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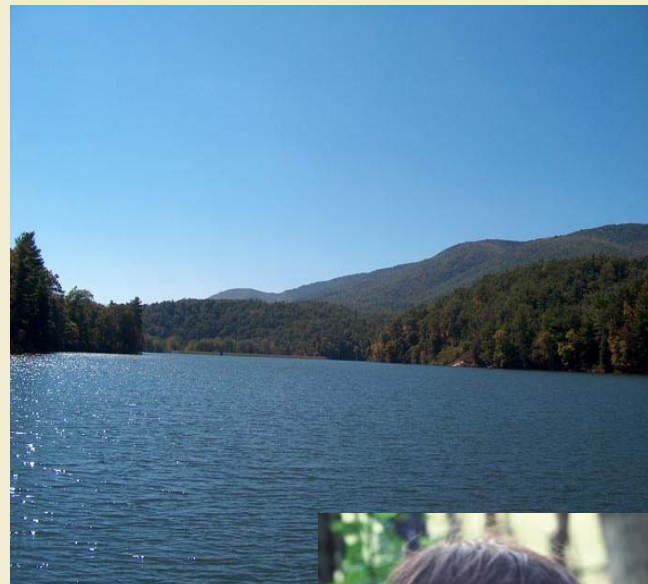


Ecosystem Services

BUCK KLINE AND VIJAY A SATYAL



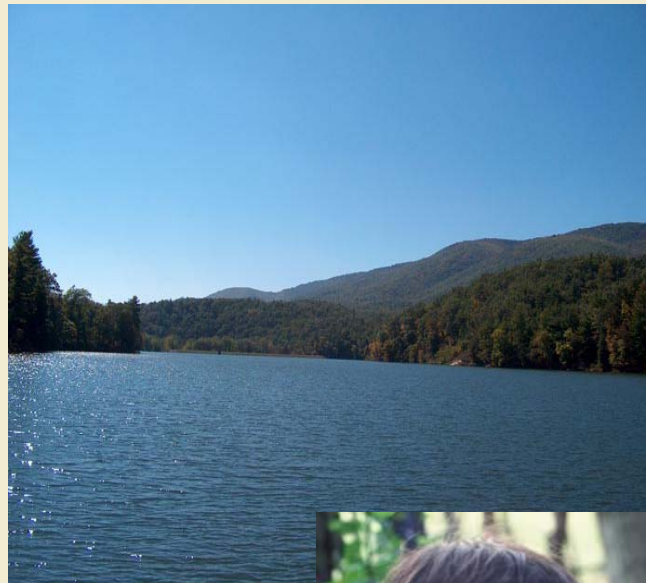
CO²



Presented to USDA Economists Group
Washington DC
May 14, 2008



CO²

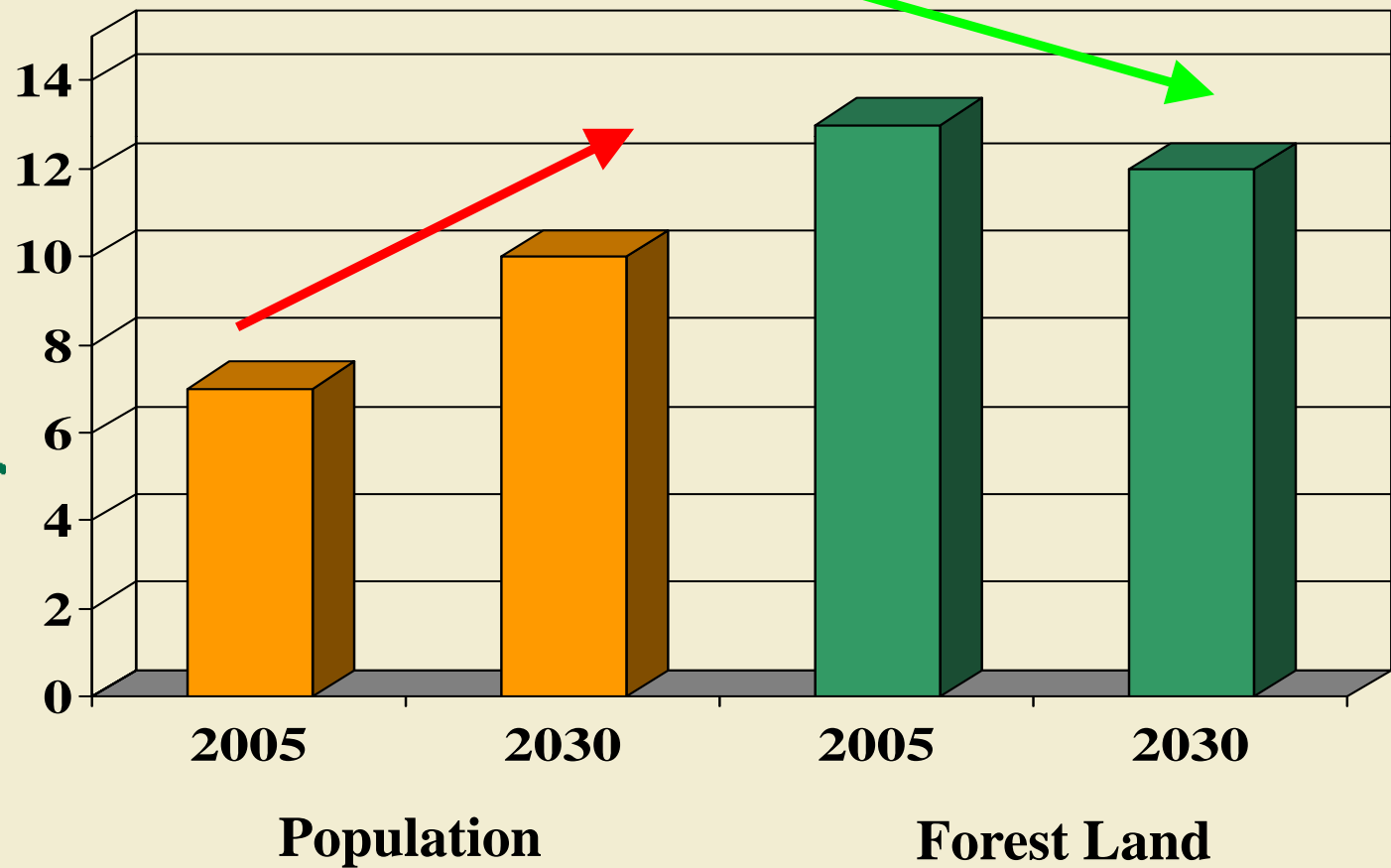


External Costs

- The loss of many of these ecosystem services is a social cost. It is not a transaction cost when converting to a more intensive land use. (Example: Clearing forests for a development)
- Regulatory drivers (wetlands legislation, cap& trade legislation) and voluntary drivers (managing the corporate environmental footprint, socially responsible investing strategies, and public relations efforts) can help internalize the social costs.
- *How can regulatory and voluntary drivers help landowners capture a value for ecosystem services and help communities to smartly manage growth?*



3 Million More People 1 Million Fewer Forest Acres



Virginia Status

FY 2006-2007 saw a net loss of an additional 27,300 acres of forest land



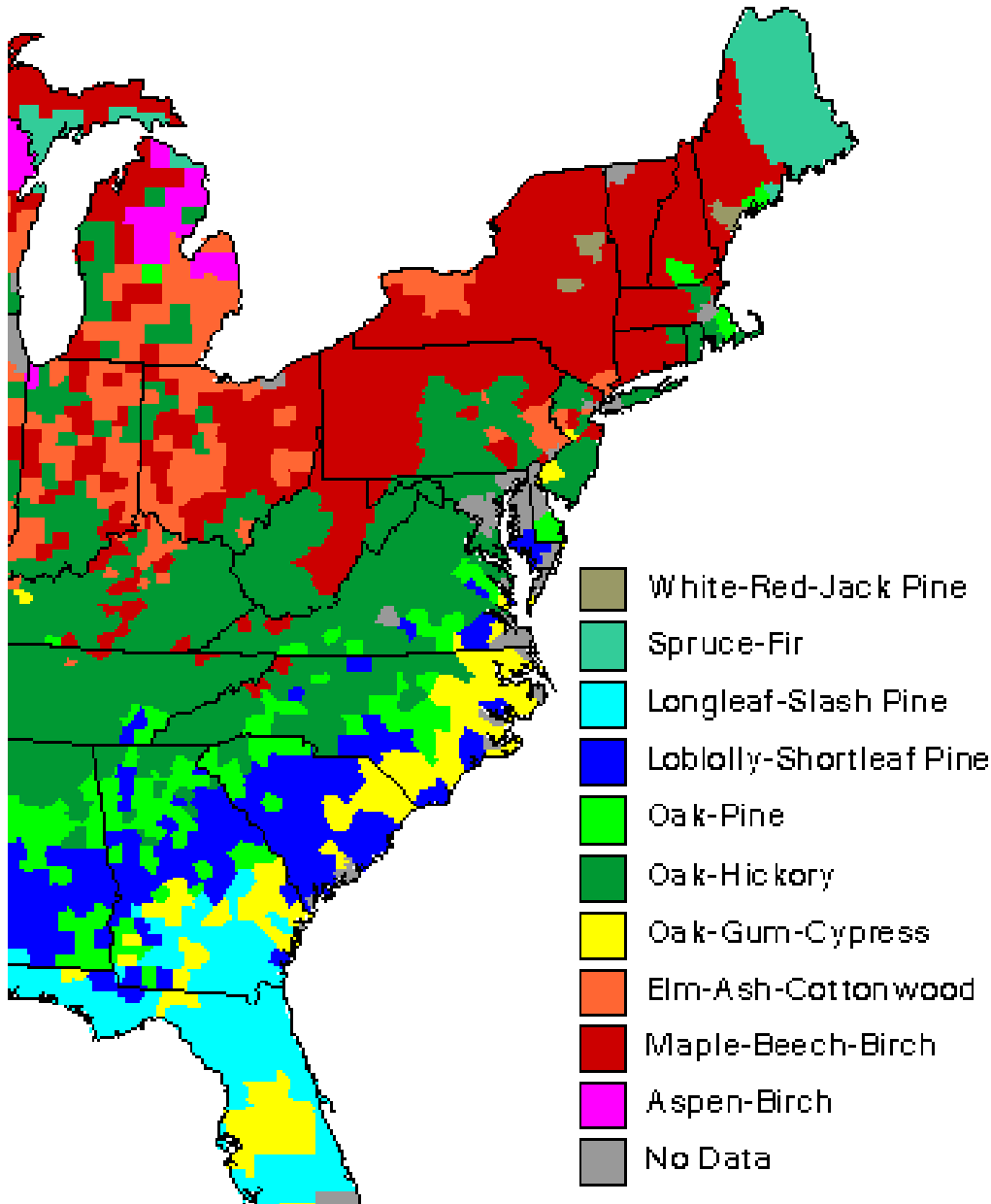
- **How can we enhance landowner participation in existing and emerging ecosystem service markets?**
- **What tools can we provide to state and local government to smartly manage growth and mitigate environmental impacts?**

Our \$25 billion Industry Needs Support to Conserve Forest Land!

- ◆ We can't get our water quality offshore
- ◆ We can't get our wildlife habitat offshore
- ◆ We can't get our viewsheds offshore
- ◆ We can't get our air quality offshore



Dominant Forest Type
Current FIA



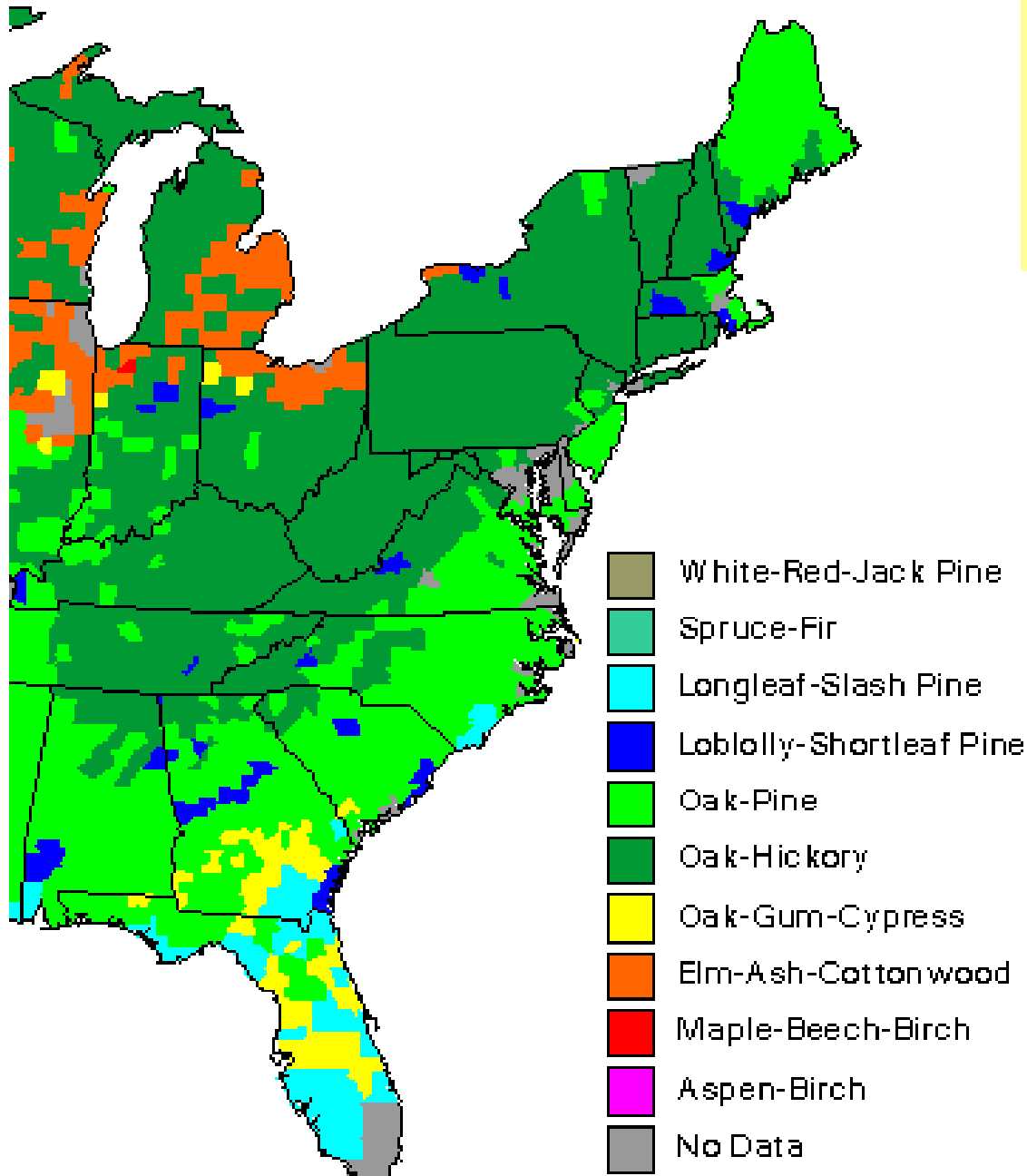
**A Climate Change Atlas for 80
Forest Tree Species of the
Eastern United States**

**Anantha M. Prasad and Louis R.
Iverson**

**USDA Forest Service,
Northeastern Research Station,**

**[http://www.nrs.fs.fed.
us/atlas/](http://www.nrs.fs.fed.us/atlas/)**

Average Forest Type (5-GCMs)



5 Models of Global Climate Change at 2X CO₂

All five models show an increase in importance for southern yellow pines and the xeric oaks

*NOTE: These predictions demonstrate potential changes in suitable habitat conducive to a particular species establishment

Summary of DOF Effort



- ◆ Ecosystem Service Workgroup
 - Identify “front-burner” services
 - Identify metrics for credit calculation
 - Explore opportunities for markets and ecosystem-based mitigation
 - Any effort must compliment existing state programs and regulatory drivers





Current Efforts

- ◆ Carbon Sequestration
- ◆ Water Quality
 - Nutrient load reduction
 - Sediment loading/infiltration
- ◆ Air Quality
- ◆ Wildlife/Biodiversity



**Increasing
degree of
difficulty**



Credit Calculation

The Foundation of the Effort

- ◆ Good metrics are important
 - Must be backed by science
 - Must meet existing regulatory criteria



QUALITY CREDIT

(Quantity for market or mitigation)





Additionality Test

To be considered for an offset credit:

- New forest management projects provide for ecosystem services above and beyond what currently is provided by existing forest lands.
- It is a choice between a technological solution and an environmental solution. *It is not “paying to pollute”*.

Examples: Cropland conversion for water quality nutrient load reduction, Afforestation for carbon sequestration

Environmental or Technological Solution?



AND/
OR



CAP



Why Favor Environmental Solutions?

	WWTP Upgrade	Forestry Practice
Pollutant of Concern	YES	YES
Other Pollutants	NO	YES
Wildlife Habitat	NO	YES
Carbon Sequestration	NO	YES
Stormwater Management	NO	YES
Recreation	NO	YES

Water Quality Efforts

(Sediment Load & Nutrient Load Reduction)

Chesapeake Bay Nutrient Credit Trading

- ◆ **DEQ/DCR have developed the regulations**
- ◆ **Practices**
 - Crop, hay, and pastureland conversion to forests
 - Ag BMPs that reduce Nitrogen and Phosphorus Loading
 - Must meet baseline requirements

Waste Water Treatment Plant



Water Quality Efforts

Sediment Load Reduction – Infiltration

◆ Practices

- Ag land conversion to Forest
- Stream restoration work

◆ Potential Applications

- Municipal water supplies (reservoir life, treatment costs)
- Stormwater management
- TMDLs



How Does Forest Cover Influence Air Quality?

Pollutants

(ozone, PM, SO_x, NO_x)

Objectives

- Determine a science based physical measure for air quality credits
- Explore voluntary mitigation opportunities or market-based solutions



Air Quality

Dr. David Nowak, USFS

Trees and Air Pollution

- Physiological – take in through stomata during photosynthesis
- Physical – aerodynamic drag and surface conductance causes surface deposition

Flux Equation ($F=VdC$)

- F is downward flux of air pollution
- Vd is velocity of deposition
- C is concentration of air pollutant

Basis for EPA allowing forest cover/tree canopy as a voluntary measure in State Implementation Plans (SIPs)



Developing the Tools (Virginia Tech Effort)



- ◆ Are creating a pilot GIS-enabled tract-based ecosystem service credit calculator tool that will provide spatially-referenced information
- ◆ Tool will incorporate existing GIS data and inventoried inputs (species, age, stocking)
- ◆ Starting with carbon (aboveground biomass) and water quality (sediment/nutrients)

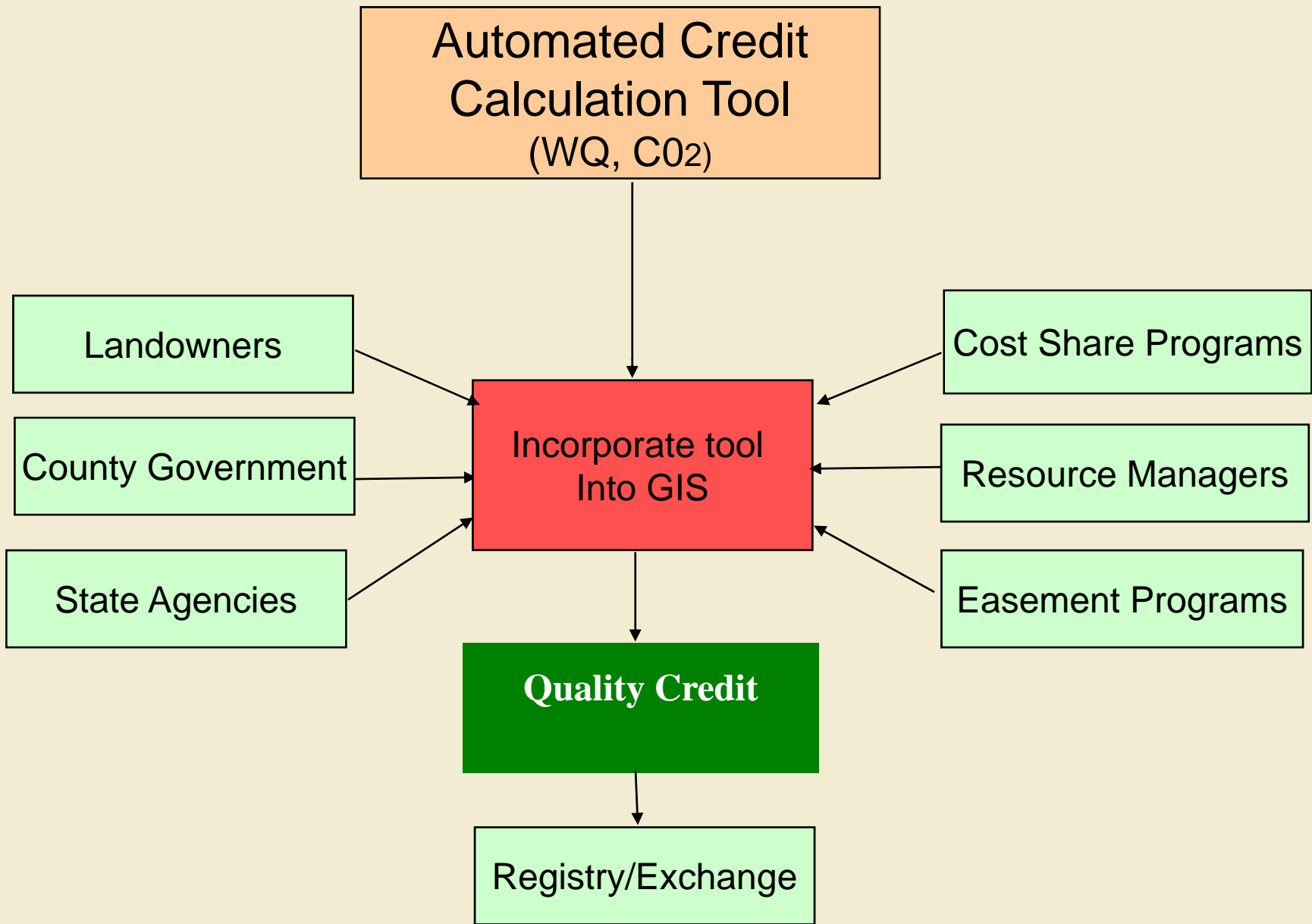


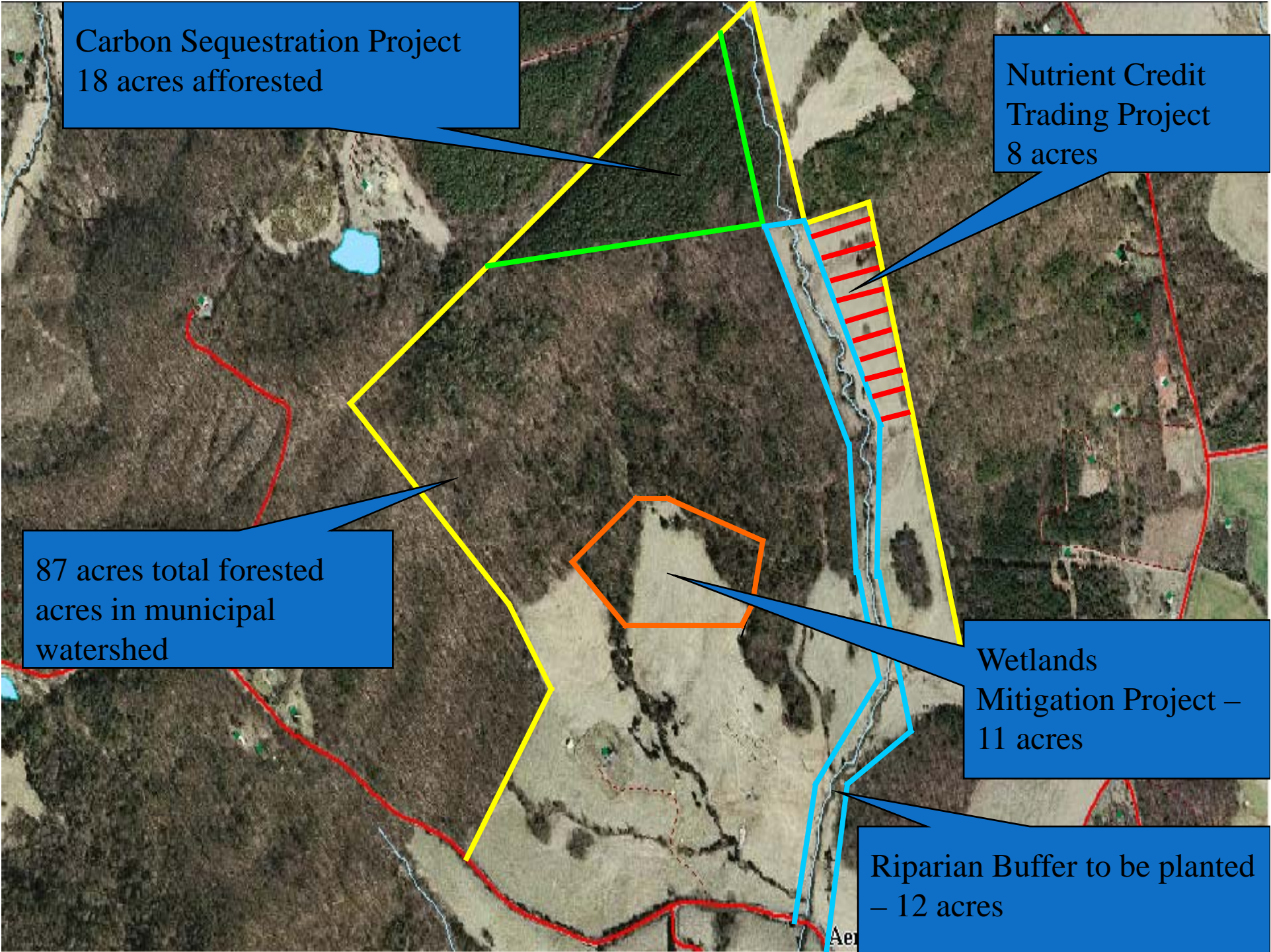
Developing the Tools (Carbon)



- ◆ User can select tract via spatial or database query, then calculate potential carbon storage for desired period
- ◆ Alternative land use and management options available for “what-if” scenarios (growth and yield model)







Carbon Sequestration Project
18 acres afforested

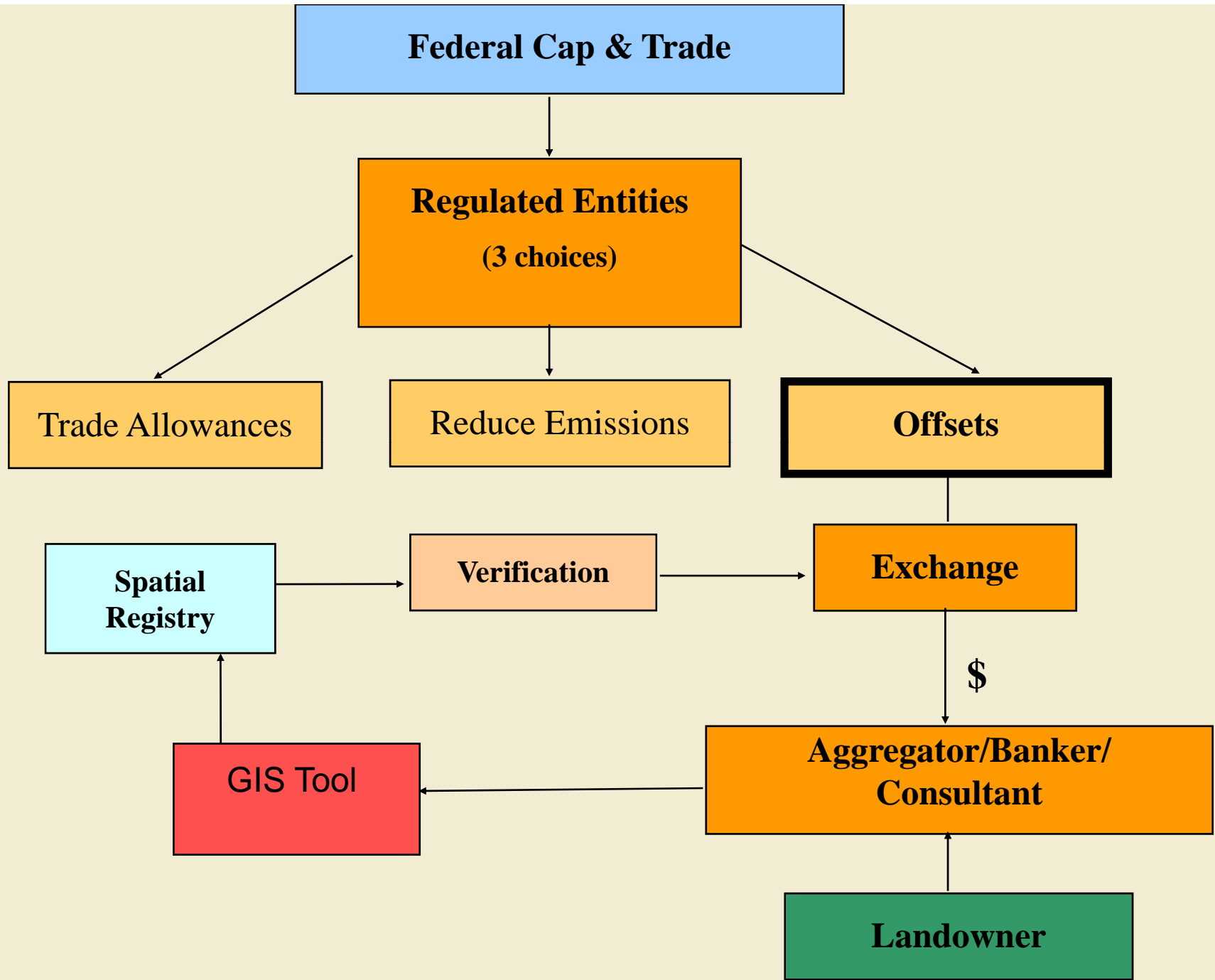
Nutrient Credit
Trading Project
8 acres

87 acres total forested
acres in municipal
watershed

Wetlands
Mitigation Project –
11 acres

Riparian Buffer to be planted
– 12 acres

Aer



Needs

1. Resource Managers trained in developing ecosystem service portfolios and marketing those services
2. Landowner Education
3. Cost analyses to enhance the landowner and community based decision making process
4. Development process must be dynamic to reflect legislation, existing agency programs, and regulatory drivers. Collaboration is needed.
5. Create a multiple-use product (markets, voluntary mitigation, land-use planning, program prioritization)
6. Marketing strategy for voluntary credit purchases (Corporate stewardship, socially responsible investing (SRI), public relations, etc.)
7. Progress forward is dependent on funding opportunities and bullet #4



SAVE THE DATE

Ecosystem Services: Marketing Environmental Solutions

March 12-13, 2009





Questions?

