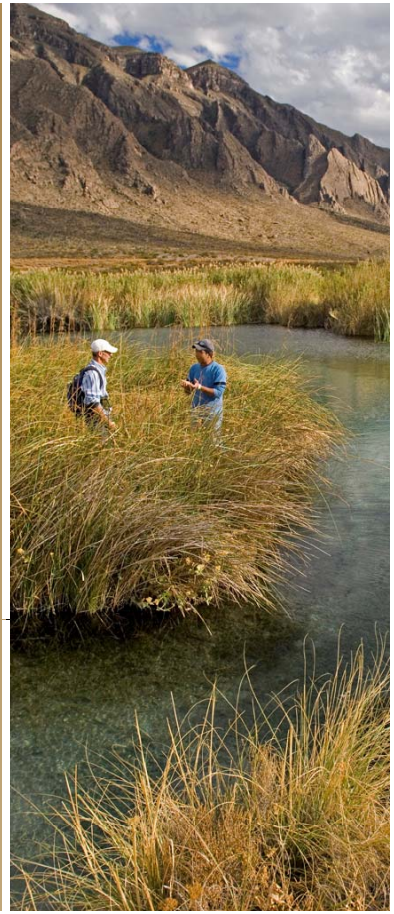
The Nature Conservancy

Protecting nature. Preserving life.

The Nature Conservancy's Perspective on Sustainable Woody Biomass Utilization and Project Development in the Interior West

David J. Ganz, PhD



Why is a conservation organization interested in promoting sustainable woody biomass utilization?

- Conservation *for* people rather than conservation *from* people.

- Scale and magnitude of the wildfire and forest health issues in the interior west. It is predicted that 80% of federal forests may experience uncharacteristically high severity wildfire threatening the delivery of a wide variety of ecosystem goods and services.

- Retention of a forestry sector is important for restoration treatments at a meaningful scale.

Advantages of Biomass Power

Provides base-load renewable energy(24/7) on a cost effective basis.

Has numerous societal benefits:

- Supports hazardous fuels reduction
- Reduces waste material destined for landfills
- Net improvement in air quality
- Provides employment (4.9 jobs/MW)
- Can be located near existing transportation/distribution system

Biomass Project Development -

Deal Killer Issues to Consider

Community Support

Fuel Supply

- Sustainability

Project Economics

- Transportation

Appropriate Technology

Siting/Infrastructure

- Existing infrastructure
- New siting analysis

Community Support

Best to have grass roots support.

Poll key stakeholders:

- Local peer groups
  - Board of Supervisors
  - Chamber of Commerce
  - Environmental organizations
  - Local, State and Federal agency representatives
  - Private sector resource managers, landowners

White Mountains Multi-Party Monitoring Board

Apache-Sitgreaves National Forests
Apache County
Apache County NRCD
Arizona Game and Fish Department
Arizona Wildlife Federation
Creative Green Homes, LLC
Eastern Arizona Counties
Ecological Restoration Institute
Life in the Forest, Inc.
Navajo County
The Nature Conservancy
Town of Eagar
U of A Cooperative Extension, Navajo County
White Mountain Conservation League

Stewardship Contracting: Multi-Party Monitoring in the White Mountains

- Required multi-party monitoring (*social, economic, ecological*)
- Monitoring Board provides input to USFS on priority monitoring objectives
- Board reviews data, provides input, may assist in monitoring
- Results incorporated in future planning efforts

Multi-Party Monitoring Board

- Convened when contract signed
- First year developing priorities; expert input; some protocols; initiated baseline studies
  - Social:
    - *ASU Doctoral social study*
  - Economic:
    - *Cluster study on forest industries*
  - Ecological:
    - *Multiple studies*

Fuel Supply – Conventional wisdom

Typically considered sustainable long term supply located within close proximity (25 to 75 mile radius)

Economically available

Environmentally available

Meets quality specifications

Available in quantities and from diverse sources that will support project financing:

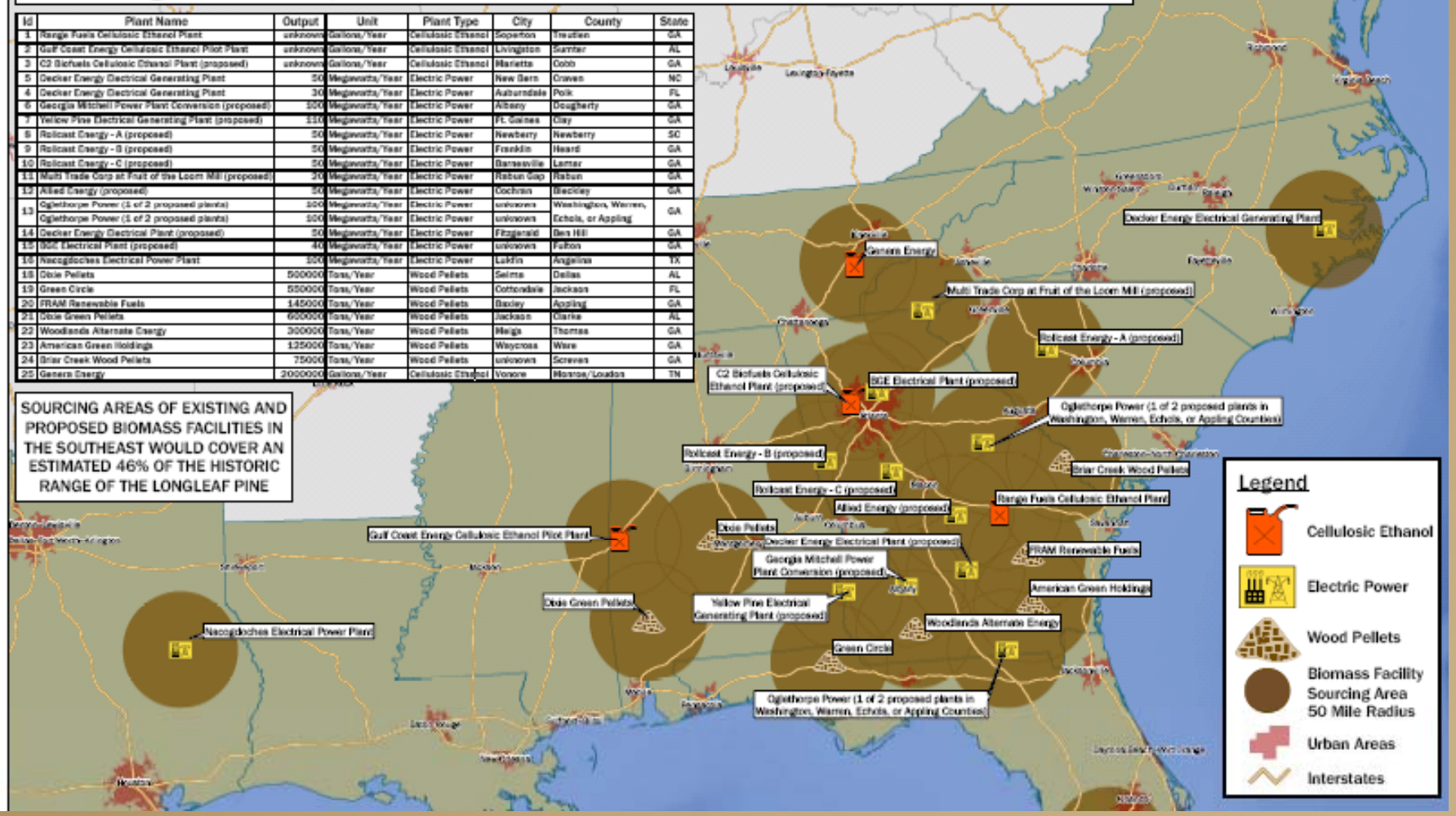
» Minimum 10 year supply, 70% under contract

Traditional Paradigm

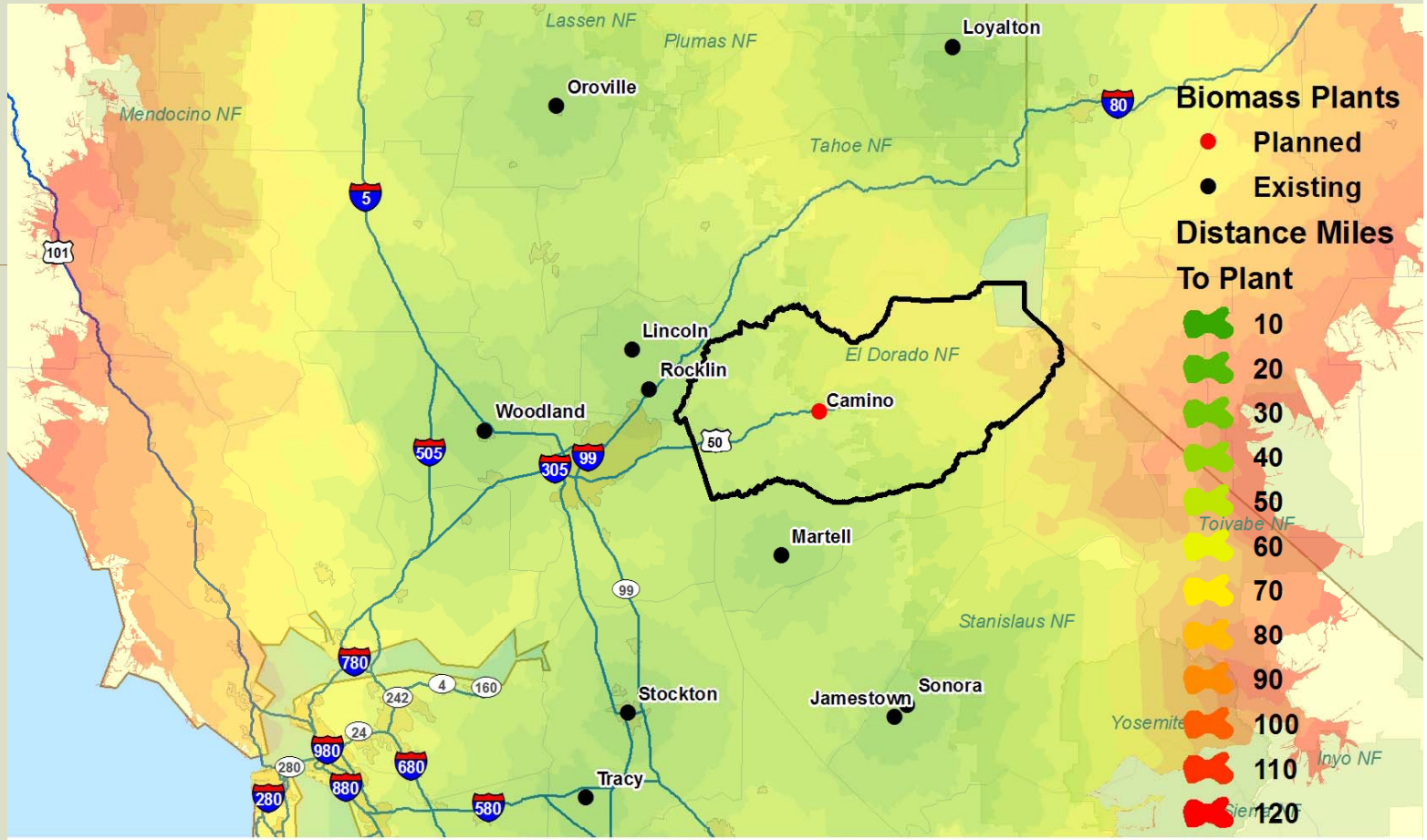
Existing and Proposed Biomass Facilities in the Southeast

Id	Plant Name	Output	Unit	Plant Type	City	County	State
1	Range Fuels Cellulosic Ethanol Plant	unknown	Gallons/Year	Cellulosic Ethanol	Soperton	Treutlen	GA
2	Gulf Coast Energy Cellulosic Ethanol Pilot Plant	unknown	Gallons/Year	Cellulosic Ethanol	Livingston	Sumter	AL
3	C2 Biofuels Cellulosic Ethanol Plant (proposed)	unknown	Gallons/Year	Cellulosic Ethanol	Marietta	Cobb	GA
5	Decker Energy Electrical Generating Plant	50	Megawatts/Year	Electric Power	New Bern	Craven	NC
4	Decker Energy Electrical Generating Plant	30	Megawatts/Year	Electric Power	Auburndale	Polk	FL
6	Georgia Mitchell Power Plant Conversion (proposed)	100	Megawatts/Year	Electric Power	Albany	Dougherty	GA
7	Yellow Pine Electrical Generating Plant (proposed)	110	Megawatts/Year	Electric Power	Ft. Gaines	Clay	GA
8	Rolicast Energy - A (proposed)	50	Megawatts/Year	Electric Power	Newberry	Newberry	SC
9	Rolicast Energy - B (proposed)	50	Megawatts/Year	Electric Power	Franklin	Heard	GA
10	Rolicast Energy - C (proposed)	50	Megawatts/Year	Electric Power	Barnesville	Lamar	GA
11	Multi Trade Corp at Fruit of the Loom Mill (proposed)	20	Megawatts/Year	Electric Power	Rabun Gap	Rabun	GA
12	Allied Energy (proposed)	50	Megawatts/Year	Electric Power	Cochran	Bleckley	GA
13	Oglethorpe Power (1 of 2 proposed plants)	100	Megawatts/Year	Electric Power	unknown	Washington, Warren,	GA
	Oglethorpe Power (1 of 2 proposed plants)	100	Megawatts/Year	Electric Power	unknown	Echols, or Appling	
14	Decker Energy Electrical Plant (proposed)	50	Megawatts/Year	Electric Power	Fitzgerald	Ben Hill	GA
15	SGE Electrical Plant (proposed)	40	Megawatts/Year	Electric Power	unknown	Fulton	GA
16	Nacogdoches Electrical Power Plant	100	Megawatts/Year	Electric Power	Lufkin	Angelina	TX
18	Dixie Pellets	500000	Tons/Year	Wood Pellets	Selma	Dallas	AL
19	Green Circle	550000	Tons/Year	Wood Pellets	Cottondale	Jackson	FL
20	FRAM Renewable Fuels	145000	Tons/Year	Wood Pellets	Baxley	Appling	GA
21	Dixie Green Pellets	600000	Tons/Year	Wood Pellets	Jackson	Clarke	AL
22	Woodlands Alternate Energy	300000	Tons/Year	Wood Pellets	Meigs	Thomas	GA
23	American Green Holdings	125000	Tons/Year	Wood Pellets	Waycross	Ware	GA
24	Briar Creek Wood Pellets	75000	Tons/Year	Wood Pellets	unknown	Screven	GA
25	Genera Energy	2000000	Gallons/Year	Cellulosic Ethanol	Vonore	Monroe/Loudon	TN

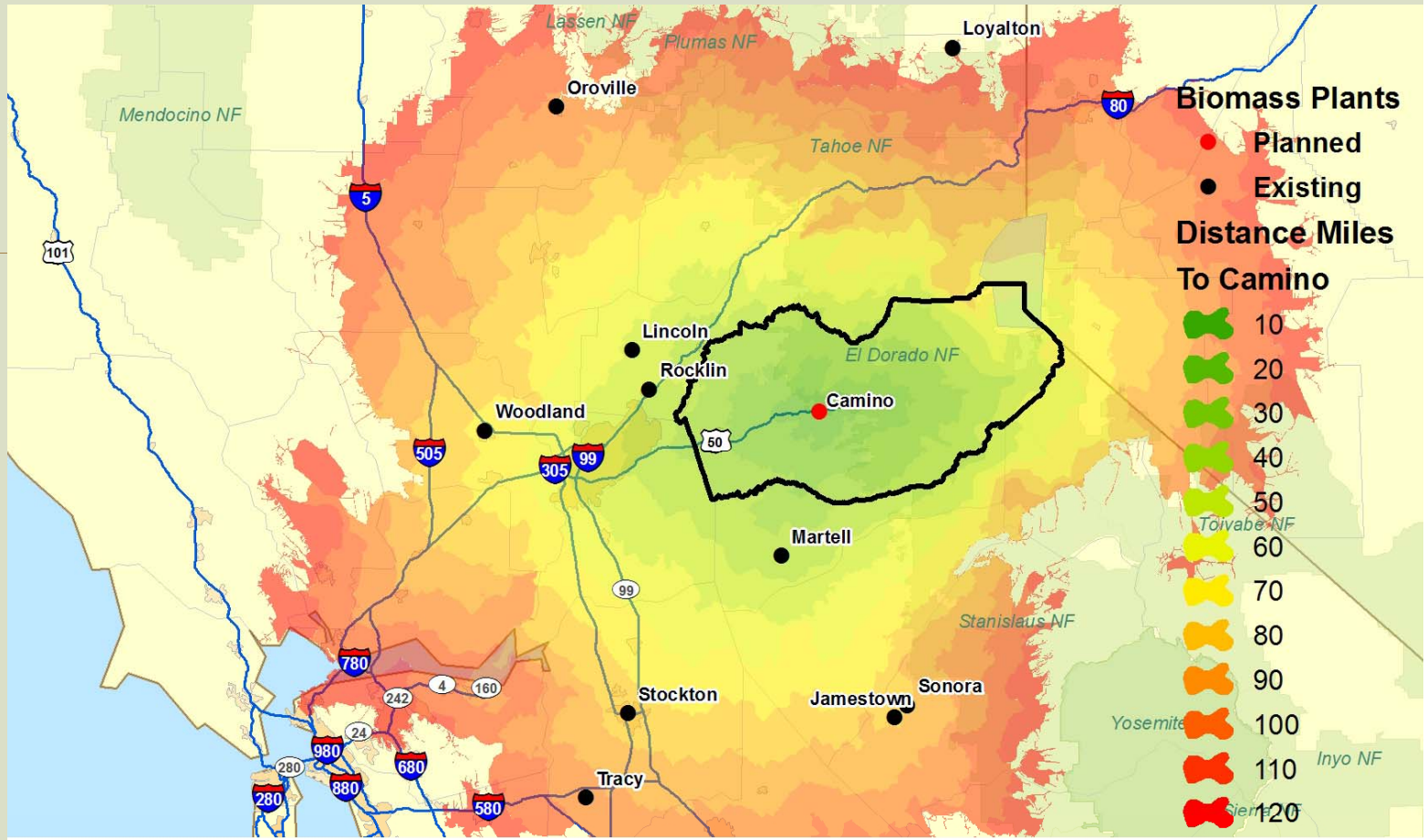
SOURCING AREAS OF EXISTING AND PROPOSED BIOMASS FACILITIES IN THE SOUTHEAST WOULD COVER AN ESTIMATED 46% OF THE HISTORIC RANGE OF THE LONGLEAF PINE



Existing Biomass Infrastructure Distance – Example Camino, CA



Camino Distance



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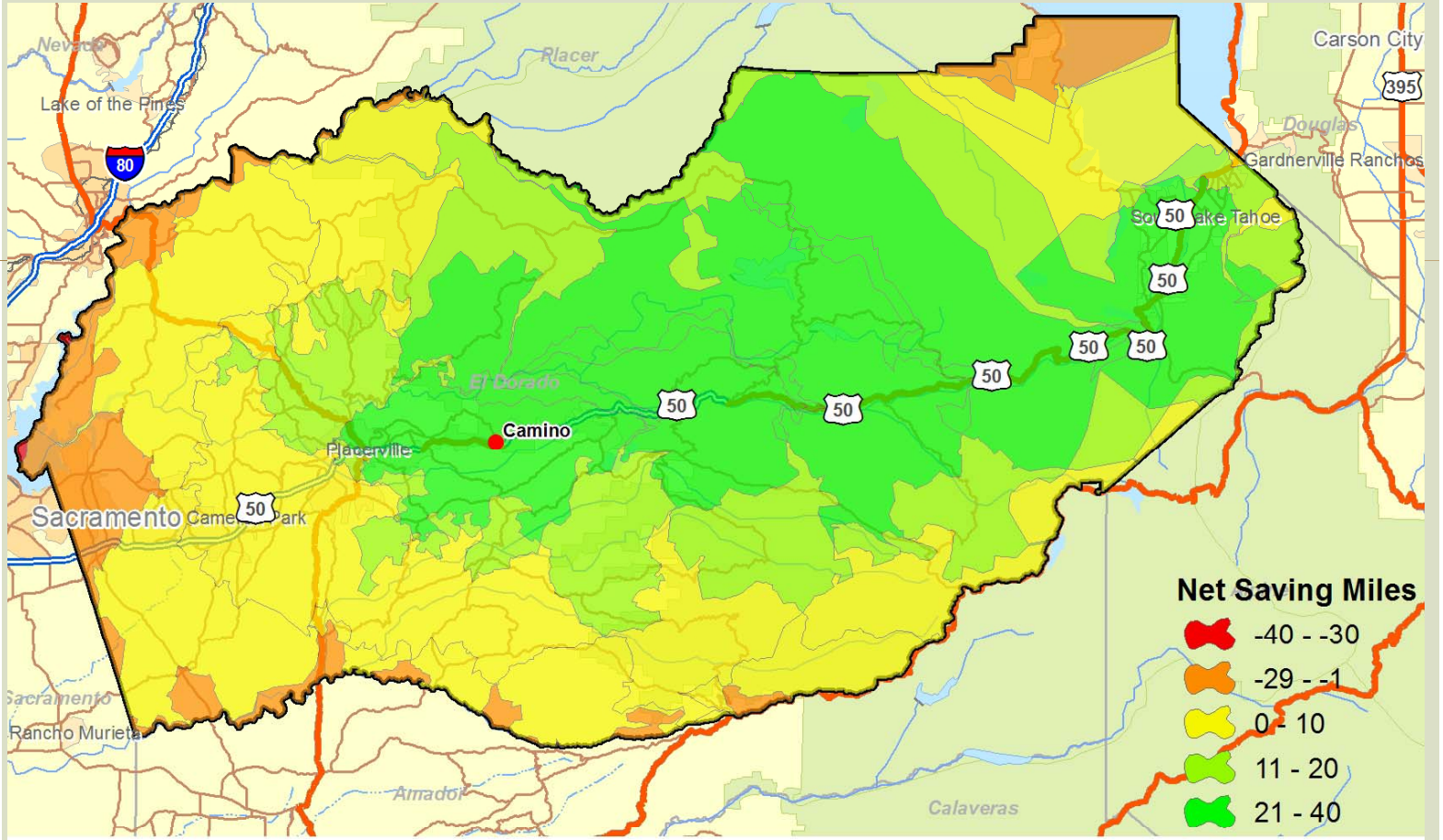
Projection: Albers
Date: April, 2008

Miles
0 5 10 20 30 40

N

New Plant Net Distance Savings



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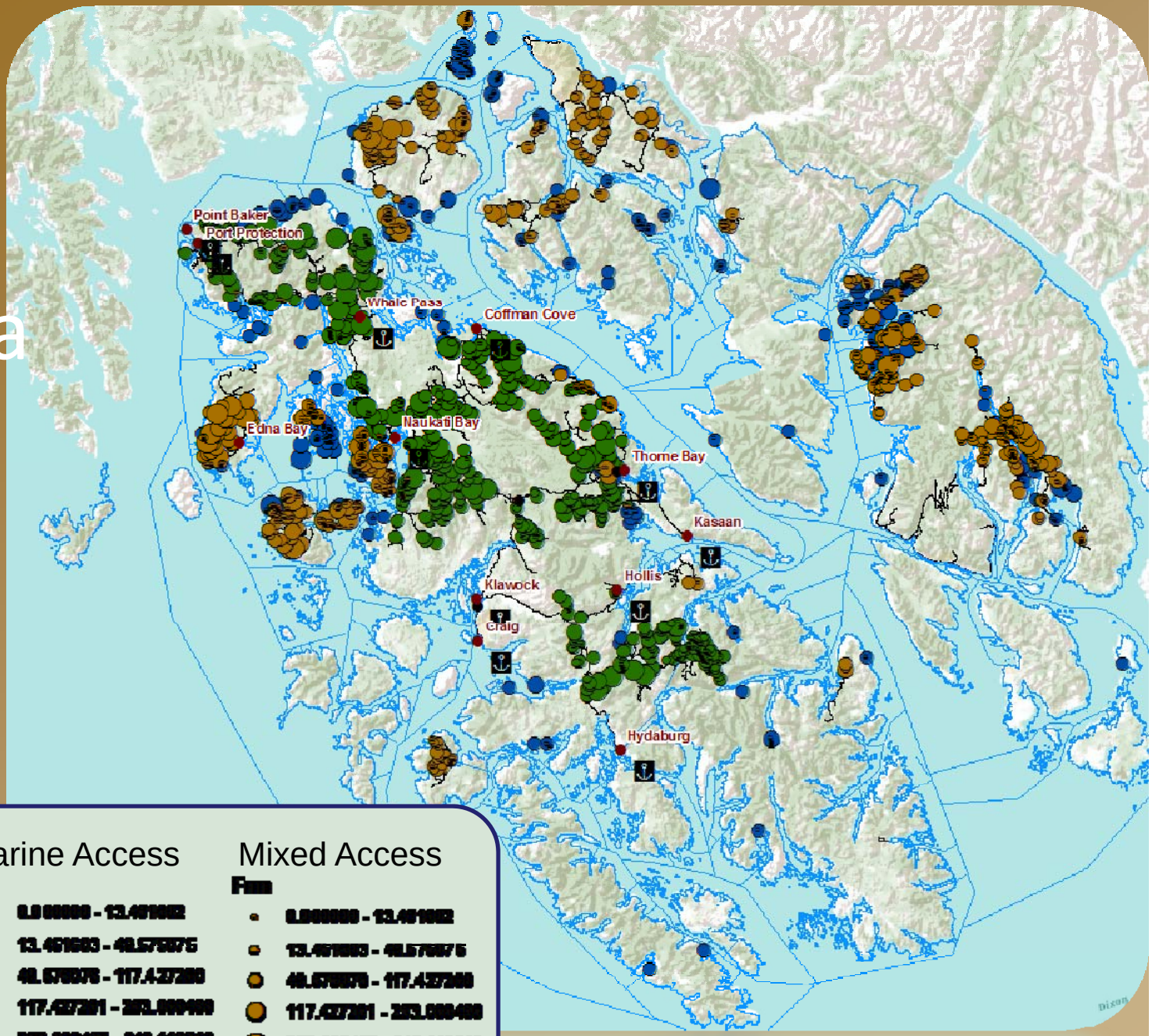
Projection: Albers
Date: April, 2008

Miles
0 1.5 3 6 9 12

N

Example SE Alaska Biomass Sources

Young Growth PCT
MMU = 50 acres



Road Access

Marine Access

Mixed Access

Project Economics

Markets for heat and power

- Market support justifies capital investment

Return on investment

- Minimum ROI of 19%

Economies of scale

- Combustion efficiencies
- Labor and overhead

Appropriate Technology

Search for most appropriate technology considering project location and fuel supply

- Ability to convert local fuel supply into heat/power
- Must meet local permitting specifications

Technology must be proven:

- Commercially available
- Operates efficiently on available fuel supply
- Operates cleanly on available fuel supply
- Appropriate for site and local resources

Scale of the issue: Why work on fire?

Wildland Fire Occurrence

- Avg100,000 fires/year
- Annual acreage burned 3,300,000 acres
  - (1,000,000 – 6,500,000 acres)
- Nationally about 50% or fires from people, 50% from lightning
- Approximately 52% of annual area burned by lightning fires

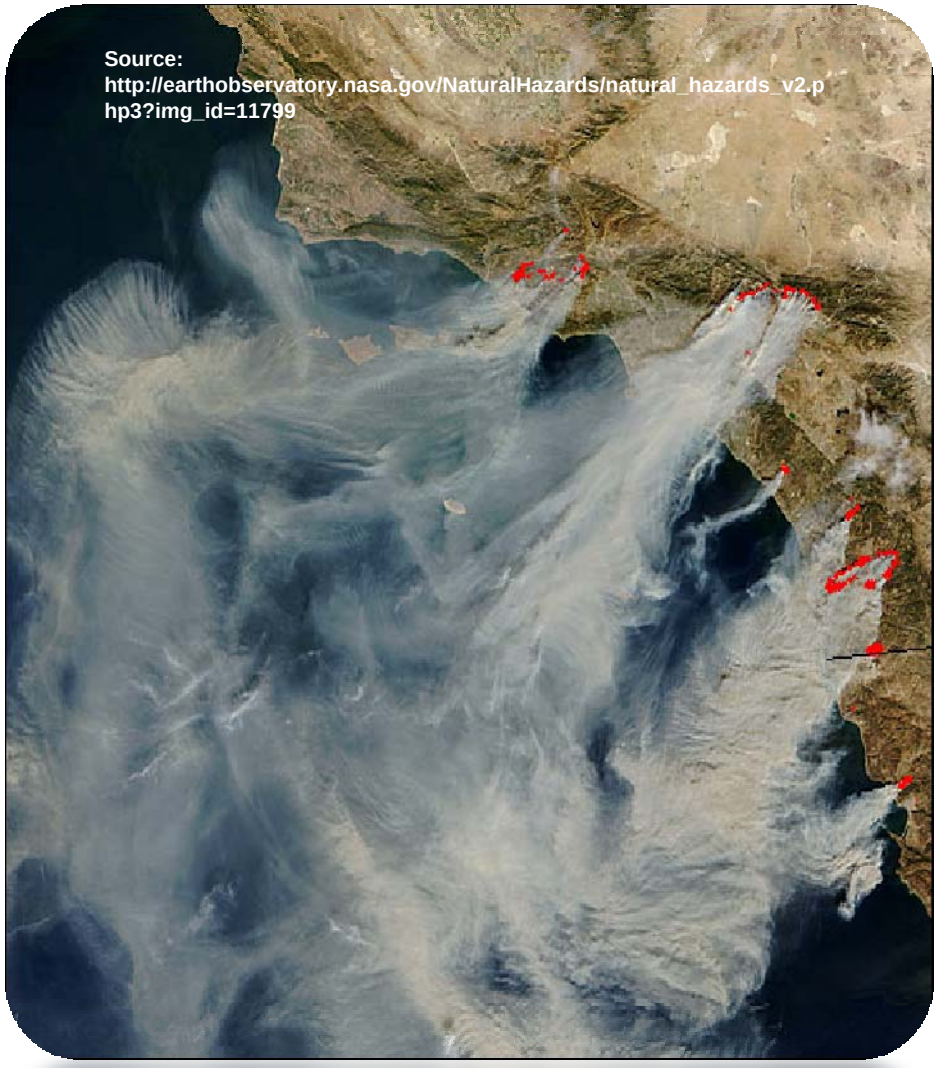
Climate Changing Fire

- Climate change could effect fire regimes before changes in vegetation occurred
- In fire prone ecosystems, fire may be the main vehicle of vegetation change. Could occur over a few decades with higher frequency fires
- Extension of fire season, especially in areas with snow pack (2-3 weeks)

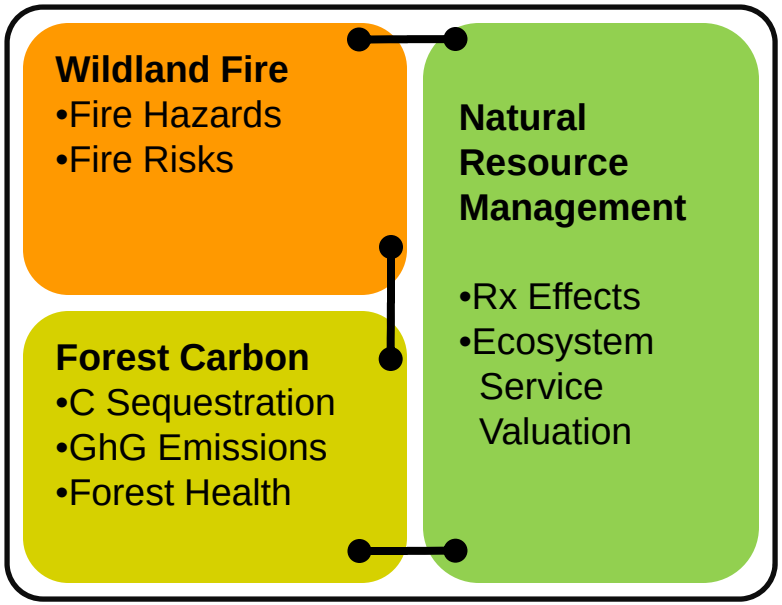
Fire Changing Climate

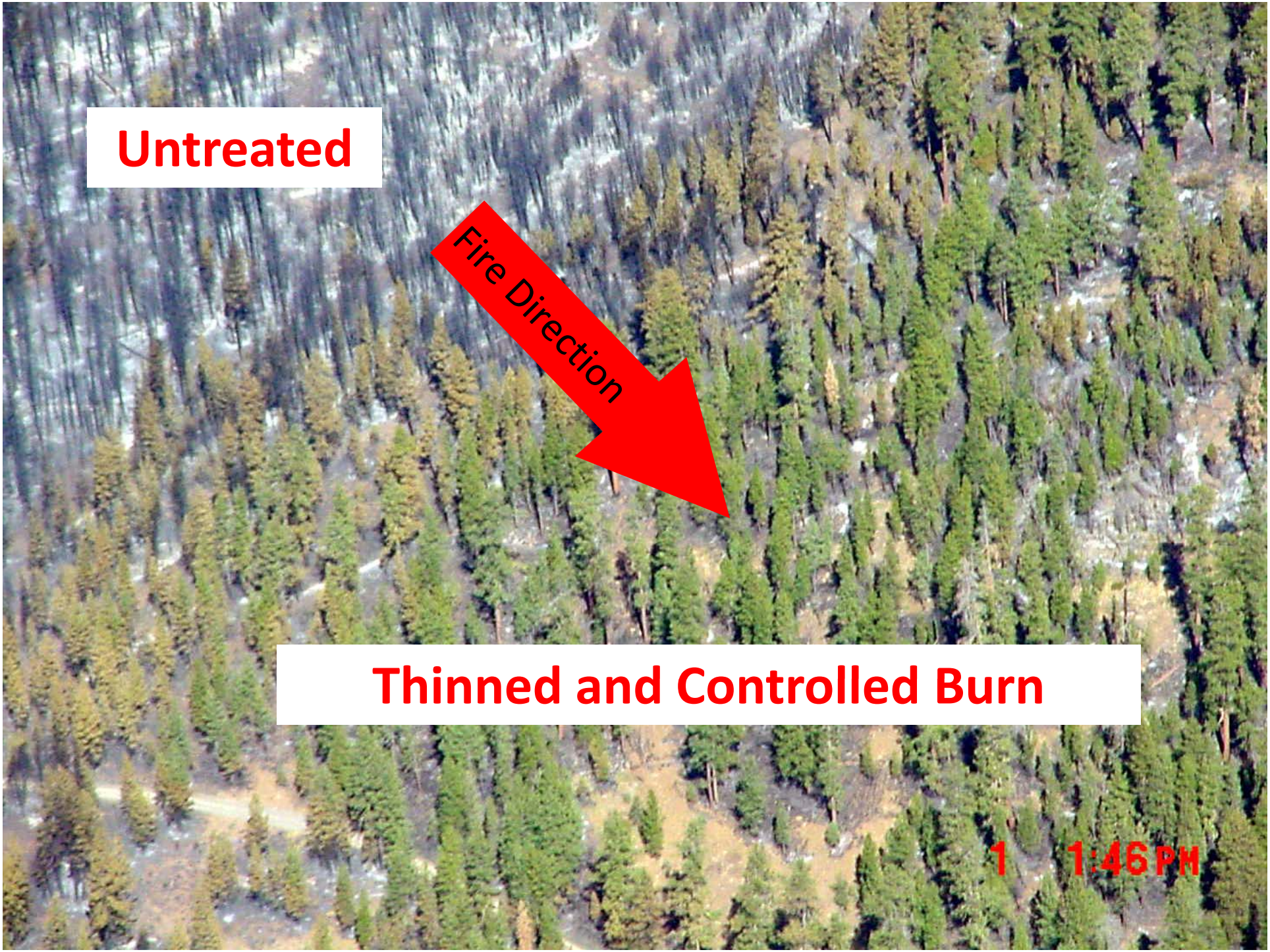
- Wildland fire is major natural source of GhG emissions.
- Carbon emissions reduction credits could be given to fuels treatment projects…
- Carbon sequestration projects could be discounted, due to risk of loss to fire…

Question…

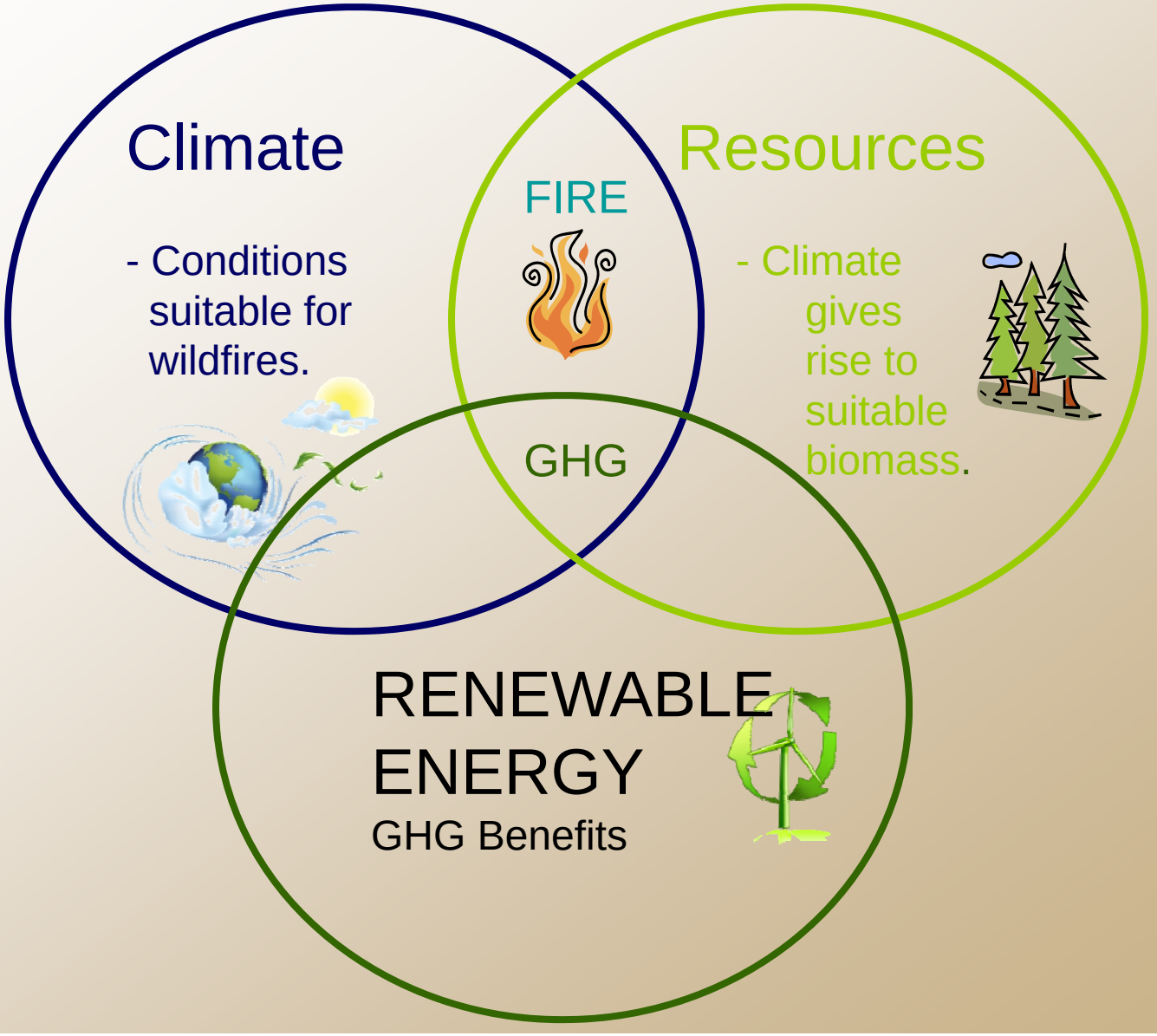


How can natural resource management address wildland fire for mitigating the impacts of climate change?




Untreated
Fire Direction
Thinned and Controlled Burn
1 1:46PM

Convergence with Climate Change Trends



Convergence with Climate Change Trends

- The scope of the fire-climate change issue is beyond the capacity of national and state governments to handle alone.

- Trend towards community-based bioenergy development which can reduce GHGs while improving public safety, stimulating economic activity and optimizing many other environmental benefits.

Some key questions to ponder

What are the carbon benefits of promoting woody biomass utilization in the interior west? Is avoided wildfire emissions going to change the economics of biomass utilization?

What are the resource assessments and monitoring systems needed to make sure that promoting biomass utilization does not lead to over-exploitation of forest resources?

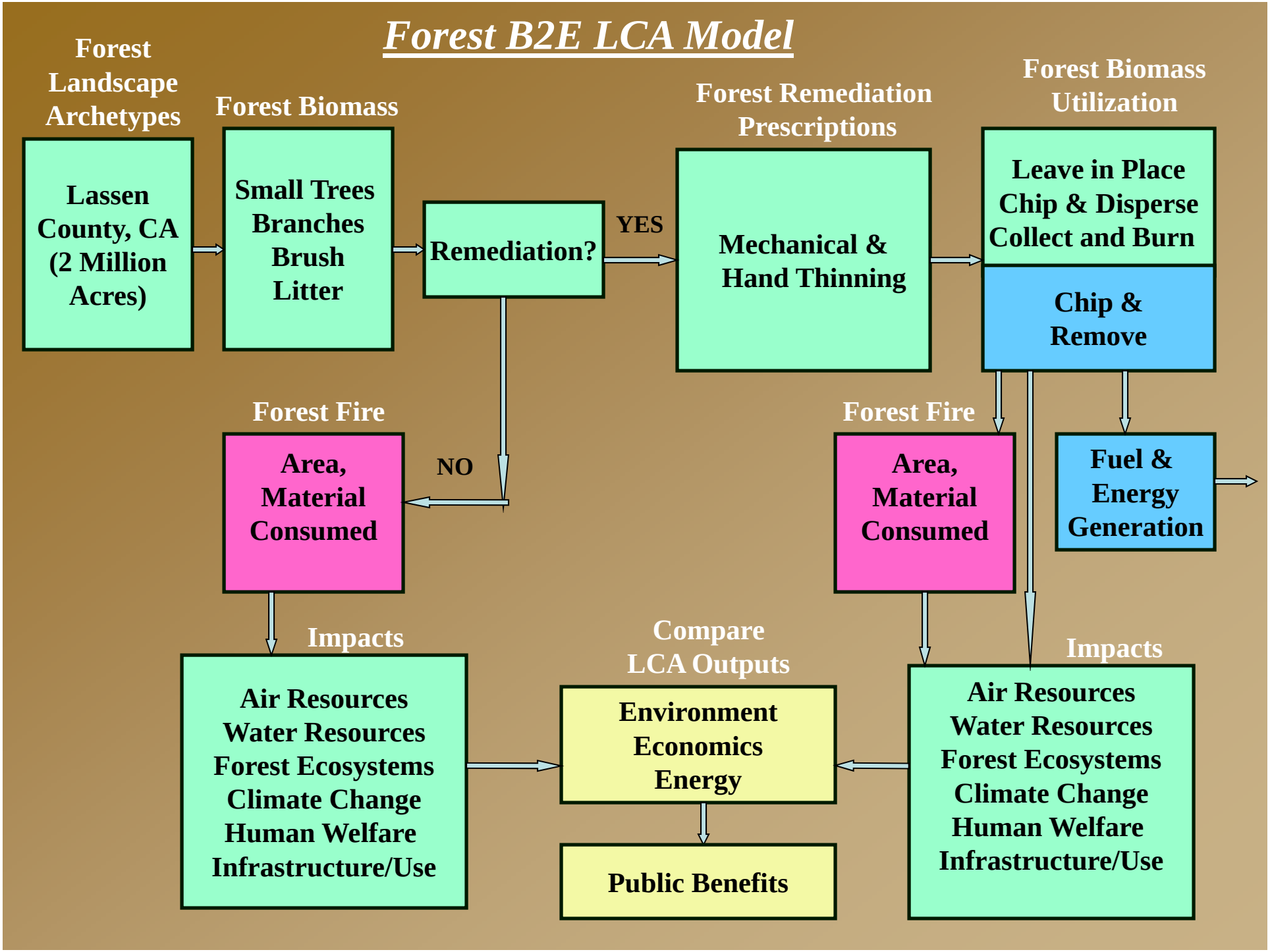
The Life Cycle Approach

1. Model LIFE CYCLE environmental values of using forest biomass for energy and heat production
2. Test effects of different transportation modes, total emissions and other environmental factors.
3. Develop a decision-support framework to test biomass manufacturing locations and other assumptions and scenarios.

The Forest Health Conundrum

- Forest *health* and *resilience* are measured by a complex array of factors
- Major disagreements over what to measure and what matters
- Management objectives differ by landowner and place
- Data and science improving, but…
- Ecosystem services are poorly quantified, regulated, monetized and/or traded.

Forest B2E LCA Model



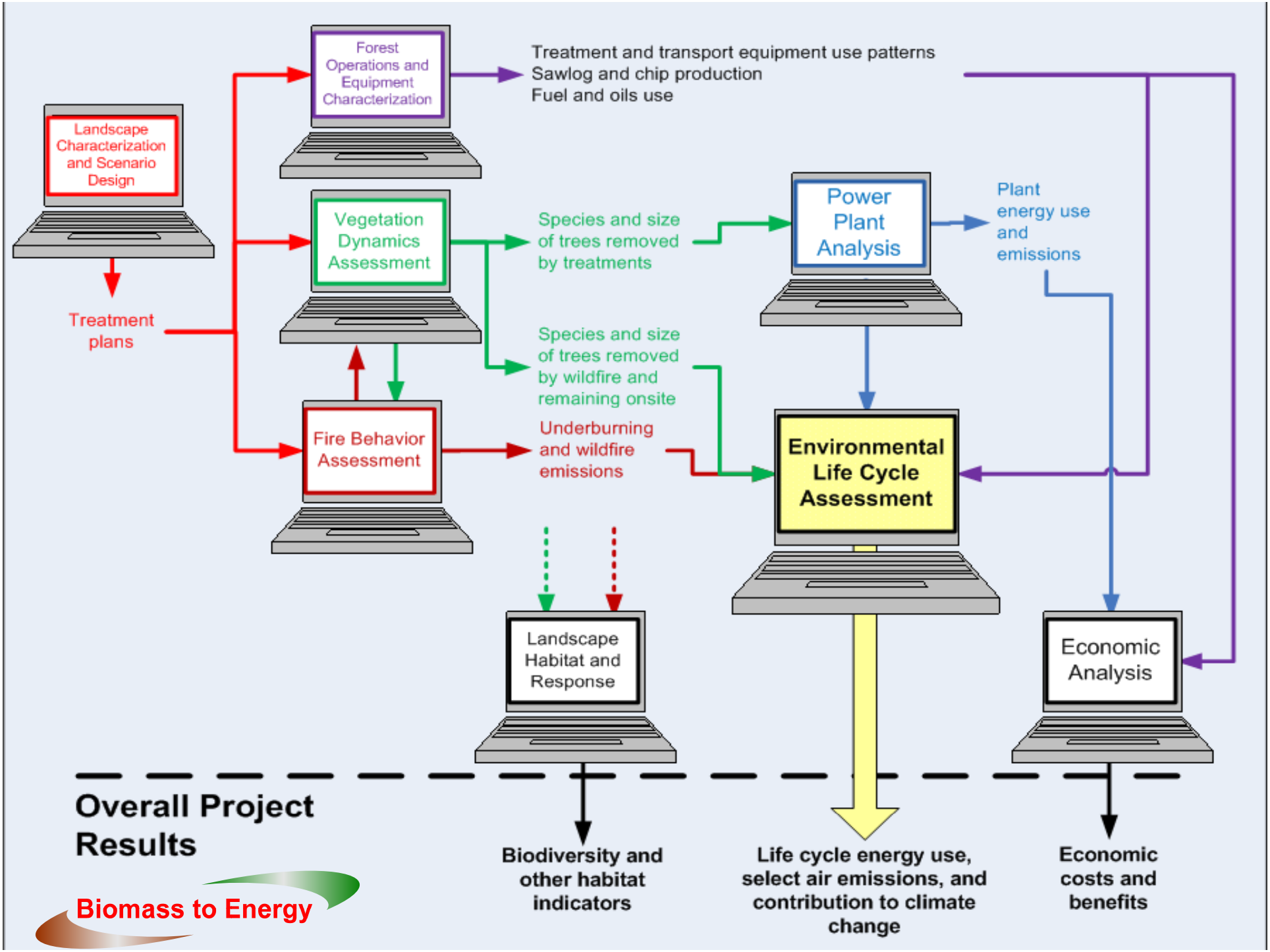
Some LCA findings from California

This Test Scenario -- modeling thinning, transporting, and converting biomass into electrical power -- yielded the following results when compared to the no-treatment.

- **$1.58 billion** in power revenues, assuming an 8.3-cent per kilowatt-hour price on the wholesale power market. A negligible amount of fossil fuels (approximately 1.3 percent of total energy consumed) is required to produce this power.

- Clear life cycle climate change benefits, including a **65 percent net reduction** in greenhouse gas emissions
  - from 17 million tons of CO2 equivalents to 5.9 million tons of CO2 equivalents

- **22 percent reduction** in the number of acres burned by wildfires.


Landscape Characterization and Scenario Design
Treatment plans
Forest Operations and Equipment Characterization
Treatment and transport equipment use patterns
Sawlog and chip production
Fuel and oils use
Vegetation Dynamics Assessment
Species and size of trees removed by treatments
Species and size of trees removed by wildfire and remaining onsite
Fire Behavior Assessment
Underburning and wildfire emissions
Power Plant Analysis
Plant energy use and emissions
Environmental Life Cycle Assessment
Landscape Habitat and Response
Economic Analysis
Overall Project Results
Biodiversity and other habitat indicators
Life cycle energy use, select air emissions, and contribution to climate change
Economic costs and benefits
Biomass to Energy

What are some of our concerns?

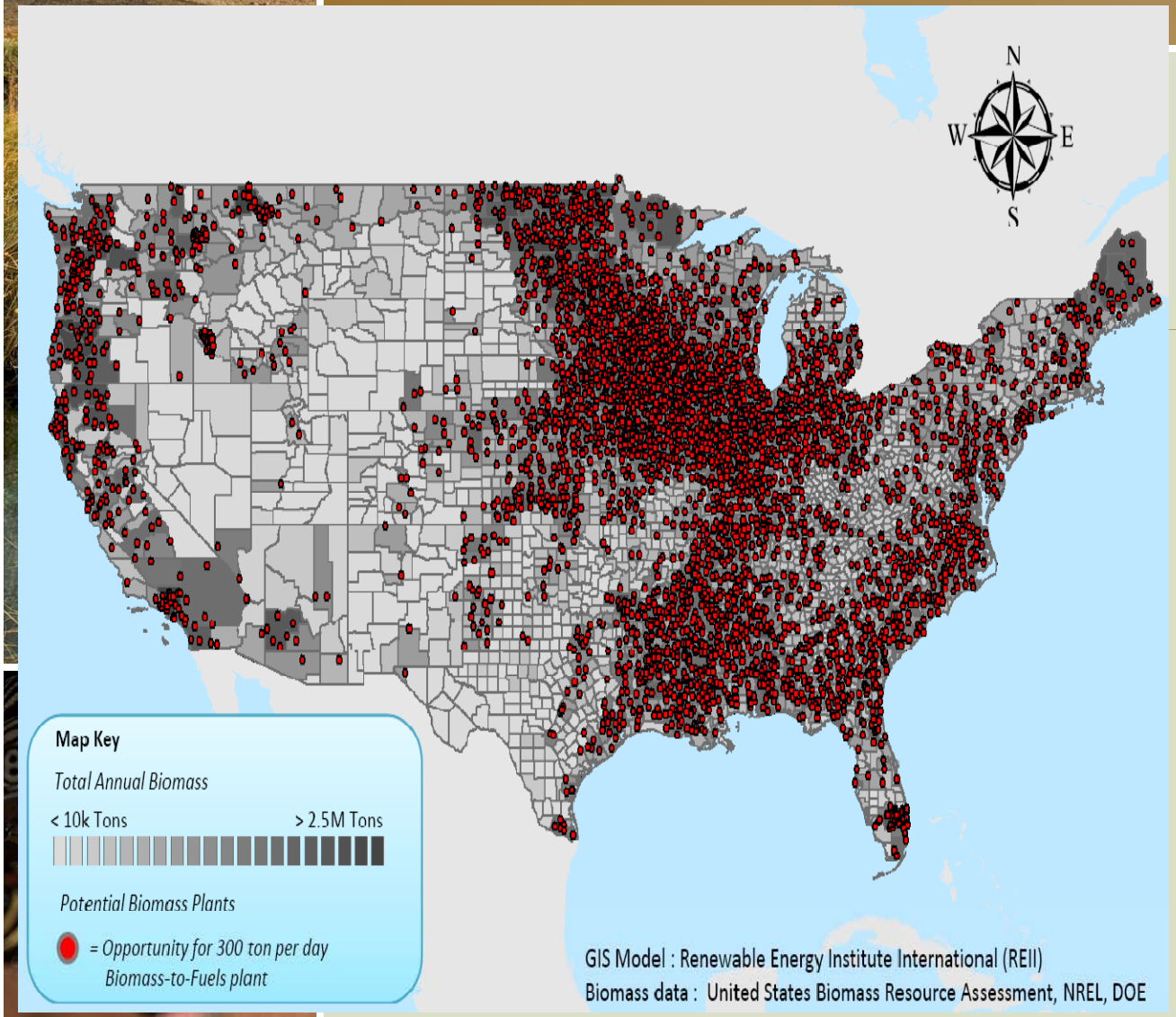
Land Use

- PLoS One (McDonald et al 2009) - Energy sprawl or energy efficiency?
- Different energy production techniques will lead to severe impacts on habitat types, ecosystem services, and community needs.

Sustainability – Combating Energy Sprawl

- Need for energy conservation, appropriate siting, sustainable production practice, and compensatory mitigation offsets
- Scale : distributed generation at appropriate scale…. Trend towards community-based bioenergy development which can reduce GHGs.

Possible U.S. Locations for 300 ton per day Biomass to Clean Diesel and Renewable Electricity Plants



- 1 Billion Tons of Biomass Annually
- 10,000 PRF Biomass-to-Energy Plants Possible Based on PRF's Technology
- Resulting in 50 Billion Gallons of Fuel
- Displacing 1.2 Billion Barrels of Imported Oil
- And Producing 575,000 Billion Watt-hrs of Electricity
- Creating over 1 Million Long Term Jobs

Any Questions?

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