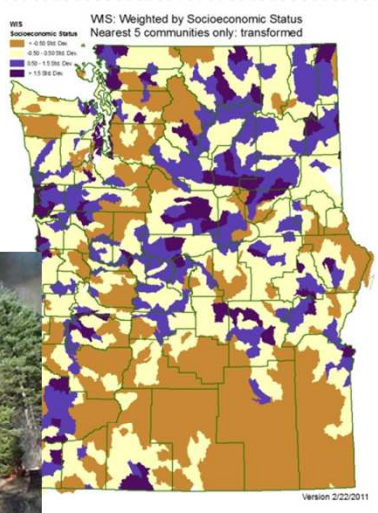
Update on BIOMASS RESEARCH

COLLEGE OF FORESTRY
OREGON STATE UNIVERISTY

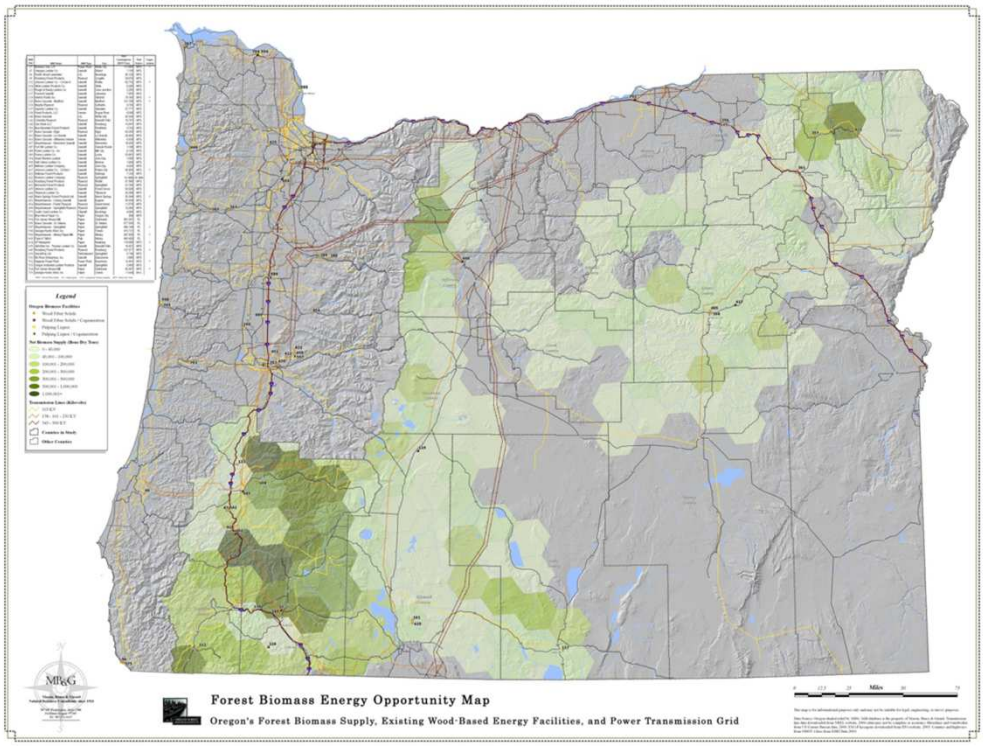


FUTURE ENERGY

Portland, April 2011

OREGON STATE

David Smith, OSU



2006 OFRI Biomass Opportunity Map

Thin 4.25 MM Acres to reduce fire risk

Yield 1 MM bdt/y of biomass

Oregon State University

"Opportunity" Limited by Funding

» **OSU Forestry research focus:**

Prioritize Activities to Maximize Values by:

1. Reducing risk of catastrophic fire
2. Identifying communities that most benefit
3. Reducing collection, transport & processing costs
4. Improving quality of processed biomass
5. Producing practical products to serve new markets

» Forest Restoration Goals

- > Understand Fire Behavior
- > Understand Fuel Treatment Options
- > Understand Fuel Treatment Impacts
- > Employ the "80/80 Rule"

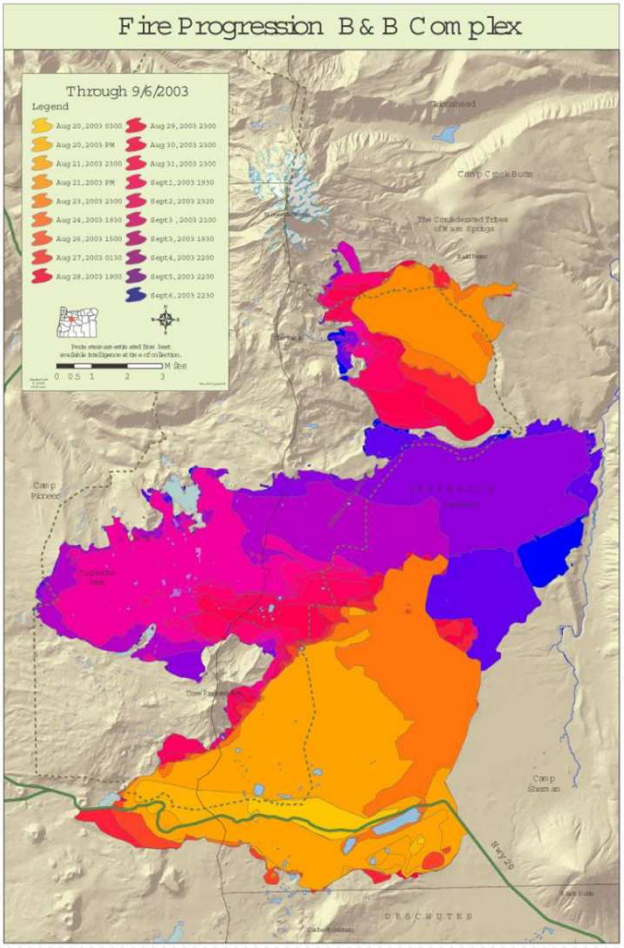
John Bailey: Connecting Forest Restoration, Silviculture & Biomass

Oregon State University

» Understanding Fire Behavior

- > B&B Complex, Santiam Pass, 2003
- > Weather driven August 20-21
- > Fuel driven fire thereafter

Oregon State University



Forest Health and Fire Resiliency

Dry-conifer forests are particularly at risk

OREGON STATE

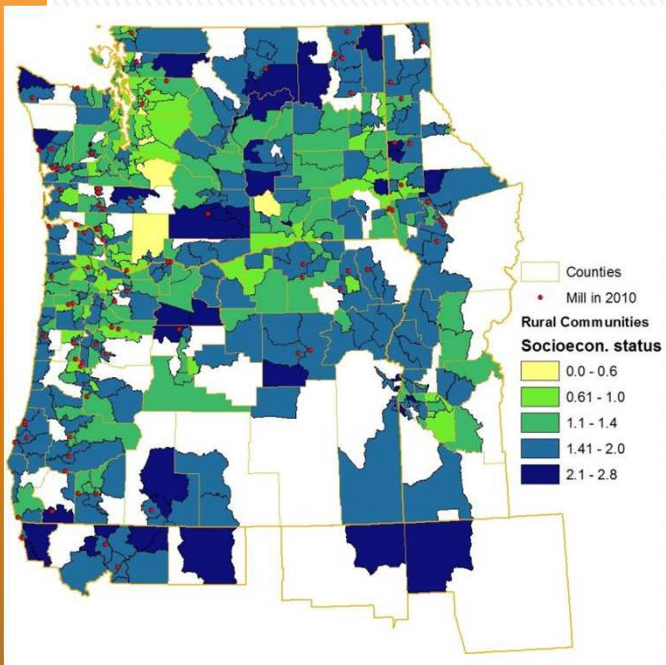
- **Complimentary Forest Policy Objectives:**
  - Forest restoration
  - Healthy rural economies in forest-dependent communities
- Prioritize large scale fuel treatment and restoration thinning projects by their the potential to revitalize economies of distressed rural communities.

Claire Montgomery:
Considering Benefits to Communities

Oregon State University

COMMUNITIES in DISTRESS in Oregon and Washington

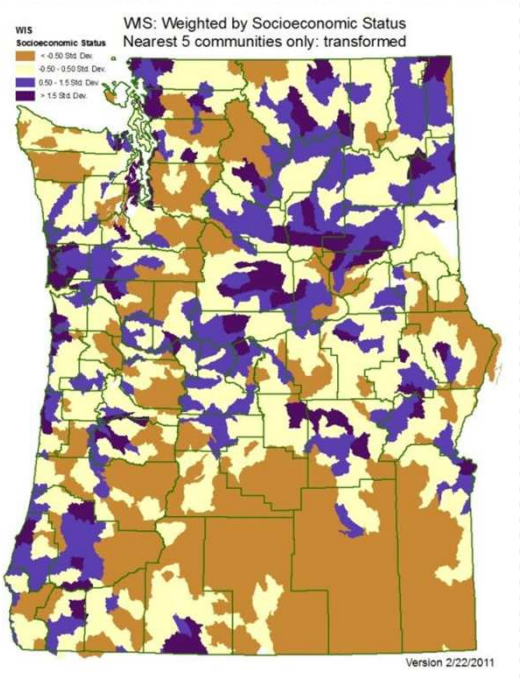
sum of 5 SES variables standardized 0-to-1



Blue = Economically Distressed Communities

COMMUNITY IMPACT SCORES for EACH WATERSHED

$$G_j^{SES} = \sum_i \frac{SES_i}{d_{ij}}$$



Blue = forested watersheds near distresses communities

OREGON STATE

- Millions of tons of low value biomass are left in the woods because its not economical to bring them out
- Researching solutions to improve economic efficiency of biomass logistics for beneficial use

Loren Kellogg : Biomass Supply, Harvesting and Transport

9

Oregon State University

Harvesting Challenges…..

- Piece size and shape
- Scattered locations
- Low market value
- High cost of new equipment

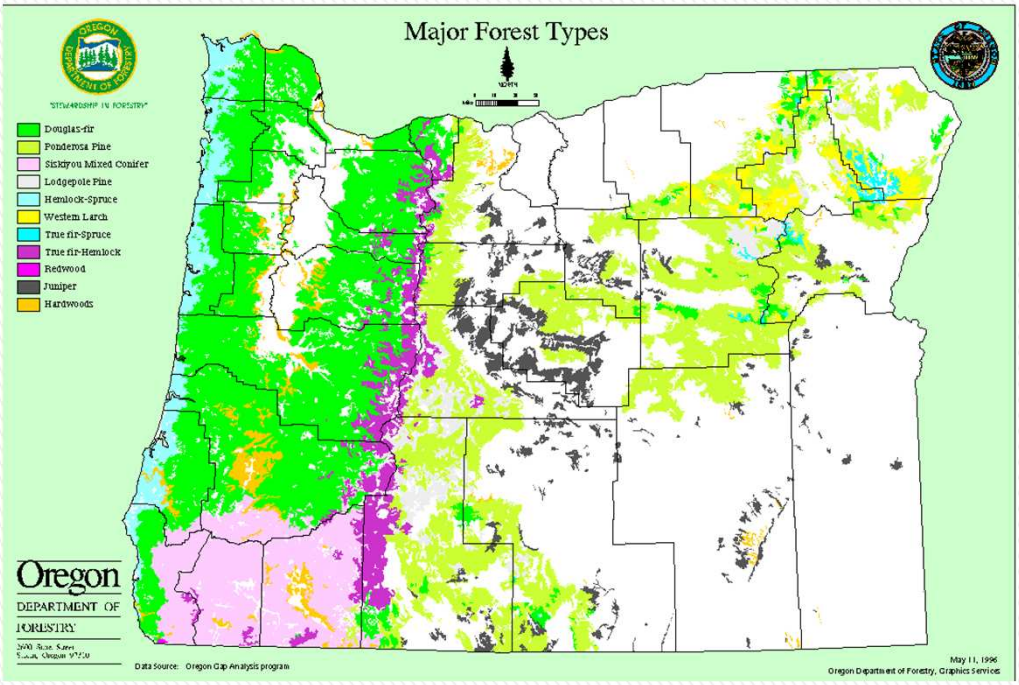
OREGON STATE

Solutions…….

(1) Using conventional technology in new ways
(2) Integrated harvesting and silviculture operations

OREGON STATE

Challenge… Implementing Forest Fuel Reduction and Biomass Utilization on Federal Land



12

OREGON STATE

Solution… Facilitate Collaborative Projects

Deschutes Skyline Landscape
Collaborative Forest Landscape Restoration Act

145,000 Acres (97,000 NF & 33,000 Private)
$1.3 million for 2010 – 2011
Up to $10 million over next 10 years
$12.23 million National Forest & Partners match



- Evaluating point of Comminution
- Managing chipping versus grinding
- Evaluating opportunities to increase loads
- Truck scheduling to improve transport logistics and utilization
- Improving energy efficiency in transportation

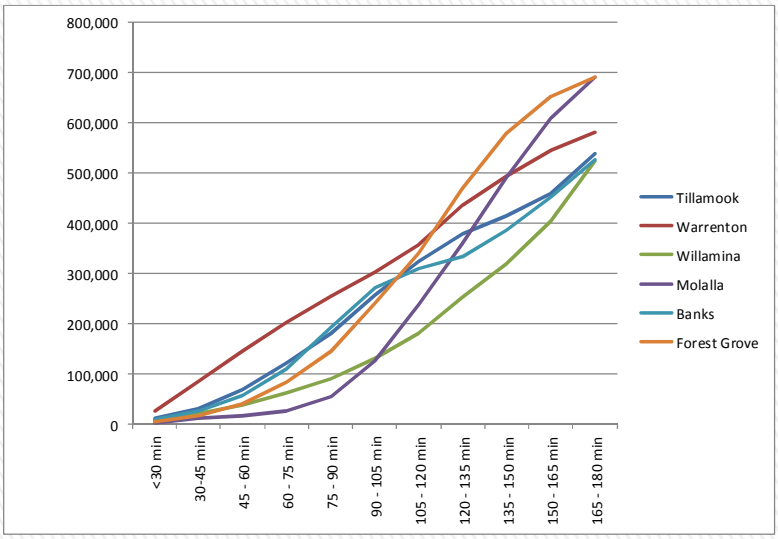
John Sessions:
Supply Chain Management

Oregon State University

14

Biomass Supply:

- Regional biomass assessments
- Biomass supply cost curves, facility location models



Road Access

» Engineering considerations in assessing forest roads for biomass operations

» Converting Forest Biomass to Fuel

» Expanding markets for higher–value products

David Smith:
Assessing Biomass Quality

Oregon State University

17

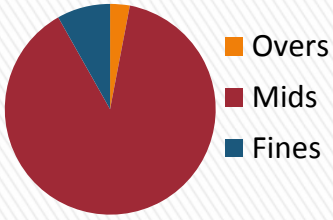
Field sampling & laboratory testing

- Measure…
  - Size distribution
  - % Dry
  - Bulk Density
  - Ash content
  - Heat Value

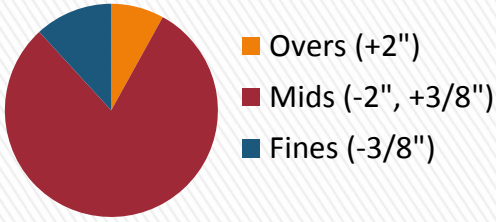
Particle size, Largest Dimension	Chipper % of total	Horz. Grinder % of total
Plus 6”	0.5	2.9
3” to 6”	7.0	19.4
3/8” to 3”	84.4	65.6
1/16” to 3/8”	6.5	8.8
Minus 1/16”	1.7	3.3
Total	100	100

Particle size distribution
Fir logging slash processed with different machines

Chipper



Grinder



Size distribution

19

Oregon State University

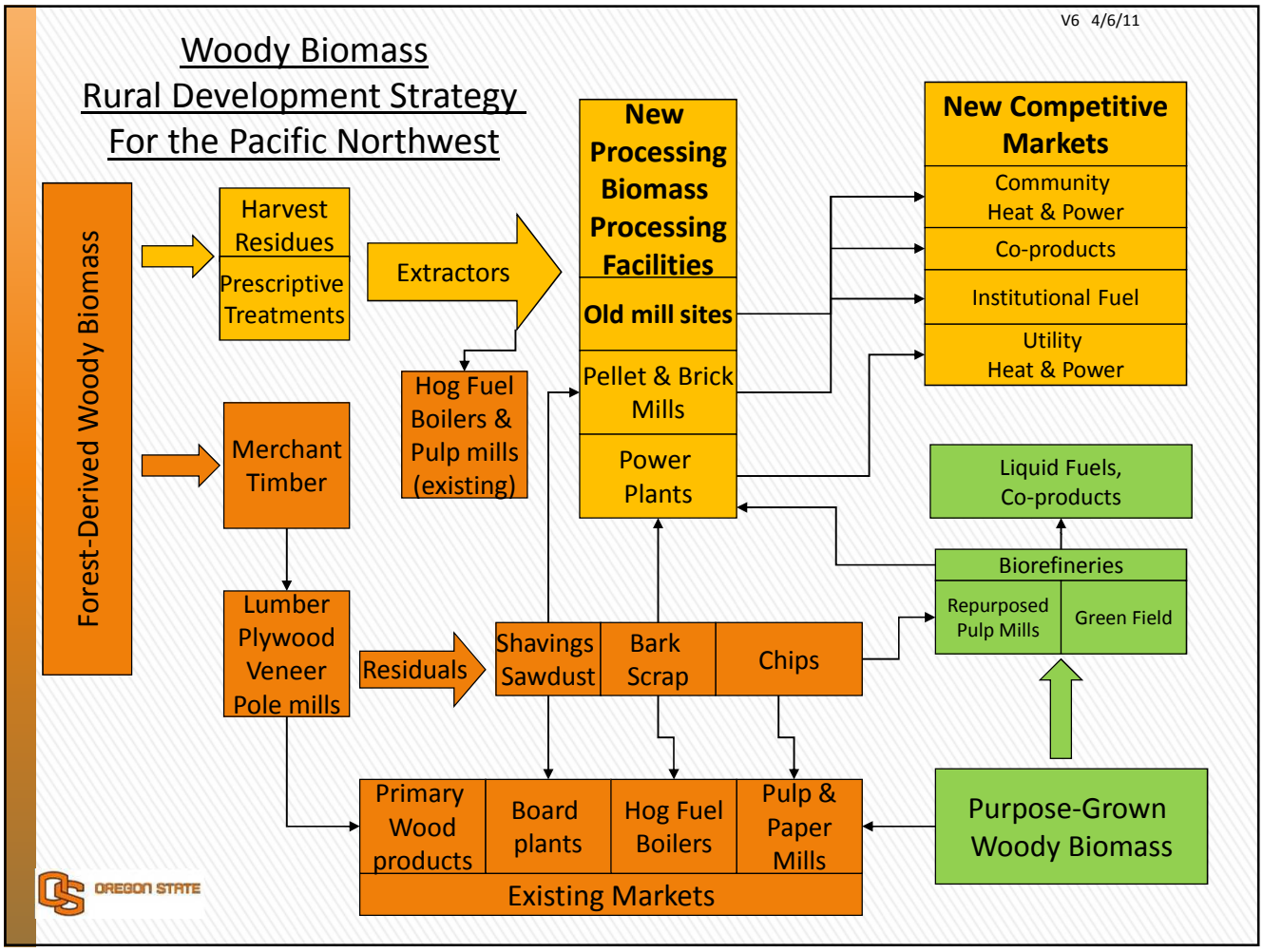
Material	% Dry	# Dry/ft3	% Ash	LHV, Btu/#
Chipped Slash				
Average	66	10.0	0.9	5500
Overs	72	--	0.9	6000
Mids	62	9.3	0.8	5000
Fines	67	9.2	1.4	5900
Ground Slash				
Average	68	7.7	1.1	5800
Overs	70	--	0.5	6400
Mids	69	6.7	0.9	5700
Fines	69	6.8	3.7	5500

Lower Heating Value (LHV) : Usable heat released by combustion after evaporating entrained water

Heat value, ash, & bulk density

20

OREGON STATE


V6 4/6/11
Woody Biomass
Rural Development Strategy
For the Pacific Northwest
Forest-Derived Woody Biomass
Harvest Residues
Prescriptive Treatments
Merchant Timber
Lumber Plywood Veneer Pole mills
Residuals
Extractors
Hog Fuel Boilers & Pulp mills (existing)
New Processing Biomass Processing Facilities
Old mill sites
Pellet & Brick Mills
Power Plants
Shavings Sawdust
Bark Scrap
Chips
Primary Wood products
Board plants
Hog Fuel Boilers
Pulp & Paper Mills
Existing Markets
New Competitive Markets
Community Heat & Power
Co-products
Institutional Fuel
Utility Heat & Power
Liquid Fuels, Co-products
Biorefineries
Repurposed Pulp Mills
Green Field
Purpose-Grown Woody Biomass
OREGON STATE

Use Woody Biomass as a TOOL to Stimulate Rural Communities

- Simultaneous Development
  - > New biomass processing facilities
  - > New biomass markets

- Focus incentives on small-scale biomass thermal systems – market pull

- Increase value of woody biomass fuels

OREGON STATE

David Smith
Renewable Materials
Wood Science and Engineering
Oregon State University
119 Richardson Hall
Corvallis, OR 97331
(541) 737-8506
david.smith@oregonstate.edu
www.renewablematerials.oregonstate.edu

Thank you!