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Key Accounting Principles for Improved Forest Management Projects within the Forest Protocol

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Climate Action Reserve, May 22, 2019

Key Summary Points of the Protocol's Accounting Principles

1. Improved forest management projects enable forests to transition to sustainable forests that are more resilient to impacts of climate change, appropriately stocked, have larger and older trees, maintain high growth rates, and often will result in higher production of wood products than in the baseline case over the project life.

2. Important greenhouse gas accounting themes within the protocol, such as baselines, additionality, environmental safeguards, and leakage risk, are assessed over a 100-year timeframe. The current literature discussing leakage risks in forests is very limited and highly variable and is not appropriate for use in the context of a 100-year offset project.

3. Standardized baselines, with a basis in carbon stocking among landowner peers defined for each forest type, are used to account for the fact that potential baseline outcomes are hypothetical (i.e., one cannot know a future outcome that will not occur).

4. Forest carbon stocks are continually at risk of degradation or conversion, particularly given the frequency of timber market fluctuations and land transactions, which are largely motivated by timber and alternative land use value. Forest carbon projects remove these risks with guaranteed monitoring reporting and verification for the next 100-years plus. The long-term result of forest carbon projects will be bigger, older, and more resilient forests, many with enhanced productivity. More than 8 million acres are enrolled in the program now and those forests will be managed sustainably for at least the next 100 years.

5. Crediting in the forest protocol is conservative due to:
   a. A conservative baseline. Forest carbon projects with high initial carbon stocks relative to the project's peers are only able to capture a small portion of the emissions associated with potential degradation and conversion. However, all forest carbon must at least be maintained for a project life that exceeds 100 years.
   b. All projects contribute approximately 15-20% of their credits to an insurance buffer pool that backstops emissions associated with project failure, principally as the result of fires, floods, hurricanes, and other natural disturbances.
   c. No accounting is included for carbon accumulations in soils, litter, and duff, which together account for about 40% of the total carbon in a forest, even though these carbon pools increase substantially as part of a forest carbon project.

d. Leakage risk of about 37% for shifting harvest and wood products emissions is assessed as a deduction in the quantity of credits only when it detracts from project crediting due to lower harvest levels. A similar 'positive' leakage value is not issued for projects that harvest more wood products than in the baseline analysis.
e. Carbon in wood products in landfills is only accounted for when baseline harvest exceeds project harvest, i.e., reduces the number of credits received. Projects do not receive credits for carbon stored in landfills when project harvest exceeds baseline harvest.

Introduction

The forest carbon offset protocol in use by the State of California as part of its compliance offset program, as well as the one in use by the Climate Action Reserve for its voluntary offset program, share a common history. Understanding the key terms and definitions within an offset protocol requires an appreciation of the history of the development of the protocol, how the key principles for rigorous offset credits are addressed in the protocol, and the function the protocol serves in the market. This document seeks to provide this crucial context, allowing readers to arrive at a common understanding of what the protocol is and how it is intended to function.

History of the Climate Action Reserve and the Protocol Development Process

The Climate Action Reserve was originally chartered by California State legislation in 2001 (as the California Climate Action Registry) to address GHG reporting and soon evolved to encourage and recognize early voluntary actions to reduce emissions, as a precursor to California's impending climate action legislation. After AB32 was passed in 2006, the Reserve's focus shifted to helping to establish a North American carbon offsets program. Under this initiative, the Reserve developed new, and updated existing, voluntary offset protocols – several of which were ultimately adopted by CARB for use in the cap and trade compliance program.

The protocol development process undertaken by the Reserve has always used a public, transparent, and multi-stakeholder process. This process includes input from experts, and an iterative process involving workgroup and public comment periods. Protocol concepts are assessed for conformance with the following criteria that are crucial to the implementation of a robust carbon offset market, and are required by California law:

1. **Offsets must be real.** This involves complete, conservative emissions accounting (i.e., err on the side of recognizing lower, not higher, emission reductions), that includes secondary effects ("leakage").

2. **Offsets must be additional.** GHG reductions must be in addition to actions that would have occurred in the absence of the offsets market.
3. **Offsets must be permanent,** and any reversals must be fully accounted for and compensated. For the sake of sequestration projects, "permanent" is defined as carbon held out of the atmosphere for a period of 100 years.
4. **Offsets must be verified,** through independent third-party review.
5. **Offsets must be enforceable** in that their ownership must be unambiguous, and measures must be taken to avoid double-counting.

The Reserve also strives to ensure offset projects cause no harm, and that ideally, they provide environmental and/or social benefits beyond mitigating for climate change. Protocols developed by the Reserve also strive for practicality, to promote cost-effective climate action and reduce potential barriers to implementation.

Offsets Successfully Defended in Previous Challenges to Additionality

At the launch of California's cap and trade program, there was a significant challenge to the fundamentals of offsets. In 2012, Citizens Climate Lobby and Our Children's Earth Foundation filed a lawsuit asserting that the offset program would result in the issuance of non-additional offset credits. After a full vetting in court, it was ruled that offset credits issued under California's cap and trade program are additional and that the use of a performance standard approach for additionality was justified.[1]

The court decision was made with the full understanding that it is impossible to absolutely identify the timing when an offset would occur; any effort, under any protocol, to determine what would have happened in the absence of an offset market must inherently rely on counterfactual assumptions (i.e., what might have happened in the future if the project had not occurred).[2] Since such assumptions about the future must be made, the Reserve conservatively applies the best available data to establish standardized business-as-usual baselines to ensure offsets issued are "real" as detailed above. Standardized baselines are used in forest projects as conservative projections of the myriad of potential business-as-usual outcomes for a project area. Any activities beyond these conservative baselines have been deemed to be additional. This is described in further detail below.

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1 https://oag.ca.gov/sites/all/files/agweb/pdfs/environment/ocef-v-arb-offsets-case-1st-dca-opinion.pdf

2 Intervenor Climate Action Reserve's Opposition and Joinder in Respondent CARB's Opposition to Petitioner's Brief on the Merits, 2012.

History of the Reserve's Forest Project Protocol

2003 - 2007

Forest projects were introduced under the Reserve's first offset protocol (the Forest Project Protocol version 1.0) in 2005. Several updates to the protocol occurred in rapid succession, which resulted in the first voluntary credits being issued in early 2007 under version 2.1. Those projects were of a type titled "Conservation-based Forest Management" that required the implementation of a conservation easement on project lands. All projects submitted under version 2.1 allowed for timber harvest activities.

Under version 2.1, the project's baseline was determined in terms of maximum legal harvest levels, i.e., assuming that in the absence of the project, the landowner would harvest to the maximum extent allowed by law. Maximum legal harvest was modeled in a dynamic fashion, with growth and harvest fluctuating over the 100-year baseline period, resulting in a "sawtooth" baseline as carbon stocks increase with forest growth and decline with periodically assumed harvest events. This approach was not nearly as conservative as the approach implemented today, which is described below.

The "sawtooth" approach included the inevitable "ups" and "downs" of periodic growth and harvesting and made basic project quantification extremely complex, introducing an unnecessary barrier to entry for forest owners wishing to undertake an offset project. Furthermore, the V2.1 baseline approach created artificial reversals, due to the lack of alignment of project harvests and baseline harvests. That is, while these fluctuations may have been artificially associated with specific years in the baseline, harvests under the baseline scenario were in no way guaranteed to have occurred in any given year.

As described above, all offset project baselines must make assumptions about a hypothetical future scenario, with a myriad of different potential outcomes depending on the exact timber management scenario used. Throughout a project lifetime of 100 years, the potential outcomes for a given forested area might also include conversion to housing, vineyards, parking lots or some other land use. The protocol required the landowner to make educated assumptions about what would happen on the land in the absence of the carbon market; however, this process was not as refined under version 2.1 of the protocol as the methodologies implemented today.

2007 - 2011

During development of the Version 3.x series of the Forest Project Protocol, which was initiated in 2007, the Reserve again implemented a two-year stakeholder workgroup process, with numerous opportunities for public input. The stakeholder workgroup consisted of foresters, government personnel, environmental personnel with expertise in climate change, and academics. The process was transparent and there were many public comment periods. Information regarding the protocol development process can be found on the Climate Action Reserve's website: http://www.climateactionreserve.org/how/protocols/forest/dev/version-3-0/.

A key component of the 3.x Forest Project Protocol was the integration of a performance standard into the standardized baseline approach, which is used as a key determinant of additionality. While the various concepts for addressing additionality all have the same goal of determining if the project actions would have occurred in the absence of the project, the standardized baseline approach has the advantage of adding clarity to carbon markets and reducing transaction costs.[3] Several important policy decisions were made pertaining to standardized project baselines:

1. Standardized project baselines would no longer be based on the maximum legal harvest level. Projects would be required to show that assertions of baseline harvests were both legally permissible and financially feasible (see Figure 1). Adding the lens of financial feasibility raises the baseline, leading to more conservative, and realistic, project accounting. There was a heightened focus on what the population of similar land actors are doing based on the timber market instead of what they could do based on what is allowed for by law.

2. Standardized project baselines would further be constrained by the implementation of "Common Practice." Common Practice is a metric of average carbon stocking across geographically and ecologically similar private forest land and serves as a performance standard for the forest protocol. As a performance standard, it provides a practical benchmark for what "business-as-usual" forest management activities are, based on an impartial third-party data source[4] that can be updated over time and used as a long-term check against leakage. Baselines may not assume management operations below Common Practice levels, which creates a conservative backstop on what projects may otherwise assert as legally permissible and financially feasible baseline harvest scenarios that would yield more credits.

3. Standardized project baselines were averaged. The averaging of the ups and downs of forests' carbon stocks due to forest growth and harvest cycles simplifies project quantification, allowing us to overcome the impracticalities associated with the "sawtooth" baselines of version 2.1, as discussed above. This improved methodology creates a standardized baseline value that remains constant for the full 100-year project crediting period. The use of standardized baseline approaches is well-recognized in national and international efforts to develop baselines that are simple, cost-effective, objective, predictable, and scalable.[5]

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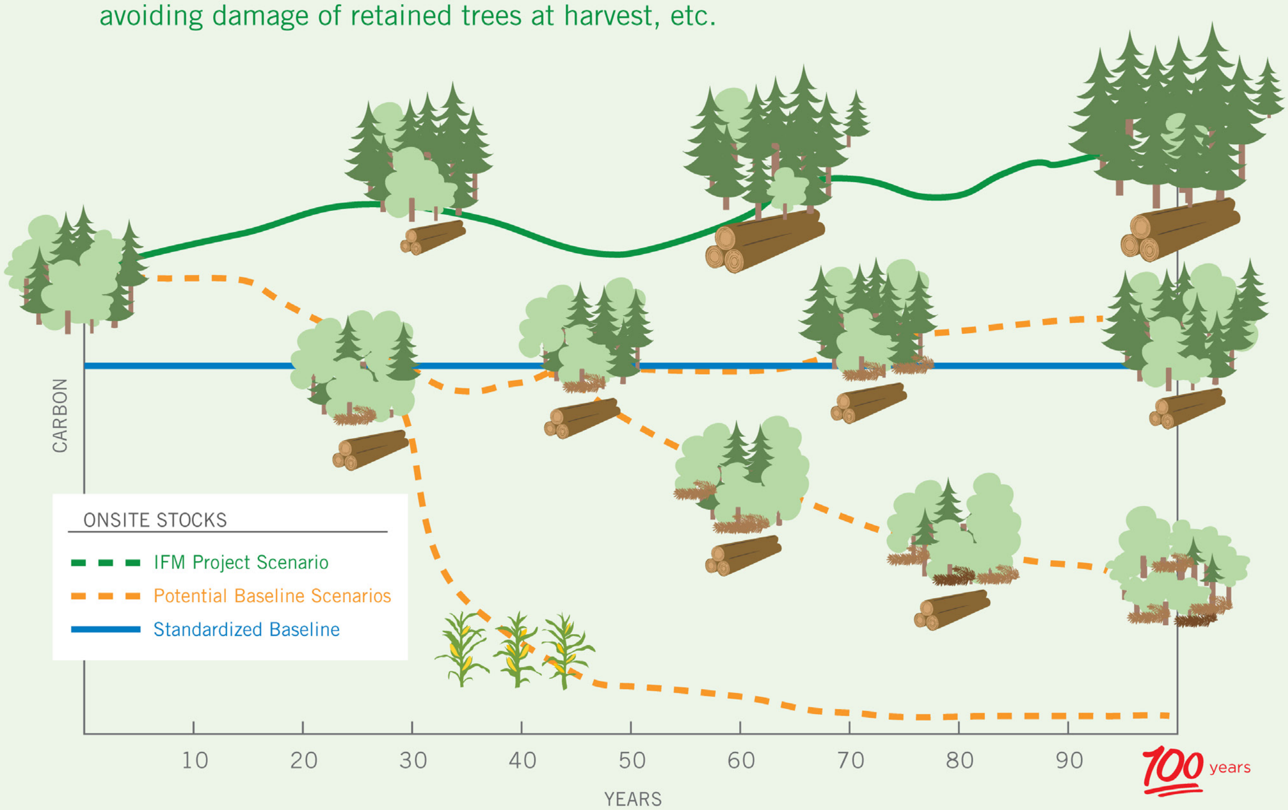
[3] Trexler, Mark C., Derik J. Broekhoff and Laura H. Kosloff. "A Statistically-driven Approach to Offset-based GHG Additionality Determinations: What Can We Learn?" Sustainable Development Law & Policy, Winter 2006, 30-40.

[4] Common Practice values are established using data from the US Forest Service's Forest Information and Analysis program (FIA). For more information on Common Practice, please refer to: http://www.climateactionreserve.org/wp-content/uploads/2010/02/Description_of_Assessment_Areas.pdf

[5] UNFCCC. Standardized Baselines. April 2019. Accessed at: https://cdm.unfccc.int/methodologies/standard_base/2015/sb62.html, Western Climate Initiative. Offset System Essential Elements Final Recommendations Paper. July 2010. Accessed at: http://www.westernclimateinitiative.org/document-archives/Offsets-Committee-Documents/Offsets-System-Essential-Elements-Final-Recommendations/, UNDP. Guidance Note: Standardized Baselines. December 2013. Accessed at: https://www.undp.org/content/dam/undp/library/Environment%20and%20Energy/MDG%20Carbon%20Facility/Guidance%20note_SB_20%2012%202013.pdf

Improved Forest Management Project Scenario: IFM includes activities such as growing older forests, stocking improvement, retention of the best-growing trees, avoiding damage of retained trees at harvest, etc.



Potential Baseline Scenarios: There are multiple potential outcomes for a given project area, most of which are based on management that is focused on short-term economic returns. This may occur through short rotations, harvesting the best-growing and most valuable trees, and leaving only slow growing or poorly formed trees, or even conversion to other land use.

Standardized Baseline: A representation of business-as-usual for the project, which is based on an analysis of legally-binding and financially feasible criteria, and further governed by a performance standard, which is a statistic of average carbon stocking within a given forest community (common practice) and is conservatively defined to avoid over-crediting.

Figure 1. The relationship of project activities to the myriad of potential baseline scenarios and the standardized baseline.

This version of the protocol also established the Improved Forest Management (IFM) project type. This project type replaced the "Conservation-based Forest Management" type and served as a better reflection of the kinds of project activities expected under the protocol. The idea with IFM is not to preserve forestland and set it aside, which creates a high risk of forest management activities shifting to other lands as potential leakage. Instead, the protocol was designed to encourage landowners to actively manage their forests for both increased forest carbon and the production of harvested wood products over 100 years. Carbon funding is the key to providing the investment needed to move forest management in this direction since such changes in management present an opportunity cost to the landowner. Version 3.2 of the forest protocol was adopted and adapted by the California Air Resources Board, becoming the 2011 Forest Offset Protocol.

Context for Additionality under the Forest Project Protocol

The goal of an IFM project is that forest landowners will contribute to long-term increases in carbon stocking on their project sites while also increasing the productivity of their forest over the long term. To the extent carbon funding (i.e., credit generation) influences management decisions, project owners are encouraged to manage for healthy, vigorous forest growth up to the time in which growth declines, a point known in forest management as the culmination of mean annual increment, or CMAI. Carbon markets serve as an incentive to leave the best trees to grow toward CMAI before initiating management activities, rather than cashing in on the same trees for timber revenue before their maximum biological growth has been achieved. As an example, redwood trees are often harvested when the trees are less than 65 years old, although redwood forests continue to accrue carbon at rapid rates until at least twice that age, at which point the amount of wood products generated is substantially increased.

The forest project protocol was developed with a 100-year landowner commitment as a fundamental precursor to participation. The concepts around defining additionality, identifying a reasonable baseline, and determining leakage were all developed within that timeframe of 100 years.

The protocol requires that forest carbon stocks must be maintained or increased throughout the project life, even if peers within the same forest community manage their forests at reduced inventory levels.

Fifty-six percent of the 751 million acres of forest land in the United States is privately owned. Over 290 million acres is owned by family forest owners, with 1 in 6 of those acres owned by people who plan to sell or transfer some or all their forest land in the next 5 years.[6]

It is impossible to predict landowner behavior, especially over a project life of 100 years. But the protocol's 100 year plus project life is appropriate to ensure the forest remains in forest cover and enables the forest to respond to management improvements.

A definition of 'Business as Usual' must be constructed by recognizing that forest management for any given tract of land will change, either by market demands or by new ownership. The forest protocol accomplishes this through a standardized baseline design that assesses risks of emissions from harvesting based on current practices of the population of landowners within the same forest community, along with project-specific analysis for legal and financial constraints.

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[6] Butler, B. J., et al. 2016. "Family Forest Ownerships of the United States, 2013: Findings from the USDA Forest Service's National Woodland Owner Survey." Journal of Forestry 114 (6): 638–47. doi:10.5849/jof.15-099.

As a result, the risks associated with future land use conversion to non-forest uses and the depletion of forest inventories through aggressive harvest are eliminated once a forest carbon project commences and for the length of time a project remains engaged in the project.

Forest projects recognize additionality through both the maintenance of existing carbon (avoiding emissions from existing in-forest stocks) and increases in the amount of CO2 removed from the atmosphere relative to business-as-usual management as carbon stocks increase. Additionality in the Forest Project Protocol is justified by the following baseline assumptions:

- Emissions result from the clearing of trees to convert a forest to another land use or from harvest activities that reduce average in-forest carbon stocking. Once enrolled, a project cannot convert their forest to another land use without a considerable penalty.[7]

Penalties for early termination of forest carbon projects is intended to ensure that project additionality is achieved. Projects that terminate within 50 years of the project start date compensate (purchase credits to replace the project credits) with up to 140% of the issued credits. This compensation rate gradually decreases to a 1 to 1 compensation, because the likelihood that the baseline scenario would have been realized in the absence of the project increases over time. All projects that terminate prior to 100 years must compensate for all of their credits.

- In-forest carbon stocks are at risk of substantial reductions in stocking from unsustainable harvesting over a 100-year time scale due to market influences that affect the landowner's decision to harvest. There is risk in any given year, but the counterfactual nature of the baseline means there is no guarantee when those risks would have been realized. However, the Forest Project Protocol addresses this risk by requiring that all project stocks be maintained or increased at all times, as demonstrated through 100 years of monitoring, reporting, and independent 3rd party verification following the final credit issuance.

The Forest Project Protocol contains additional conservativeness measures beyond a conservative baseline that extends over 100 years. They include deductions based on statistical uncertainty for forest inventory estimates, contributions to the buffer pool (i.e., 15-20% of the total credits), deductions for the risk of leakage occurring over the project life, deductions for market responses to wood product production, and the exclusion of recognized benefits from carbon pools that have greater levels of uncertainty, such as lying dead wood and soil carbon.

[7] Early project termination requires that all previously issued credits (or more than the previously issued credits, in the case of IFM projects) be compensated for by the Forest Owner.

- Land ownership and management direction are transitory, except in cases where binding commitments limit management options, such as conservation easements. Management goals and objectives are likely to change over time, especially as forest ownership changes. This often occurs during generational transfers of family forest land[8] and industrial forest land transactions between entities owning forests as a financial investment, where ownerships may turn over as frequently as every 10 years.[9] While risks of forest conversion or aggressive harvesting may appear minimal under a current owner, the probabilities are high that forest ownership will change hands many times over the 100-year period, with timber value and development pressure being the drivers of value in ownership transactions.

Additionality is achieved by committing a site to the long-term requirements specified in the forest protocol (e.g., monitoring, reporting, and 3rd party verification; compensation for reversals; buffer pool contributions, etc.), thereby removing such risks of emissions over the life of the project. While offset projects are voluntarily entered into by project owners, once initiated, they represent real commitments. There are real, legal consequences for failing to abide by these rules and requirements. Projects must monitor and report their forest inventories annually and undergo periodic 3rd party verification. Projects that fail to sustain their inventory commitments must compensate the market with penalties.

In sum, the forest protocol recognizes the critical importance that the project's baseline—the way business-as-usual management is standardized for quantification purposes—is a hypothetical, yet conservative representation of what may have actually occurred if the project had never happened. Project crediting follows the action of committing the forest to 100 years plus of monitoring, reporting, and verification to ensure that no possible baseline scenarios that would substantially reduce carbon stores take place. Furthermore, project crediting takes a conservative stance, as previously described, in comparison with the potential baseline outcomes. The uncertainty around timing of credits is acceptable because the net crediting over the life of the project is conservative.

Application of Leakage under the Forest Offset Protocol

The approach to estimating leakage risk in the forest protocol considers how changes in harvesting within an offset project site can lead to changes in harvesting (increases and/or decreases) on other forestlands over the course of the 100-year project lifetime. Because the baseline is a conservative standardized scenario that captures the multitude of possible management regimes in the absence of a project, baseline pools, including those used to

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[8] Butler, B. J., et al. 2016. "Family Forest Ownerships of the United States, 2013: Findings from the USDA Forest Service's National Woodland Owner Survey." Journal of Forestry 114 (6): 638–47. doi:10.5849/jof.15-099.

[9] Bliss, J. C., et al. 2010. "Disintegration of the U. S. Industrial Forest Estate: Dynamics, Trajectories, and Questions." Small-Scale Forestry 9 (1): 53–66. doi:10.1007/s11842-009-9101-7.

quantify leakage risk, are averaged across the baseline period (i.e., 100 years) to facilitate project accounting. As project leakage can only be estimated at the end of the project lifetime (and is still based on theoretical assumptions of leakage), it must be assumed that leakage might be occurring throughout the project lifetime. The potential leakage risk associated with each project is thus considered in relation to the standardized baseline harvesting.

While project crediting and leakage risk undergo annual monitoring and reporting, both the baseline and leakage risk are intended to be analyzed throughout the project lifetime (i.e., minimum of 100 years), as has been discussed previously. As such, the accounting method is appropriate and accurate for ensuring high-quality, rigorous and additional carbon credits.

Whereas additionality is based on the elimination of risks to existing and future carbon stocks that immediately comes into effect when an offset project is initiated, leakage risk does not similarly occur all at once under any business-as-usual scenario. Leakage risk, in fact, is accounted for each reporting period as a cumulative sum of harvest effects in the standardized baseline compared to the actual harvest in the project over the entire project lifetime. Indeed, the amount of leakage risk is expected to change over time as cumulative project harvest rates vary relative to cumulative baseline harvest rates. Leakage risks can even be eliminated over the course of a project as the project activities may lead to greater timber productivity on the project site.

Leakage Challenges

The version 3.x series of the Forest Project Protocol established two mechanisms to address leakage risk. First, a 20% leakage risk deduction rate is applied to the difference between baseline harvested carbon and project harvested carbon, which is calculated based on the full effects of potential emissions associated with the harvesting of trees off the project site. Second, the protocol also considers 'market effects', which is calculated as 80% of the difference between the baseline and project harvested wood products, which thereby further increases the overall leakage deduction.

The combined leakage risk deduction varies depending on the type of wood products associated with the project. For example, where the wood products associated with the project results in long-lived products, such as dimensional lumber, the combined leakage risk will average about 37% when market effects are included. Any deductions associated with leakage risk are recouped when cumulative project harvesting trends upwards compared to cumulative baseline trends.

The stakeholder workgroup had little scientific literature to inform an approach to leakage. It has been more than 10 years since the workgroup developed its approach to leakage risk and the literature continues to reveal highly variable rates and suggests actual leakage is dependent on a number of factors.[10] Additionally, the literature continues to focus on immediate cause and effect and there remains considerable uncertainty how directly relevant those values are to a 100-year plus project.

The approach to leakage in the protocol is based on the recognition that some projects will harvest more wood products than the baseline case and others would harvest less. Therefore, a population-wide estimate of leakage risk was assigned to all projects, understanding that those projects that will increase harvested wood products (compared to baseline) over the project life (which has uncredited 'positive leakage')[11] will compensate for those that do not harvest as much, or at all.

As has been pointed out in this document, the Forest Project Protocol is a long-term commitment. Baseline development, additionality, and the assessment of leakage are evaluated over the entire project life, which is at least 100 years. Since many projects are anticipated to harvest as much, or more, wood products over the course of the project, the scientific literature focused on short-term effects does not align well with the long-term perspective of a forest carbon project.

Although projects completely foregoing all timber harvesting over the project life may result in higher levels of leakage,[12] those projects that do continue to harvest over the project lifetime are expected to reduce leakage over the project life. The risk of leakage may even be eliminated as increased productivity over time compensates for earlier temporary reductions in the supply of harvested wood products.

Conclusion

A substantial amount of dedicated thought and analysis from a wide variety of stakeholders has been invested in the development and ongoing evolution of the forest protocol. Most stakeholders can agree on certain key elements of forest offsets. First, forests have value that go well beyond valuing timber alone. It is only when those values are recognized in the

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[10] See, for example: Wear, David N., and Brian C. Murray. 2004. "Federal Timber Restrictions, Interregional Spillovers, and the Impact on US Softwood Markets." Journal of Environmental Economics and Management 47 (2): 307–30. doi:10.1016/S0095-0696(03)00081-0; Murray, Brian C., Bruce McCarl, and Heng-Chi Lee. 2004. "Estimating Leakage from Forest Carbon Sequestration Programs." Land Economics 80 (1): 109. doi:10.2307/3147147; Sohngen, Brent, and Sandra Brown. 2004. "Measuring Leakage from Carbon Projects in Open Economies: A Stop Timber Harvesting Project in Bolivia as a Case Study." Canadian Journal of Forest Research 34 (4): 829–39. doi:10.1139/x03-249.
[11] 'Positive' leakage may occur should project harvesting exceed baseline harvesting, theoretically reducing harvest elsewhere. While leakage risk is a discount to project crediting, positive leakage is not credited since no actions are taken to attempt to measure it offsite.
[12] Murray, Brian C., Bruce McCarl, and Heng-Chi Lee. 2004. "Estimating Leakage from Forest Carbon Sequestration Programs." Land Economics 80 (1): 109. doi:10.2307/3147147.

marketplace that foresters and landowners can make more complex management decisions that recognize the full array of environmental services forests provide. Second, management decisions that affect forest composition and structure need long time horizons to realize the desired effect they are seeking. The 100-year (minimum) time horizon of a forest carbon project is an appropriate time capsule to assess the beneficial outcomes of carbon investments today.

Forests have changed substantially in the past 50 - 100 years, owing to shifting wood products markets and land tenure, as well as competing land use interests. Therefore, investing in forests today for better carbon futures can do much to restore forests to more productive and more resilient conditions. To date, the forest carbon offset program has been highly successful in terms of ensuring that over 8 million acres of forestland across the United States will remain in forest cover for at least the next 100 - 200 years and that they do so with increasing carbon stocks composed of native species, mixed age classes, and habitat structure. Participating project forests trend toward bigger, older, and more resilient forests, many with increased wood production over time as carbon markets support aligning forest harvest rotations with the forest's biological potential and climate benefits.