

# Application for Listing an Improved Forest Management U.S. Forest Offset Project

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## Part I. Entity Submitting Report

This form being submitted by the Authorized Project Designee (APD).

## Part II. Offset Project Information

Project Name: Blue Source- Marmet Improved Forest Management Project

City: Logan

State: West Virginia

Zip: 25601

Registry: American Carbon Registry

Compliance Offset Protocol: U.S. Forest Projects

Version: November 14, 2014

Start Date: 10/20/2015

Reporting Period End Date: 10/19/2017

Crediting Period: 10/20/2015 to 10/19/2040

The commencement date is signified by the submittal of the project listing form ACR. Per page 15 of the ARB Forest Protocol, an IFM project's commencement date can be signified by the submittal of the project's listing information.

The reporting period end date is predicted to be 24 months from project commencement.

## Part III. OPO/APD Information

### Offset Project Operator

OPO Name: Heartwood Forest Fund VIII, LP

CITSS ID#: CA1950

Mailing Address: P.O. Box 9162, Chapel Hill, NC 27515

Contact Person: Kaarsten Turner- Dalby

Phone Number: 303-838-2515

Email: kaarsten@forestlandgroup.com

### Authorized Project Designee

APD Name: Blue Source LLC

APD's CITSS ID#: CA1278

Contact Person: Joshua Strauss

Mailing Address: 1935 E Vine Street, Suite 300, Murray, UT 84121

Phone Number: 949-233-1501

Email: jstrauss@bluesource.com

## Part IV. Land Ownership

1. **Whether the Offset Project Operator is the owner in fee for the project area. Yes**
  - a. **If yes, provide documentation (e.g. deed of trust, title report) showing the Offset Project Operator's ownership interest in the property and its interest in the trees and standing timber on the property.**

Please see provided deeds.
2. **Offset project type (reforestation, improved forest management, or avoided conversion).**

Improved Forest Management

3. **A description of the management activities that will lead to increased carbon stocks in the Project Area, compared to the baseline.**

Across the project area, the forested acres will be managed such that in any given year, annual growth will exceed harvesting, building carbon stocks over time. Because the baseline harvest activities will meet or exceed annual growth, the management practices utilized in the project scenario will increase and maintain carbon stocks above the baseline over time.

4. **Indicate if the offset project occurs on public or private lands, and further specify if the offset project occurs on any of the following categories of land:**

Private Lands

- a. **Land that is owned by, or subject to an ownership or possessory interest of a Tribe; No**
- b. **Land that is "Indian lands" of a Tribe, as defined by 25 U.S.C. §81(a)(1); or No**
- c. **Land that is owned by any person, entity, or Tribe, within the external borders of such Indian lands. No**

## Part V. Offset Project Area

### 1. **Governing jurisdictions, and latitude/longitude coordinates**

Governing Jurisdictions: Boone, Nicholas, and Raleigh Counties fall within the 25<sup>th</sup>, 28<sup>th</sup>, and 10<sup>th</sup> Judicial Circuit courts of West Virginia, respectively.

Latitude/ Longitude: 38.02° N/ -81.62° W

### 2. **Existing land cover and land use**

Land Cover: The Project Area's land cover is mainly hardwood forests. All non-forest acres will be removed from the project.

Land Use: The current land use is commercial forestry.

### 3. **Forest vegetation types**

The main forest type across the property is mature Oak-Hickory forests, dominated by yellow poplar, chestnut oak, white oak, and hard maple.

### 4. **Site classes**

100% of the property is considered low site class as the annual forest productivity (cubic feet/ acre) is less than 120 cubic feet/ acre. Site class will be determined using NRCS soil data and the associated NRCS Forestland Productivity reports.

### 5. **Land pressures and climate zone/classification**

Though the neighboring properties are almost all commercial forestlands, there has been noted some land development on adjoining properties as noted in an appraisal conducted on the property on December of 2014. Certain portions of the property could be developed for rural residences or hunting residences at this time. Water and sewer services are not currently available to most of the property, so the cost of large-scale developing would be significantly higher than in other less rural areas. Although the property is reasonable close to Charleston and Beckley, West Virginia, there does not appear to be sufficient demand for large-scale development in the area. Industrial or commercial development is not economically feasible for the property as a whole.

Climactic zone: The project area falls within climactic zones 6a and 6b on the USDA plant hardiness zone map.<sup>1</sup> Average annual extreme minimum temperatures for these zones range from -10 to -5 and -5 to 0 degrees Fahrenheit, respectively.

#### **6. Historical land uses, current zoning, and projected land use within project area and surrounding areas**

The property and the surrounding area has been used for timber production. Located in rural central Appalachia, mineral extraction and timber harvesting are common throughout the region.

The property is not critically zoned and is located in a rural area. The project area falls into unincorporated areas of Boone, Nicholas, and Raleigh Counties, West Virginia, which have no zoning classification. There do not appear to be legal restrictions to the land use. The use of the subject area has been as a forestry property with compatible recreational use.

#### **7. Project Area Assessment Areas**

Supersection	Assessment Area	Acres
Allegheny & North Cumberland Mountains	Allegheny & North Cumberland Mountains Cove Forests	8,473
	Allegheny & North Cumberland Mountains Northern Hardwoods	9,643
	Allegheny & North Cumberland Mountains Oak-Hickory	15,999
TOTAL		34,116

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<sup>1</sup> <http://planthardiness.ars.usda.gov/PHZMWeb/>

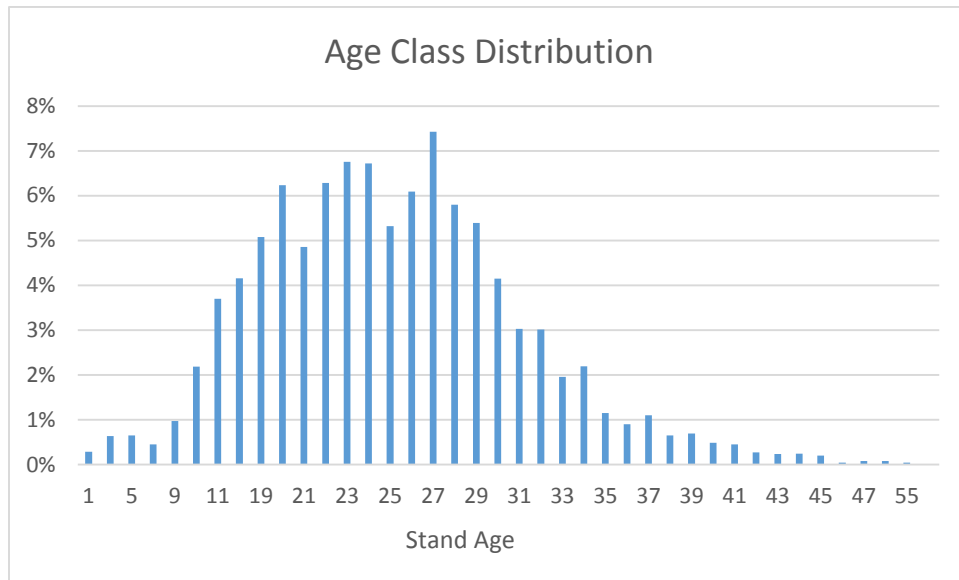
**8. General description of the forest conditions within the Project Area:**

**a. Species (tree) composition;**

Chestnut Oak, Red Oak, and Yellow Poplar are the main species found across the property, comprising 41% of the total live basal area in the Project Area. The remaining species are a mix of northern hardwood species. Of the softwood species, eastern hemlock, red spruce, virginia pine, and white pine only comprise 3% of the total live basal area across the Project Area.

Species	%
Ash	1%
Basswood	4%
Beech	7%
Black Birch	2%
Black Locust	0%
Black Oak	7%
Blackgum	1%
Buckeye	0%
Cherry	0%
Chestnut Oak	14%
Cucumber Tree	2%
Eastern Hemlock	2%
Elm	0%
Hard Maple	3%
Hickory	5%
Other Hardwoods	1%
Pawlonia	1%
Red Oak	10%
Red Spruce	0%
Sassafras	0%
Scarlet Oak	5%
Soft Maple	6%
Sourwood	0%
Sweetgum	0%
Sycamore	2%
Virginia Pine	0%
White Oak	7%
White Pine	0%
Yellow Birch	0%
Yellow Pine	1%
Yellow Poplar	18%

**b. Age class distribution;**



**c. Management history;**

The property has been historically managed for commercial timber operations. After the acquisition of the project area by the OPO, the land has been under sustainable forest management with Forest Stewardship Council certification.

**9. Indicate whether the project will employ a Qualified Conservation Easement.**

No.

## Part VI. Offset Project Eligibility

1. **A statement as to whether any GHG reductions or GHG removal enhancements associated with the Project Lands have ever been listed or registered with, or otherwise claimed by, another registry or program, or sold to a third party prior to listing, including;**
  - a. **Have any lands within the Project Area ever been listed or registered with an offset project registry or program in the past?**
  - b. **Have greenhouse gas emission reductions or removal enhancements associated with lands within the Project Area been credited or claimed for the purpose of greenhouse gas mitigation or reduction goals, whether in a voluntary or regulatory context?**
  - c. **If yes, identify the registry or program (include vintages and reporting period).**

None of the Project Lands have ever been listed, registered with, or otherwise claimed by, another registry or program. No greenhouse gas emission reductions or removal enhancements associated with lands within the Project Area have ever been credited or claimed for the purpose of greenhouse gas mitigation or reduction goals, whether in a voluntary or regulatory context.

2. **A statement as to whether the project is being implemented and conducted as the result of any law, statute, regulation, court order, or other legally binding mandate? If yes, explain.**

The project is not being implemented and conducted as the result of any law, statute, regulation, court order, or other legally binding mandate.

**3. Declaration that the offset project does *not* employ broadcast fertilization.**

The offset project does not employ broadcast fertilization.

**4. If the Forest Project is located on public land, a description and copies of the documentation demonstrating explicit approval of the offset project's management activities and baseline including any public vetting processes necessary to evaluate management and policy decisions concerning the offset project.**

This project does not occur on public lands, so therefore this section is not applicable.

**5. If the Forest Project is located on the following categories of land, a description and copies of documentation demonstrating that the land within the Project Area is owned by a tribe or private entities:**

This project does not occur on tribal lands, so therefore this section is not applicable.

**6. If commercial harvesting is either planned or ongoing within the Project Area, a description of how the Forest Owner satisfies one of the three requirements for employing and demonstrating sustainable long-term harvesting practices on all of its forest landholdings (refer to Section 3.8.1).**

☐ Not applicable; no commercial harvesting is occurring within the Project Area.

☒ Third party certification under the Forest Stewardship Council, Sustainable Forestry Initiative, or Tree Farm System, whose certification standards require adherence to and verification of harvest levels which can be permanently sustained over time.

☐ Adherence to a renewable long-term management plan that demonstrates harvest levels which can be permanently sustained over time and that is sanctioned and monitored by a state or federal agency.

☐ Employ uneven-aged silvicultural practices and maintain canopy retention averaging at least 40% across the forest, as measured on any 20 acres within the entire forestland owned by the Forest Owner, including land within and outside of the Project Area (areas impacted by Significant Disturbance may be excluded from this test).

**7. A description of how the offset project meets (or will meet) the definition of "Natural Forest Management" (refer to Section 3.8.2), including:**

**a. Composition of native species;**

The project area naturally consists of a mixed species distribution where no single species' prevalence, measured as the percent of basal area of all live trees in the Project Area, exceeds the percentage value of standing live carbon shown under the heading 'Species Diversity Index' in the Assessment Area Data File. Specifically, as noted in section V8a, the species with the highest frequency (%) throughout the project area is Yellow Poplar with 18% of the total live basal area, well below the 65% threshold found within the Allegheny & North Cumberland Mountains Oak-Hickory assessment area. The species diversity threshold for the remaining supersections is 70%.

**b. Distribution of age classes / sustainable management;**

As shown in Part V, section 8b, 82% of the project area is over 20 years old. Across the project area, less than 18% of the project's forestlands are maintained in age classes less than 20 years old.

c. **Structural elements (standing and lying dead wood);**

Live C (tonnes C/acre)	Dead C (tonnes C/acre)	% Standing Dead
32.5	1.0	3.0%

Currently, the quantity of lying dead wood is commensurate with recruitment from standing dead trees as the project maintains an average of at least one metric ton of carbon (C) per acre.

## Part VII. Carbon Stock Inventory

### IFM-1 Standing Live

All live trees will be recorded for species, DBH (to nearest 0.1 inch), % missing/rotten wood (using procedure outlined below), and decay class (using the Domke et al. 2011 classification system). If a tree will be snapped, the height as the tree originally stood, as well as the height in the tree's current condition (in feet), will be recorded.

Total height and height to a 4" top will be measured to the nearest foot for all trees sampled on every plot. All heights will be recorded for each tree; however, in the instances where heights could not be recorded due to landscape limitations, the missing heights will be regressed by species using all measured total heights.

Missing and cull deductions will be calculated by dividing each damaged tree into thirds (considering the height of the tree as it originally stood, based on the height of similar nearby trees) and estimating the percentage that will be missing or rotten in each third. This percentage figure will be then multiplied by the approximate percentage of tree biomass found in each third of a typical tree (65% in the bottom third, 25% is in the middle third, and 10% is in the top third according to CAR's FPP 3.3 Quantification Guidance document) to get the total deduction percentage.

Additional detail on the measurement of standing live can be found in the Inventory Methodology below.

Biomass was computed using the component ratio method and Jenkins coefficients following the procedures and equations outlined in "The Forest Inventory and Analysis Database: Database Description and User's Manual Version 4.0 for Phase 2," and as specifically described in Appendix J Tables 1 through 4. As stated in the COP, biomass will be converted into 0.5 to calculate the mass (kg) in carbon. This product must be multiplied by 0.001 tons/kg to convert the mass to metric tons of carbon. Then, the product will be multiplied by 3.664 to convert the metric tons of carbon into metric tons of CO<sub>2</sub>e.

Gross cubic foot volume will be calculated using equations outlined in Woodall et al. 2011, "Methods and Equations for Estimating Aboveground Volume, Biomass, and Carbon for Trees in the U.S. Forest Inventory, 2010".

The belowground portion of live and dead trees is calculated using the component ratio method ("CRM") described in Appendix J of the FIA documentation cited in the Protocol.

	Weighted Average tCO <sub>2</sub> e/acre	Total tCO <sub>2</sub> e
Start Date Estimate	124.9	4,262,347

Projected Growth: The Northeast (NE) variant of the Forest Vegetation Simulator (Dixon and Keyser 2013) will be used to model forest growth, mortality and harvest over 100 years. Plot data will be entered into a database readable by FVS, with each plot entered as an individual stand and each tree record multiplied by the appropriate factor to determine trees per acre. After entry into FVS, the "forest" will be grown 100 years and the resulting tree list used to calculate biomass.

For project and baseline modeling, all FVS defaults will be used besides the following calibration components:



- The location code
- Age of the stands
- Site index values derived from a site index tree at each plot
- Minimum acceptable harvest volumes
- Minimum DBH for all harvests

Site index will be determined using cores collected during the inventory. Cores will be collected from a determined “indicator species” that is representative across the entire project area. For each plot, the site index value of the determined indicator species will be entered into FVS, which will automatically calibrate the site index values to each measured species using default conversion values. Site index values for each species does not need to be calculated prior to running FVS.

FVS defaults used can be found in Part VIII, section 3.

Adjustments for Start Dates: To determine CO<sub>2</sub> stocks at the project commencement date, the tree data will be degrown from the date of inventory to the project’s start date. This adjustment will take place by growing individual trees backwards at the appropriate seasonal rate based on FVS predicted diameter growth rates for each tree. Each sapling and tree will be grown from the inventory date for 10 years to calculate the annual reduction in tree per acre (TPA) for each tree. This method for determining individual tree mortality will be done separately for trees and saplings. The default mortality settings for the NE Variant of FVS will be used for all of the baseline modeling.

Adjustments for Reporting Period Calculations: To determine CO<sub>2</sub> stocks at the end of the reporting period, all trees will be grown forward to the reporting period end date set at the appropriate seasonal rate based on FVS predicted diameter growth rates for each tree (the same method used for the start date calculations). In addition, the mortality that occurred between the inventory and the reporting period will be simulated by decreasing or increasing the trees per acre for each tree record at the appropriate rate based on the FVS predicted mortality rate for each tree. All plots harvested during the reporting period will be re-inventoried so that all harvested trees will be removed from the inventory for the reporting period calculations.

### IFM-3 Standing Dead

All standing dead trees of ≥5” DBH and ≥15’ of height will be recorded for species (if possible), height as the tree originally stood, height in the tree’s current condition (in feet), DBH (to nearest 0.1 inch), % missing/rotten wood (using procedure outlined above), and decay class (using the Domke et al. 2011 clasification system).

Standing dead wood carbon will be calculated by estimating above and below ground biomass in the same manner it will be for live trees and then converting this figure to CO<sub>2</sub>e. Domke 2011 will be used to apply Structural Loss Adjustments and Density Reduction Factors for standing dead trees.

The estimates of standing dead wood will be calculated on a per acre basis for each stratum. A project-wide estimate of standing dead wood is calculated using a weighted average with weights assigned based on stratum size.

Estimates of standing dead will be updated in the project scenario every time new inventory data is collected. For the baseline, standing dead is projected to remain constant over the 100 year baseline at 3.7 tonnes CO<sub>2</sub> per acre.

	Weighted Average tCO <sub>2</sub> e/acre	Total tCO <sub>2</sub> e
Start Date Estimate	3.7	127,870

### IFM-6 Soil (if applicable)

Excluded.

#### IFM-7 Carbon in in-use forest products

Carbon in in-use forest products will be calculated based on standing tree inventory data. No specific inventory processes apply.

Wood products calculations will be completed using an excel model based on the ACR Forest Project Calculation worksheet. (Provided separately for verification purposes.)

A default regional value will be used for mill efficiency and product mix based on weighted average of relative acreage.

#### End of Reporting Period Estimate

Project Harvested Wood Products Summary	Total (tCO <sub>2</sub> e)	tCO <sub>2</sub> e / acre
Total Harvested Wood Products	125,718	3.69
Long-term storage in in-use wood products	26,252	0.78

#### IFM-8 Forest product carbon in landfills

Forest product carbon in landfills will be calculated based on standing tree inventory data. No specific inventory processes apply. Forest product carbon in landfills will be calculated in accordance with the procedures described per Appendix C of the Forest Protocol.

#### End of Reporting Period Estimate

Project Harvested Wood Products Summary	Total (tCO <sub>2</sub> e)	tCO <sub>2</sub> e / acre
Long-term storage in wood products in landfills	13,326	0.39

#### IFM- 9 Biological emissions from site preparation

NA

#### IFM-14 Biological emissions/removals from change in harvesting on forestland outside the Project Area

NA

#### IFM-17 Biological emissions from decomposition of forest products

Biological emissions from decomposition of forest products will be calculated based on standing tree inventory data. No specific inventory processes apply. Biological emissions from decomposition of forest products will be quantified as a component of carbon stored in in-use forest products (IFM-7) and landfills (IFM-8).

## Inventory Methodology

For all applicable carbon pools, the following inventory methodology will be employed:

Project Boundary: The offset Project Area will be determined using the most recent geospatial file of the of the property. All roads, right-of-ways, major water bodies, and other non-forested areas will be removed from the Project Area. Some forested areas may be removed due to management considerations.

Stratification: The Project will be stratified into three distinct strata. The stratification is be based on the most recent stands geospatial file and inventory in order to reduce the sampling error below 5.1%.

Plot Number and Locations: A network of randomly selected permanent inventory plots will be be installed across the project area. Using the Random Point Generator tool in ArcGIS, plots will be selected across the entire project area, placed the plots at least 74.4 feet apart, ensuring no overlapping plot boundaries.

Monumentation: Permanent inventory plot centers will be monumented with a rebar pole pounded into the ground and topped with a small rebar cap flush with the ground.

Sampling Method: Permanent, fixed-radius plots will be established across the Quercus West Virginia, LLC property to facilitate precise tracking of individual tree growth and ease of verification. At each plot location a 1/10th-acre (37.2' radius) fixed-radius plot will be established to measure all trees greater than or equal to 5.0" in diameter at breast height (DBH); and a 1/100th-acre (11.8' radius) sub-plot will be taken to capture woody trees and saplings less than 5" (1.0 to 4.9" DBH). This plot design gave forest managers the opportunity to consistently track the growth and development of specific trees over an extended timeline and will allow for improved ease of plot location during field work and site verifications.

The protocol defines trees as "A woody perennial plant, typically large and with a well-defined stem or stems carrying a more or less definite crown with the capacity to attain a minimum diameter at breast height of 5 inches and a minimum height of 15 feet with no branches within 3 feet from the ground at maturity." As a result, please measure all species  $\geq 1$ " DBH that meet this definition (a master list of FIA species coeds for trees found on the property can be found on the final page of this document).

Statistical Standard: Mean volume estimates (e.g. above ground carbon per acre) for the ownership will be reported with a minimum statistical precision of  $\pm 5\%$  of the mean at the 95% confidence level. These objectives may be adjusted for more or less precision based on a property-specific analysis of data collection cost relative to return.

Sampling Frequency: Full project-level inventories of the carbon project will be conducted at 6-12 year intervals. Inventories of select portions of the Project Area will be updated periodically in response to natural disturbance or significant forest management activities. Traditional pre and post-harvest monitoring techniques will be employed to inform land managers of potential needs to implement a more comprehensive monitoring of carbon pools (refer to Pearson, Brown, Birdsey 2007).

Harvest Re-Measurement: If a plot is harvested, the plot will be re-measured within 6 months of yarding to assess which trees will be taken out so that the inventory can be updated for the current reporting period. Blue Source will work with the OPO to determine which plots have been harvested during the reporting period.

Data Collection Materials: Data will be collected on hand held electronic data recorders. If data recorders are not available, field data can be collected on paper tally sheets and manually entered into a computer for data analysis. All data sheets will be scanned and sent to Blue Source.

QA/QC Field Procedures: At least 5% of the plots will be checked by a different forester than cruised the plot, preferably by someone senior to the field crew. This will involve full plot measurement to identify any problems with determining in/out trees, species calls, defect measurements, DBH measurements, and height measurements. Any consistent height, species, DBH, or defect errors will be resolved by talking with the foresters.

QA/QC Desk Procedures: The following QA/QC approach is designed to ensure that field data, once input, is appropriately managed and maintained, and that subsequent calculations using that data to determine onsite

carbon stocks and associated ARBOC issuance are correctly implemented. A three-stage QA/QC process with a defined review group for the project will be established, engaging both personnel intimately familiar with all project files and documentation, as well as independent reviewers are able to bring “fresh eyes” to key outputs.

Independent Forester Review: The project implementation team (Blue Source) includes multiple foresters with intimate knowledge of the files, models and documents. The development of quantitative components, such as Access databases, FVS model runs and Excel workbooks, are led by one of these foresters. Prior to finalization, a second forester who did not lead development of that component is tasked with a QA/QC review including random examinations and data checks to identify and fix any errors.

Technical Review: Once quantitative outputs are finalized, exported from Access/FVS to Excel, and are ready to be transferred into the Offset Project Data Report (OPDR) and other project documents, an independent manager reviewed these outputs. This individual performs data checks by tracing key outputs back from final ARBOC calculations through the chain of Excel documents to the underlying Access/FVS database.

Senior Management Review: Once outputs have been transferred from Excel to the OPDR and other project documents, a senior manager reviews these documents and checks that all quantitative elements have been correctly exported from the underlying workbook. At this stage, the senior manager (or other individual not involved in document preparation) also reviews text, grammar and formatting for presentation and accuracy.

Data Processing and Storage: Manually and electronically filed data are stored and archived. Backup copies of all electronically stored data are maintained in a separate data center with scheduled archiving to assure data protection. Future revisions to project documents after initial verification and registration will be clearly identified by saving them as separate files and including the date of revision in any modified documents. All data will be stored on Dropbox or similar online cloud storage service as well as on an external hard drive and kept by Blue Source for a minimum of 15 years.

#### Inventory Confidence Statistics- Estimate

Total	n	Stratified Standard Error	Bound	Sampling Error
4,390,218	250	97,250	159,976	3.6%

The inventory sampling error is calculated as follows:

- 1)  $97,250 \times 1.645 = 159,565$
- 2)  $(159,976 / 4,390,218) \times 100 = 3.6\%$

The estimated sampling error of 3.6% is below 5.1%, so no confidence deduction should be applied to the inventory results.

#### Reversal Risk Rating- Estimate

Reversal Risk Rating will be calculated using the following formula:

Reversal Risk=  $100\% - (1 - \text{Financial Failure}) \times (1 - \text{Illegal Forest Biomass Removal}) \times (1 - \text{Conversion}) \times (1 - \text{Over Harvesting}) \times (1 - \text{Social Risk}) \times (1 - \text{Wildfire}) \times (1 - \text{Disease/Insect Outbreak}) \times (1 - \text{Other Catastrophic Events})$

$$= 1 - (1 - 0.05) \times (1 - 0.0) \times (1 - 0.02) \times (1 - 0.02) \times (1 - 0.02) \times (1 - 0.04) \times (1 - 0.03) \times (1 - 0.03)$$

$$= 19.2\%$$

## Part VIII. Offset Project Baseline

1. The aboveground Common Practice (CP) value is 90.7 mtCO<sub>2</sub>e/acre with a live value of 108.7 mtCO<sub>2</sub>e/acre. The project's ICS live carbon stocks of 124.9 mtCO<sub>2</sub>e/acre is above the CP value.

Supersection	Assessment Area	Site Class	CP	Acres
Allegheny & North Cumberland Mountains	Allegheny & North Cumberland Mountains Cove Forests	Low	91	8,4723
	Allegheny & North Cumberland Mountains Northern Hardwoods	Low	87	9,643
	Allegheny & North Cumberland Mountains Oak-Hickory	Low	93	15,999
<b>Weighted Average/ Total</b>			90.7	34,116

2. Baseline Carbon Stocks

Aboveground (mtCO <sub>2</sub> e/acre)	Belowground (mtCO <sub>2</sub> e/acre)	Live (mtCO <sub>2</sub> e/acre)	Dead (mtCO <sub>2</sub> e/acre)	Standing (mtCO <sub>2</sub> e/acre)
90.7	18.0	108.7	3.7	112.4

3. If the Forest Project's initial standing live carbon stocks are below Common Practice, a determination of the "High Stocking Reference" for the Project Area.

Because the project's initial standing live carbon stocks are above common practice, this section is non-applicable.

4. Baseline Wood Products Summary:

Baseline Harvested Wood Products Summary	Total (tCO <sub>2</sub> e)	tCO <sub>2</sub> e / acre
Baseline Carbon Harvested for Wood Products (tonnes CO <sub>2</sub> e)	139,750	4.10
Baseline Carbon Delivered to Mill (tonnes CO <sub>2</sub> e)	74,068	2.17
Baseline Carbon Stored in Wood Products – Excl. Landfill (tonnes CO <sub>2</sub> e)	29,627	0.87
Baseline Carbon Stored in Wood Products Incl. Landfill (tonnes CO <sub>2</sub> e)	44,441	1.30

5. Baseline Modeling

As stated in section 6.2.1.2 of the protocol, all legal constraint that could affect the baseline growth and harvesting must be incorporated. Thus, all legal constraints (detailed in Attachment I) will be modeled.

All FVS defaults for the will be used besides the following calibration components:

- The location code: Wayne (914)
- Age of the stands
- Site index values derived from a site index tree at each plot
- Minimum acceptable harvest volumes of 2,000 board feet/ acre
- Minimum DBH for all harvests

Site index for each plot will be measured as outlined in Part VII IFM-1.

Clearcut, shelterwood, and single-tree selection treatments will be modeled using 5-10 year simulation periods with harvest frequency triggered when a stand reaches the appropriate basal area targets for each treatment. Species retention post-harvest will be determined using FVS defaults.

Default FVS Setting (NE Variant):

Parameter or Attribute	Default Setting	
Number of Projection Cycles	1 (10 if using Suppose)	
Projection Cycle Length	10 years	
Location Code (National Forest)	922 – White Mountain	
Slope	5 percent	
Aspect	0 (no meaningful aspect)	
Elevation (default location)	20 (2000 feet)	
Latitude (Default location)	43.53	
Longitude (Default location)	71.47	
Site Species	27 (sugar maple)	
Site Index	56 feet (total age; 50 years)	
Maximum Stand Density Index	Species specific	
Maximum Basal Area	Species specific	
Volume Equations	National Volume Estimator Library	
Pulpwood Volume Specifications:		
Minimum DBH / Top Diameter	Hardwoods	Softwoods
919 – Allegheny	6.0 / 5.0 inches	5.0 / 4.0 inches
920 – Green Mountain-Finger Lakes	8.0 / 4.0 inches	5.0 / 4.0 inches
921 – Monongahela	5.0 / 4.0 inches	5.0 / 4.0 inches
914 – Wayne, 911 – Wayne-Hoosier	6.0 / 4.0 inches	5.0 / 4.0 inches
922 – White Mountain	5.0 / 4.0 inches	5.0 / 4.0 inches
Stump Height	1.0 foot	1.0 foot
Sawtimber Volume Specifications:		
Minimum DBH / Top Diameter	Hardwoods	Softwoods
All location codes	11.0 / 9.6 inches	9.0 / 7.6 inches
Stump Height	1.0 foot	1.0 foot
Sampling Design:		
Large Trees (variable radius plot)	40 BAF	
Small Trees (fixed radius plot)	1/300 <sup>th</sup> acre	
Breakpoint DBH	5.0 inches	

Regeneration FVS Defaults:

Table 6.0.1 Regeneration parameters by species in the NE variant.

FVS Number	Alpha Code	Sprouting Species	Minimum Bud Width (in)	Minimum Tree Height (ft)	Maximum Tree Height (ft)
1	BF	No	0.1	0.33	20.0
2	TA	No	0.1	0.50	24.0
3	WS	No	0.2	0.25	18.0
4	RS	No	0.2	0.25	16.0
5	NS	No	0.2	0.25	18.0
6	BS	No	0.2	0.25	16.0
7	PI	No	0.2	0.25	16.0
8	RN	No	0.1	0.25	18.0
9	WP	No	0.4	0.33	20.0
10	LP	No	0.5	0.25	14.0
11	VP	No	0.5	0.42	14.0
12	WC	No	0.1	0.33	16.0
13	AW	No	0.1	0.33	16.0
14	RC	No	0.5	0.33	16.0
15	OC	No	0.5	0.33	16.0
16	EH	No	0.1	0.25	16.0
17	HM	No	0.1	0.25	16.0
18	OP	No	0.5	0.25	16.0
19	JP	No	0.1	0.33	14.0
20	SP	No	0.4	0.25	14.0
21	TM	No	0.5	0.25	16.0
22	PP	No	0.5	0.42	18.0
23	PD	No	0.5	0.25	12.0
24	SC	No	0.5	0.33	20.0
25	OS	No	0.3	0.25	16.0
26	RM	Yes	0.2	1.00	20.0
27	SM	Yes	0.2	0.25	16.0
28	BM	Yes	0.2	0.25	16.0
29	SV	Yes	0.2	0.42	18.0
30	YB	Yes	0.1	0.42	22.0
31	SB	Yes	0.1	0.42	20.0
32	RB	Yes	0.1	0.33	18.0
33	PB	Yes	0.1	0.42	18.0
34	GB	Yes	0.1	0.42	18.0
35	HI	Yes	0.3	0.33	14.0
36	PH	Yes	0.3	0.33	14.0
37	SL	Yes	0.3	0.33	14.0
38	SH	Yes	0.3	0.33	14.0
39	MH	Yes	0.3	0.33	18.0
40	AB	Yes	0.1	0.25	14.0
41	AS	Yes	0.2	0.42	24.0
42	WA	Yes	0.2	0.42	24.0
43	BA	Yes	0.2	0.33	18.0
44	GA	Yes	0.2	0.42	24.0
45	PA	Yes	0.2	0.42	28.0
46	YP	Yes	0.2	0.42	24.0
47	SU	Yes	0.2	0.33	18.0
48	CT	Yes	0.2	0.33	20.0
49	QA	Yes	0.3	0.42	20.0
50	BP	Yes	0.2	0.42	24.0

## Part IX. Attestations and OPO Signature

I certify under penalty of perjury under the laws of the State of California the GHG reductions and/or GHG removal enhancements for Blue Source- Marmet Improved Forest Management Project from 10/20/2015 to 10/19/2040 will be measured in accordance with the Compliance Offset Protocol U.S. Forest Projects, November 14, 2014, and all information required to be submitted to ARB is true, accurate, and complete.

Initial: *RW*

I understand I am voluntarily participating in the California Greenhouse Gas Cap-and-Trade Program under title 17, article 5, and by doing so, I am now subject to all regulatory requirements and enforcement mechanisms of this program and subject myself to the jurisdiction of California as the exclusive venue to resolve any and all disputes arising from the enforcement provisions in this article.

Initial: *RW*

I understand that the offset project activity and implementation of the offset project must be in accordance with all applicable local, regional, and national environmental and health and safety laws and regulation that apply to the offset project location. I understand that offset projects are not eligible to receive ARB or registry offset credits for GHG reductions and GHG removal enhancements that are not in compliance with the requirements of the cap-and-trade program.

Initial: *RW*

In signing this form, I certify under penalty of perjury of the laws of California that the information contained in this form is true, accurate, and complete. I further certify that I am an Account Representative of the Offset Project Operator (OPO).

Signature: *Roger Williams IV*

Printed Name: Roger Williams, IV

Title: President, Blue Source LLC

Date: 10/20/2015



## Part X. Attachments

### Attachment A: Forest Owner

Please see corresponding folder containing all deed, provided separately for verification purposes.

### Attachment B: Public Projects

N/A

### Attachment C: Qualified Conservation Easement

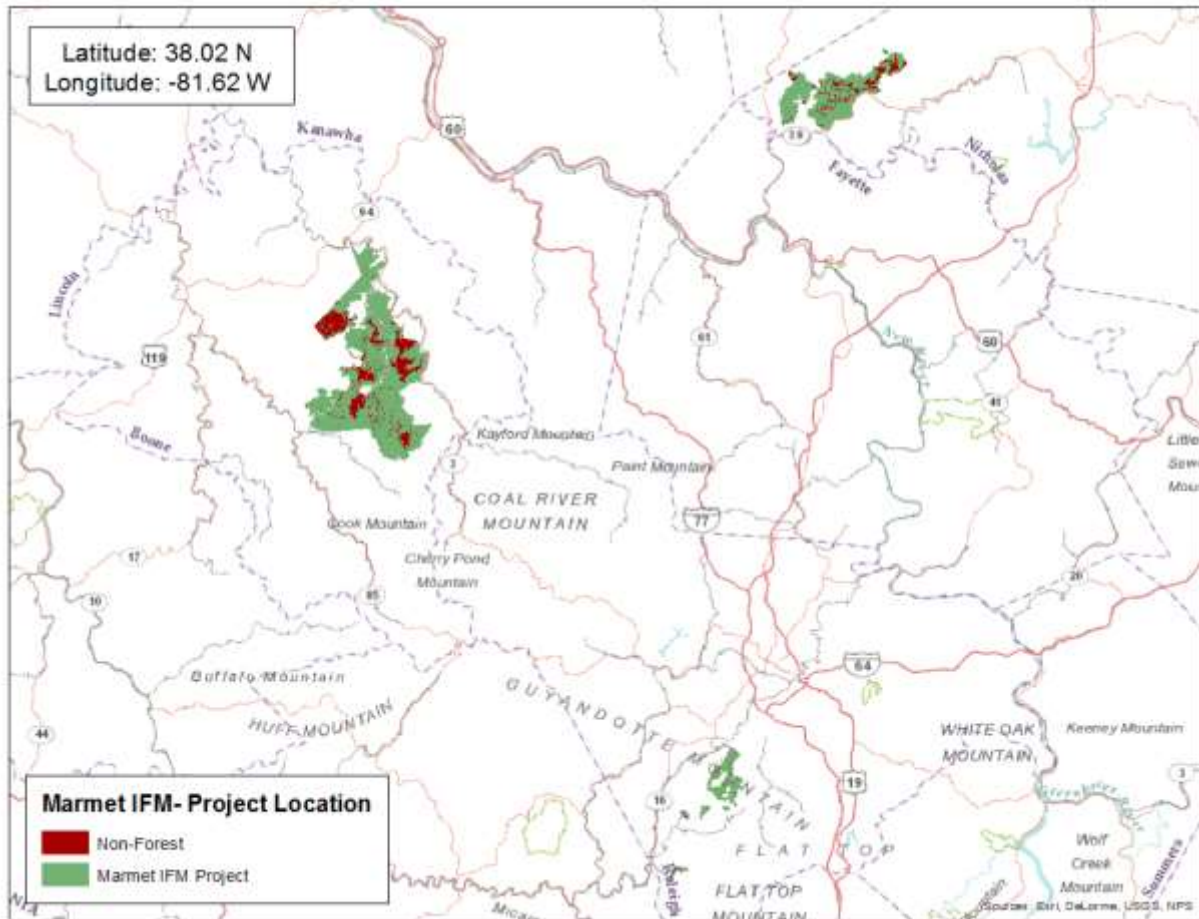
N/A

### Attachment D: Tribal Projects

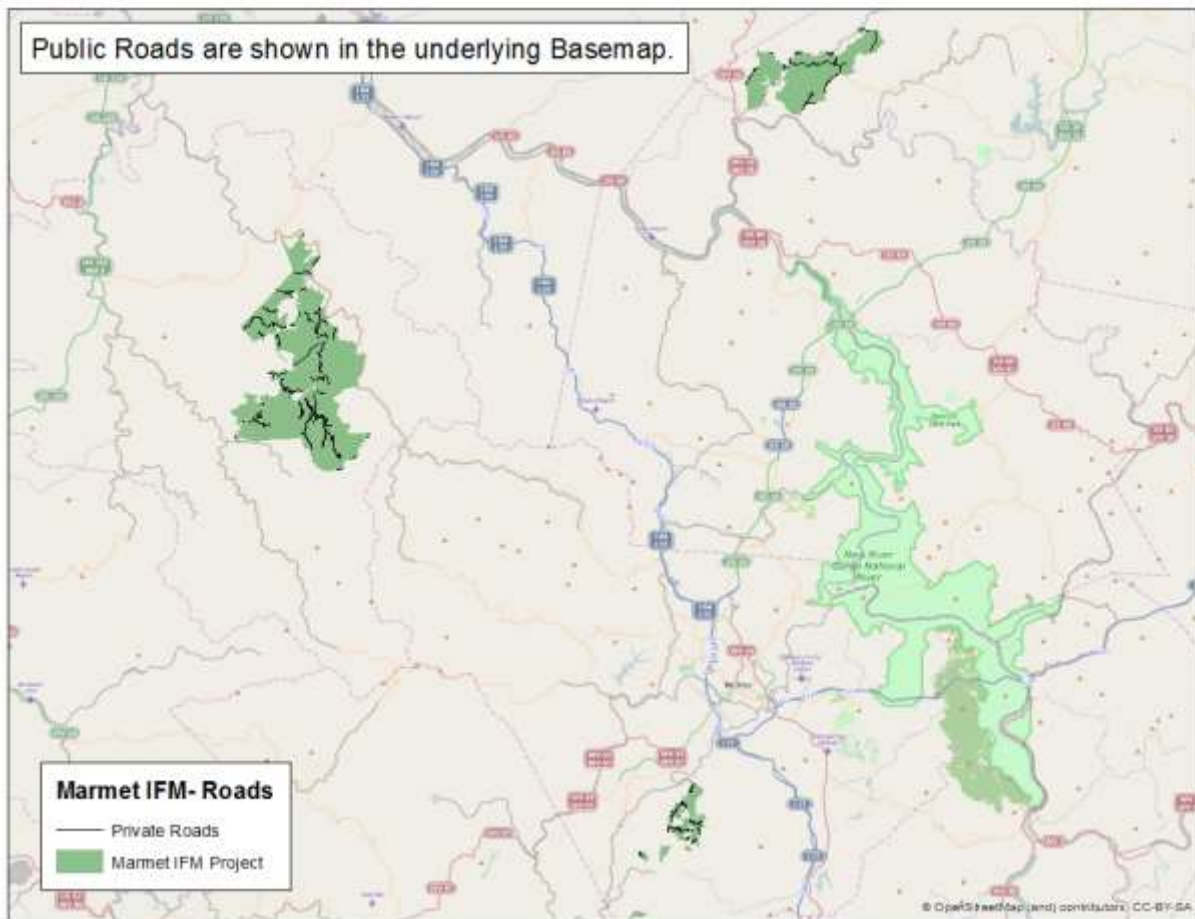
N/A

Attachment E: Project Maps

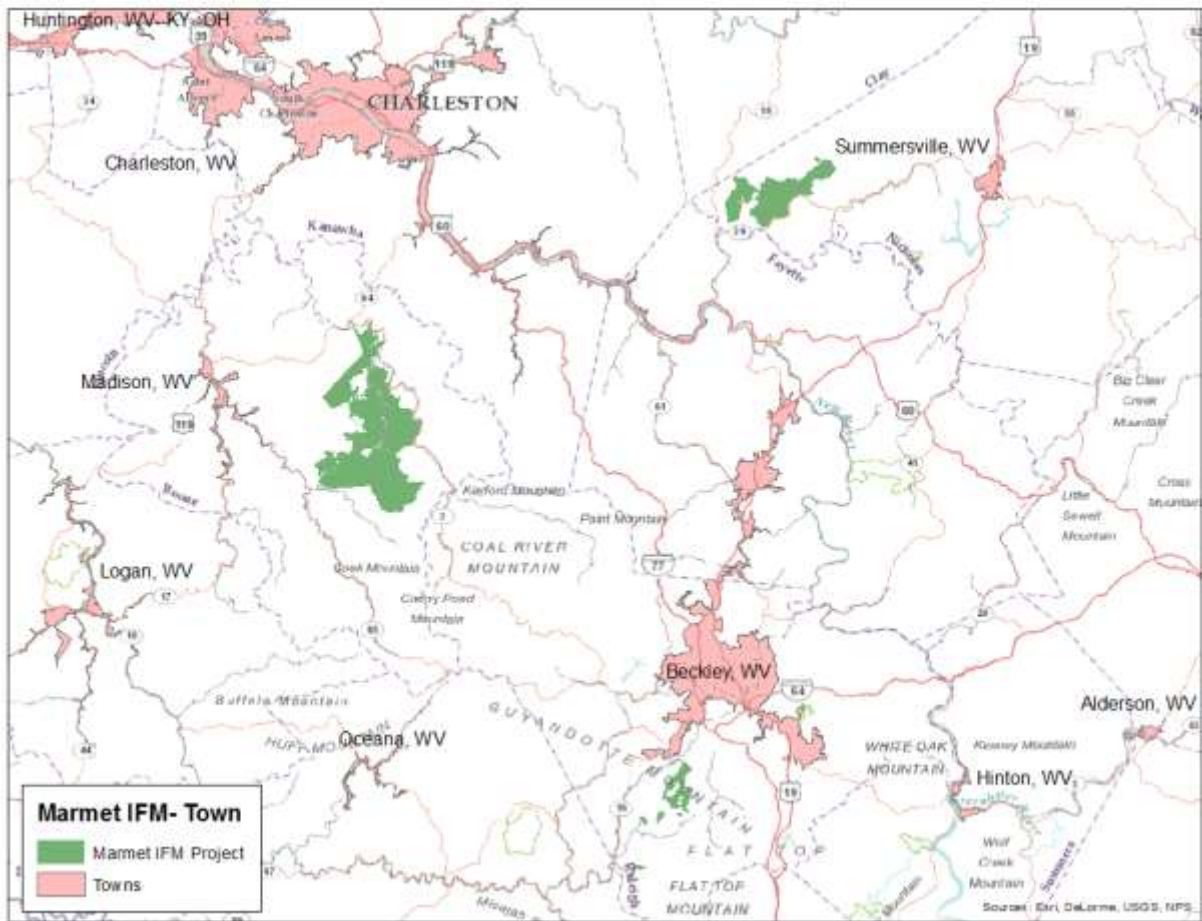
1. Latitude/longitude



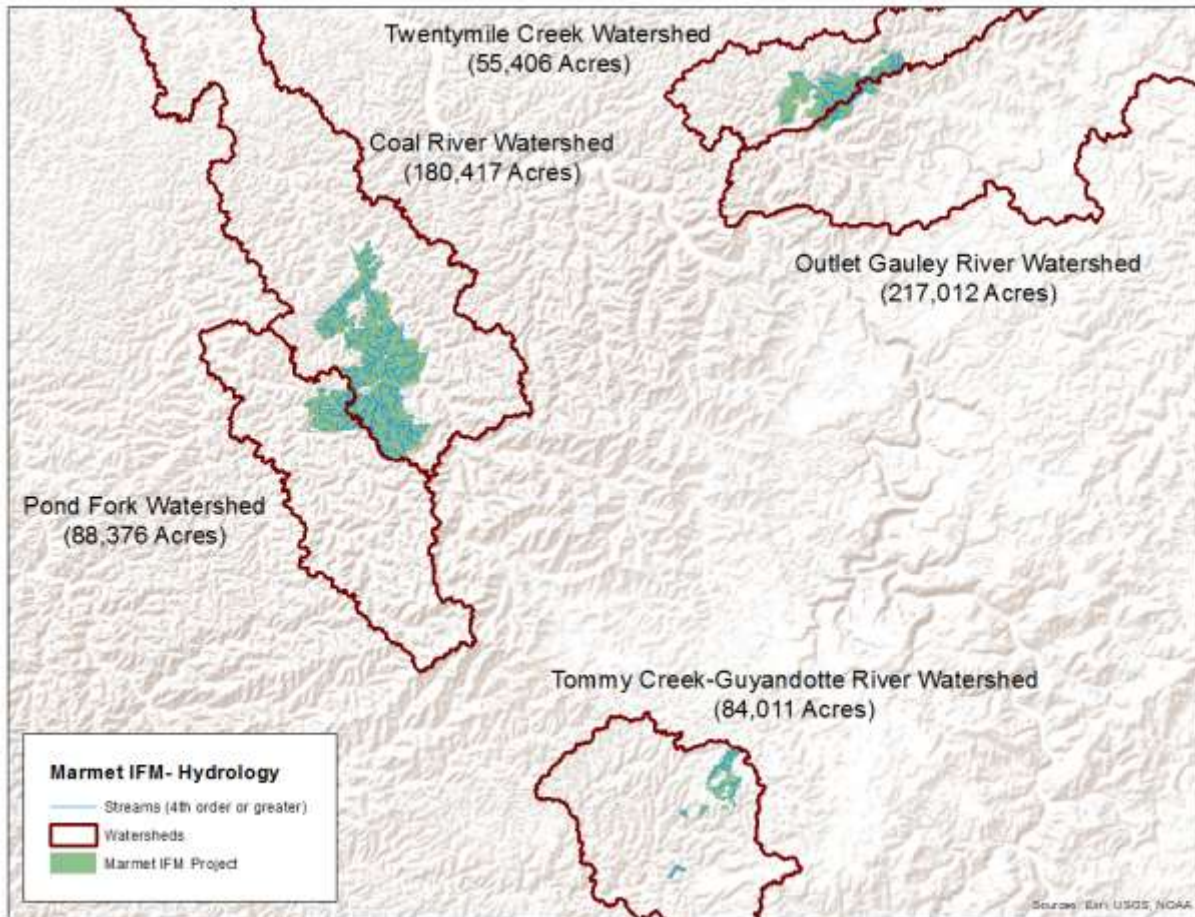
## 2. Public and private roads (map)



### 3. Towns (map)

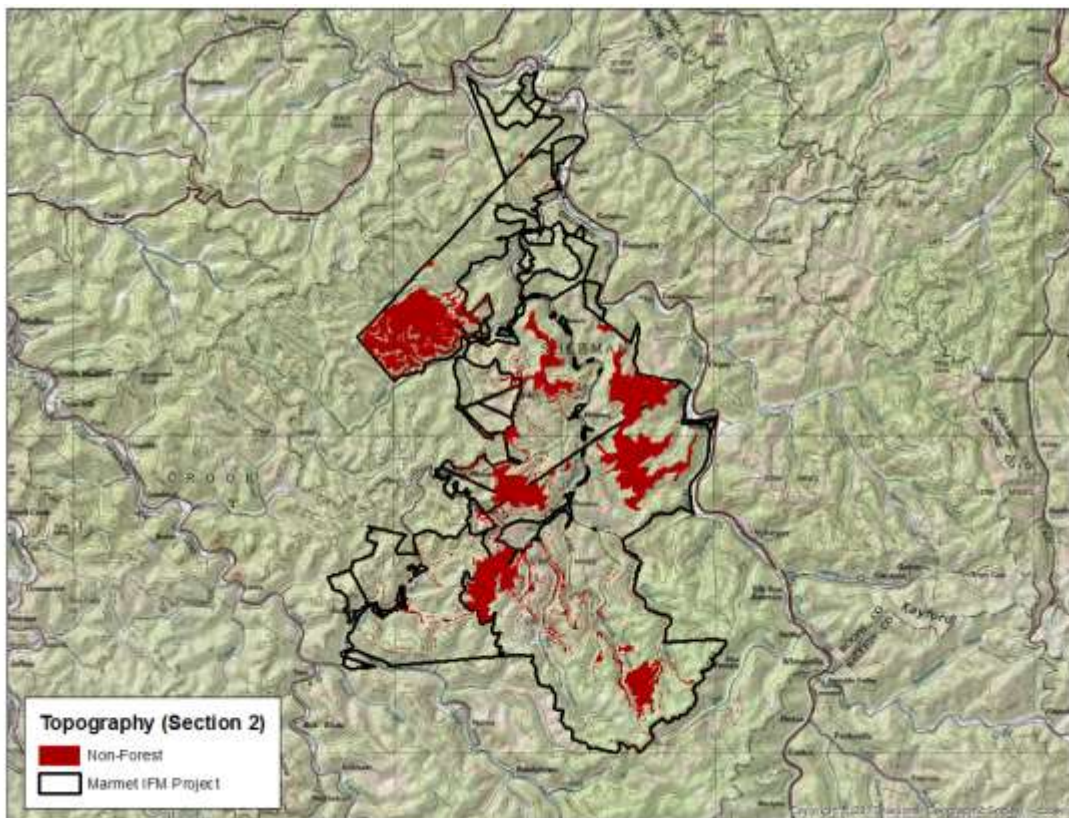
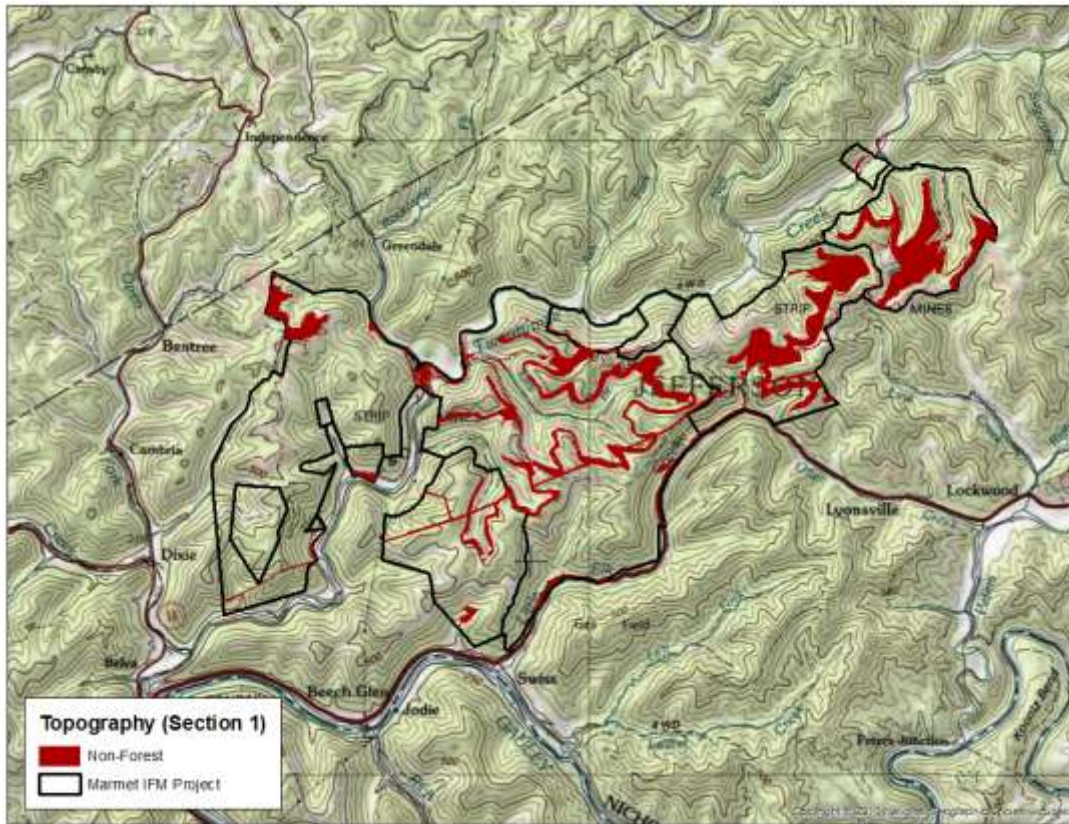


4. Major watercourses (4th order or greater), water bodies, and watershed description (map)

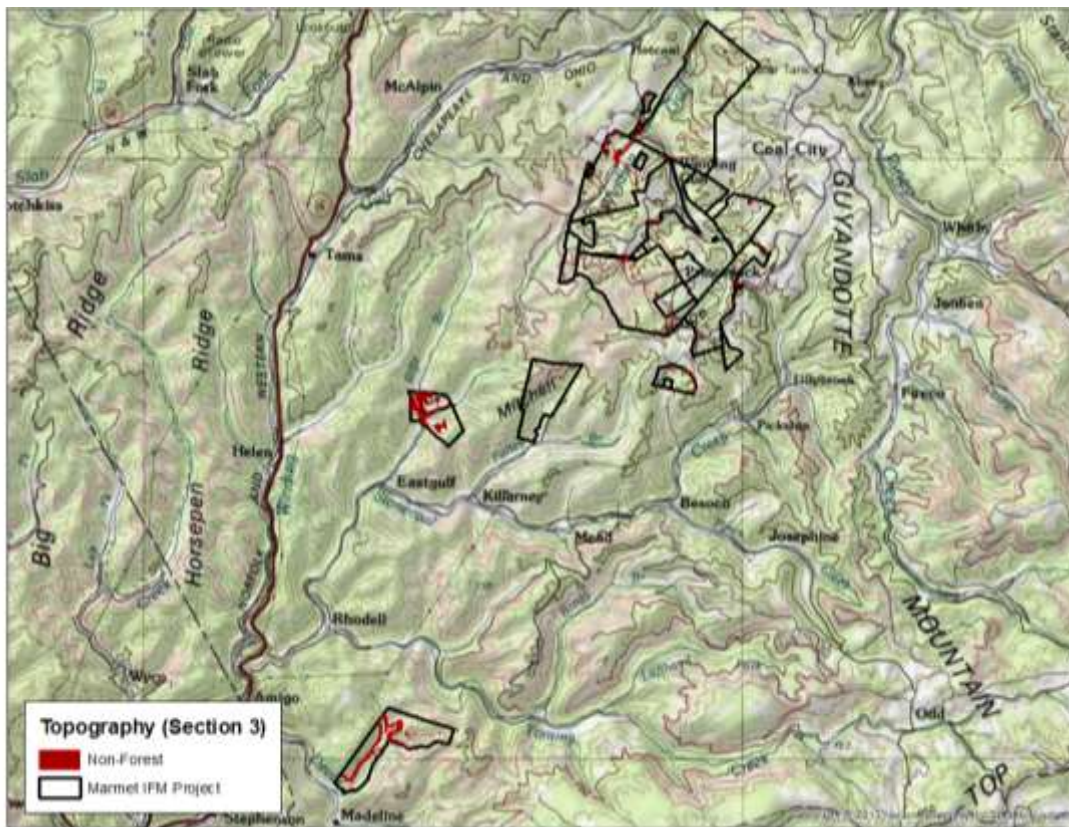




## 5. Topography (map)



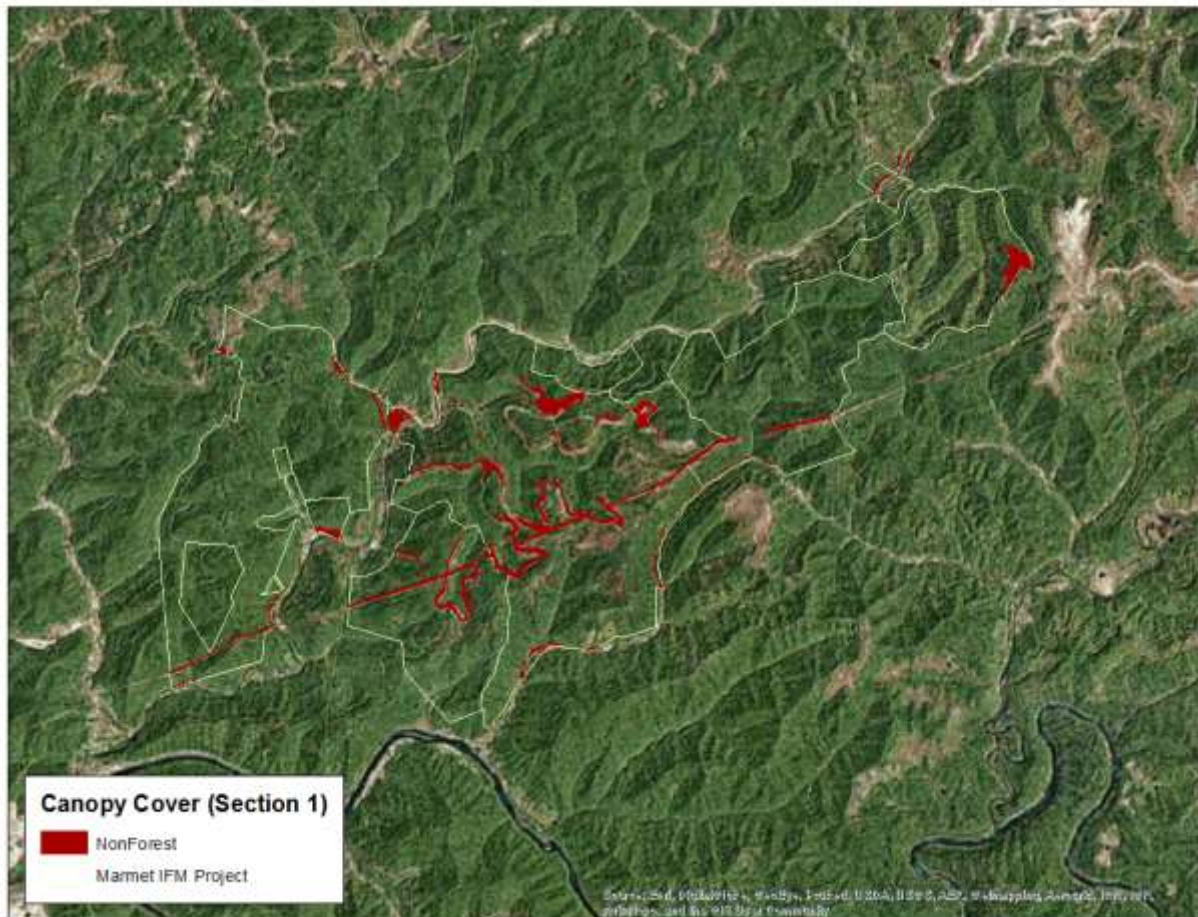




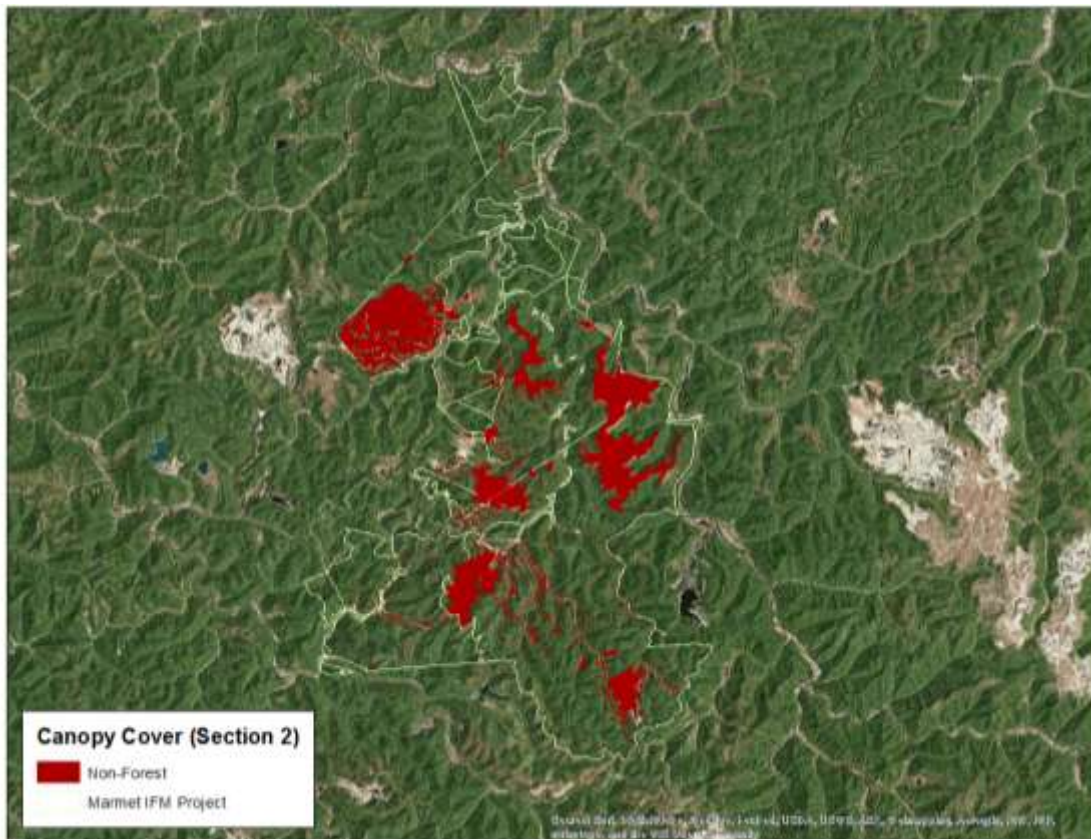
6. Townships, ranges, and sections or latitude and longitude (map)  
See map 1.
7. Georeferenced shape file  
Please see provided georeferenced shapefile.

## Attachment F: Canopy Cover

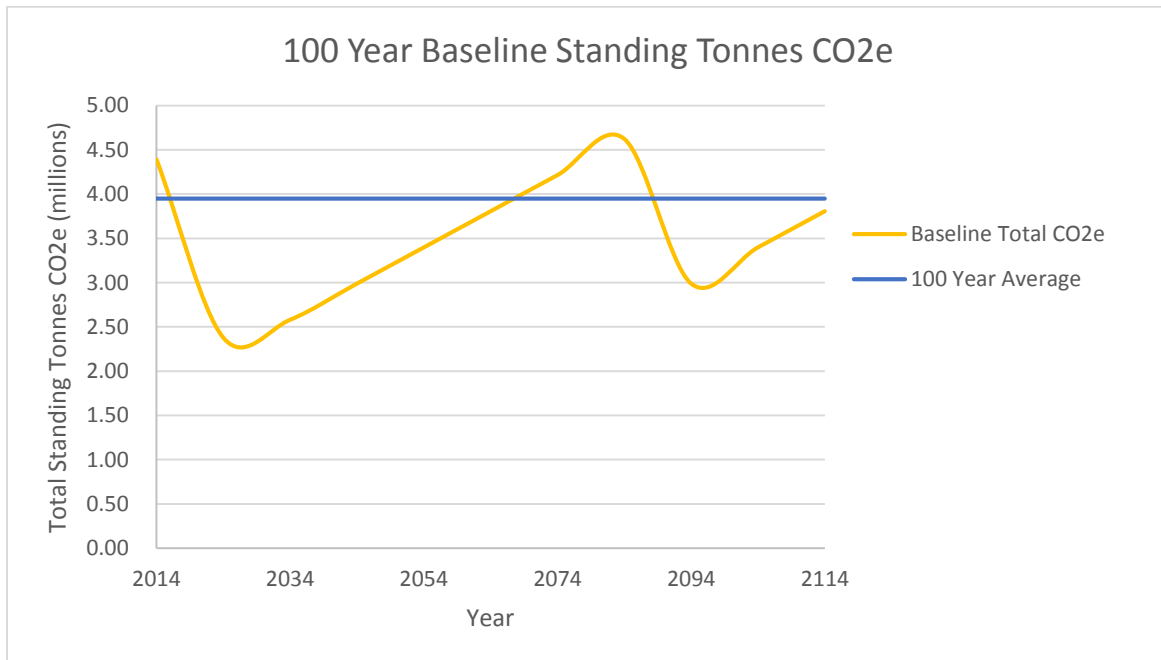
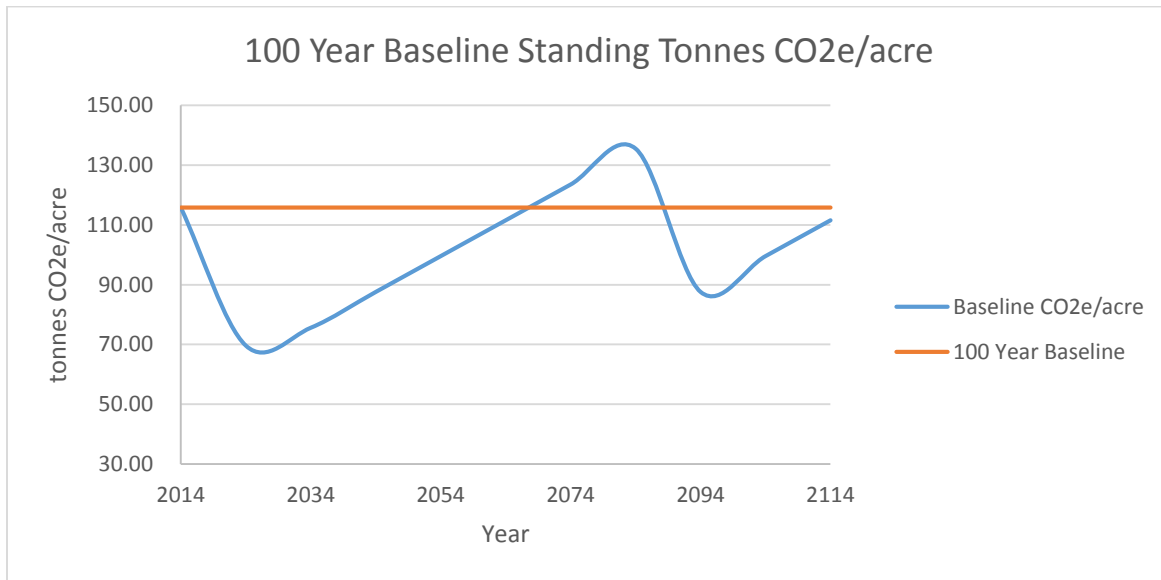
As evidence by recent aerial imagery, the Project Area contains greater than 10% canopy cover.





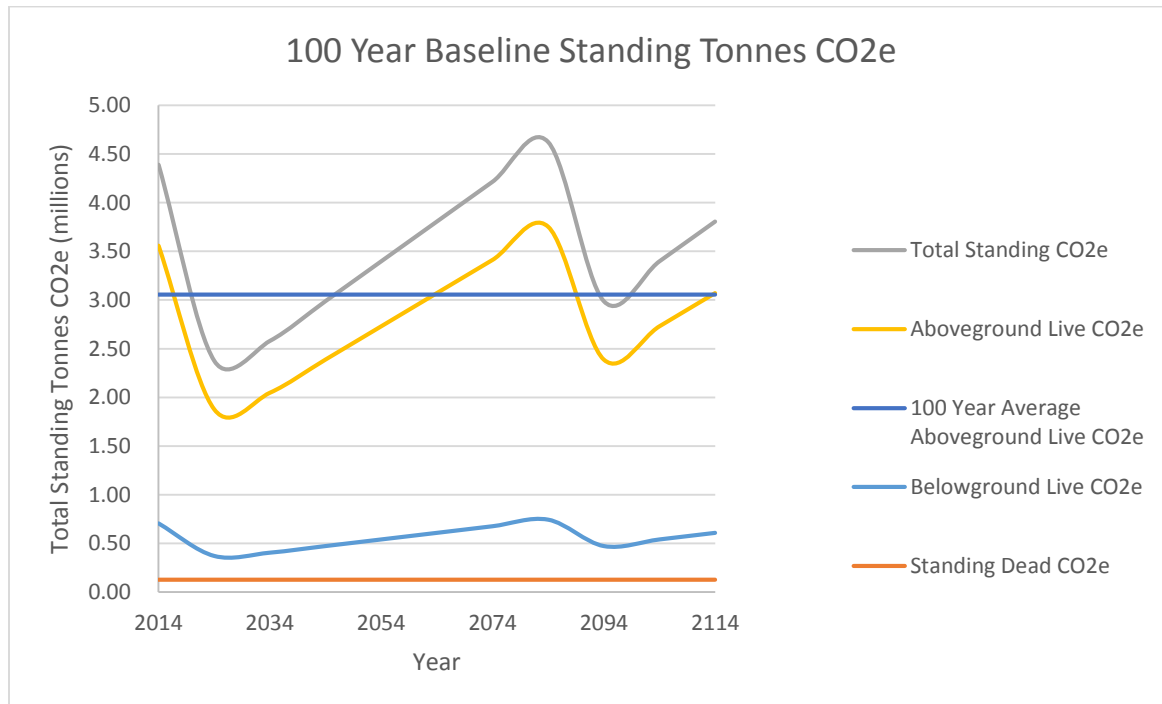


Attachment G: 100-year Baseline



\*Diagrams are an estimate of baseline and will be revised upon completion of final verified baseline model.

## Attachment H: Baseline Onsite Carbon Stocks



Within 5 years after the project commencement, a large majority of the carbon stocks on the property will be harvested using even-aged silviculture techniques. Over the next fifty years, these stocks will re-establish to at or above current levels. At this time a large pulpwood harvest is anticipated, and overstory removal of optimal sawtimber trees. Following this less-intensive harvest, the remaining growing stock will continue to grow until the end of the 100-year timeframe.

\*Diagram is an estimate of baseline and will be revised upon completion of final verified baseline model.

## Attachment I: Legal Constraints

As stated in *West Virginia Silvicultural Best Management Practices for Controlling Soil Erosion and Sedimentation from Logging Operations* (2009), "The federal Clean Water Act of 1972, amended in 1977, specified under section 208 that states must reduce silvicultural non-point source (NPS) pollution. This law led West Virginia to enact the Logging Sediment Control Act (LSCA), West Virginia Code 19-1B in 1992. The LSCA mandates the use of Best Management Practices (BMPs) to limit and control erosion and soil movement into streams.

Stream BMPs: "The minimum SMZ width or distance between exposed or disturbed soil and a perennial or intermittent stream should be no less than 100 feet slope distance on either side of the stream from the top or edge of the channel. On ephemeral streams it should be no less than 25 feet slope distance on each side from the edge of the channel or visible scour."

To model these constraints, the SMZ will be determined by placing a 100ft buffer will be placed around all intermittent and perennial streams, and a 25ft buffer will be placed around ephemeral streams. Within these constraints, usual practice is the selection of an occasional mature stem within the buffer zone and maintaining at minimum 50% of the live basal area within these zones.

#### **Attachment J: Financial Feasibility**

A financial analysis (Forest Protocol section 6.2.1.3, option 1) of the baseline growth and harvest regime reveals that the activities represented in baseline scenario are clearly feasible.