




# Applied Ecosystem Services in Working Forests

**D. Stuart Hale**  
M.S. Candidate  
University of Tennessee-Knoxville  
Forestry, Wildlife, and Fisheries



Natural Resource Policy Center

---

---

---

---

---

---

---


---

# Introduction

Ecosystem Services are the benefits people obtain from ecosystems.

Examples include:

- Climate Regulation
- Carbon Sequestration
- Water Quality
- Nutrient Cycling
- Biodiversity




---

---

---

---

---


---

---

---

# Introduction

## Human relationships with ecosystems



- **Plato (c. 400 BC)**  
First noted human impacts on the environment
- **George Marsh**  
*Man and Nature*, in 1864, argued that natural resources are finite
- **Gifford Pinchot**  
Conservation ethic for natural resources use, allocation, and protection
- **Aldo Leopold**  
Humans role in natural communities and view them more than only being a commodity
  - The term "ecosystem services" was first introduced in the report, *Study of Critical Environmental Problems* in 1970.

---

---

---

---

---

---

---

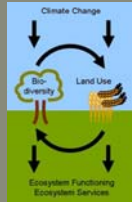
---

## Introduction

The UN Millennium Ecosystem Assessment was initiated in 2001 as a global assessment of ecosystem health and human impacts comprised of 1,360 experts worldwide.

### General Categories of Ecosystem Services :

- **Provisioning Services:**  
food, water, fuel, fiber, and other goods
- **Regulating Services:**  
climate, water quality, disease regulation, pollination
- **Supporting Services:**  
soil genesis, nutrient cycling
- **Cultural Services:**  
educational, aesthetic, heritage, recreation




---

---

---

---

---

---

---

---

## Justification for Research

### Millennium Ecosystem Assessment found:

- Human actions are depleting the Earth's natural capital straining the planet's ecosystems ability to sustain future generations.
  - It is possible to reverse the ecosystem degradation over the next 50 years but will require substantial changes in policy and practice, not currently underway.
  - Major gaps in knowledge were found at the local and national levels on the status of ecosystems and their economic values.
- "...at the local scale there is typically insufficient information on the full economic costs and benefits of alternate uses of ecosystems to fully inform decisions." (MEA 2001)*

---

---

---

---

---

---

---

---

## Justification for Research

### Increasing demand for benefits of Ecosystem Services due to:

- Dynamic land-use and ownership patterns
- Public policy and regulatory shifts
- Potential economic benefits to landowners and communities




---

---

---

---

---

---

---

---

## Research Objectives

- Quantify opportunities for marketable Ecosystem Services
- Demonstrate applications of Ecosystem Services on land base
- Estimate economic values of Ecosystem Services
- Project economic estimates of Ecosystem Services across ownership period (1-15 years)
- Compare economic values of timber production to estimated economic values of Ecosystem Services

---

---

---

---

---

---

---

---



## Goals

- Determine validity of Ecosystem Services as part of a comprehensive resource management strategy
- Provide an demonstrative example of Ecosystem Services management
- Use open-source information as available

---

---

---

---

---

---

---

---

## Proposed Project Area



- Proposed Project Area is approximately 4,300 acres
- Part of a larger 160,000 acres ownership
- Currently TIMO owned but prior owners include Clinchfield Coal and Pittston Coal
- Harvest 3-5 million FSC Certified board feet annually on approximately 2,500-3,000 acres

---

---

---

---

---

---

---

---

## Proposed Methods

### Identify Ecosystem Services markets

#### Examples:

- Chicago Climate Exchange
- The Bay Bank
- The Nature Conservancy
- MACED
- The Katoomba Group
- Advocacy Groups
- "Over the Counter" (OTC)




---

---

---

---

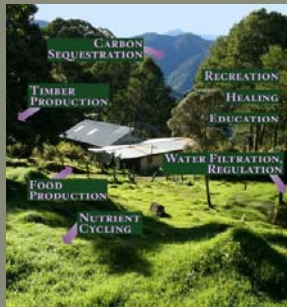
---

---

---

---

## Proposed Methods



### Ecosystem Services to be examined:

1. Carbon Sequestration
2. Wetland Mitigation/Banking
3. Stream Mitigation/Banking
4. Forest/Biodiversity Conservation
5. Habitat Restoration/Conservation
6. Recreation

---

---

---

---

---

---

---

---

## Proposed Methods

### Landscape features with potential of marketable Ecosystem Services:

1. Culturally significant sites
2. Areas of recent timber harvest
3. Areas unlikely/unsuitable for timber harvest
4. Sites for reforestation and/or habitat restoration
5. Critical habitat
6. Grasslands
7. Wetlands
8. High Value Conservation Forests
9. Critical viewsheds
10. Areas with public safety concerns




---

---

---

---

---

---

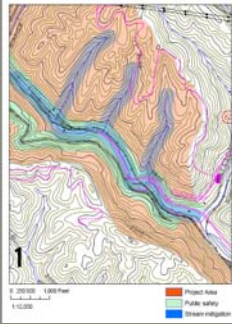
---

---

## Proposed Methods

**Quantify land features with marketable Ecosystem Services potential**

- 125 acres potential stream banking/mitigation
- 150 acres public safety
- potential for "stacking" acres




---

---

---

---

---

---

---

---

## Proposed Methods

**Valuate marketable Ecosystem Services as available and projected**

$$y = \sum_{i=1}^{10} (a_i)(v_i)$$

Whereas,  
 $y$  = economic benefits to landowner  
 $i$  = landscape feature  
 $a$  = units of marketable Ecosystem Services  
 $v$  = value per unit of marketable Ecosystem Services

Ex.  
 $y = (125 \text{ acres stream banking/mitigation} * \$200 \text{ per acre}) + (150 \text{ acres carbon sequestration} * \$122.10 \text{ per acre})...$   
 $y = \$25,000 + \$18,315.79 = \$43,315.79$




---

---

---

---

---

---

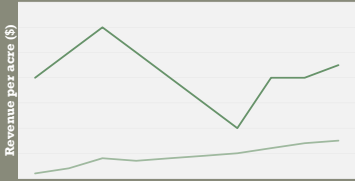
---

---

## Proposed Methods

**Compare Ecosystem Services values to timber revenues**

Timber and Ecosystem Services Revenue Comparison




---

---

---

---

---

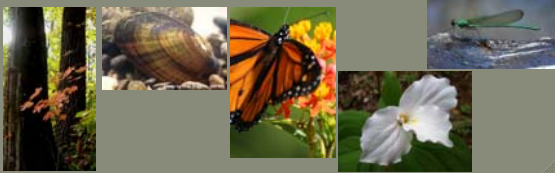
---

---

---

## Acknowledgments

- The University of Tennessee
  - Department of Forestry, Wildlife, and Fisheries
  - Dr. Don Hodges, Natural Resource Policy Center
- Craig Kaderavek, The Forestland Group
- Bobby Campbell, The Forest Management Company
- Brad Kreps, Clinch Valley Program of TNC



---

---

---

---

---

---

---

---

## Questions



---

---

---

---

---

---

---

---