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Carbon Accounting Rules and Guidelines for the United States Forest Sector

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ABSTRACT

The United States Climate Change Initiative includes improvements to the U.S. Department of Energy's Voluntary Greenhouse Gas Reporting Program. The program includes specific accounting rules and guidelines for reporting and registering forestry activities that reduce atmospheric CO_2 by increasing carbon sequestration or reducing emissions. In the forestry sector, there is potential for the economic value of emissions credits to provide increased income for landowners, to support rural development, to facilitate the practice of sustainable forest management, and to support restoration of ecosystems. Forestry activities with potential for achieving substantial reductions include, but are not limited to: afforestation, mine land reclamation, forest restoration, agroforestry, forest management, short-rotation biomass energy plantations, forest protection, wood production, and urban forestry. To be eligible for registration, the reported reductions must use methods and meet standards contained in the guidelines. Forestry presents some unique challenges and opportunities because of the diversity of activities, the variety of practices that can affect greenhouse gases, year-to-year variability in emissions and sequestration, the effects of activities on different forest carbon pools, and accounting for the effects of natural disturbance.

The evolving U.S. national plan for reducing greenhouse gases involves research to develop new technology, voluntary participation, and targeted incentives (Abraham, 2004). A key part of the plan is the revision of guidelines for voluntary reporting of greenhouse gas reductions and sequestration by entities in the private and public sectors. In 2002 the President directed the Departments of Energy (DOE) and Agriculture (USDA) to revise the system for reporting and registering reductions in greenhouse gas emissions (United States Department of Energy, 2005). The reporting program was originally authorized by the Energy Policy Act of 1992 Section 1605(b) and is often referred to as the "1605(b) program."

The purpose of this paper is to provide a general introduction to the accounting rules and guidelines for the forestry sector. The rationale for including forestry in an emissions reduction program is presented, along with a description of the kinds of forestry activities that have potential to increase carbon sequestration or reduce emissions. The basic elements of the reporting system are described, and some of the specific issues for reporting forestry activities are discussed.

An *entity* (a recognized business, institution, organization, or household) may be interested in using the registry to establish and document an emissions baseline and a record of subsequent emissions reductions and sequestration. This will facilitate their ability to take advantage of a possible future in which transferable emissions credits acquire value, and to receive public recognition for taking voluntary steps to address climate change. In the forestry sector, there is potential for the economic value of emissions credits to provide increased income for landowners, to support rural development, to facilitate the practice of sustainable forest management, and to support restoration of ecosystems. Some entities may be interested in using forestry activities to compensate for emissions from other kinds of activities such as manufacturing or electricity generation.

Nationally, forestry activities represent a significant portion of the opportunities to manage greenhouse gases (Pacala and Socolow, 2004; Caldeira et al., 2004). There are many kinds of forestry activities that may be considered by entities as a means to reduce greenhouse gases. Cost is a major factor guiding decisions about which activities in forestry or other sectors to pursue. Economic analyses suggest that improved management of existing forest lands may be attractive to landowners at a carbon price as low as $10/Mg, and that afforestation requires a higher carbon price to induce landowners to change land use (Lewandrowski et al., 2004; USEPA, 2005; Stavins and Richards, 2005). In practice, some forest carbon sequestration projects involving afforestation or ecosystem restoration have already been initiated even though sequestered carbon has little current value in the United States (Winrock International, 2005).

Estimating the quantity of carbon sequestered by a forest can be a complex and potentially expensive task, representing a significant part of the cost of reporting. The rules and guidelines attempt to provide estimating and reporting options at the lowest possible cost while maintaining sufficient accuracy of estimates so that carbon sequestration is equivalent to emissions reductions. The different options range from simple and inexpensive to complex and costly. Reporters may choose the simplest available methods that provide estimates with an accuracy that meets reporting objectives. For example, "default" factors and estimates are provided for those wishing to enter data that is typical for forestry activities in a region, but that may not accurately represent effects of specific entity activities on carbon in forest ecosystems and wood products (Smith et al., 2006). For estimates that are more specific to an entity or activity, measurement and modeling approaches are described. The most intensive estimation process may involve establishing a monitoring system based on remote sensing, field measurements, and models.

The forestry guidelines produce estimates that are consistent and directly comparable with estimates of emissions reductions for other sectors in the 1605(b)

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program. The guidelines are consistent with protocols used to report changes in forest carbon stocks in U.S. greenhouse gas inventories (USEPA, 2004; USDA, 2004). This is achieved through use of consistent terminology, consistent definitions of ecosystem and wood product carbon pools, and consistent estimation approaches based on national forest inventory statistics.

The forestry technical guidelines include: (i) an overview of calculation approaches, estimation methods, issues, and activities; and (ii) appendices with detailed method guidelines for measurement, models, look-up tables, and wood products. This paper is a summary of selected parts of the general guidelines and technical forestry guidelines as of December 2005. Readers should be aware that the guidelines will be modified over time, and that this paper constitutes an overview of the guidelines rather than a substitute for them.

GREENHOUSE GAS SEQUESTRATION AND EMISSIONS BY THE FORESTRY SECTOR

Forestry sector activities can remove carbon from the atmosphere and store it, a process known as *carbon sequestration*. Increasing carbon sequestration by forests and wood products reduces the concentration of carbon dioxide in the atmosphere as effectively as reducing emissions from burning fossil fuels. Carbon sequestration is a two-step process: carbon dioxide is first withdrawn from the atmosphere by plants through the photosynthetic process, where carbon is stored in organic materials over a period of time. The sequestration process ends when the carbon is released back to the atmosphere principally as carbon dioxide, through either combustion or decay processes. Net carbon in a forest ecosystem increases when the rate of carbon withdrawal from the atmosphere exceeds the rate of release of carbon to the atmosphere.

Carbon is extracted from the forest as trees are harvested. However, the carbon is not necessarily returned directly to the atmosphere. If the trees are used to make wood products, a portion of the sequestered carbon will remain stored in solid form up to several decades or longer. If the harvested trees are used to produce energy, carbon will be released through combustion, offsetting carbon that would have been released through the burning of fossil fuels. Both cases demonstrate the variety of effects that forest harvesting and product use may have on carbon flows.

Forestry activities affect many different carbon pools. Table 1 highlights the key carbon pools that reporters should account for when reporting in the context of the 1605(b) program. With the exception of harvested wood, estimates are directly associated with the land area. Some carbon pools such as the soil may not be affected significantly by a forestry activity, or the changes may be exceptionally difficult to assess. The guidelines include some special provisions for addressing emissions that are very small or impracticable to assess. In developing an estimation process, reporters should consider each of the forest and wood product carbon pools, whether the carbon pools are significantly affected, and what methods are available for making estimates.

Although effects on all greenhouse gases are reportable, forestry activities mainly involve the exchange of carbon dioxide between the land and the atmosphere. Thus, accounting for carbon stocks and flows is the primary focus of the accounting rules and guidelines for forestry. There may be cases where other greenhouse gases are significantly affected by an activity. Of particular concern for forestry is nitrous oxide, which may be released from fertilized forests or during prescribed fire, and methane, which is released from forested wetlands. Since most forestry activities primarily affect carbon stocks, the guidelines for the forestry sector only address sequestration and emissions of carbon dioxide. However, entities should estimate and report effects on other greenhouse gases if significant.

ELIGIBLE ACTIVITIES WITHIN THE FORESTRY SECTOR

The forestry sector involves a broad range of potential greenhouse gas emissions sources, emissions reductions activities, and carbon sequestration activities (Birdsey et al., 2000). Examples include, but are not limited to, the following:

- Afforestation (conversion of agricultural land to forest) can lead to large increases in carbon stocks for the treated area.

Table 1. Carbon pools of forest ecosystems and wood products.

Detailed measurement and estimation	Summarized estimates for default tables	Summarized estimates for reporting
Live trees: aboveground	Live trees	Ecosystem carbon
Live trees: belowground		
Tree seedlings	Understory vegetation	
Shrubs, herbs, forbs, grasses		
Standing dead trees: aboveground	Standing dead trees	
Standing dead trees: belowground		
Down dead wood	Down dead wood	
Stumps and dead roots		
Fine woody debris	Forest floor	
Litter		
Humus		
Soil carbon	Soil carbon	
Harvested wood mass (total removed)	Harvested wood mass (in use and in landfills)	Wood products carbon
	Harvested wood mass (burned for energy)	Not counted in emissions inventories because it is biogenic
	Harvested wood mass (emissions/not used for energy)	Not directly reported, but counted as a reduction in other forest carbon pools

- Restoration of native vegetation and wildlife habitat has the potential to sequester large quantities of carbon.
- Reforestation (active regeneration of harvested forest land) can accelerate the natural regeneration process and allow for the establishment of fast-growing species.
- Agroforestry (cultivation of trees with crops or pasture) can sequester carbon and potentially decrease requirements for fossil energy and energy-intensive chemicals in the production of food and fuel.
- Typical forest management practices may be modified to increase the rate of carbon sequestration from the atmosphere or reduce emissions from decay of specific forest carbon pools.
- Short-rotation woody biomass plantations can sequester carbon and provide energy feedstocks that displace fossil fuels in energy production.
- Protecting existing forests from harvest and/or from conversion to non-forest land use may prevent release of carbon stocks.
- Low-impact harvesting methods can decrease the emissions from soil disturbance and biomass decay that often follow timber harvest.
- Management of the carbon flows in processing of harvested timber for wood products can reduce emissions from wood waste and energy used.
- Urban forestry can increase carbon sequestration in trees and reduce energy used in heating or cooling homes and businesses.

BASIC ELEMENTS OF THE 1605(b) REPORTING SYSTEM

Reporting Entities

Defining the reporting entity is an important first step in the reporting process. The reporting entity must specify certain structural aspects of its operation, such as organizational boundaries, the greenhouse gas sources and sinks that fall within those boundaries, whether it is a large or small emitter, and whether it wants to report or register its greenhouse gas reductions. These decisions will influence how estimates are made.

There is a distinction between large and small entities. *Large entities* are defined as those having annual greenhouse gas emissions that exceed 10000 Mg carbon dioxide equivalent per year. Large entities must report on an entity-wide basis. A large entity may report net emissions reductions and changes in carbon storage from individual projects or specific parts of the entity, but these reports will not be eligible for registration. *Small entities* are defined as those having annual carbon dioxide emissions that are less than 10000 Mg per year. Small entities may register net emissions reductions and changes in carbon storage associated with specific activities as long as all activities of a similar nature are included together. Small entities must certify that emissions reductions are not offset by related activities elsewhere in their organization.

Sub-entities must be defined when more than one calculation method is required, although the reporting will be done at the entity level. Defining sub-entities is appropriate when an entity engages in multiple activities that are unrelated, because a single approach to calculations or a single measure of output may not be feasible.

The general guidelines allow net emission reductions achieved by non-reporting entities (referred to as *offsets*) to be included in an entity's report and be registered. In addition, *aggregators* may (i) act as a reporting entity for third parties and submit reports directly to the Energy Information Administration (EIA), or (ii) facilitate preparation of reports by small entities. Aggregators must provide entity and certification statements for each third party, as well as separate estimates of emissions inventories and reductions. Small entities that serve as aggregators may submit reports for registration without reporting on their own emissions.

General Description of the Reporting and Registration Process

There is a distinction between *reporting* and *registering* greenhouse gas reductions. Reports that are complete and consistent with the provisions of the general and technical guidelines will be accepted. To be eligible for registration, reports must meet additional requirements: include all of the entity's emissions and emissions reductions; calculate reductions using a base period ending no earlier than 2002 (unless participating in voluntary federal programs known as "Climate Leaders" and "Climate Vision"); submit annual reports for each year since the start year; and use calculation methods that meet certain rating standards (described below). Registered reductions will be credited to the entity for use to the extent that a future program recognizes such reductions.

Reports include two basic parts: (i) an entity statement that clearly defines the entity, entity boundaries, sub-entities, type (large or small), types of emissions, start year, and certification statement; and (ii) an initial inventory of greenhouse gas emissions and carbon stocks, followed by annual estimates of emission reductions and changes in carbon stocks. Reporters must provide a self-certification statement that the technical guidelines were followed in developing the estimates, and should retain documentation of methods used to make estimates.

Entities must select a *start year* to begin reporting. For greenhouse gas reductions that are to be registered, the start year may not be earlier than 2002. Reports may be filed for activities between 1990 and 2002, but reductions cannot be registered for this time period. The start year is the first reporting year, and remains fixed. The entity should submit a complete emissions inventory for the start year; however, the emissions inventory for the start year may be computed from a *base period* of up to four years immediately preceding and including the start year. The first year after the start year becomes the *first reduction year*, that is, the first year in which the entity may report a reduction in greenhouse gas emissions relative to the start year. Once an entity begins reporting, annual reports are required. Circumstances may require adjustments to reports that have already been filed, particularly in cases where the inventory for the start year must be adjusted because of acquisitions or divestitures.

METHODS FOR CALCULATIONS

Reporters must use one of five approved calculation methods:

- Changes in emissions intensity—changes in the quantity of emissions associated with the production of a particular product in the reduction year relative to the base year.
- Changes in absolute emissions—changes in the absolute quantity of emissions in the reduction year relative to the base year, as long as the total output has not declined.
- Changes in carbon storage—annual changes in quantities of carbon stored (either biotic or geologic).
- Changes in avoided emissions—reductions associated with electricity, steam, or hot or chilled water that is exported outside of an entity's boundaries, and whose emissions intensity is lower than a benchmark intensity value provided by DOE.
- Action-specific emission reductions—emission reductions from specific actions that cannot be quantified using any of the previous four methods.

Each of these five calculation methods is suited for specific situations. Entities should carefully consider which calculation method (or methods) is best for their own situation. If more than one method is used, a subentity must be defined for each method.

Rating System for Estimates

The technical guidelines describe a variety of methodologies for estimating emissions and carbon sequestration. The methods may generally be described as direct measurement, scientifically based models, emission factors and other inference-based formulas, and look-up tables. Each methodology within a sector is given a rating from A to D, with the most accurate methodology rated A and the least accurate rated D, with B and C in between. Each rating is assigned a score: A = 4, B = 3, C = 2, and D = 1. If more than one methodology is used the entity must calculate a weighted emissions inventory rating, with the weight based on the relative magnitude of reported reductions calculated with each of the methods used. An entity's emissions inventory rating determines whether it can register its emissions reductions under the 1605(b) program, or simply report them. To register reported reductions, the average rating must equal a score of 3.0 or higher.

Exclusions

There are provisions for excluding certain emissions. These include (i) emissions that are comparatively small (*de minimus*), (ii) all non-anthropogenic emissions, and (iii) emissions that are not practicable to assess. Entities may omit reporting up to 3% of total emissions from all sources (estimated in carbon equivalent units) under the *de minimus* provision. For forestry activities, if effects on some carbon pools or other greenhouse gases are greater than 3% of an entity's total emissions, the effects must be estimated and included in the report.

METHODS AND ISSUES SPECIFIC TO THE FORESTRY SECTOR

Basic Calculations and Methods for Forest Land

The "Changes in Carbon Storage" calculation method will be used most often for forest land operations. Forest product manufacturers may need to use additional methods to account for changes in fossil fuel emissions. This paper only addresses the methods for estimating changes in carbon storage on land and in wood products and landfills.

The carbon storage calculation may be approached in two equivalent ways: (i) sum the annual changes in carbon stocks, and (ii) calculate the cumulative changes in carbon stocks from the base year to the reporting year. Both approaches require an annual estimate of the inventory of carbon stored within the boundaries of the reporting entity. Calculating the quantity of carbon in an area of forest requires two pieces of information: the area of forest land included in the entity or activity, and the amount of carbon per unit area. These quantities are multiplied to get an estimated total carbon inventory.

To determine the amount of carbon per unit area, technical guidelines for using three estimation methods are provided. The guidelines are intended to ensure that use of these methods meets minimum acceptable standards of accuracy and precision for reporting. The three estimation methods described in the technical guidelines, and their ratings, are:

- Look-up tables—"Default" estimates that represent average forest conditions by region, ownership class, forest type, and productivity class. Use of default tables will generally be assigned a "C" rating, although reporters may take additional steps to elevate this method to a "B."
- Models—A variety of models are available for many different forest conditions and activities, and may be more accurate than look-up tables for specific projects or entities. If the modeling guidelines are followed, this method will be assigned a "B" rating. Reporters may take additional steps to elevate this method to an "A" rating.
- Measurement—The most accurate way to estimate carbon stocks or flows for a project or entity is to use direct measurement with a specified sampling procedure. The effort required and the cost may be higher than using look-up tables or models, but this method will be assigned an "A" rating if the specifications in the technical guidelines are followed.

Entities may find it useful to partition the land base into computational domains (or strata) to facilitate efficient estimation. Partitioning allows the use of more than one estimation method, giving the reporting entity some flexibility to reduce overall estimation costs by aligning methods with need for accuracy. Use of partitioning does not require defining separate sub-entities because it is part of a single calculation method. A special case of partitioning involves a category of land defined as *incidental*—land that is a minor component of an entity's operations and is not actively managed for production of goods and services. Only specific categories of land may be labeled incidental (e.g., transmission line rights-of-way or grounds surrounding a building). Entities may use approved estimation methods or may assume a default carbon change value of zero for incidental lands.

Basic Calculations and Methods for Wood Products

Carbon pools in wood products include wood-in-use (e.g., lumber, furniture, paper) and wood products that have been discarded in landfills or recycled. If carbon remaining in wood products is not part of the accounting, the calculation of carbon stock change for the forest area that is harvested will indicate that all of the removed carbon is immediately released to the atmosphere, which overestimates emissions.

There are two basic approaches that can be used to estimate carbon in wood products. The first approach is to track, over time, the decay of materials stored in wood products and account for the emissions in the year in which they occur. Each year that harvest takes place must be followed by separate annual tracking and reporting of changes in wood product pools. The second approach is to account for the net expected change in the wood products pool at the end of 100 yr. This approach involves estimating the amount of carbon expected to be stored in wood products and in landfills at the end of a 100-yr period, and reporting that quantity only once for the year of harvest. Regardless of which approach is used, accounting for carbon in wood products begins at the first year of harvest after the start year selected by the reporter. It is not necessary to estimate changes in the carbon content of wood products that were harvested in years before the start year.

There are three starting points for calculating carbon in harvested wood products (Fig. 1). The first is the volume of wood in a forest (the volume of *growing stock*) available for harvest and subsequent processing. The second is the quantity of roundwood that is harvested and removed from the forest, and available for use by mills that manufacture primary wood products. The third starting point is the primary wood products which are products produced at mills (e.g., lumber or paper). Reporters may choose any of these starting points, depending on the information available to them for making estimates. Technical guidelines are provided to assist reporters in each of these cases (Smith et al., 2006).

The reporting entity may use either of the two estimation approaches for wood products with one or more of the three starting points. The rating for estimates of carbon in wood products depends on how well the estimates represent the specific products produced by the reporting entity, or more generally, produced from the harvested wood. If the selected estimation approach is a good match, it should result in a "B" rating.

Biomass energy involves an important cross-sectoral linkage between forestry and the electricity supply sector. Analysis of the carbon flows should account for both changes in carbon sequestration (using the methods described here) and effects of substitution of biomass energy for fossil fuel energy. Calculating the release of carbon from the combustion of biomass fuel and the displacement of emissions from fossil fuels is described in technical guidelines for the electricity supply sector.

Some Specific Forestry Issues

Impacts of *natural disturbance* require calculations that separate the effects of the natural disturbance from human-caused effects of activities. The affected land must then be tracked separately, and the entity cannot report additional increases in carbon stocks on affected land until those stocks return to pre-disturbance levels.

Purchase or sale of land is common among forestry entities. If land is sold or acquired, carbon stock estimates for the start year and the reporting year must be adjusted accordingly by both entities if both are already entered into the reporting system. If acquired land has not previously been part of the reporting system, it may be difficult or impossible to estimate an initial inventory that corresponds to the start year of the entity acquiring the land. In this case the reporting entity may choose to define a new sub-entity for calculating changes in carbon stock for the newly acquired land.

Averaging and modeling may be useful for estimating annual changes in forest carbon stocks from measurements because the change in stocks in a single year may be too small to measure cost effectively. Therefore, reporters are allowed to estimate net emissions reductions and changes in carbon stocks using average values obtained over multi-year periods. An effective approach is to combine measurement and modeling. This involves periodic measurements supplemented with models to

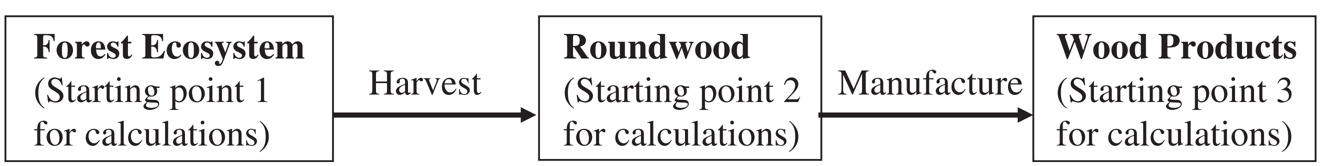

Fig. 1. Flow of wood from forest to wood products, showing starting points for calculations. Starting Point 1 is an estimate of the volume of growing stock in a forest, which excludes unmerchantable trees and portions of merchantable trees left in the forest at time of harvest. Starting Point 2 is an estimate of the roundwood available for processing at mills, including logs, bolts, and other round timber. Starting Point 3 is a compilation of the primary wood products manufactured from harvested wood, such as lumber, plywood, or paper.

estimate annual changes in carbon stocks between measurement years.

Sustainably managed forests may receive special treatment in the estimation process if the land has been certified sustainable by a third party. Reporters may then choose to enter a default value of zero net carbon flow for these lands. However, the reporter may then be forgoing the benefit of claiming an increase in carbon stocks resulting from improved management on those lands.

Leakage, or the amount of an activity's sequestration benefit that is offset elsewhere, is commonly discussed in literature about forest carbon sequestration. To minimize leakage within an entity's boundaries, entity-wide reporting is required for large emitters. For small emitters, "activity-level" reporting is allowed, with certification that activities do not increase emissions elsewhere on lands under control of the entity. Leakage associated with changes in economic activity outside the control of the reporting entity is not addressed in the 1605 (b) program.

Permanence, or the retention of sequestered carbon over time, is often discussed in the literature because gains in carbon stocks may be reversed by natural disturbance events or timber harvesting. This is addressed in the 1605(b) program by requiring continuous reporting once an entity enters the reporting system. Losses as well as gains in carbon stocks must be accounted for.

ASSISTANCE FOR REPORTERS

There are specific sections for forestry in the technical guidelines, and supplemental technical appendices that provide (i) default estimates for common forest types of United States; (ii) methods for estimating carbon in wood products; (iii) guidelines for using models; and (iv) sampling and measurement protocols. These documents are all available at the 1605(b) program web site (United States Department of Energy, 2005).

Reporting entities may already have available expertise for quantifying carbon sequestration in forests or wood products. If not, several decision-support systems are available or under development to assist reporters in compiling estimates at low cost using approved methodology. As the 1605(b) program is implemented over the next few years, these decision-support systems will improve with experience of users and additional research, and additional decision-support systems will become available. Several of the decision-support systems currently undergoing development and testing are briefly described here. Each of these is being customized to facilitate reporting under greenhouse gas management registries and programs.

The Carbon OnLine Estimation tool (COLE) is a graphical web-based tool that provides estimates of forest carbon stocks, carbon stock changes, and other basic forest inventory parameters (Proctor et al., 2005; USDA Forest Service, 2005a). Outputs are based on USDA Forest Service Forest Inventory and Analysis data, augmented by estimators used in the carbon budget model (FORCARB2) to convert forest inventory data to carbon estimates (Smith et al., 2004). FORCARB2 is also the basis for the carbon inventory of the forest sector reported in the U.S. greenhouse gas inventory (USEPA, 2004; USDA, 2004). COLE will produce carbon stock tables by age class for user-defined forest types, regions, and other attributes so that estimates can be closely matched with specific conditions of land.

The Forest Vegetation Simulator (FVS) is a family of forest growth simulation models (USDA Forest Service, 2005b). Variants of FVS include well-known growth and yield models for specific geographic areas and most major forest tree species, forest types, and stand conditions of the United States. FVS is an individual-tree, distance-independent growth and yield model that can simulate a wide range of silvicultural treatments. FVS is the most widely used forest stand simulator in the United States because of its applicability to such a wide range of treatments and forest stand conditions. Research has begun to add complete carbon accounting to the FVS model.

The "Growout" model is designed to project the growth, mortality, and benefits of a population of urban trees. The user enters a minimal amount of critical information and the model projects total number of surviving trees by diameter class, the percentage of tree cover, carbon storage, and value. Growout is being enhanced to include annual monitoring capability and calculation of energy benefits of urban trees. Growout is based on a well-known urban tree model called the Urban Forest Effects Model (UFORE). The UFORE computer model was developed to help managers and researchers quantify urban forest structure and its functions (Nowak and Crane, 2000).

CONCLUSIONS

This paper is a summary of the main features of the general guidelines, and some of the issues specific to the forestry sector. It is not intended to replace the technical guidelines, but rather, to serve as an introduction to the key features of the guidelines.

Future climate policy will be shaped by many factors, including scientific research, social and political pressures, and economic conditions. Future approaches to managing greenhouse gases may involve regulatory limits on emissions, market mechanisms, and continuation of voluntary actions. Regardless of how greenhouse gases are eventually managed, a user-friendly reporting system that has a scientific basis, is transparent and consistent, and addresses key accounting principles, is an essential component of the policy.

The 1605(b) greenhouse gas registry may eventually become a basis for valuing carbon credits. The rules and guidelines are needed to provide consistent estimation of the quantity of carbon sequestered and emissions reduced by different forestry activities, and can be used to determine the value of the credits. To support future emissions trading, methods must be accurate and compatible with approaches used to report and register activities in other economic sectors. The rules and guidelines for forestry are based on solid scientific and technical work, and efforts have been made in developing the rules and guideline to avoid imposing an excessive burden on voluntary reporters.

To facilitate the reporting process, research is underway to develop and disseminate decision support systems for managing, estimating, and reporting forest carbon sequestration. This research will lower the time and resource costs of participation in programs to increase forest carbon sequestration.

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