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Navigating Dual Enrollment: Assessing Compatibility Between Improved Management Carbon Offset Projects and Preferential Property Tax Programs Across Nine States

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ABSTRACT

Dual enrollment in preferential property tax programs and improved forest management carbon offset projects is recognized as a promising strategy to optimize financial benefits and achieve sustainable management objectives for landowners. Despite this, empirical studies examining this question are limited. To assess the nuances of program compatibility for dual enrollment, a policy analysis and 37 semi-structured expert interviews were conducted to explore state-level forest tax interpretations, enforcement, and county-level discretion, with a focus on harvest and forest management plan requirements. While results indicate relatively high levels of compatibility in the states assessed, none have strategic, long-term approaches addressing enrollment in both program types, with compatibility generally being contingent upon case-by-case evaluations of landowners' management objectives and program requirements. In many instances, compatibility is determined by county tax officials with varying degrees of input from state governments. This decentralized approach can lead to a confusing operating environment, potentially affecting the opportunities for landowners to participate in both programs. These issues are identified as key barriers to the expansion of market participation among small landowners, often who are interested in retaining their tax benefits provided by tax programs and may be concerned about forfeiting them to participate in an improved forest management project.

KEYWORDS

Preferential property taxes; improved forest management; forest carbon offsets; voluntary carbon market; tax policy; compatibility; policy analysis

Introduction

According to the 2018 National Woodland Owners Survey (NWOS), 72% of U.S. private forest owners are either moderately or greatly concerned about high property taxes (U.S. Forest Service, 2023). To mitigate against elevated tax burdens, all 50 states have established preferential treatments for forestland uses (Frey et al., 2019). These programs, known as preferential property tax programs (PPTPs), offer landowners options to reduce, modify, defer, or eliminate their tax burden. They are designed to promote and encourage specified forestry-related land uses, including commercial, recreational, and conservation classes (Kilgore et al., 2017, 2018; Ma et al., 2014; Malme, 1993). Tax policies that give preferential

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treatment to forestland can counteract or minimize economic pressure to convert forests to other land uses and often have a dual objective of maintaining wood feedstocks by requiring commercial harvest (Hickman, n.d.). As a result, the degree to which they are supportive of forest conservation and carbon sequestration efforts is up for debate (Frey, 2023; Kilgore, 2014; Williams et al., 2004). In part, this question hinges on the tax program's ability to minimize forest conversion.

In addition to PPTPs, forest landowners are able to enroll in forest carbon offset (FCO) projects associated with voluntary carbon markets. The benefits and costs for a landowner participating in a forest carbon program vary widely and depend on several factors, such as the size and type of forest, the particular requirements of the program, the payment structure, and current carbon offset prices (Alhassan et al., 2019; Khanal et al., 2017; Mei & Clutter, 2022). In general, landowners derive a financial benefit through the sale of carbon credits on the marketplace, which can promote income diversification.

In the U.S., three main types of FCO projects are recognized by major carbon credit platforms. Afforestation and reforestation projects aim to restore tree cover through planting and regeneration, typically on previously deforested land (American Carbon Registry, n.d.-a; Cho et al., 2025). Avoided conversion projects prevent the conversion of forests to non-forestland uses, often through conservation easements (American Carbon Registry, 2019; Cho et al., 2025). Improved forest management (IFM) projects, accounting for 82.6% of the total number of FCO projects on the U.S. voluntary market, implement climate-smart management practices that sequester more carbon than would otherwise be stored through traditional measures (American Carbon Registry, n.d.-b; Haya et al., 2023, 2025). In part due to their prevenance in the U.S., alongside the greater volume of credits they generate, IFM projects are the primary subject of this paper.

The question of compatibility between PPTPs and IFM projects is crucial for understanding and anticipating landowner decision-making and the potential attractiveness of voluntary carbon markets. Both offer financial incentives for undertaking forest management activities with varying degrees of prescription in an effort to achieve particular management objectives, such as conservation, consistent harvest to maintain the state's wood feedstock, or merely keeping forests as forests. Where landowners are not eligible to enroll in both program types simultaneously, it is assumed that they will assess each program's relative financial value and alignment with their own forest management goals. It is further assumed that lower compatibility across programs will lead to lower participation in forest carbon programs overall, as a potential loss in tax incentives resulting from incompatibility could mean additional economic cost for landowners.

Importantly, there are many ways to define compatibility between PPTPs and IFM projects. Simply put, compatibility hinges upon alignment between the various rules and structures of both program types. For landowners to participate in an IFM project, they must usually adhere to third-party verification and restrictions on timber harvesting, ensuring that carbon credits generated are verifiable and permanent. Meanwhile, PPTPs generally have a range of acreage, harvest rotation, and forest management plan (FMP) requirements. Dual enrollment necessitates administrative and operational compliance under each set of requirements.

This paper focuses on three dimensions of compatibility: 1) whether PPTPs mandate timber harvests, 2) whether they require FMPs, and 3) who is involved in the development and amendment of FMPs. These factors were selected because they directly influence

a landowner's ability to maintain compliance with IFM requirements over time while also participating in a PPTP. For example, if a PPTP mandates periodic harvests, this may not inherently conflict with IFM protocols; however, the nature, timing, and intensity of those harvests can. IFM projects often aim to extend rotation lengths, increase stocking levels, and enhance forest structure to optimize long-term carbon sequestration (American Carbon Registry, n.d.; Galik & Jackson, 2009; Haya et al., 2023, 2025; Smyth et al., 2014). In contrast, some PPTPs emphasize short harvest cycles or have landowner-initiated compliance periods, subject to program-defined rotation expectations. These requirements can create tension, particularly where early or frequent harvests would reduce the carbon benefits achievable through IFM strategies. These dynamic underscores the potential misalignment in harvest timelines and IFM obligations. While harvest requirements do not universally preclude compatibility, they serve as an important indicator of potential tension between program goals.

Likewise, if an FMP is needed, this creates an additional administrative burden for landowners who must ensure that the plan aligns with both PPTP and IFM requirements. This could lead to additional costs, navigating potential distrust of institutional processes, and experiencing a perceived loss of autonomy. Past research has shown that such constraints can serve as barriers to both FCO and PPTP participation (Frey et al., 2019; Miller et al., 2012). Additionally, when FMPs must be authored or amended in consultation with state-approved foresters, tensions may arise if the forester's professional judgment or priorities diverge from the landowner's goals, such as discouraging IFM enrollment due to perceived economic trade-offs or management risks.

Importantly, while other features of PPTPs (e.g., contract duration, eligibility criteria) may also play a barrier to enrollment in IFM projects, this paper centers on harvest and FMP-related constraints because they are the most directly relevant to the operational demands of IFM projects. Compatibility concerns can also arise from the opposite direction. IFM standards around additionality, permanence, and leakage could further complicate dual participation. However, because of the diversity of methodologies and standards used across the voluntary market, and the variability in how these concepts are operationalized across carbon project registries, these factors are not the primary focus of this paper. They are instead discussed briefly below to acknowledge their potential implications for program compatibility.

To the authors' knowledge, no studies to date have presented evaluatory frameworks for assessing the compatibility between PPTPs and FCO projects, IFM or otherwise. Building upon an extensive policy review and semi-structured interviews with government officials and forestry professionals, this study employs a ranking approach for identifying relative program compatibility in Alabama (AL), Florida (FL), Georgia (GA), Kentucky (KY), North Carolina (NC), Ohio (OH), South Carolina (SC), Tennessee (TN), and Virginia (VA). These states were selected due to the recent introduction of new forest carbon offset initiatives, primarily driven by the expansion of the Family Forest Carbon Program (FFCP) within these regions. This study hopes to provide a comprehensive understanding of the interplay between PPTPs and IFM projects by quantifying compatibility on the key dimensions of harvest and FMP requirements, thereby enhancing the state of forest carbon policy knowledge.

This article is organized as follows: a literature review outlining the factors relevant to compatibility; a policy background and context section outlining the programs assessed;

a methods and data section detailing data collection, the evaluatory framework; a results section presenting the study's findings and key assumptions and limitations; a discussion section interpreting these findings and outlining policy implications and recommendations, and a conclusion outlining future research and summarizing the study's contributions.

Literature review

Numerous studies have focused on barriers limiting landowner participation in FCO projects broadly. Table 1 outlines key limitations to the establishment projects that emerged from a systematic literature review of core publications conducted by C. Pan et al. (2022).

Verifying additionality, permanence, and leakage presents unique challenges for the establishment of IFM projects. Additionality refers to carbon sequestered that is in addition to an established baseline level or additional to what would have otherwise occurred under a business-as-usual (BAU) scenario (Gillenwater, 2012; Michaelowa & UNEP, 2011). The carbon stored over time due to project activities is measured against a BAU scenario, with the difference between the two being referred to as the carbon benefit (Intergovernmental Panel on Climate Change [IPCC], 2023). To be considered additional in most cases, this carbon benefit must be derived from IFM projects exclusively, rather than other policy schemes, alternative investment, or advances in technology (Broekhoff et al., 0000; Gehring & Phillips, 2016; Liu et al., 2024). This requirement is a key source of potential friction between forest taxes and voluntary carbon market programs. First, it is the need for additionality that leads many IFM projects to require delayed or avoided harvest for enrollment: a requirement that stands in direct contrast with some tax program requirements, namely those looking to ensure a constant wood feedstock via commercial harvest. From the perspective of IFM projects, the need for additionality in order to generate credits can limit the ability for program administrators to enroll landowners who are already incentivized to avoid harvest. This includes landowners enrolled in PPTPs that explicitly do not permit, or necessitates the reduction of, commercial harvest in order to receive tax benefits.

Meanwhile, permanence refers to a guarantee that credited carbon will not be re-released back into the atmosphere for an agreed upon number of years (Anderegg et al., 2020; Charnley et al., 2010; Kang et al., 2012; Malmsheimer et al., 2011). Despite efforts to compensate for forest disturbances and tree mortality by implementing measures like insurance mechanisms compensating for involuntary reversals, climate change necessarily results in more instability in nature (Badgley et al., 2022; Loehle, 2023; Ruseva et al., 2020). This culminates in forest fires, flooding, disease outbreaks, and other events that are difficult to predict, thus complicating the ability of projects to guarantee long-term carbon sequestration that satisfies permanence (Kim et al., 2008). Because many PPTPs require active

Table 1. Barriers to establishing FCO projects.

Methodological	Socio-Economic	Implementation
• Additionality • Permanence • Leakage	• Opportunity costs • Social costs • Transaction costs • Market prices	• Monitoring • Reporting • Initial verification

management and/or commercial harvest, concern about carbon reversal and diminished carbon storage could limit compatibility between both programs.

Leakage is another important methodological challenge, referring to a measurable increase in greenhouse gas (GHG) emissions outside a project boundary as a result of emissions-related activities being limited within (W. Pan et al., 2020). Generally, two types of leakage are defined: activity-shifting and market leakage (Richards & Andersson, 2001). Activity-shifting leakage occurs when agents shift their deforestation/degradation activities outside the project area, while market leakage occurs when the project activity reduces the production of a commodity and causes an increase in production elsewhere to meet continuing market demand (Babiker, 2005; UN-REDD Programme Activity-shifting leakage [Internet], 2021; Watson et al., 2000). These complex factors make leakage difficult to quantify and track. Here, another compatibility issue arises. In some states (e.g., OH), landowners may enroll a portion of their property in a PPTP, resulting in differential harvest regimes (e.g., intensive vs. non-intensive). If an IFM project was exclusively established on the non-intensive acres, activity-shifting could occur if landowners increased carbon-degrading activities on intensive harvest acres not enrolled in the PPTP.

Regarding socio-economic and implementation barriers, landowners may weigh the opportunity cost of enrolling in an IFM project in comparison to benefits associated with their existing land use, ultimately deciding that the former does not justify IFM participation. They may find the potential development value of their land to be greater than the combined benefits (e.g., carbon payments) and costs (e.g., market entry, withdrawal penalties) (Markowski-Lindsay et al., 2011). Low and unpredictable market prices could make this comparison yet more difficult, with prospective applicants unable to ascertain the extent of potential earnings (Forest Trends, 2024). Likewise, social costs – such as limited information or general distrust of climate-linked interventions – many undermine willingness to engage in forest carbon projects (Wade & Moseley, 2011).

Relatedly, monitoring, reporting, and initial verification can be time-consuming and financially burdensome for landowners lacking necessary resources. For instance, Kerchner and Keeton (Kerchner & Keeton, 2015) report that northeast forest landowners in the U.S. were wary of the 100-yr monitoring costs associated with FCO projects for the compliance market in California. In some cases, landowner management practices may not align with monitoring requirements, necessitating the implementation of more costly and rigorous guidelines (Carton & Andersson, 2017).

Alignment between IFM projects and PPTPs has been suggested as a way of easing the socio-economic and implementation barriers facing smaller landowners. In a study conducted by Miller et al. (2012), they conclude that family forest owners in the Lake States might be interested in IFM projects operating in a voluntary or compliance market, as this would allow for less stringent requirements while preserving alignment with management objectives. They note that tax relief in exchange for forest sequestration efforts could be the most successful way to engage with concerned landowners (Miller et al., 2012). In a subsequent focus group study, Miller et al. (2014) found several landowners who stated they would only be willing to enroll in an FCO project if they could receive a tax benefit, considering compensation from carbon credits as unsatisfactory for covering their tax liability. Landowners already enrolled in PPTPs voiced concern as to whether their participation in a forest carbon project would conflict with their obligations to receive tax abatement (Miller et al., 2014). Focus group participants emphasized that tax relief in exchange for participation in a forest carbon project

could present fewer enrollment obstacles, such as less paperwork, shorter contract lengths, and no "in addition to BAU" requirement (Miller et al., 2014). This observation is in line with findings from a study by Wade and Moseley (Wade & Moseley, 2011), in which survey respondents suggested reducing compliance burdens by partnering with existing state property tax assessment systems. Some respondents went further, responding positively to the notion that property tax systems in some states could be modified to determine carbon credits amounts and verify alignment with FMPs (Wade & Moseley, 2011). However, while property taxes and PPTPs are recognized as salient factors influencing landowner interest and participation in forest carbon projects, no research to date has empirically studied the dual enrollment compatibility. This study aims to fill this research gap by analyzing the requirements for PPTPs in AL, FL, GA, KY, NC, OH, SC, TN, and VA, where a landowner's ability to enroll in both programs is determined primarily by harvest and FMP obligations.

Policy background and context

In the nine states evaluated, there are a total of 14 PPTPs. These are all modified assessment laws, which allow forest properties to be valued differently than other forms of property (Hickman, n.d.). This commonly comes in two forms: 1) applying current use valuation (CUV), a method of assessing property value based on its current use, and 2) reducing the potential or fair market value (FMV) used in assessing property value (Anderson & England, 2015). Appendix A presents a summary of key provisions related to each program.

Most (92.8%) of the evaluated PPTPs have minimum or maximum acreage requirements, with a majority (64.3%) have no harvest requirements – or harvest requirements that are open to landowner discretion. Only four programs require an FMP (28.6%). In terms of assessment and valuation, most derive their tax benefit from CUV (64.3%).

Methods and data

This study employs a ranking approach for identifying and scoring relative program compatibility across PPTPs and IFM projects. Information gathered from a policy review, in addition to 37 semi-structured interviews, were used to inform this ranking system.

Policy review

To gather policy relevant information on the PPTPs in each state, a review of program guidelines, handbooks, and statutory requirements was conducted. The documents consulted for each tax program included in this analysis are described in Table 2.

The primary objective of this initial step was to ascertain potential legal requirements (as distinct from enforced practice) and to compare statute language against administrative and legal interpretations, as well as inform interview questions and facilitate dialogue between the authors and interviewees.

Semi-structured interviews

Semi-structured interviews were held between April and May 2023 with a variety of experts, including state program administrators (some of whom were also state foresters), county

Table 2. Program documents reviewed.

State	Tax Program	Document	Document Type
AL	Agricultural Land Classification	Current Use Valuation-Departmental Regulations, Rule 810–4-1-.01	Administrative Rule
FL	Agricultural Classification (Greenbelt)	How to Apply for a Greenbelt Agricultural Tax Assessment	Program Guide/ Handbook
GA	Preferential Agricultural Assessment (PAA)	GA Code § 48–5–7.1	Statute
	Conservation Use Valuation Assessment (CUVA)	Conservation Use Assessment Information	Website
	Forest Land Protection Act (FLPA)	Georgia Forest Land Protection Act	Website
	Qualified Timberland Property (QTP)	Qualified Timberland Property Appraisal Manual	Program Guide/ Handbook
KY	Agricultural Land Classification	KRS 132.010	Statute
NC	Present-Use Value (PUV)	Present-Use Valuation Program Guide	Program Guide/ Handbook
	Wildlife Conservation Land Program (WCLP)	Wildlife Conservation Land Program Handbook	Program Guide/ Handbook
OH	Ohio Forest Tax Law (OFTL)	Ohio Forest Tax Law (OFTL)	Website
	Current Agricultural Use Value (CAUV)	Current Agricultural Use Value (CAUV)	Website
SC	Agricultural Special Assessment	117–1780 Classification of Property - Agricultural Use Property	Statute
TN	Agricultural, Forest and Open Space Land Act (Greenbelt)	Tennessee Greenbelt Manual	Program Guide/ Handbook
VA	Land Use Value Assessment (LUVA)	State Land Evaluation Advisory Council (SLEAC) Manual	Program Guide/ Handbook

Table 3. Semi-structured interviews by state and profession.

State	State Official	County Official	Extension Specialist	Private Forester	Industry Representative	Total
AL	0	1	1	0	1	3
FL	0	2	1	0	0	3
GA	2	0	1	0	0	3
KY	0	0	2	0	1	3
NC	2	0	1	1	1	5
OH	1	3	0	0	1	5
SC	1	1	1	0	1	4
TN	0	1	1	2	1	5
VA	4	1	0	1	0	6
Total						**37**

tax officials, university and extension specialists, private certified foresters, and forest industry representatives (Table 3).

These interviews were conducted with the primary goal of better understanding program administration, including eligibility, statute interpretation, enforcement, and county-discretion. Interviewees were additionally asked about state voluntary carbon market activity, including any state-level opposition and perceived landowner interest. For a complete overview of topics discussed, a copy of the interview questionnaire is shown inAppendix B.

Scoring system

To quantify program compatibilities, a ranking system was developed to consider how the harvest and FMP requirements for each PPTP interacts with landowner potential to dual enroll in an IFM project. This is similar to an approach taken by Chizmar et al. (2022), who

reviewed PPTP policy documents (statues, rules, regulations, guides, manuals, etc.) and classified each program's compatibility with agroforestry practices. In their system, the compatibility range was defined to three categories (unacceptable, acceptable, and emphasized), whereas our rankings are based on a combination of program features which lead to an overall compatibility score.

As shown in Figure 1, overall compatibility rankings range from 0 (Limited Compatibility) to 3 (Full Compatibility). These scores are determined by three features: whether harvest is required, whether an FMP is required, and whether that plan can be developed and/or amended by a landowner or certified forester. Each feature is given a different weight, based upon their impact on compatibility between IFMs and PPTPs. For instance, because the requirement for harvest is ultimately the most significant barrier to participation in both program types, they are given a higher weight (+3 and +1) than the two FMP-related features (ranging from −0.5 to +1).

When harvest is not obligatory, it is presumed that there is full compatibility between IFM and PPTP enrollment. In cases like this, the other features are not determinant of the final ranking. If an FMP is required, while the harvest is not, compatibility remains consistent. The same is true when considering how FMPs are developed/amended: there is ultimately no influence on compatibility when harvest is not a required component for enrollment in a PPTP.

If it is determined that landowners must harvest to participate in a PPTP, the overall compatibility score is calculated sequentially based on the features above. Upon assigning a +1 to indicate that harvest is required, the next step is determining whether an FMP is necessary for program enrollment. If this is required statewide, the overall compatibility ranking decreases (−0.5), since this represents an all-encompassing provision relevant to all landowners. If plans are only required in some counties, no score is assigned (+0). If an FMP is not required, the final score increases (+1). The development of FMPs is then assessed, examining who is able to create and/or amend plans. If landowners can act

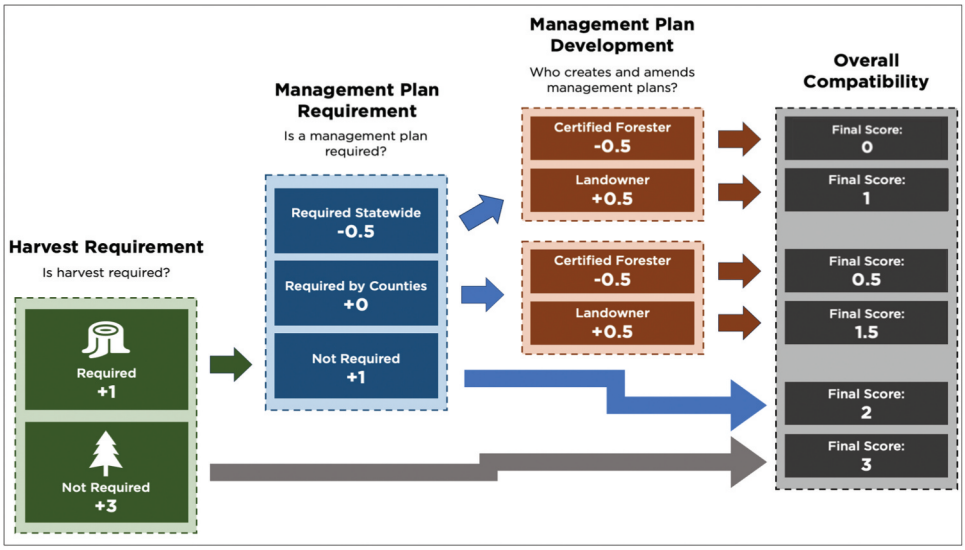

Figure 1. Ranking system.

without a consenting forestry professional, the final compatibility score increases (+0.5), as interviewees repeatedly noted that foresters would be unlikely to approve changes that drastically compromise harvest rotation, ecological health, and forest stewardship. Likewise, if a certified forester or equivalent personnel is needed to develop initial plans and amend them based on landowner objectives, the overall ranking decreases (–0.5). With these determinations in mind, the scoring system was applied to each of the 14 PPTPs across the nine states included in this study. To ensure robustness and reliability, both authors calculated and reviewed final compatibility scores.

Results

This section presents the scores for each PPTP, along with the rationale underpinning them. Using the ranking system described above, Figure 2 demonstrates compatibility across the study area, with dashed lines representing states with multiple programs that received different scores.

Table 4 presents this information in further detail, outlining the three sub-component scores – harvest, FMP, and plan amendability – influencing the overall ranking. In cases where the harvest score is 3, FMP and plan amendability were not quantified as they lack relevance to programs without harvest requirements, which is ultimately the prime factor influencing compatibility.

In states with two or more PPTPs, some programs received similar compatibility scores, while others registered in different scoring categories entirely. For instance, GA's four programs were scored as fully compatible (Malme, 1993), while NC's programs – PUV and WCLP – received partial (1.5) and full (Malme, 1993) compatibility rankings. This comes down to alternative program requirements operating within the same state. In NC, while the WCLP program is explicitly aimed at conservation practices that enhance wildlife habitats, the PUV program mandates FMPs and commercial harvest exclusively.

Overall, eight programs (57.14% of assessed) in five states were given full compatibility (Malme, 1993) scores for having no harvest requirements. Four programs across five states (28.57% of assessed) received partial compatibility (1.5–2) scores, while two projects in two states (14.29% of assessed) were classified as limited compatibility (0–1). For the programs

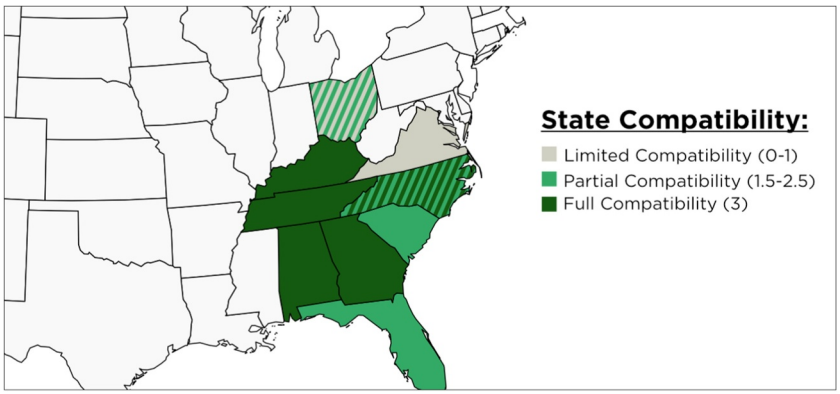

Figure 2. Compatibility results map.

Table 4. Compatibility score results.

State	Program	Harvest Score	FMP Score	Amendability Score	Overall Score
AL	Agricultural Land Classification	3	–	–	3
FL	Agricultural Classification (Greenbelt Law)	1	0*	0.5	1.5
GA	Preferential Agricultural Assessment (PAA)	3	–	–	3
	Conservation Use Valuation Assessment (CUVA)	3	–	–	3
	Forest Land Protection Act (FLPA)	3	–	–	3
	Qualified Timberland Property (QTP)	3	–	–	3
KY	Agricultural Land Classification	3	–	–	3
NC	Present-Use Value (PUV)	1	0	0.5**	1.5
	Wildlife Conservation Land Program (WCLP)	3	–	–	3
OH	Ohio Forest Tax Law (OFTL)	1	−0.5	−0.5	0
	Current Agricultural Use Value (CAUV)	1	0*	0.5	1.5
SC	Agricultural Special Assessment	1	1	–	2
TN	Agricultural, Forest and Open Space Land Act (Greenbelt)	3	–	–	3
VA	Land Use Value Assessment (LUVA)	1	0*	−0.5	0.5

*Some, but not all, counties require an FMP.
**Landowners permitted to create their own FMPs if they have the analytical skills.

that require harvest, four have conditions for FMPs at the county-level, one program requires FMPs statewide, and the other does not mandate FMPs despite having a harvest provision. Of those with FMP obligations, two need sign-off from a certified forester, while three do not.

Assumptions and limitations

While this analysis presents a comprehensive view of PPTPs and IFM project compatibility across the study area, several assumptions were made, and important limitations exist.

First, state-level program compatibility scores fail to capture variation at the county-level. This is significant for several programs where many enrollment and policy decisions are made by county administrators, either within the bounds of minimally applicable state-wide guidance (e.g., CAUV in OH, Greenbelt in FL) or with complete county discretion (e.g., Agricultural Land Classification in AL). To account for this, the most conservative view was taken, either utilizing state-wide policy to characterize PPTP compatibility or the behavior of the most restrictive counties. For example, some, but not all, counties in Ohio require FMPs for CAUV enrollment. Thus, the state itself was ranked +0 for the FMP score category, despite the fact that some counties do not require them. Acknowledging this, further research into this topic could include a survey of county officials in order to gain a more granular understanding of this policy and administrative environment, as well as county enforcement of state statue.

The ranking framework also rests on the assumption that harvest requirements and FMPs developed by certified foresters inherently limit compatibility. While requirements may make compatibility more difficult to achieve, this oversimplifies the relationship and potentially leads to an inaccurate understanding of how these programs interact with FMPs. Oftentimes, landowner-specific conditions often play a significant role in determining compatibility. For instance, a program with harvest requirements could possibly be just as compatible with an FMP as a program without FMP requirements depending on the specific goals and needs of the landowner. The current compatibility system fails to account for these nuances, like cases where landowners' harvest rotations run parallel to IFM project

requirements. In a similar way, FMPs involving certified foresters do not intrinsically curtailing compatibility with IFM projects. While they may add an additional layer of preventing enrollment, foresters could be just as likely to work with landowners to meet with dual objectives of PPTP and IFM participation.

As noted above, compatibility is assessed entirely from the perspective of the PPTP system, assuming that if PPTP requirements are satisfied, there will be no barriers to IFM enrollment. This obscures the fact that IFM projects may introduce additional compatibility concerns themselves, specifically related to additionality, permanence, and leakage. This underscores the need for future research into this subject.

Discussion

This section explores the policy implications of the results above, focusing on the decentralized ambiguity characterizing county-level discretion and lack of state guidance, varying levels of enforcement and interpretations, and proposed tax reforms. Subsequently, policy recommendations meant to enhance compatibility are made.

Decentralized ambiguity

While 85.71% PPTPs assessed ranked as fully or partially compatible with IFM dual enrollment, key issues remain that may complicate participation in both. One major challenge is decentralization; while some states administer and centralize program requirements at the state-level (e.g., PUV program in NC) others (e.g., Agricultural Land Classification in AL) grant a large amount of discretion to county governments. This trend has been identified in previous studies, which single out decentralization of a key contributor to program effectiveness (Hibbard et al., 2003; Ma et al., 2014). Interviewees reported that this patchwork of regulations resulting from decentralization makes it difficult for landowners to navigate and fully understand the regulatory environment in their state. For example, in FL, an interviewee noted that compatibility between the Greenbelt Law (which reviewed a partial compatibility score of 1.5) and IFM project enrollment heavily depends on whether county tax offices require FMPs. In VA, decentralization is further complicated by the fact that not all counties offer the LUVA program (limited compatibility score of 0.5) to landowners. Because compatibility so often hinges on harvest and FMP requirements, county discretion significantly contributes to a complex regulatory and policy environment for landowners.

Relatedly, most programs do not offer landowners a clear direction on compatibility. Out of the 14 programs assessed, only the PUV program (partial compatibility score of 1.5) in NC formally acknowledges how these programs might intersect. According to the PUV Program Guide, questions have arisen regarding the coexistence of carbon sequestration activities and the program (North Carolina Department of Revenue, 2023). It notes that "given the myriad of practices, it is impossible to address each practice directly," and if landowners would like to engage in a carbon market program and maintain their PUV eligibility, "the practices must not interfere with or diminish the ability of the land to meet the statutory requirements of the present-use value program" (North Carolina Department of Revenue, 2023). As a result, landowners are advised to "consult with the tax assessor prior to [forest carbon project] implementation" to ensure practices are compatible with the

program (North Carolina Department of Revenue, 2023). The guide goes on to explicitly state that FMPs can be written to include forest carbon projects, but the compatibility with the PUV program remains untested" (North Carolina Department of Revenue, 2023). Overall, even in states where compatibility exists according to the ranking system employed in this study, the lack of official communication and reliance on local-level discretion make it difficult for landowners to access dual enrollment opportunities. Without explicit codification in state law and/or explanation in program documentation, many may remain hesitant to engage in carbon markets out of fear they may lose their PPTP tax benefits.

This could be addressed with clearer guidance on IFMs or alignment between carbon sequestration and PPTP objectives, as seen in the PUV program in NC and FLPA program in GA (full compatibility score of 3). As outlined above, the PUV Program Guide acknowledges that questions have arisen about the coexistence of carbon sequestration activities and PUV eligibility. The guide advises landowners that while carbon projects may be included in FMPs, compatibility remains untested, requiring consultation with local tax assessors. Meanwhile, the FLPA program explicitly recognizes carbon sequestration under the state's Carbon Sequestration Registry as a permissible secondary land use (Georgia Department of Revenue, n.d.). Without clear strategies at the state-level, landowners are left to navigate these complexities independently, often without a full understanding of their options, with this lack of structure leaving many landowners unsure where to start, highlighting the need for states to play a more active role as market stewards.

Also, contributing to the fragmentation of state policy environments is the existence of multiple PPTP offerings within the same state, each with distinct eligibility criteria and administrative oversight. Three states (33.33% of assessed), GA, NC, and OH, all have two or more programs. In some states, this is in order to capture different types of forest landowners. For example, in NC, the PUV program is intended for landowners engaged in commercial harvest, while the WCLP program (full compatibility score of 3) is meant for landowners managing their property for conservation purposes (North Carolina Wildlife Resources Commission, n.d.). However, in states like GA and OH, the distinction between programs is less straightforward, with deciding between the program offerings depending on factors like ownership size, enrollment length, and comparative tax benefits. With multiple PPTPs available within a single state, dual enrollment may be hindered by the added complexity of navigating differing eligibility requirements, management expectations, and administrative procedures. This can complicate compliance decisions for landowners and create uncertainty about how participation in one program may affect eligibility for another, particularly when engaging in IFM projects. Although this study assesses compatibility at the individual program level, future research should examine how the coexistence of multiple PPTPs within a state influences overall compatibility and whether it compounds broader challenges related to decentralization and the absence of clear, centralized state guidance.

Enforcement and interpretation

Although enforcement practices and interpretations of harvest and FMP requirements were not included as factors influencing overall compatibility scores, they emerged as critical issues during interviews.

A key insight that emerged from conversations with stakeholders is that enforcement mechanisms vary considerably by geography and often shaped by local capacity and fiscal incentives. Some counties conduct regular audits or field inspections, while others rely on landowner self-reporting. In NC, interviewees highlighted the limited enforcement of FMPs, noting that enforcement appears less stringent in rural counties compared to urban ones, where shorter evaluation cycles and stricter audits upon application are more common. This heightened scrutiny appears aimed at limiting enrollment in the PUV program to minimize revenue loss. In contrast, rural counties often lack the administrative resources to perform routine checks, resulting in more lenient or inconsistent enforcement.

Interviewees also highlighted a wide range of interpretations regarding what constitutes compliant forest use. For example, in AL, forestland is classified as "supports a forest growth or which under prevailing natural and economic conditions may be expected to support such a growth in the future or which is being used or reserved for any forest purpose" (Justia, 2024). To receive agricultural land classification (full compatibility score of 3), this definition must be meant. In practice, however, this requirement is interpreted quite flexibly: as long as a landowner is growing and managing a crop, they meet the standard regardless of whether any harvest occurs or whether there is a timeline for doing so. Theoretically, land could remain forested without active harvesting and still qualify, so long as it retains potential for future production. This view is replicated in other states, including GA and KY, whose programs focus on preventing land-use conversion over active management. These findings highlight a critical disconnect between policy design and implementation. The wide variation in both enforcement and interpretation may undermine the objectives of PPTPs, as inconsistent application weakens accountability and opens the door for noncompliance. Future research should more explicitly examine how enforcement regimes and interpretive practices influence policy effectiveness and compatibility with IFM projects and conservation goals more broadly.

Landowner interest and compatibility

In interviews, participants were asked to gauge landowner interest in voluntary carbon markets, revealing a range of perspectives that highlight both enthusiasm and skepticism. Oftentimes, this was within the same state. In AL, some interviewees noted that landowners were actively being approached and showed interest in potential income, prompting new educational and research efforts. However, others cited a lack of inquiries, possibly due to low carbon credit prices or the dominance of softwood forests and robust timber markets reducing voluntary market appeal.

In GA and KY, interest was more consistently positive, especially given past programs like Natural Capital Exchange (NCX) in KY that had proven beneficial to landowners. NC presented perhaps the most complex picture: interviewees reported that while some landowner, especially larger non-industrial and conservation-minded ones, were intrigued by the possibility of revenue with minimal behavior change, others lacked awareness or expressed concern over compatibility with the PUV program.

In OH, interest was reported to be generally low, with some suggesting that landowners might be interested if better educated, while others emphasized autonomy and confusion as barriers. SC echoed similar sentiments: informed landowners showed interest, especially those with idle land, but smaller landowners often preferred retaining

land as a financial safety net rather than enrolling in long-term contracts. TN participants described landowner curiosity but noted a prevailing sense of caution or disinterest, with some dismissing the markets as scams or too complex. Finally, in VA, while both small and large landowners demonstrated interest, evidenced by well-attended seminars, concerns lingered about long-term restrictions and the impact on forest product supply.

These mixed responses suggest that while interest in VCMs exists, it is highly contingent on landowner education, trust, contract length, economic incentives, and compatibility with existing land management goals. Additionally, due to the difficulty of quantifying these numerous and often contradictory responses on a standardized or statistically meaningful scale, the potential relationship between landowner interest and compatibility scores was not explored further. Future research should be conducted to better examine this to better inform more equitable and effective VCM outreach strategies.

Sustainability and conservation in tax policies

Throughout stakeholder interviews, many participants suggested altering the underlying structure of PPTPs to encourage greater participation in IFM projects among small, non-industrial forest landowners. This argument is made in line with Pigouvian economic, which states that regulators should subsidize positive externalities and tax negative ones (Baumol & Oates, 1988; Pigou & Pigou, 1921). Accordingly, PPTPs are justifiable when they support environmental benefits with positive externalities, but harder to defend when they influence the production of market goods like timber which do not inherently generate positive externalities and in some cases, it may cause negative externalities (Kline & Alig, 2001; Tietenberg & Lewis, 2018; Wear & Greis, 2013). Indeed, while PPTPs have historically geared toward commercial timber production, many landowners now prioritize long-term ecosystem health, which may put them at odds with existing tax systems (Butler et al., 2021). For example, interviewees noted that policymakers in TN recognize that revising the state's Greenbelt program (full compatibility score of 3) could better accommodate landowner participation in conservation and carbon-oriented programs. Given the increasing prominence of forest carbon programs and federal conservation initiatives like the Environmental Quality Incentives Program (EQIP), states could revise tax codes to more easily facilitate dual enrollment (Environmental Working Group, n.d.; Wallander et al., 2021). This could involve incorporating sustainability and conservation practices as qualifying criteria for PPTPs, alongside commercial harvest requirements.

However, tax policy reforms remain politically sensitive. For one, preferential tax treatments for agricultural and forestlands create fiscal challenges for state and county governments. This is because PPTPs can result in revenue shortfalls, particularly in rural counties where a significant portion of land is tax-exempt or taxed at reduced rates. As one interviewee noted, counties with large agricultural tax bases lose substantial revenue due to PPTP arrangements, compelling them to find alternative sources of funding. The state government in KY, according to one interviewee, forfeits an estimated $45 million annually in property tax revenue from counties due to deferred assessments. In response, some counties have implemented more stringent enrollment criteria, while others have increased real property taxation on non-agricultural properties, such as homesteads, to offset losses. These fiscal trade-offs have broader implications for agricultural communities, local

economies, and tax policy, raising questions about how to balance incentives for conservation with the financial needs of local governments.

Recommendations

Based on the discussion above, several recommendations emerge to improve alignment between PPTPs and IFM projects. First, states should develop and disseminate clearer, centralized guidance regarding the compatibility of PPTPs with carbon sequestration activities. This could involve codifying IFM eligibility within PPTP statutes and guidance documents, providing model language for FMPs that incorporate carbon practices, and requiring or encouraging tax assessor consultations to give landowners greater certainty before enrolling in carbon programs.

Given the significant variability in interpretation and enforcement at the county level, particularly in decentralized states, further steps are needed to promote consistency. States could establish minimum enforcement standards or audit protocols to help reduce the urban-rural divide in scrutiny. Additionally, offering training or state-funded support to under-resourced counties could promote more uniform interpretation of FMP and harvest requirements. Creating a centralized state review mechanism for compatibility issues would also reduce the burden on local offices and improve interpretive consistency.

Modernizing PPTP eligibility requirements to reflect conservation priorities would further expand opportunities for dual enrollment. Reforms could include expanding eligibility criteria to explicitly recognize carbon sequestration, reforestation, and stewardship as valid primary or second land uses (such as FLPA in GA), and allowing for long-term carbon project contracts provided the land remains under sustainable forest management.

Finally, addressing uneven landowner interest in voluntary markets participation is essential. Many landowners are deterred by confusion, mistrust, or a lack of awareness. States, universities, nonprofit organizations, and market actors should develop targeted outreach campaigns that address local concerns and highlight the potential benefits and trade-offs of participation. They could also create decision-support tools or cost-benefit calculators that consider both PPTP and carbon market dynamics, and facilitate peer-to-peer learning through landowner networks and success stories, particularly in rural communities.

Conclusions

This study highlights the complexities of dual enrollment in preferential property tax programs (PPTPs) and improved forest management (IFM) forest carbon offset (FCO) projects (hereafter, IFM projects), underscoring the need for clearer policies and guidance for landowners. While many PPTPs appear to be fully or partially compatible with dual enrollment in IFM projects, significant practical barriers not fully captured by the ranking system likely remain, particularly regarding decentralization, lack of state-level direction, and inconsistencies in program structures, enforcement, and interpretation.

Future research should expand this evaluatory framework to additional states to determine whether the observed patterns hold across different political and policy landscapes. Another key area for exploration is the degree of decentralization and discretion given to the county-level for administration and program enforcement,

which could be examined through surveys of county tax officials to assess how local discretion influences compatibility. This could also include an analysis of states with multiple PPTPs to understand how this may further complicate landowner decision-making and contribute to fragmented policy environments. Additionally, more work is needed to establish an empirical connection between interest in voluntary markets and compatibility between PPTPs and IFM projects, which will better inform outreach and engagement efforts. Finally, future work should investigate compatibility concerns beyond the scope of this study's harvest and PPTP-focused assessment, particularly regarding additionality, permanence, and leakage-three core principles of carbon offset integrity. Understanding these issues would provide a more comprehensive picture of the challenges and opportunities landowners face when considering dual enrollment.

Further empirical research is also needed to explore how compatibility issues manifest in practice. Key questions include whether the perceived risk of losing PPTP benefits discourages landowners from pursuing IFM participation, how many current PPTP landowners' express interest in enrolling in carbon markets, and how many have actively attempted dual enrollment. Answering these questions would help policymakers and researchers better understand the extent of demand for integrated participation in both programs and where the most significant barriers lie.

The primary contribution of this study is its role as the first formal analysis of compatibility between PPTPs and IFMs, laying the groundwork for more focused analyses. It builds upon prior research that has examined barriers to IFM enrollment by introducing PPTPs as a potential mechanism to facilitate participation among small, non-industrial landowners (Miller et al., 2012, 2014; Wade & Moseley, 2011). While past studies have explored enrollment patterns and program incentives, this research extends the discussion by focusing specifically on the structural compatibility between tax incentives and carbon markets. By identifying areas of alignment and potential conflict, particularly around harvest mandates and forest management planning, this study provides a foundation for policymakers and researchers seeking to harmonize these programs in ways that maximize their collective benefits for landowners, conservation objectives, and long-term carbon sequestration.

These insights also contribute to broader debates about the design and coordination of forest conservation incentives, particularly in the U.S. South, where non-industrial private forest owners manage approximately 86% of forestland (Butler & Leatherberry, 2004; Wear & Greis, 2013). According to 2018 NWOS data, smaller landowners in the U.S. South have higher average enrollment rates in PPTPs, raising the importance of exploring PPTP and IFM dual enrollment as the voluntary carbon market expands to this region (U.S. Forest Service, 2023). With this paper, understanding how existing frameworks interact is critical to scaling participation without creating unintended disincentives to enroll in one program type over another. This study also speaks to the wider literature on the implementation challenges of forest carbon payment schemes by highlighting the financial and regulatory frictions that can complicate enrollment decisions (Khanal et al., 2019; Markowski-Lindsay et al., 2011; Miller et al., 2012, 2014; Soto et al., 2016; Wade & Moseley, 2011). Ultimately, clarifying program compatibility and offering actionable guidance on best practices can help ensure that landowners are empowered to make informed decisions, while supporting efforts to advance stewardship, sustainable management goals, and economic resilience in the forestry sector.

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APPENDICES

Appendix A

Table A1. Key program provisions.

State	Program	Acreage	Harvest	FMP	Tax Benefit
AL	Agricultural Land Classification	Minimum of five acres, less than five acres requires additional data	No harvest requirements	No FMP required	CUV, rather than FMV
FL	Agricultural Classification (Greenbelt)	No minimum or maximum acreage requirements	Harvest required	FMP requirements vary by county	CUV, rather than FMV
GA	Preferential Agricultural Assessment (PAA)	Maximum of 2,000 acres	Harvest left to landowner discretion	Applying with less than 10 acres, some counties require FMPs	30% FMV
	Conservation Use Valuation Assessment (CUVA)	Maximum of 2,000 acres	Harvest left to landowner discretion	Applying with less than 10 acres, some counties require FMPs	40% CUV
	Forest Land Protection Act (FLPA)	Minimum of 200 contiguous acres	Harvest left to landowner discretion	Applying with less than 10 acres, some counties require FMPs	40% CUV
	Qualified Timberland Property (QTP)	Minimum of 50 contiguous acres	Harvest left to landowner discretion	Recommended, but not required	Assessed at QTP value, which cannot be < 175% of the property's FLPA value
KY	Agricultural Land Classification	Minimum of 10 contiguous acres	No harvest requirements	No FMP required	CUV, rather than FMV
NC	Present-Use Value (PUV)	Minimum of 20 acres	Harvest required	FMP required	CUV, rather than FMV
OH	Ohio Forest Tax Law (OFTL)	Minimum of 10 contiguous acres	Harvest required	FMP required	50% reduction in FMV
	Current Agricultural Use Value (CAUV)	Minimum of 10 acres or demonstrate an average gross/ projected income of at least $2,500 per yr for three yr	Harvest required	FMP requirements vary by county	35% CUV
SC	Agricultural Special Assessment	Minimum of five acres	Harvest left to landowner discretion	FMP requirements vary by county	4–6% FMV
TN	Agricultural, Forest and Open Space Land Act (Greenbelt)	Minimum of 15 acres, maximum of 1,500 acres	No harvest requirements	FMP required	25% CUV
VA	Land Use Value Assessment (LUVA)	Minimum of 20 acres	Harvest required	FMP required	CUV, rather than FMV

Appendix B

Interview Protocol

My name is _____, I am _____ at the Michigan State University, Forest Carbon and Climate Program (FCCP). The FCCP is an institute in the Department of Forestry at MSU that's actively engaged in research and knowledge transfer on a diversity of topics related to forest carbon, including forest ecology, carbon modelling, harvested wood products, carbon markets, and state forest policies.

This project is interested in the overlap and any barriers to compatibility between state property tax programs and forest carbon projects associated with voluntary carbon markets. For context, forest carbon projects necessarily alter landowner forest management practices, sometimes reducing or delaying timber harvesting regimes, in order to sequester and store more carbon. We will ask you a series of questions about forest property tax programs in your state, specifically about their administration, eligibility, and implementation.

Thank you very much for taking the time to interview with us! Participation in this interview is fully voluntary, and you may refuse to answer any question or withdraw at any time. All information will be kept confidential and anonymous. Do you consent to participate? If so, do you consent to having the interview recorded for internal reference purposes?

(1) Please describe your position and how your role relates to the _____ program(s).
(2) How many landowners participate in the _____ program(s)?
    (a) Is it popular amongst private landowners? Particular groups more than others (e.g., smaller non-industrial versus larger industrial owners)?
    (b) If not popular overall or among particular groups, why do you think this is the case? Lack of awareness? Insufficient incentive? Other barriers?
    (c) Have there been any trends or shifts in landowner participation, e.g., increasing or decreasing enrollment/adoption overall or by landowner type?
    (d) Any indication of future changes?
(3) It seems that _____ program has _____ harvest requirements.
    (a) What determines the quantity and time frame of the required harvest? Do wood land managers or conservation foresters play any role here?
    (b) How is this harvest requirement interpreted in practice?
    (c) How is it monitored?
    (d) How is noncompliance treated?
    (e) Are there any allowable exceptions for noncompliance?
(4) Are forest management plans required? And who is able to develop them (e.g., certified foresters only or the landowners themselves)?
    (a) Do these plans prescribe specific amounts to be harvested within a given timeframe?
    (b) How precisely are those prescriptions given (e.g., how large might the ranges for harvest amount and timeframe be)?
    (c) What is the typical length of harvest rotations prescribed?
    (d) How amendable are forest management plans (both in terms of timeline and scale of harvest)? And who is able to amend them (e.g., certified foresters only or the landowners themselves)?
    (e) Who ensures changes fulfil program requirements?

    (1) Are there any other management/enrollment requirements?
    (2) Does the _____ program vary from county to county in terms of what is expected of landowners and who can participate (i.e., is there some county-level discretion), or are practices and landowner expectations fixed at the state-level?

(3) *[IF MULTIPLE PROGRAMS]* I am wondering about the overlap between _____ programs. Are landowners able to enroll in both? Is there a benefit to doing so?
(4) How would you describe the general approach to voluntary carbon markets in your state (e.g., encouraging or opposing landowner participation, interest in providing awareness about them, etc.)?
(5) From your perspective or experience, do you believe there is an interest in voluntary carbon markets among private landowners? If so, which types of landowners (e.g., family forest land, smaller non-industrial owners, large industrial owners, all types equally)?
(6) If a landowner *reduced* harvest (but did not stop altogether) for 10 years as part of a forest carbon project, is your understanding that they would be out of compliance with the _____ program? How about . . .

(a) 20 years?
(b) 100 years?
(c) How much less could they harvest and still be considered compliant?
(d) What if they stopped harvesting altogether for those time periods?

(1) What if a landowner reduced or stopped harvest for other reasons? That is, not because of a forest carbon project? If they just stopped seeing economic benefit in harvesting, for instance.
(2) From the state forest property tax perspective, could a landowner enroll *part* of their land in a forest carbon project (and reduce or stop harvest on those areas accordingly) without falling out of compliance with the _____ program? (i.e., if they continued to harvest on their other lands?)
(3) Does the _____ program apply tax benefits to residual acres? For example, forests land that borders agricultural land on the same parcel.
(4) Have you ever encountered any conflicts or misunderstandings related to the interaction between FCPs and the _____ program? Among landowners or between program administrators, as examples.
(5) Do you see preferential tax programs in your state evolving in the future? More lenient requirements? Stricter?

(a) *[If MULTIPLE PROGRAMS]* If so, which programs? And what factors do you think will drive these changes?
(b) If not now, do you think compatibility with voluntary carbon markets might be something your state will strive to change in the future (in either direction – more or less compatible)?
(c) Have there been any efforts to move toward compatibility with voluntary carbon markets in the past?

(1) That you know of, are there any organizations or interest groups in the state with strong opposition to VCMs and forest carbon projects?
(2) Are there any other factors or considerations that you believe are important to understand when examining the current or potential interaction and compatibility between voluntary carbon markets and preferential forest property tax programs in your state?
(3) Are there any other people or organizations you could recommend I reach out to about these questions?