STATE OF MAINE
DEPARTMENT OF CONSERVATION
MAINE FOREST SERVICE
22 STATE HOUSE STATION
AUGUSTA, MAINE
04333-0022

JOHN ELIAS BALDACCI
GOVERNOR

PATRICK K. McGOWAN
COMMISSIONER

Date: July 15th, 2009

To: Christopher Sherry, Lois New, and William Lamkin, Regional Greenhouse Gas Initiative Staff Working Group

From: R. Alec Giffen, Director, Maine Forest Service

Re: Recommendations to RGGI Regarding Forestry Offsets

Enclosed, you will find recommendations from the Maine Forest Service and its partners, Environment Northeast and the Manomet Center for Conservation Sciences, for expanding the category of forestry offset projects allowed under the Regional Greenhouse Gas Initiative (RGGI). You will recall that at a meeting held in Maine on March 21, 2007, the RGGI Staff Working Group requested that the Maine Forest Service develop these recommendations for your consideration, and that an earlier draft was sent to you on June 11, 2008. Since that time, we have conferred with a number of constituents and interests that care about this issue to refine the draft.

Before getting into the details, I wish to thank you for the opportunity to contribute to RGGI's work, and to the important effort to capitalize on the opportunities forests and forest products provide for reducing atmospheric levels of greenhouse gases. We have taken your request very seriously and have spent a great deal of time crafting the recommendations enclosed. This simply would not have been possible without the help of Environment Northeast, the Manomet Center for Conservation Sciences, and the Maine Department of Environmental Protection. We all are also indebted to feedback and participation of over 60 stakeholders who generously shared their knowledge, experience, and perspectives with us. Much of their wisdom is incorporated into these recommendations.

I am sure that you will recognize when you read them that these recommendations are tailored specifically to RGGI's requirements, particularly the five-part test for offset projects and your desire to use performance standards for offset projects to the maximum extend practicable and avoid complex modeling of what might constitute business as usual management. In these regards, they make recommendations for how to approach requirements for additionality, leakage, and permanence. We believe this will assure that for each ton of carbon dioxide (CO_2) allowed to be released into the atmosphere in exchange for a forestry offset, a ton of CO_2 will be removed. We are persuaded that being able to make this case is fundamentally important if forestry offsets are to assume their rightful place in a cap and trade program that achieves its targets for reducing atmospheric greenhouse gas levels.

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You will note that some of the recommendations included in here differ from RGGI's current requirements for afforestation (e.g., which pools of carbon are to be measured/credited); and thus, one or the other of these sets of specifications may need to be adjusted to achieve consistency. You will also note that additional information is needed on certain topics to refine and implement these recommendations – for example, using econometric models to estimate leakage from some project types. We have already initiated efforts with experts in these fields to evaluate the most accurate way of assessing leakage and substitution benefits as well. Fully implementing these recommendations will require that we complete this work and satisfy ourselves and you that these methods are both reliable and practical.

As we have worked to develop these recommendations, it has become apparent to us that in order to get the standards for forestry offsets "right" – they must be rigorously defined to achieve their purpose – they are unlikely to appeal to all landowners particular smaller ones; hence, they have inherent limitations. I am persuaded that these projects simply cannot achieve all of what we need to do as a society to capitalize fully on the benefits that forests can provide in reducing atmospheric greenhouse gases. Because of this, I believe that a two-pronged effort will be needed to take advantage of the full range of opportunities that forests represent for reducing atmospheric greenhouse gas levels. Such an effort should include programs designed for landowners who are not likely to participate in the offset markets, but who nonetheless are interested in retaining forests as forests and managing them sustainably. Simply put, offset projects which meet a rigorous application of the five part test are very unlikely to achieve all of the potential that forests offer. Recognition of this fact is fundamentally important in designing a truly effective policy response to climate change. For, among other facts, if we are not successful in keeping forests as forests, not only do we stand to lose the contribution US forests currently make by sequestering approximately 12% of annual emissions nationwide, but forest conversion will add to emissions of greenhouse gas.

A list of the various interested parties that have made comments and their full comments are available if you wish. We look forward to your comments and stand ready to answer any questions you may have.

Thank you again for the opportunity to work on this important project.

RAG/rld

Encl: Recommendations to RGGI for Including New Forest Offset Categories

MAINE FOREST SERVICE
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A Policy Framework for Including Avoided Deforestation and Forest Management Practices as Forest Offset Types in the Regional Greenhouse Gas Initiative

Final Draft

July 15th, 2009

EXECUTIVE SUMMARY

Forests play a significant role in sequestering carbon in the United States. The most recent U.S. Greenhouse Gas Inventory[1] estimates that sequestration from the nation's grasslands, cropland and forests currently offsets 14.8% of our annual emissions. Of the 883.7 tera-grams (Tg) of carbon dioxide sequestered annually, 745.1 Tg or 84% is delivered by forestlands.

To put this in perspective, annual domestic carbon sequestration is equivalent to all emissions from fossil fuel combustion in the industrial sector (862.2 Tg CO2/ yr). And yet, rather than continuing the trend of sequestration, the EPA estimates that sequestration of forest carbon will *decrease* 7% over the next 20 years if current trends continue, contributing to increasing global warming.

Currently, afforestation is the only forestry offset project type recognized by the Regional Greenhouse Gas Initiative (RGGI) model rule. However, the opportunity for increasing carbon sequestration through afforestation is limited in many parts of the region. Sustainably managing forests to increase carbon storage and conserving forests threatened with conversion offers a significant opportunity to reduce emissions and increase carbon storage in the RGGI region. Improved forest management and forest conservation also have substantial co-benefits, in the form of clean water, biodiversity protection, and healthier forests that are more resilient to pollution, climate change and other stresses. Furthermore, forests can be managed to produce biomass energy and durable products that can substitute for more fossil fuel-intensive alternatives. As the fourth report of the IPCC notes, "*In the long term a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fiber, or energy from the forest, will generate the largest sustained mitigation benefit.*"[2]

The RGGI model rule clearly states that other offset types, specifically including forest offsets, will be considered for approval as additional offset categories. In 2007 RGGI requested that the Maine Forest Service (MFS) present a proposal for how new forest project types should be considered, and MFS has been working in collaboration with the Maine Department of Environmental Protection, Environment Northeast and Manomet Center for Conservation Sciences to develop such a proposal. RGGI further directed that this proposal should be consistent with RGGI approach of emphasizing performance measures in offset categories and that all offsets meet a rigorous application of the 5-part test established by RGGI.

The current draft has been updated and expanded since the June 2008 draft submitted to RGGI, and is the product of further discussion with stakeholders. In contrast to previous drafts of our recommendations, we do not include biomass plantations as a separate offset category. We anticipate that a federal cap-and-trade system will cover transportation and heating fuels as well as electricity generation. Therefore, the fossil fuel substitution benefit generated by biomass plantations would not be eligible as an offset in a federal system and is not a priority offset type to develop at this time. However, if a federal cap-and-trade program does not develop in this way, this category could be reconsidered, given the

[1] Inventory Of U.S. Greenhouse Gas Emissions And Sinks: 1990-2006(April 2008) USEPA #430-R-08-005
[2] IPCC, see Chapter 9 from http://www.ipcc.ch/ipccreports/ar4-wg3.htm

significant benefits sustainable biomass plantations could provide to regional heating facilities.

Below we describe how project protocols could be structured for three new categories: 1) forest management, 2) urban forestry, and 3) avoided deforestation. In each case we discuss the potential for each category, suggest methodologies for how each would meet the 5-part test *(real, surplus (additional), verifiable, permanent, enforceable),* and outline further data and decisions necessary to develop a detailed protocol.

Summary Recommendations

Forest Management – Landowners are eligible to receive credit for long-term (99-year) increases in carbon storage. Increases are measured against initial project levels, and then discounted based on where the project falls in comparison to a regional performance standard. The performance standard is based on average carbon stocking, which reflects the impacts of average management behavior in the region. For most types and areas, this can be calculated with acceptable accuracy using Forest Inventory and Analysis (FIA) data. Project boundaries are based on historical management units, but to address potential leakage, landowners must report on harvest and inventory levels on the entire ownership within the RGGI region. If significant changes in harvesting levels occur, than a leakage discount may be applied.

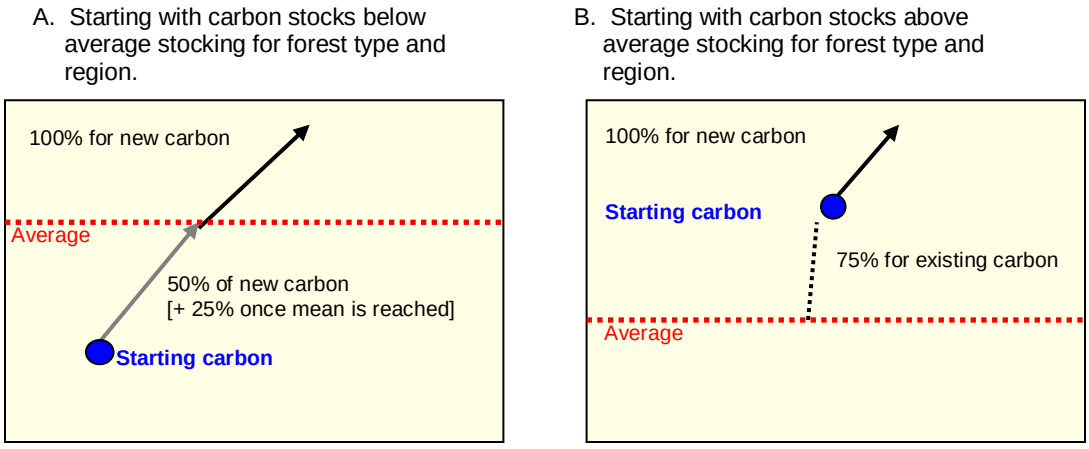

Figure 1. Recommended carbon credit for projects that start (A) **below** the average carbon stocking level for the forest type and region, and (B) **above** the average.

Urban Forestry – Municipalities, utilities, educational institutions or other public institutions that manage trees are eligible to receive credit for afforestation of urban areas through planting and maintenance of street trees and park trees. Credit is given for a permanent increase in stocking compared to a 5-year rolling average. For each year of the project, the project calculates tree removals and tree plantings. An increase in average tree planting or decrease in average tree removals determines how many eligible "protected" project trees

can be designated that year. Specific eligible project trees are identified each year by the project developer and tracked individually for the duration of the project. Carbon storage and additional sequestration in the eligible project trees are the basis for calculating GHG emissions reductions.

Avoided Deforestation – Credit would be given for projects that permanently project forests as forests and retain carbon above that which would normally be retained by development patterns and practices in the area involved (the baseline). Land must be protected with a permanent easement. The baseline would be determined by assessing the amount of legally developable land involved in the project area and then assessing how that would likely be developed in the absence of the project. This assessment involves: 1) a build out analysis; 2) appraisal of the current fair market value of the proposed activity vs. the current use; 3) an assessment of the carbon impact of each unit of the proposed activity; and 4) discounting based on factors controlling likelihood of development (such as slope and distance to amenities). Leakage discounts may also apply if the project eliminates legally permissible development as opposed to generating carbon savings through activities such as clustering development or transfer of development rights.

I. Forest Management

Purpose of Category

The purpose of the forest management offset type is to provide an incentive to change long-term management practices in a way that will increase sequestration and reduce emissions associated with forest management.[3]

Potential of Category

There are 44.48 million acres of privately-owned timberland in the 10-state RGGI region.[4] As one example of the scale of sequestration possible, modeling by the Maine Forest Service and Environment Northeast of northern hardwood stands has demonstrated that changes in harvesting practices could sequester 44 more tons per acre over approximately 99 years by switching from business-as-usual harvesting behavior to early commercial thinning. An economic analysis commissioned by The Nature Conservancy found that up to 23.9 million t CO2e of present value carbon could be sequestered in the region for $10/t CO2e, and up to 28.6 million t CO2e carbon for $20/tCO2e. The analysis considered extending rotation ages of softwood forests, harvesting and re-stocking currently under-stocked forests, conserving forests in riparian zones, and additional thinning. The greatest benefits came from the first two categories.[5]

Summary of Recommendations

Forest landowners who permanently increase carbon stocks, or permanently maintain them above a regional average, are eligible to sell offsets. In order to quantify the amount of eligible credits, the 5-part test must be applied as follows:

> Baseline – The landowner must measure carbon in the applicable carbon pools at the start of the project. Mandatory pools include live aboveground and belowground tree biomass[6], standing dead trees and coarse woody debris. Optional pools include soil carbon, litter and duff and shrubs/herbaceous carbon.

[3] Because only a portion of carbon from the tree ends up in wood products, onsite carbon increases generate more credits proportionally than off-site storage in wood products. In order to maximize credits, a forest manager would need to increase onsite carbon while at least maintaining production of wood products. This is possible with certain changes in management practices, but increasing onsite carbon can involve trade-offs due to decreasing harvests and discounting for leakage that follows as a portion of harvest shifts to other properties.

[4] USDA Forest Service Forest Inventory and Analysis data

[5] Sohngen, B., Walker, S., Brown, S. and S. Grimland. 2006. Terrestrial Carbon Sequestration in the Northeast: Quantities and Costs: Part 4 Opportunities for Improving Carbon Storage and Management on Forest Lands.

[6] Belowground biomass is estimated based on accepted formulas, as opposed to measured directly.

To prevent an incentive for the landowner to harvest heavily before project enrollment, landowners must use the highest inventory levels in the last 5 years as a baseline. Many small landowners will not have past inventory data. However, methodologies can be developed to reconstruct past inventories from data on the current inventory and past harvests.

In order to calculate a harvested wood products baseline, landowners who have harvest records should calculate an average annual removal rate per management unit based on harvest rates for the preceding 5 years. Ideally this should be broken down into harvest rates for hardwoods and softwoods, and into product classes, such as sawtimber, pulp, firewood and chips. Smaller non-industrial landowners in states that do not collect harvest data may not have records available, or they may be harvesting on intervals much greater than 5 years. These landowners should use as a baseline a regional average on removals per acre based on FIA data or other state-level data. This could also potentially apply to land which has recently changed ownership.

Additionality – Inventory data should be used to create a **performance standard** for average carbon stocks per acre for the type and geographic area involved. This performance standard is meant to reflect the result of typical historical management practices for the relevant region and forest type, as a proxy for business-as-usual (BAU). Data gathered through the federal Forest Inventory and Analysis (FIA) program is currently the best source of data for generating average carbon stocking in the region because it is available in all 10 RGGI states, as well in the majority of the United States. However, in the future additional sources of data, such remote sensing data, could be useful in generating regional averages. The performance standard should be calculated by state agencies and published by RGGI.

There are several reasons why we have chosen to use this approach, including: 1) The use of average carbon stocking as a performance standard, as opposed to state agencies defining average practices, is more objective and transparent; and 2) using legal requirements to define business-as-usual (such as used in the California Climate Action Reserve) is not sufficient in the RGGI region because harvesting regulations vary widely between states and are often not the most significant determinant of behavior.

The FIA performance standard is used in conjunction with the onsite measurements of baseline and project carbon storage solely to determine what *percentage* of carbon above the baseline the project is eligible to sell.

Landowners who are currently below the mean would be eligible to sell credit for 50% of any increase in carbon storage above their baseline as it accrues until the mean is reached, at which point they would be eligible to sell an additional 25% of the new carbon sequestered up to that point. Once the mean has been reached, they would be eligible to sell 100% of any increases thereafter. Landowners currently above the mean would receive 75% credit for existing carbon above the mean if they agree to maintain this permanently, and 100% credit for any increase

in carbon stocks above their baseline. The percentages used here represent a conceptual model of how the performance standard should be applied. If RGGI decides to use this model, more discussion may be necessary to ascertain whether these are the appropriate discounts to apply. (*See Figure 1*)

The purpose of this approach is threefold: 1) The 100% credit for new sequestration above the mean is meant to encourage permanent increases above business-as-usual storage; 2) The 75% credit for permanently preserving existing carbon above the mean targets landowners who are at a point in their management cycle where there is a significant amount of timber volume that could be harvested. This provides an incentive to maintain this to the extent possible and harvest in a way that minimizes net carbon loss. Only the portion of existing carbon stocks that is above the performance standard is eligible. Furthermore, this should be discounted by some amount (e.g. 25%) because carbon above the mean is being credited based on avoided future emissions, which are subject to uncertainty; 3) the 50% credit for new permanent sequestration below the mean targets landowners who have understocked stands resulting from historical management. This represents a way to provide a significant incentive for landowners to enroll their land now, while ensuring that there is a further reward for eventually reaching the mean (the additional 25% credit). Furthermore, by offering 100% credit for new carbon only once the performance standard is surpassed, an incentive then exists to not only reach the mean, but exceed it. While some owners could continue to manage in perpetuity below the mean in the absence of the project, new carbon below the mean is discounted based on the assumption that a certain portion of landowners with below-average stocks are at a point in their management cycle where they would normally let stocks increase their volume before their next significant harvest. Once enrolled in a project, any increase in carbon that is sold as a credit must be maintained for 99 years.[7]

Because projects must use their highest inventory in last 5 years as a baseline, a landowner who has carried out regeneration cuts over a large area of the management unit in the last 5 years may take several years without any credit to reach their own "baseline."

In addition to the performance standard, all RGGI offset projects must meet a **legal additionality test** to demonstrate that offset activities are not required according to any "local, state or federal law, regulation, or administrative or judicial order." For forest management projects, this would mean that all acres enrolled in a project must demonstrate that they are legally able to be harvested. For example, legally required retention in riparian buffer areas would have to be subtracted. If the landowner is currently above the FIA mean and sells credits for existing carbon, they must prove that they would legally be able to harvest down to the FIA mean according to federal, state and local regulations that might reasonably be assumed to influence carbon stocking over time. Examples would include requirements for buffers, streamside protection zones, wildlife protection, maximum clearcut size and minimum stocking standards. This also should include

[7] Whereas, in the absence of the project they might increase stocks and harvest back below the mean again.

other legally binding requirements affecting carbon stocks, such as pre-existing conservation easements. Landowners selling new carbon above their baseline must similarly demonstrate that they are legally able to harvest back down to their baseline levels.

Landowners may get credit for increases in carbon storage in long-lived wood products above the harvested wood product baseline. However, credit will only be given for estimated carbon that remains after initial emissions and decay over a 100-year period. Accounting for the long-term storage of wood products should follow the EPA 1605(b) methodology (Technical Guidelines for Voluntary Reporting of Greenhouse Gas Program, Ch. 1, Emission Inventories, Section 1).

Permanence – Credits sold from an improved forest management project must be maintained permanently. Following common legal practice, and consistent with guidance from the Intergovernmental Panel on Climate Change, permanence is defined here as **99 years**. Any credits lost due to natural disturbance or project termination before 99 years must be replaced. The 99-year requirement starts from the date of credit verification.

The need to replace any reversals in sequestration is assessed during the periodic verification. However, the replacement requirement is triggered immediately if unexpected project termination occurs during the interim.

In order to ensure the project has the ability to replace credits, a project must either maintain a **reserve pool** of credits or purchase **insurance**. Proof of insurance should be required in the consistency application. Acceptable insurance policies will guarantee replacement of 100% of any credits that are reversed prior to the 99 year deadline.

If the reserve pool option is used, the project will be required to set aside a certain percentage of credits every year based on a standardized risk assessment. Both compliance credits and reserve credits would be monitored and verified at the same time. RGGI would keep the reserve credits in a separate account and draw down this account whenever reversals are verified. Unintentional reversals would not need to be reimbursed, but projects with intentional reversals would need to reimburse the pool by the full amount, minus the initial contribution to the pool.

The **standardized risk assessment** should take into account three factors: 1) risk of early project termination (*e.g.*, long-term contracts vs. permanent easements providing extra legal and financial guarantees that the land will remain in a forested state); 2) risk of natural disturbance (*e.g.*, mean fire or hurricane return interval); and 3) evaluation of the management plan for the property (modeling should demonstrate whether planned harvests will reduce carbon below the project baseline and whether the average increase in carbon stocks can be maintained).

Measurement and Verification- Sampling plans and measurement and verification protocols should follow the RGGI rules for afforestation projects. Credits are sold only once they are verified. If a project undertakes monitoring and verification

once every five years, then the credits sold should absorb some of the annual fluctuations during this period. If credits are sold more frequently, then new carbon sequestration should be calculated on a rolling 5 year average.

Leakage – In order to avoid internal leakage, a landowner must enroll all lands in a management unit. For landowners with <1000 acres, this would mean the entire ownership. For landowners with >1000 acres, this would need to be justified and verified in the consistency application, based on past management practices, contiguity of land, etc. Furthermore, some level of reporting on inventory levels and harvest volumes should be required on lands owned within the RGGI region to assess if any obvious shifting in harvesting activities is occurring in the larger region. Market leakage must also be accounted for. If a project maintains harvesting close to the baseline rate, it will not need to apply any discount rate. If it significantly decreases harvesting, then a **leakage discount** should apply (See next section).

Certification – In order to ensure that maximizing carbon sequestration does not detract from other important environmental goals, and to be consistent with the RGGI afforestation protocol, forest management project land must be third-party certified.

Issues to Resolve

There are a number of technical issues that would need to be further resolved in a full project protocol.

Harvested Wood Products - RGGI would need to decide whether or not to add downstream fuel and electricity emissions to the EPA 1605(b) estimates of carbon emissions lost from the wood during harvesting and processing. Some electricity emissions may be captured by RGGI. Transportation emissions are not, although they will likely be dealt with in some manner by a federal cap-and-trade system. Furthermore, downstream emissions reductions, such as substitution benefits from using wood in the place of concrete or steel, are also unlikely to be assessed.

Methodologies for calculating long-term storage in products should be updated as necessary to reflect emerging research or changes in assumptions governing the use and disposition of wood products. RGGI should also consider whether an uncertainty discount should apply to this carbon pool, given that it is outside the control of the project developer.

Leakage Rates – In order to calculate an accurate leakage rate, more data is needed on the market for wood products in the region. This would include a quantification of such things as the elasticity of demand for each product. It is proposed that the Maine RGGI Trust fund the first phase of this research, (**Appendix A**). On larger ownerships, if certain discrete parcels have not ever been harvested (due to access issues, etc.) but are enrolled in the project because they could feasibly be harvested today, then standard leakage rates also might not apply.

FIA data – While there are sufficient FIA plots to calculate a performance standard by state, public/private ownership, ecoregion and forest type for some of the larger states and common forest types, error rates will be large for less common forest types, particularly in small states. This may argue for using ecoregions rather than state boundaries in some cases. Furthermore, while it is desirable to capture differences in the mean between forest types, the forest typing that FIA uses differs from common landowner practice. Thus, a translation is needed to compare typical forest typing prepared for management planning with FIA forest types. State forestry agencies in each RGGI state should undertake an assessment of how to create a statistically valid and relevant mean.

Mandatory vs. Optional Carbon Pools – Coarse woody debris and standing dead trees are recommended as mandatory carbon pools to measure. However, many landowners will not have existing inventory data on these pools when they initiate their projects. For these landowners, methods could be developed to demonstrate no net reductions in these pools in the initial 5-year project period, thereafter they could be measured.

If a landowner chooses to include optional pools, such as soil carbon, in the project, there may not be sufficient FIA or other data to generate a performance standard for these pools. Because the performance standard is used only to determine the timing and percentage of crediting, it may be appropriate to use a mean based on only a subset of pools. However, a project seeking to get discounted credit for carbon above the mean would not be able to get credit for existing carbon in pools without a performance standard.

Legal Additionality – Existing easements on project land that restrict the types of forest management that occur must be considered when demonstrating additionality. However, projects may wish to bundle new easements with carbon contracts. There should be some flexibility to allow for the fact that the easement and the offset application may not be finalized on the same day, as long as it is within a reasonable timeframe and there is a demonstration that they are part of the same deal.

Aggregators - The protocol should be carefully examined to determine whether additional elements specific to project aggregators need to be incorporated.

Permanence – Carbon must be removed from the atmosphere for 99 years. In order to ensure this, permanent easements or long-term contracts should be the default contractual model for forest management projects. Discussions on structuring federal forest offset projects have considered the possibility of more flexible project structures, such as shorter-term contracts, as long as carbon is fully replaced if the contract lasts for less than the required time period (e.g. 99 years). These discussions are in their early stages, and it remains to be seen if reliable mechanisms dealing with the replacement of carbon in short-term contracts can be developed. RGGI could consider this possibility, but it would also need to address the additional administrative burden this would create and whether further discounting of credits would be necessary through the standardized risk assessment.

II. Urban Forestry

Purpose of Category

Municipalities, utilities, educational institutions or other public institutions that manage trees should be eligible to receive credit for afforestation of urban areas through planting and maintenance of street trees and park trees. Currently, afforestation credits are restricted to converting non-forest land to forest land. Planting street trees would not be eligible, as these areas would continue to be classified as non-forest. The RGGI afforestation category should be expanded to include tree planting and maintenance activities permanently increasing carbon storage in trees in urban and suburban areas.

Potential of Category

The Northeast region of the U.S. has the highest proportion of land classed as "urban" (9.7%; Nowak et al. 2005). Across the U.S, tree coverage in urban areas averages 27% of the land area (Birdsey and Lewis 2003) and the national average urban forest carbon storage density is 25.1 tC/ha (Nowak and Crane 2002). An estimated 700 million metric tons of carbon is stored in urban forests, with a gross annual carbon sequestration rate of 22.8 million metric tons of carbon *per* year (Nowak and Crane 2002). Tree density and diameter distribution of trees both affect the potential of urban areas to store carbon. Urban forestry practices that increase tree density and the average size of trees will result in increases in carbon storage. An opportunity exists to use forest carbon offsets as a mechanism to sequester additional carbon through an increase in percent cover, tree density, and mean diameter of trees in urban (and suburban) forests in the Northeast. Moreover, urban trees are managed and easily assessed, making the quantification and monitoring of carbon benefits feasible. Revenue from forest offset payments could significantly influence the cost-effectiveness of tree planting and maintenance activities (McHale et al. 2007).

Tree planting and maintenance activities are recognized to reduce building energy use for cooling and heating, and thus reduce GHG emissions associated with power production. While these reductions are not eligible as offsets under RGGI since a large portion of the emissions come from the capped electricity sector, these co-benefits are significant.

Summary of Recommendations

The following recommendations draw from the California Climate Action Registry's Urban Forest Project Reporting Protocol, with some modifications. Project developers could be municipalities, utilities or public institutions such as educational institutions that have direct ownership and/or clear management responsibilities with respect to the planting and maintenance of trees for the life of the project. Credit is given for a permanent increase in stocking compared to a historical 5-year average. Activities should occur on areas of land that do not conform to RGGI's definition of forest[8] and include trees that are open-grown in managed landscapes. The 5-part test would be applied as follows:

[8] The major components of this definition are that the forest is at least 1.0 acre in size and 120.0 feet wide. Forested strips must be 120.0 feet wide for a continuous length of at least 363.0 feet in order to meet the acre threshold; and at least 10%stocked by trees of any size or has been at least 10% stocked in the past.

Baseline - An inventory of street and/or park **tree sites** is made at the start of the project, and monitored throughout the life of the project. Sites are used as the baseline unit to allow for flexibility in tracking carbon storage volume over time, and could include small clusters of trees. The baseline should be calculated using the annual average number of urban trees planted and removed in the entity over the most recent five-year period. There should be separate baselines for average trees removed and average trees planted.

Additionality - Eligible project trees are in two categories: 1) reductions in removals; and 2) increases in plantings. Both are calculated based on the difference between the baseline and project planting and removal rates by the entity. We believe it is important to have separate baselines for removals and plantings, rather than use the net of trees planted vs. removed, because of the potentially large difference in carbon between older trees removed and new saplings planted.

For each year of the project, the project calculates an annual average of **tree removals** (TR) and **tree plantings (**TP), based on a five-year rolling average, except in the first five years of the project. When the average annual TR for the entity is less than the baseline rate, the net difference (e.g. a reduction in 5 trees removed per year) determines how many eligible "protected" project trees can be designated that year. Specific eligible project trees (*e.g.*, 5 individual trees) are identified each year by the project developer and tracked individually for the duration of the project. Carbon storage and additional sequestration in the eligible project trees are the basis for calculating GHG emissions reductions.

Similarly, when the average annual TP for the entity is greater than the baseline rate, the net increase determines how many eligible "planted" project trees can be designated that year. These will be tracked individually for the duration of the project. Carbon sequestration in the eligible project trees are the basis for calculating GHG reductions.

This approach is meant to identify net gains and losses in carbon storage while avoiding having to sample and track each individual tree.

A regulatory test is performed to determine that the planting, replanting, and maintenance of trees are not a regulatory or statutory requirement.

Permanence - The project developer must commit to maintaining this increased inventory of street or park trees over 99 years. If eligible project trees must be removed prior to **99 years**, they must be replanted within one year of removal. If lost project trees are unable to be replaced within a year, they must be replaced with other allowances or offsets purchased by the project developer.

Measurement - Measurement protocols should be based on specific equations derived for use on "open-grown" street trees. Look-up tables for growth and mortality rates have already been developed by the DOE and accepted under the EPA 1605b, Chicago Climate Exchange, and California Climate Action Registry protocols.

Leakage – Market leakage is unlikely in urban forestry projects because there is little market for urban forest products. To avoid internal leakage, which could occur through diversion of tree care funds from one site to another, a municipality, educational institution or utility must account for all urban trees under its control when calculating their baseline. Net tree planting and net tree removal are reported on an annual basis, so major shifts in funding away from project trees that cause increased mortality elsewhere should be captured.

Issues to be Resolved

Additionality – The California Climate Action Registry requires entities to use a performance standard based on an analysis of 18 high-performing municipalities and 10 university campuses. The organizations involved in drafting this recommended protocol feel that tree planting performance varies so widely between municipalities within each state and within the region that a performance standard would not be as useful as simply relying on the average 5-year performance of the entity. However, it would be reasonable to survey tree programs throughout the region, perhaps a range of Tree City USA's within each state to assess whether a useful performance standard could be developed.

Treatments of woody waste - Maintenance of street and park trees can generate significant woody waste. Municipalities and institutions could receive some credit for carbon stored in enduring wood products.

Emissions from planting and maintenance – The California protocol requires that the project account for emissions from planting and maintenance equipment. Washington state draft recommendations do not, based on the assumption that these emissions will eventually be accounted for elsewhere. Existing RGGI offsets do not account for these types of indirect emissions, so to be consistent, it may make sense to exclude these.

III. Avoided Deforestation

Purpose of Category

The purpose of an avoided deforestation project is to prevent the emissions that are caused when forests are cleared for development, and to preserve the capacity of the forest to serve as a carbon sink.

Potential of Category

Loss of forest land to other non-forested uses is a large problem in the Northeast, and threatens the long-term ability of the region's forests to remove carbon dioxide from the atmosphere. Within the RGGI region, approximately 0.3 million acres of forest land were converted to other non forested uses between 1997 and 2002. This conversion has resulted in approximately 105 million MtCO2e of greenhouse gas emissions. In Maine alone, estimates from FIA and other sources indicate that 5,000 to 10,000 acres of forest land are converted to development each year. Mature forest stands in Maine can contain 344 to 485

MtCO2e in the trees (above and below ground) and in the organic layers at the soil surface.[9] Whether or not avoided deforestation is ultimately deemed eligible as an offset under RGGI, this source of emissions needs to be minimized.

Summary of the Recommendations

Eligible Parties – Project developers could include landowners, residential developers or NGOs.

Additionality – Credit would be given for carbon retained above that retained by normal development patterns and practices experienced in the area involved (the baseline).

Baseline – The baseline would be determined by assessing the amount of legally developable land involved in the project area and then assessing how that would likely be developed in the absence of the project based on development practices prevalent in the area. There are three components to this assessment:

1. Determining the **maximum legally-allowed buildout** based on zoning and other land use regulations. This will be a project-specific analysis and the project developer would be responsible for providing this information and having it certified as accurate by the local permitting authorities. In locations without local zoning, state minimums for lot size and other factors (septic, soil suitability) should be used, along with consideration of the average lot size in the town. In no case can the proposed baseline exceed this maximum.

2. Determining the **likelihood of development**. Performance standards for multiple regions within each state should be developed. There are several elements from current and previous drafts of the California Climate Action Reserve Forest Project Protocol that could be adapted for use in the RGGI region:

- A requirement that the project demonstrate that current fair market value of the proposed conversion for the project area is significantly greater than the current land use value. A standard minimum amount (e.g. >40%) should be set. Current fair market value would be determined by Uniform Standards of Professional Appraisal Practice and the appraiser must meet the qualification standards outlined in the Internal Revenue Code, Section 170 (f)(11)(E)(ii).
- A discount value applied to the project's emissions reductions, based on a set of standardized factors meant to reflect the likelihood of the project's conversion to its proposed use. Based

[9] The regional numbers are built from Forest Resources of the US, 2002. Smith et al 2004; and on-line access to the COLE estimator of carbon. GTR-NE-343 (Smith et al. 2006) was used to estimate carbon storage for 125 year-old stands within Maine's FIA Major Forest Types.

on studies done on forest loss in the Northeast[10], the most important factors would include slope, soil suitability, proximity to population centers, proximity to local and state roads, proximity to already developed lands and population density. Other factors to consider include distance to local provisions (e.g. groceries, fuel, supplies), population growth in area with 5 hours drive time, costs of service (electricity, water), and seasonal access.

Each factor is divided into a range that falls into either High, Moderate or Low likelihood of conversion, with a corresponding point value. Projects would have to be above a certain total point threshold in order to be eligible for avoided deforestation credits, and discount values would be determined based on how high above the threshold the project falls.

The values in the below chart are meant to illustrate how discount values could be applied, and are not meant to be final values.

Table 1: Project Score for Likelihood of Conversion

Likelihood of Conversion	Slope	Distance to population centers	Distance to local road	Distance to state road	Distance to already developed parcel
High (2 points)	<25%	<3 hours to a population >500,000	<1 mile	<5 miles	<1 mile
Moderate (1 point)	25-40%	<3 hours to a population >50,000	1-5 miles	5-15 miles	1-5 miles
Low (0 points)	>40%	>3 hours to a population>50,000	>5 miles	>15 miles	> 5 miles

Table 2: Discount for Conversion Uncertainty
(Based on the example Table 1, using only 5 factors**)**

Conversion Score	**Discount Rate**
10	5%
9	10%
8	15%
7	20%
6	25%
<6	Not eligible

[10] Tyrrell et al. 2004.

3. Determining the **carbon impact per acre** in the proposed use. Description of the proposed use should include information on lot sizes, house footprints, amount of cleared area per lot and impermeable surfaces. Average values for the typical percentage reduction in aboveground and belowground carbon per area of road/house/yard would be developed and applied to the average forest age and type in the project area.

Measurement and verification – Measurement protocols for carbon stocks would be similar to those for afforestation projects.

Permanence – The project area which is protected from conversion must be protected with a **permanent easement**. Insurance or a reserve pool of credits should be required to allow for replacement of lost credits. Reserve pools should follow the standardized risk assessment described in the forest management protocol.

Leakage –

- If the number of housing units which could have been accommodated on the property in question, according to the baseline analysis cited earlier, are accommodated on the property, no leakage will be deducted. This could be accomplished through clustered developments which clear less land per housing unit.
- If the number of housing units which could have been accommodated on the property in question, according to the baseline analysis cited earlier, are added to the allowable housing units on another property in the area, through a mechanism such as a transfer of development rights, no leakage will be deducted.
- If the number of housing units which could have been accommodated on the property in question, according to the baseline analysis, is not accommodated in the manner outlined in the two preceding bullets, the carbon credits need to be discounted for the activity displaced. Development of a method to calculate the appropriate discount is being explored.

Location – Projects involving clustered development or transfer of development rights must locate housing units in areas that have been designated as appropriate for development.

Issues to Resolve

A Method for Calculating Leakage- The feasibility of calculating leakage rates for avoided deforestation will be part of the research project proposed to be funded by the Maine RGGI Trust (**Appendix A**). Determining the appropriate boundaries for where development might be displaced and the substitutability of urban vs. rural vs. clustered development are some issues that need to be analyzed further.

Data for Determining a Performance Standard for Development Practices – There is currently limited published data on the carbon impacts of land clearing for residential development, which varies by urban/suburban/exurban regions within each state.

Baseline – The most recent draft (April 2009) of the California Forest Project Protocol[11] has changed from scoring the project based on a table of conversion factors, and instead is proposing to rely only on the difference in the current use and appraised fair market value of the property. While appraisals allow for consideration of many of the factors we have recommended using to assess development risk, they also involve subjective judgments. We continue to believe that it is more transparent and objective to have a standardized list of factors and point values.

[11] The project protocols are being developed by the Climate Action Reserve, and new branch of the California Climate Action Registry (CCAR)

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APPENDIX A

Estimating Leakage and Product Substitution Benefits from Forest Carbon Offset Projects

Draft Workplan

An important part of estimating the carbon benefits of avoided deforestation (AD) and active forest management projects (AMPs) is estimating the potential leakage that may stem from their implementation. In this context, leakage involves the process by which the greenhouse gas (GHG) reduction (sequestration) benefits of a forest carbon project leads to a shifting of emissions to other uncontrolled sources outside the project boundary. This workplan presents the steps to carry out an initial analysis to do this.

The first section below identifies the research tasks that need to be performed to address these leakage issues. The second section identifies a work plan for the first exploratory phase of the project.

1 Research Tasks

1.1 Changes in Supply of Developable Land - Leakage from AD

Since much of deforestation in the Northeast region can be tracked to development, estimating leakage requires an understanding of how the market for developable land works in the region. This will involve three tasks.

1.1.1 Defining the Markets

A key early issue to resolve is the problem of appropriate regional boundaries for use in calculating leakage. How far geographically the leakage calculation should be carried out is a difficult question, made more so by the regional nature of RGGI. Defining the number of "regions" to serve as areas for potential leakage is a necessary step before estimating the elasticities for the leakage calculation.

1.1.2 Estimating Elasticities

Estimating the net reduction in developable land from an AD project is dependent on how responsive the land market is to changes in developable land supply and price. The land market could react in a very different manner when a project takes developable land off the market in one part of the region than in another. Different regions and/or land types may vary in their response to these changes and therefore possess different elasticities (parameter capturing demand for developable land with respect to its price). It is likely these elasticities are not readily available for the Northeast, thus requiring new research and data collection.

1.1.3 Estimating the Relative Carbon Consequence of Developing in Different Locations

To estimate leakage, we calculate the relative carbon densities of land preserved in the project area vs. land developed elsewhere. Because this is a theoretical displacement of development, broad regional averages for carbon storage per acre (by type of forest or agricultural land) would likely be applied.

1.2 Changes in Supply of Wood Products – Leakage and Product Substitution from AMPs

Leakage can also be influenced by the supply response of wood products to price. For instance, if a project withdraws some wood products from the market, other producers will respond to the pressure that action exerts on the market (indicated by a rise in the price). Increasing (decreasing) the supply of wood products can induce substitution with non-wood products. Depending on the scope of the program and the status of cross-economy GHG controls, the RGGI rules may want to account for these emission effects in the project accounting.

1.2.1 Defining the markets

The first challenge to using this framework in practice is defining the markets and/or regions affected. This may not be a straightforward exercise, as a project may bring many different types of timber to market, each having a variety of end-uses and corresponding non-wood substitutes. A first step would be to delineate which wood products markets correspond to which non-wood products markets.

Another important question to examine is whether forest lands that have not been actively managed in the past would have any market effects if they are protected from harvesting in the future, and if leakage discount rates would be different for these types of lands.

1.2.2 Estimating Elasticities

In order to assess the impact of AMPs, we will need to estimate the price elasticities in the wood products markets as well as the cross-price elasticities between the wood products and non-wood substitutes. Estimates of elasticities for the wood products market may already exist and be easily adaptable (for example, Willey and Chameides, 2007). The cross-price elasticity between relevant markets would need to be calculated, though it is an open question whether some or all of these non-wood markets serve as substitutes or complements. It is possible that the cross-price elasticities calculated for some non-wood markets may not support crediting AMPs with benefits from product substitution.

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1.2.3 Calculation of product substitution carbon benefits

The elasticities of supply and demand in the non-wood markets are used to estimate the net reduction in supply and consumption of non-wood products. Then the carbon consequence of this net reduction is estimated using data from life-cycle analyses of the various products. This could modify the credit due to the AMP. This carbon analysis can be conducted via models that capture lifecycle emissions from non-wood products such as steel and cement.

1.2.4 Calculation of leakage in wood markets

Using the market regions defined in the Step 1 and wood products elasticities in Step 2, we can estimate the leakage outside of the RGGI region associated with application of AMPs.

2 Proposed Workplan

This workplan is geared towards providing RGGI and other stakeholders with as much information as possible about the feasibility and difficulty of estimating leakage from avoided deforestation and active management projects. To this end, this work will determine what data is required, what data is available, and how difficult it will be to analyze this data to calculate standardized leakage rates. If RGGI goes forward with the inclusion of forest management projects or avoided deforestation projects, the next step of the research would be to develop lookup tables for the 10-state RGGI region.