


# Chicago Climate Exchange®

## Forestry Carbon Sequestration Project Protocol



### Forestry Carbon Sequestration Projects

The Chicago Climate Exchange (CCX®) Forest Carbon Sequestration Project Protocol contains CCX requirements and guidelines for registering forest carbon offset and commercial forest projects. CCX General Offsets Program Provisions, CCX Offset Project Verification Guidance Document and CCX Offset Project Protocols can be downloaded by visiting [www.theccx.com](http://www.theccx.com). Requests for further information or comments may be directed to [offsets@theccx.com](mailto:offsets@theccx.com).

[PAGE INTENTIONALLY LEFT BLANK]

# CHICAGO CLIMATE EXCHANGE OFFSET PROJECT PROTOCOL

## Forestry Carbon Sequestration Offset Projects

### Table of Contents

Acronyms, Terms and Definitions.....	7
1. Introduction.....	12
2. General Provisions.....	12
3. Associated Documents.....	13
4. Project Definition.....	13
4.1 Eligible Forestry Carbon Sequestration Project Types.....	13
4.1.1 Afforestation / Reforestation Projects.....	13
4.1.2 Sustainably Managed Forest Projects.....	14
5. Eligibility Criteria.....	14
5.1 CCX Membership.....	14
5.2 Eligibility Governing Entities with Minor Emissions.....	14
5.3 Ownership and Control.....	15
5.3.1 Land Acquisition/Disposition Rules.....	16
5.3.2 Prevention of Double-Counting.....	18
5.3.3 Required Contract Conditions for Aggregated Projects.....	18
5.4 Project Start Date.....	18
5.5 Project Location.....	19
5.6 Eligible Carbon Pools.....	19
5.7 Performance Benchmark.....	19
5.7.1 Additionality.....	20
5.7.1.1 Regulatory Criteria.....	20
5.7.1.2 Common Practice Criteria.....	20
6. Project Boundary.....	21

6.1	Identification of GHG Sources, Sinks and Reservoirs .....	21
6.1.1	Controlled GHG Sources and Sinks .....	21
6.1.2	Related GHG Sources and Sinks .....	22
6.1.3	Affected GHG Sources and Sinks .....	22
6.2	Determining the Baseline Scenario .....	22
6.3	Project Emissions .....	22
7.	Quantifying Emission Reductions.....	23
8.	Project Permanence .....	23
8.1	Carbon Reserve Pool .....	23
8.2	Commitment to Maintaining Enrolled Land as a Forest .....	24
8.3	Letter of Intent to Maintain Forest Stocks beyond the CCX Market Period .....	24
9.	Afforestation / Reforestation and Widely-Spaced Tree Planting Offset Project Guidelines	25
9.1	Project Summary/Definition.....	25
9.2	Record-Keeping Requirements.....	25
9.3	Sustainable Forest Management Certification Requirements .....	25
9.4	Project Registration, Verification and Crediting Procedure for Afforestation / Reforestation Offset Projects .....	26
9.5	Forest Carbon Quantification Methodology .....	26
9.5.1	CCX Carbon Accumulation Tables.....	26
9.5.2	Baseline Year Establishment .....	27
9.6	Project Boundary Rule.....	27
10.	Sustainably Managed Forestry Offset Project Guidelines .....	27
10.1	Project Summary/Definition .....	27
10.2	Record-Keeping Requirements .....	28
10.3	Sustainable Forest Management Certification Requirements .....	28
10.4	Project Registration, Verification and Crediting Procedure for Sustainably Managed Forestry Offset Projects.....	29
10.5	Forest Carbon Quantification Methodology.....	29
	Equation 1: Calculating the Net Annual Change in Carbon Stocks.....	29
10.5.1	Quantifying Change in Carbon Stocks .....	30
10.5.2	Baseline Year Establishment.....	30

10.5.3	Discounting Net Annual Change .....	30
10.6	Project Boundary Rule .....	31
11.	Long-Lived Wood Products Guidelines.....	31
11.1	Quantification Methodology for Carbon Dioxide in Long-Lived Wood Products....	32
11.1.1	Conversion Factors for Weight of Wood into Carbon Dioxide Equivalent for Landowners at Harvest .....	32
11.1.2	Recognized Wood Product Categories for Landowners at Harvest.....	33
	Equation 3: Quantity of Carbon Dioxide in LLWP at the End of 100 Years.....	33
11.2	Primary Wood Products Manufacturer Overview .....	34
11.3	Primary Wood Products Manufacturer Quantification Methodology .....	35
12.	Supplemental Information for Commercial Forest Members .....	35
12.1	Commercial Forest Company Overview.....	35
12.2	Limitations on Use of CFIs Issued on the Basis of Net Changes in Carbon Stocks	36
	Table 1 – Maximum Levels of Annual Increases / Decreases in Carbon Stocks.....	36
12.3	Alternative Method for Defining Maximum Net Increases or Decreases in Carbon Stocks	37
	Equation 4: Synthetic Direct Emission Baseline .....	37
13.	Validation and Verification Requirements.....	38
13.1	Validation.....	38
13.2	Verification.....	38
13.2.1	In-Field Inspection Requirements .....	38
13.2.2	Desk Audit Requirements .....	39
13.2.3	Materiality Thresholds for Afforestation / Reforestation, Widely-Spaced Tree Planting and Long-Lived Wood Products Offset Projects Using CCX Carbon Accumulation Tables.....	39
13.2.4	Materiality Thresholds Afforestation/Reforestation and Sustainably Managed Forestry (using direct measurements).....	40
13.2.5	Procedures for Evaluating Reported In-Field Inventory.....	40
13.2.6	Procedures for Evaluating Remote Sensing Measurements .....	41
14.	References.....	41
	Appendix A: Verification Checklist.....	43
	Appendix B – Afforestation / Reforestation Supplemental Information .....	47

Table 2 – Classification of Afforestation / Reforestation Regions.....	47
Table 3 – Regional Estimates of Annual Carbon Accumulation in Live trees and Soil Organic Carbon for Afforestation / Reforestation (Metric tons CO <sub>2</sub> / acre/ year age of tree) .....	48
Appendix C: Sample Letter of Intent to Maintain Forest Stocks beyond the CCX Market Period for Forestry Projects.....	50
Appendix D: Example of Land Acquisition and Disposition .....	51
Example: Land Acquisition .....	51
Example: Land Disposition .....	51
Appendix E: Sustainably Managed Forest Supplemental Information .....	52
Table 4 – CCX-approved Certification Schemes for Sustainable Forest Management... ..	52
Appendix F: LLWP Supplemental Information .....	54
Conversion Factors.....	54
Table 5 – Selected CCX factors for Average Disposition Patterns of Carbon as fractions of Roundwood by Region and Roundwood Category (assuming no bark on roundwood and excluding fuel wood) .....	54
Table 6 – Volume Multipliers for Converting Timber and Chip Units into Thousand Cubic Feet (MCF).....	55
Table 7 – Basic Factors for Converting Merchantable Wood Yield to Carbon Yield by Species.....	56
LLWP Pooled Participant Quantification Examples .....	57
Example 1 – Harvest Reported in Weight.....	57
Example 2 – Harvest Reported in Volume .....	58
Table 8 – Product Categories Included in CCX LLWP Protocols.....	59
Example 3 – Estimating LLWP Carbon for Commercial Forest Companies with CCX Registered Forest Land.....	60
Appendix G: Widely-Spaced Tree Planting Supplemental Information.....	62
Equation 6: Calculating Age of Widely Spaced Trees.....	62
Table 9 – Tree Types and Growth Rates Applied to Widely-Spaced Tree Plantings (Urban and Suburban Tree Planting Programs) .....	64
Table 10 – Annual CCX Carbon Accumulation Quantities for Widely-Spaced Tree Plantings (Urban and Suburban Tree Planting Programs) (Mt CO <sub>2</sub> ) per One Hundred Trees by Tree Type and Age .....	66
Appendix H: CCX-Approved Growth-and-Yield Models.....	67

Appendix I: Synthetic Baseline – Hypothetical Example ..... 68

Table 11 – Modified Limitations on Sales of Exchange Allowances from Net Increases in Forest Carbon Stocks for Firm (metric tons of CO<sub>2</sub>)..... 68

## Acknowledgements

CCX would like to thank members of the CCX Forestry Committee and the CCX Forestry Verifiers Committee for their review, evaluation, and feedback of the CCX Offset Project Protocol for Forestry Carbon Sequestration Offset Projects.

### **CCX Forestry Committee Members:**

**Robert Fledderman**, MeadWestvaco (Chair)  
**Jim Rakestraw**, International Paper (Vice-Chair)  
**Christoph Bulholzer**, Precious Woods  
**Robert Burke**, Lugar Stock Farm  
**Silvia Gomez Caviglia**, Greenoxx Global Environmental Program  
**David MacFarlane**, Michigan State University  
**David Miller**, Agragate Climate Credits Corporation  
**Rob Olszewski**, Plum Creek Timber Company  
**Todd Parker**, Delta Institute  
**Neil Sampson**, National Carbon Offset Coalition (NCOC)  
**Matt Smith**, Forecon EcoMarket Solutions LLC

### **CCX Forestry Committee Advisors:**

**Thomas Schmidt**, U.S. Forest Service  
**David Skole**, Michigan State University  
**Gary Kaster**, Winrock International  
**John Shideler**, NSF-ISF<sup>1</sup>

### **CCX Forestry Verifier Committee Participants:**

**John Bennett**, SGS  
**Richard Boitnott**, Bureau Veritas Certification  
**Burl Carraway**, Texas Forest Service  
**Mike Ferrucci**, NSF-ISR  
**Adam Gibbon**, Rainforest Alliance  
**Jeffrey Haywood**, Rainforest Alliance  
**Ron Honea**, SGS  
**Robert Hrubes**, Scientific Certification Systems  
**Robin Jolley**, American Forest Management  
**Gary Kaster**, Winrock  
**Christian Kobel**, SGS  
**Kurt Krueger**, Larson & McGowin  
**Alexander McCall**, Larson & McGowin  
**Janice McMahon**, Environmental Services, Inc.  
**Shawn McMahon**, Environmental Services, Inc.  
**Steve Ruddell**, First Environment  
**Martin Schroeder**, TUV SUD

---

<sup>1</sup> Is also a Member of the CCX Forestry Verifier Committee

## ACRONYMS, TERMS AND DEFINITIONS<sup>2</sup>

<b>ANSI</b>	American National Standards Institute
<b>CCX</b>	Chicago Climate Exchange
<b>DBH</b>	Diameter at Breast Height
<b>GHG</b>	Greenhouse Gas
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>WBCSD</b>	World Business Council on Sustainable Development
<b>WRI</b>	World Resources Institute

<b>Above-ground Biomass:</b>	That part of a plant's cellular substance that is above the ground, i.e. excluding the root system.
<b>Afforestation:</b>	A land-use change followed by the establishment of forest on land that has been in a non-forest use for ten (10) years or longer prior to the afforestation.
<b>Annual Removals:</b>	The net volume of growing stock trees removed from the inventory during a specified year by harvesting, cultural operations such as timber stand improvement, or land clearing.
<b>Basal Area:</b>	The total area, measured in square feet, occupied by tree trunks at breast height.
<b>Breast Height:</b>	The height at which forest inventory measurements are taken (four and one-half feet above the base of a tree).
<b>Carbon Stock:</b>	A quantity of carbon stored in soils or biomass, expressed in metric tons carbon dioxide equivalent.
<b>Commercial Forestry Members:</b>	Entities that have joined CCX as an emitting member undertaking an emissions reduction commitment that are eligible to accrue CFIs from forest carbon stock flux or long-lived wood products.

---

<sup>2</sup> Please refer to CCX General Offsets Program Provisions for additional "Acronyms, Terms and Definitions"

- Crown:** The portion of the top of a tree that is harvested but that is not merchantable or weighed.
- DOE Technical Guidelines, Voluntary Reporting of Greenhouse Gases (1605(b)) Program<sup>3</sup>:** Hereafter referred to as the *US DOE 1605(b) report*. The purpose of the guidelines is to establish the procedures and requirements for filing voluntary reports, and to ensure that the annual reports of GHG emissions, emission reductions, and sequestration activities submitted by corporations, government agencies, non-profit organizations, households, and other private and public entities to submit are complete, reliable, and consistent.
- Down Dead Wood (U.S.):** Woody material that includes logging residue and other coarse dead wood on the ground and larger than 7.5 cm in diameter, and stumps and coarse roots of stumps.<sup>4</sup>
- Forest Carbon Sequestration:** The removal of carbon dioxide from the atmosphere and retention in a forest system.
- Forest floor (U.S.):** Organic material on the floor of the forest that includes fine woody debris up to 7.5 cm in diameter, tree litter, humus, and fine roots in the organic forest floor layer above mineral soil.<sup>5</sup>
- Forest Land (U.S)<sup>6</sup>:** Land at least 10 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use. (Note: Stocking is measured by comparing specified standards with basal area and/or number of trees, age or size, and spacing.) The minimum area for classification of forest land is 1 acre. Roadside, streamside, and windbreak strips of timber must have a crown width of at least 120 feet to qualify as forest land. Unimproved roads and trails or clearings in forest areas shall be classed as forest if less than 120 feet wide. Water bodies (rivers, streams, or lakes) less than 30 feet in width shall be classed as forest if less than 30 feet wide. Water bodies more than 30 feet in width are classified as water.
- A classification of forest land based on the species forming a plurality of live tree stocking. The associated species for each forest type are based on

---

<sup>3</sup> US DOE 1605b Report: <http://www.eia.doe.gov/oiaf/1605/gdlins.html> (January 2007)

<sup>4</sup> US DOE 1605b Report: <http://www.eia.doe.gov/oiaf/1605/gdlins.html> (January 2007)

<sup>5</sup> US DOE 1605b Report: <http://www.eia.doe.gov/oiaf/1605/gdlins.html> (January 2007)

<sup>6</sup> Forest Inventory and Analysis definition by the U.S. Forest Service.

net volume of growing stock by species group. Major forest types are:

- **Nonforest land:** Land that has never supported forests, and land formerly forested where use for timber management is precluded by development for other uses. (Note: Includes areas used for crops, active Christmas tree plantations as indicated by annual shearing, orchards, nurseries, improved pasture, residential areas, city parks, improved roads of any width and adjoining clearings, powerline clearings of any width, and 1- to 40-acre areas of water classified by the Bureau of the Census as land.) If intermingled in forest areas, unimproved roads and nonforest strips must be more than 120 feet wide and more than 1 acre in area to qualify as nonforest land.
- **Nonforest land without trees:** Nonforest land with no live trees present.
- **Nonforest land with trees:** Nonforest land with one or more trees per acre at least 5 inches d.b.h.
- **Nonstocked land:** Timberland less than 10 percent stocked with all live trees.
- **Other forest land:** Forest land not capable of producing 20 cubic feet per acre per year of industrial wood crops under natural conditions and not associated with urban or rural development. Many of these sites contain tree species that are not currently utilized for industrial wood production or trees of poor form, small size, or inferior quality that are unfit for most industrial products. Unproductivity may be the result of adverse site conditions such as sterile soil, dry climate, poor drainage, high elevation, and rockiness. This land is not withdrawn from timber utilization.

**Forest Land (Non-U.S.)<sup>7</sup>:**

Forest Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use.

- Forest is determined both by the presence of trees and the absence of other predominant land uses. The trees should be able to reach a minimum height of 5 meters in situ. Areas under reforestation that have not yet reached but are expected to reach a canopy cover of 10 percent and a tree height of 5 m are included, as are temporarily

---

<sup>7</sup> Food and Agriculture Organization (FAO) of the United Nations – Forestry Department: Global Forest Resources Assessment Update 2005, Terms and Definitions, p.16(34), Rome 2004 <http://www.fao.org/forestry/media/7797/1/0/>

unstocked areas, resulting from human intervention or natural causes, which are expected to regenerate.

- Includes areas with bamboo and palms provided that height and canopy cover criteria are met.
- Includes forest roads, firebreaks and other small open areas; forest in national parks, nature reserves and other protected areas such as those of specific scientific, historical, cultural or spiritual interest.
- Includes windbreaks, shelterbelts and corridors of trees with an area of more than 0.5 ha and width of more than 20 m.
- Includes plantations primarily used for forestry or protection purposes, such as rubberwood plantations and cork oak stands.
- Excludes tree stands in agricultural production systems, for example in fruit plantations and agroforestry systems. The term also excludes trees in urban parks and gardens.<sup>8</sup>
- **Other Wooded Land<sup>9</sup>:** Land not classified as Forest, spanning more than 0.5 hectares; with trees higher than 5 meters and a canopy cover of - 10 percent, or trees able to each these thresholds in situ; or with a combined cover of shrubs, bushes and trees above 10 percent. It does not include land that is predominantly under agricultural or urban land use.

**Gross Growth:** Annual increase in volume of trees at least 5.0 inches d.b.h. in the absence of cutting and mortality. (Gross growth includes survivor growth, ingrowth, growth on ingrowth, growth on removals before removal, and growth on mortality before death).

**Live Trees:** Live trees refers to: “Live trees with diameter at breast height (d.b.h.) of at least 2.5 cm (1 inch), including carbon mass of coarse roots (greater than 0.2 to 0.5 cm, published distinctions between fine and coarse roots are not always clear), stems, branches, and foliage.”<sup>10</sup>

**Net Annual Change:** Increase or decrease in volume of live trees at least 5.0 inches d.b.h. Net annual change is equal to net annual growth minus average annual

---

<sup>8</sup> The term is mainly related to FRA 2005 National Reporting Table T1.

<sup>9</sup> The term is mainly related to FRA 2005 National Reporting Table T1.

<sup>10</sup> Table 1.1 of the US DOE 1605b Report: <http://www.eia.doe.gov/oiaf/1605/gdlines.html> (January 2007)

removals.

<b>Net Annual Growth:</b>	The average annual net increase in the volume of trees during the period between inventories. Components include the increment in net volume of trees at the beginning of the specific year surviving to its end, plus the net volume of trees reaching the minimum size class during the year, minus the volume of trees that died during the year, and minus the net volume of trees that became cull trees during the year.
<b>PEFC Council:</b>	The PEFC Council (Programme for the Endorsement of Forest Certification schemes) is an independent, non-profit, non-governmental organization, founded in 1999 which promotes Sustainably Managed Forests through independent third party certification. The PEFC provides an assurance mechanism to purchasers of wood and paper products that they are promoting the sustainable management of forests. <sup>11</sup>
<b>Pooled Participant:</b>	A landowner or Project Owner that has entered into contract with a CCX Offset Aggregator.
<b>Reforestation:</b>	Reestablishing a forest on land where forest cover has been lost, usually through a severe disturbance that is not the result of intentional management activity or gross negligence, and where the desired forest is not regenerating naturally.
<b>Soil Organic Carbon:</b>	Belowground carbon without coarse roots, but including fine roots and all other organic carbon not included in other pools, to a depth of 1 meter. <sup>12</sup>
<b>Standing Dead Trees (U.S.):</b>	Standing dead trees with d.b.h. of at least 2.5 cm, including carbon mass of coarse roots, stems, and branches. <sup>13</sup>
<b>Thinning:</b>	The removal of certain trees in a stand to reduce competition for resources among the trees.
<b>Timber Cruise:</b>	A systematic field measurement of trees for the purpose of establishing a timber inventory.

---

<sup>11</sup> <http://www.pefc.org/internet/html/>

<sup>12</sup> Table 1.1 of the US DOE 1605b Report: <http://www.eia.doe.gov/oiaf/1605/gdlines.html> (January 2007)

<sup>13</sup> US DOE 1605b Report: <http://www.eia.doe.gov/oiaf/1605/gdlines.html> (January 2007)

## 1. INTRODUCTION

Chicago Climate Exchange (CCX) is the world's first and North America's only active voluntary, legally binding integrated trading system to reduce emissions of all six major greenhouse gases (GHGs), with Offset Projects worldwide. CCX Members with significant GHG emissions voluntarily enter into a legally binding agreement to reach CCX GHG Emission Reduction Commitment<sup>14</sup>. Upon enrollment with CCX, Exchange Allowances are issued to Members in amounts equal to their emission reduction targets. CCX Exchange Offsets are issued to Owners or Aggregators of registered projects on the basis of verified sequestration, destruction or reduction of GHG emissions not included under the CCX Emission Reduction Commitment. Members are required to turn in the amount of Exchange Allowances and/or Exchange Offsets equal their actual GHG emissions annually.

CCX strives to promote transparency and integrity in the carbon market. In accordance with this goal, in developing this document, CCX was guided by the fundamental principles of project GHG accounting outlined in ISO 14064-2: *Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements*, Version 1. These principles include:

- Relevance
- Completeness
- Consistency
- Accuracy
- Transparency
- Conservativeness

The following sections of this Protocol discuss the project criteria, boundaries, monitoring requirements, emissions reduction calculations and other guidelines that each Project Proponent must meet in order to generate Exchange Offsets from Forestry Carbon Sequestration Projects.

## 2. GENERAL PROVISIONS

Projects are subject to the conditions of this Protocol, the CCX General Offset Program Provisions and determinations of the CCX Forestry Committee. All Project Proponents should review CCX General Offset Program Provisions and CCX Offset Project Protocol for Forestry Carbon Sequestration Offset Projects.

---

<sup>14</sup> <http://theccx.com/content.jsf?id=72>

### 3. ASSOCIATED DOCUMENTS

This Protocol references the use of several associated documents. These documents include:

- CCX General Offset Program Provisions
- CCX Project Implementation Document – Forestry
- CCX Project Specific Conflict of Interest Form
- CCX Greenhouse Gas Emission Factors Form
- CCX Project Ownership Attestation
- CCX General Verification Guideline

These documents are available on the Offsets section of the CCX website: [www.theccx.com](http://www.theccx.com).

### 4. PROJECT DEFINITION

Forestry Projects have the potential to make a significant contribution to mitigating climate change and are synergistic with activities promoting adaptation and sustainable development<sup>15</sup>. A CCX Forestry Project consists of the sequestration of atmospheric carbon dioxide in defined forest carbon pool in accordance to the eligibility criteria and other requirements outlined in these guidelines.

#### 4.1 Eligible Forestry Carbon Sequestration Project Types

##### 4.1.1 Afforestation / Reforestation Projects

CCX Afforestation and Widely Spaced Tree Planting Projects consist of a land-use change followed by the establishment of forest on land that has been in a non-forest use for ten (10) years or longer prior to the Afforestation. CCX Reforestation Projects consist of reestablishing a forest on land where forest cover has been lost, usually through severe disturbance that is not the result of intentional management activity or gross negligence, and where the desired forest is not regenerating naturally.

CCX Afforestation / Reforestation and Widely Spaced Tree Planting Projects guidelines are available in [section 10](#) of this document.

---

<sup>15</sup> 2007 Intergovernmental Panel on Climate Change Working Group III Report *Mitigation of Climate Change*, Chapter 9: Forestry.

#### **4.1.2 Sustainably Managed Forest Projects**

CCX Sustainably Managed Forest Projects involved sequestration of carbon dioxide through active maintenance or increases in forest carbon stock through sustainable management strategies. Offset Providers or Aggregators seeking to be issued Exchange Offsets from Long-Lived Wood Products (LLWP) must enroll the net change in their Forest Carbon Stock in the Sustainably Managed Forest Protocol to be eligible. CCX Sustainably Managed Forest Projects guidelines are available in [section 11](#) of this document.

### **5. ELIGIBILITY CRITERIA**

Several factors determine a Project's eligibility for generating Exchange Offsets including the Proponent's membership status, ownership status, project start date, location and whether the project meets the CCX performance benchmark. Project Proponents should submit the CCX Project Implementation Document – Forestry for review and determination of eligibility.

#### **5.1 CCX Membership**

The Project Proponent(s) must be a Member or Participant Member (Offset Provider or Aggregator) of CCX. For-profit entities, cooperatives, governmental bodies and non-profit organizations may act as CCX Offset Aggregators. An Aggregator serves as an administrative representative, on behalf of Project Owners, of one or more projects. Forestry Offset Aggregators are responsible for maintaining a database of Pooled Participant records and maintaining accurate records of enrolled Projects' forest inventories. Project Proponents should contact CCX directly for membership rules and information.

#### **5.2 Eligibility Governing Entities with Minor Emissions**

Entities with an entity-wide emissions profile greater than 10,000 metric tons of carbon dioxide equivalent (Mt CO<sub>2</sub>e) for the most recent calendar year may register and trade CCX Exchange Offsets only if the entity is a Member of CCX and undertakes the CCX Emission Reduction Commitment. For specific guidance on this provision, Project Proponents should review CCX General Offset Program Provisions.

Entities who are unsure of their emissions profile should estimate their direct CO<sub>2</sub> emission using well accepted methodologies such as those available at the World Resources Institute (WRI)/World Business Council on Sustainable Development (WBCSD). CCX requires that all entities that are not Members, including producers enrolled with Aggregators, provide an attestation relating to their direct emissions in a the Project Ownership Attestation Form.

Project Emissions shall be calculated in accordance with the CCX Project Emissions Guidance Document. Fossil fuel emissions factors are available at [http://www.theccx.com/docs/misc/GHG\\_Emission\\_Factors.pdf](http://www.theccx.com/docs/misc/GHG_Emission_Factors.pdf).

For specific guidance on this provision, Project Proponents should review the CCX General Offset Program Provisions.

### **5.3 Ownership and Control**

The Project Owner must demonstrate clear ownership of the GHG mitigation rights associated with the project in order to register the offsets with CCX.

CCX Offset Aggregators must demonstrate to the project's CCX-Approved Verifier and CCX that they have acquired rights for trading of CCX Exchange Offsets associated with the project activity in order to execute its responsibilities on CCX pursuant to CCX General Offset Program Provisions. This may be demonstrated in the contract from the Project Owner providing the Aggregator the rights to register and trade Offsets on behalf of the Project Owner.

Project Proponents may satisfy the requirement of ownership of GHG mitigation rights by demonstrating that they own the land on which the project is enrolled. Acceptable documentation for legal ownership by participants may include a property deeds, tax receipts from the most recent calendar year, or a title or abstract to the property. Pooled Participants represented by an Aggregator can satisfy this requirement by having the ownership declared by the Pooled Participant in the contract with their Aggregator.

Project Proponents may enroll Carbon Stocks on leased land provided that there is a signed agreement between the Pooled Participant and lessor concerning ownership of the GHG rights on the leased land. For leased land, the Verifier is responsible for reviewing and establishing land ownership by the lessee, the lease agreement between the lessee and lessor, and the signed agreement between the Pooled Participant (lessee) and lessor establishing the ownership of forest carbon on the leased land. Pooled Participants represented by an Aggregator can satisfy this requirement by including a signed statement by the lessee in the contract filing attesting to these requirements.

If the lessor is represented by an Aggregator and the lease arrangement is less than 15 years from the CCX enrollment date, the lessee is responsible for signing a contract with the Aggregator ensuring that the land will satisfy the permanence requirement described in [Section 9](#).

Acceptable requirements for establishing ownership for projects located in non-Annex I countries as defined under the Kyoto Protocol will be evaluated on a case-by-case basis by the CCX Forestry Committee.

### **5.3.1 Land Acquisition/Disposition Rules**

The quantification of changes in Carbon Stocks will be adjusted to reflect acquisition or disposition of forested land. Each Member shall report any acquisitions and dispositions of forested land to the contracted CCX-Approved Verifier in the immediate verification subsequent to the transaction. The report shall state any retrospective adjustments to be made in net changes in the Member's Carbon Stocks as a result of the transaction. Examples of accounting for land acquisition and disposition are included as Appendix D.

#### **5.3.1.1 Land Acquisition**

When forested land is acquired, the enrolled landowner may include eligible forest carbon accumulation provided that it meets all of the criteria set forth in this document. When forest parcels are purchased, the carbon stocks on the purchased forest are not credited as growth for remainder of the calendar year in the year that they were purchased, but are added into the baseline at the end of the calendar year of purchase so that the net growth may be credited in subsequent years. A Member shall not be issued CFI's for increases or decreases in Carbon Stocks prior to this year.

Following the acquisition of forested land, a forest inventory shall be conducted and the corresponding Carbon Stocks quantified. A baseline for acquired land is established as December 31 for the year in which it was acquired. Thus, the baseline for the project for the first complete calendar year subsequent to the year this new land was acquired will equal the sum of the baseline for the lands previously owned and for lands newly acquired.

Projected annual changes in Carbon Stocks reported to CCX shall be adjusted to take account of the projected changes in Carbon Stocks on the land acquired for the first full CCX program year subsequent to when it was acquired. Members shall be issued or shall surrender CFIs for increases or decreases in Carbon Stocks on that land through the current CCX Market Period for which the project is enrolled.

#### **5.3.1.2 Land Disposition**

If forested land is disposed by a land owner, then the Offset Provider or Aggregator will be penalized by the total amount of Offsets issued by CCX for sequestered carbon from those acres for entire length of time that the land has been enrolled in the program. In such cases, the Member shall surrender an amount of CFIs equivalent to the amount issued to that Member in previous years on the basis of the increase in Carbon Stocks on that parcel of forested land.

Disposition by a Member of a parcel of forested land on which there had been a net reduction in Carbon Stocks between the baseline and the time of its disposition will not result in any adjustments to the net reduction.

Following the disposition of forested land, projected annual changes in Carbon Stocks reported to CCX shall be adjusted to take account of the disposition. A Member shall not be issued or shall not surrender CFIs for increases or decreases in Carbon Stocks on forested land after the date of its disposition.

#### **5.3.1.2.1 Implications of Purchaser on Land Disposed by CCX Member**

For all forestry projects, the Member will not be required to surrender accrued CFIs on the disposed land only if the purchaser of the land meets the following conditions on an annual basis:

1. Enrolls the acquired land in CCX as per the CCX Forestry Carbon Sequestration Offset Project Protocol; or
2. Maintains certification for sustainable forest management on the acquired land under a CCX-approved sustainable forest certification standard through the CCX market period; and satisfies **one** of the following criteria:
  - a. Signs an attestation that Carbon Stocks are non-decreasing on this parcel from the time of purchase through the end of the CCX Market Period.
  - b. The CCX Member is able to verify through remote sensing techniques that Carbon Stocks on the purchased land are non-decreasing on this parcel from the time of purchase through the end of the CCX Market Period.
  - c. The CCX Forestry Committee may consider acceptable alternatives to b) and c) on a case-by-case basis. Acceptable alternatives may include requiring a percentage of the accrued CFIs to be surrendered.

#### **5.3.1.3 Anticipated Land Disposition for Commercial Forestry Members**

CCX Commercial Forestry Members that have identified beforehand that they intend to dispose forest land after the CCX commitment period will still be required to enroll all of their land in the Program should they elect to be issued CFIs for their forest carbon flux. However, the CCX Member can request the creation of two separate accounts for accounting purposes for land that is anticipated to be sold and land that is not anticipated to be sold. When the anticipated land is eventually sold, CFIs and Super Reductions that have been issued for net carbon increases on this land will be treated under existing rules governing land disposition.

### **5.3.2 Prevention of Double-Counting**

Project Proponents that have enrolled Forest Carbon Stocks are not permitted to either register or sell Forest Carbon Stocks from the corresponding land and time period either over-the-counter, through other GHG registries, programs, or standards, or within CCX through a different Aggregator. To ensure this for aggregated projects, contracts between Aggregators and Pooled Participants must explicitly state that the Forest Carbon Stocks from the enrolled land and time period are being exclusively registered and sold on CCX through that Aggregator.

### **5.3.3 Required Contract Conditions for Aggregated Projects**

Contracts signed between Aggregators and Pooled Participants must stipulate the following conditions that the Pooled Participant will adhere to. These are described in more detail later in the Protocol:

- A 15 year commitment to maintain the land as a forest (if the forest is sustainably managed, then this must be a 15 year commitment to maintain the forest as sustainably certified by a CCX-approved standard) from the date of enrollment.
- A declaration that they own the land under which the forest carbon stocks are enrolled. If the land is leased, then either appropriate documentation of the ownership carbon rights must be provided to the Pooled Participant (outlined below) or the lessee can sign a statement the Aggregator stipulating the ownership of the carbon rights.
- A declaration that the GHG mitigation rights are exclusively being sold through that Aggregator on CCX (i.e., they are not being sold through another registry or program, over-the-counter, or through another Aggregator on CCX).
- For Sustainably Managed Forests Projects, a declaration that they are enrolling all entity-owned land except for exemptions explicitly granted by the CCX Forestry Committee.
- A declaration by the Pooled Participant that they have read and understand the CCX Project Guidelines for Forestry and will accurately report harvest information, land acquisition and disposition, and forest land impacted by a catastrophic loss.
- A declaration that the Pooled Participant's entity-owned emissions are less than 10,000 Mt CO<sub>2e</sub> per year.
- A declaration concerning any increase in GHG emissions due to project activity that may have occurred as a result of the project.
- A declaration that the project is not required by law or other legally-binding, enforceable agreement.
- The letter-of-intent to maintain the land in a forest beyond the CCX Market Period.

## **5.4 Project Start Date**

Projects must start on or after January 1, 2003, which corresponds with the beginning of the CCX cap and trade program.

## **5.5 Project Location**

Forestry projects shall be located either in the United States or in a country designated as a non-Annex I country under the Kyoto Protocol.

## **5.6 Eligible Carbon Pools**

CCX Exchange Offsets are issued on the basis of increases in Carbon Stocks of enrolled project lands in:

- Above-ground biomass.
- Below-ground biomass.
- Soil organic carbon.
- Standing dead trees.
- Down dead wood.
- Forest floor portions.
- LLWPs are an eligible carbon pool for Sustainably Managed Forest Projects.
- Acceptable methods for the inclusion of coarse roots in the United States are defined in Jenkins JC, Chojnacky DC, Heath LS, Birdsey RA (2003) National-Scale Biomass Estimators for United States Tree Species. *Forest Science* 49(1):12-35.
- Acceptable methods for the inclusion of below-ground biomass for regions outside of the United States are defined in Cairns M, Brown S, Helmer E, Baumgartner G (1997) Root Biomass Allocation in the World's Upland Forests. *Oecologia* 111: 1-11.

The CCX Forestry Committee may consider and approve additional methods for quantification of carbon pools.

## **5.7 Performance Benchmark**

Forestry Carbon Sequestration projects are not eligible to generate Exchange Offsets in instances where the forestry project can be considered a standard business practice (i.e. business as usual) or is required by law or other legally binding framework. CCX has identified two performance criteria that projects must meet to be considered for Exchange Offset issuance.

### **5.7.1 Additionality**

CCX has adopted a “base year” procedure to ensure forestry project additionality. Natural ecosystem dynamics and unpredictable future management make projections of what may happen in the future highly speculative. Project Owners make land-use management decisions, such as planting, harvesting, and other silvicultural practices, to manage the health of forest land continuously on a daily basis. These actions can also be easily reversed and the discontinuation of the practices can result in loss of carbon stored in forests.

To comply with CCX forestry guidelines, Project Owners must make voluntary, legally binding commitments to sequester additional carbon in their forests. The basis for measurement of additional carbon is based on the baseline inventory established at the beginning of the project. The Project Owner is credited when the forest generates positive amounts of carbon above their baseline inventory and debited if the forest is managed in a manner that leads a reduction in stored carbon.

CCX has identified the following additionality tests that projects must pass to be considered for Exchange Offset issuance.

#### **5.7.1.1 Regulatory Criteria**

In order to be eligible to generate Exchange Offsets under these guidelines, forestry carbon projects must be voluntary. The project shall not be required by law under any federal, state or local regulations or other legally binding framework or enforceable agreement. For projects located outside the United States, the project shall not be required under any enforceable regulation or agreement.

Pooled Participants of Aggregated Projects are required to declare that the project is not required by law or other legally-binding, enforceable agreement in the contract with the Aggregator. For non-Aggregated Projects, the Project Proponent shall sign an attestation stating that the project is not required under any federal, state, or local regulation or other legally binding framework.

#### **5.7.1.2 Common Practice Criteria**

According to the GHG Protocol for Project Accounting, “*Common practice refers to the predominant technologies or practices in a given market, as determined by the degree to which those technologies or practices have penetrated the market (defined by a specified geographic area).*”<sup>16</sup>

---

<sup>16</sup> World Resources Institute and World Business Council for Sustainable Development. 2005. *The Greenhouse Gas Protocol for Project Accounting*. WRI/WBCSD, Washington, D.C.

Plantings for Afforestation and Widely-Spaced Tree projects must have occurred on or after January 1, 2003 on land that had been in a non-forest use for ten years or longer prior to the land being afforested. Methods by which to verify the length of time that the land has been out of forest cover include satellite or photo imagery, federal crop records, or other evidence deemed acceptable by the Verifier. Plantings for Reforestation projects must have occurred on or after January 1, 2003 on land where forest cover has been lost, usually through a severe disturbance that is not the result of intentional management activity or gross negligence, and where the desired forest is not regenerating naturally. These planting dates correspond to the beginning of the CCX cap-and-trade program.

Sustainably Managed Forest projects may be eligible irrespective of the planting date. Evidence of sustainable forest management through certification from a CCX approved standard (see [Appendix E](#)) for each year of enrollment is required. Non compliance to this requirement may result in the cancellation of issued carbon from the Members account. This additionality requirement ensures that the health and ecological function of the forest is maintained, that the management supports socioeconomic and biodiversity principles, and that the lands have been certified beyond business-as-usual management practices.

## **6. PROJECT BOUNDARY**

The Project Boundary includes all entity-owned forest lands of the Project Proponent or entity being represented by the Project Proponent. Exceptions to this requirement are contained in [Section 6.1.3](#) Affected GHG Sources and Sinks, otherwise known as Project Leakage.

### **6.1 Identification of GHG Sources, Sinks and Reservoirs**

ISO 14064-2 requires that the project's GHG Sources and Sinks be categorized as controlled by the Project Proponent, related to the project, or affected by the project. These are discussed below.

#### **6.1.1 Controlled GHG Sources and Sinks**

Controlled GHG Sources and Sinks for Forestry Carbon Sequestration Offset Projects are those that occur within the Project Boundary. Therefore, controlled GHG Sources and Sinks for forestry projects refer to those that are part of the forest planting, management, measurement and monitoring practices.

### **6.1.2 Related GHG Sources and Sinks**

Related GHG Sources and Sinks for Forestry Carbon Sequestration Offset Projects refer to those that have material or energy flows into or out of the project.

### **6.1.3 Affected GHG Sources and Sinks**

Affected GHG Sources and Sinks are those that are influenced by the forestry project and result in new or changed activities outside the boundary of the project that actually increase GHG emissions. This concept is commonly referred to as Leakage. Project Leakage is defined as new or changed activities that result in a decrease or increase in GHG emissions outside of the project's accounting boundary. CCX does not expect forestry projects to result in new or changed activities that change GHG emissions outside of the project boundary, and therefore, no project-specific leakage assessment is required.

The sections 10.6 and 11.6 outline rules governing the definition of project boundaries for Afforestation / Reforestation and Sustainably Managed Forests Project Owners, respectively.

## **6.2 Determining the Baseline Scenario**

In accordance with the process outlined in ISO 14064-2, a baseline scenario assessment is required for each forestry carbon project. The baseline is established as the Forest Carbon Stock in the enrolled parcels on December 31 of the year preceding their registration. Members are eligible to earn Offsets based on verified documentation of net changes in Forest Carbon Stocks from the baseline year. Project documentation must present sufficient data on forest inventories and management activities on enrolled forest land while establishing the baseline for the approved quantification methodology.

Acceptable methodologies for establishing the baseline include direct measurement and approved remote sensing technology. In order to encourage high-quality inventories, smaller discounts are applied to projects with a higher degree of accuracy for a given level of precision. This is elaborated in [Section 11.5.3](#). All methodologies for establishing the baseline are subject to approval by the CCX Forestry Committee.

## **6.3 Project Emissions**

CCX considers direct project emissions as resulting from the use of the combustion of fossil fuel and mobile source emissions resulting from the use of equipment to implement Afforestation / Reforestation and sustainable forest management projects.

## 7. QUANTIFYING EMISSION REDUCTIONS

CCX approaches for quantifying GHG emission reductions from Forestry Carbon Sequestration Projects are provided in project type-specific subsequent sections,

- [Section 10.5](#) for Afforestation, Reforestation and Widely Spaced Tree Plantings.
- [Section 11.5](#) for Sustainably Managed Forestry Projects.
- [Section 12.2](#) for Long-Lived Wood Products.

## 8. PROJECT PERMANENCE

To address uncertainty in the permanence of carbon sequestration in forestry projects, Project Proponents shall be required to:

- Hold Exchange Offsets as escrow in a Forest Carbon Reserve Pool.
- Include in the contract from each Pooled Participant a fifteen-year commitment to maintain their land as a forest.
- Sign or obtain from each Pooled Participant a signed statement of intent recognizing the long-term objective of recognizing carbon stored in forest stocks.

### 8.1 Carbon Reserve Pool

Each CCX Afforestation / Reforestation and Sustainably Managed Forest project shall be required to place 20 percent of the Exchange Offsets it earns into a CCX Forest Carbon Reserve Pool. Such Exchange Offsets shall remain the property of the Member and Exchange Offsets that remain in the Forest Carbon Reserve Pool shall be released to the Member near the end of the CCX Market period.

Exchange Offsets in the Forest Carbon Reserve Pool will be used to compensate for any catastrophic losses that arise from non-management activity. Examples of catastrophic events may include hurricanes, fires, pests, or floods. In the event of a loss of Forest Carbon, the amount of Exchange Offsets in the Forest Carbon Reserve Pool equal to the amount of the carbon released by the catastrophic event will be cancelled. The maximum amount of such carbon loss to be recognized by CCX for catastrophic losses shall be no more than the total quantity of Offsets available in the Forest Carbon Reserve Pool. This provision applies to project Aggregators at the aggregated pool level.

Aggregated projects may represent Pooled Participants from geographically diverse regions, where a catastrophic event that impacts one Pooled Participant may not impact the other Pooled Participants in the pool. Due to geographic diversification, a catastrophic loss

impacting one Pooled Participant of an aggregated project will not imply that other Pooled Participant in the pool will be systematically impacted. Therefore, a Carbon Reserve Pool of 20% for the aggregated project provides assurance that there will be a sufficient reserve of Exchange Offsets to compensate for any individual catastrophic loss that a particular Pooled Participant may experience.

In cases of catastrophic weather events or outbreaks of fire and pest damage that reduce the quantity of Carbon Stocks on a parcel of forested land to levels below those documented for baseline, the Member shall document the quantity of timber destroyed by the fire, pest or adverse weather event. Those stands shall be excluded from future projections of annual changes in Carbon Stocks until the quantity of Carbon Stocks in those stands reaches the reported quantities for baseline. All reports of significant damage caused by pest, fire and adverse weather events shall be subject to audit by a CCX-Approved Verifier.

The registered CFI's attributed to Long-Lived Wood Products are not required to maintain an escrow in the Forest Carbon Reserve Pool.

## **8.2 Commitment to Maintaining Enrolled Land as a Forest**

Upon registration, Members must document that the registered Forest Carbon Stocks in the project will be subject to long-term maintenance. For Pooled Projects, this includes a commitment by each Pooled Participant that the enrolled land will be maintained as a forest for at least 15 years from the date that the Pooled Participant enrolled with the Program to be included in the contract with the Offset Aggregator. For Pooled Participants in the Sustainably Managed Forest program, this commitment must explicitly state that the enrolled land will be maintained in a CCX-eligible sustainably certified forest management program.

The duration of the contract between the Offset Aggregator and Pooled Participant must be for at least the length of the CCX Market Period at a minimum and requires Pooled Participants to maintain enrolled in CCX for that length of time. This contract must be included in the project filing.

## **8.3 Letter of Intent to Maintain Forest Stocks beyond the CCX Market Period**

Each Pooled Participant must sign a statement of intent declaring that the applicant intends to respect and abide by this Protocol for all land enrolled in the Program and, that the applicant intends to preserve the forest beyond December 31, 2010. This letter will be included in the project filing. A sample letter of intent is included as [Appendix C](#).

## **9. AFFORESTATION / REFORESTATION AND WIDELY-SPACED TREE PLANTING OFFSET PROJECT GUIDELINES**

### **9.1 Project Summary/Definition**

- Eligible forestry projects involving Afforestation and Widely-Spaced Trees via plantings initiated on or after January 1, 2003 on land that had been in a non-forest use for ten years or longer prior to the Afforestation, may earn CCX Exchange Offsets. Reforestation projects must have been initiated on or after January 1, 2003.
- Eligible Afforestation / Reforestation and Widely-Spaced Tree projects must not involve any harvesting, including thinning, during the contract period. If projects enrolled under the Afforestation / Reforestation Protocol are subsequently harvested, they must meet the Protocol requirements for Sustainably Managed Forests in order to remain enrolled in CCX. Projects that do not remain enrolled in CCX under the Sustainably Managed Forest Protocol must surrender all accrued Exchange Offsets.
- CCX Aggregators representing individual Pooled Participants must maintain a detailed database documenting the necessary information relevant for verification outlined in [section 13](#).
- CCX Exchange Offsets will be issued to owners of CCX-eligible Afforestation / Reforestation and Widely-Spaced Tree Planting projects on the basis of verified documentation reporting the annual increase in Carbon Stocks on eligible sites included in the project during the years 2003 through 2010. Verification guidelines are contained as [section 13](#).

### **9.2 Record-Keeping Requirements**

Forest Offset Aggregators are responsible for maintaining a database of Pooled Participant records and maintaining accurate records of enrolled project forest inventories. The database records, model inputs and enrolled lands as outlined in section 13 are subject to third party verification by CCX-Approved Verifiers.

### **9.3 Sustainable Forest Management Certification Requirements**

Sustainable forest management certification is not required since harvesting or thinning is not permitted for Afforestation / Reforestation and Widely-Spaced Tree Planting Offset Projects. In the event that a harvest does occur on Afforestation / Reforestation and Widely-Spaced Tree Planting Offset Projects, the Project is therefore required to either:

- Surrender all accrued Exchange Offsets, or,
- Enroll the Project as a Sustainably Managed Forestry Project, thereby meeting the eligibility requirements of section 10, including sustainable forest management certification.

Project Proponents are required to notify CCX of any harvests and subsequent Project enrollment decisions.

## **9.4 Project Registration, Verification and Crediting Procedure for Afforestation / Reforestation Offset Projects**

Afforestation / Reforestation projects are required to submit a CCX Project Implementation Document – Forestry. Afforestation / Reforestation projects are eligible for direct registration provided that they are quantified using CCX Carbon Accumulation Tables and strictly satisfy the standardized requirements of the project category with no material deviations. Any material deviations from the standardized requirements of the project category should be described and will be subject to approval by the CCX Forestry Committee.

## **9.5 Forest Carbon Quantification Methodology**

Afforestation / Reforestation projects in the continental United States may quantify carbon sequestered in eligible forests either through either the use of the CCX Carbon Accumulation Tables for Afforestation / Reforestation Projects found in Appendix B or by combining direct measurement with a growth-and-yield modeling approach. See Section 10.5 for guidance on CCX growth-and-yield modeling approach.

### **9.5.1 CCX Carbon Accumulation Tables**

The CCX Carbon Accumulation Tables for Afforestation / Reforestation Projects reflect the live tree and soil organic carbon portion of the carbon pool forest (expressed in Mt CO<sub>2</sub>e). The CCX Carbon Accumulation Tables for Afforestation / Reforestation Projects are derived from the Department of Energy Technical Guidelines, Voluntary Reporting of Greenhouse Gases (1605(b)) Program<sup>17</sup>. To be conservative, these values are discounted by 30 percent from the reported values to reflect potential uncertainty with regard to using accumulation tables<sup>18</sup>.

---

<sup>17</sup> <http://www.eia.doe.gov/oiaf/1605/gdlines.html> (January 2007)

<sup>18</sup> 30% represents the range of accuracy predicted for using accumulation tables. See Department of Energy *Technical Guidelines for Voluntary Reporting of Greenhouse Gas Program*, Part I Appendix: Forestry, page 3. <http://www.eia.doe.gov/oiaf/1605/gdlines.html> (January 2007)

In addition, discounts will be applied in aggregated pooled projects based on verification outcomes as described in section 13 Verification Requirements.

Widely Spaced Tree planting projects in the United States may quantify carbon sequestered through use of the parameters and associated growth rates in Appendix G.

### **9.5.2 Baseline Year Establishment**

Afforestation / Reforestation and Widely-Spaced Tree Plantings baselines are established as the year in which the plantings occur.

## **9.6 Project Boundary Rule**

Project Proponents that own less than 250 forested acres may enroll eligible acres under the Afforestation / Reforestation Protocol without being required to enroll all owned lands in CCX either under the Afforestation / Reforestation Protocol or Sustainably Managed Forest Protocol. These Proponents are required to report any harvests from non-enrolled stands and deduct the carbon loss from any harvest. In the case of aggregated projects this must be included in the contract between the Aggregator and Project Owner.

Project Proponents that own greater than 250 forested acres must enroll all owned land in CCX either under the Afforestation / Reforestation Protocol or Sustainably Managed Forest Protocol in order to enroll any eligible acres under the Afforestation / Reforestation Protocol. Exceptions to this may be granted on a case-by-case by the CCX Forestry Committee under the exceptions outlined under the Sustainably Managed Forest section below.

# **10. SUSTAINABLY MANAGED FORESTRY OFFSET PROJECT GUIDELINES**

## **10.1 Project Summary/Definition**

- Eligible forestry projects involving sustainable management of forests that lead to an increase in Carbon Stocks may earn CCX Exchange Offsets.
- CCX members in the commercial forestry sector are categorized as owners of Sustainably Managed Forests and are issued Exchange Offsets on the basis of increases in Forest Carbon Stocks.
- Long-Lived Wood Products are considered an eligible carbon pool for Sustainably Managed Forests.

- All Sustainably Managed Forest project proposals are subject to review for approval by the CCX Forestry Committee.
- If an enrolled project land does not conform to the Sustainably Managed Forest Protocol requirements, such event shall be promptly reported to CCX. Such reporting shall occur through a project's Aggregator if the project is registered through an Aggregator. CCX will then cancel CCX Exchange Offsets in an amount equal to the quantity of Exchange Offsets previously issued to the project. CCX has the discretion to prohibit the owner of the non-conforming forest project from further participation in CCX.

## **10.2 Record-Keeping Requirements**

Forest Offset Aggregators are responsible for maintaining a database of Pooled Participant records, for maintaining accurate records of enrolled project forest inventories, and for keeping track of management activities in enrolled forest lands. The database records, model inputs and enrolled lands are subject to third party verification by CCX-Approved Verifiers.

## **10.3 Sustainable Forest Management Certification Requirements**

Project Proponents must provide evidence of sustainable forest management of all Sustainably Managed Forest land through certification from agencies or schemes that have been endorsed by the PEFC Council (Programme for the Endorsement of Forest Certification schemes) or the Forest Stewardship Council. A complete list of CCX-approved certification schemes is available in [Appendix E](#).

Provided all other requirements are satisfied, Exchange Offsets may be issued retroactively for CCX program years prior to obtaining certification for sustainable management provided that sustainable certification exists when the project enrolls in CCX for projects that enroll up until 2010. Exchange Offsets may only be issued for years in which certification for sustainable management exists for projects that enroll after 2010.

In addition, acceptable certification schemes include state sustainably programs that have been recognized by the American Tree Farm System (ATFS) as satisfying ATFS requirements. Examples of this include Wisconsin's Managed Forest Law and Indiana's Classified Forest and Wildlands Program.

## 10.4 Project Registration, Verification and Crediting Procedure for Sustainably Managed Forestry Offset Projects

Sustainably Managed Forestry projects seeking CCX approval are required to submit a CCX Project Implementation Document – Forestry, describing project eligibility criteria including quantification methodology, sustainable certification (if required), start dates, monitoring plan, and other pertinent information for review by the CCX Forestry Committee. [Appendix I](#) provides information required in the CCX Project Implementation Document – Forestry. The CCX Forestry Committee is responsible for providing expert guidance, Protocol development and interpretation, and recommending approvals for reviewed forestry projects. If approved, CCX staff will issue the Project Proponent an Official CCX Project Approval Letter with an explicit description of the conditions under which the project was approved.

## 10.5 Forest Carbon Quantification Methodology

### Equation 1: Calculating the Net Annual Change in Carbon Stocks

$$\text{Net Annual Change in Carbon Stocks} = (\text{Net Annual Growth of Carbon Stocks}) \text{ minus } (\text{Annual Removals of Carbon Stocks})$$

In addition, Project Owners and Aggregators with entity-owned emissions less than 10,000 Mt CO<sub>2e</sub> per year must subtract any increase in GHG emissions that have occurred due to project activity.

Quantification of annual net changes in Forest Carbon Stock must involve a combination of direct measurement through either an in-field timber inventory and/or remote sensing techniques. These measurements may be combined with a growth-and-yield models to project growth. Sustainably Managed Forest projects will be issued or debited CFI's on the basis of net annual change in Forest Carbon Stocks through the CCX Market Period. Members are eligible to earn CFIs based on verification of net changes in Forest Carbon Stocks from the baseline year. Procedures for establishing the baseline year is outlined in [Section 6.2](#).

All methods and procedures approved by CCX for quantifying and reporting changes in Carbon Stocks shall conform to the following standards:

- Relevant mathematical and statistical formulae and models shall be publicly accessible (excluding exemptions granted under provisions stated below).
- Protocols for measuring and monitoring inventories and calculating variances of the estimates shall be publicly accessible (excluding exemptions granted under provisions stated below).

- All aspects of the quantification of changes in the Member's Carbon Stocks shall be subject to verification by independent CCX-approved entities at the Member's expense; and, the verified data and quantification methods are subject to audit by CCX.
- Post-harvest cruises must be conducted for a particular Pooled Participant subsequent to a significant harvest or thinning.
- The quantification of changes in Carbon Stocks will be adjusted to reflect acquisition or disposition of forest land on an annual basis as outlined in Section 5.3.1.

### ***10.5.1 Quantifying Change in Carbon Stocks***

Quantification of net changes in Forest Carbon Stocks must involve a measurement-based accounting approach. The timber inventory techniques and growth-and-yield model used to estimate these changes must be approved by the CCX Forestry Committee. A list of approved growth-and-yield models is contained as Appendix H. Members using models that have previously been approved by the CCX Forestry Committee must still obtain project approval from the CCX Forestry Committee for other aspects of their project. In-field timber inventory or remote sensing techniques shall include a plan for direct measurement of tree growth and a method for calculating the variance of estimates of increases in Carbon Stocks due to tree growth in a transparent and statistically valid manner.

Project Proponents that propose to use proprietary quantification models must disclose all aspects of the model to the CCX Forestry Committee for approval. A necessary requirement for the approval of proprietary models is evidence of third-party peer review, validation, and/or client references from entities that have used the model in practice, and the qualifications of the evaluator of the proprietary model.

### ***10.5.2 Baseline Year Establishment***

Sustainably Managed Forest projects are eligible for crediting for the CCX program year of the initial baseline inventory and for subsequent years that the project remains enrolled in CCX. Exchange Offsets cannot be issued retroactively based on regressive modeling, or other quantification methodologies, for CCX program years prior to the year of the initial baseline inventory.

Baseline inventories are required to use measurement procedures and a sufficiently large sample size such that there is 90% confidence that the resulting reported value is within 10% of the true mean.

### ***10.5.3 Discounting Net Annual Change***

Growth and yield model estimates of net annual changes in carbon from forestry project will be discounted to account for variance in model estimates by two times the reported statistical error associated with a 90% confidence interval of the baseline inventory data.

No discount will be applied for instances when in-field inventories are conducted on an annual basis or for years in which the inventory occurred. Discounts for projects using remote sensing quantification methodologies will be determined by the CCX Forestry Committee on a case-by-case basis. In addition, discounts will be applied in aggregated pooled projects based on verification outcomes as described in Verification Requirements section 13.

## **10.6 Project Boundary Rule**

All Forest Carbon Stocks from Sustainably Managed Forest Projects must be included in CCX accounting for all entity-owned forest lands. This requirement prevents proponents from shifting harvesting activity, and corresponding decrease in forest carbon stocks, from stands that they have enrolled in CCX to other stands that they own.

Forest Carbon Stocks from lands of different species and/or geographic regions may be excluded at the discretion of the CCX Forestry Committee on a case-by-case basis under the following circumstances:

- If the forest land is sustainably certified by a CCX-approved sustainable certification standard.
- If lands are not managed for biomass removal and have long-term protection (such as a land easement).
- If a case can be made that there is no causal relationship in the management activity between the enrolled and non-enrolled lands.
- Immature stands that have not yet undergone an inventory.

Project Proponents may still enroll a Sustainably Managed Forest project in the Program if they have non-enrolled land that does not satisfy these categories if this land is less than 5% of their total owned land. Under such a circumstance, the Project Proponent is required to monitor all harvests from these lands and debit any harvests from accrued CCX Forest Carbon Stocks.

Verification requirements can be satisfied in the case of aggregated projects through a statement in the contract between the Aggregator and Project Owner.

## **11. LONG-LIVED WOOD PRODUCTS GUIDELINES**

Offset Providers or Aggregators seeking to be issued Exchange Offsets from Long-Lived Wood Products (LLWP) must enroll the net change in their Forest Carbon Stock in the Sustainably Managed Forest protocol to be eligible. CCX-approved crediting factors for LLWP are only applicable in the continental United States.

In order to receive Exchange Offsets from eligible LLWP projects, CCX Aggregators must establish contractual agreements with forest Pooled Participants to provide exclusive carbon rights from LLWPs. Pooled Participants must also establish exclusive contractual rights with the primary wood products manufacturer to retain the carbon rights associated with LLWPs. The Project Proponent must provide, on an annual basis, third party verified information documenting the quantity of wood products harvested by category, species and region.

CCX Project Proponents or Aggregators that register LLWP carbon are responsible for maintaining a sound database and monitoring management system capable of tracking annually each individual owner's forest land holding enrolled in CCX, records of management activity, and any sales of harvested wood. All of these records must be available for third-party verification.

## **11.1 Quantification Methodology for Carbon Dioxide in Long-Lived Wood Products**

Members electing to quantify and report carbon sequestration in LLWP need to report harvest quantity by CCX recognized wood product categories. CCX CFIs will be issued for the calendar year based on the fraction of carbon in LLWP in use and landfills after 100 years from the harvested wood.

### ***11.1.1 Conversion Factors for Weight of Wood into Carbon Dioxide Equivalent for Landowners at Harvest***

The weight of the wood harvested shall be converted into the amount of carbon dioxide equivalent (CO<sub>2e</sub>) removed or sequestered from the atmosphere in order to yield that weight of wood in a three stage process:

1. From "green" weight (i.e., including moisture) of the harvested timber into "dry" weight (i.e., not including moisture). The conversion factor for converting dry weight of harvested timber to weight of carbon shall be 0.5.
2. From dry weight to the amount of carbon stored in the harvested timber. The conversion factor for converting dry weight of harvested timber to weight of carbon shall be 0.5.

3. From the amount of carbon stored in the timber to the amount of CO<sub>2e</sub> sequestered as the harvested timber grew. The conversion factor for converting the weight of carbon in above-ground biomass to weight of CO<sub>2e</sub> shall be 3.666667.

### **11.1.2 Recognized Wood Product Categories for Landowners at Harvest**

Using procedures outlined in the DOE 1605b technical guidelines for forestry, CCX has developed factors that convert the volume of harvested wood by category to carbon in use and landfills at the end of 100 years across wood categories. Verification requirements will involve an audit of sales receipts from the enrolled forest Pooled Participant. The receipts must specify the wood products being sold from the following categories:

- Softwood saw timber
- Softwood pulpwood
- Hardwood saw timber
- Harwood pulpwood

### **Equation 3: Quantity of Carbon Dioxide in LLWP at the End of 100 Years**

$$CPR = \sum_C \text{Wood Product Category } R, C * \text{Harvest Volume } R, C$$

Where:

<b>CPR</b>	Carbon dioxide in Harvested wood products in Region, R
<b>R</b>	Region
<b>C</b>	Wood product category (Softwood saw log; Softwood pulpwood, Hardwood saw log and Hardwood pulpwood)

Carbon dioxide equivalent in use and landfills after 100 years from LLWP is determined as follows:

1. If the harvest is reported in volume, the harvest must be converted into weight using conversion factors found in [Appendix F](#).
2. If the harvest is reported in weight, determine the dry tons of carbon in CCX recognized wood product categories. This process involves converting green tons of harvested wood to dry tons across CCX wood product categories using a factor of 0.5

- and converting dry tons across wood product categories to carbon tons using a factor of 0.5.
3. Distribute carbon tons by wood product category.
  4. Use CCX prescribed conversion factors to calculate the quantity in use and landfills after 100 years by wood product category.
  5. Convert to metric tons of carbon dioxide. This is done by multiplying by 3.67 (conversion from C to CO<sub>2</sub>) and by 0.907 (conversion to MtCO<sub>2</sub>).

## 11.2 Primary Wood Products Manufacturer Overview

Primary wood products manufacturers may elect to register CFIs from LLWPs using CCX conversion factors. CCX Members must provide, on an annual basis, third party verified information documenting the quantity of LLWPs produced under each product category. Members may be issued CFIs for the production of harvested wood from their own Sustainably Managed Forest land.

Primary wood products manufacturers may also acquire rights to carbon sequestered in LLWPs from Pooled Participants provided that this can be documented according to chain of custody and contractual evidence outlined in this document. LLWPs carbon rights cannot be transferred beyond the primary wood products manufacturer at this time. Members may be issued CFIs on purchased timber provided that:

- The seller of the wood transfers the LLWPs rights of the sequestered carbon in the wood in the sales contract to the Member.
- The Member is eligible to be issued CFIs for purchased timber from forests that have certification for sustainable forest management from one of the schemes outlined in the [Appendix E](#). CFIs may be issued for the production of LLWPs pro rata across all LLWPs equal to the percentage obtained from sustainably certified sources.
- Independent third party verification for purchased wood is required through chain-of-custody certification. Chain-of-custody practices for primary wood products manufacturers must be certified by the Forest Stewardship Council or the Sustainable Forestry Initiative if purchased wood is to be credited.

### **11.3 Primary Wood Products Manufacturer Quantification Methodology**

Members must quantify Carbon sequestered in the production of LLWPs using CCX prescribed default product utilization coefficients. CCX parameters developed to estimate the Carbon sequestered in LLWPs are contained in Appendix F.

Recognized product categories for crediting include the following:

- Softwood lumber / Laminated veneer lumber / glulam lumber / I joints
- Hardwood lumber
- Softwood plywood
- Oriented strandboard
- Nonstructural panels:
  - Hardwood veneer / plywood
  - Particleboard/Medium density fiberboard
  - Hardboard
  - Insulation board
- Paper

The quantity of LLWPs to be included in the determination of net Carbon Stock changes will be the fraction of carbon dioxide equivalent in LLWPs in use and landfills at the end of 100 years, based on the U.S. Department of Energy 1605b technical guidelines for forest products.

## **12. SUPPLEMENTAL INFORMATION FOR COMMERCIAL FOREST MEMBERS**

### **12.1 Commercial Forest Company Overview**

Commercial forest companies that enroll in CCX as an emitting member, provided that they satisfy the previously outlined eligibility requirements, have the following options:

- Elect to register Forest Carbon sequestered under the Sustainably Managed Forest Protocol provided that this occurs for each year of their CCX Commitment Period.

- Elect to register carbon sequestered in Long-Lived Wood Products (LLWPs).
- Elect to register both:
  - Forest Carbon sequestered under the Sustainably Managed Forest Protocol for each year of their CCX commitment period.
  - Carbon sequestered in LLWPs.
- Elect to not register sequestered carbon under either the Sustainably Managed Forest or Long-Lived Wood Products Protocol.

Commercial forest companies enrolling in CCX as Emitting Members must also sign the non-binding statement, contained in [Appendix C](#), with respect to permanence.

## 12.2 Limitations on Use of CFIs Issued on the Basis of Net Changes in Carbon Stocks

For all commercial forest companies registering Forest Carbon sequestration, the maximum net increases or decreases in Carbon Stocks for Sustainably Managed Forests and LLWPs of CFIs shall be limited to the levels identified in Table 1. Exceptions to this may be granted on a case-by-case basis by CCX to commercial forest companies with a sufficiently small GHG baseline.

**Table 1 – Maximum Levels of Annual Increases / Decreases in Carbon Stocks**

Year	Maximum Annual Increase	Maximum Annual Decrease
<b>PHASES I &amp; II MEMBER</b>		
2007	7.25% of Member's baseline	7.25% of Member's baseline
2008	7.5% of Member's baseline	7.5% of Member's baseline
2009	8% of Member's baseline	8% of Member's baseline
2010	9% of Member's baseline	9% of Member's baseline
<b>PHASES II MEMBER</b>		
2007	4.5% of Member's baseline	4.5% of Member's baseline
2008	6% of Member's baseline	6% of Member's baseline
2009	7.5% of Member's baseline	7.5% of Member's baseline
2010	9% of Member's baseline	9% of Member's baseline

The limitations specified above on the Surrender, sale or use for True-up of CFIs shall be applied separately to the limitations on the Surrender, sale or use for True-up of CFIs associated with changes in Direct Emissions and Electricity Purchase Opt-ins (Sections 4.8, 4.10 & 4.11.2 of the CCX Rulebook).

The Single Firm Sales Limit (Section 4.11.3 & 4.11.4 of the CCX Rulebook) and the limitations on Banking (Section 4.11.5 of the CCX Rulebook) shall be applied to Exchange Allowances issued on the basis of increases in Carbon Stocks separately to the application of these limitations to other CFIs issued to a Member.<sup>19</sup>

CFIs issued on the basis of increases in Carbon Stocks in excess of the limits on the sale of such CFIs as specified above may be marketed as Super Reductions in accordance with Section 4.11.2.1 of the CCX Rulebook.

### 12.3 Alternative Method for Defining Maximum Net Increases or Decreases in Carbon Stocks

The maximum net increases or decreases in Carbon Stocks that shall be recognized for the purpose of True-up and sales on the CCX can be defined on the basis of a Synthetic Direct Emission Baseline. The Synthetic Direct Emission Baseline is defined as a quantity of metric tons of carbon dioxide emissions calculated.

#### Equation 4: Synthetic Direct Emission Baseline

$$\text{Synthetic Direct Emission Baseline} = \text{Total heat content of all fuels combusted on-site (in gigajoules)} \times 0.0273$$

Where:

<b>Total heat content of all fuels combusted on-site (in gigajoules)</b>	The heat content associated with total fuel consumption (to include fossil fuels and biomass-based fuels) during a year that is representative of the CCX Direct Emissions baseline period.
<b>0.0273</b>	The average emissions factor for U.S. paper and pulp companies. <sup>20</sup>

The quantity of total heat content of all fuels combusted on-site that is reported to CCX must be supported by documented evidence provided by a third party entity that has experience in developing GHG emission inventories. A hypothetical example is included as [Appendix I](#).

<sup>19</sup> i.e. a Member that has reached its Single Firm Sales Limit with regard to Exchange Allowances sold on the basis of a reduction in Direct Emissions, shall nevertheless be able to sell Exchange Allowances issued on the basis of increases in Carbon Stocks up to the quantity specified by the Single Firm Sales Limit, and vice versa.

<sup>20</sup> Energy sources for the U.S. pulp and paper industry are contained in *Profile of Pulp and Paper Industry 2<sup>nd</sup> Edition*, EPA Office of Compliance Sector Notebook Project.

## **13. VALIDATION AND VERIFICATION REQUIREMENTS**

### **13.1 Validation**

CCX Projects utilizing these guidelines are validated using one of two methods. Afforestation / Reforestation and Widely-Spaced Tree Planting Projects that adhere strictly to the requirements of this Protocol are considered to be validated and do not require a separate validation by the CCX Forestry Committee. The Project Proponent is required to submit the CCX Project Implementation Document – Forestry with the project described in detail for all Sustainably Managed Forestry Projects or any Afforestation / Reforestation and Widely-Spaced Tree Planting Projects not using the standard carbon accumulation tables. Upon receipt and review of the CCX Project Implementation Document – Forestry, the CCX Forestry Committee will review the proposal and, as needed, seek guidance appropriate technical experts. Project Proponents will be notified of the CCX Forestry Committee decision and shall proceed accordingly.

### **13.2 Verification**

Verification of CCX Afforestation / Reforestation and Sustainably Managed Forest projects must be conducted by a CCX-Approved Verifier on an annual basis. Verification is intended to confirm the reported species mix and characteristics, verify acreage enrolled in the CCX, confirm that forest management practices on enrolled land are in compliance with the CCX criteria, and to identify any acres not in compliance with eligibility criteria. Verification costs are borne by the Member. Pool Participants that are unable to provide sufficient documentation will be ineligible. A checklist list of verification requirements is contained in Appendix A. Further information about the roles and responsibilities of Verifiers and the roles and responsibility of Members during verification are discussed in detail in *Chicago Climate Exchange Offset Program Verification Guidance Document* available on the CCX webpage: [www.theccx.com](http://www.theccx.com).

#### ***13.2.1 In-Field Inspection Requirements***

In-field inspections must occur with the first verification after the project is initially approved and at the end of the CCX commitment period for all projects irrespective of size. The stands selected for field verification are chosen at the discretion of the Verifier. The frequency and size of the in-field verification will be conducted corresponding to the size of the project according to the following requirement:

- For pooled projects with pools greater than 25,000 acres, in-field verification must occur every other year of at least 20% of both Pool Participants (in the case of aggregated projects) and acreage enrolled in CCX every other year.
- For pooled projects with pools less than 25,000 acres but greater than 10,000 acres, in-field verification must occur every third year of at least 15% of both Pooled Participants (in the case of aggregated projects) and acreage enrolled in CCX every other year.
- For pooled projects with pools less than 10,000 acres, in-field verification must occur every fourth year of at least 10% of both Pooled Participants (in the case of aggregated projects) and acreage enrolled in CCX every other year.

The CCX Forestry Committee will review state forest programs that involve monitoring on a case-by-case basis to determine if the verification process associated with state programs could act as a substitute for CCX field verification.

### ***13.2.2 Desk Audit Requirements***

A desk audit of at least 40% of both enrolled Pool Participants and acreage is required in years when an in-field inspection does not occur.

### ***13.2.3 Materiality Thresholds for Afforestation / Reforestation, Widely-Spaced Tree Planting and Long-Lived Wood Products Offset Projects Using CCX Carbon Accumulation Tables***

Some offset project types at CCX typically consist of Aggregators representing a collection of Pooled Participants that are each individually adhering to CCX eligibility requirements. In these instances, the GHG assertion presented to CCX represents the sum of the individual contribution of each Pooled Participant. Because there could be many Pooled Participants, materiality threshold for errors, omissions, and misrepresentations for each participant are defined relative to the individual Participants contribution to the GHG assertion rather than the aggregate GHG assertion.

For Forest Carbon Sequestration Offset Projects for which GHG emission reduction assertions are based upon standardized annual carbon accumulation rates, the materiality threshold applies to 3% of the calculated GHG emission reductions per individual Pooled Participant. Any identified discrepancy (or the aggregation of all discrepancies) that exceeds the materiality threshold of 3% will be considered material. If a project is found to have a material discrepancy, the calculated GHG emission reductions for project must be corrected accordingly. Further, the GHG emission reduction assertion for the non-sampled projects in the pool must be discounted by an amount equal to the percentage correction that occurred as a consequence of verification from the participants in the verified sample.

### ***13.2.4 Materiality Thresholds Afforestation/Reforestation and Sustainably Managed Forestry (using direct measurements)***

Forest Carbon Sequestration Offset Projects quantified using direct measurements establish baseline inventory through in-field measurements or remote-sensing technology; and/or utilize growth-and-yield modeling for annual carbon accumulation. Materiality thresholds for GHG sequestration calculations and associated data are not defined in terms of a percentage of the overall GHG assertion. Many aspects of the calculations involved with quantifying the GHG assertion either cannot be replicated, such as obtaining the measurement of a tree from a historical time period, or are prohibitively expensive to replicate. Thus, CCX has outlined qualitative materiality criteria the Verifier is required to evaluate to ensure that the calculation and associated data satisfy the eligibility requirements. These principles are outlined in the CCX Forestry Verification Guidelines and Checklist.

### ***13.2.5 Procedures for Evaluating Reported In-Field Inventory***

CCX-Approved Verifiers are responsible for using their professional judgment to evaluate that the reported inventory is accurate to a reasonable level of assurance. These procedures must be involved as part of this verification:

- Verify that inventory documentation data is supported by:
  - Confirming inventory procedures followed approved methodology (when, procedures, and quantity of plots established) through review of records, documents, and interview of foresters that conducted inventory. Documents to review include field files, maps, inventory specifications and records, digital tally files, inventory processing software outputs, and other equivalent documents.
  - Verify measurements were accurately performed to review overall field conditions in comparison to carbon accounting and mapping for the project by selecting sample of stands for empirical field review or walk-through inspections, reviewing site mapping and stand or tract reports, air photos, harvest records, planting records, and other equivalent documentation.

A full re-inventory or audit of inventory plots is not required. Verification or audits of actual plot data may be conducted, when the data plots or points are monumented, if the Verifier is of the opinion that there may be a significant divergence between field conditions and the reported data for a stand.

- For projects using annual measurements from fixed plots, Verifiers should visit and verify randomly selected plot level measurements

and records at a level appropriate to the size and scale of the project being verified.

- Confirm management activity from harvest or thinning is properly accounted for and that reinventory occurred
- Verify inventory and growth-and-yield calculations were performed correctly through spot-check of calculations

### ***13.2.6 Procedures for Evaluating Remote Sensing Measurements***

CCX-Approved Verifiers are responsible for using their professional judgment for confirming the remote sensing inventory results is accurate to a reasonable level of assurance. These procedures must be followed as part of this verification:

- Verify that the flight took place by reviewing flight mission plan, GPS flight records, or equivalent documentation.
- Verify data covered appropriate property boundaries by reviewing images and maps produced.
- Verify instrument was calibrated by reviewing calibration records.
- Verify raw data was corrected for errors.
- Verify ground-truthing was performed (see procedures on review of inventory).
- Verify correlations from remote sensing were determined using ground-truthing inventories.
- Verify calculations of error around total volume estimate.

## **14. REFERENCES**

International Standard Organization 14064-2:2006. Greenhouse Gases Part 2: Specification with Guidance at the Project Level for Quantification, Monitoring, and Reporting of Greenhouse Gas Emission Reductions or Removal Enhancements.

U.S. Department of Energy. Technical Guidelines for Voluntary Reporting of Greenhouse Gas (1605(b)) Program. Chapter 1, Emission Inventories. Part I Appendix: Forestry. March 2006.

U.S. Department of Energy. Method for Calculating Carbon Sequestration by Trees in Urban and Suburban Settings. Voluntary Reporting of Greenhouse Gases. April 1998.

Intergovernmental Panel on Climate Change Working Group III Report *Mitigation of Climate Change*, Chapter 9: Forestry. 2007.

*Profile of Pulp and Paper Industry 2<sup>nd</sup> Edition*, EPA Office of Compliance Sector Notebook Project.

## APPENDIX A: VERIFICATION CHECKLIST

CCX Requirement	Assessment Criteria	Verification Findings
	Management staff and titles; Organizational chart; Defined roles, responsibilities, and authorities regarding forest carbon and CCX verification.	
<b>Forestry Program General Guidelines</b>		
Validation	CCX Project Approval Letter.	
Verification: Conflicts of Interest	Complete a conflicts of interest assessment.	
Contract Information	Verifier must obtain and review the contract to confirm inclusion of the information listed in the Protocol.	
CCX Membership	Confirm the Project Owner is a CCX Member or working through CCX Member.	
	Entity acknowledges understanding and to comply with CCX Project Guidelines in contract.	
Ownership and Control	Confirm the CCX Member / Participant Member has management control of the enrolled land and the GHG mitigation rights associated with the project.	
Project Location	Project is in approved location.	
Project Boundary	Appropriate acreage, species, and age.	
Eligible Carbon Pools	Only approved carbon pools are included.	
Project Emissions	Entity has less than 10,000 Mt CO <sub>2e</sub> annually if emissions not enrolled in CCX in contract.	
	Project-based emissions that occurred as result of project in contract.	
Additionality -- Regulatory Test	Project is not required by law.	
Prevention of Double- Counting	Explicit statement to prevent double-selling included in contract.	
Project Permanence	Catastrophic loss (if any) reported.	

	Lands with catastrophic loss excluded until baseline level (if applicable).	
	15-year commitment included in contract.	
	Letter of Intent signed.	
Land Acquisition / Disposition	Confirm acquisition / disposition accurately reported.	
	Confirm land acquisition / disposition properly quantified.	
<b>Afforestation / Reforestation and Widely-Spaced Tree Planting Guidelines</b>		
Additionality -- Performance Test	Plantings were initiated on or after 1/1/03.	
	Land was in unforested condition for 10 years (for Afforestation).	
	Land satisfies definition of a forest (for Afforestation / Reforestation).	
Management Activity	Confirm no biomass removal, harvest, or thinning has occurred.	
<b>Sustainably Managed Forest Guidelines</b>		
Additionality -- Performance Test	Entity-wide sustainable certification by CCX-approved standard.	
Project Leakage	Confirm all entity-owned forest lands included.	
	Confirm lands excluded as approved (if applicable).	
	Confirm harvests deducted from lands excluded as approved (if applicable).	
<b>Quantification Methodology</b>		
Carbon accumulation tables Afforestation or Widely-Spaced Tree Only	Appropriate region, acreage, species, and age.	
Inventory Establishment through In-Field Measurement	Sampling procedure implemented and processed as approved.	
	Measurements accurately performed.	
	Baseline calculated as approved.	
	Confirm harvests are properly documented and consistent with	

	management plan.	
	Confirm post-harvest cruise conducted after harvest.	
	Inventory documentation is sufficient to support reported data and that calculations were performed correctly.	
	CCX conversion factors correctly used.	
	Statistical error at 90% CI.	
Inventory Establishment through Remote Sensing	Confirm flight occurred.	
	Confirm data covered appropriate boundary.	
	Confirm instrument calibrated.	
	Confirm data corrected for errors.	
	Confirm ground-truthing performed.	
	Confirm remote sensing correlations were determined using ground-truth inventories.	
	Confirm calculations of error around total volume estimate.	
	Confirm in-field inventory verified according to standard procedures.	
Growth-and-Yield Model	Use of model implemented as approved.	
	Retroactive modeling is not occurring prior to baseline establishment.	
	Parameters estimated / model calibrated as approved.	
	Carbon flux from all project land included in each project accounting year.	
	Carbon loss from harvests properly debited.	
<b>Long-Lived Wood Products</b>		
Conditions for Landowner at Harvest	Confirm entity using proper CCX quantification method.	
	Confirm sales contract retaining carbon rights from manufacturer.	

Primary Wood Products Manufacturer Conditions	Confirm entity using proper CCX quantification method.	
	Confirm sales contract retaining carbon rights for purchased timber (if purchased timber included).	
	Confirm entity has chain-of-custody certification by CCX-approved standard (if purchased timber included).	
	Confirm % of purchased timber from sustainably certified forest (if purchased timber included).	

## APPENDIX B – AFFORESTATION / REFORESTATION SUPPLEMENTAL INFORMATION

Table 2 – Classification of Afforestation / Reforestation Regions

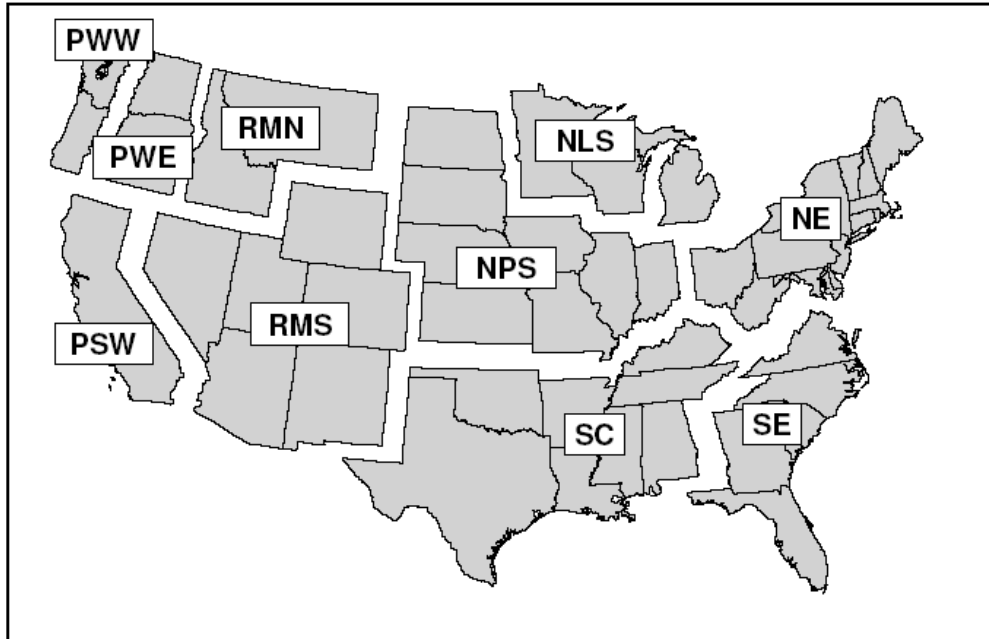


Figure 1.1—Definition of regions: Pacific Northwest, West (PWW); Pacific Northwest, East (PWE); Pacific Southwest (PSW); Rocky Mountain, North (RMN); Rocky Mountain, South (RMS); Northern Prairie States (NPS); Northern Lake States (NLS); Northeast (NE); South Central (SC); and Southeast (SE). Note that regions are merged for some tables, these combinations include: NLS and NPS as North Central; PWW, PWE, and PSW as Pacific Coast; RMN and RMS as Rocky Mountain; SC and SE as South; and RMN, RMS, PWE, and PSW as West (except where stated otherwise).

**Table 3** – Regional Estimates of Annual Carbon Accumulation in Live trees and Soil Organic Carbon for Afforestation / Reforestation (Metric tons CO<sub>2</sub>/ acre/ year age of tree)

Region	Species	1 through 5	6 through 10	11 through 15	16 through 20	21 through 25	26 through 30
Northeast	Aspen-birch	1.424	1.628	1.706	1.852	1.852	1.883
Northeast	Maple-beech-birch	1.571	2.199	2.702	2.638	2.481	2.449
Northeast	Oak-hickory	1.467	2.718	3.886	3.592	3.215	3.016
Northeast	Oak-pine	1.320	1.874	2.314	2.460	2.502	2.423
Northeast	Spruce-balsam fir	1.508	1.617	1.570	1.679	1.642	1.768
Northeast	white-red-jack pine	1.571	2.037	2.388	2.230	1.957	1.868
Northern Lake States	Aspen-birch	1.592	1.402	0.983	1.531	1.861	2.044
Northern Lake States	Elm-ash-cottonwood	0.921	1.098	1.024	1.483	1.661	1.802
Northern Lake States	Maple-beech-birch	1.131	1.240	1.140	1.788	2.239	2.379
Northern Lake States	Oak-hickory	1.466	1.429	1.266	1.752	2.082	2.160
Northern Lake States	Spruce-balsam fir	0.837	1.185	1.138	2.010	2.487	2.805
Northern Lake States	white-red-jack pine	0.146	0.679	1.036	2.260	3.297	3.396
Northern Prarie States	Elm-ash-cottonwood	0.859	0.826	0.669	0.909	1.014	1.359
Northern Prarie States	Maple-beech-birch	1.110	0.942	0.691	0.931	1.067	1.287
Northern Prarie States	Oak-hickory	1.425	1.251	1.016	1.256	1.413	1.476
Northern Prarie States	Oak-pine	1.089	1.063	0.984	1.419	1.801	1.916
Pacific Northwest, East	Douglas-fir	0.607	0.784	0.816	2.198	3.434	3.884
Pacific Northwest, East	Fir-spruce-mountain hemlock	0.691	0.581	0.397	0.868	1.235	1.742
Pacific Northwest, East	Lodgepole pine	0.419	0.628	0.754	1.361	1.884	1.905
Pacific Northwest, East	Ponderosa pine	0.712	0.691	0.586	0.910	1.162	1.177
Pacific Northwest, West	Alder-maple	1.739	2.272	2.638	5.193	7.572	6.932
Pacific Northwest, West	Douglas-fir	1.802	2.214	2.482	5.503	8.379	8.331

CCX Offset Project Protocol: Forestry Carbon Sequestration

<u>Region</u>	<u>Species</u>	<u>1 through 5</u>	<u>6 through 10</u>	<u>11 through 15</u>	<u>16 through 20</u>	<u>21 through 25</u>	<u>26 through 30</u>
Pacific Northwest, West	Fir-spruce-mountain hemlock	0.712	0.890	0.994	2.277	3.456	4.079
Pacific Northwest, West	Hemlock-Sitka spruce	1.299	1.717	1.968	4.182	6.220	6.644
Pacific Southwest	Mixed conifer	0.901	0.738	0.502	0.722	0.858	0.962
Pacific Southwest	Fir-spruce-mountain hemlock	0.712	0.675	0.586	0.926	1.172	1.350
Pacific Southwest	Western oak	0.566	0.487	0.377	0.418	0.418	1.429
Rocky Mountain, North	Douglas-fir	0.587	0.544	0.439	1.120	1.749	2.167
Rocky Mountain, North	Fir-spruce-mountain hemlock	0.670	0.549	0.366	0.884	1.329	1.890
Rocky Mountain, North	Lodgepole pine	0.419	0.387	0.303	0.774	1.193	1.518
Rocky Mountain, North	Ponderosa pine	0.712	0.576	0.387	0.774	1.120	1.434
Rocky Mountain, South	Aspen-birch	0.670	0.622	0.471	0.774	0.994	1.261
Rocky Mountain, South	Douglas-fir	0.566	0.565	0.534	1.015	1.434	1.707
Rocky Mountain, South	Fir-spruce-mountain hemlock	0.398	0.366	0.293	0.638	0.942	1.214
Rocky Mountain, South	Lodgepole pine	0.461	0.387	0.283	0.466	0.607	0.774
Rocky Mountain, South	Ponderosa pine	0.377	0.340	0.251	0.481	0.680	0.885
Southeast	Loblolly-shortleaf pine	2.367	2.472	2.303	2.136	2.261	2.135
Southeast	Longleaf-slash pine	1.173	1.644	1.957	2.061	2.281	2.239
Southeast	Oak-gum-cypress	1.487	2.219	2.637	2.532	2.521	2.363
Southeast	Oak-hickory	1.739	2.262	2.430	2.136	2.178	2.041
Southeast	Oak-pine	1.571	2.157	2.440	2.220	2.083	1.968
South Central	Elm-ash-cottonwood	1.823	2.000	2.052	2.031	2.104	2.041
South Central	Loblolly-shortleaf pine	2.284	2.482	2.367	2.147	2.199	2.010
South Central	Oak-gum-cypress	1.152	1.948	2.534	2.419	2.345	2.104
South Central	Oak-hickory	2.053	2.252	2.220	2.073	2.042	1.958
South Central	Oak-pine	1.844	2.304	2.535	2.262	2.157	1.989

**APPENDIX C: SAMPLE LETTER OF INTENT TO MAINTAIN FOREST STOCKS BEYOND THE CCX MARKET PERIOD FOR FORESTRY PROJECTS**

**CHICAGO CLIMATE EXCHANGE FORESTRY SECTOR**

STATEMENT LETTER OF INTENT TO MAINTAIN FOREST STOCKS BEYOND 2010

[COMPANY]

[ADDRESS]

TO: CHICAGO CLIMATE EXCHANGE

This Statement of Intent issued by \_\_\_\_\_(Pool Participant / Member), to Chicago Climate Exchange (“CCX”) confirms Pool Participant’s / Member’s intent to respect the Principle of Permanence regarding its Forest Carbon Stock to maintain beyond December 31, 2010, excluding catastrophic events and land sales, the quantity of Carbon Stocks held by the Pool Participant / Member in its CCX-registered Forestry Project as defined in the CCX Rulebook including any amendments and/or interpretations thereto.

It is recognized by Pool Participant / Member and CCX that this is a non-binding Statement that reflects the Pool Participant’s /Member’s intent in regards to the issues described herein. The Pool Participant / Member acknowledges that the effectiveness of forest stocks in sequestering carbon dioxide depend on the forests stocks being maintained for a considerable time period. The Pool Participant /Member acknowledges that an objective of the Chicago Climate Exchange is the development of Offset Project Protocols to advance climate change mitigation objectives and that the Chicago Climate Exchange issues offsets for Forest Carbon Stocks with the objective that the forest stocks sequester carbon for a considerable time period. The Pool Participant / Member acknowledges that they support the objectives of the Chicago Climate Exchange and the use of forest Offset Projects as a means of carbon sequestration.

DATED this \_\_\_\_ day of \_\_\_\_\_, [Year]

By: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

## APPENDIX D: EXAMPLE OF LAND ACQUISITION AND DISPOSITION

### Example: Land Acquisition

Suppose a member owns 100 hectares on January 1 with a carbon stock of 14,000 metric tons of carbon dioxide equivalent (Mt CO<sub>2e</sub>). On December 31 of that year, the carbon stock on those hectares had increased to 14,500 Mt CO<sub>2e</sub>. Suppose that the member acquired an additional 25 hectares on August 23 with a carbon stock of 3,000 m Mt CO<sub>2e</sub> at the time of purchase, and that the carbon stock had increased to 3,250 Mt CO<sub>2e</sub> by December 31 of that year of purchase.

During the subsequent year, the carbon stock on the initial 100 hectares decreased to 14,400 Mt CO<sub>2e</sub> and the carbon stock on the newly acquired 25 hectares increased to 3,500 Mt CO<sub>2e</sub>. If we disregard the application of any discount CCX rules may require, forest carbon stocks would be quantified on CCX in the following manner:

Category	2002	2003
Total Owned Area – Beginning of Year (ha)	100	125
Total Owned Area – End of Year (ha)	125	125
Total Metric Tons of Carbon Dioxide Equivalent on January 1 – Land Owned at Beginning of Year (Mt CO <sub>2e</sub> )	14,000	17,750
Total Metric Tons of Carbon Dioxide Equivalent on December 31 – Land Owned at Beginning of Year (Mt CO <sub>2e</sub> )	14,500	17,900
Total Metric Tons of Carbon Dioxide Equivalent on December 31 – Land Acquired During that Year (Mt CO <sub>2e</sub> )	250	N/A
<b>Total Volume Change Eligible for CCX Crediting in Metric Tons of Carbon Dioxide Equivalent (Mt CO<sub>2e</sub>)</b>	<b>500</b>	<b>150</b>

### Example: Land Disposition

Suppose a member owns 200 hectares that they had enrolled in CCX for three years. At the end of three years, the member had been issued CFIs equal to 5,000 Mt CO<sub>2e</sub>. Suppose that the member decided to sell 50 hectares, and of the total 5,000 Mt CO<sub>2e</sub> for which they had been credited, 1,000 Mt CO<sub>2e</sub> had accrued on those hectares. Thus, unless the member was able to demonstrate or satisfy one of the requirements necessary for retaining the 1,000 Mt CO<sub>2e</sub> in the sale, they would be responsible for surrendering all of the accrued CFIs on those lands.

## APPENDIX E: SUSTAINABLY MANAGED FOREST SUPPLEMENTAL INFORMATION

**Table 4 – CCX-approved Certification Schemes for Sustainable Forest Management**

Country	Name	Schemes
Australia	Australian Forestry Standard Limited	Australian Forest Certification Scheme
Austria	PEFC Austria	Austrian Forest Certification Scheme (2006)
Belarus	Belarusian Association of Forest Certification	
Belgium	WoodNet - Commission PEFC Belgique	Belgian Forest Certification Scheme
Brazil	National Institute of Metrology, Standardization and Industrial Quality	Cerflor - Brazilian Program of Forest Certification
Canada	CSA International; SFI Canada	CSA Sustainable Forest Management Program
Chile	CertforChile Forest Certification Corporation	CertforChile
Czech Republic	PEFC Czech Republic	Czech Forest Certification Scheme (2006)
Denmark	PEFC Denmark	Danish Forest Certification Scheme
Estonia	Estonian Forest Certification Council	Estonian Forest Certification Scheme
Finland	Finnish Forest Certification Council	Finnish Forest Certification Scheme
France	PEFC France	French Forest Certification Scheme (2006)
Gabon	PAFC Gabon	PAFC Gabon Forest Certification Scheme
Germany	PEFC Germany e.V	Revised German Forest Certification Scheme (2005)
Ireland	PEFC Council of Ireland	
Italy	PEFC Italy	Italian Forest Certification Scheme
Latvia	PEFC Latvia Council	Latvian Forest Certification Scheme
Lithuania	PEFC Lietuva (PEFC Lithuania)	Lithuanian Forest Certification Scheme
Luxembourg	PEFC Luxembourg	Luxembourg Certification Scheme for Sustainable Forest Management
Malaysia	Malaysian Timber Certification Council	
Norway	PEFC-Norway	Norwegian Living Forest Standard

		and Certification Scheme
Poland	PEFC Polska	Polish Forest Certification Scheme
Portugal	Portuguese Forestry Sector Council	Portuguese Forest Certification Scheme
Russia	Partnership on the Development of PEFC Forest Certification	
Slovakia	Slovak Forest Certification Association	Slovak Forest Certification Scheme
Slovenia	Institute of Forest Certification Slovenia	Slovenian Forest Certification Scheme
Spain	PEFC España	Spanish Forest Certification Scheme
Sweden	Swedish PEFC Co-operative	Swedish Forest Certification Scheme
Switzerland	PEFC Switzerland and HWK-Zertifizierungsstelle	Swiss Q-label certification scheme
United Kingdom	PEFC UK Ltd.	UK Scheme for Sustainable Forest Management
		PEFC UK certification scheme for sustainable forest management (revised 2006)
United States	Sustainable Forestry Initiative (SFI Inc.) American Forest Foundation (AFF)	SFI - Sustainable Forestry Initiative American Tree Farm System
International	Forest Stewardship Council (FSC)	Forest Stewardship Council (FSC)

## APPENDIX F: LLWP SUPPLEMENTAL INFORMATION

### Conversion Factors

**Table 5** – Selected CCX factors for Average Disposition Patterns of Carbon as fractions of Roundwood by Region and Roundwood Category (assuming no bark on roundwood and excluding fuel wood)<sup>21</sup>

Region	Softwood Sawlog	Softwood Pulpwood	Hardwood Sawlog	Hardwood Pulpwood
Northeast	0.318	0.09	0.316	0.261
North Central	0.346	0.092	0.297	0.304
Pacific Northwest (East)	0.337	0.337	0.265	0.265
Pacific Northwest (West)	0.409	0.076	0.207	0.207
Pacific Southwest	0.355	0.355	0.265	0.265
Rocky Mountain	0.367	0.367	0.265	0.265
Southeast	0.336	0.141	0.304	0.188
South Central	0.334	0.162	0.285	0.176

---

<sup>21</sup> Source: Technical Guidelines for Voluntary Reporting of Greenhouse Gas Program. Part I Appendix Forestry. Table 1.6 Average disposition patterns of carbon as fraction in roundwood by region and roundwood category. Pages 36-48 March 2006

**Table 6** – Volume Multipliers for Converting Timber and Chip Units into Thousand Cubic Feet (MCF)<sup>22</sup>

<b>Unit</b>	<b>Factor</b>
Bone Dry Tons	0.0713
Bone Dry Units	0.0825
Cords	0.075
Cubic Meters	0.0353
Cunits-Chips (CCF)	0.1
Cunits-Roundwood	0.1
Cunits-Whole tree chip	0.126
Green Tons	0.0315
MBF-Doyle	0.222
MBF-International 1/4"	0.146
MBF-Scribner ("C" or "Small")	0.165
MBF-Scribner ("Large" or "Long")	0.145
MCF-Thousand Cubic Feet	1
Oven Dried Tonnes	0.0758

---

<sup>22</sup> American Forest & Paper Association, Sustainable Forestry Initiative Program Annual Progress Reporting Form.

**Table 7** – Basic Factors for Converting Merchantable Wood Yield to Carbon Yield by Species<sup>23</sup>

Region	Forest Type	Specific Gravity	Lbs. per Dry cu. foot	Percent Carbon	Lbs C per Cubic foot
SE	Loblolly Pine	0.47	29.33	0.531	15.57
SE	Longleaf Pine	0.54	33.70	0.531	17.89
SE	Oak-Hickory (SI=79)	0.61	38.06	0.479	18.23
NE	Pines	0.41	25.58	0.521	13.33
NE	Spruce-fir	0.37	23.09	0.521	12.03
NE	Oak-hickory (all)	0.61	38.06	0.498	18.96
NE	Maple-beech-birch	0.61	38.06	0.498	18.96
NC	Pines	0.41	25.58	0.521	13.33
NC	Spruce-fir	0.37	23.09	0.521	12.03
NC	Oak-hickory	0.61	38.06	0.498	18.96
NC	Maple-beech	0.58	36.19	0.498	18.02
NC	Aspen-birch	0.46	28.70	0.498	14.29
West	Douglas-fir	0.45	28.08	0.512	14.38
West	Ponderosa pine	0.38	23.71	0.512	12.14
West	Fir-spruce	0.35	21.84	0.512	11.18
West	Hemlock-Sitka sp.	0.43	26.83	0.512	13.74
West	Lodgepole pine	0.42	26.21	0.512	13.42
West	Redwoods	0.42	26.21	0.512	13.42
West	Hardwoods	0.38	23.71	0.496	11.76

<sup>23</sup> Birdsey 1996 (See also Appendices 2 & 3, Sampson and Hair 1996)

## LLWP Pooled Participant Quantification Examples

### *Example 1 – Harvest Reported in Weight*

Consider a harvest in the Northeast of the United States produced 4,000 tons green weight of round wood. Further assume that the harvest was distributed across wood product categories in following fashion:

Wood Product Category	Distribution of Harvest (%)
Softwood saw timber	7.9%
Softwood pulpwood	5.1%
Hardwood saw timber	46.5%
Harwood pulpwood	40.5%

The 100 year in-use carbon dioxide in Long-Lived Wood Products (expressed in metric tons) is determined as follows:

**Step 1:** Convert green weight of roundwood to dry tons:

$$(4000 \text{ green tons} * 0.5 \text{ (green tons / dry tons)}) = 2,000 \text{ dry tons}$$

**Step 2:** Convert dry tons to carbon tons:

$$(2,000 \text{ dry tons} * 0.5 \text{ (dry tons / carbon tons)}) = 1,000 \text{ carbon tons}$$

**Step 3:** Distribute carbon tons across categories:

Wood Product Category	Carbon Tons
Softwood saw timber	79 carbon tons
Softwood pulpwood	51 carbon tons
Hardwood saw timber	465 carbon tons
Harwood pulpwood	405 carbon tons

**Step 4:** Estimate 100 year in use value by wood product category

Wood Product Category	Carbon Tons	Carbon as fractions of Roundwood by Region and Roundwood Category	100 Year Value (Total = 282.357 t Carbon)
Softwood saw timber	79 carbon tons	0.318	79 tons of carbon * 0.318 = 25.122 tons
Softwood pulpwood	51 carbon tons	0.090	51 tons of carbon * 0.090 = 4.59 tons
Hardwood saw timber	465 carbon tons	0.316	465 tons of carbon * 0.316 = 146.94 tons
Harwood pulpwood	405 carbon tons	0.261	405 tons of carbon * 0.261 = 105.705 tons

**Step 5:** Convert to metric tons of carbon dioxide:

$$282.357 * 3.67 * 0.907 = 939.88 \text{ Mt CO}_2$$

**Example 2 – Harvest Reported in Volume**

Consider a harvest of maple-beech-birch forest in the Northeast that produced 200 MBF of hardwood sawtimber and 1,000 cords of hardwood pulpwood.

**Step 1:** Convert volumes to common unit:

$$\text{Sawtimber: } 200 \text{ MBF} * 0.146 = 29.2 \text{ MCF}$$

$$\text{Pulpwood: } 1,000 \text{ cords} * 0.075 = 75 \text{ MCF}$$

**Step 2:** Convert volumes to metric tons of carbon:

$$\text{Sawtimber: } 29.2 \text{ MCF} * 18.96 \text{ lb c/cu ft} = 553.6 \text{ thousand pounds}$$

$$553.6 \text{ thousand pounds} / 2.204 = 251.2 \text{ metric tons carbon}$$

$$\text{Pulpwood: } (75 * 18.96) / 2.204 = 645.2 \text{ metric tons carbon}$$

**Step 3:** Estimate 100 year in-use value by wood product category

$$\text{Sawtimber: } 251.2 * 0.316 = 79 \text{ metric tons}$$

$$\text{Pulpwood: } 645.2 * 0.261 = 168 \text{ metric tons}$$

**Step 4:** Convert to metric tons of carbon dioxide equivalent

$$(79 + 168) * 3.67 = 909 \text{ metric tons of carbon dioxide equivalent}$$

**Table 8 – Product Categories Included in CCX LLWP Protocols<sup>24</sup>**

		<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>Product Category</b>	<b>Units</b>	<b>Factor to convert units of product to metric tons of carbon</b>	<b>Factor to convert units of product to metric tons carbon dioxide</b>	<b>Fraction remaining after 100 year end use and landfills</b>	<b>CCX Woods Products Crediting Factor (metric tons of CO<sub>2</sub>)</b>
Softwood lumber / laminated veneer lumber/	thousand board feet	0.443	1.624	0.639	1.038
Hardwood lumber	thousand board feet	0.765	2.805	0.554	1.554
Softwood plywood	thousand square feet, 3/8-inch basis	0.236	0.865	0.645	0.558
Oriented strand board	thousand square feet, 3/8-inch basis	0.275	1.008	0.696	0.702
Non structural panels (average)	thousand square feet, 3/8-inch basis	0.289	1.060	0.592	0.628
Hardwood veneer/ plywood	thousand square feet, 3/8-inch basis	0.286	1.049	0.592	0.621
Particleboard / medium density fiberboard	thousand square feet, 3/4-inch basis	0.587	2.152	0.592	1.274
Hardboard	thousand square feet, 1/8-inch basis	0.138	0.506	0.592	0.300
Insulation board	thousand square feet, 1/2-inch basis	0.220	0.807	0.592	0.478
Paper	Tons, air dry	0.496	1.819	0.151	0.275

Notes:

- i. Conversion from carbon to carbon dioxide uses standard conversion factor of 3.6667
- ii. CCX wood products crediting factor (column D) is the product of columns B and

<sup>24</sup> Source: Technical Guidelines for Voluntary Reporting of Greenhouse Gas Program. Forestry Tables- Table 1.7, Table 1.8. Department of Energy, March 2006

**Example 3 – Estimating LLWP Carbon for Commercial Forest Companies with CCX Registered Forest Land**

Consider a Member with the following production statistics for a reporting year.

<b>Product From Owned/Managed Forest Land</b>	<b>Quantity Wood for Production</b>
Non structural panels	1,500,000 thousand square feet 3/8 inch
Hardwood Lumber	2,000,000 thousand board feet
Medium density fiberboard	2,500,000 thousand square feet 3/4 inch
<b>Product From Purchased Wood</b>	<b>Quantity Wood for Production</b>
Non structural panels	2,500,000 thousand square feet 3/8 inch
Hardwood Lumber	1,000,000 thousand board feet
Medium density fiberboard	500,000 thousand square feet 3/4 inch

Let us assume that all of the owned forest land by member is certified as sustainably managed under a PEFC endorsed program. However, for the sake of this hypothetical example let us consider two scenarios with regards to purchased logs.

1. Scenario 1: All of the purchased logs are certified as sustainably managed under a CCX-approved program and independently verified through chain of custody.
2. Scenario 2: Fifty percent of the purchased logs are certified as sustainably managed under a CCX-approved program and independently verified through chain of custody.

The estimation of Carbon Stocks to be recognized under the Protocol for Long-Lived Wood Products is presented as follows.

**Step 1.** Estimate the eligible stock of Long-Lived Wood Products for recognition under the Protocol. The example assumes evidence of CCX-approved certification program for sustainable forest management exists.

<b>Column</b>	<b>Product category</b>	<b>Non structural panels (thousand square feet 3/8 inch)</b>	<b>Hardwood Lumber (thousand board feet)</b>	<b>Medium density fiberboard (thousand square feet 3/4 inch)</b>
<b>A</b>	Scenario 1 and 2: Production from Own Sources	1,500,000	2,000,000	2,500,000
<b>B</b>	Scenario 1: 100% Purchased logs certified for sustainable forest management (Eligible purchased logs = 100%*Wood Products from Purchased logs)	2,500,000	1,000,000	500,000

<b>C</b>	Scenario 2: 50% Purchased logs certified for sustainable forest management (Eligible purchased logs = 50%*Wood Products from Purchased logs)	1,250,000	500,000	250,000
----------	---	-----------	---------	---------

Using the above figures, we can estimate total eligible production of wood products for crediting as follows:

Product	Units	Scenario 1 (A + B)	Scenario 2 (A + C)
Non structural panels	(thousand square feet 3/8 inch)	4,000,000	2,750,000
Hardwood Lumber	(thousand board feet)	3,000,000	2,500,000
Medium density fiberboard	(thousand square feet 3/4 inch)	3,000,000	2,750,000

**Step 2:** The total eligible production of Long-Lived Wood Products is converted to metric tons of CO<sub>2</sub> using the CCX product conversion factors established in [Appendix F](#).

Product	CCX Products Conversion factor	Credits from Long-Lived Wood Products (metric tons of CO <sub>2</sub> )	
		Scenario 1	Scenario 2
Non structural panels	0.628 per thousand square feet 3/8 inch	2,512,000	1,727,000
Hardwood Lumber	1.554 per thousand board feet	4,662,000	3,885,000
Medium density fiberboard	1.274 per thousand square feet 3/4 inch	3,822,000	3,503,500
<b>Total</b>		<b>10,996,000</b>	<b>9,115,500</b>

## APPENDIX G: WIDELY-SPACED TREE PLANTING SUPPLEMENTAL INFORMATION

Methods for Quantifying Carbon Accumulation for Widely-Spaced Tree Plantings (Urban and Suburban Tree Planting Programs)

**Step 1:** Determine the number and species of qualifying live trees standing at the end of 2002 (or upon Project registration) on lands included in the CCX-registered Project. Qualifying trees are those planted after December 31, 2002 on sites not forested at that time.

Annual carbon sequestration values are calculated per one hundred trees.

**Step 2:** Reference [Table 9](#) to determine how many trees in the Project (rounded to the nearest hundred) correspond to the tree types listed below

(Species: H = Hardwood, C = Conifer) and growth rates (S = Slow, M = Moderate, F = Fast).

Do not include trees with diameters less than 1 inch at breast height.

**Step 3:** Apply the annual carbon accumulation values provided in [Table 10](#) to determine annual Mt CO<sub>2</sub>.

For the purpose of calculating Tree Age in order to use [Table 10](#), zero-year trees are 1 inch in diameter at Breast Height (total diameter at Breast Height of all trunks for multi-trunk trees).

To calculate Tree Age for trees with a diameter greater than 1 inch, use the following formula:

### Equation 6: Calculating Age of Widely Spaced Trees

$$\text{Tree Age} = (\text{Tree diameter (in inches)} - 1) \times 3$$

NOTE: Round the result to the nearest whole number. Retain all worksheets, calculations, field assessments and other information on tree counts.

### Calculation Example:

A city planted 10,000 two-inch diameter White Ash trees in 2007, so they are age 1 during 2008. The city concludes that 90% of the trees were successfully planted (9,000 remain alive).

The carbon sequestration calculation is as follows:

Tree type:	White Ash
Tree count:	9,000
Tree types, growth rate:	H, F
Carbon accumulated during 2008:	$90 \times 2.25 = 42.3 \text{ Mt CO}_2$

**Table 9 – Tree Types and Growth Rates Applied to Widely-Spaced Tree Plantings (Urban and Suburban Tree Planting Programs)<sup>25</sup>**

Species	Type	Growth Rate	Species	Type	Growth Rate
Ailanthus, Ailanthus altissima	H	F	Maple, bigleaf, Acer macrophyllum	H	S
Alder, European, Alnus glutinosa	H	F	Maple, Norway, Acer platanoides	H	M
Ash, green, Fraxinus pennsylvanica	H	F	Maple, red, Acer rubrum	H	M
Ash, mountain, American, Sorbus americana	H	M	Maple, silver, Acer saccharinum	H	M
Ash, white, Fraxinus americana	H	F	Maple, sugar, Acer saccharum	H	S
Aspen, bigtooth, Populus grandidentata	H	M	Mulberry, red, Morus rubra	H	F
Aspen, quaking, Populus tremuloides	H	F	Oak, black, Quercus rubra	H	M
Baldcypress, Taxodium distichum	C	F	Oak, blue, Quercus douglasii	H	M
Basswood, American, Tilia americana	H	F	Oak, bur, Quercus macrocarpa	H	S
Beech, American, Fagus grandifolia	H	S	Oak, California black, Quercus kelloggii	H	S
Birch, paper (white), Betula papyrifera	H	M	Oak, California White, Quercus lobata	H	M
Birch, river, Betula nigra	H	M	Oak, canyon live, Quercus chrysolepsis	H	S
Birch, yellow, Betula alleghaniensis	H	S	Oak, chestnut, Quercus prinus	H	S
Boxelder, Acer negundo	H	F	Oak, Chinkapin, Quercus muehlenbergii	H	M
Buckeye, Ohio, Aesculus glabra	H	S	Oak, Laurel, Quercus laurifolia	H	F
Catalpa, northern, Catalpa speciosa	H	F	Oak, live, Quercus virginiana	H	F
Cedar-red, eastern, Juniperus virginiana	C	M	Oak, northern red, Quercus rubra	H	F
Cedar-white, northern, Thuja occidentalis	C	M	Oak, overcup, Quercus lyrata	H	S
Cherry, black, Prunus serotina	H	F	Oak, pin, Quercus palustris	H	F
Cherry, pin, Prunus pennsylvanica	H	M	Oak, scarlet, Quercus coccinea	H	F
Cottonwood, eastern, Populus deltoides	H	M	Oak, swamp white, Quercus bicolor	H	M

<sup>25</sup> “Method for Calculating Carbon Sequestration by Trees in Urban and Suburban Settings,” in Energy Information Administration, U.S. Department of Energy, *Voluntary Reporting of Greenhouse Gases*, April 1998.

Crabapple, Malus spp.	H	M	Oak, water, Quercus nigra	H	M
Cucumbertree, Magnolia acuminata	H	F	Oak, white, Quercus alba	H	S
Dogwood, flowering, Cornus florida	H	S	Oak, willow, Quercus phellos	H	M
Elm, American, Ulmus Americana	H	F	Pecan, Carya illinoensis	H	S
Elm, Chinese, Ulmus parvifolia	H	M	Pine, European black, Pinus nigra	C	S
Elm, rock, Ulmus thomasi	H	S	Pine, jack, Pinus banksiana	C	F
Elm, September, Ulmus serotina	H	F	Pine, loblolly, Pinus taeda	C	F
Elm, Siberian, Ulmus pumila	H	F	Pine, longleaf, Pinus palustris	C	F
Elm, slippery, Ulmus rubra	H	M	Pine, ponderosa, Pinus ponderosa	C	F
Fir, balsam, Abies balsamea	C	S	Pine, red, Pinus resinosa	C	F
Fir, Douglas, Pseudotsuga menziesii	C	F	Pine, Scotch, Pinus sylvestris	C	S
Ginkgo, Ginkgo biloba	H	S	Pine, shortleaf, Pinus echinata	C	F
Hackberry, Celtis occidentalis	H	F	Pine, slash, Pinus elliottii	C	F
Hawthorne, Crataegus spp.	H	M	Pine, Virginia, Pinus virginiana	C	M
Hemlock, eastern, Tsuga canadensis	C	M	Pine, white eastern, Pinus strobus	C	F
Hickory, bitternut, Carya cordiformis	H	S	Poplar, yellow, Liriodendron tulipifera	H	F
Hickory, mockernut, Carya tomentosa	H	M	Redbud, eastern, Cercis canadensis	H	M
Hickory, shagbark, Carya ovata	H	S	Sassafras, Sassafras albidum	H	M
Hickory, shellbark, Carya laciniata	H	S	Spruce, black, Picea mariana	C	S
Hickory, pignut, Carya glabra	H	M	Spruce, blue, Picea pungens	C	M
Holly, American, Ilex opaca	H	S	Spruce, Norway, Picea abies	C	M
Honeylocust, Gleditsia triacanthos	H	F	Spruce, red, Picea rubens	C	S
Hophornbeam, eastern, Ostrya virginiana	H	S	Spruce, white, Picea glauca	C	M
Horsechestnut, common, Aesculus Hippocastanum	H	F	Sugarberry, Celtis laevigata	H	F
Kentucky coffeetree, Gymnocladus dioicus	C	F	Sweetgum, Liquidambar styraciflua	H	F
Linden, little-leaf, Tilia cordata	H	F	Sycamore, Platanus occidentalis	H	F
Locust, black, Robinia pseudoacacia	H	F	Tamarack, Larix laricina	C	F
London plane tree, Platanus X acerifolia	H	F	Walnut, black, Juglans nigra	H	F
Magnolia, southern, Magnolia grandifolia	H	M	Willow, black, Salix nigra	H	F

**Note:** H = Hardwood, C = Conifer; Growth Rate: S = Slow, M = Moderate, F = Fast

**Table 10** – Annual CCX Carbon Accumulation Quantities for Widely-Spaced Tree Plantings (Urban and Suburban Tree Planting Programs) (Mt CO<sub>2</sub>) per One Hundred Trees by Tree Type and Age

Annual Sequestration Rates by Tree Type and Growth Rate (metric tons CO <sub>2</sub> per one hundred trees)							
Tree Age*	Tree diameter (at 4.5 feet height)	Hardwood			Conifer		
		Slow	Moderate	Fast	Slow	Moderate	Fast
0	1 inch	0.15	0.22	0.31	0.08	0.12	0.16
1	1.33"	0.19	0.31	0.47	0.10	0.17	0.26
2	1.66"	0.23	0.41	0.63	0.13	0.23	0.36
3	2.0"	0.28	0.50	0.80	0.16	0.29	0.48
4	2.33"	0.33	0.61	0.99	0.19	0.36	0.61
5	2.66"	0.37	0.71	1.18	0.22	0.43	0.75
6	3.0"	0.43	0.83	1.38	0.26	0.51	0.89
7	3.33"	0.48	0.94	1.59	0.29	0.59	1.04
8	3.66"	0.54	1.06	1.81	0.33	0.68	1.19
9	4.0"	0.58	1.19	2.03	0.36	0.77	1.36
10	4.33"	0.64	1.31	2.25	0.41	0.86	1.54
11	4.66"	0.70	1.43	2.48	0.44	0.96	1.71
12	5.0"	0.76	1.57	2.72	0.49	1.06	1.90
13	5.33"	0.82	1.70	2.96	0.54	1.15	2.09
14	5.66"	0.87	1.84	3.21	0.57	1.26	2.28
15	6.0"	0.94	1.97	3.46	0.62	1.38	2.49
16	6.33"	1.00	2.11	3.72	0.66	1.48	2.70
17	6.66"	1.06	2.26	3.97	0.71	1.60	2.91
18	7.0"	1.13	2.40	4.23	0.77	1.71	3.14
19	7.33"	1.19	2.55	4.50	0.82	1.83	3.36
20	7.66"	1.26	2.70	4.78	0.86	1.95	3.59
21	8.0"	1.33	2.84	5.05	0.92	2.07	3.82
22	8.33"	1.40	3.01	5.33	0.97	2.20	4.07
23	8.66"	1.46	3.16	5.61	1.03	2.33	4.31
24	9.0"	1.53	3.31	5.90	1.07	2.46	4.56
25	9.33"	1.60	3.47	6.19	1.13	2.59	4.81
26	9.66"	1.67	3.64	6.48	1.19	2.73	5.07
27	10.0"	1.75	3.79	6.77	1.25	2.87	5.33
28	10.33"	1.82	3.95	7.08	1.31	3.01	5.59
29	10.66"	1.89	4.11	7.38	1.36	3.15	5.86

## **APPENDIX H: CCX-APPROVED GROWTH-AND-YIELD MODELS**

The CCX Forestry Committee has approved the following growth-and-yield models:

- SiMS / GaPPS / PMRC for southern yellow pine
- TWIGS for hardwoods (all U.S. regional variants approved)
- U.S. Forest Service FVS for hardwoods and conifers (all regional variants approved)  
<http://www.fs.fed.us/fmrc/fvs/>
- Southern Hardwood Research Cooperative “SOHARC” growth-and-yield model for Southern U.S. hardwoods
- CO<sub>2</sub> FIX model for tropical tree species

## APPENDIX I: SYNTHETIC BASELINE – HYPOTHETICAL EXAMPLE

Consider a hypothetical firm with total energy usage of 100,000,000 GJ for baseline years. The following is the energy mix for the hypothetical firm:

Type of Energy	Energy Mix (%)	Energy Mix (GJ)	Emissions (Mt CO <sub>2</sub> e)*
Fossil Fuel	15%	15,000,000 GJ	840,900 (Mt CO <sub>2</sub> e)
Renewable Energy	85%	85,000,000 GJ	N/A

*\*In this example, we assume that the only fossil fuel energy source for the firm is natural gas. Based on WRI/WBCSD CO<sub>2</sub> emission factors, the direct emissions baseline is 840,900 metric tons of CO<sub>2</sub>.*

Applying the proposed procedure the synthetic emissions baseline for the firm is computed as 2,727,727 metric tons of CO<sub>2</sub> (100,000,000 GJ\*0.0273 metric tons per GJ). Computations for maximum allowed sales from Forest Carbon Stocks will be based on this Synthetic emissions baseline. The limits on sales from net increases in Forest Carbon Stocks for the firm are presented in the following table.

**Table 11 – Modified Limitations on Sales of Exchange Allowances from Net Increases in Forest Carbon Stocks for Firm (metric tons of CO<sub>2</sub>)**

Compliance Year	Maximum Recognized net increases in forest stocks
2003	81,832
2004	109,109
2005	163,664
2006	190,941
<b>Total</b>	<b>354,605</b>