Flying Planes with Trees?

Stakeholder's levels of knowledge and support for a wood-based biofuels industry in the Pacific Northwest

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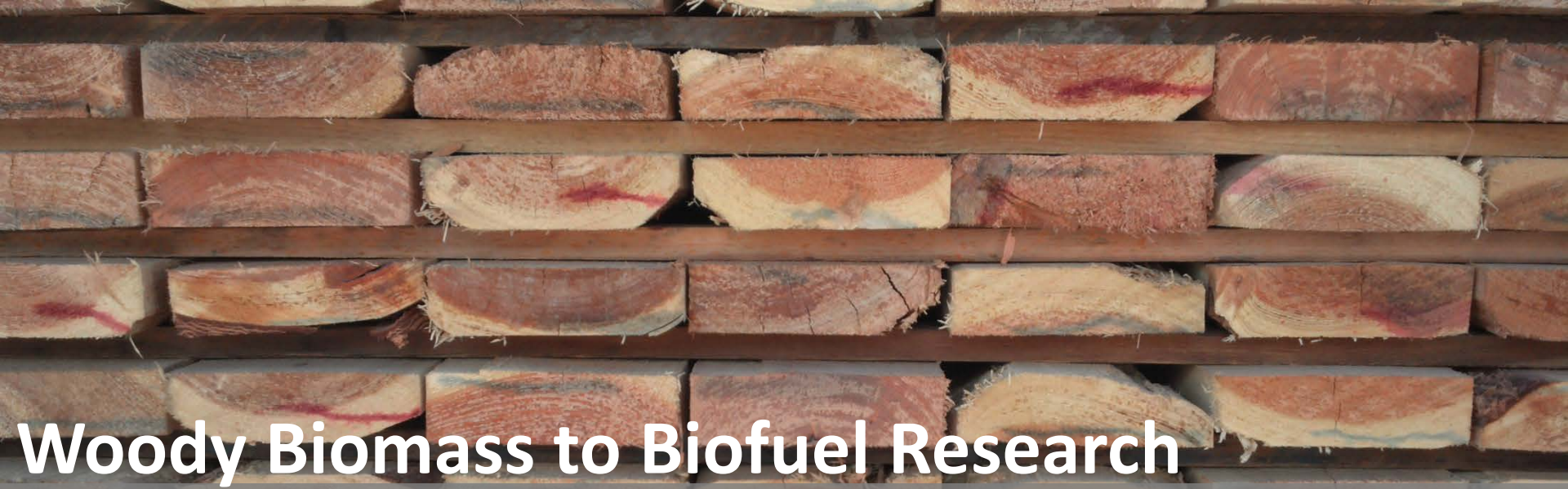
Northwest Wood-Based Biofuels + Co-Products Conference
May 3, 2016, Seattle, WA

Outline

- Background
- Survey Findings
  - Quantitative Overview
  - Qualitative Overview
  - Application and Outreach
- OP Case Study
- Conclusion

Background

- Concentration of green house gases (GHG) rising, specifically CO2
- Human causes: burning fossil fuels, deforestation
- Government initiatives to explore renewable energy options: Energy Independence and Security Act (2007)
- Several large scale fuel users specifically interested in woody biomass to aviation fuels



Woody Biomass to Biofuel Research

Economic

-New markets

-Economic competitiveness

-Costs and benefits

Environmental

-Forest Health
Wild Fires
Bark Beetles

-Sustainable harvesting

Social

-Knowledge?

-Perceived benefits?

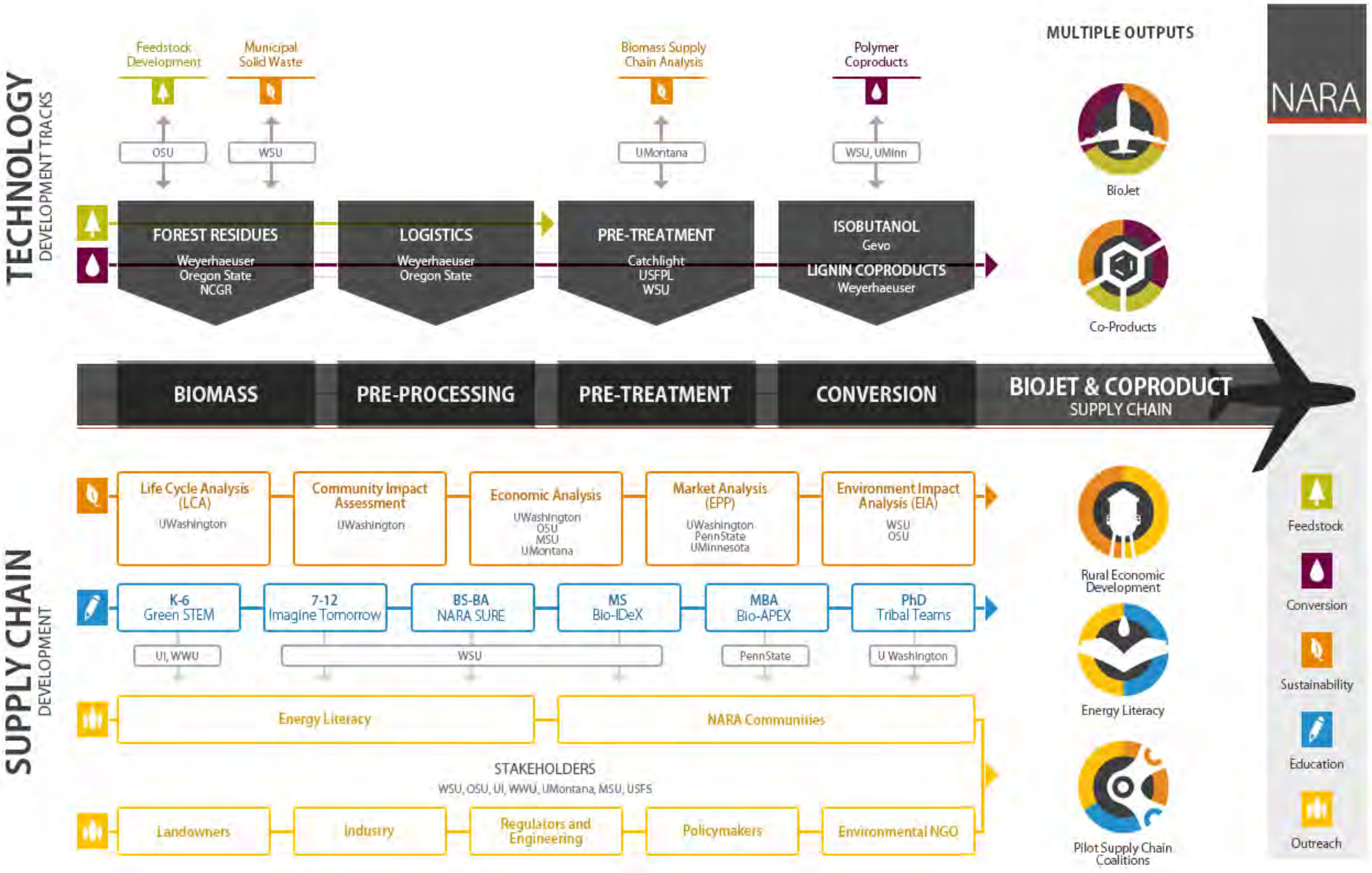
-Concerns?

Northwest Advanced Renewables Alliance (NARA) Goals

Sustainable BioJet
Valuable Lignin Co-Products
Rural Economic Development
Supply Chain Coalitions
Energy Literacy

NATIONAL MODEL

NARA Teams


TECHNOLOGY
DEVELOPMENT TRACKS
Feedstock Development
Municipal Solid Waste
Biomass Supply Chain Analysis
Polymer Coproducts
OSU
WSU
UMontana
WSU, UMinn
FOREST RESIDUES
Weyerhaeuser
Oregon State
NCGR
LOGISTICS
Weyerhaeuser
Oregon State
PRE-TREATMENT
Catchlight
USFPL
WSU
ISOBUTANOL
Gevo
LIGNIN COPRODUCTS
Weyerhaeuser
MULTIPLE OUTPUTS
BioJet
Co-Products
NARA
BIOMASS
PRE-PROCESSING
PRE-TREATMENT
CONVERSION
BIOJET & COPRODUCT
SUPPLY CHAIN
SUPPLY CHAIN
DEVELOPMENT
Life Cycle Analysis (LCA)
UWashington
Community Impact Assessment
UWashington
Economic Analysis
UWashington
OSU
MSU
UMontana
Market Analysis (EPP)
UWashington
PennState
UMinnesota
Environment Impact Analysis (EIA)
WSU
OSU
K-6
Green STEM
7-12
Imagine Tomorrow
BS-BA
NARA SURE
MS
Bio-IDeX
MBA
Bio-APEX
PhD
Tribal Teams
UI, WWU
WSU
PennState
U Washington
Energy Literacy
NARA Communities
STAKEHOLDERS
WSU, OSU, UI, WWU, UMontana, MSU, USFS
Landowners
Industry
Regulators and Engineering
Policymakers
Environmental NGO
Rural Economic Development
Energy Literacy
Pilot Supply Chain Coalitions
Feedstock
Conversion
Sustainability
Education
Outreach

NARA
Northwest Advanced Renewables Alliance

SUPPLY CHAIN

FRP

FOREST RESIDUES PREPARATION

Primary feedstock targets include forest residues from logging and thinning operations. We are also considering mill residues and discarded woody material from construction and demolition, in regions where these materials are under utilized.

ONE BONE DRY **TON** WOODY BIOMASS +

T

TRANSPORTATION

Feedstocks are transported from the collection site to a conversion facility. Chipping can take place at the loading or in a preprocessing facility.

DIESEL +

PT

PRE-TREATMENT

Wood chips are treated to make the sugar polymers (polysaccharides) accessible to degrading enzymes. These processes allow the lignin to be available for separation.

HEAT, WATER, & CHEMICALS =

EH

ENZYMATIC HYDROLYSIS

Specific enzymes are added to hydrolyze (cleave) the polysaccharides and generate simple sugars (monosaccharides).

~600 POUNDS LIGNIN AND

F

FERMENTATION

Specialized yeast convert the monosaccharides into isobutanol.

~59 GALLONS ISOBUTANOL OR

BCP

BIOJET & CO-PRODUCTS

Aviation fuels can be generated from the platform molecules derived from wood sugars. Lignin can be used to generate co-products such as epoxies, structural materials and bio-based plastics. As an alternative, lignin can be burned to produce renewable energy.

~45.6 GALLONS BIOJET

NARA is led by Washington State University and supported by the Agriculture and Food Research Initiative Competitive Grant no. 2011-68005-30416 from the USDA National Institute of Food and Agriculture.

USDA

Stakeholder Study Goals

- Identify **key differences in knowledge, support, and opinions** regarding the acceptability of an emerging wood based biofuels supply chain by demographic and geographical groups in the PNW

- **Compare knowledge levels** of stakeholders to determine which demographic groups are lacking information

- Determine the **best methods of communication** for stakeholder outreach

Survey Design

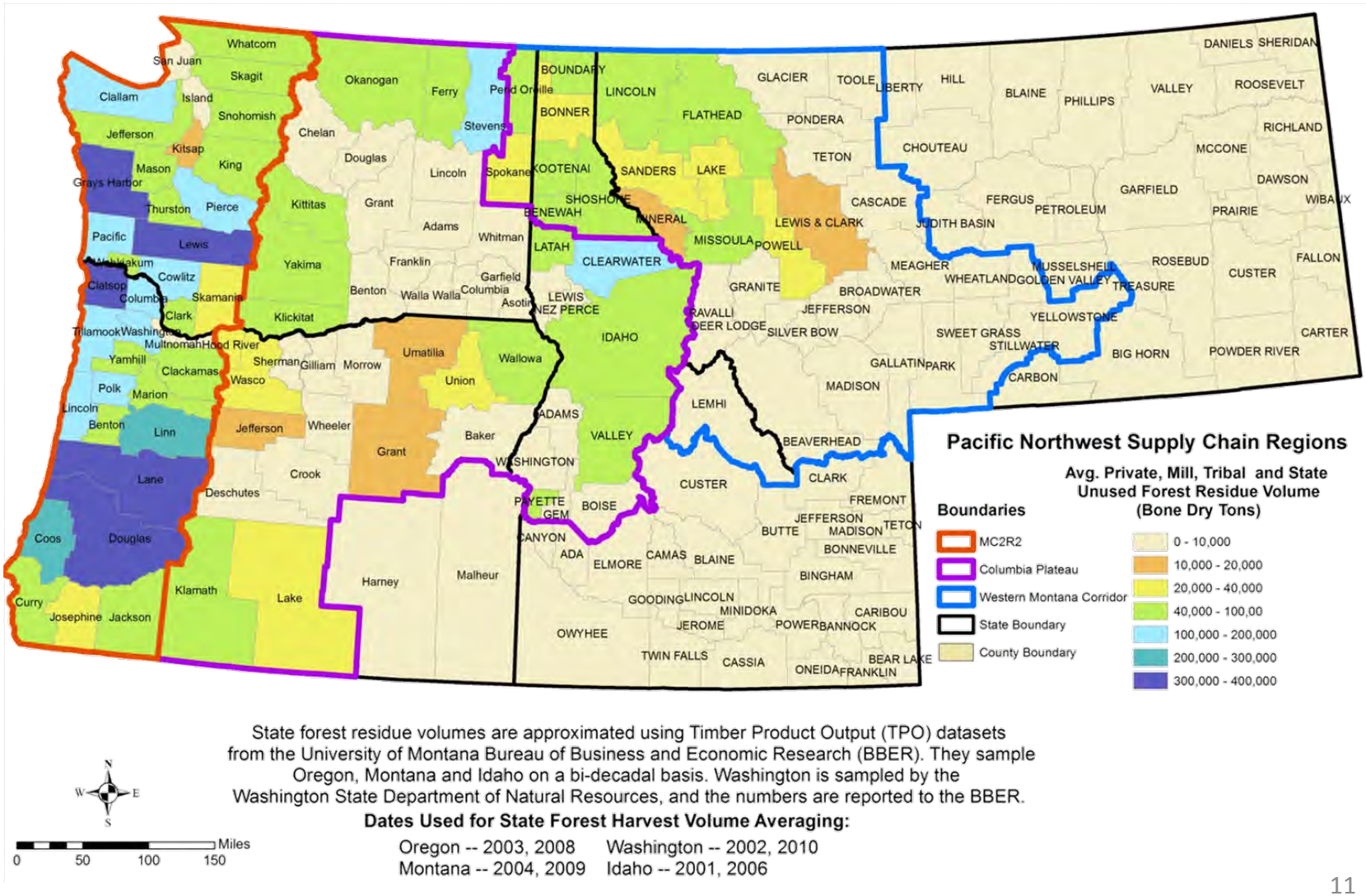
Topics covered include:

- Support
- Perceived Knowledge
- Agreement
- Worry
- Trust
- Perceived Benefits/Drawbacks

Survey Instrument

- 22 qualitative and quantitative questions
  - Scaling/Likert type questions
  - Open ended questions
- Demographic questions
  - Gender, education, political affiliation, age, zip code
- Option to take online, by phone, or hard copy through mail

Research Area



State forest residue volumes are approximated using Timber Product Output (TPO) datasets from the University of Montana Bureau of Business and Economic Research (BBER). They sample Oregon, Montana and Idaho on a bi-decadal basis. Washington is sampled by the Washington State Department of Natural Resources, and the numbers are reported to the BBER.

Dates Used for State Forest Harvest Volume Averaging:

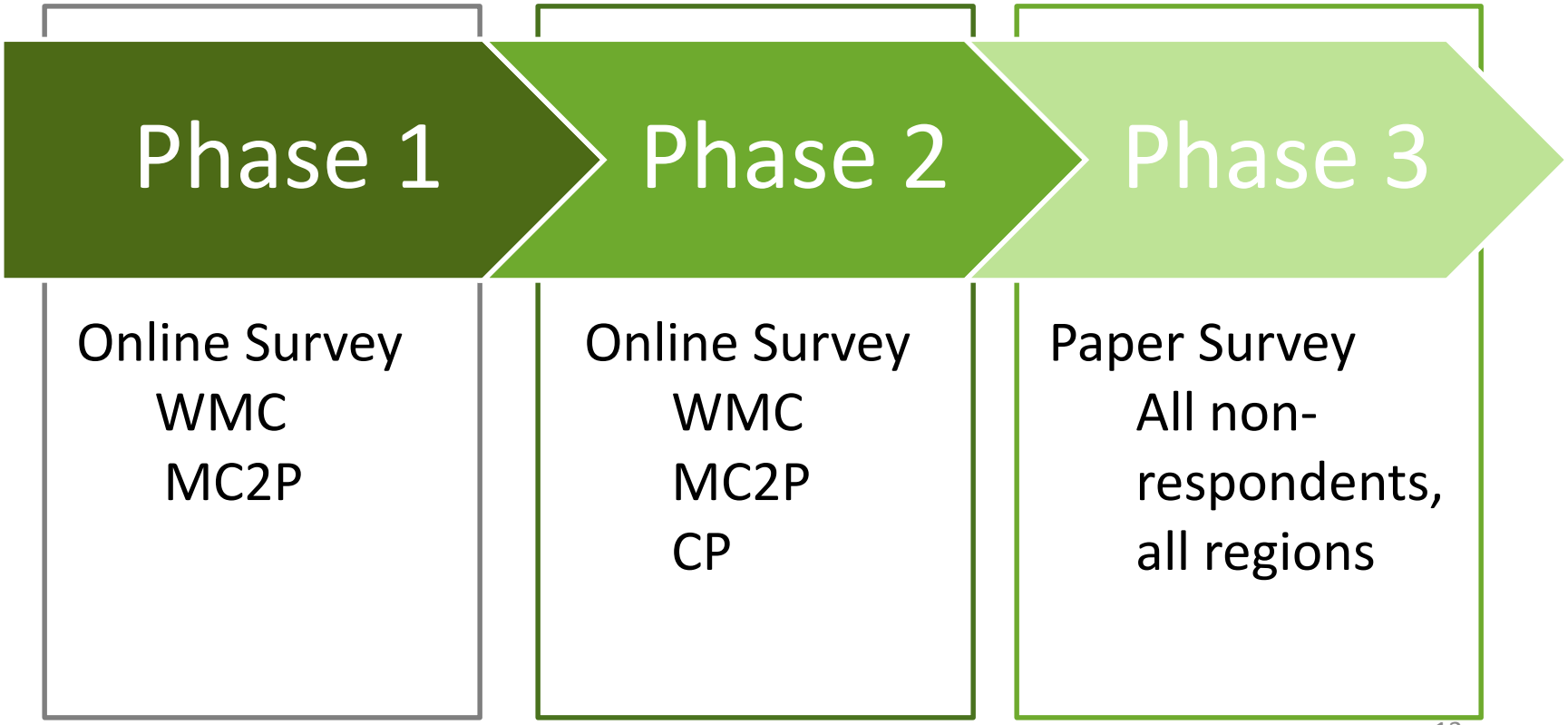
Oregon -- 2003, 2008 Washington -- 2002, 2010
Montana -- 2004, 2009 Idaho -- 2001, 2006

Stakeholder Groups

Industry	Conservation/ Tribal	Local Interests	Federal/State Gov.
• Forest Industry • Non-Industrial Land Owners • Private Foresters • Industrial Landowners • Harvesters/Haulers • Secondary/Primary/ Paper Products	• Tribal Members • ENGOs • Local Resource Managers • Wilderness Outfitters/Recreation	• University Extension • Economic/Business Development • Interested Local Businesses/Investors • City/Town Elected Officials • County Elected Officials	• Academic Researchers • Extension Foresters • State Foresters • State and Federal Scientists • State and Federal Natural Resource Managers • District Rangers

Survey Process

Survey Pilot:
10 in person interviews with WMC Stakeholders January 2013

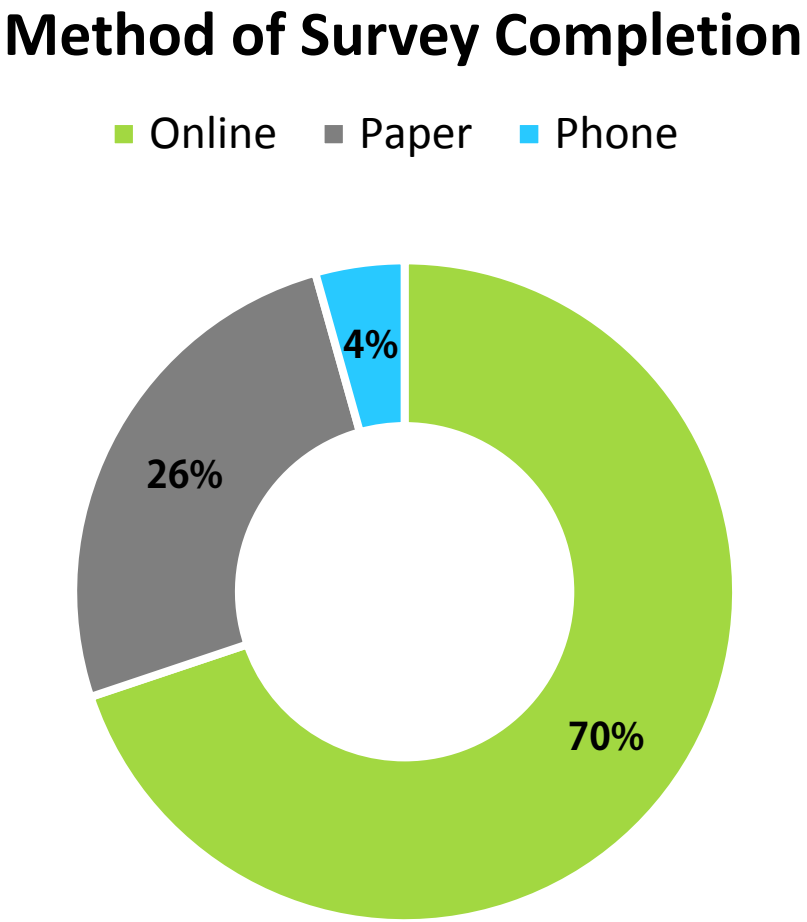


Survey Response

Total population: n= 868

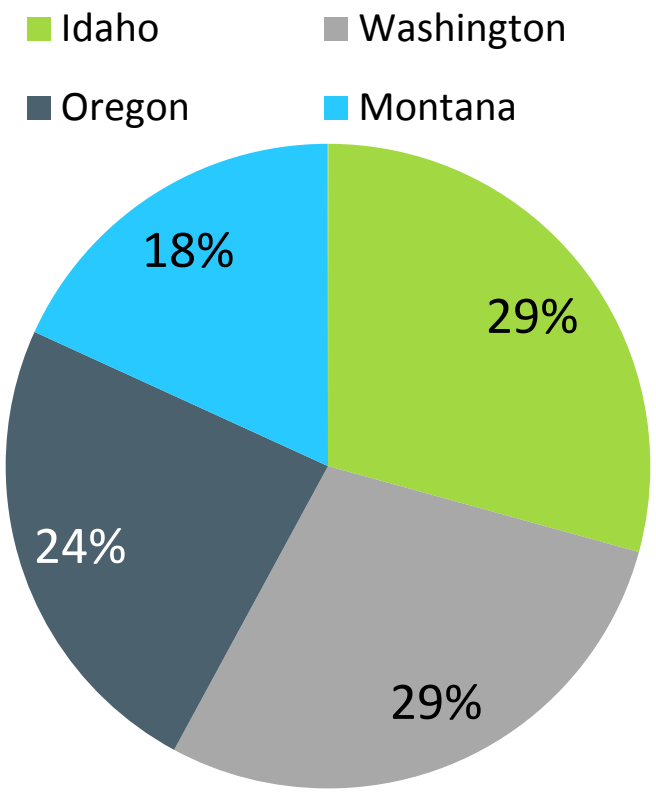
Total respondents: 298

Overall response rate: 34.3%

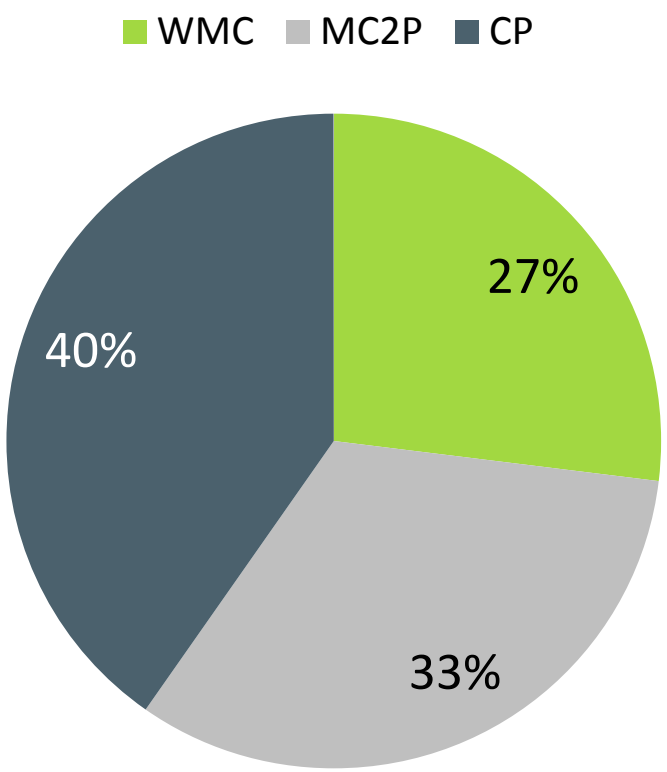


Participant Demographics

Survey Response by State

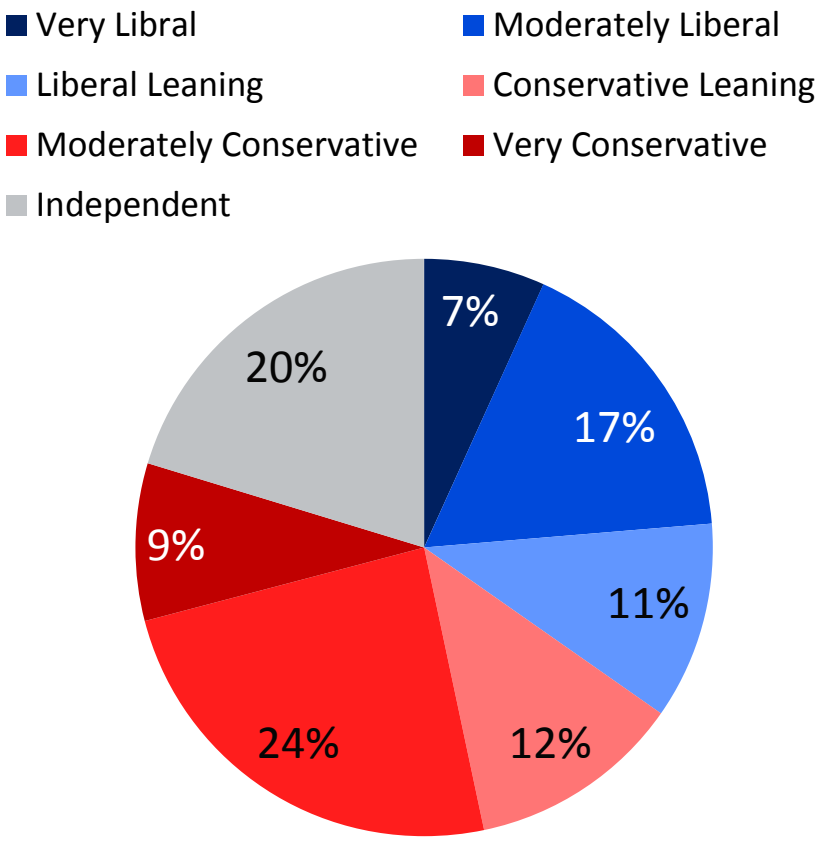


Survey Response by Region

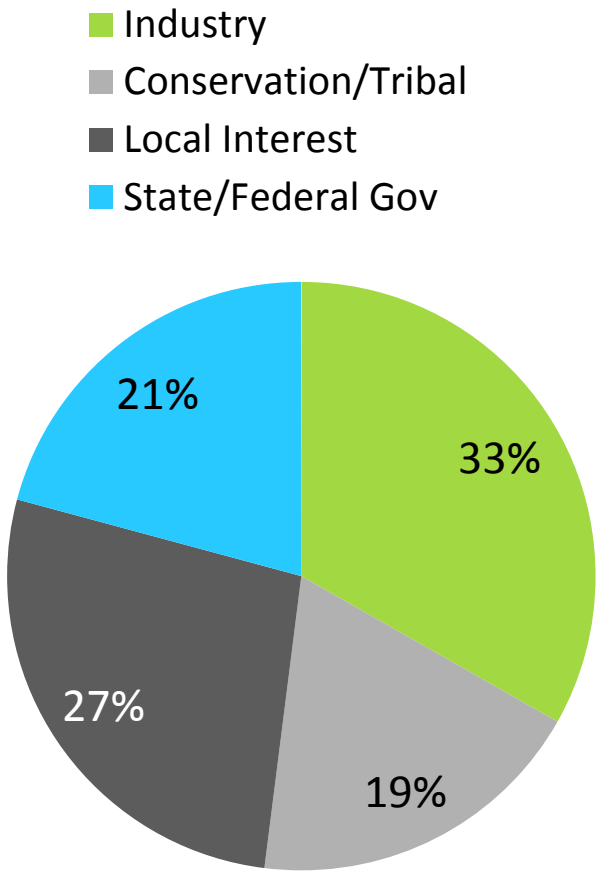


Participant Demographics

Survey Response by Political Affiliation



Survey Response by SHG

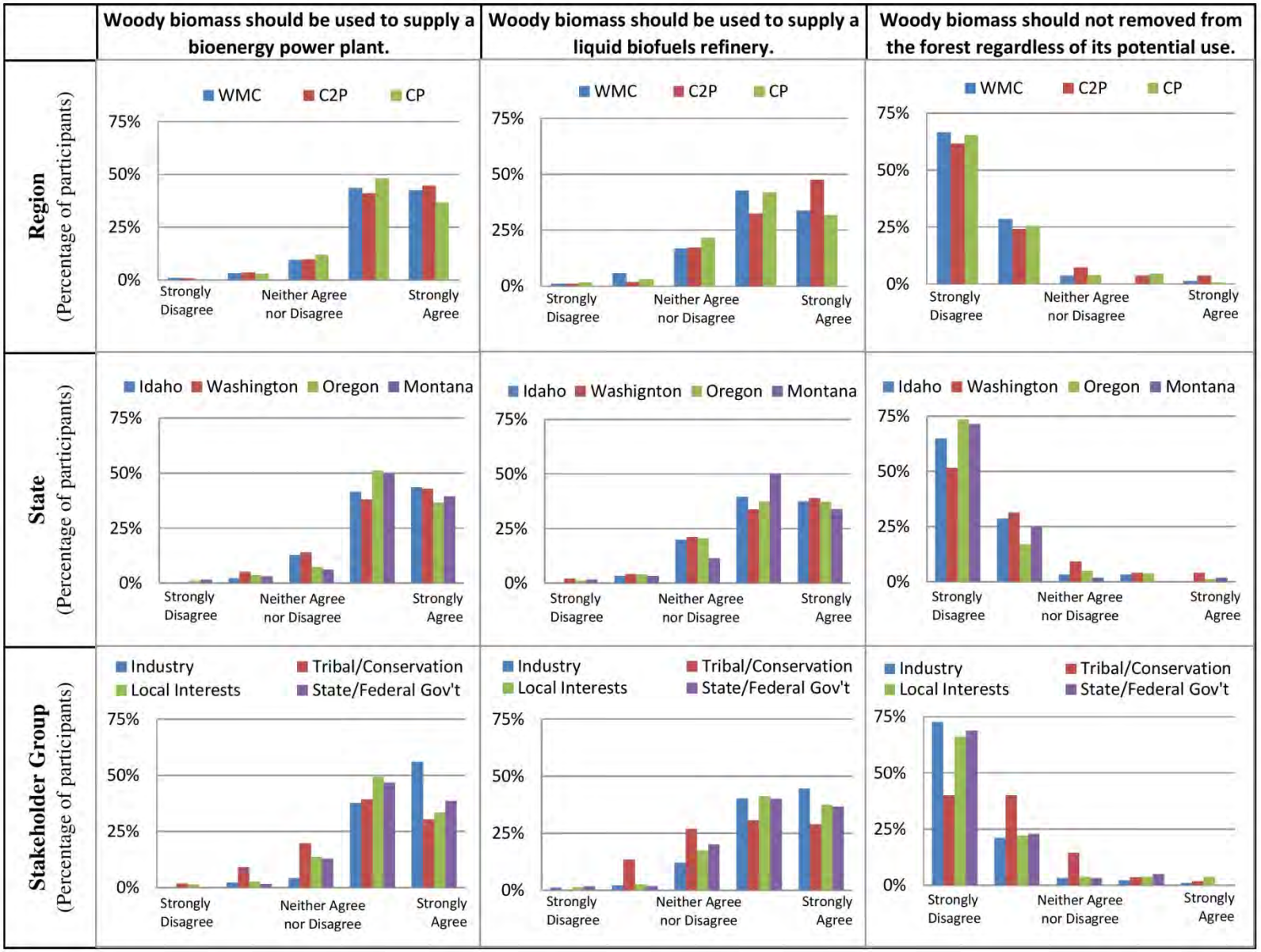


Findings

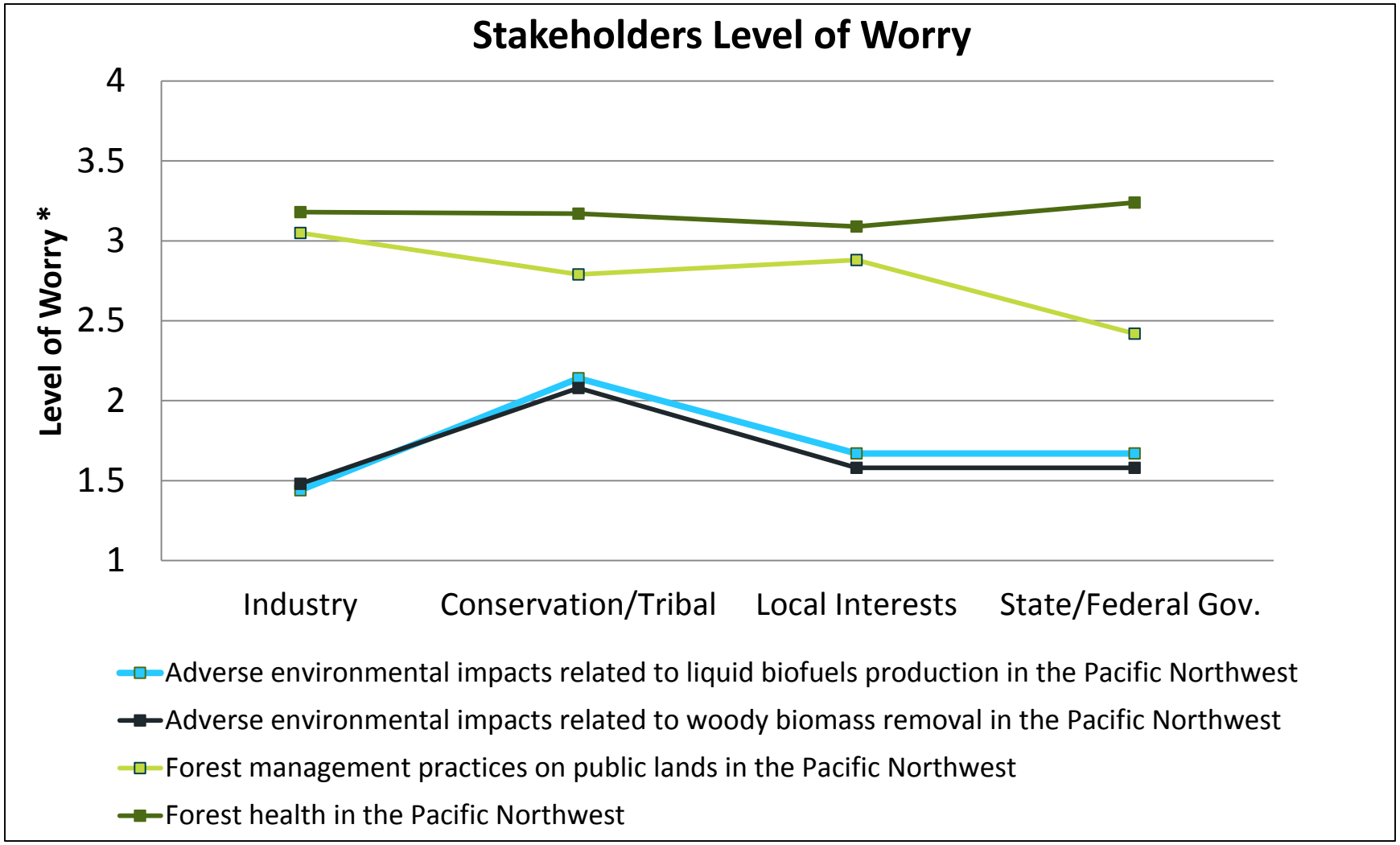
- While subtle and significant differences exist between stakeholder groups and regionally, overall a relatively **high level of acceptance of biomass related activities** was found among survey participants. These results are supported by:
  - Quantitative Findings
  - Qualitative Findings

And used to suggest Outreach Methods

Quantitative Findings:
Biomass Use vs Non-removal



Quantitative Findings: Worry



*Worry scale from 1 to 4 where 1 is not at all worried, and 4 is very worried.

Qualitative Findings: Forest Concerns

State	N	Diseased	Excess Fuel	Fire Hazard	Insect Problems
Idaho	85	32%	24%	28%	5%
Montana	50	24%	14%	28%	24%
Oregon	71	32%	39%	21%	9%
Washington	82	11%	28%	23%	12%

Idaho most frequently mentioned concern: diseases in forests

Montana most frequently mentioned concern: fire hazards

Oregon & **Washington** most frequently mentioned concern : excess fuel

Qualitative Findings: Perceived Benefits

Stakeholder Group (SHG)	n	Economic Benefits	Reduce Fires	Healthier Forest Stands	Decrease Insect Damage	Renewable Energy
Industry	81	35%	67%	38%	14%	22%
Tribal/Conservation	47	23%	55%	38%	9%	19%
Local Interests	63	30%	71%	47%	3%	8%
State/Federal	67	30%	76%	44%	10%	12%

Most frequently mentioned benefit, **all Stakeholders**: reduce fires

Industry mentioned economic benefits & renewable energy more frequently than others

Local Interests mentioned healthier tree stands more frequently than others

Qualitative Findings: Potential Negative Effects

SHG	N	Loss of Material	Soil Degradation	Loss of Habitat	No Negative Effects
Industry	78	30%	24%	10%	40%
Tribal/Conservation	47	21%	34%	28%	19%
Local Interests	64	14%	19%	19%	41%
State/Federal	66	24%	26%	26%	17%

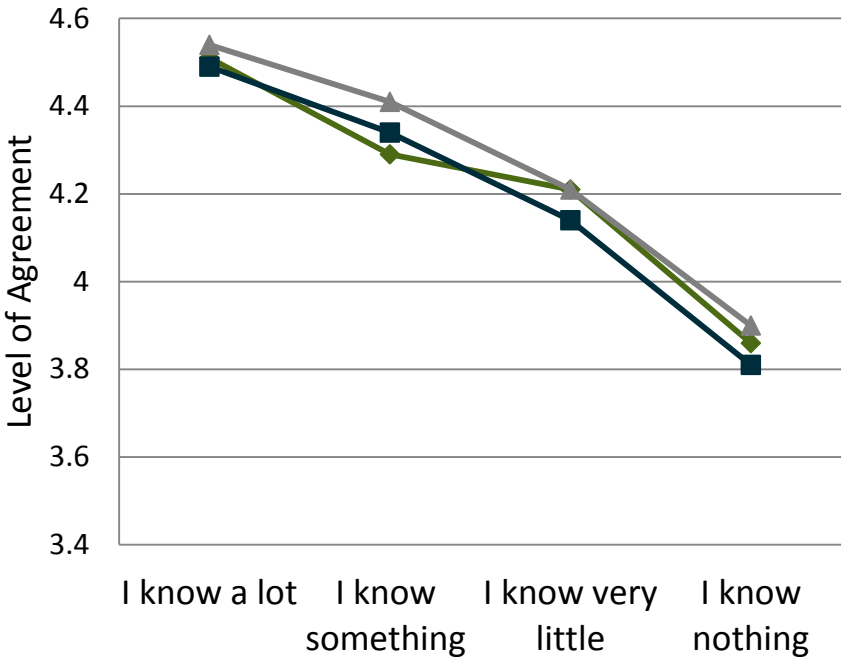
Industry & **Local Interests** most frequently mentioned: *No* negative effects

Tribal/Conservation groups' most frequently mentioned negative effect: loss of habitat

State/Federal groups' most frequently mentioned negative effects: soil degradation & loss of habitat

Knowledge Levels:
Woody Biomass Sources & Uses

Which sources of woody biomass do you agree should be used for bioenergy?

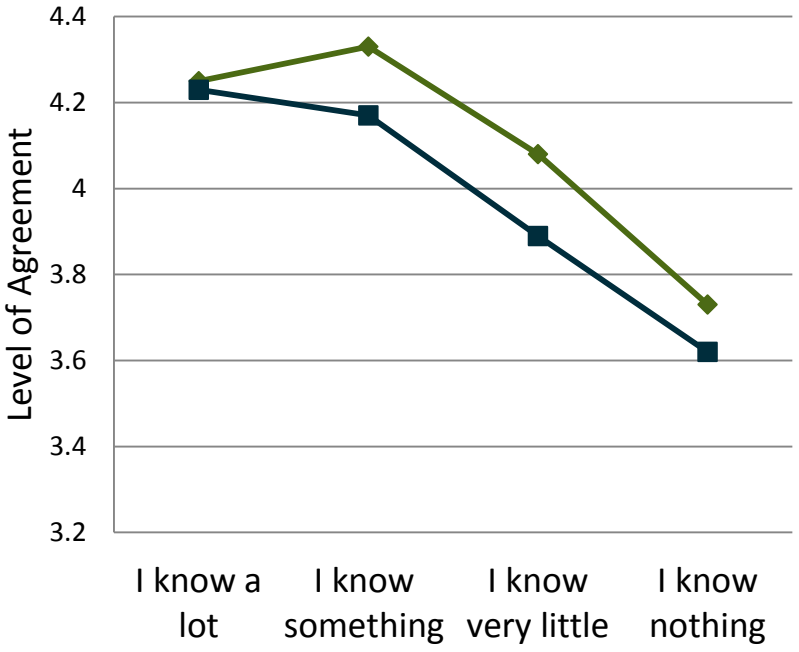


Woody biomass from forest thinning (p= .029)

Woody biomass from timber harvesting and logging residues (p= .009)

Woody biomass from bug infested/diseased trees (p= .007)

Which options for use of woody biomass generated from forest management activities do you agree with?



A bioenergy power plant (p= .003)

A liquid biofuels refinery (p= .006)

Knowledge Levels: Stakeholder Groups with Least Knowledge about Liquid Biofuels by State

State	Stakeholder Group(s)
Idaho	Conservation/Tribal
Montana	Local Interests Industry
Oregon	Conservation/Tribal Local Interests
Washington	Conservation/Tribal Industry

Knowledge Gaps

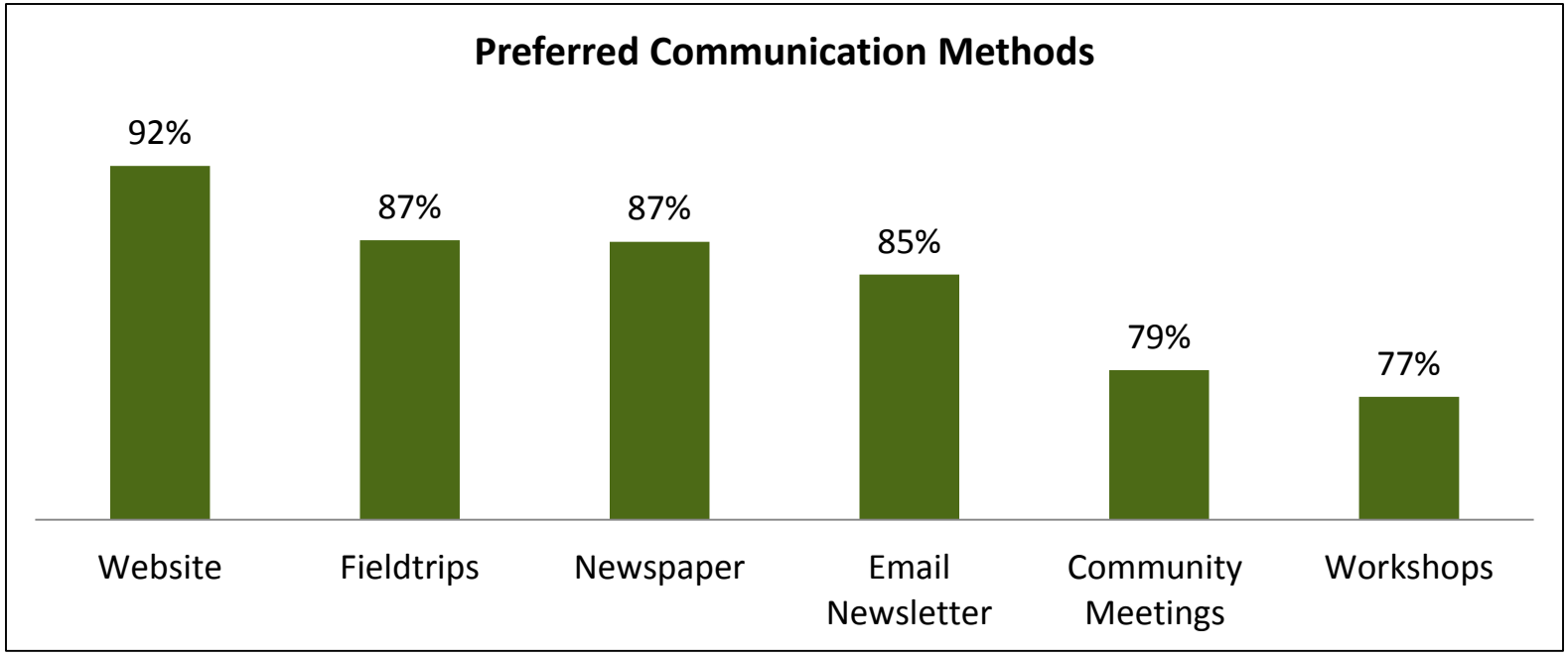
- The top two topics that stakeholders from all groups and states said they "knew very little" to "nothing about"
  - Using woody biomass to produce liquid biofuels
  - Liquid biofuels

- Top questions from each state were about economic feasibility and environmental impacts. The next most frequent question by state was:
  - Idaho- regulation and policy questions about using public lands
  - Montana- "When can we start?"
  - Washington- Feedstock sources and composition
  - Oregon-Environmental impacts

Communication Methods

•Little variation in outreach methods by state or stakeholder group.

•Stakeholders most interested in being able to access information themselves *and* opportunities where they can receive information and ask questions in real life.



Outreach Recommendations

- General outreach should focus on identified knowledge gaps:
  - Using woody biomass to produce liquid biofuels
  - Liquid biofuels in general
- Specific outreach by state and stakeholder group should emphasize perceived benefits and addressing concerns
- Methods should include information which can be accessed by stakeholders in their own time, and two way communication where stakeholders can get information *and* ask questions

Stakeholder Survey Summary

- Overall, survey participants showed **high levels of support** for a woody biomass to liquid biofuel supply chain in the PNW.
- Reoccurring themes throughout the survey were questions or uncertainty about **environmental impacts** and **economic feasibility.**
- **Concerns and perceived benefits impact levels of support** for a wood based biofuels supply chain, therefore, these topics should be addressed through outreach methods.

Olympic Peninsula Case Study

- Compared Clallam and Jefferson counties, WA
  - Strengthen what we already know
  - Detailed, contextual analysis
  - In depth, place-based understanding
  - Important for facility siting

Clallam County

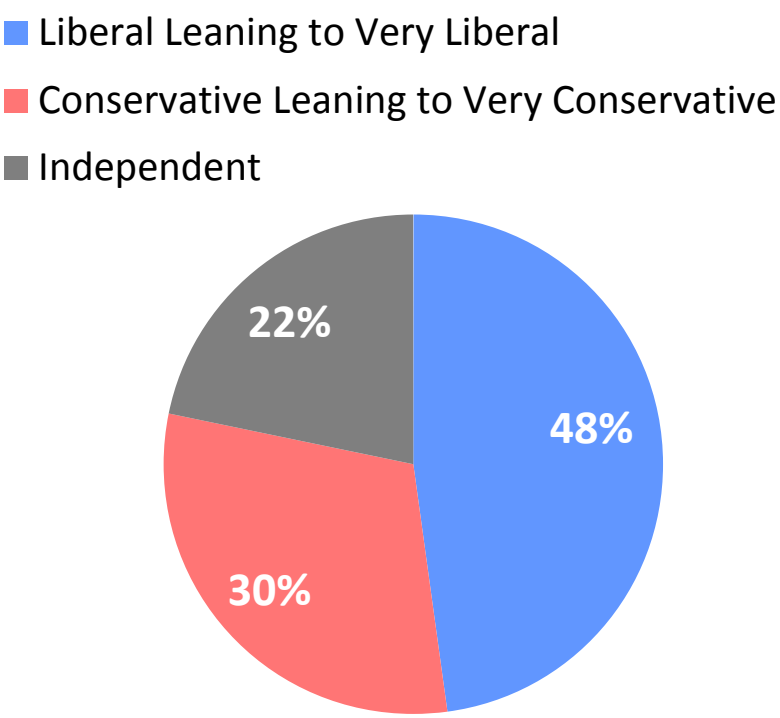
Jefferson County

County Profiles

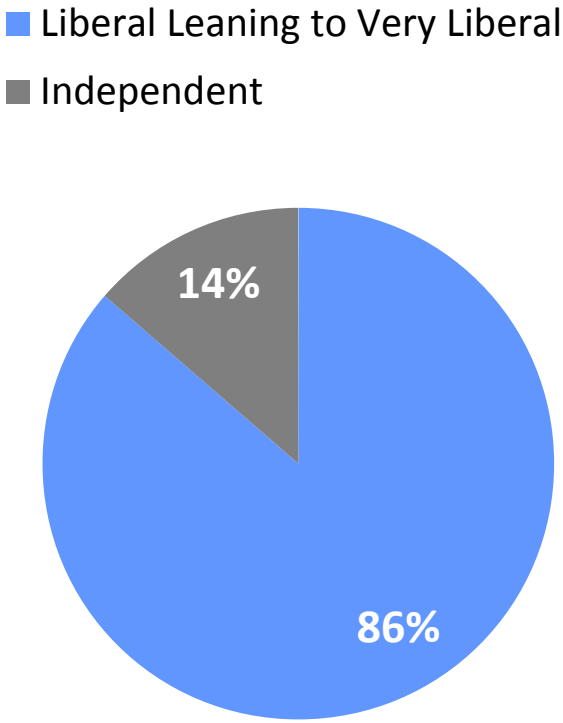
	Clallam	Jefferson
Population	72,715	30,228
Unemployment	8.7%	8.3%
Timber % of total personal income	5.8%	3.3%
Travel & Tourism % of total employment	18.0%	20.2%
Federal Land	46.3%	60.9%
% of Gov't Jobs	22.3%	16.5%

Participant Political Affiliation

Clallam County

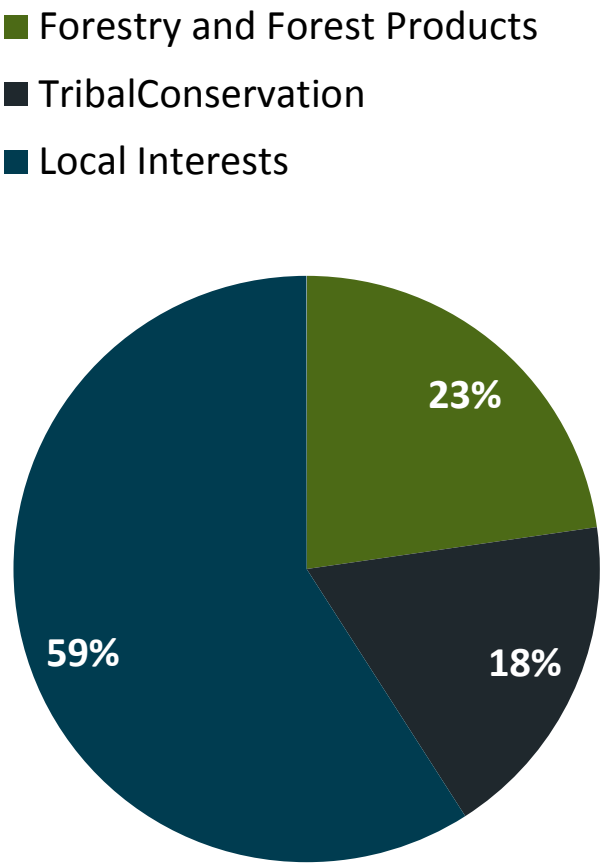


Jefferson Count

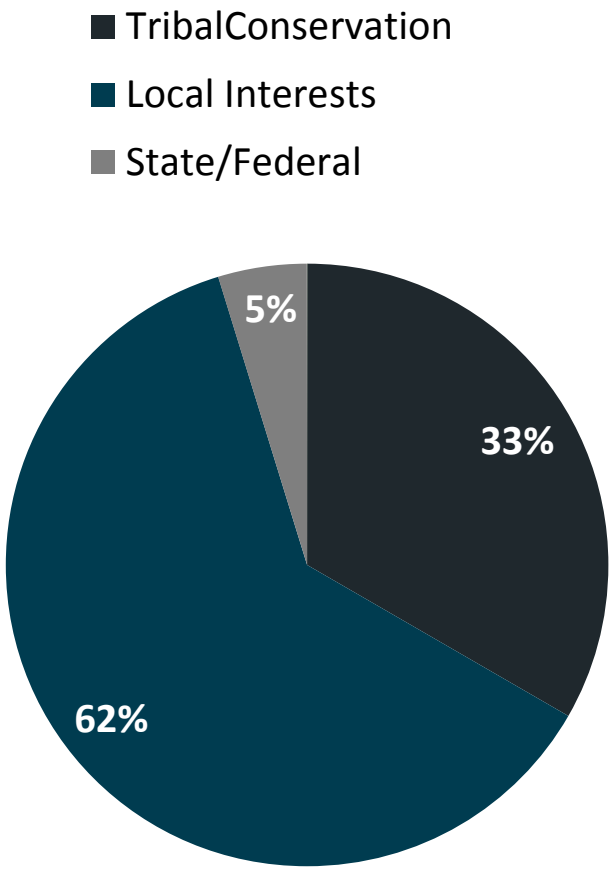


Participant Stakeholder Group

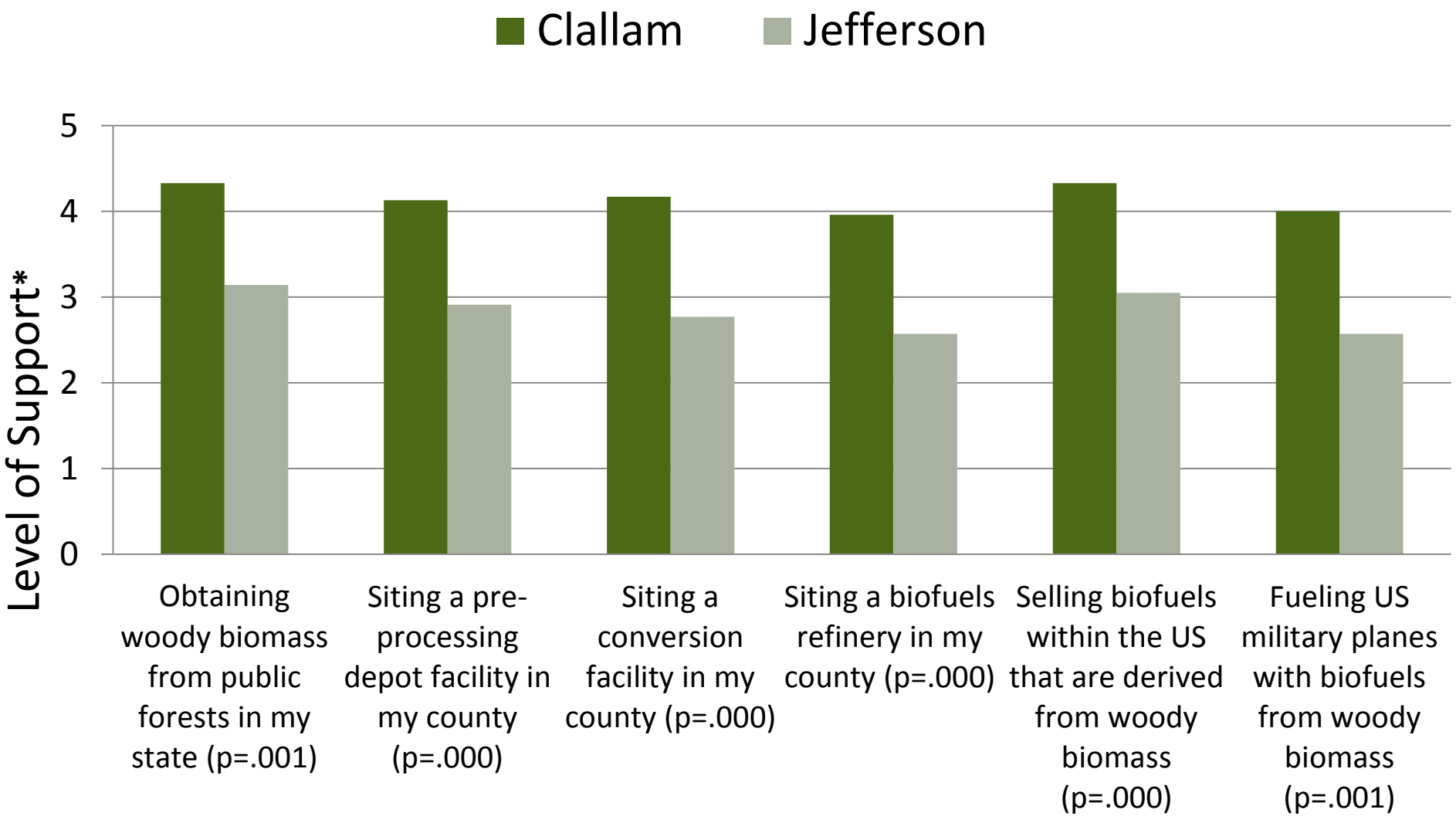
Clallam County



Jefferson County



Stakeholder Level of Support



*Support scale: 1 (strongly oppose) to 5 (strongly support).

OP: Perceived Benefits

County	n	Economic Benefits	Reduce Fires	Healthier Forest Stands	Decrease Insect Damage	Renewable Energy
Clallam	24	25%	29%	33%	0%	42%
Jefferson	22	0%	27%	5%	9%	14%

Most frequently mentioned benefits**, Clallam participants:** healthier forest stands & renewable energy

Most frequently mentioned benefit, **Jefferson County**: reduce fires

"[Benefits include] a good energy source to replace fossil fuels; employment; reduce wildfire risks.."
–Participant from Clallam County

OP: Potential Negative Effects

County	N	Loss of Material	Soil Degradation	Loss of Habitat	No Negative Effects
Clallam	24	25%	4%	8%	17%
Jefferson	22	64%	9%	14%	0%

Clallam & Jefferson most frequently mentioned: Loss of Organic Materials

Clallam participants more likely to mention: *no* negative affects

Jefferson participants' more likely to mention negative effect of : loss of habitat

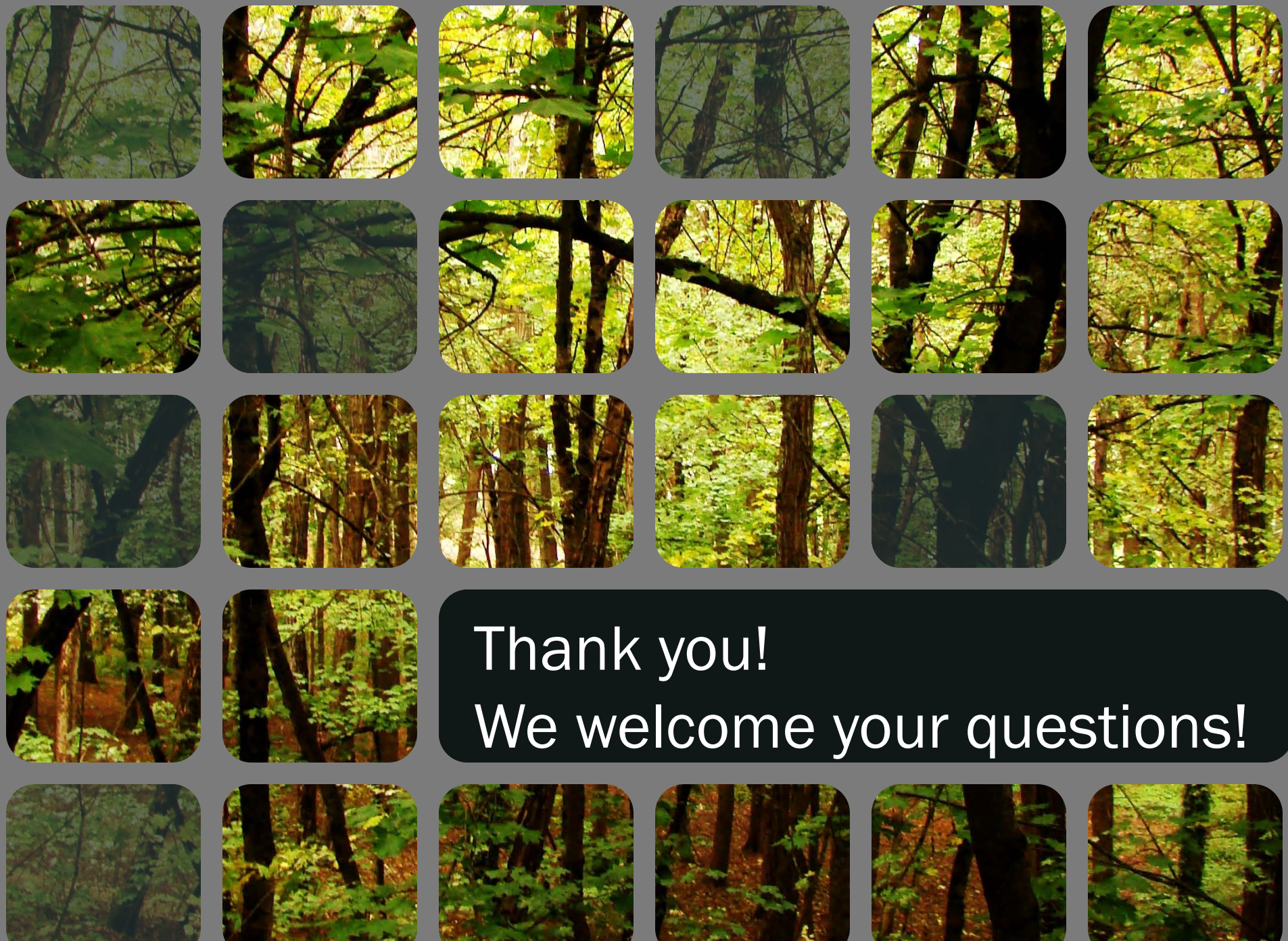
"I worry a lot that if too much biomass is removed, the health of the forest will suffer." *–Participant from Jefferson County*

Conclusion

- Region as whole showed fairly high levels of support for wood to biofuels industry
  - Place specific analysis should be done for validation
- Less supportive stakeholders are mainly concerned about environmental impacts and economic feasibility
  - Place specific outreach addressing these concerns may be helpful

Siting Biofuels Facilities on the OP

- Check out posters
- Presentation tomorrow, May 4, 8-8:30 AM
- Micronized wood depot and conversion facility siting in Port Angeles, WA


Thank you!
We welcome your questions!