Carbon Sequestration Study

In the Fall of 2022, BRMC partnered with the Institute for Integrative Conservation at William & Mary to explore the use of Nature-Based Solutions (NbS) to protect forested land masses in the Bull Run Mountains Region. This is an ongoing project.

*Click here for **BRMC final report***

*Click here for **BRMC Land Conservation Toolkit***

Goals

The objective of this ongoing research project is to determine the viability of integrating the carbon market as a successful land management strategy in the Bull Run Mountains region. The approach involves two key perspectives: quantifying the carbon storage within the study area and understanding the values that local landowners place on their land.

The objectives are as follows:

Study area, which encompasses about 66,700 acres

- Summarize landowner perspectives on the intrinsic, monetary, and ecological value of these lands.
- Summarize the landowner's existing knowledge of the carbon market and encourage conservation easements on their properties
- Identify deforestation hotspots by creating land cover change maps using ArcGIS Pro.
- Measure the carbon sequestration value of the forest within the study area by parcels, and convert it into a relative monetary value
- Develop and distribute local and accurate toolkit for landowners containing actionable steps, resources, and contacts to help them get started/advise them on the best solutions for their property

Methods

1. Landowner Interviews

Five interviews were conducted with landowners in the region to learn more about the landowner's preferences for land use, existing knowledge of the carbon market, and willingness to explore options within it.

4.3 Carbon storage

	Area(he)	Carbon(MT)	Forest Density	Area Proportion	Carbon Proportion
total easement	10005.2	393211.1	48%	37%	39.82%
total conservation lands	1124.7	71483.5	95%	4%	7.24%
Others (developed and potential development area)	15948.1	522693.2	44%	59%	52.94%
Total Study Area	27078.0	987387.8	48%	1.00	1

Table 2 This table summarizes the area, carbon storage, forest density, and respective proportions of total easement, conservation lands, and other areas within a study zone, indicating the significant role of total easement and developed areas in carbon sequestration and land distribution.

2. Deforestation Hotspots and Carbon Storage

	Conservation Land	Conservation Easement
Definition	Land designated for preserving natural resources and cultural sites.	A legal agreement that restricts development on a landowner's property to preserve its conservation values.
Ownership	Owned by public entities or private conservation organizations.	Remains under the private ownership of the landowner.
Primary Function	Protects natural environments from development or degradation.	Limits specific types of development to protect ecological, scenic, or historical values of the land.

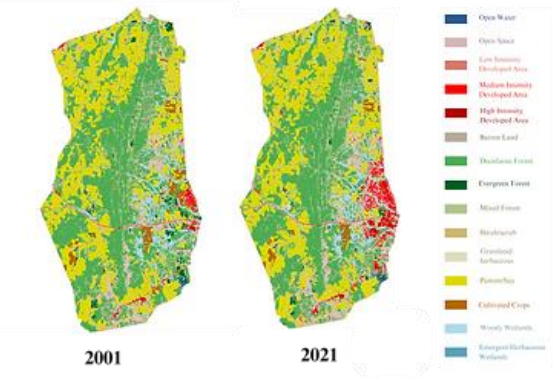
Using publicly available databases from the United States Geological Survey

the USDA Forest Service Forest Inventory, and Analysis (FIA) programs; the researchers were able to assess the deforestation rates and carbon storage capacities.

3. Integrating local land management strategies and zoning plans to assess areas of development and potential expansion.

Results

The results of the interviews concluded that the landowner's primary value of their land was to maintain its natural beauty. Many of the landowners had part of their land in conservation easements while being open to the idea of furthering their easements in the future. As for the analysis, The Total Easement, covering 10,005.2 hectares, constitutes 37% of the study area and holds 393,211.1 metric tons (MT) of



Comparison between landcover for 2001 and 2021

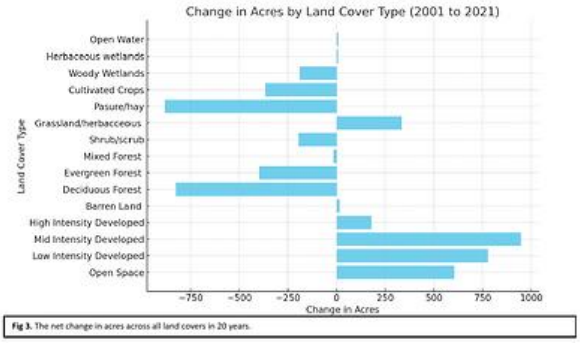


Fig 3. The net change in acres across all land covers in 20 years.

carbon, representing 39.82% of the total carbon storage, with a forest density of 48%. In contrast, Total Conservation Lands, though only encompassing 1,124.7 hectares (4% of the area), is significant for its high forest density of 95%. It stores 71,483.5 MT of carbon, accounting for 7.24% of the total carbon, highlighting its disproportionately high carbon density.

These findings illustrate the critical role of each land category in carbon sequestration, with particular emphasis on the high carbon storage efficiency of conservation lands despite their smaller area.