Blandin Native American Hardwoods Conservation & Carbon Sequestration Project

November 2015

Blandin Paper Company

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A.
PROJECT OVERVIEW

A1. PROJECT TITLE

Blandin Native American Hardwoods Conservation & Carbon Sequestration Project

A2. PROJECT TYPE

Improved Forest Management

A3. PROOF OF PROJECT ELIGIBILITY

Relevant eligibility requirements and demonstration that they are met by the project are elaborated below.

Eligibility Requirement	**Demonstration of compliance**
Start date	The project start date is after January 1 2000. GHG mitigation was an objective of the project activity at the time of the start date on July 28 2010 (> 2 years prior to date of listing in May 2014). Offsets were considered at that time as a source of financing the ongoing conservation and management of the project area, and were specifically mentioned in the signed conservation easement, which specifies that the rights to any offsets generated by the project are retained by the Grantor, Blandin Paper Company, hereafter referred to as "Blandin" (see Annex A conservation easement, section 4.2). The evidence referenced above further complies with the methodology (Improved Forest Management Methodology for Quantifying GHG Removals and Emission Reductions through Increased Forest Carbon Sequestration on Non-Federal U.S. Forestlands) requirement that "If the project Start Date is more than one year before submission of the GHG plan, the Project Proponent shall provide evidence that GHG mitigation was seriously considered in the decision to proceed with the project activity. Evidence shall be based on official and/or legal documentation. Early actors undertaking voluntary activities to increase forest carbon sequestration prior to the release of this requirement ***may submit as evidence recorded conservation easements*** or other deed restrictions that affect onsite carbon

	stocks."
Project term	The project employs the ACR Forest Carbon Project Standard v2.1 requisite 40 year minimum project term, over which time Blandin commits to project continuance, monitoring and verification.
Crediting period	The project employs the ACR Forest Carbon Project Standard v2.1 requisite 20 year initial crediting period.
Real	The project seeks no issuance of ex ante credits.
Direct emissions/Offset title/Land title	GHG emission reductions generated by the project activity are generated from forest carbon sources and sinks over which Blandin has all management (see Annex A conservation easement, section 4.1) and ownership rights. Blandin holds title to all lands in the project area (see Section G below) and all rights to carbon credits/offsets produced through management of forests in the project area (see Annex A conservation easement, section 4.2).
Additional	Additionality is demonstrated in Section C below.
Permanent	Permanence is addressed by the project through ongoing assessment of risk using the VCS AFOLU Non-Permanence Risk Tool (dated 04 October 2012, version 3.2) and contributions commensurate with risk, determined using the tool, to the ACR buffer pool.
Net of leakage	Leakage is addressed using the ACR-approved methodology Improved Forest Management Methodology for Quantifying GHG Removals and Emission Reductions through Increased Forest Carbon Sequestration on Non-Federal U.S. Forestlands
Independently validated and verified	The project has been submitted for independent validation and verification, and is expected to complete the process in 2014.
Community and environmental impacts	Net positive community and environmental impacts are demonstrated in Section F below.
Forest definition	All areas qualify as "forestland" per the methodology (Improved Forest Management Methodology for Quantifying GHG Removals and Emission Reductions through Increased Forest Carbon Sequestration on Non-Federal U.S. Forestlands) definition of >10% stocking, or roughly around >8ft^2/acre basal area in trees >5" dbh.
Eligible landownership type	All landownership types, including private as in the case of this project, are eligible per the ACR Forest

	Carbon Project Standard v2.1

A4. LOCATION

The project property is entirely in the state of Minnesota, mainly located within a 70 mile radius of Grand Rapids, in 7 different counties: Itasca, St. Louis, Koochiching, Aitkin, Clearwater, Beltrami, and Cass. A shapefile of the project area is archived in the project database, and illustrated in Figure A1. In addition, the project database includes a GIS database ("UPM_GIS"), which together with the shapefile, "Blandin_PA_2015.07.14.shp", depicts all parcel locations in the project area and their unique identifiers.

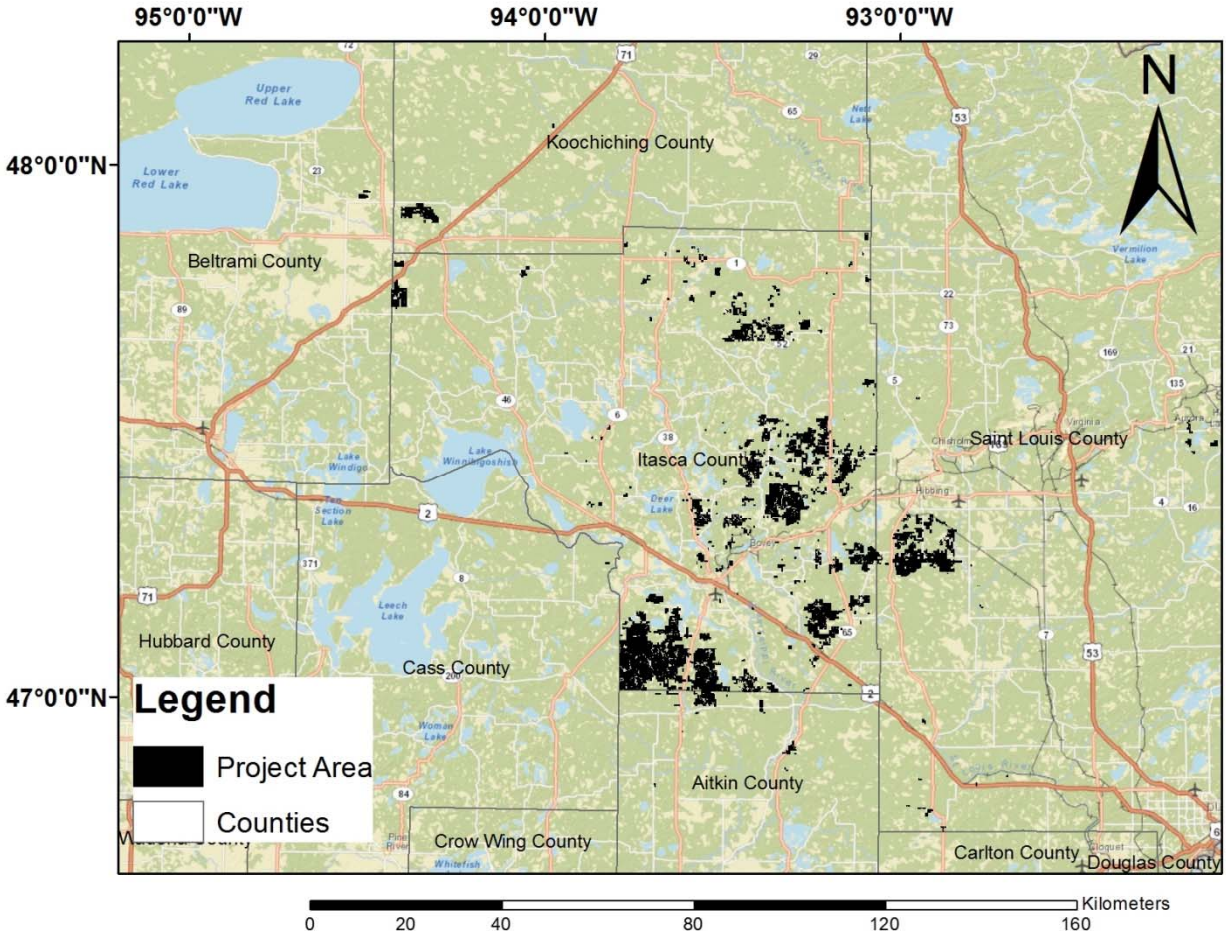

Figure A1. Blandin Native American Hardwoods Conservation & Carbon Sequestration Project area.

A5. BRIEF SUMMARY OF PROJECT

The Blandin forest lands constituting the project area were acquired and consolidated progressively over the past century, with significant acquisitions in the 1950s through the 1990s. The most recent acquisition was in 2008 via a land exchange between Blandin and Itasca County. Parts of the Blandin forest have been harvested for timber since early in the 20th century, when spruce bogs were considered the key element for wood supply. In fact, there is evidence on the property of old logging camps dating back to 1880-1920.

The land lies within four sub-sections of the National Hierarchical Framework of Ecological Units (Figure A2):

- Chippewa Plains
- Nashwauk Uplands
- St. Louis Moraines
- Tamarack Lowlands

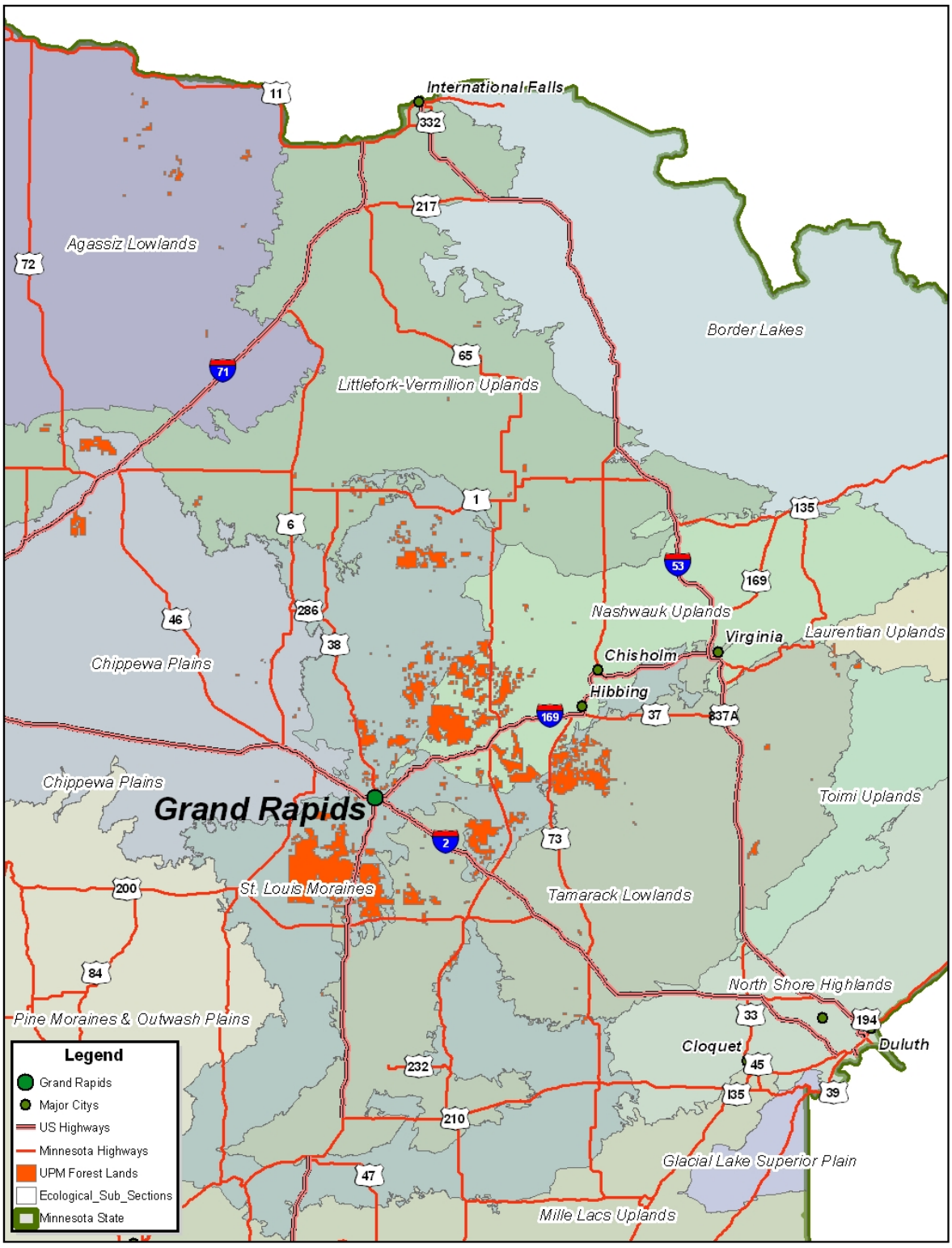

Figure A2. Project area in relation to National Hierarchical Framework of Ecological Units.

The Blandin forest is composed of 28% softwood (conifer) and 72% hardwood (deciduous broadleaf) types, with Quaking Aspen (*Populus tremuloides*), Black Spruce (*Picea mariana*), northern hardwoods (e.g. *Acer saccharum*, *Tilia americana*, *Betula papyrifera*), White Spruce (*Picea glauca*), lowland hardwoods (e.g. *Fraxinus nigra*) and Balsam Fir (*Abies balsamea*), comprising the majority of the forest cover types.

The age class structure across the Blandin forest is fairly typical of the state of Minnesota's overall age class distribution, with 70% of forest stands between 0 and 50 years old, and older stands aged >50 years covering 30% of the forest area.

On July 28 2010, Blandin signed a perpetual conservation easement covering 187,876 acres of land under its ownership in northern Minnesota. The State of Minnesota holds the easement. Within the area under easement, 173,385.5 acres are forested acres meeting ACR standard and methodology eligibility requirements. The conservation easement formalizes and ensures the continued application in perpetuity of Blandin's current Smart Forestry practices (see: http://www.upm.com/na/blandin-forestry/smart-forestry/Pages/default.aspx), maintaining the diversity of natural forest communities and aligning management with ecological regimes, reducing harvest impacts, as well as mitigating climate change. Specifically, the following provisions of the conservation easement serve to specify the improved forest management practices that constitute the project activity:

- Section 2.2.1, stated purpose "To continue management of the Protected Property as a sustainable working forest in a manner that will protect in perpetuity the Conservation Values and to prevent any use of the Protected Property that will significantly impair or interfere with the Conservation Values …" [note: "Conservation Values" include "significant … native plant communities and wildlife species habitat" and "native forests and natural ecosystems"; Section 2.1]
- Section 2.2.2, stated purpose "…to provide for the … ecologically sustainable production and harvesting of forest resources in a manner that is compatible with maintaining surface water quality, fish and wildlife habitat and other ecological values…"
- Section 6.1.1, "Grantor [Blandin or any future owner, "transferee", of the property under the easement] shall not perform any activities or uses in or on the Protected Property that would or are likely to significantly impair or interfere with the Conservation Values of the Protected Property or the Purpose of this Conservation Easement"
- Section 7.2.4, forest management shall be conducted to
    - "to use present and future generally accepted knowledge regarding forestry, based on the application of principles of forest ecology, silviculture, and timber harvesting to maintain forest productivity and the Protected Property for the sustainable production of forest products from a variety of native species, ages and sizes"

  - "To reasonably and practically emulate the patterns and processes of the dominant natural disturbance agents and resulting species and growth stages typical for forest types found in each Native Plant Community on the Protected Property"
  - "To protect the Conservation Values"
- Section 7.2.5, the following restrictions on forest management apply:
  - "In order to ensure the future economic vitality of the forests on the Protected Property including high quality residual forests on appropriate Native Plant Communities, there shall be no Highgrading on the Protected Property. For the purposes of this Conservation Easement, the term "Highgrading" shall mean the removal of only certain species over time above a certain size or of high value, leaving residual stands composed of trees of poor condition or species composition, through which the forest may become depleted over time of the best genetic growing stock"
  - "There shall be no creation by [Blandin or any transferee] of a forest stand established or maintained by sowing, planting or the application of other silvicultural practices that results in the development of forests atypical of the Native Plant Community"
  - "…no Non-Native Species and no Genetically-Modified or Replicated Organisms shall be intentionally planted, introduced, released, or broadcast by Grantor [Blandin or any transferee] on the Protected Property without Grantee's [State of Minnesota] prior written approval. Grantor [Blandin or any transferee] and Grantee [State of Minnesota] agree to coordinate their efforts to control non-native species"

Per the conservation easement, compliance with forest management restrictions in Sections 7.1 and 7.2 of the conservation easement may be demonstrated by holding forest certification by an internationally-recognized forest certification program (Section 7.3), or through State of Minnesota oversight of forest management planning and implementation (Section 7.4). At the project start date, the Blandin forest was certified under the Sustainable Forestry Initiative (SFI).

A6. PROJECT ACTION

The project activity is improved forest management, with Blandin's management practices representing an improvement in carbon storage and conservation value over higher return, more aggressive management regimes, characterized by shorter rotation, even-aged management and plantation forestry, typical of industrial private lands in the region at the time of the project start date in 2010. By comparison, Blandin's forest management practices involve longer rotations/cutting cycles, and in some cases moving from even-aged to uneven-aged management systems (e.g. from clearcutting aspen to mixed wood, aspen and white spruce, stands via periodic selective harvest).

Management prescriptions, including annual allowable cuts (AAC), are prepared in a forest management plan, updated every five years. Management decisions are focused on enhancement, restoration and maintenance of forest ecosystems/habitat types.

Blandin's forest land is managed according to Habitat Types, a single stage integration of soil moisture and nutrients, slope, climate, aspect, disturbance, and landform that uses floristic composition (understory species as well as trees) as an indicator of the environmental factors that affect species reproduction, growth, competition, and community development (Kotar and Burger 2000). Management prescriptions are developed in alignment with the species compositions and natural disturbance and stand development processes corresponding to Habitat Type, and often involving repeated, low intensity treatments from seedling to regeneration harvest.

Blandin further voluntarily excludes significant areas of forest from harvest, including designated old growth, unique habitats and watercourse buffers amounting to 10,720 acres of reserve forest.

A7. *EX ANTE* OFFSET PROJECTION

Estimates of GHG emission reductions and removal enhancements for the first 20-year crediting period are provided in table A1 below (derived in Section E).

Table A1. Estimates of annual emission reductions and cumulative emission reductions for the first crediting period. Throughout the GHG Plan, the convention is employed that project year refers to the year at the end of the annual interval, i.e. 2011 emission reductions represent emission reductions realized from July 28 2010 to July 27 2011.

Project Year	Annual net GHG emission reductions (t CO2)	Cumulative emission reductions earned (t CO2)
2011	(118,317.6)	-
2012	151,856.6	33,539.1
2013	(74,341.7)	33,539.1
2014	219,700.6	178,898.0
2015	192,888.6	371,786.6
2016	261,710.1	633,496.7
2017		947,355.1

	313,858.4	
2018	367,702.7	1,315,057.9
2019	510,046.0	1,825,103.9
2020	453,894.9	2,278,998.8
2021	143,109.7	2,422,108.5
2022	143,109.7	2,565,218.2
2023	143,109.7	2,708,327.9
2024	143,109.7	2,851,437.6
2025	141,222.4	2,992,660.0
2026	141,222.4	3,133,882.5
2027	141,222.4	3,275,104.9
2028	141,222.4	3,416,327.3
2029	141,222.4	3,557,549.8
2030	141,222.4	3,698,772.2
First Crediting Period Total	3,698,772.2	3,698,772.2

A8. PARTIES

List full contact information, roles, and responsibilities for project proponent, other project participants, relevant regulator(s) and/or administrators of any GHG Program(s) in which the project is already enrolled, and the entities holding offset and land title (if applicable).

Project Proponent contact information:

Blandin Paper Company

Joe Maher, Mill General Manager (Tel +1-218-327-6398, email: joe.maher@upm.com) or

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Grand Rapids, MN 55744

Project Landowners

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115 SW First St.

Grand Rapids, MN 55744

Offset project consultant or project developer contact information:

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Director Forestry & Technical Services

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Charlottesville, Virginia 22903 U.S.A

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B.
METHODOLOGY

B1. APPROVED METHODOLOGY

Improved Forest Management Methodology for Quantifying GHG Removals and Emission Reductions through Increased Forest Carbon Sequestration on Non-Federal U.S. Forestlands version 1.1 (August 2014).

(hereafter referred to as the "methodology")

B2. METHODOLOGY JUSTIFICATION

The chosen methodology is appropriate for improved forest management on private lands in the U.S. Relevant applicability conditions and demonstration that they are met by the project are elaborated below.

Applicability conditions	**Demonstration of compliance**
Applicable only on non-federally owned forestland within the United States	The project area is privately-owned and located in the United States
The methodology applies to lands that are subject to commercial timber harvesting activities by entities owning or controlling timber rights on forestland under a forest management plan	The project area is under the ownership and management of Blandin and subject to commercial timber harvest in accordance with a forest management plan created in 2007 and to be revised every 10 years. Forest Resources Manager and staff prepare and update each of the following plans periodically as necessary. Plans are approved by the Manager and may be reviewed with Blandin General Manager, and Blandin Management Team. 1. Wood Procurement Plan describes the company's wood quality requirements, regional sourcing strategies, potential for new wood supplies, and relationships with logging contractors. 2. Forest Management Plan sets forth generally accepted and Blandin-specific forest management philosophy, site specific and landscape approaches to planning, silvicultural standards, species growth, rotation ages, etc., given corporate strategic objectives. The Minnesota Forest Resources Council's North Central Landscape Plan will help establish forest management objectives from a landscape perspective.
Private or non-governmental organization	The entire project area was SFI-certified at the

ownerships must be certified by FSC, SFI, or ATFS or become certified within one year of the project Start Date	time of the July 28 2010 start date.
All Tribal lands in the United States, except those lands that are managed or administered by the Bureau of Indian Affairs, are eligible under this methodology	Not applicable
Public non-federal ownerships must: ・ be certified by FSC, SFI, or ATFS or become certified within one year of the project Start Date; or ・ have its forest management plan sanctioned by a unit of elected government officials within a state, or a state agency, or a federal agency; ・ and have its forest management plan updated at minimum every 10 years.	Not applicable
Use of non-native species is prohibited where adequately stocked native stands were converted for forestry or other land uses after 1997	The project area is composed entirely of native forest types and no non-native species are used in any post-harvest plantings
Draining or flooding of wetlands is prohibited	The project activity does not involve any hydrological manipulation of wetlands
Project proponent must demonstrate its ownership or control of timber rights for a period not less than 12 months prior to the project start date	The entire project area has been under Blandin ownership since fall of 2008 (the last land purchase by Blandin), more than 12 months prior to July 28 2010.
The project must demonstrate an increase in on-site stocking levels above the baseline condition by the end of the Crediting Period	The project is projected to increase on-site stocking levels above the baseline condition by the end of the Crediting Period (see Section E6 below)

B3. PROJECT BOUNDARIES

The project area boundary is delineated in a shape file archived in the project database and illustrated above in Figure A1. All areas qualify as “forestland” per the methodology definition of >10% stocking (i.e. roughly around >8ft^2/acre basal area in trees >5” dbh), and not currently developed for non-forest uses. This includes some forest areas temporarily un-stocked (e.g. recently clearcut). Non-forest land cover/use classes on the Blandin property were excluded.

The first project crediting period is from July 28 2010 to July 27 2030. The project term extends through July 27 2050.

B4. IDENTIFICATION OF GHG SOURCES AND SINKS

The project includes the carbon pools and GHG sources detailed in Table B1.

Table B1. Carbon Pools and GHG Emissions Sources Included in the Project Boundary.

Carbon pools	Included / Excluded	Justification / Explanation of Choice
Above-ground biomass carbon	Included	Major carbon pool subjected to the project activity. The project employs a minimum dbh of 5”.
Below-ground biomass carbon	Included	Major carbon pool subjected to the project activity. The project employs a minimum dbh of 5”.
Standing Dead Wood	Excluded	Excluded per methodology deviation issued by ACR 14 October 2015.
Lying Dead Wood	Excluded	This pool is conservatively excluded. Lying dead wood is optional to include.
Harvested Wood Products	Included	Major carbon pool subjected to the project activity.
Litter/Forest Floor	Excluded	Changes in the litter pool are considered *de* *minimis* as a result of project implementation
Soil Organic Carbon	Excluded	Changes in the litter pool are considered *de* *minimis* as a result of project implementation
Emissions from Biomass Burning	Included	This pool is included. It is conservatively assumed to be zero in the baseline. No logging slash is burnt in either the baseline or with-project cases as part of management practices.
Market Leakage	Included	As more wood is harvested in the baseline than in the project scenario, market leakage is accounted for to reflect that wood supply elsewhere increases in response to project activity-attributable reductions, assuming demand is constant.

B5. BASELINE

The baseline scenario represents an aggressive industrial harvest regime, targeted to maximize net present value at a 6% discount rate, typical of ca. 2010 practices in the project region on private lands. Baseline practices involve large scale clearcuts and conversion of natural hardwood stands to managed white spruce plantations. Derivation and justification for the baseline is detailed in Section E.

B6. PROJECT SCENARIO

The project activity is improved forest management, via implementation of Smart Forestry practices. The implementation of Smart Forestry practices is ensured in perpetuity through the conservation easement, signed in July 2010. The conservation easement was put on all 187,876 acres of Blandin property, covering the entirety of the eligible project area (173,385.5 acres). It provides for the continuation of management by habitat types and promotes a working forest. Under the easement, Blandin cannot subdivide the land in any fashion or develop the land. Relevant constraints on forest management imposed by the conservation easement are explained in detail in Section A5 above.

In practice, Smart Forestry, as compared with the typically aggressive cutting by other private industrial forest managers in the region, involves longer rotations/cutting cycles, and in some cases moving from even-aged to uneven-aged management systems (e.g. from clearcutting aspen to mixed wood, aspen and white spruce, stands via periodic selective harvest).

B7. REDUCTIONS AND ENHANCED REMOVALS

The project activity produces net emission reductions by increasing stocking relative to the baseline, via improved forest management practices previously described in Sections A5, A6 and B6.

B8. PERMANENCE

The project addresses permanence by application of the VCS AFOLU Non-Permanence Risk Tool (version 3.2), to assess risk of reversal and withhold from issuance a commensurate percentage of ERTs, to be held in reserve in the ACR buffer pool. The risk analysis is detailed in the accompanying project risk report, that will be updated at each verification.

C.
ADDITIONALITY

C1. REGULTORY SURPLUS TEST

Minnesota does not have a forest practices act or any other forestry laws, and the project activity is not required by law.

Forest management activities are exempt from Minnesota county zoning ordinances (governing e.g. restrictions on road and building construction).

Minnesota Best Management Practices (BMPs[1]) related to forest management and water quality, which are incorporated in Blandin's operations procedures, are voluntary. The Minnesota Forest Resources Council (MFRC) publishes and periodically updates forest management guidelines (MFRC 1999, 2007[2]), but the MFRC is not a regulatory body, and like BMP's, the MFRC guidelines are voluntary.

C2. COMMON PRACTICE TEST

At the time of the project start date, ca. 2010, most forest managers in the project region were motivated to harvest as much timber as possible with little investment and eventually to sell the land, and few were committed to long-term forest management. Blandin's SmartForestry practices, which constitute the project activity, are not practiced by other forest managers, and represent a significant departure from the practices of other forest managers in the region, and thus cannot be construed as constituting common practice. In particular, the mixed-wood two age system which is a central management practice on the Blandin forest contrasts starkly with the even-aged clearcut management regimes predominately practiced by other forest ownerships in Minnesota (69% of acres under management in 2008; D'Amato et al 2009[3]).

In the 10 years prior to the project start date, plantation forestry was an important element in forest management as practiced in Minnesota. Referencing USFS Forest Inventory and Analysis (FIA) Program timberland area data from 2008-2012, acreages of timberland with "clear evidence of artificial regeneration" in the 0-5 year and 6-10 year ages classes were 83,270 and 78,738 acres, respectively, statewide, indicative of plantation establishment rates of ~16,000 acres per year, much of this acreage in red pine and white spruce. In 2008 alone, an estimated 39,989 acres were established via artificial regeneration in Minnesota, across all ownership categories including forest industry (D'Amato et al

[1] SUSTAINING MINNESOTA FOREST RESOURCES--Voluntary Site-level Forest Management Guidelines (revised 2005)

[2] http://mn.gov/frc/documents/council/site-level/MFRC_FMG&Biomass_2007-12-17.pdf

[3] D'Amato, A.W., Bolton, N.W., Blinn, C.R. and A.R. Ek. 2009. Current status and long-term trends of silvicultural practices in Minnesota: A 2008 Assessment. Staff Paper Series No. 205, Department of Forest Resources, University of Minesota, St Paul, MN.

2009). Plantation forestry, particularly with white spruce, is also practiced on state lands and promoted by state agencies (John Almendinger, MN Department of Natural Resources, personal communication Sep 2014, Cheryl Adams, Blandin, personal communication Jun 2014). On Minnesota state lands from 2000 to 2012, 13,317 acres in red pine and 5,954 acres in white spruce plantations were established (Curtis Vanderschaaf, personal communication September 2014). Planting is also an important regeneration practice on federal lands (NFS) in Minnesota, as a means to restore conifers to the landscape, converting currently aspen-dominated stands (D'Amato et al 2009, Stone et al 2001[4]). In 2008, artificial regeneration was dominated (98%) by conifer species (D'Amato et al 2009). Acreage of plantations established annually in Minnesota more than doubled between 1996 and 2008 (D'Amato et al 2009).

C3. IMPLEMENTATION BARRIERS TEST

The project activity faces a financial barrier. Net present values were calculated referencing the baseline and project scenarios outlined in Sections E1 and E6 below, using a 6% discount rate over the 20 year crediting period from 2010 to 2030. Property taxes were ignored, as they are equal in the two scenarios. The project activity, without carbon revenue, is expected to generate a NPV (in 2010 $$) of $5,651,266, a substantially lower return than the NPV maximization scenario, that would yield an expected NPV (in 2010 $$) of $35,201,775. The project activity is thus clearly not the most profitable forest management use.

An additional financial challenge to the project activity arose in 2010, when property tax rebates for forest management provided through the Minnesota Sustainable Forest Incentive Act (SFIA) were substantially reduced for the Blandin property (from $1.6M to $0.1M per year).

While the sale of the conservation easement to the State of Minnesota generated revenue representing ~40% of the value of the property, most of the opportunity cost compensated for through the sale of the easement was related to the encumbrance on conversion to another land use (i.e. represented potential recreational/suburban development values, less significantly differences in revenues from forest management).

More relevant to the IFM project activity is that the conservation easement also imposed constraints on forest management, and, importantly, sales of carbon credits were intended to close the gap on the opportunity cost and finance the project activity, specifically provided for in provisions of the conservation easement Section 4.2:

> "Subject to the provisions of this Conservation Easement, Grantor shall have the right to sell wetland mitigation credits, endangered species credits, carbon sequestration credits, and similar such credits, so long as such sales or other similar interests imposed on all or any portion of the

[4] Stone, D.M., J.D. Elioff, D.V. Potter, D.B. Peterson, and R. Wagner. 2001. Restoration of aspen-dominated ecosystems in the Lake States. In Sustaining Aspen in Western Landscapes, eds., Shepperd, W.D. Binkley, D. Bartos, T. Stohlgren, and L. Eskey, 137-143. GTR RMRS-P-18. USDA, Forest Service

Protected Property are 1) subject and subordinate to this Conservation Easement, 2) shall not physically harm the Protected Property's Conservation Values, and 3) imposed in a manner that will not, upon event of foreclosure, result in a division that is prohibited by this Conservation Easement."

C4. PERFORMANCE STANDARD TEST

Not applicable.

D.
MONITORING PLAN

D1. MONITORED DATA AND PARAMETERS

Live tree stocks will be monitored via forest inventory conducted every 5 years or less, with field measurement and estimation procedures consistent with those outlined in Section E1 below. Harvested wood products will be monitored via Blandin's established tracking systems. Any burning of logging slash will be recorded and quantified.

The following parameters, specified in the Improved Forest Management Methodology for Quantifying GHG Removals and Emission Reductions through Increased Forest Carbon Sequestration on Non-Federal U.S. Forestlands, will be monitored.

Data or Parameter Monitored	$C_{P,TREE,t}$
Unit of Measurement	metric tons CO_2
Description	Carbon stored in above and below ground live trees at the beginning of the year *t*
Data Source	Forest inventory.
Measurement Methodology	To be consistent with standard operating procedures detailed in Eaton and Shoch 2014[5]
Data Uncertainty	To be calculated as the mean +/- 90% confidence interval
Monitoring Frequency	Every 5 years or less, or at request for ERT issuance
Reporting Procedure	
QA/QC Procedure	To be consistent with standard operating procedures detailed in Eaton and Shoch 2014. The inventory will use a stratified random sample design and re-measure the same permanent plots established in 2014, which targeted a precision level of +/- 10% of the mean live tree biomass with 90% confidence.
Notes	

Data or Parameter Monitored	$BS_{P,t}$
Unit of Measurement	in metric tons CO_2
Description	Carbon stock in logging slash burned in the project

[5] Eaton, J. and D. Shoch. 2014. Standard operating procedures for the UPM Blandin Forest Carbon Inventory. TerraCarbon LLC.

	in year *t*
Data Source	
Measurement Methodology	Burning of any kind is not performed as part of management practices. Routine surveillance and reporting by on-site land managers to confirm non-occurrence of burning logging slash.
Data Uncertainty	
Monitoring Frequency	
Reporting Procedure	
QA/QC Procedure	
Notes	

Data or Parameter Monitored	$C_{P,HWP,t}$
Unit of Measurement	metric tons CO_2
Description	Carbon remaining stored in wood products 100 years after harvest for the project in year t.
Data Source	Monitored via Blandin's established tracking systems.
Measurement Methodology	Wood volumes harvested will be monitored using Cengea: WTS (Computer software). Harvested wood delivered to the mill is scaled at its final destination, and the scale receipts are returned to the Blandin forest manager, Wood is scaled either by weight scales that are certified by the State of Minnesota or by certified scalers (see QA/QC procedures below).
Data Uncertainty	
Monitoring Frequency	Annual data summed for the monitoring period, applied as average annual for the monitoring period
Reporting Procedure	
QA/QC Procedure	Harvest volumes cut and delivered to the mill will be either (1) weighed at the mill on scales tested annually by the state of Minnesota Division of Weights and Measures and converted to wood volume in Cengea, or (2) directly scaled to volume by log scalers certified by the Minnesota Division of Weights and Measures.
Notes	

Data or Parameter Monitored	Project area

Unit of Measurement	Acres
Description	Area of IFM project
Data Source	Validated project GHG Plan
Measurement Methodology	Not re-measured – area remains fixed through crediting period. Project area determined based on cover type mapping of the Blandin ownership produced from field assessments and review of aerial imagery by Blandin.
Data Uncertainty	None
Monitoring Frequency	Not monitored.
Reporting Procedure	Reported in GHG Plan and all monitoring reports.
QA/QC Procedure	None
Notes	

Data or Parameter Monitored	Sample plot area
Unit of Measurement	Acres
Description	Collective area of forest inventory sample unit (cluster)
Data Source	Eaton, J. and D. Shoch. 2014. Standard operating procedures for the UPM Blandin Forest Carbon Inventory. TerraCarbon LLC
Measurement Methodology	As per standard operating procedures detailed in Eaton and Shoch 2014. Note that the inventory sample unit is a cluster of four subplots, with each subplot a circular plot with 24 ft radius. The center points for subplots 2, 3, and 4 are located 120 feet from the center of the cluster (i.e., the center of plot 1) at azimuths of 0°, 120° and 240°). Plot centers are permanently marked in the field.
Data Uncertainty	None
Monitoring Frequency	Sample plot area is not monitored. Sample plots

	are to be re-measured every 5 years or less.
Reporting Procedure	Reported in project monitoring reports.
QA/QC Procedure	As per detailed quality control procedures outlined in Eaton and Shoch 2014.
Notes	

Data or Parameter Monitored	Tree species
Unit of Measurement	Taxon (to species level)
Description	Species of tree measured in forest inventory sample unit (cluster)
Data Source	Forest inventory
Measurement Methodology	As per standard operating procedures detailed in Eaton and Shoch 2014.
Data Uncertainty	None
Monitoring Frequency	Sample plots are to be re-measured every 5 years or less.
Reporting Procedure	Reported in project monitoring reports.
QA/QC Procedure	As per detailed quality control procedures outlined in Eaton and Shoch 2014. Inventory field crew members will be trained in or have familiarity with regional dendrology.
Notes	

Data or Parameter Monitored	$GHG_{P,t}$
Unit of Measurement	metric tons CO2e
Description	Greenhouse gas emission resulting from the implementation of the project in year (t).
Data Source	Calculated using equation 13 of the methodology
Measurement Methodology	Not measured (calculated from monitored parameter $BS_{P,t}$)
Data Uncertainty	None
Monitoring Frequency	Calculated at each monitoring event every 5 years or less
Reporting Procedure	Reported in project monitoring reports

QA/QC Procedure	None
Notes	

E.
QUANTIFICATION

E1. BASELINE

For inventory and growth and yield modeling purposes, we first delineated 8 strata reflecting broad similarities in species composition and management regimes, then appended an additional stratum to sample an area not included in the original inventory design (Table E1). For both the baseline and with-project cases, the following strata were used:

Table E1. Sample area and strata delineated in the 2014 inventory.

Inventory Strata	Species composition/ predominant forest cover classes	Number of sample clusters	Inventory Acres
AS	"Aspen" (AS) – Quaking Aspen, Balsam Poplar, Birch and Balsam Fir	45	86116.5
AS2	"non-commercial Aspen" (AS2) – Aspen and Birch, comprised of low-stocked stands	8	23201.9
BS	"Black spruce" (BS) – Black Spruce and Tamarack	7	12199.9
JP	"Jack pine" (JP) – Jack Pine	6	372.4
NH	"Northern Hardwoods" (NH) – Northern Hardwoods, Oak and Lowland Hardwood	15	19356.8
RP	"Red pine" (RP) – Red Pine	6	1085.0
UN	"Un-managed" (UN) – Northern White Cedar	6	3943.1
WS	"White Spruce" (WS) – White Spruce and upland Black Spruce	8	13405.5
Add	Stratum delineated in the 2014 inventory to include additional acres of eligible forest land not included in the original inventory design. All of the forest cover classes above are represented in the "Add" stratum, predominately Aspen.	20	13704.5
	Total	121	173,385.5

The inventory employed a stratified random sampling design. Sample size was calculated to target a precision of +/- 10% of the mean (live tree carbon stock) with 90% confidence, referencing measurement data collected in a previous (1997/1998) forest inventory of the Blandin property. The sample unit was a cluster of four fixed area plots (standard operating procedures are detailed in Eaton and Shoch 2014[6]). Clusters were allocated among strata using a Neyman allocation, ensuring a minimum of 3 clusters in each stratum. For all strata except "Add", the sample was drawn from a larger pool of

[6] Eaton, J. and D. Shoch. 2014. Standard operating procedures for the UPM Blandin Forest Carbon Inventory. TerraCarbon LLC.

permanent clusters established in the 1997/1998 inventory, which were effectively a random (un-stratified) sample, with 1 cluster assigned every 100 acres from a list of stands (lower intensity in non-commercial stands), then randomly allocated within the stand; yielding equal probability for every acre. Clusters in the "add" stratum, where no permanent samples had been previously established, were located at random using ArcGIS. Cluster locations are detailed in Eaton and Shoch 2014. Field work was carried out from July to September 2014.

Total heights were directly measured in the field via a subsample whereby tree heights were measured only in the center subplot of each cluster. From this sample of 772 trees, height regressions were developed, using a logarithmic model, for 10 species/species groups (birch, pine, poplar, aspen, ash, maple, other hardwoods, black spruce, northern white cedar and other conifers) (Table E2), which were then applied to estimate the total heights of the unmeasured trees as a function of dbh and species/species group.

Table E2. Total height regressions derived for species/species groups from 2014 inventory data collected in the project area.

		*Eq form: Total ht ' = M *ln dbh " + B*			
Species/ species group	**Species included**	**M**	**B**	**n**	**R^2**
birch	Yellow and paper birch	21.493	10.372	13	0.72
pine	White, jack, red and scotch pine	25.458	0.3414	43	0.48
poplar	Balsam poplar	23.926	7.1101	37	0.64
aspen	Quaking and bigtooth aspen	31.998	-4.1933	245	0.41
ash	Black and green ash	28.302	-6.8608	56	0.44
maple	Red and sugar maple	20.157	11.449	44	0.21
Other hardwoods	American elm, Box elder, Basswood, Red oak and willow[7]	39.094	-27.488	28	0.64
black spruce	Black spruce	42.889	-31.413	39	0.54
white cedar	Northern white cedar	11.596	12.926	95	0.16
other conifers	White spruce, tamarack, Balsam fir	25.463	-8.7169	122	0.53

Biomass carbon was estimated from inventory data using the following approach, broadly consistent with the FVS Fire and Fuels Extension (FFE) biomass/carbon calculations (Rebain et al 2012; Stephanie Rebain, US Forest Service, personal communication, September 2014). For each stem, total

[7] Note that willow was the only species not represented in the height dataset, and was assigned to the other hardwoods category for height estimation; for context willow represented 0.06% of sampled stems in the inventory

merchantable stem (pulp) cubic foot volume was estimated from dbh and total height applying species-specific volume equations referenced from the National Volume Estimator Library[8]; volume estimates were processed through FVS-LS. Stem volume was then converted to dry mass applying species-specific lbs/ft^3 conversions provided in Table 4.11.5 of the FFE manual (wood density values used in the FFE-LS variant[9]). Root, stem bark and branches and tops components were then estimated from total aboveground biomass (estimated as a function of stem biomass) using component ratios derived in Jenkins et al 2003[10], to produce total live tree biomass (excluding the foliage component). Total live tree biomass was converted from pounds to metric tons, multiplied by 0.5 to estimate carbon fraction, then multiplied by 44/12 to calculate CO2 equivalent.

For growth and yield projections, we used the US Forest Service Forest Vegetation Simulator (FVS) Lake States (LS) variant[11]. The FVS-LS model was calibrated to the Blandin site entering the FVS location code 903 (Chippewa National Forest) and the following site indices (average site indices of index species at Blandin based on Blandin data):

1. Trembling Aspen: 71 ft height at 50 years
2. Black Spruce: 38 ft height at 50 years
3. Red Pine: 62 ft height at 50 years
4. Black Ash: 49 ft height at 50 years
5. Sugar Maple: 59 ft height at 50 years
6. White Spruce: 60 ft height at 50 years
7. Jack Pine: 63 ft height at 50 years

The FVS "NoTriple" command was entered to avoid excessive tree records and speed processing.

Initial carbon stock estimates for the 2010 project start date were back-modeled via FVS-LS from 2014 inventory data via the approach outlined below.

Modeling approach to de-grow Blandin July-Sep 2014 inventory data back to July 2010 start date

Inventory data, measured July-Sep 2014, were de-grown to a July 2010 start date.

1. July-Sep 2014 inventory data was entered into FVS-LS and grown for 10 years with no management (with "NoTriple" keyworded to track individual trees and permit cross-referencing to raw inventory dataset).

[8] http://www.fs.fed.us/fmsc/measure/volume/nvel/index.php
[9] http://www.fs.fed.us/fmsc/ftp/fvs/docs/gtr/FFEguide.pdf
[10] Jenkins, J.C., Chojnacky, D.C., Heath, L.S. and R.A. Birdsey. 2003. National-scale biomass estimators for United States tree species. Forest Science 49:12-35
[11] Dixon, Gary E.; Keyser, Chad E., comps. 2008 (revised September 7, 2012). Lake States (LS) Variant Overview – Forest Vegetation Simulator. Internal Rep. Fort Collins, CO: U. S. Department of Agriculture, Forest Service, Forest Management Service Center. 37p.

2. For each live tree (ascribed a unique identifier), annual diameter growth was derived assuming linear growth during the 10-year projection interval (i.e. for dbh, annual growth calculated as dbh at end of 10-year interval *minus* dbh at beginning of 10-year interval, reported in the FVS Treelist output, *divided by* 10).
3. For each live tree, diameter and height data from the July-Sep 2014 inventory was degrown referencing the annual rates derived in step 2 above, subtracting four years annual growth from the July-Sep 2014 measurement value.
4. Initial carbon stocks were recalculated using the degrown data, and stocks in trees harvested from 2010-2014 estimated and added to produce a complete stock estimate at project start date (see below).
5. The baseline scenarios were subsequently modeled entering the degrown inventory data into FVS-LS.

De-grown results for live tree biomass are presented in Table E3.

Table E3. Carbon stock estimates for live trees (above- and belowground biomass) calculated from 2014 measurement data de-grown to 2010.

	Add	AS	AS2	BS	JP	NH	RP	UN	WS
mean live tree tCO2/ac	31.1	23.9	19.0	28.6	30.7	76.5	49.5	46.1	34.9
ac	13,704	86,117	23,202	12,200	372	19,357	1,085	3,943	13,405
Project area Mean tCO2/ac	31.55								

Estimated total stock in live trees in 2010, de-grown from the 2014 inventory data, is 5,469,792.4 t CO2 (= 31.55 t CO2/ac live * 173,385.5 acres).

Stocks of live tree biomass harvested between July 2010 and July 2014, not present in the July 2014 inventory, were estimated from Blandin harvest sales data (July 1 2010 to July 31 2014) (Table E4). The following assumptions were applied to estimate live tree biomass carbon from recorded harvest volumes:

- 1 cord = 80 cubic feet solid wood
- MBF (one thousand board feet) stumpage = 2.36 cubic meters
- Live tree (above- and belowground) biomass estimated from harvested volumes using forest type-specific transformations from Smith et al 2003[12], for the Northern Lake States, referencing

[12] Smith, James E.; Heath, Linda S.; Jenkins, Jennifer C. 2003. Forest volume-to-biomass models and estimates of mass for live and standing dead trees of U.S. forests. Gen. Tech. Rep. NE-298. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 57 p.

average growing stock per unit area estimates derived from the 2014 forest inventory (which is conservative as 10% of the sample clusters were un-stocked); foliage component was excluded by multiplying estimate by (1 – 0.0389), 3.89% being the volume-weighted average foliage fraction of total above- and belowground biomass for trees in the 2010 de-grown inventory

Table E4. Stocks of live tree biomass (above- and belowground, "ABG") harvested between July 2010 and July 2014, estimated from Blandin harvest sales data (July 1 2010 to July 31 2014).

Species category / forest type	Palettes m^3	Pulp m^3	Sawn wood m^3	Total volume m^3	Total ABG live tree biomass extracted t CO2
pine	193.9	10500.7	456.2	11,150.8	22,304.4
lowland hardwood	775.8	1264.3	7.8	2,047.9	4,713.1
aspen birch	12164.7	278891.9	0.0	291,056.6	767,810.4
spruce fir	12.6	98608.6	0.0	98,621.2	247,210.4
maple beech birch	633.9	54428.1	0.0	55,062.0	138,351.9
oak hickory	664.6	2724.9	0.0	3,389.6	9,295.0
				total	1,189,685.1

*lowland hardwood = Black Ash
aspen birch = Aspen, Balsam Poplar, Birch
maple beech birch = Basswood, Maple
oak hickory = Oak
pine = Jack Pine, Red Pine, White Pine
spruce fir = Balsam Fir, Tamarack and White Spruce

The total live tree biomass harvested between the project start date and the July 2014 inventory is estimated as 1,189,685 t CO2 from across the project area, which was added to the de-grown 2014 inventory to produce an estimate of July 2010 (initial) stocks.

Estimated total stock in live trees in 2010 is 6,659,477.5 t CO2.

NPV ANALYSIS

Discount rate assumption

We analyzed the Net Present Value (NPV) of projected cash flows for each baseline stratum for each year over a 100-year period to determine the baseline management scenario (that maximizes NPV). For purpose of our NPV analysis, we used a real discount rate of 6%, the rate for private industrial forestlands stated in the methodology.

Timber and revenue assumptions

To compute the net present value for each stratum, we first modeled harvestable timber (in cubic feet) from sawlogs and from pulp from the 2014 inventory data de-grown to 2010 for 100 years using FVS-LS. The following stands were modeled (Table E5):

Table E5. Stands modeled in FVS-LS.

Stand	Predominant commercial species	Project area acres	Stand data entered into FVS-LS, notes on area represented
AS	Aspen	86,116.5	Modeled from inventory data from the "AS" stratum
AS2	Aspen	23,201.9	Modeled from inventory data from the "AS2" stratum
BS	Black Spruce	12,875.0	Modeled from inventory data from the "BS" stratum. Area represented includes 675.1 acres of "BS" type in "Add" stratum.
JP	Jack Pine	451.0	Modeled from inventory data from the "JP" stratum. Area represented includes 78.6 acres of "JP" type in "Add" stratum.
NH	northern hardwoods	19,356.8	Modeled from inventory data from the "NH" stratum
RP	Red Pine	1,085.0	Modeled from inventory data from the "RP" stratum
UN	None	4,222.9	Modeled from inventory data from the "UN" stratum. Area represented includes 279.7 acres of "UN" type in "Add" stratum.
WS	White Spruce	13,405.5	Modeled from inventory data from the "WS" stratum
2AS	Aspen	8,395.3	Modeled from inventory data from the "Add" stratum corresponding to "AS" forest type
2AS2	Aspen	1,653.8	Modeled from inventory data from the "Add" stratum corresponding to "AS2" forest type
2NH	northern hardwoods	1,231.7	Modeled from inventory data from the "Add" stratum corresponding to "NH" forest type
2RP	Red Pine	232.8	Modeled from inventory data from the "Add"

			stratum corresponding to “RP” forest type
2WS	White Spruce	1,157.4	Modeled from inventory data from the “Add” stratum corresponding to “WS” forest type
total		173,385.5	

Note that stands within the “Add” stratum of the inventory were modeled separately (rather than lumping data with corresponding non-“Add” stratum, e.g. combining 2AS and AS data) to avoid improper weighting of inventory data in model projections. Note that BS, JP and UN “types” are not represented in the “Add” stratum data.

Model projections were made for two management scenarios for each stand: (1) allowing existing stocks to grow (Scenario: Grow; to determine year in which stand would be clearcut and re-initiated), and (2) immediate clearcut of existing stands and regeneration via planting or natural recruitment (Scenario: Cut and Regenerate; to determine optimal rotation age) (Figure E1). Stratum/stand “UN”, composed of Northern White Cedar, is unmanaged in the baseline.

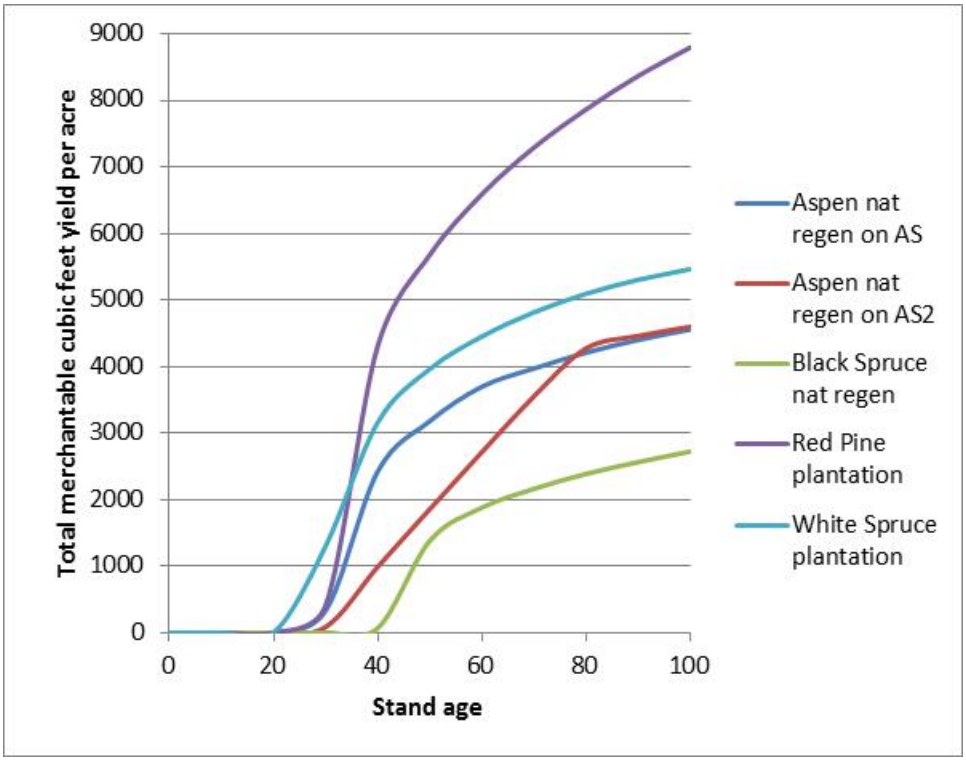

Figure E1. FVS-LS-projected yields of baseline strata at Blandin.

Next, we projected the revenues from sawlogs and pulp using the average stumpage price for each species (representing the majority of harvested volumes for that stratum) from auctions that took place between January 1, 2010 and December 28, 2010 (Table E6). We assumed that only pulp would be sold for Aspen, Black Spruce, Jack Pine, Northern Hardwoods and White Spruce.

Table E6. Assumptions: Stumpage price in 2010 (per cubic foot; assumes 80 cubic feet solid wood per cord)

Species	Sawlog	Pulp
Aspen	N/A	$0.33
Black spruce	N/A	$0.33
Northern hardwood	N/A	$0.09
Jack pine	N/A	$0.34
Red pine	$0.78	$0.37
White spruce	N/A	$0.35

Cost assumptions

We projected the non-harvest related expenses with owning and managing the timberlands, based on Blandin operational costs. Property taxes were referenced from 2010 Blandin financial reports, applied on a per acre basis as $12.99 per acre per year; note that this (net) cost includes the value of the Sustainable Forestry Incentive Act tax rebate. We did not separately project costs related to cut, hauling and delivery because they are implicitly accounted for in the stumpage price. We also did not factor in road construction costs because a well-developed road network, sufficient to facilitate all harvests, existed at the time of the project start date. For Scenario 2: Regenerate and grow, we also estimated replanting (stock and planting) and thinning costs for those species where natural regeneration does not occur. Replanting and thinning costs, as well as property taxes, were sourced from Blandin (pers. comm. with Cheryl Adams). It is assumed that site preparation is not done, which reflects prevailing practice on private industry lands in Minnesota ca. the project start date, with this practice "declining considerably" on industry lands between 1996 and 2008 (D'Amato et al 2009). All cost assumptions are summarized in Table E7.

Table E7. Assumptions: Replanting and Thinning Costs (per acre) in Scenario 2: Cut and Regenerate

Stand	**Replant**	**Release**
AS, 2AS, AS2, 2AS2	$0 (natural regen)	$120 in year 7
BS	$0 (natural regen)	
NH, 2NH	N/A (replanted to White Spruce; costs below)	
JP	N/A (replanted to Red Pine; costs below)	
RP, 2RP	$231	$90 in years 3,5 and 7
WS, 2WS	$231	$90 in years 3,5 and 7

NPV calculation and optimal rotation ages

Finally, for each stratum and management scenario, we calculated the NPV of cash flows at each year during the 100-year period using the 6% real discount rate and then selected the year that maximized the NPV as the optimal rotation age; where the maximum NPV, rounded to the nearest dollar, was yielded in more than one year, the rotation/cutting year was set as the earliest year, reflecting a motivation to both maximize profit and to realize profit in the shortest time possible. The results of our analysis are presented in Table E8 and support the basis for the management scenarios incorporated in the project baseline.

Table E8. Optimal year to clearcut and NPVs at 6% real discount rate (per acre).

	Scenario 1: Grow and clearcut	
Stand	**Optimal clearcut year (from 2010)**	**NPV @ 6%**
AS	8 yrs	$269/acre
AS2	0 yrs	$148/acre
BS	0 yrs	$246/acre
JP	2 yrs	$290/acre
NH	0 yrs	$161/acre

RP	2 yrs	$807/acre
WS	7 yrs	$424/acre
2AS	8 yrs	$245/acre
2AS2	10 yrs	$151/acre
2NH	0 yrs	$192/acre
2RP	0 yrs	$3,313/acre
2WS	5 yrs	$134/acre

Note that while in the Scenario 1 "Grow" analyses of NPV, values of timber volumes harvested from 2010-2014 (not entered into FVS-LS) were not considered, overall they represent a small fraction of standing volumes (~10%) and would have a minor effect on NPV outcomes – in fact, it is conservative to exclude them from analysis, as the additional volumes and increased value close to rotation age would result in moving forward the year in which NPV is maximized (cutting date).

None of the scenario 2 NPV analyses yielded an optimal rotation age under 35 years, thus there is no support for subsequent harvests taking place following the first clearcut in the first 20 year crediting period.

Baseline management scenarios, as of 2010, are not constrained by any legal requirements, as detailed in Section C. Best Management Practices (BMPs) in Minnesota are voluntary. There are further no restrictions pertaining to rare or threatened communities.

BASELINE MODEL PROJECTIONS

Projections of carbon stocks were made using the FVS-LS growth and yield model, as per the same model specifications detailed above, modeled from 2014 forest measurement data de-grown to 2010. Projections were made for a 20-year period (2010-2030) covering the first 20-year baseline crediting period.

Baseline scenarios were modeled based on the outcomes of the NPV maximization analysis, namely setting year in which existing stocks are clearcut and length of subsequent rotations, and are detailed in Table E9. For the larger strata/stands, harvests were staged in biannual cohorts over 10 years to reflect logistical constraints, with the midpoint of the cohorts set by the optimal cutting year.

The scenarios conform with "silvicultural prescriptions recommended by published state or federal agencies", including US Forest Service Managers' Handbooks and US Forest Service Silvics of North America[13]. The state of Minnesota has traditionally promoted single species, even-aged clearcut systems (Cheryl Adams, pers comm Jun 2014, John Almendinger, MN DNR, pers. comm. Sep 2014). Regeneration assumptions were developed in consultation with Cheryl Adams of Blandin and reflect her 20+ years of experience as a forest manager of the project area.

Conversion of pre-existing hardwood forest to Red Pine/ White Spruce plantations has occurred on a comparable scale in the project region as that envisioned in the project baseline. Over 19,000 acres of Red Pine/ White Spruce plantations were established between 2000 and 2010 in the northern Minnesota, as tracked by Minnesota DNR[14], much of it converted from under-stocked hardwood stands. Figures A2 to A6 demonstrate pre-existing forest conditions in 1991 (using the latest available aerial photography prior to 2000) on a sample of these stands.

Plantations established on state lands between 2000 and 2010[15] can be overlain with 1991 aerial imagery to confirm forest conditions prior to conversion to Red Pine/ White Spruce plantations. 1991 imagery is available from the State on Minnesota's Geospatial Information Office, via a server link[16], http://geoint.lmic.state.mn.us/cgi-bin/wms? using ArcCatalog in ESRI's ArcGIS software.

Figure A2. Red Pine/White Spruce plantations in Saint Louis County, MN (outlined in red) established between 2000-2010 (source: Minnesota DNR) overlaying aerial imagery from 1991 depicting native forest (i.e., imagery over 10 years prior to project start).

[13] Burns, Russell M., and Barbara H. Honkala, tech. coords. 1990. Silvics of North America: 1. Conifers; 2. Hardwoods. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC. vol.2, 877 p.

[14] See shapefile "redpine_whitespruce_100114_onlyplant.shp" provided by Minnesota DNR.

[15] Red Pine/White Spruce stands established between 2000 and 2010 can be identified using the attribute table in the "redpine_whitespruce_100114_onlyplant.shp" file provided by Minnesota DNR. In the attribute column "New_Age_12", indicating stand age in 2012, stands populated with values 2 through 12 indicate establishment in years 2010 and 2000, respectively.

[16] Directions can be found at Minnesota's Geospatial Information Office website, http://www.mngeo.state.mn.us/chouse/wms/wms_image_server_arcgis_instructions.html

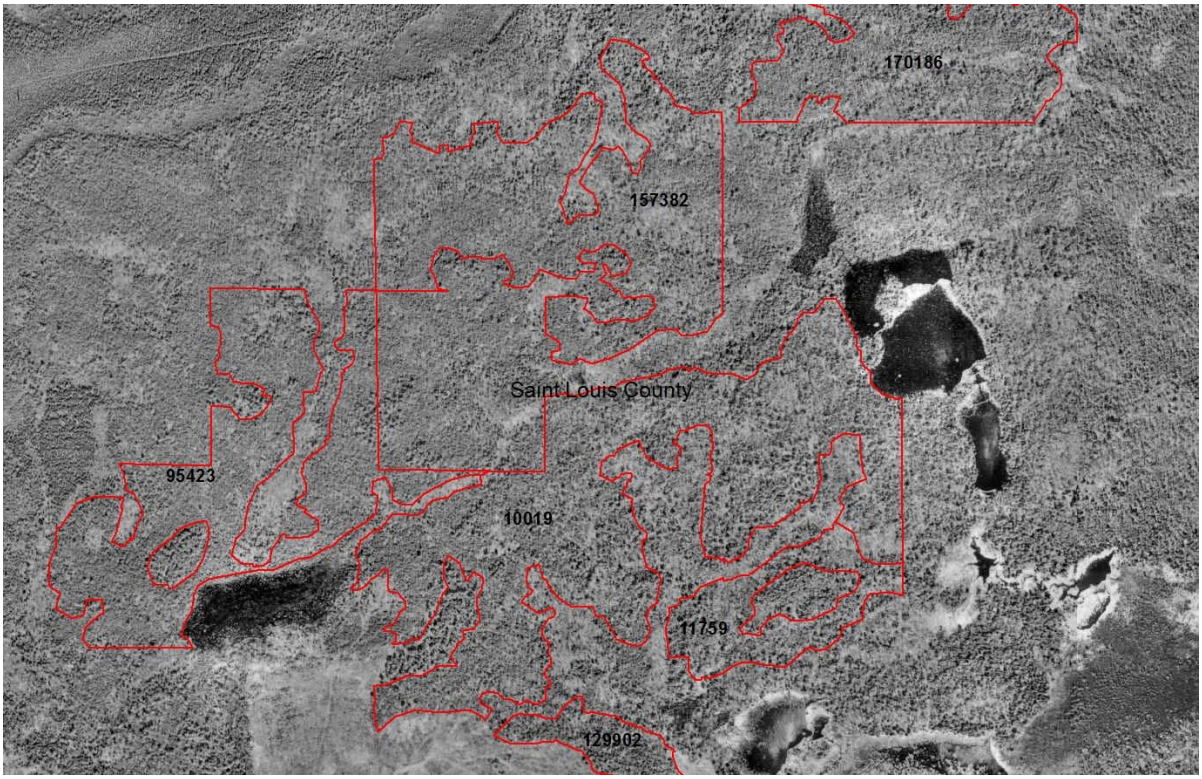
170186
157382
Saint Louis County
95423
10019
11759
129902

Figure A3. Red Pine/White Spruce plantations in Itasca County, MN (outlined in red) established between 2000-2010 (source: Minnesota DNR) overlaying aerial imagery from 1991 depicting native forest (i.e., imagery over 10 years prior to project start).

Figure A4. Additional Red Pine/White Spruce plantations in Itasca County, MN (outlined in red) established between 2000-2010 (source: Minnesota DNR) overlaying aerial imagery from 1991 depicting native forest (i.e., imagery over 10 years prior to project start).

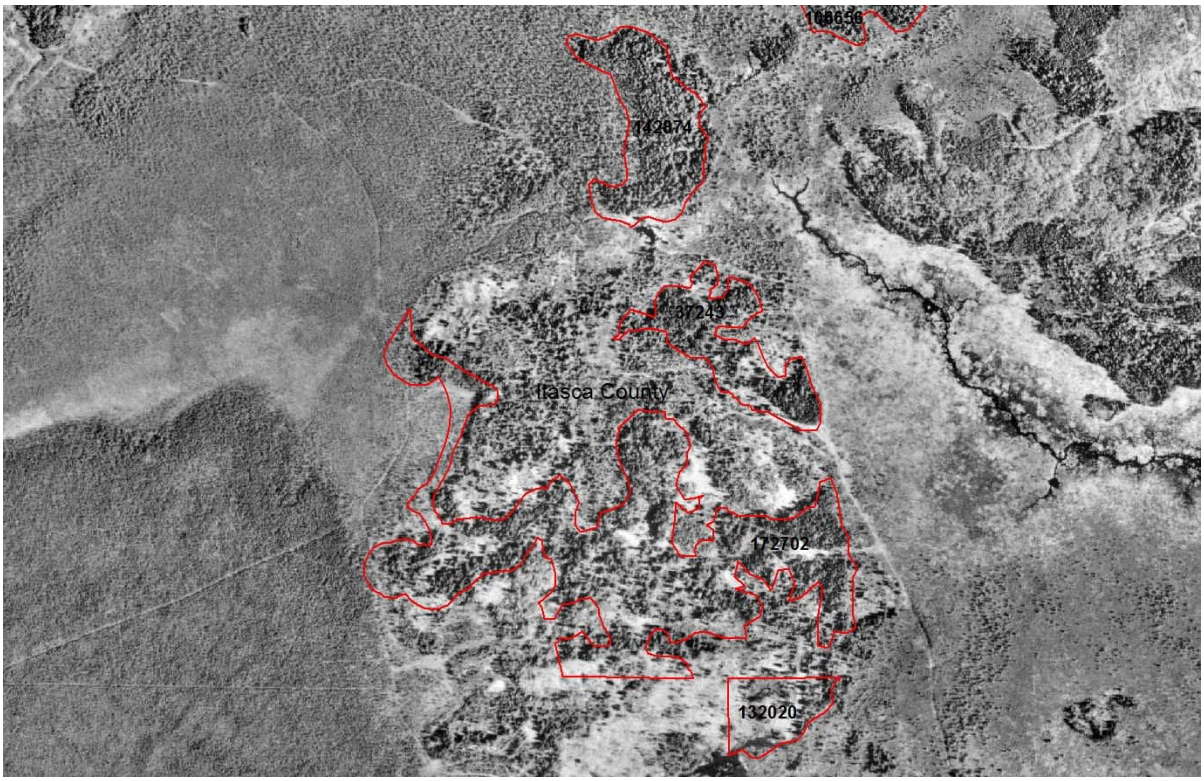

Figure A5. Red Pine/White Spruce plantations in Beltrami County, MN (outlined in red) established between 2000-2010 (source: Minnesota DNR) overlaying aerial imagery from 1991 depicting native forest (i.e., imagery over 10 years prior to project start).

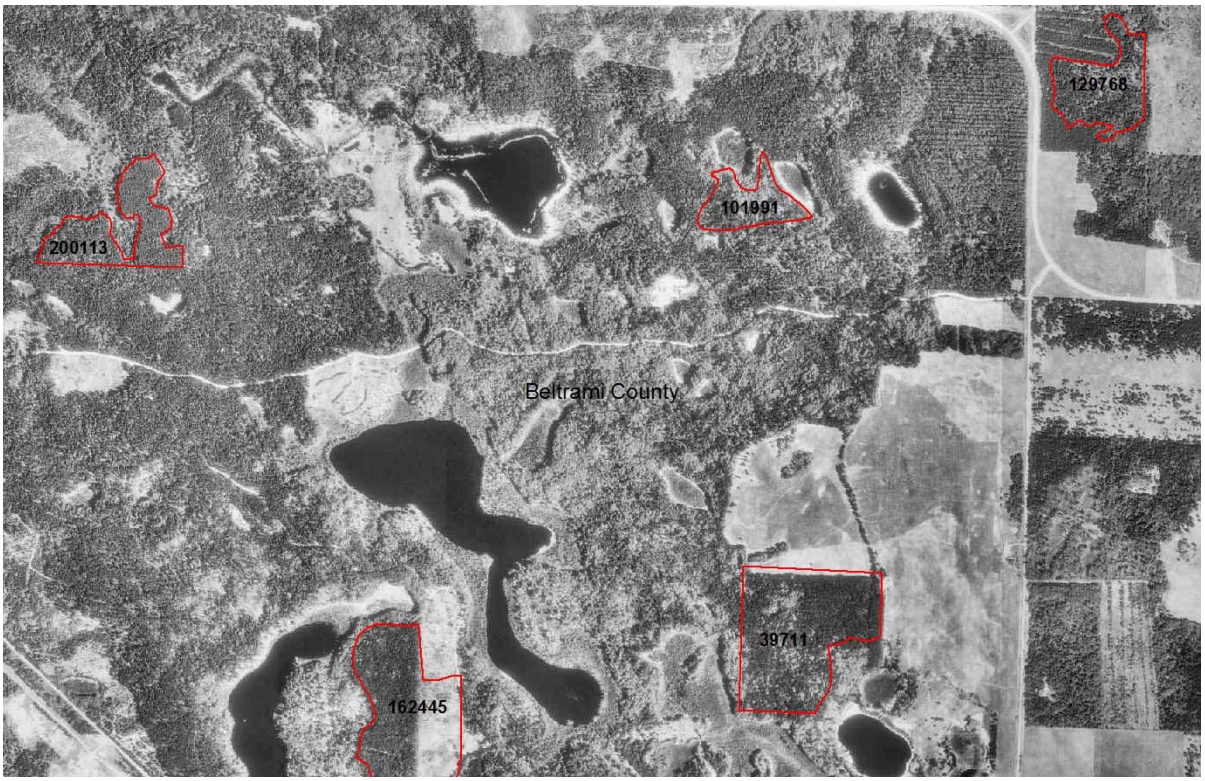

Figure A6. Additional Red Pine/White Spruce plantations in Saint Louis County, MN (outlined in red) established between 2000-2010 (source: Minnesota DNR) overlaying aerial imagery from 1991 depicting native forest (i.e., imagery over 10 years prior to project start).

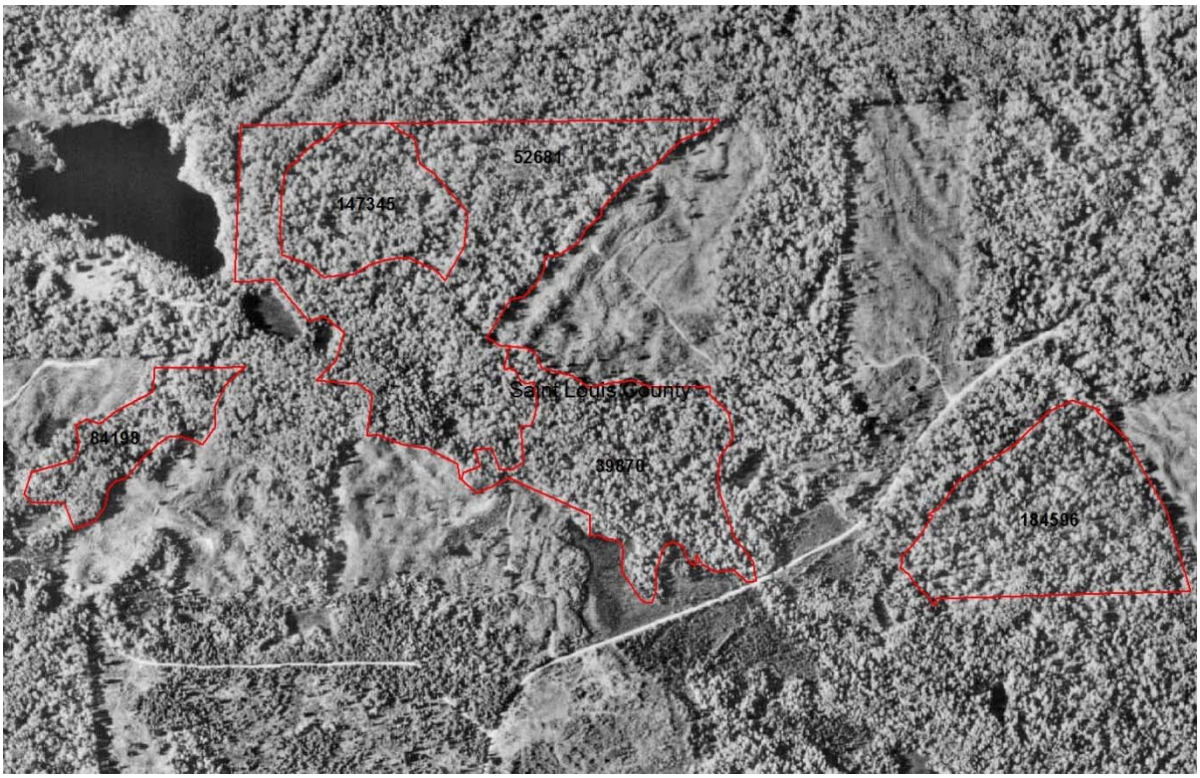

Table E9. Management scenarios entered into FVS-LS for projection of the baseline.

Stands	Baseline management scenario – maximization of NPV with 6% real discount rate
AS, 2AS	• Clearcut existing stocks in years 4, 6, 8, 10 and 12 (harvests staggered in biannual cohorts) • Natural regeneration via resprouting • No subsequent cuts during first 20 years (rotation length > crediting period)
AS2	• Clearcut existing stocks starting year 1 (harvests staggered in biannual cohorts) • Natural regeneration via resprouting • No subsequent cuts during first 20 years (rotation length > crediting period)
2AS2	• Clearcut existing stocks in year 10 • Natural regeneration via resprouting • No subsequent cuts during first 20 years (rotation length > crediting period)
BS	• Clearcut starting year 1 (harvests staggered in biannual cohorts) • Natural recruitment of Black Spruce at 3000 stems /acre • No subsequent cuts during first 20 years (rotation length > crediting period)
JP, RP, 2RP	• Clearcut starting year 2

	• Replant with Red Pine at 890 stems/acre • No subsequent cuts during first 20 years (rotation length > crediting period) • No natural regeneration is modeled to reflect mechanical removal of non-target management species during release operations
NH, 2NH	• Clearcut starting year 1 (harvests in NH staggered in biannual cohorts) • Replant White Spruce at 890 stems/acre, 80% survival • Sprouting is turned off in the model to reflect mechanical control of hardwood competition conducted during release interventions in year 3, 5 and 7 • No natural regeneration is modeled to reflect mechanical removal of non-target management species during release operations • No subsequent cuts during first 20 years (rotation length > crediting period)
WS, 2WS	• Clearcut in years 3, 5, 7, 9 and 11 (harvests in WS staggered in biannual cohorts) • Replant White Spruce at 890 stems/acre, 80% survival • No natural regeneration is modeled to reflect mechanical removal of non-target management species during release operations • No subsequent cuts during first 20 years (rotation length > crediting period)
UN	• Not managed

In all, 37 stands/cohorts representing the scenarios above were projected in FVS-LS for the period 2010 to 2030. Projections were annualized using linear interpolation (FVS-LS produces projections in 10 year cycles). As explained above, stocks in live tree carbon harvested in project years 2011-2014 (Jul 2010 to Jul 2014), not present in the inventory dataset, were estimated from reported volumes, and added to the baseline projections for those years, assuming ¼ of the stock harvested annually over the four years.

Carbon estimates for live trees were calculated using the same approach as detailed above; FVS FFE estimates of live tree carbon were not used because they include trees < 5" dbh (the diameter threshold used in this project), also because they do not include bark.

Long-term storage in wood products was calculated from FVS projections of removals referencing the US DOE 1605(b) guidance (Table 1.6 from the Forestry Appendix of the Technical Guidelines of the U.S. Department of Energy's Voluntary Reporting of Greenhouse Gases Program) and Smith et al 2006[17] (values for North Central US)[18]. Projected harvested volumes were broken out into the following categories: softwood sawlog, softwood pulp, hardwood pulp and hardwood sawlog. Biomass carbon in

[17] Smith, James E.; Heath, Linda S.; Skog, Kenneth E.; Birdsey, Richard A. 2006. Methods for calculating forest ecosystem and harvested carbon with standard estimates for forest types of the United States. Gen. Tech. Rep. NE-343. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 216 p.
[18] Note that the Smith et al 2006 tables are the same as the tables from the 1605b guidelines – see: http://www.nrs.fs.fed.us/carbon/tools/#gtrne343

units of t CO2e in each category was then multiplied by the percentages of carbon remaining stored in wood products (in-use wood products and landfill) for 100 years, detailed in Table E10. The percentages are derived from fraction of growing stock volume (referenced from volumes reported in the FVS CutList output file) removed as roundwood (Smith et al 2006 Table 5), ratio of industrial roundwood to growing stock volume removed as roundwood (Smith et al 2006 Table 5), and finally percentages remaining stored 100 years after production in in-use wood products and landfill (Smith et al 2006 Table 6). Red pine stands are managed for pulp and sawlogs, all other stands are managed for pulp, as per the baseline scenario assumptions derived above (see table E8). Calculations are documented in supporting document "Blandin_baselineA wood prod proj.xls"

Table E10. Percentages of carbon in growing stock volume harvested remaining stored in wood products for 100 years (growing stock volume → roundwood → industrial roundwood; following Smith et al 2006).

	softwood		**Hardwood**	
	sawlog	**pulp**	**Pulp**	**Sawlog**
In-use wood products	0.088035	0.009571	0.14638	0.025528
Land fill	0.229259	0.100492	0.20401	0.211406

Equivalent estimates of carbon remaining stored in wood products for 100 years for volumes harvested in project years 2011-2014 (*actuals*, see above) were calculated applying the same assumptions and annualized and added to modeled values in the baseline in years 2011, 2012, 2013 and 2014; it is assumed that these reported volumes are harvested in this period in both the baseline and with-project cases. Calculations are documented in supporting spreadsheet "Blandin HWP harvested 2010_2014 baseline and project.xls".

Projections of area-weighted average live tree carbon in the baseline scenario are illustrated in Figure E7, and of all pools in Table E11.

Emissions due to burning logging slash are conservatively assumed in the baseline to be zero. This is in fact an accurate assumption, as Blandin does not burn logging slash as part of its management operations, nor would it be motivated to in a profit maximization scenario. Thus, parameter BS_{BSL} equals zero and the outcome of equation 4 of the methodology, parameter GHG_{BSL}, equals zero.

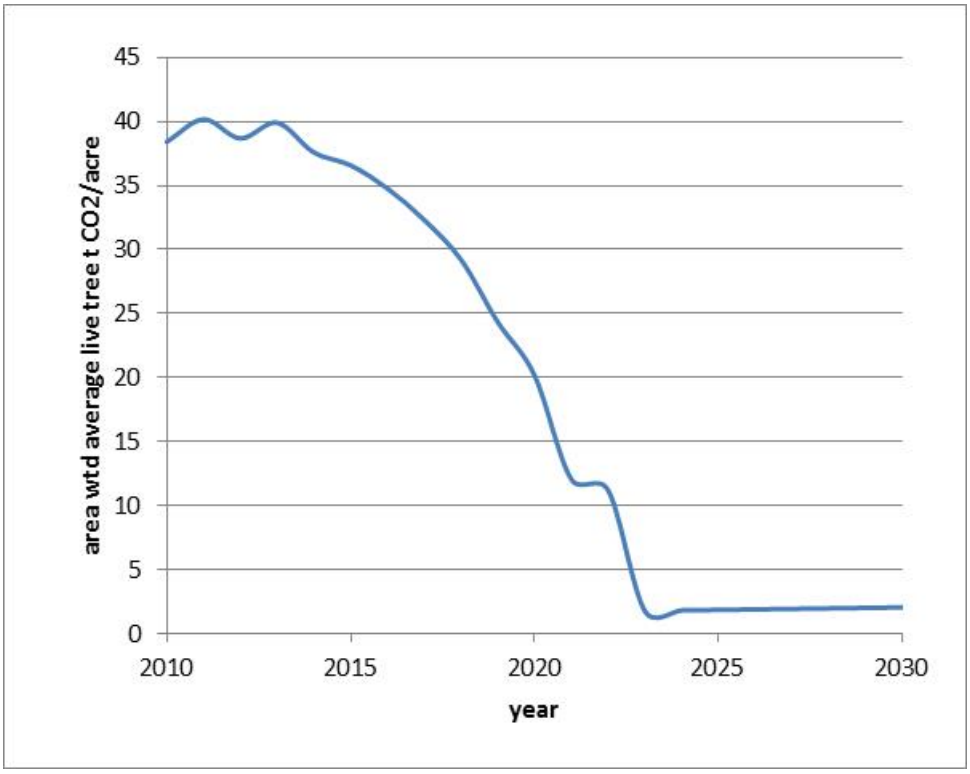

Figure E7. Projections of area-weighted average live tree (above- and belowground) carbon in the baseline scenario.

Table E11. Projections of live tree and harvested wood products carbon stocks in the project area in the baseline scenario for the first crediting period from 2010 to 2030. For the live tree pool, stocks represent stocks on Jul 28 of the corresponding year. For harvested wood products (HWP), stocks represent stocks harvested in the year interval beginning July 28 of the corresponding year.

Year	total live t CO2	total HWP t CO2
2010	6,659,477.5	23,334.2
2011	6,963,215.9	113,682.2
2012	6,705,862.0	38,859.1
2013	6,916,895.3	114,180.1

2014	6,515,625.6	109,899.6
2015	6,341,422.5	102,297.5
2016	6,027,160.6	131,907.6
2017	5,603,303.8	115,709.0
2018	5,064,871.2	177,975.1
2019	4,220,737.9	124,466.1
2020	3,497,485.5	241,386.4
2021	2,092,829.3	20,556.4
2022	1,944,301.9	264,158.4
2023	310,046.3	-
2024	316,939.6	-
2025	323,832.9	-
2026	330,726.2	-
2027	337,619.5	-
2028	344,512.8	-
2029		-

	351,406.1	
2030	358,299.4	-

From the modeled stocks, we first calculated long-term average baseline stocking level for the first 20-year crediting period, 3,622,334.2 t CO2, and the change in baseline carbon stocks for each year.

T, year 11 (2021), is the year that projected stocking levels in the baseline reach the long-term average, after which ΔCBSL,t becomes 0; i.e. the crediting baseline is equal to the modeled baseline until the modeled baseline reaches the long-term average, at which point baseline stocks are assumed to be constant (and subsequent change in stocks is equal to zero).

Figure E8 depicts the projected baseline stocks, along with the average baseline stock for the first crediting period.

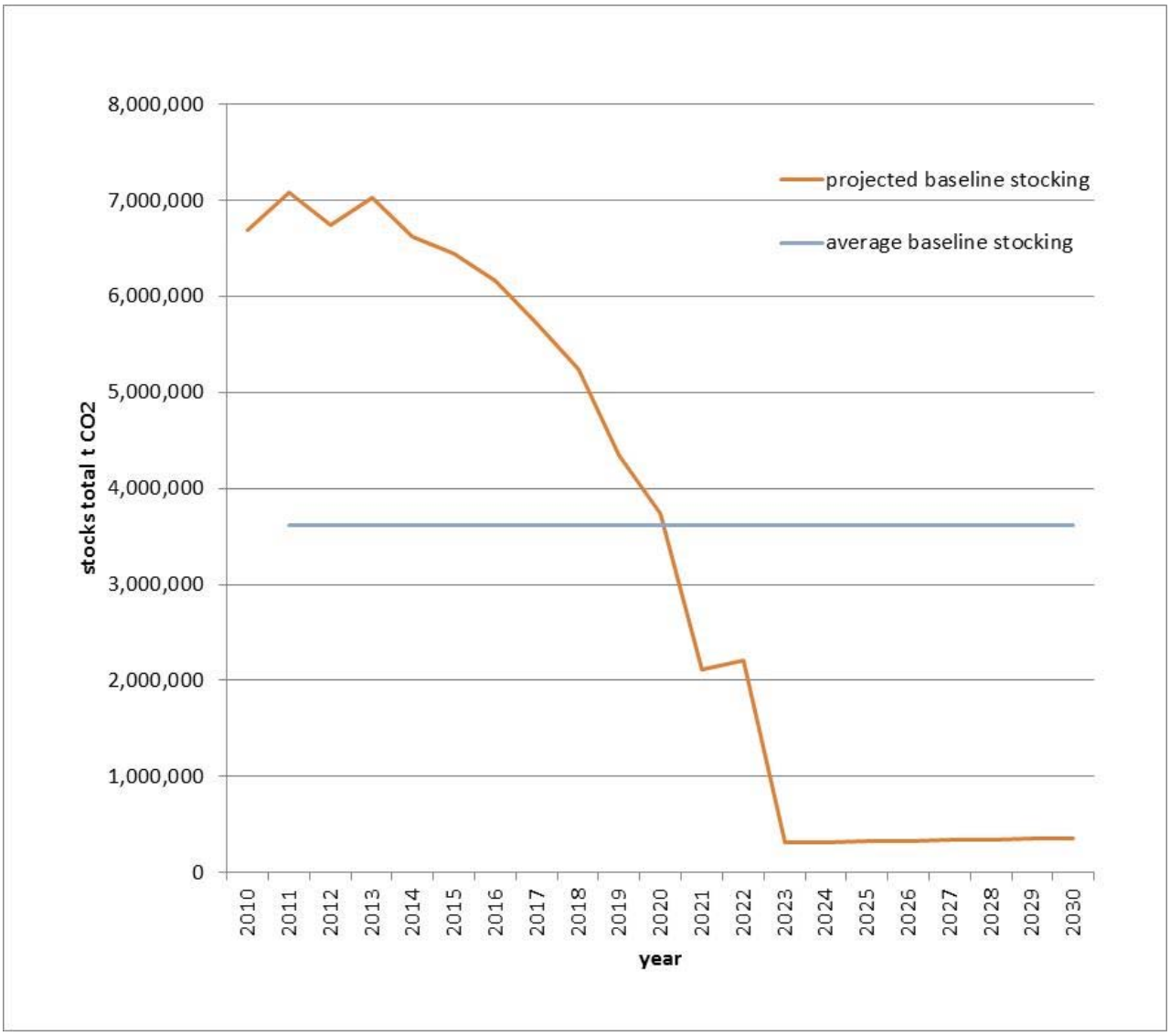

Figure E8. Annual projected carbon stocks over the first crediting period in the baseline scenario.

E2. PROJECT SCENARIO

Ex ante projection of the project scenario is derived and documented in Section E6 below.

E3. LEAKAGE

Quantification of leakage is limited to market leakage, as no activity-shifting leakage is allowed by the methodology beyond *de minimis* levels. Blandin's current Sustainable Forestry Initiative (SFI) certification serves to demonstrate no activity shifting leakage within Blandin operations (per methodology section D6).

Market leakage was determined by quantifying the merchantable carbon removed in both the baseline and with-project case. Merchantable carbon values were derived from the FVS Harvested Carbon Report. Merchantable carbon was then summed separately for the baseline and with-project scenario by crediting period years. The decrease in wood production relative to the baseline was then calculated as seen in Table E12 and the applicable market leakage discount factor was determined.

Table E12 Calculation of leakage factors for baseline.

Period	Sum of inputs to HWP stored for 100 yrs in the Baseline, proxy for total wood products produced (tCO2e)	Sum of inputs to HWP stored for 100 yrs in the Project Scenario, proxy for total wood products produced (tCO2e)	Decrease in Wood Products as Percentage of Baseline Stocks	Applicable Leakage Factor
2010-2030	1,578,412	275,751	83	0.4

E4. UNCERTAINTY

Per the methodology, "The 90% statistical confidence interval (CI) of sampling can be no more than ±10% of the mean estimated amount of the combined carbon stock across all strata. If the Project Proponent cannot meet the targeted ±10% of the mean at 90% confidence, then the reportable amount shall be the lower bound of the 90% confidence interval."

Parameter $e_{BSL,TREE}$ (14.7%) is derived below from 2014 inventory data (from which 2010 stocks were estimated (Table E13)).

Table E13. Live tree statistics from 2014 inventory

	Add	AS	AS2	BS	JP	NH	RP	UN	WS
mean live tCO2/ac	38.5	34.7	23.7	32.3	38.4	87.9	59.5	53.1	48.8
variance	2558.6	1195.4	484.7	1150.6	1170.1	3003.4	1554.9	838.4	1879.2
stan dev	50.6	34.6	22.0	33.9	34.2	54.8	39.4	29.0	43.3
CV(%)	1.3	1.0	0.9	1.0	0.9	0.6	0.7	0.5	0.9
stan error	11.3	5.2	7.8	12.8	14.0	14.2	16.1	11.8	15.3
90% CI	19.6	8.7	14.7	24.9	28.1	24.9	32.4	23.8	29.0
n	20	45	8	7	6	15	6	6	8
ac	13704.5	86116.5	23201.9	12199.9	372.4	19356.8	1085	3943.1	13405.5
N (ac)	13704.5	86116.5	23201.9	12199.9	372.4	19356.8	1085	3943.1	13405.5
variance	2.4E+10	1.97E+11	3.26E+10	2.45E+10	2704415 0	7.5E+10	3.05E+08	2.17E+09	4.22E+10
stan error	3.6								
mean	41.0								
90% CI	6.0								
90% CI as % of mean	**14.7%**								

Overall uncertainty in the baseline is calculated using equation 10 of the methodology,

$$UNC_{BSL} = \sqrt{((C_{BSL,TREE} * e_{BSL,TREE})^2 + (C_{BSL,DEAD} * e_{BSL,DEAD})^2 + (C_{BSL,HWP} * e_{BSL,TREE})^2 + (GHG_{BSL} * e_{BSL,TREE})^2)} / (C_{BSL,TREE} + C_{BSL,DEAD} + C_{BSL,HWP} + GHG_{BSL})$$

where $C_{BSL,TREE}$ is the live tree carbon stock at the start date, $C_{BSL,DEAD}$ is the dead wood carbon stock at the start date and $C_{BSL,HWP}$ is the twenty-year average stock of carbon in long term storage in wood products. As explained above, emissions due to burning logging slash are conservatively assumed in the baseline to be zero, thus parameter GHG_{BSL} equals zero.

Also, as standing dead wood is excluded from accounting, stock ($C_{BSL,DEAD}$) is treated as zero and this pool has no contribution to overall uncertainty.

Overall uncertainty in the baseline is 14.5%.

E5. REDUCTIONS AND REMOVAL ENHANCEMENTS

Methodology calculations and estimates of net reductions and removals enhancements are detailed in Tables E14.

Table E14. Calculations for the first crediting period.

Project Year	(2010)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Baseline											
Live Tree CO2 Baseline	6,659,477.5	6,963,215.9	6,705,862.0	6,916,895.3	6,515,625.6	6,341,422.5	6,027,160.6	5,603,303.8	5,064,871.2	4,220,737.9	3,497,485.5
Standing dead CO2 Baseline											
HWP Baseline	23,334.2	113,682.2	38,859.1	114,180.1	109,899.6	102,297.5	131,907.6	115,709.0	177,975.1	124,466.1	241,386.4
20yr Avg Baseline		3,622,334.2	3,622,334.2	3,622,334.2	3,622,334.2	3,622,334.2	3,622,334.2	3,622,334.2	3,622,334.2	3,622,334.2	3,622,334.2
Year T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
deltaC baseline		382,659.0	-178,433.4	289,954.0	-322,349.1	-95,282.5	-235,341.4	-344,936.2	-459,512.0	-765,212.8	-644,331.8
Project											
Live Tree CO2 Project	6,659,477.5	6,771,507.6	6,883,537.6	6,995,567.7	7,107,597.8	7,390,661.3	7,673,724.9	7,956,788.4	8,239,852.0	8,522,915.5	8,805,979.1
Standing dead CO2 Baseline											
HWP Project	23,334.2	23,334.2	23,334.2	23,334.2	11,400.9	11,400.9	11,400.9	11,400.9	11,400.9	11,400.9	11,400.9
sum stocks	6,682,811.7	6,794,841.8	6,906,871.9	7,018,901.9	7,118,998.7	7,402,062.2	7,685,125.8	7,968,189.3	8,251,252.8	8,534,316.4	8,817,379.9
deltaC project		135,364.3	135,364.3	135,364.3	135,364.3	294,464.4	294,464.4	294,464.4	294,464.4	294,464.4	294,464.4
Total uncertainty		0.11	0.10	0.11	0.11	0.08	0.09	0.09	0.10	0.11	0.10
Emissions reduction at t		-118,317.6	151,856.6	-74,341.7	219,700.6	192,888.6	261,710.1	313,858.4	367,702.7	510,046.0	453,894.9
Negative C balance		-118,317.6	0.0	-74,341.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERTs Issued at time t		0.0	33,539.1	0.0	145,358.9	192,888.6	261,710.1	313,858.4	367,702.7	510,046.0	453,894.9
ERTs Transferred In		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERTs Transferred Out		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERTs Retired		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tradable Balance at time t			0.0	33,539.1	0.0	145,358.9	192,888.6	261,710.1	313,858.4	367,702.7	510,046.0
Total Tradable Balance	0.0	0.0	33,539.1	33,539.1	178,898.0	371,786.6	633,496.7	947,355.1	1,315,057.9	1,825,103.9	2,278,998.8

Project Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Baseline										
Live Tree CO2 Baseline	2,092,829.3	1,944,301.9	310,046.3	316,939.6	323,832.9	330,726.2	337,619.5	344,512.8	351,406.1	358,299.4
Standing dead CO2 Baseline										
HWP Baseline	20,556.4	264,158.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20yr Avg Baseline	3,622,334.2	3,622,334.2	3,622,334.2	3,622,334.2	3,622,334.2	3,622,334.2	3,622,334.2	3,622,334.2	3,622,334.2	3,622,334.2
Year T	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
deltaC baseline	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Project										
Live Tree CO2 Project	9,089,042.6	9,372,106.1	9,655,169.7	9,938,233.2	10,217,413.5	10,496,593.8	10,775,774.0	11,054,954.3	11,334,134.6	11,613,314.8
Standing dead CO2 Baseline										
HWP Project	11,400.9	11,400.9	11,400.9	11,400.9	11,400.9	11,400.9	11,400.9	11,400.9	11,400.9	11,400.9
sum stocks	9,100,443.5	9,383,507.0	9,666,570.6	9,949,634.1	10,228,814.4	10,507,994.6	10,787,174.9	11,066,355.2	11,345,535.4	11,624,715.7
deltaC project	294,464.4	294,464.4	294,464.4	294,464.4	290,581.1	290,581.1	290,581.1	290,581.1	290,581.1	290,581.1
Total uncertainty	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Emissions reduction at t	143,109.7	143,109.7	143,109.7	143,109.7	141,222.4	141,222.4	141,222.4	141,222.4	141,222.4	141,222.4
Negative C balance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERTs Issued at time t	143,109.7	143,109.7	143,109.7	143,109.7	141,222.4	141,222.4	141,222.4	141,222.4	141,222.4	141,222.4
ERTs Transferred In	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERTs Transferred Out	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERTs Retired	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Tradable Balance at time t	143,109.7	143,109.7	143,109.7	143,109.7	141,222.4	141,222.4	141,222.4	141,222.4	141,222.4	141,222.4
Total Tradable Balance	2,422,108.5	2,565,218.2	2,708,327.9	2,851,437.6	2,992,660.0	3,133,882.5	3,275,104.9	3,416,327.3	3,557,549.8	3,698,772.2

Emission reductions and removal enhancements were calculated applying equation 20 of the methodology as the change in with-project stocks minus the change in baseline stocks multiplied by a market leakage discount, uncertainty discount, and risk buffer discount. The results of these calculations are summarized in Table E15 below. We have incorporated leakage factors calculated in Section E3 and a risk buffer of 10%, derived in the accompanying risk assessment.

Table E15. Estimates of annual emission reductions and cumulative emission reductions for the first crediting period. Project year refers to the year at the end of the annual interval, i.e. 2011 emission reductions represent emission reductions realized from July 28 2010 to July 27 2011.

Project Year	Annual net GHG emission reductions (t CO2)	Cumulative emission reductions earned (t CO2)
2011	(118,317.6)	-
2012	151,856.6	33,539.1
2013	(74,341.7)	33,539.1
2014	219,700.6	178,898.0
2015	192,888.6	371,786.6
2016	261,710.1	633,496.7
2017	313,858.4	947,355.1
2018	367,702.7	1,315,057.9
2019		1,825,103.9

	510,046.0	
2020	453,894.9	2,278,998.8
2021	143,109.7	2,422,108.5
2022	143,109.7	2,565,218.2
2023	143,109.7	2,708,327.9
2024	143,109.7	2,851,437.6
2025	141,222.4	2,992,660.0
2026	141,222.4	3,133,882.5
2027	141,222.4	3,275,104.9
2028	141,222.4	3,416,327.3
2029	141,222.4	3,557,549.8
2030	141,222.4	3,698,772.2
First Crediting Period Total	3,698,772.2	3,698,772.2

E6. EX-ANTE ESTIMATION METHODS

The *ex ante* project scenario is based on actual data for 2010 to 2014, and stock projections post 2014. Annual inputs to harvested wood products from 2014-2029 were assumed to be constant (i.e. total projection for the period incorporated as an annual average), and as for live tree carbon stocks, were based on FVS-LS 10-year cycle projections. Live tree carbon stocks were projected applying annual average increment for the periods 2015-2024 and 2025-2030, calculated from FVS-LS 10-year cycle projections.

As with baseline forest carbon stocks, ex-ante estimates of with-project stocks were derived from modeling the with-project management scenario using FVS-LS, using the same parameters as described above, resulting in projections of annual with-project stocks and stock changes. Models were run from 2014 inventory data (not de-grown to 2010 as for the baseline), from 2014 to 2034. Modeled scenarios were developed based on consultation with Cheryl Adams of Blandin, and are intended to conform broadly with anticipated management from 2014 to 2030 (Table E16).

Table E16. Management scenarios entered into FVS-LS for ex ante projection of the with-project scenario.

Stands	With-project management scenario
AS	"Mixed wood": • Thin Aspen species group (thin to 35% residual BA for these species) (harvests staggered in biannual cohorts), with an ongoing batch of cohorts resuming year 2028, on 30 year thinning cycles • Natural hardwood regeneration via resprouting
2AS	"Mixed wood": • Thin Aspen species group (thin to 35% residual BA for these species) starting year 2, plant Balsam Fir and White Spruce at 250 stems/acre each[19] (plantings on dense plots, 70% survival) (harvests staggered in biannual cohorts) • Control initial hardwood competition (no resprouting) • Manage species on 60-year rotations via selective harvest with thinning at 30 years (alternating Aspen species and planted conifers)
AS2, 2AS2	• Non-commercial stands, not managed
BS	• No harvest over project modeling period (typical rotations 80-100 years)
JP	• Clearcut in year 2017

[19] Often, either Balsam Fir or White Spruce alone is planted at 500 stems/acre

	• Natural hardwood regeneration via resprouting
RP, 2RP	• Thin to 90 ft^2/ac BA periodically when BA > 120 (maximum every 10 years) • Natural hardwood regeneration via resprouting
NH, 2NH	• Thinning throughout a diameter range, with a batch of cohorts ending in year 2015, on 20 year cycles down to 60 BA in stems >9-10" dbh (bringing total residual BA down to 100-120) (harvests staggered in biannual cohorts) • Natural regeneration via resprouting
WS, 2WS	• Maintain via thinning at ~ 90 ft^2/ac BA, maximum thin every 10 years (harvests staggered in biannual cohorts) • Natural hardwood regeneration via resprouting
UN	• Not managed

Carbon estimates were output from FVS-LS using the FVS Fire and Fuels Extension (FFE)[20] as FVS_Carbon and FVS_Hrv_Carbon reports; live tree (above- and belowground) biomass was estimated via the FFE default approach, using regional volume equations from the National Volume Estimator Library, specific gravity factors, and crown biomass equations; foliage was excluded by applying a deduction of 3.89% (volume-weighted average foliage fraction of total above- and belowground biomass for trees in the 2010 de-grown inventory) to FFE live tree biomass outputs. Long-term storage in wood products was calculated from FVS FFE harvested carbon report projections of removals, applying the same assumptions as above. Projections of the with-project scenario are summarized in Table E17.

No burning of any kind is expected to be performed in the course of management in the project area. Thus, parameter BS_P equals zero and the outcome of equation 13 of the methodology, parameter GHG_P, equals zero.

In ex ante calculations of net emission reductions, it is assumed that future inventories achieve overall precision of +/-10% of the mean with 90% confidence, thus UNC_P is assumed to be equal to UNC_{BSL}

Table E17. Projections of live tree and harvested wood products carbon stocks in the project area in the project scenario for the first crediting period from 2010 to 2030. For the live tree pool, stocks represent stocks on Jul 28 2010 of the corresponding year. For harvested wood products (HWP), stocks represent stocks harvested in the year interval beginning July 28 of the corresponding year.

Year	total live t CO2	total HWP t CO2

[20] Rebain, Stephanie A. comp. 2012. The Fire and Fuels Extension to the Forest Vegetation Simulator: Updated Model Documentation. Internal Rep. Fort Collins, CO: U. S. Department of Agriculture, Forest Service, Forest Management Service Center.

2010	6,659,477.5	23,334.2
2011	6,771,507.6	23,334.2
2012	6,883,537.6	23,334.2
2013	6,995,567.7	23,334.2
2014	7,107,597.8	11,400.9
2015	7,390,661.3	11,400.9
2016	7,673,724.9	11,400.9
2017	7,956,788.4	11,400.9
2018	8,239,852.0	11,400.9
2019	8,522,915.5	11,400.9
2020	8,805,979.1	11,400.9
2021	9,089,042.6	11,400.9
2022	9,372,106.1	11,400.9
2023	9,655,169.7	11,400.9
2024	9,938,233.2	11,400.9
2025		

	10,217,413.5	11,400.9
2026	10,496,593.8	11,400.9
2027	10,775,774.0	11,400.9
2028	11,054,954.3	11,400.9
2029	11,334,134.6	11,400.9
2030	11,613,314.8	11,400.9

F.
COMMUNITY & ENVIRONMENTAL IMPACTS

F1. NET POSITIVE IMPACTS

The project area has SFI Certification and a Conservation Easement demonstrating high quality sustainable management. Furthermore, the Blandin forest has maintained ISO certification since 1999, with recertification every 3 years.

Community impacts

Blandin allows access for recreational use of the property, including for snowmobiling, hunting, fishing, trapping, cross-country skiing, bird watching, berry picking, hiking and snow shoeing. The public is guaranteed access for recreation in accordance with Blandin's recreation policy and through the conservation easement. Blandin partners each year with the National Ruffed Grouse Society to provide areas for their annual hunt.

Forest management activities at Blandin provide employment to 8 employees and about 30 contractors. Blandin provides firewood permits to the public for no fee and gives away 5,000 seedlings each spring.

Because of Blandin's unique style of forest management, Blandin accomodates many requests from the MN DNR, counties, the University of Minnesota and tribal groups to provide tours and expertise on forest practices. Blandin is a regular supporter, through active participation and financial contributions, of the Minnesota Logger Education Program, Minnesota Forest Resources Council, and Sustainable Forestry Education Cooperative. Blandin is on the forestry advisor group for the Forestry Tech Program at Itasca Community College and contributes and promotes the Historical Forest History Center. Blandin is a member of Minnesota Forest Industries and the Minnesota Forest Resources Partnership.

Environmental impacts

Baseline plant data was established during habitat typing of forest inventory plots. The information collected is all plant species on the plot not just those needed for habitat type identification. Since the coordinates of all the plots are in the GIS, they can be resampled at any time to evaluate changes in species composition due to management activities. Blandin manages by habitat types and a range of successional stages to address a range of biodiversity goals tracked internally, including coarse woody debris, stand structure, BMP implementation and protected natural areas delineated and designated as reserves.

Ongoing research is important to evaluate different aspects of forestry. Blandin has completed a 6 year ecto-mycorrhizae survey by habitat type through the University of Wisconsin-Madison, and is involved in cooperative research with the Natural Resources Research Institute and the National Council on Air and

Stream Improvement. Blandin also participated in a 10 year project to evaluate the effects of different riparian management techniques to revise the MN BMP's.

F2. STAKEHOLDER COMMENTS

The Blandin Stakeholder Advisory Group meets three times a year to discuss and evaluate forest management matters, providing a positive opportunity and communication channel for regular community feedback. The advisory group is made up of the

MN DNR, The Conservation Fund, Forest History Center, MPCA, 2 Legislators, NRRI, MP, 2 City of Grand Rapids officials, USFS, and 2 citizens at large. Usually there is also a representative from the logging community.

G.
OWNERSHIP AND TITLE

G1. PROOF OF TITLE

Land title for the project area is housed at the Blandin office in Grand Rapids, MN and made available during project validation. An extensive title review was conducted in 2010 for the conservation easement and title insurance was issued at the time.

G2. CHAIN OF CUSTODY

Not Applicable – no offsets have been bought or sold previously, nor has the project entered into any forward option contracts.

G3. PRIOR APPLICATION

Not Applicable – the project proponent has not applied for GHG emission reduction credits through any other GHG emissions trading system or program.

H.
PROJECT TIMELINE

H1. START DATE

The project start date is July 28 2010, the date of closing the conservation easement in Minneapolis, Minnesota. The recorded conservation easement constitutes evidence establishing the project start date, and GHG mitigation objective, for projects in which the activity precedes the submission of the GHG Plan by more than one year (methodology Section B3). Conformance with ACR Forest Carbon Project Standard Requirements is demonstrated in Section A3 above.

H2. PROJECT TIMELINE

Project timeline is elaborated below.

Table H1. Schedule of project activities

Project activity	Date	Source/Notes
Project start date and start of the crediting period	28 July 2010	Date of signing conservation easement
Forest inventory and first monitoring event	Jul-Sep 2014	
Validation and first verification of the project	Anticipated 2014	
Registration of the project	Anticipated 2014	
Periodic monitoring and verification	2014-2030	Every 5 years or less, or at request for ERT issuance
End date of project crediting period	27 July 2030	
Second crediting period	28 Jul 2030 – 27 Jul 2040	Baseline re-evaluated in Jul 2030
End date of project term	27 July 2050	