SUSTAINABLE BIOMASS FROM U.S. FORESTS

Edie Sonne Hall| February 12, 2013

Presentation to Low Carbon Fuel Standard Sustainability Workgroup, California Air Resources Board

AGENDA

- **Intro to Weyerhaeuser, Intro to Catchlight Energy**
- **What are people's concerns about sustainability?**
- **Setting the Stage- practical issues with biomass traceability**
- **How can we address concerns?**
  - Risk Assessment
  - BMP effectiveness
- **What other information do we need?**
  - Current Weyerhaeuser research

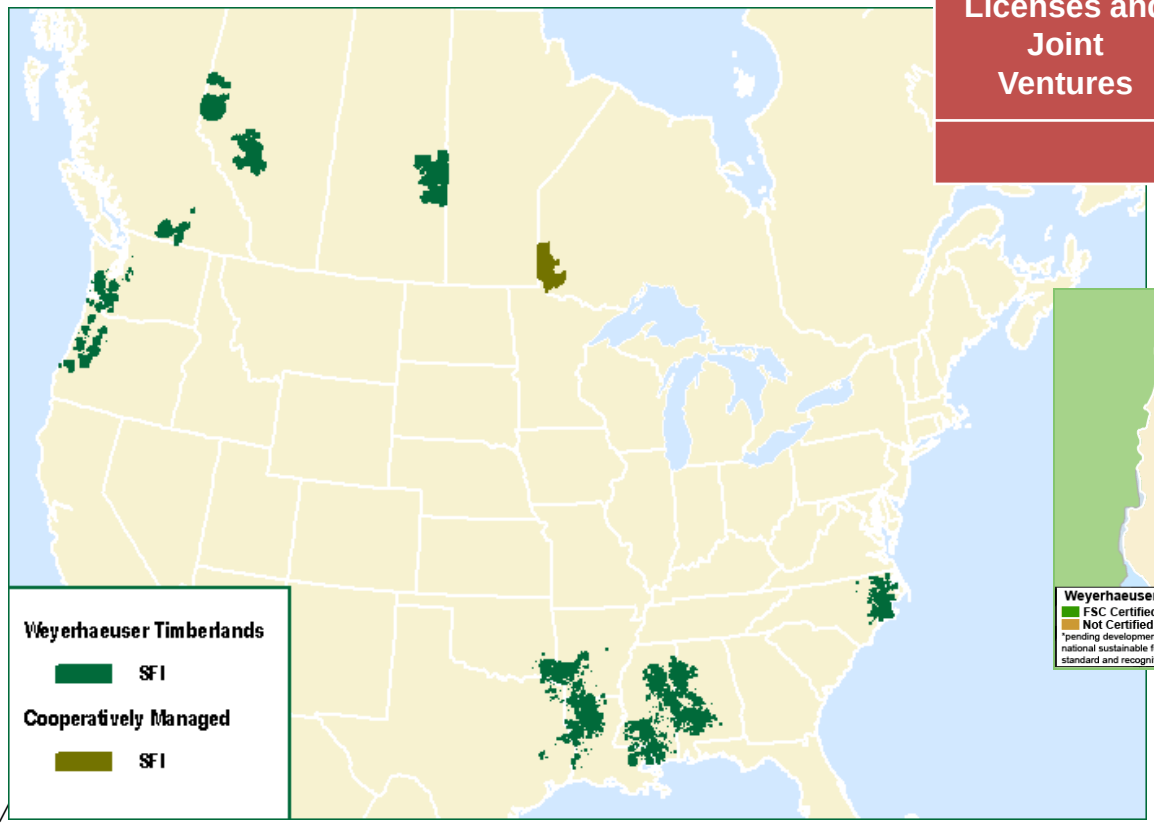
WEYERHAEUSER

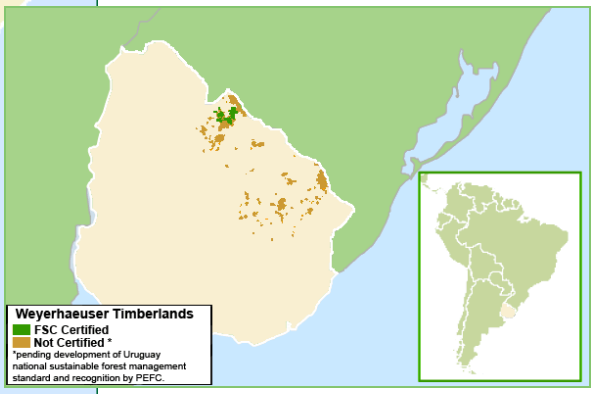
- **Integrated operations**

GLOBAL TIMBERLANDS

- **Focus on high quality sawtimber**
- **Sustainable forest management & third-party certification**

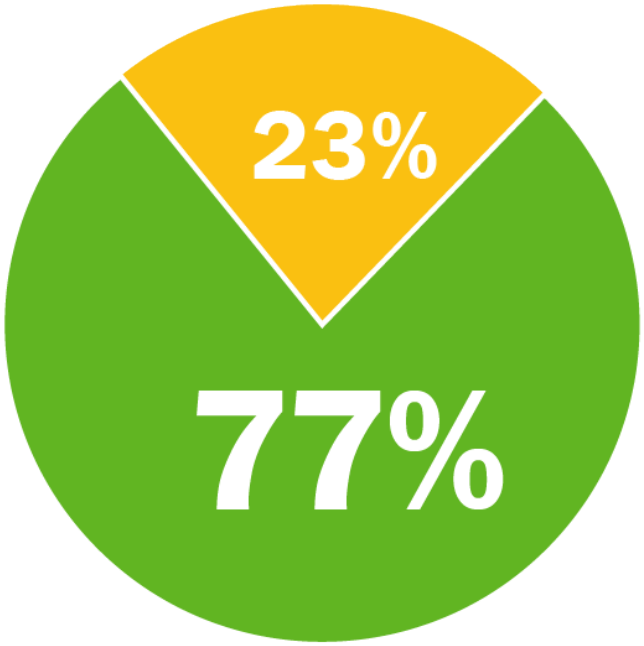
	Operating Regions	Acres
Fee lands	Southern US	4,114,000
	Western US	2,063,000
	Uruguay	341,000
Licenses and Joint Ventures	Canada	15,000,000
	Total	21,518,000





WEYERHAEUSER BIOENERGY USE

Percentage of energy consumed that was generated from biomass fuel, 2011



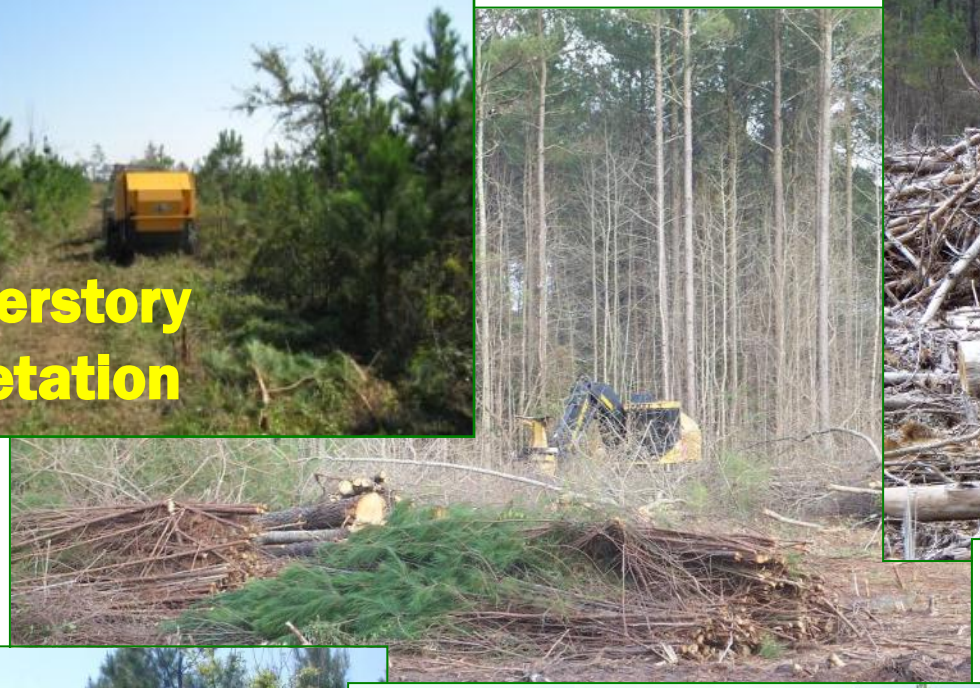
- *Biomass fuel*
- *Other fuel sources*

EMERGING BIOMASS MARKETS

- **Catchlight Energy**
  - 50/50 Chevron –Weyerhaeuser joint venture
  - Commercialize large scale production of liquid transportation fuels

End-to-End Value Chain Solution Leverages the Strengths of Two Natural Resource Leaders

SUSTAINABLE, FOREST-BASED SOURCES



ENVIRONMENTAL SUSTAINABILITY

As defined by CA LCFS…

Production and delivery of alternative fuels do not harm natural resources, such as land, water, air

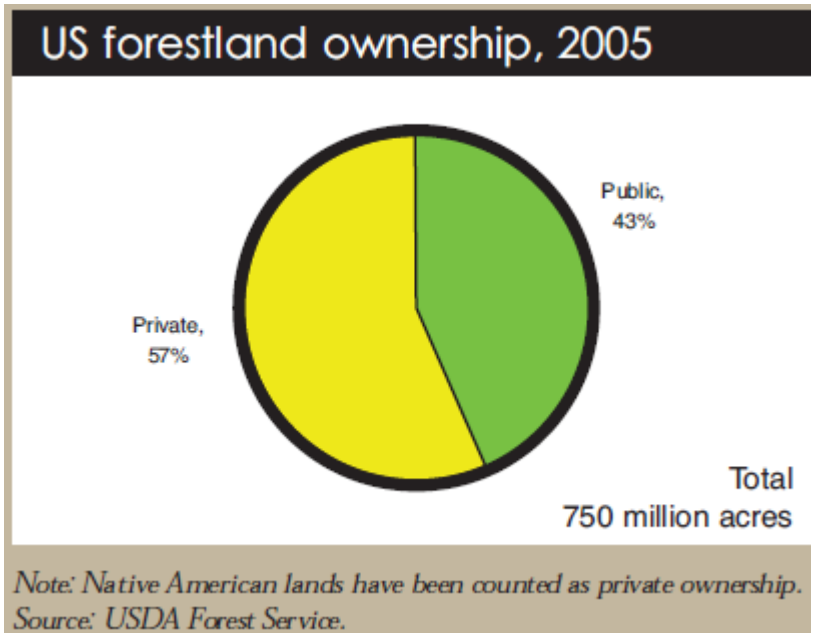
- **Land: soil quality, soil erosion, loss of biodiversity**
- **Water: water quality and availability**
- **Air: increased emission of criteria pollutants, toxic air pollutants, GHGs**

Seemingly logical solution to put requirements on fuels to prevent impacts on above….

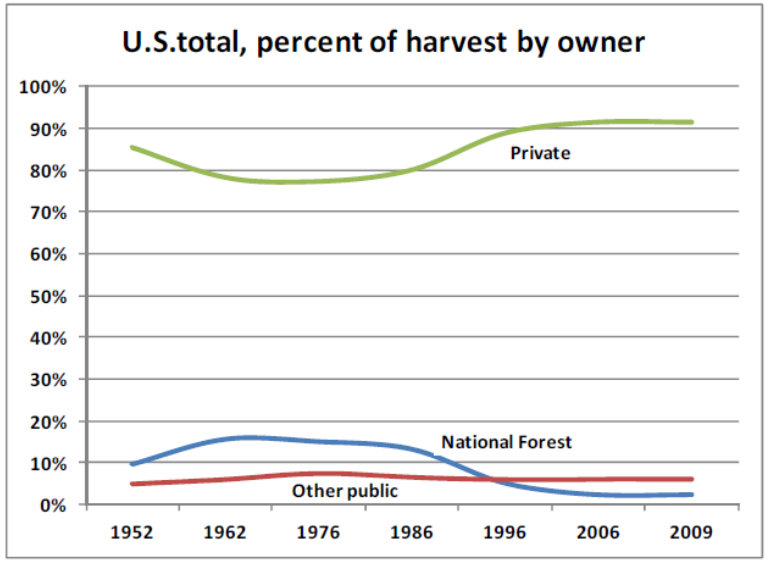
But it's not that easy, it may not be necessary, and doing so may have unintended consequences

SETTING THE STAGE- FORESTRY IN U.S.

- **~60% Forests Privately Owned**



- **And they produce ~90% harvest**



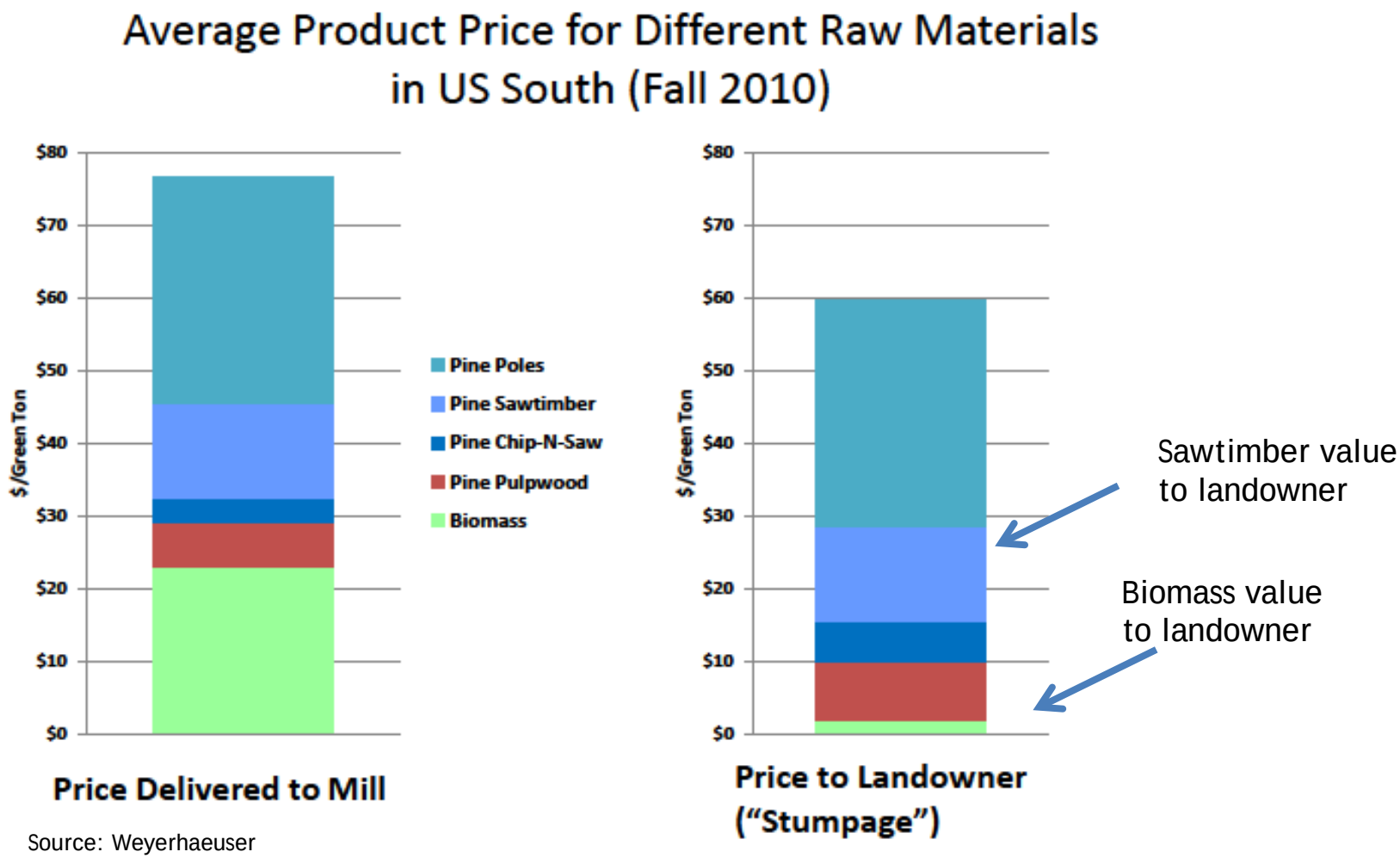
Source: U.S. Forest Service, Forest Inventory and Analysis

And 2/3 Private Land family forest owners.

INTEGRATED BUSINESS ECOSYSTEM

- One acre of land produces multiple "products" that will go to multiple destinations
- Landowners depend on ability to sort products (wood) to get highest value (large differences in value)

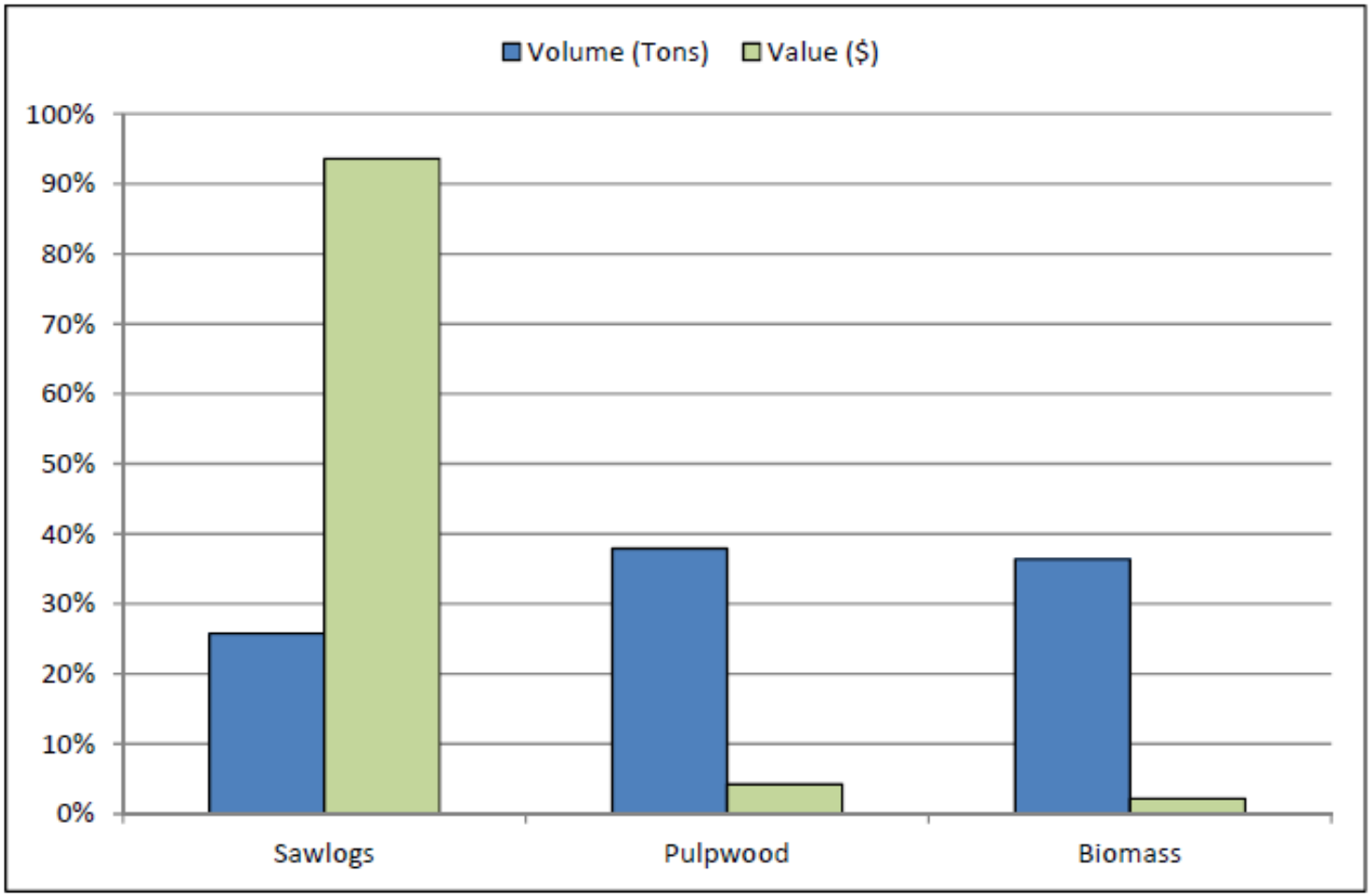
LARGE DIFFERENCES IN VALUE OF DIFFERENT WOOD PRODUCTS



Source: Weyerhaeuser

ANOTHER EXAMPLE FROM NORTHEAST

Figure 4. Volume and Value of Harvested Products, New Hampshire 2010[v]



Source: Kingsley, Eric *Importance of Biomass Energy Markets to Forestry: New England's Two Decades of Biomass Energy Experience* (2012)

U.S. BIOMASS SOURCING SCENARIOS

US biomass sourcing scenarios		
1. Producer motivation	2. Product and degree of processing	3. Supply chain
Primary products	Unprocessed: "roundwood"	Direct purchase from landowner
		Indirect purchase, via logger and/or broker
	Processed: chips produced "in woods"	Direct purchase from landowner
		Indirect purchase, via logger and/or broker
	Processed: chips produced at a chip mill; recovered paper	Direct purchase: N/A
		Indirect purchase, via chip mill (plus possibly logger and/or broker), recycling center
Byproducts or co-products	Unprocessed: harvest residuals	Direct purchase from landowner
		Indirect purchase, via logger and/or broker
	Processed: "residual chips," pulping byproducts, or "hog fuel"	Direct purchase: N/A
		Indirect purchase via sawmill, pulp mill (plus possibly logger and/or broker)

BOTTOMLINE

- **Difficult to trace back to the acre, especially for the lowest value material**

- **SO HOW CAN WE ADDRESS OUR SUSTAINABILITY CONCERNS?**

KEY LEARNINGS FROM FOREST CERTIFICATION

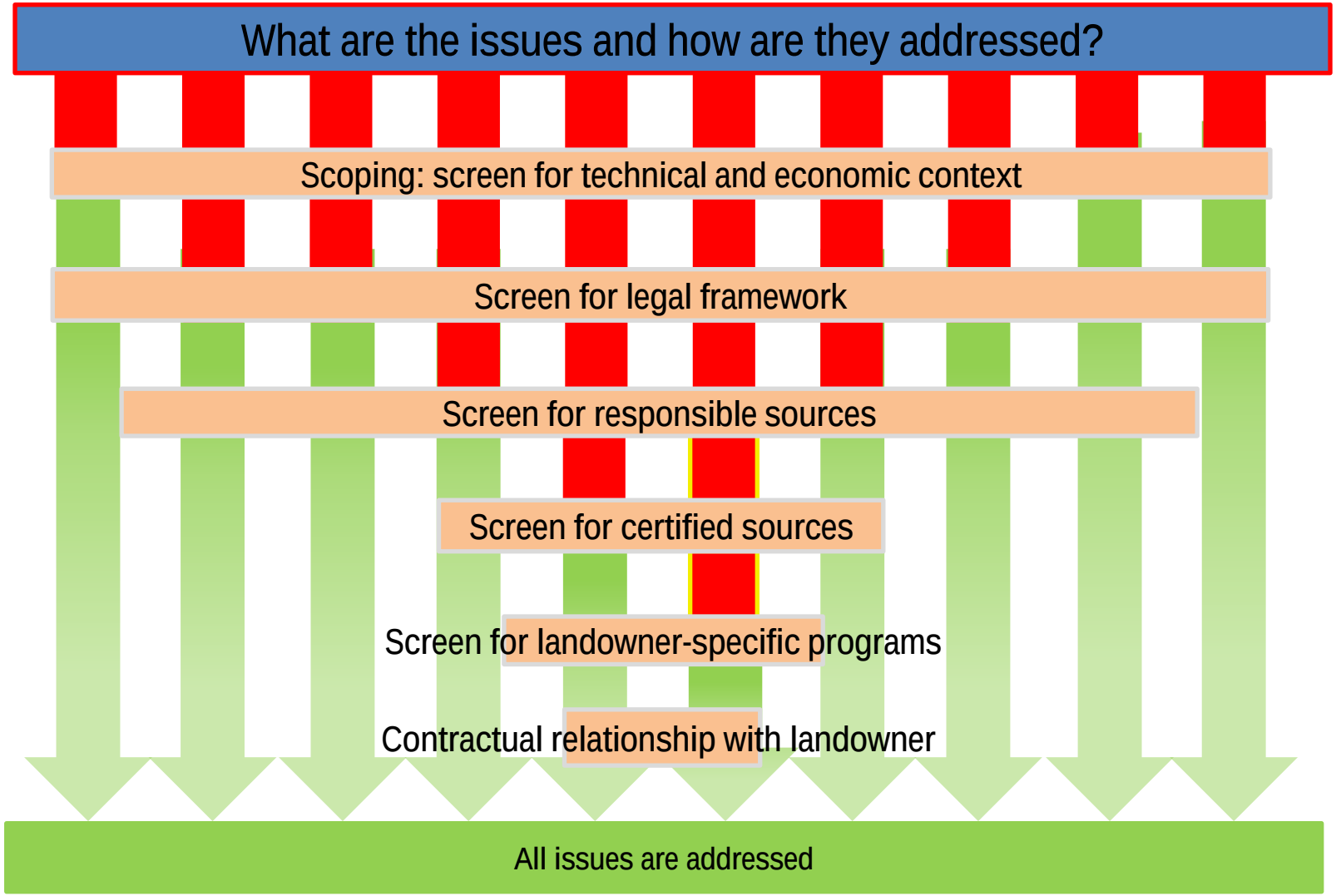
- **Need different tools for different situations**
  - Sources will not all be certified, especially in the U.S. where 10 million family forest owners produce most commercial wood
  - Some places will have comprehensive controls, e.g., through regulation, and some will not
- **Want a range of programmatic and landowner-specific solutions**
  - Leveraging programmatic solutions can reduce costs, increase supply, avoid competitive risks, and build political support (e.g. State forestry bmp programs)
- **It all starts with traceability (and understanding its limits)**
  - Must be able to trace supplies sufficiently to meet requirements, substantiate claims
  - Conversely, do not impose requirements or ask for claims that exceed feasible tracing

SUPPLY CHAIN/RISK ANALYSIS FRAMEWORK

Background – why this approach

- **Wood of all types is a commodity with complex supply chains, efficiency driver**
- **Suite of common issues identified in laws, standards**
- **Want a framework that delivers affordable biomass from good sources and supports claims**
  - Meets legal requirements / qualifications
  - Doesn't run afoul of trade laws
  - Market expectations - governed by Green Guides, from consumer perspective
- **Approach:**
  - Due diligence: risk assessment upstream from the converter
  - Risk management: consider controls in place and supplement where needed
  - Substantiation: verification as needed to support claims

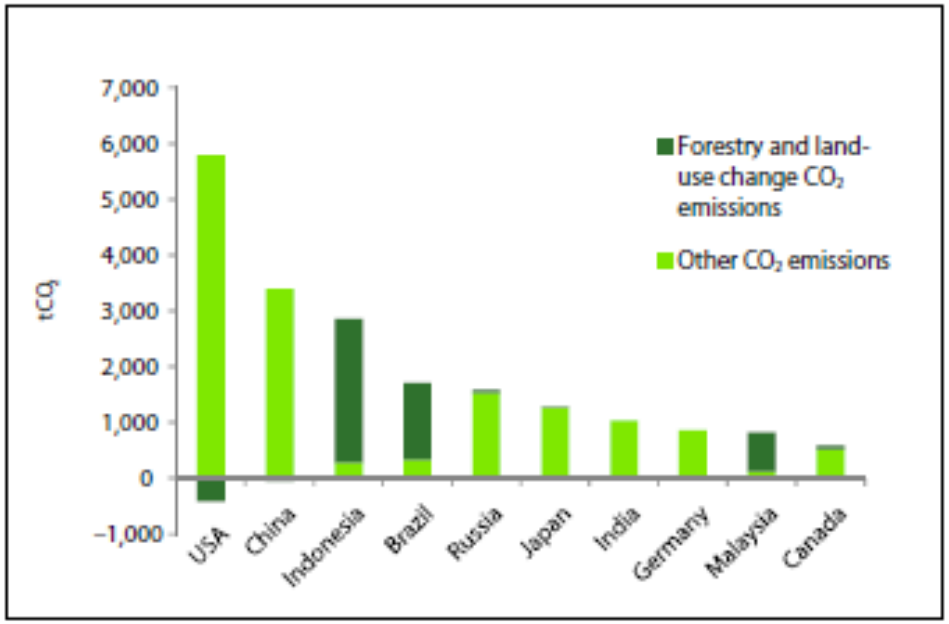
CONCEPTUAL FRAMEWORK



A FEW EXAMPLES…

LANDUSE CHANGE– TECHNICAL AND ECONOMIC CONTEXT

Figure 1.2. Forestry and land-use change emissions as a portion of total emissions for top ten emitters in 2000.



- **"Not spread evenly throughout the world"**
- **Inversely correlated with wood product markets**
  - 2011 USFS study: "lowest rates of deforestation . . . occur in global regions with the highest rates of forest product output"

Source: Madeira, Erin Myers, Lydia Olander, William Boyd, Kathleen Lawlor, and John O. Niles, *The Crucial Role of Forests in Combating Climate Change, at 3, Nicholas Institute for Environmental Studies NI PB 09-05 (June 2009), available at http://nicholasinstitute.duke.edu/ecosystem/redd-papers-for-us-policymakers/the-curcial-role-of-forests-in-combating-climate-change*

Ince, Peter J., *Global Sustainable Timber Supply and Demand,* available at http://blogs.usda.gov/2011/05/19/high-wood-product-output-doesn%e2%80%99t-correlate-to-higher-carbon-emissions-according-to-us-forest-service-research/

U.S. FOREST LAND IS STABLE

- **Area of U.S. forest land has been stable for decades**

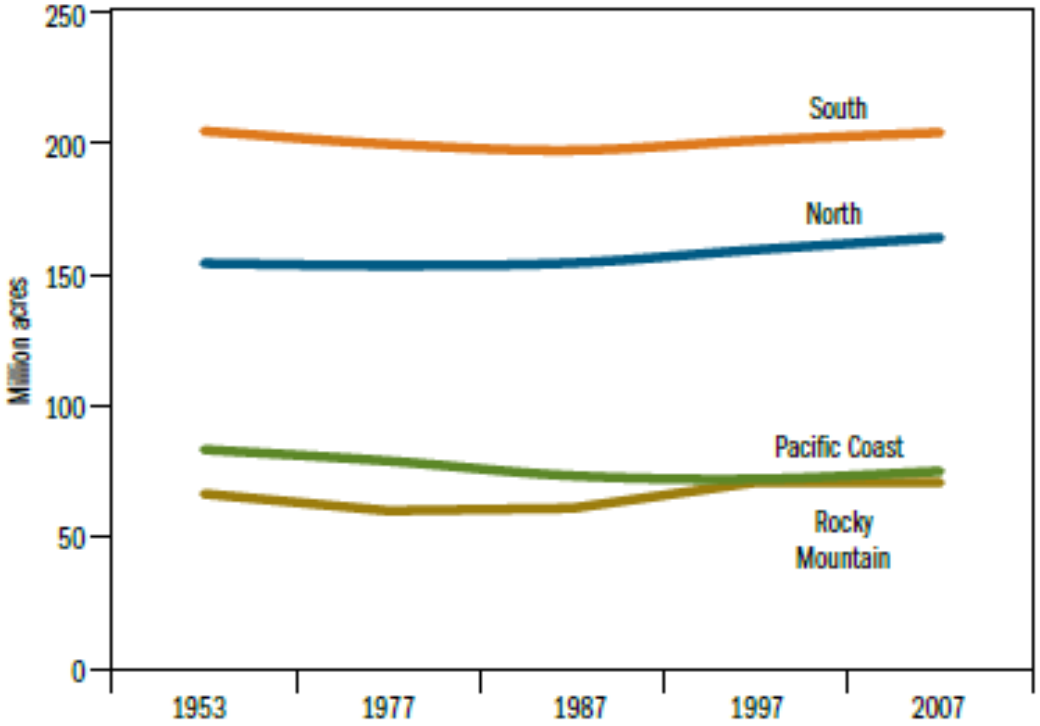
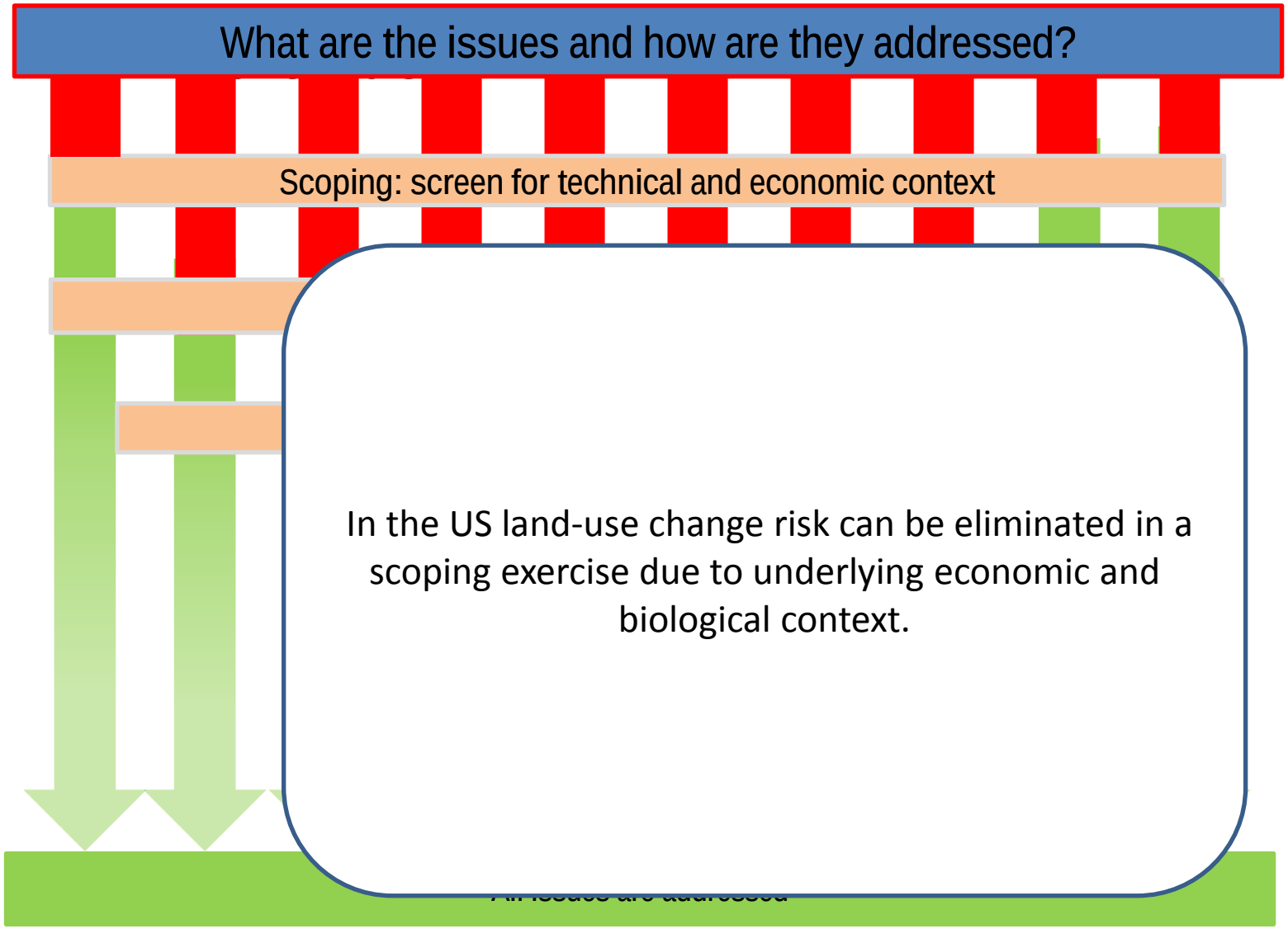


Figure 5a.1. Trends in timberland area by major region, 1953–2007.

Source: Smith et. al. 2007. Forest Resources of the United States 2007. USDA-Forest Service.

LANDUSE CHANGE SCREEN



WATER QUALITY IMPACTS

- **Best management practices for water quality are in every state with significant forestry activities. Some are enforced through regulation; some are implemented through voluntary programs.**

- **Even voluntary BMPs have high rate of compliance in forestry. 89% total compliance and climbing (Ice et al. 2010)**

Ice, G.G., E. Schilling, and J. Vowell. 2010. Trends for forestry best management practices implementation. *Journal of Forestry* 108 (6): 267-273.

BEST MANAGEMENT PRACTICES

Forestry BMPs are based on a common set of science-based principles and when implemented are effective at protecting water quality.

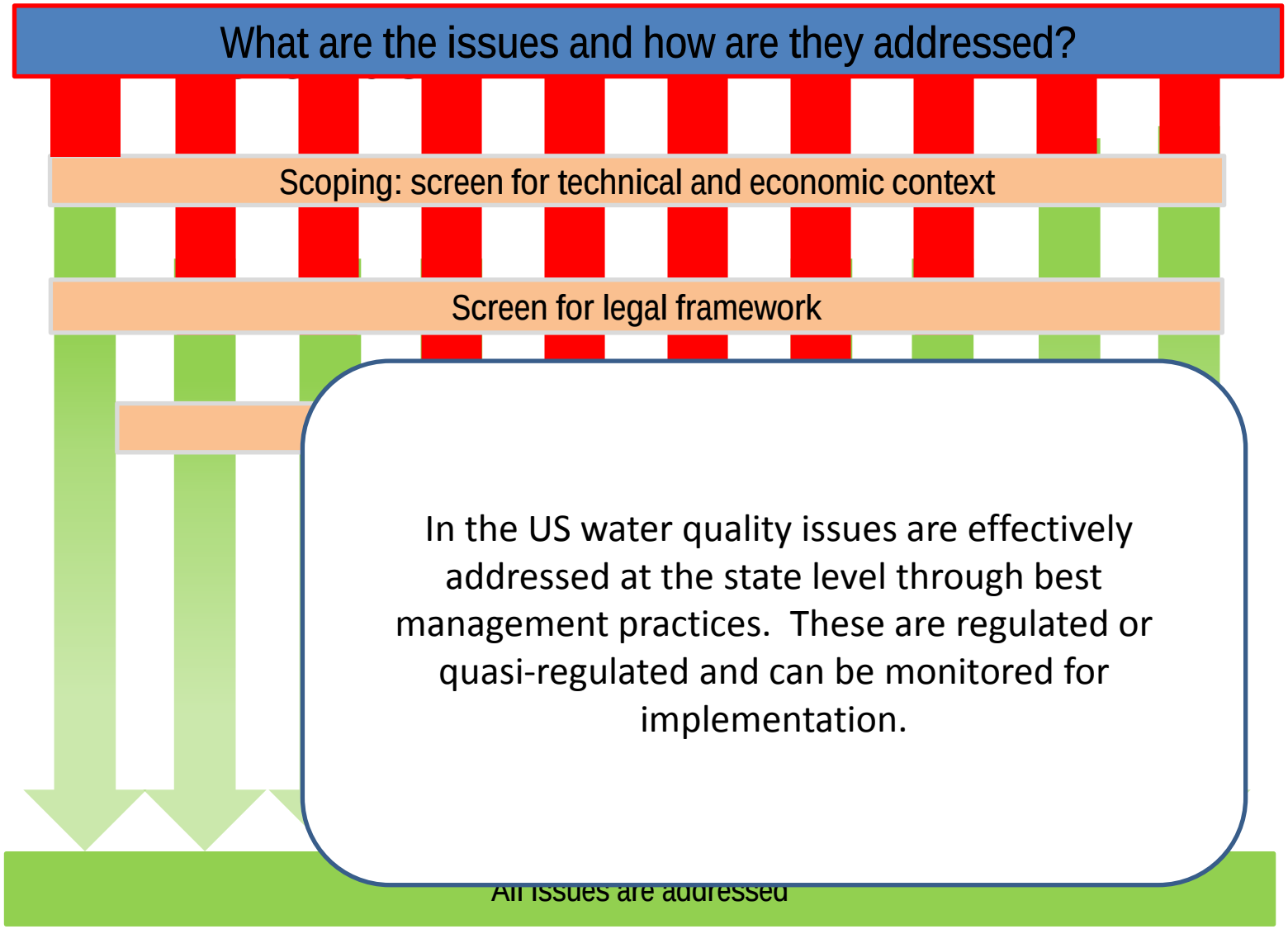
- See Shepard, J.P., W.M. Aust, C.A. Dolloff, G.G. Ice, and R. Kolka. [Eds]. 2004. Forestry Best Management practices research in the Eastern United States: The state of the science 2002. *Water, Air, & Soil Pollution: Focus* 4(1).
- Ice, G.G. 2005. Are forest Best Management Practices (BMPs) effective? In 2004 CIF/SAF Proceedings: *One forest under two flags (Une foret sous deux drapeaux).* Society of American Foresters-CD, Bethesday, MD.
- Ice, G.G. 2005. BMP effectiveness and related water issues. In Proceeding of the Louisiana Natural Resources Symposium, Louisiana State University, Baton Rouge, LA.
- Olszewski, R. and R. Jackson. 2006. Best Management Practices and water quality. 1-11 in *A Primer on the Top Ten Forest Environmental and Sustainability Issues in the Southern United States.* Special Report 06-06, National Council for Air and Stream Improvement, Inc., Research Triangle Park, NC.

WESTERN STATES REPORT

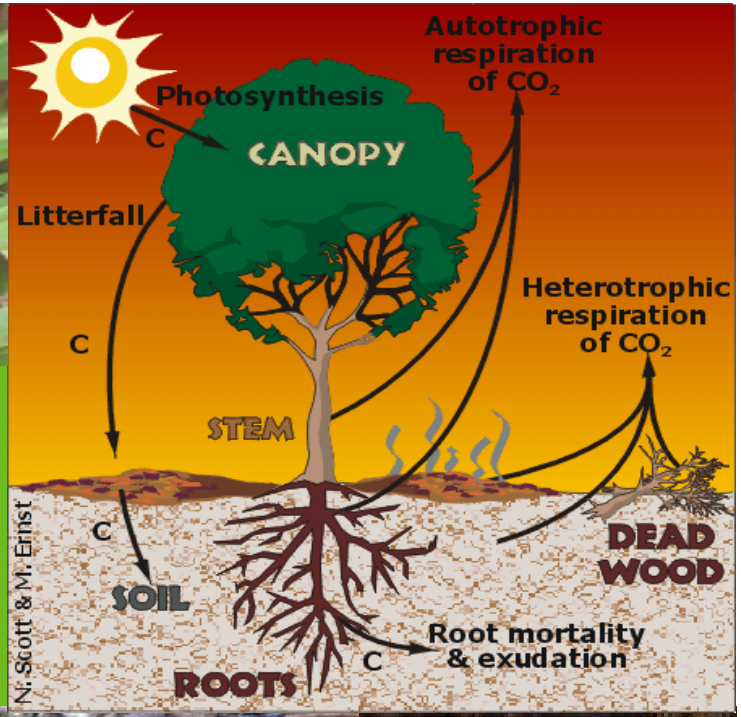
"In summary, each of the states that have assessed implementation of BMPs (eight out of 17 states) indicated BMP compliance to be relatively high. The implementation rates ranged from 75% to 97%. Additionally, the states that have conducted BMP effectiveness monitoring (nine out of 17 states) have shown that BMPs, when properly implemented, are effective in protecting water resources."

- Council of Western State Foresters. 2007. *Forestry Best Management Practices for Western States: a summary of approaches to water quality implementation and effectiveness monitoring*.

WATER QUALITY SCREEN



WEYERHAEUSER RESEARCH

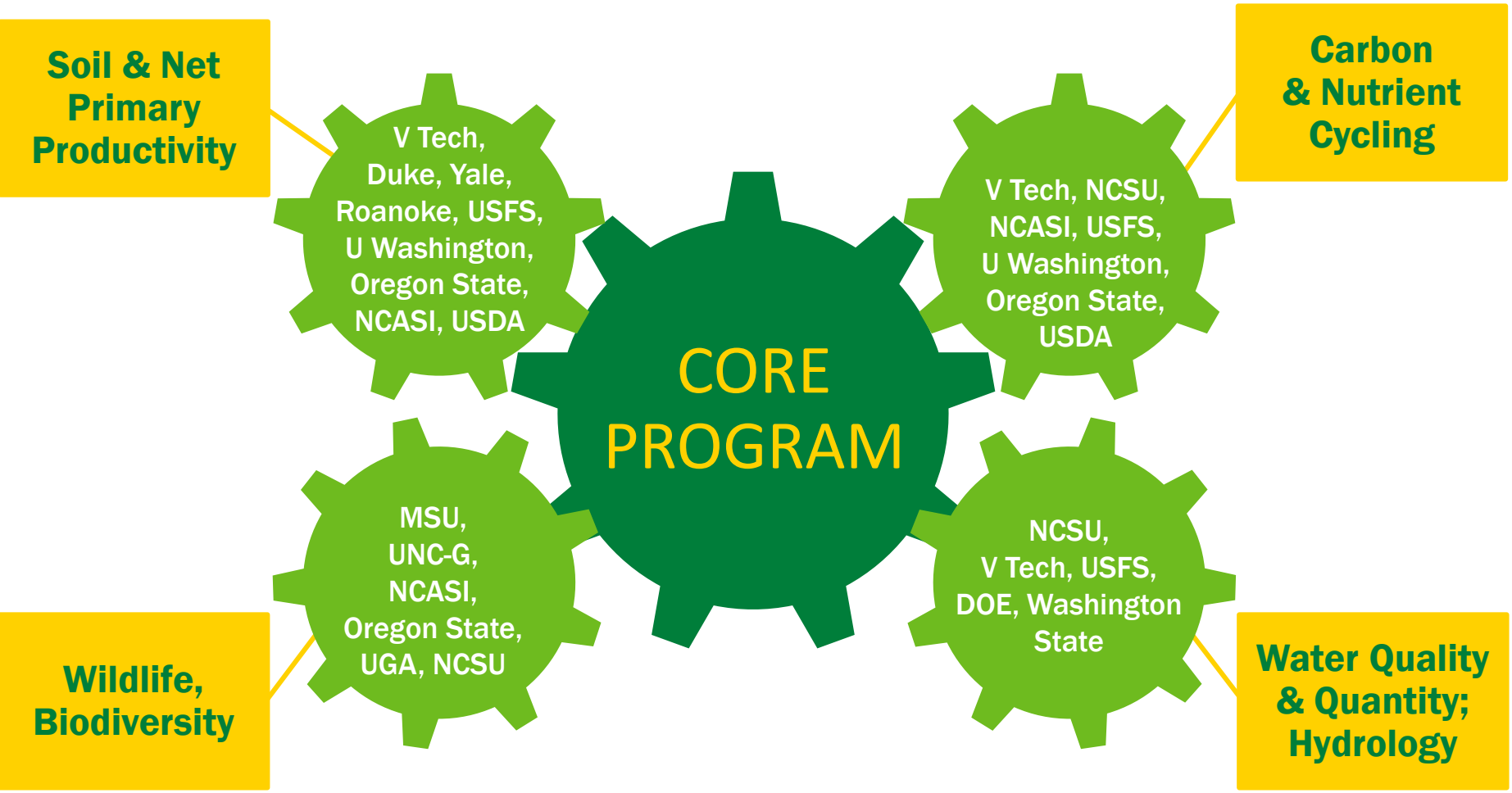


BIOMASS SUSTAINABILITY RESEARCH

BIOMASS HARVESTING RESEARCH PLATFORM

- **Soil productivity and nutrients**
  - Intercropping
  - Soil physical properties (e.g., compaction)
  - Nutrient cycling
- **Water**
  - Water quality and quantity
- **Biodiversity**
  - Vegetation/habitat response
  - Wildlife community response
- **Plus carbon LCA – Life Cycle Analysis**
  - Above and below ground carbon stocks
  - Balance of carbon uptake and release
  - Greenhouse gas emissions (CH_4, N_2O, CO_2)

RESEARCH STRATEGY



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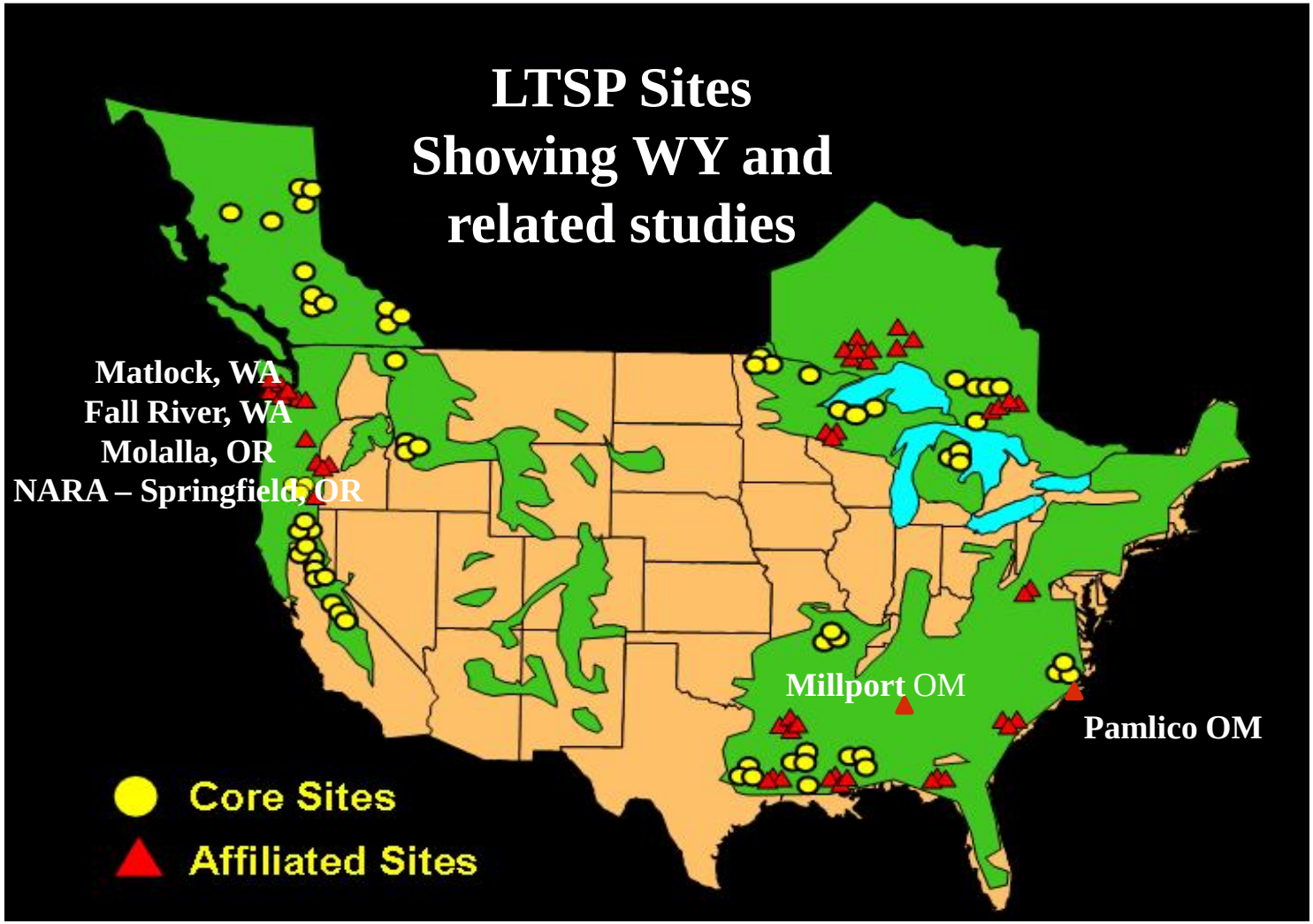
SOIL PRODUCTIVITY AND NUTRIENTS

- **SOUTH- Long-term Sustainability Studies**
  - Impact of intensive biomass harvesting and intercropping
    - Tree Productivity
    - Nutrient Availability
    - Soil Compaction
    - Carbon Sequestration
  - Organic matter manipulation studies
    - Organic matter tracing (angio- vs. gymnosperms, roots vs. litterfall, etc.)
- **WEST- Long Term Site Productivity sites**
  - Biomass harvesting effects (Tree growth, Soil nutrients / carbon, Water / Wildlife)
  - Soil Carbon Change
    - Harvest effects on Soil Carbon sequestration / C budget

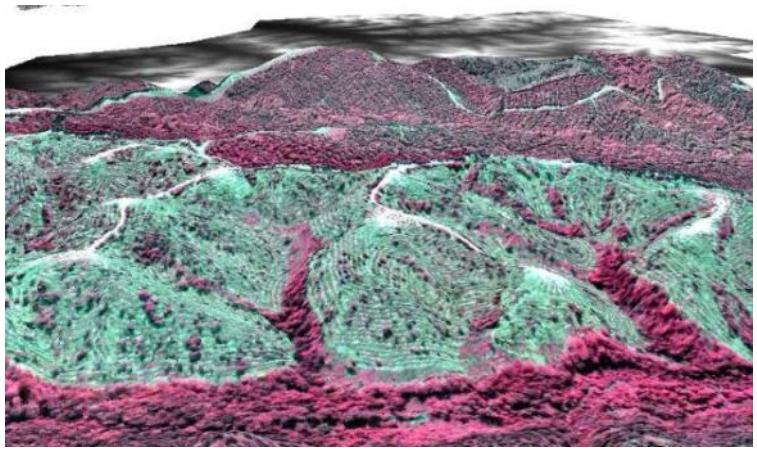
LTSP NETWORK



BIOFUEL SUSTAINABILITY AND WATER RESOURCES

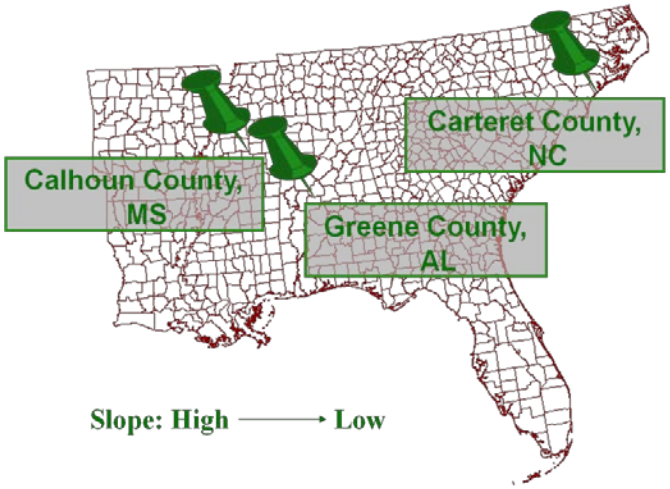
Water Resources Research

- **Water Quality**
  - Nutrients
  - Sediment
  - Temperature
- **Water Quantity**
  - Plant water use
  - Infiltration
- **Aquatic Biology**



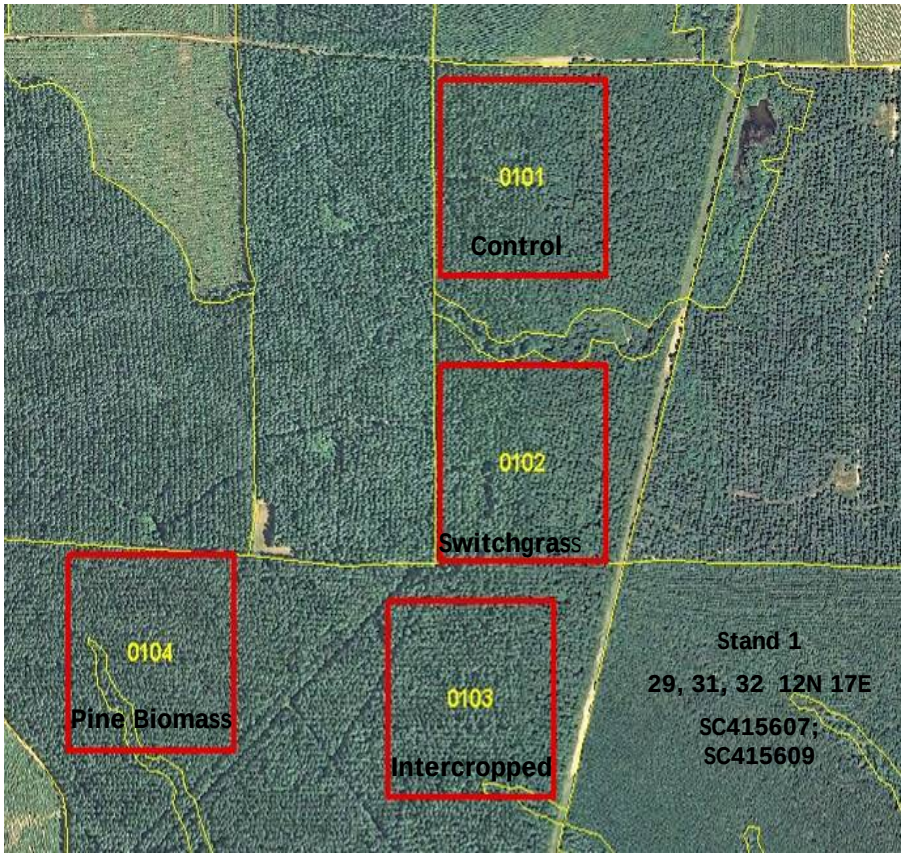
Southwide Watershed studies

- 14 highly instrumented watersheds in 3 states
- Management tract-level research
- Plot to landscape modeling
- BMP guidance
- Integrated with soils, wildlife, and productivity research



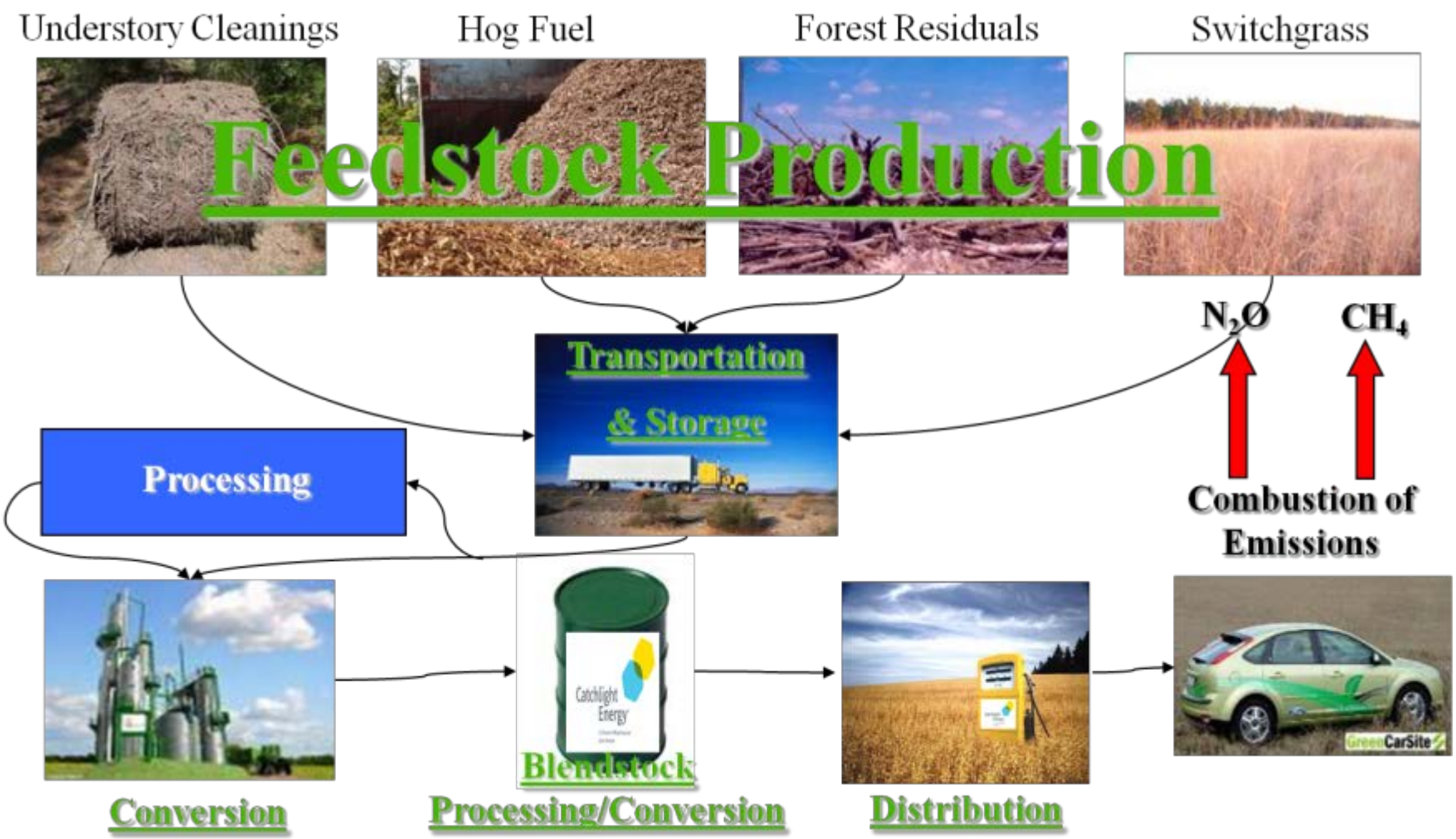
BIODIVERSITY & BIOMASS PRODUCTION

- **Understand relationships between biomass production and biodiversity**
  - Response of wildlife and plant communities to biomass removal and establishment of a native biomass crop in intensively managed pine stands
- **E.g., rodents & herptofauna**
  - Associated with down woody debris
  - Sensitive to changes in habitat structure and microclimate



Example of 4 treatments within each block (N = 6)

LIFE CYCLE ANALYSIS MODELING



COLLABORATIVE RESEARCH IS ESSENTIAL

- **We want to:**
  - Share results and methods
  - Advance the science
  - Provide science-based information for public policy discussion and decision
    - E.g., criteria defining eligible biomass
- **Requires scientifically sound and widely accepted evaluation of environmental effects**

THANK YOU