewable energy systems. Emerging carbon strategies like this can create new challenges and opportunities for the forest and wood products sector.

Conclusion

The world of carbon continues to evolve. There is continued debate over the role and credibility of offsetting. There are also anticipated impacts to the carbon market from recent funding programs and investments in working with underserved landowners in accessing these and other emerging markets (Inflation Reduction Act funding). These actions may generate new insights, opportunities, and approaches. The 2024 wildfire season is a reminder that emissions from forests are a risk. Efforts are underway for the development of new methods of carbon emission calculations from these events, including a website/mapping tool that allows landowners to do their own calculations. This tool and other efforts will continue to inform the development and opportunity for carbon markets.

Within both the state and federal government, there is uncertainty around the direction that future policies will take, and whether they will encourage further market development, prove to be restrictive, or provide disincentives to participation. State lawmakers are often more skeptical of carbon markets and concerned about their potential to hinder forestry activities. Experts are watching the Farm Bill, as well as outcomes or actions from the Voluntary Carbon Markets Joint Policy Statement and Principles issued by the White House and federal agencies, for clues about where the federal government may choose to act.

6 https://cbmjournal.biomedcentral.com/counter/pdf/10.1186/s13021-022-00202-0.pdf

7 Also referred to as "terrestrial storage of biomass" https://puro.earth/carbon-removal-methods

Carbon markets may be relatively new, but they exist within established historical patterns of valuing ecosystem services and face similar challenges with balancing interests and trade-offs. Carbon markets benefit when they recognize the interconnections and natural complexity and resist the tendency to allow for a singular management focus on carbon outcomes. This mistake raises the risk of missed opportunities to provide holistic benefits and would repeat the historic pattern of externalized costs and impacts. These negative outcomes can be avoided through the use of thoughtful analysis with the available information addressing social/cultural, ecological, and economic trade-offs. More innovations and tools are needed to accomplish this integration, including collaboration amongst project developers and across methodologies to create efficiency. This will be difficult work, but if done well, will increase confidence in forest carbon markets and prevent potential harms.

It may feel like carbon markets have left the station, but there is plenty of evidence that the train hasn't picked up speed and there are seats available onboard. Forests and wood are some of the most amazing carbon storing and climate mitigation tools that we have available at scale and within existing technologies. With good design, carbon markets can be just the investment mechanism that landowners, managers, and manufacturers have been looking for. But for that to happen, we are going to have to come together, innovate, and figure it out.

Above: *Workshop field tour attendees*

Appendix

Concept Paper

The concept paper, *Exploring the Full Effects of an Expanding Carbon Market on Working Forests and Communities in the United States,* was authored by members of the project team, and was publicly released in January. It included background on climate change and forest carbon markets, what improvements have already been made to the markets, and outlines widely held concerns about potential risks from carbon markets to forests, especially biodiversity, and forest dependent communities.

Three guiding questions were raised in the concept paper that shaped other phases of the project:

- Where there are forests with overlapping objectives, are there existing or potential conflicts in value attainment, and what tools can be developed to help identify competing priorities and balance trade-offs?
- Are the existing forest carbon offset protocols sufficient to ensure rural communities and biodiversity are appropriately addressed in the design and implementation of forest carbon projects?
- Are we missing opportunities to share perspectives, elevate awareness, and integrate critical thinking (and action) among the full spectrum of stakeholders?

The concept paper was sent to a list of 70 forestry and carbon experts, carbon project developers and buyers, and a diverse group of stakeholders to solicit feedback and further input to the questions raised above. A total of 12 individuals provided in-depth responses. Their feedback is summarized below:

1. **Where there are forests with overlapping objectives, are there existing or potential conflicts in value attainment, and what tools can be developed to help identify competing priorities and balance trade-offs?**

    - Positive opportunity to create a market for ecosystem services
        - Idea for an opt-out system where landowners receive tax breaks for keeping forests as forest
    - There are differences in perception of how much conflict markets are really causing
        - There are other factors impacting markets and wood baskets: logger employment, general sector decline, etc. that are contributing to issues separately from carbon
    - Opportunities for innovation
        - Need for technological development, better inventories, general investment in navigating tradeoffs
    - Emphasis that managing for multiple values/benefits/trade offs is something foresters have always done
        - Concern about wildfire resiliency with management for high carbon

2. Are the existing forest carbon offset protocols sufficient to ensure rural communities and biodiversity are appropriately addressed in the design and implementation of forest carbon projects?

- General consensus: no.
- Lack of federal leadership, protocols generally do not account for rural communities, biodiversity, or other non-carbon values
  - Multiple respondents emphasized that carbon markets can't/shouldn't be the solution for everything, suggested moving away from a strict carbon accounting system towards a more holistic system that is better designed to recognize multiple benefits is necessary
- There is poor marketing/structuring of programs to interest landowners

3. Are we missing opportunities to share perspectives, elevate awareness, and integrate critical thinking (and action) among the full spectrum of stakeholders?

- Yes, generally, but opportunities do exist.
- Multiple respondents brought up need to engage Native communities better (esp. with regards to culturally significant species and practices)
- Discourse about integrity of forest carbon credits has consumed the energy of developers/registries/customers and not left room for innovating new solutions
- Reiterated importance of storytelling, communicating with landowners/general public
- Lack of understanding of complexities by government(s)

The feedback that was received was incorporated into the final concept paper that was released in January 2024.[8] The release included posting at the Dovetail Partners website, distribution to the contact list that was consulted, announcement in the Dovetail Partners and Endowment newsletters, and amplification on social media. The concept paper was also promoted during the next phases of the project (i.e, to inform the design of the survey and in advance of the workshop). An article summarizing the concept paper was published by the Society of American Foresters in May of 2024 in advance of the workshop.

8 https://dovetailinc.org/portfoliodetail.php?id=6584b3231a4f6

Survey

The second component of the project, a survey, was intended to assess perceptions about forest carbon markets. Survey design was inspired by a SWOT (strengths, weaknesses, opportunities, threats) analysis, and was organized into the following sections:

1. Organizational affiliation
2. Strength of current forest carbon markets
3. Weakness of current forest carbon markets
4. Information and Innovation
5. Demographic information

In total, the survey received 190 responses. The survey opened on February 22, 2024, and while it was not officially closed, the last response was received May 9, 2024. It was distributed via Dovetail Partners' newsletter, The Outlook, as well as on social media and in the U.S. Endowment's monthly news wrap up. Survey results were analyzed descriptively and presented at the June workshop.

Key takeaways and findings from the survey are summarized below.

Organizational Affiliation:

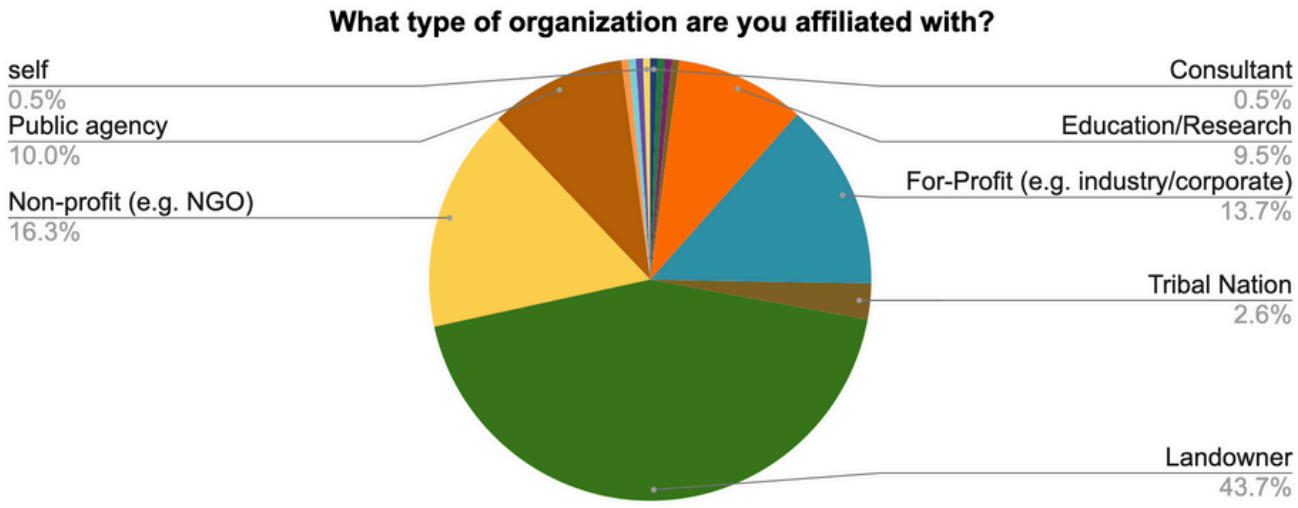

Fig. 1: Organizational affiliation of survey respondents

32% of survey respondents are currently involved in forest carbon markets. Many (43.7%) identified as landowners, while others work for non-profits (16.3%), for-profit organizations (13.7%), and educational institutions or public agencies (Fig. 1) . Respondents are involved with carbon markets as land managers (31.5%), as researchers (18%), conservation stakeholders (8.4%), as well as project developers, and advocacy positions. Survey results should be understood broadly as reflecting the views of those actively involved in forest management.

Strengths of current forest carbon markets:

Respondents were asked to indicate what they think are the most positive outcomes of forest carbon markets, as well as rate their level of excitement and provide context for what drives their level or lack of excitement. The potential for increased revenue generation for landowners surpassed any other positive impact, including contributing to climate change mitigation, as a likely positive impact (Fig. 2). This is reflective of a sentiment that while the actual ability of forest carbon markets to achieve meaningful climate mitigation in their current form is likely low, markets will drive increased investment in forests and provide an alternative revenue stream for landowners. When asked to rank their level of excitement about the potential for positive impacts from forest carbon market development, a plurality (31%) indicated a neutral position (Fig. 3). Notably, while slightly more people indicated a higher level of excitement (by selecting a 4 or 5) than a lower one (selecting 1 or 2), based on the number of respondents selecting "1" versus "5", more respondents feel strongly negative than strongly positive.

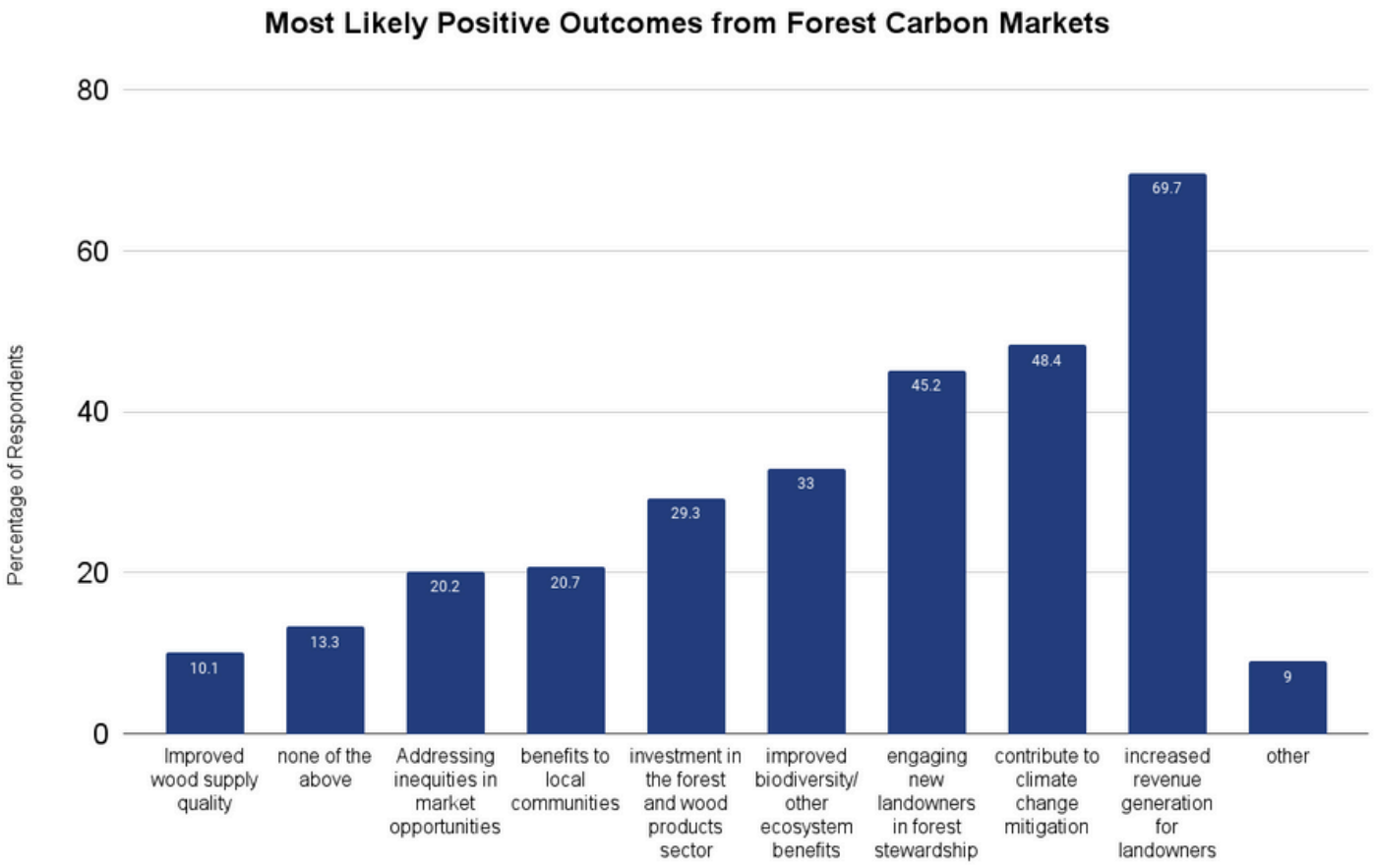

Fig. 2: Perceived positive outcomes from forest carbon markets

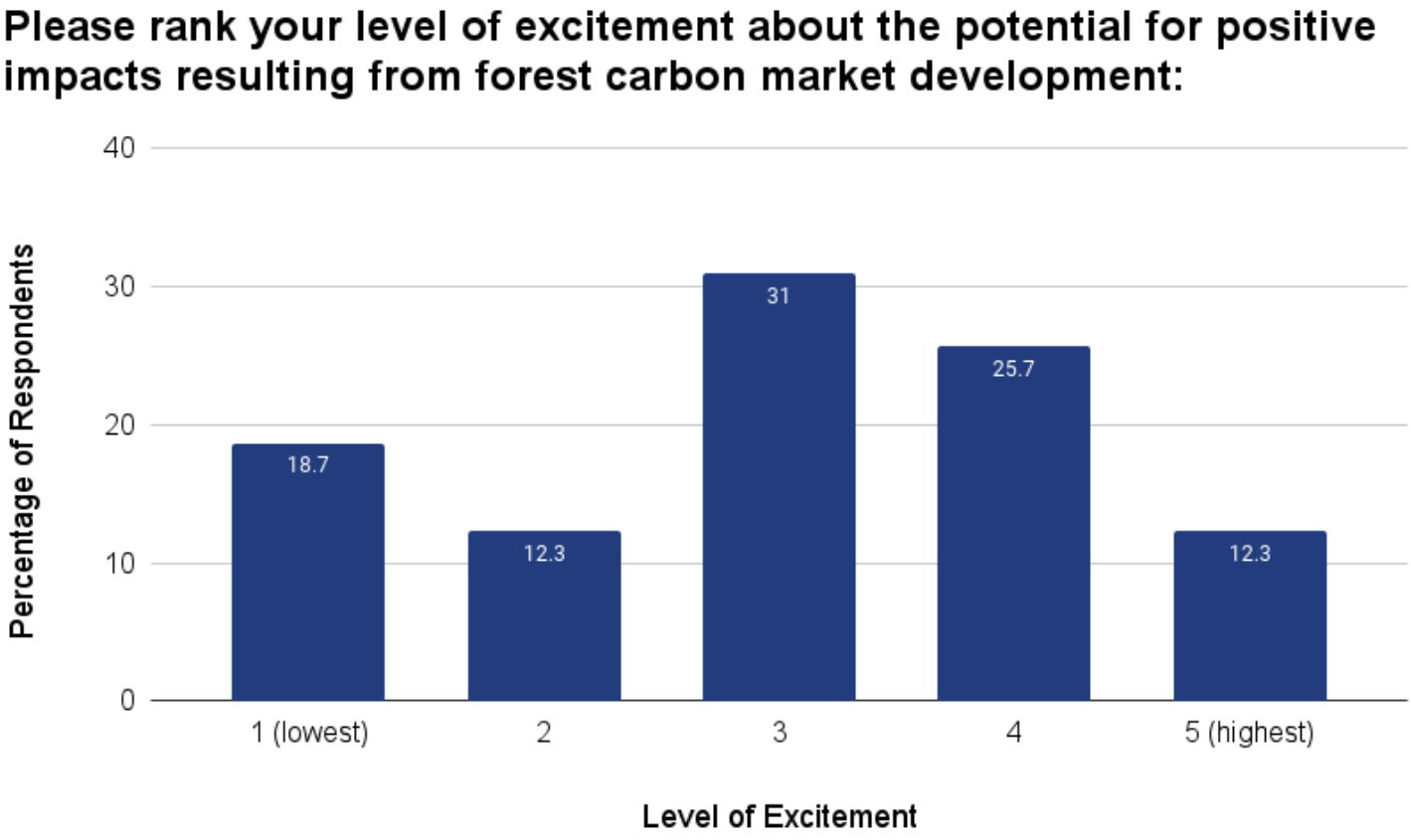

Fig. 3: Respondent enthusiasm for forest carbon markets

When asked to justify their level of excitement, responses were distributed across the following categories:

- Increased revenue/engagement for landowners
  - The most commonly cited cause for excitement was increased revenue for landowners and to a lesser extent increased engagement by landowners in forest management.
  - Some were skeptical of the climate change mitigation potential of the markets, but view anything that increases landowner revenue and incentivises keeping land forested as a positive. The following quote expresses sentiments reflected in many comments:
    - *"The recognition that there will be ample negative impacts on timber availability and that realistically, they won't make a bit of difference when to comes to mitigating climate change. At least companies can feel good that they pretended to do something beneficial and use it in their PR campaigns. I do hope the money that goes to landowners will be positive and will help them implement some good management."*
  - Many view carbon as "another tool in the toolbox"

- Climate Change Mitigation (negative and positive)
  - Respondents were split as to whether they think Forest Carbon Markets will have an impact on climate change mitigation.
  - Many think that they will have minimal/no impact, especially if current market regulations and practices continue. These respondents also frequently express frustration that large polluting companies are able to "greenwash" by purchasing credits
  - Some do think that the markets will have a positive climate impact, and frequently listed climate change mitigation as one of many benefits they think markets will provide
- Innovations in markets
  - Some respondents pointed to innovations or current developments in markets that they see as being steps in a positive direction, and an indication that the markets are still adaptable enough to meet multiple needs
  - Conversely, some view the current market situation as too uncertain, with too many discrepancies across programs to provide much value

Weaknesses of Current Forest Carbon Markets

Conversely, respondents were also asked to indicate the most likely negative outcomes they anticipate from current forest carbon markets. Overwhelmingly, conflict with other forest management goals outweighed any other option as the most likely negative impact (67.7%) (Fig. 4). Many respondents are very concerned about carbon driving a single management objective approach to forest management, and that protocols which favor carbon storage and restrict active management, including harvesting, are too limiting to foresters seeking to manage land for a variety of objectives and may lead to negative forest health outcomes. Related to the potential for carbon to outcompete traditional wood products, job loss in the forestry and wood products sector (39.7%) and shortages of raw materials (wood supplies) (37.6%) were also frequently selected. Respondents are highly concerned about the possibility of these negative impacts–53% indicated they are highly or somewhat concerned, while only 20.1% indicated little or no concern (Fig. 5). This insight, in conjunction with the ranked level of excitement, indicates that while people are somewhat excited for the potential for carbon markets to have positive impact, many of the same people are also highly concerned that there will be significant negative impacts if current standards and regulations remain the same.

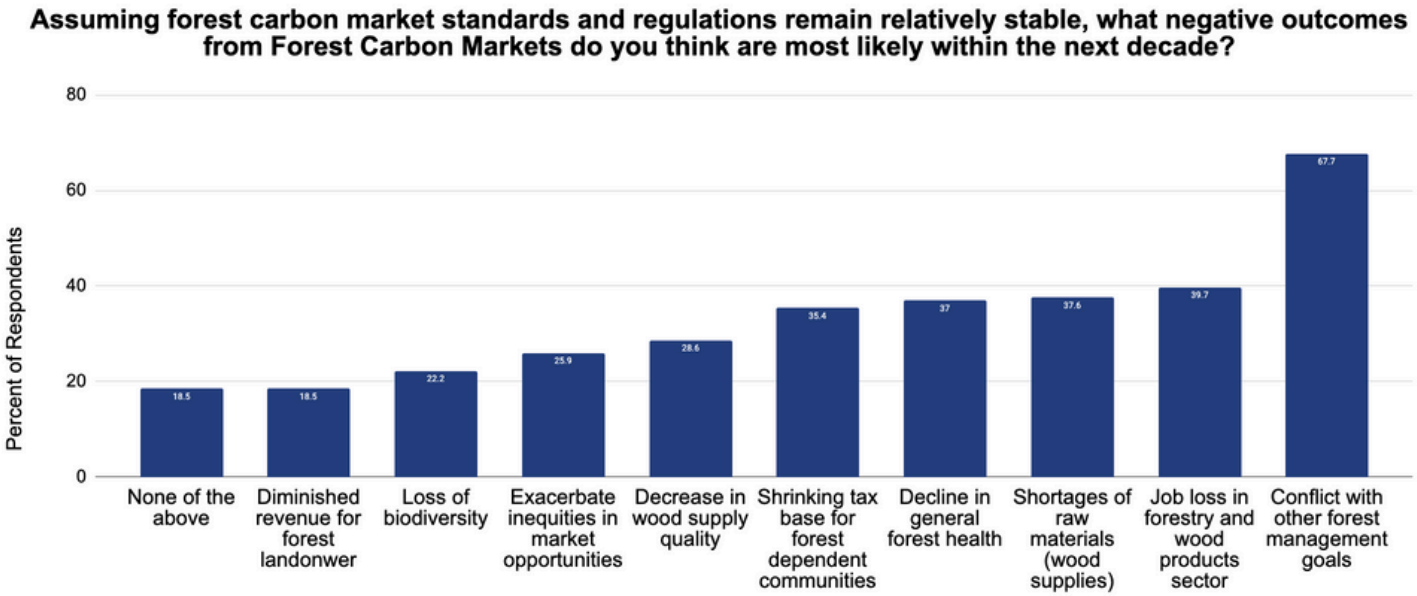

Fig. 4: Perceived negative outcomes from forest carbon markets

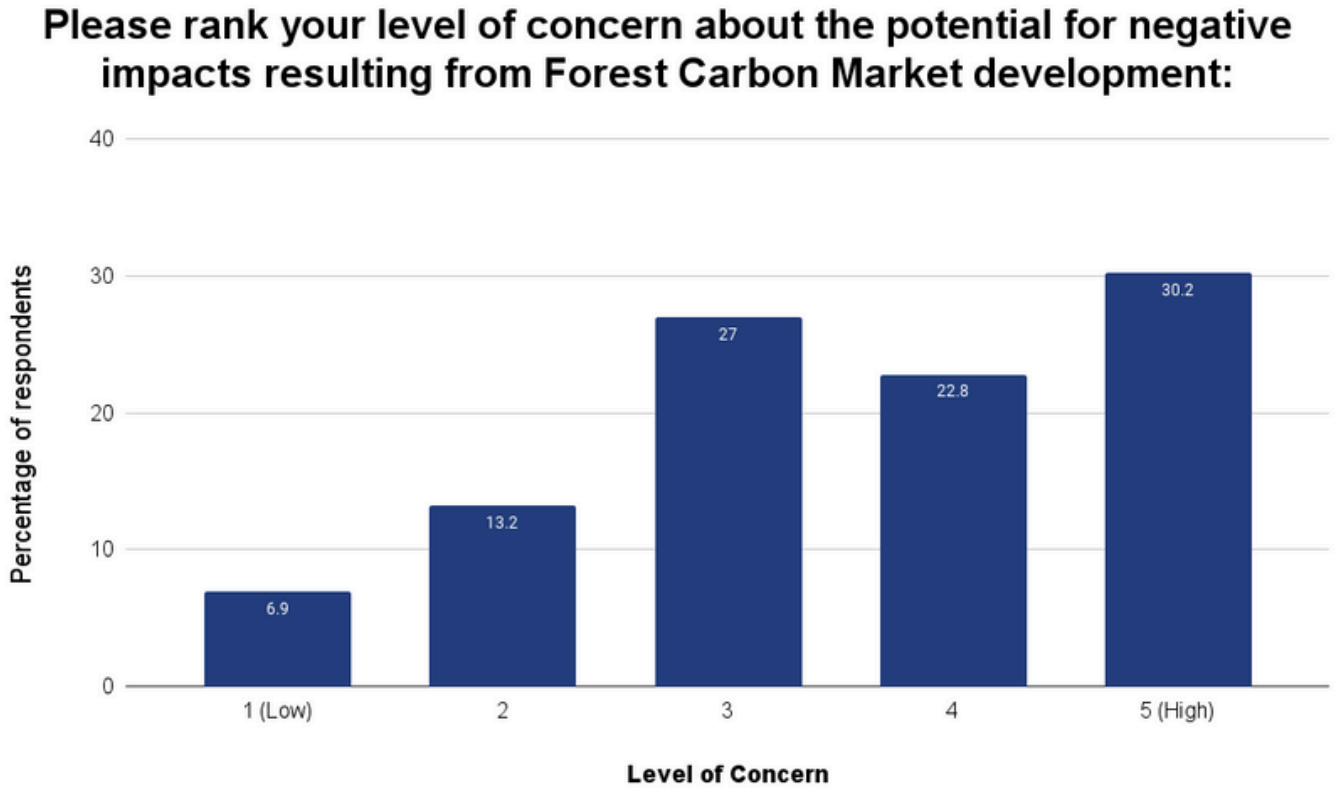

Fig. 5: Respondent concern for forest carbon markets

When asked to explain factors driving concerns about negative impacts, responses generally were distributed into the following categories:

- Lack of climate mitigation
  - Concerns about additionality and leakage were most prevalent within this category. Multiple respondents expressed a perception that large, highly polluting corporations are able take advantage of the markets to make them seem "greener" without supporting any meaningful impact on carbon/climate change.
- Forest health & management impacts
  - Many respondents indicated concerns about restrictions on beneficial management as a result of forest carbon markets. Many expressed concerns about managing for a singular objective (carbon) at the expense of other objectives (biodiversity, habitat) and measures of forest health. Multiple respondents predicted that forest carbon markets will lead to insect, disease, and fire problems due to a lack of active management.
- Impacts to social/economic systems
  - Primarily, responses which fell under this category indicated concern about a declines in forest product industry leading to mill closures and loss of jobs for rural communities.
  - Some also expressed a lack of concern about the impacts of markets, but simply because they think the markets are poorly designed and will not attract significant participation from small/medium landowners.
- Market uncertainty & lack of leadership
  - Multiple respondents described the current market situation as a "wild west" and "confusing". There were concerns about a perceived lack of transparency, unclear and shifting guidelines, politicization of forests and markets, and a lack of leadership within the forestry sector. Concerns were also raised about lacking accounting and oversight of markets.

The survey also asked respondents to provide input on the challenges posed *to* continuation of carbon markets (Fig. 6). Uncertainty and complexity ranked high as reasons why carbon markets may not be successful in the future. Low credibility and/or effectiveness was the most frequently selected response.

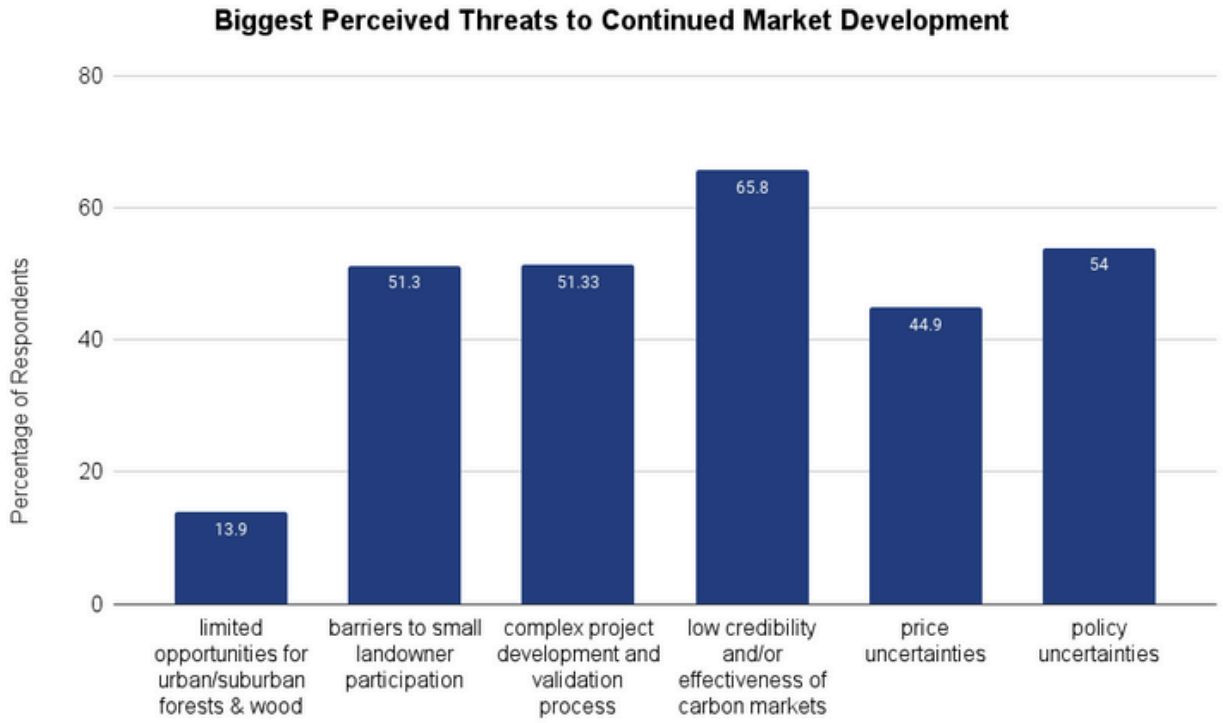

Fig. 6: Perceived threats to forest carbon makers

Information and Innovation

Questions in this section asked respondents to consider what innovations or solutions are needed to encourage positive outcomes from forest carbon markets and discourage negative ones, as well as share whether they feel they have enough information around forest carbon markets to inform decision making and what types of information would be helpful.

Innovation:

While responses varied, a few themes emerged as solutions:

- Improved data, information, and transparency
  - Respondents frequently expressed a desire for increased transparency and accountability from market providers related to their measures of impact
- Landowner engagement
  - Increased engagement and options for small landowners
  - Clearer, simpler messaging for landowners to help them understand what can be complicated contracts

- Contract improvements:
  - Accounting for carbon stored in wood products
  - Allowing for more forest management (timber harvesting)
  - Standardization and simplification across contracts and providers
  - Shortening contract lengths

Information:

Most respondents do not feel that they currently have sufficient information to understand impacts from forest carbon markets. Respondents use news and scientific journal articles, information from academic institutions and professional forestry organizations, and conversations with colleagues to understand markets and assess impacts. Respondents generally trust these sources, but identify a need for more and clearer information. Specifically, multiple people mentioned a need for economic impact studies, better public data about the location and size of projects, as well as clear, reliable science that demonstrates the climate benefits of the markets.

Full survey questionnaire

Section 1: Organizational Affiliation

1.What type of organization are you affiliated with?

a. Landowner
b. Public agency
c. For-Profit (e.g. industry)
d. Non-profit (e.g. NGO)
e. Education/Research
f. Tribal Organization
g. Other:_____

2. **Are you currently involved in forest carbon markets?**

a. Yes
b. No
c. Other: _____

3. **If yes, what is your primary role in Forest Carbon Markets?**

a. Carbon Offset Buyer
b. Conservation Stakeholder
c. Land manager (federal/state agency or private landowner)
d. Legislation and/or Policy Advocacy
e. Project Developer
f. Project Investor/Finance
g. Protocol/Registry
h. Research/Education
i. Not currently involved
j. Other:_____

4. **How long have you been involved in forest carbon markets?**

a. 0-5 yrs
b. 5-10 yrs
c. 10-15 yrs
d. 15-20 yrs
e. >20 yrs
f. Not Applicable

Section 2: Strengths of Current Forest Carbon Markets

5. Assuming forest carbon market standards and regulations remain relatively stable, what *positive* outcomes from Forest Carbon Markets do you think are most likely within the next decade? [select all that apply, checkbox]

a. addressing inequities in market opportunities
b. benefits to local communities
c. improved biodiversity/ other ecosystem benefits
d. contribute to climate change mitigation
e. engaging new landowners in forest stewardship
f. investment in the forest and wood products sector
g. improved wood supply quality
h. increased revenue generation for landowners
i. None of the above
j. Other:_____

6. Please rank your level of excitement about the potential for *positive* impacts resulting from Forest Carbon Market development:
[Rank 1-5 Not Excited to Very Excited]

7. What factors are driving your level of excitement related to *positive* outcomes from Forest Carbon Markets? [open answer]

Section 3: Weaknesses of Current Forest Carbon Markets

8. Assuming Forest Carbon Market standards and regulations remain relatively stable, what *negative* outcomes from Forest Carbon Markets do you think are most likely within the next decade?

a. exacerbate inequities in market opportunities
b. shortages of raw materials (wood supplies)
c. job loss in forestry and wood products sector
d. shrinking tax base for forest dependent communities
e. conflict with other forest management goals
f. loss of biodiversity
g. decline in general forest health
h. decrease in wood supply quality
i. diminished revenue for forest landowners
j. None of the above
k. Other: _____

9. Please rank your level of concern about the potential for *negative* impacts resulting from Forest Carbon Market development: *[rank 1-5 No Concern to Extremely Concerned]*

10. What factors are driving your level of concern related to *negative* outcomes from Forest Carbon Markets? [open answer]

11. Which challenges do you think present the biggest threats to continued development of Forest Carbon Markets? [checkbox, select all that apply]

a. barriers to small landowner participation
b. limited opportunities for urban/suburban forests & wood
c. complex project development and validation process
d. low credibility and/or effectiveness of carbon markets
e. price uncertainties
f. policy uncertainties
g. Other: _____

Section 4: Information and Innovation

12. What tools, innovations, or solutions do you think are most needed for encouraging positive impacts from Forest Carbon markets?
[open answer]

13. **What tools, innovations, or solutions do you think are most needed for mitigating negative impacts from Forest Carbon Markets?**
[open answer]

14. **Do you feel you currently have sufficient information about downstream impacts from Forest Carbon Markets to inform decision making?**
[yes/no/unsure]

15. **What types and sources of information do you currently use to understand the downstream impacts of Forest Carbon Markets?**
[Write in?]

16. **What other types of information, if any, would you like to have to understand the downstream impacts of Forest Carbon Markets?**
[short answer write in]

17. **Please share any other comments, feedback, or ideas you have.**
[long answer write in]

Thank you for your time and attention in responding to this survey!
The following demographic information is entirely optional. You can choose to answer all, some, or none of the following questions. They are included to aid in consideration of representation and inclusion within the delivery of this project. **The button to submit the survey is below the following section.**

Section 5: Personal Demographic Information

Regional representation - where you work, live, and/or feel connected. *Select all that apply.*

- Northeast, U.S.
- Midwest, U.S.
- Southeast, U.S.
- Southwest, U.S.
- Pacific Northwest, U.S.
- Western Canada
- Central Canada
- Eastern Canada
- Prefer not to respond
- Other:

What is your age range?

- < 18
- 18-35
- 36-55
- 56-65
- 66-75
- >75

How do you identify your race or ethnicity?

- Indigenous, American Indian, Native American
- Asian, Pacific-Islander, Hawaiian
- Black, African-American
- Latino, Latina, Hispanic
- White, European-American, Caucasian
- Multi-Racial, Bi-Racial
- Race or Ethnicity not listed here
- Prefer not to respond
- Other:_____

What is your gender?

- Woman
- Non-binary
- Man
- Prefer not to respond
- Other:

Mapping Pilot

The creation of the geospatial mapping interface (Fig. 7) was completed in two phases. The first phase focused on establishing a GIS data repository by scoping relevant data and aggregating it within the cloud environment of Google Earth Engine (GEE). Three key themes guided the data scoping process: Community and Socioeconomic Conditions, Forestry Conditions and Facilities, and Biodiversity and Other Ecosystem Services.

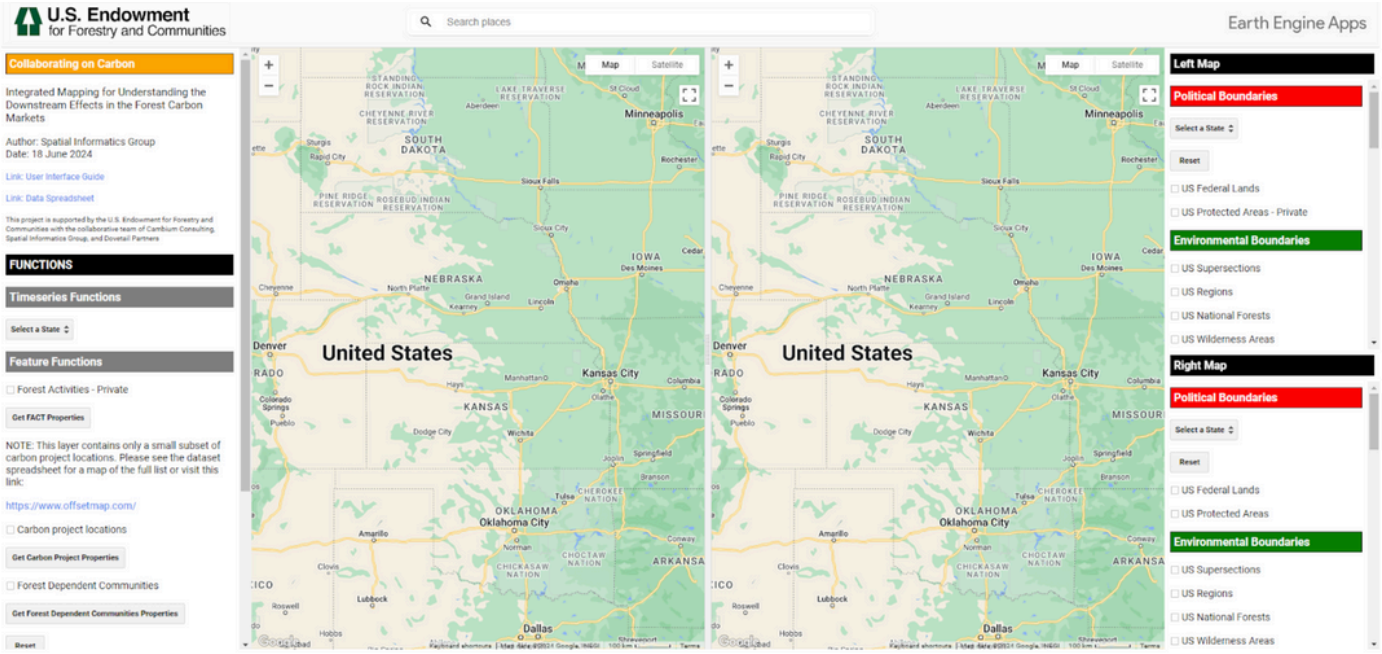

Fig. 7: Screenshot of mapping interface

A wide range of socioeconomic data related to forests and the impact of carbon markets was compiled. We started by acquiring data on the locations of forest-dependent communities, which includes demographic information from sources like the US Census. The Social Vulnerability Index (SVI), and Multidimensional Deprivation Index (MDI) were taken from the US Census as well. These datasets provide valuable insights into population demographics showing who could be most vulnerable to changes in the forest carbon market. We also identified important data on land ownership, detailing private, state, and federal ownership. Additionally, US land value data and the Tree Equity Score (derived from ACS 2017-2021 census data) were incorporated. This comprehensive spatial distribution of community socio-economic conditions allows for a nuanced analysis of the dynamics related to forests and the influence of carbon markets

To understand the downstream impact of carbon markets on forestry, we integrated a diverse range of forestry-related data sources. This included forest condition map layers from the Forest Inventory Analysis (FIA) Program, such as the TreeMap dataset, which included information on aboveground carbon storage, percent canopy cover, and volume (both Live and Standing Dead). We also included data on timber harvest locations and locations of carbon projects. Differences in mean aboveground carbon, and the number of mills by product type and volume (in MCF and Green Tons) were added, along with data from the Primary Forest Products Network. These comprehensive datasets enable a detailed analysis of the downstream effects of carbon markets on forests and their environmental impact.

To better understand the potential impact of carbon markets on biodiversity and ecosystem services, we examined datasets like NatureServe, which identify critical conservation opportunities for imperiled species. This helps reveal potential intersections between carbon market activities and critical habitats. We also included layers on Wildfire Hazard Potential (from 2023, 2020, and 2012-2018), National Insect and Disease Risks and Hazards, and forest retention and reforestation projections for the southeast (2030, 2040, 2050, 2060). Additionally, we compiled biodiversity metrics such as total and endemic richness for trees, mammals, birds, reptiles, amphibians, and fish. These datasets provide a lens to assess how carbon market strategies might impact biodiversity, helping to evaluate the conservation implications for species and their habitats.

Aggregating these data relied on GEE, a powerful cloud computing platform that combines extensive data archives with substantial processing power. GEE hosts vast amounts of publicly available geospatial datasets, totaling multiple petabytes. Using GEE to create a data repository offered significant advantages, such as easy management of access and data sharing settings, streamlined geospatial analytics, and the development of interactive mapping visualizations.

Several specific steps were taken to ensure a comprehensive and coherent aggregation of information. We began by reviewing all gathered data to ensure compatibility, especially for datasets sourced at the state and county levels. After consolidating the data into the GEE repository, we implemented access management to enable viewing and interaction by a defined group of users. This structured approach ensured that the repository was inclusive of diverse datasets and easily accessible, facilitating the generation of insights and informed decision-making.

The primary objective of the second phase was to create the geospatial map interface within GEE, allowing users to interactively engage with the aggregated data. This interface was designed to be intuitive and user-friendly, enabling valuable insights through active interaction with the data. We utilized a split map panel as the base of the interface, allowing easy and interactive comparisons between data layers (Fig. 8). The layers were organized by theme, with the ability to toggle each layer on or off. State and county boundaries were also selectable, providing quick visualizations for specific areas.

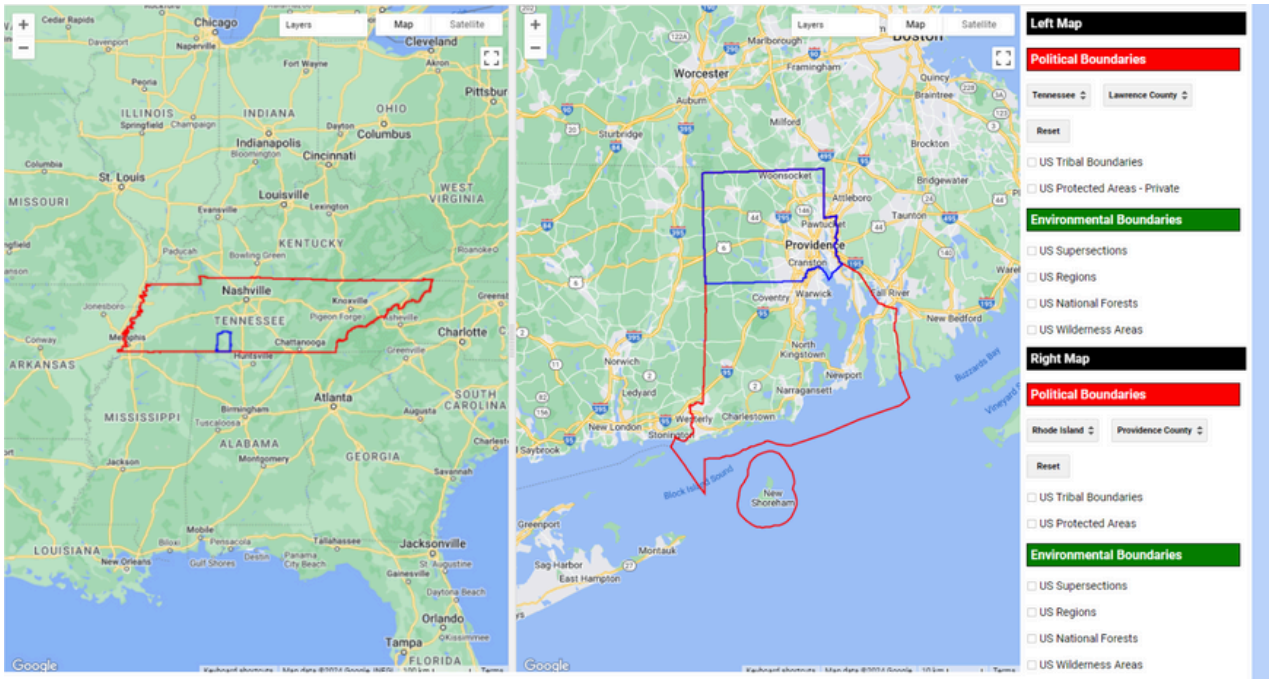

Fig. 8: Map spatial selection capabilities

To enhance functionality and interactivity, we added a 'Function' section, enabling users to conduct various analyses on the data layers. This section includes two types of functions: time series functions and feature functions. Time series functions allow users to view certain data layers by state or county as charts, making it easier to compare values over the years for a specific area (Fig. 9). Feature functions enable users to click on specific data layers to view detailed information that may not be practical to display on a map.

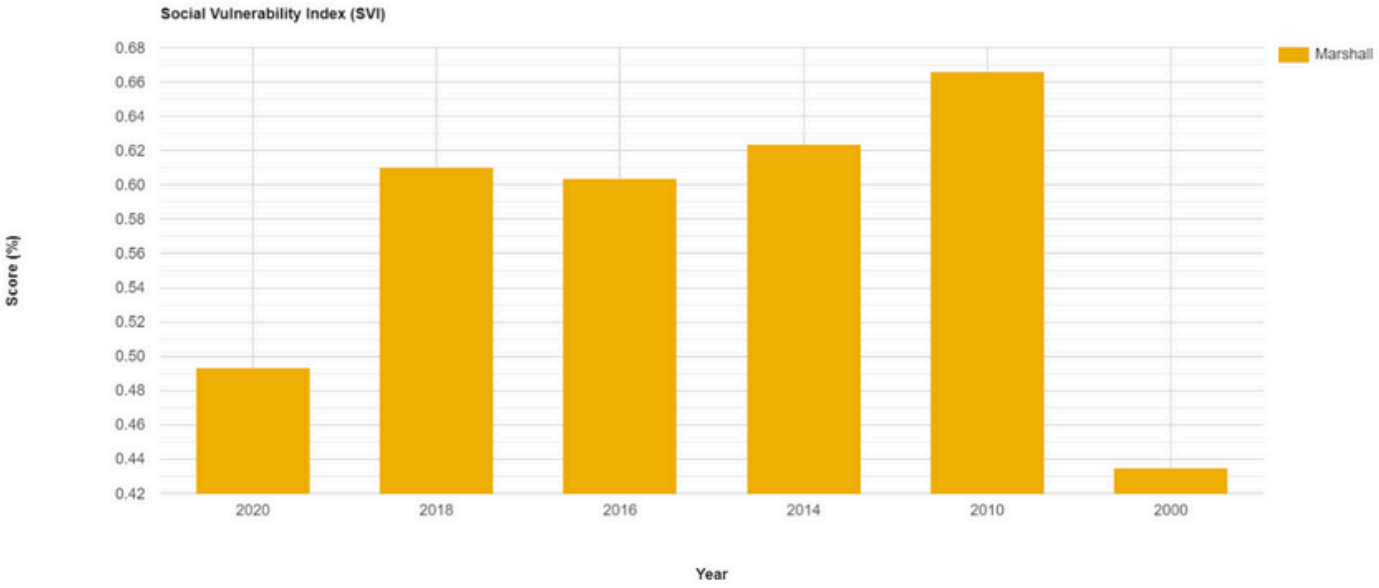

Fig. 9: Demonstration of additional data download view.

Understanding the downstream impacts of the expanding forest carbon market is crucial for adaptation. Creating a spatial data database is essential for visualizing key attributes that maximize positive outcomes and minimize negative impacts from forest carbon offset projects. Providing such data serves as a comprehensive tool, helping stakeholders make informed decisions for a balanced and sustainable approach to the forest carbon market.

Workshop

The workshop was held June 17-18 at Montgomery Bell State Park in Tennessee. The location was chosen for proximity to project members to support efficient planning, as well as for the opportunity to partner with the Tennessee Department of Agriculture, Division of Forestry, who led the field tour and helped with facilitation, outreach, and speaker development for the workshop. Approximately 40 individuals participated in-person, 25 participated remotely, and 25 of the in-person participants also attended the field tour.

The workshop consisted of a half-day field tour in Montgomery Bell Park, led by the Division of Forestry, which highlighted the role of disturbance in creating the forests of Montgomery Bell. The Division of Forestry offered extensive staff support to lead the tour and attend the workshop.

Above: *Brian Hughett leads the field tour.*

Most forests in Tennessee are an oak-hickory type. In Montgomery Bell, participants saw low levels of oak regeneration as a result of a lack of disturbance, which leads to an understory of maple and other shade tolerant species instead of oak. The Division of Forestry staff discussed potential management options that could encourage oak regeneration if more active management were allowed in the state park. Participants also visited a salvage logging operation guided by the Division of Forestry in an area affected by a recent tornado.

The agenda for the workshop included 2 panel presentations, a presentation on the project up until that point, and two workgroup sessions. The panel presentations were organized around two topics: market insights and policy.

During the market insights panel, panelists shared what challenges and opportunities they see related to participation in forest carbon markets. Themes included a need for carbon markets to recognize the substitution effect of using harvested wood

Above: *Attendees visit the salvage harvest site.*

products versus those derived from synthetic, fossil fuel based materials, a strong need for communication and understanding between landowners/forest managers and corporate buyers, and a need for systemic change within forest carbon markets to create mutually beneficially financial and ecological opportunities landowners and buyers want to engage in. There was a consensus that carbon markets are in a tumultuous period, with corporate buyers and potential regulators looking closely at integrity, additionality, and baselines.

During the policy panel, speakers shared their perspectives on policy at varying scales, from protocols within forest carbon markets to local, state, and federal policies. Within the past two years, there has been a shift in the public policy landscape, with nature-based solutions and natural climate solutions taking center stage at both the federal and state levels. Within both the state and federal governments, there is uncertainty around the direction that future policies will take, and whether they will encourage further market development, prove to be restrictive, or provide disincentives to participation. State lawmakers are often more skeptical of carbon markets and concerned about their potential to hinder forestry activities. Experts are watching the Farm Bill, as well as outcomes or actions from the Voluntary Carbon Markets Joint Policy Statement and Principles issued by the White House and federal agencies. The statement addresses carbon market policies and provides insight into how the federal government will try to balance social priorities and encourage high integrity market development (see sidebar below for the seven principles listed in the statement). Speakers also shared information about emerging protocols that recognize a need for forest management, especially in relation to wildfire risk, and seek to avoid forest health problems that could emerge from a lack of management.

Principles for Responsible Participation in Voluntary Carbon Markets

1. Carbon credits and the activities that generate them should meet credible atmospheric integrity standards and represent real decarbonization.
2. Credit-generating activities should avoid environmental and social harm and should, where applicable, support co-benefits and transparent and inclusive benefits-sharing.
3. Corporate buyers that use credits ("credit users") should prioritize measurable emissions reductions within their own value chains.
4. Credit users should publicly disclose the nature of purchased and retired credits.
5. Public claims by credit users should accurately reflect the climate impact of retired credits and should only rely on credits that meet high integrity standards.
6. Market participants should contribute to efforts that improve market integrity.
7. Policymakers and market participants should facilitate efficient market participation and seek to lower transaction costs.

Source: https://www.whitehouse.gov/wp-content/uploads/2024/05/VCM-Joint-Policy-Statement-and-Principles.pdf

At the workshop, during each of the working group sessions participants were provided with worksheets to record ideas and notes.

The morning's workshop questions were:

- What stood out to you in the survey results? What are your experiences with risks and solutions related to forest carbon markets?
- What would you like to see added, changed, or amplified in the mapping tool? How could a tool like this be useful in your work?
- What partnerships do you think are needed to encourage positive outcomes from forest carbon markets? How can we overcome barriers to creating partnerships and information sharing?

The afternoon's worksheet questions were:

- What policies or policy changes would best support positive outcomes from forest carbon markets?
- From everything you've heard today, what should be prioritized for enhancing the benefits (and minimizing the risks) associated with forest carbon markets?
- What would you like to see come out of this project? What would you like the project team to know?

- **What stood out to you in the survey results? What are your experiences with risks and solutions related to forest carbon markets?**
  - To increase landowner participation, three things are needed: shorter contract obligations, guaranteed payments, and higher payments.
  - The survey results were validating of what I perceived as what is working and what isn't working. A barrier to us as a forestry consulting firm is informing our landowner clients how to make their property eligible for these opportunities. It's difficult because we feel like the information is changing too quickly for us to keep up with.
  - Would be helpful to see the survey results to answer this question. Risks include buyers/corporations being willing to pay for high-quality, premium projects. Hope is that the definition of quality and clear, transparent guidelines will better enable these premium prices. Solutions include the opportunity to not only stack multiple ecosystem service opportunities as a method of increasing landowner revenue, but also potentially stacking multiple carbon methodologies (avoided conversion + IFM, for example)
  - People see a great opportunity for another income stream. The fears associated with implementing it poorly, resulting in reduced harvest are real and palpable. Implementation to thread this needle will take considerable concerted effort by all the people/organizations that participated and more.
  - Found it funny that climate change was not the number 1 priority
  - The "black box" that exists between developer and the landowner is a deterrent to many landowners from entering the space. Incentivizing project proponents to fit into the space between the developer and landowner important.

- What would you like to see added, changed, or amplified in the mapping tool? How could a tool like this be useful in your work?
    - I would enjoy seeing an environmental boundary selection for fire-sheds and watersheds. This type of tool would visually help us show a landowner the environmental and social benefits of establishing a project.
    - Hard to say without really digging in, but we identified opportunities to focus on improving low aboveground biomass -- that's where forestry interventions could enhance sequestration and ultimately storage. High carbon stocks are good to maintain but don't necessarily benefit from IFM.
    - Include project management activity in the tool. Track project carbon stocks in the tool and harvest level
    - Exportable single files, robust metadata with explanation,
    - Mapping tool needs to be advertised to the forestry industry and landowners. Yes, a very good tool!

- What partnerships do you think are needed to encourage positive outcomes from forest carbon markets? How can we overcome barriers to creating partnerships and information sharing?
    - More of inclusion with the wood industry is needed.
    - I would like to see more wood using facilities come to the table. It's great to hear that Thompson is at least interested in how to make a market work. I'm curious how we could get these facilities the resources to develop methodologies instead of using life cycle analysis to generate carbon credits.

A highlight of input about desired changes provided in the feedback is below:

- Including more policy/methodology that standardizes the real climate benefit of all IFM projects. There is too much question and uncertainty of the real climate value of the voluntary carbon market. We need policy to bring higher integrity and outline the mechanism all IFM project should have to be firmly climate positive.
- Reward long-lived harvested wood products, especially those that displace fossil fuel based products -Support management activities that create healthy climate adapted forests (Ie. resilient carbon sink) -Be socially responsible (benefits sharing? Compensate for loss of timber tax)
- North american IFM project should Not: discourage management at the expense of forest health, harm rural economies
- Produce a "good news" campaign about how wood stores carbon. Make sure rural markets would not be hurt.

- Policy ideas and recommendations:
    - Develop a rating system for carbon credits (buyers) and carbon programs (for landowners) to help inform risk management.
    - Establish rules for engagement for forest carbon buyers to avoid greenwashing- this has already been done for conservation banks.

- Explore tax solutions to further fund landowner carbon programs (skip the whole carbon credit approach
- Recognize landowner opportunity cost while exploring carbon management/market options (steep learning curve), perhaps incentivize some underserved landowners to learn about carbon opportunities.
- Landowners who implement climate smart forestry practices should get lower premiums on certain insurance costs
- Use carbon funds to revitalize or initiate new investment in HWP and reward climate smart practices along the values chain of production. For example, support sawmills that use climate smart tech (smaller carbon footprint), subsidize products that displace fossil fuels intensive products.
- Make federal purchase of domestic wood supply for federal projects more common place.

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