



Integrated Design Experience (IDX): Wood-based Aviation Biofuels Supply Chains in the Pacific Northwest

Dr. Tammi Laninga, AICP

Western Washington University

Dr. Karl Olsen

Washington State University

Northwest Advanced Renewables Alliance





WASHINGTON STATE
UNIVERSITY



- **RELEVANT:** Real-world problems with sustainable solutions in the built environment.
- **INTERDISCIPLINARY:** Students and faculty from engineering, design, and community planning disciplines
- **PARTNERSHIPS:** Collaboration with industry, governmental, and professional practice stakeholders



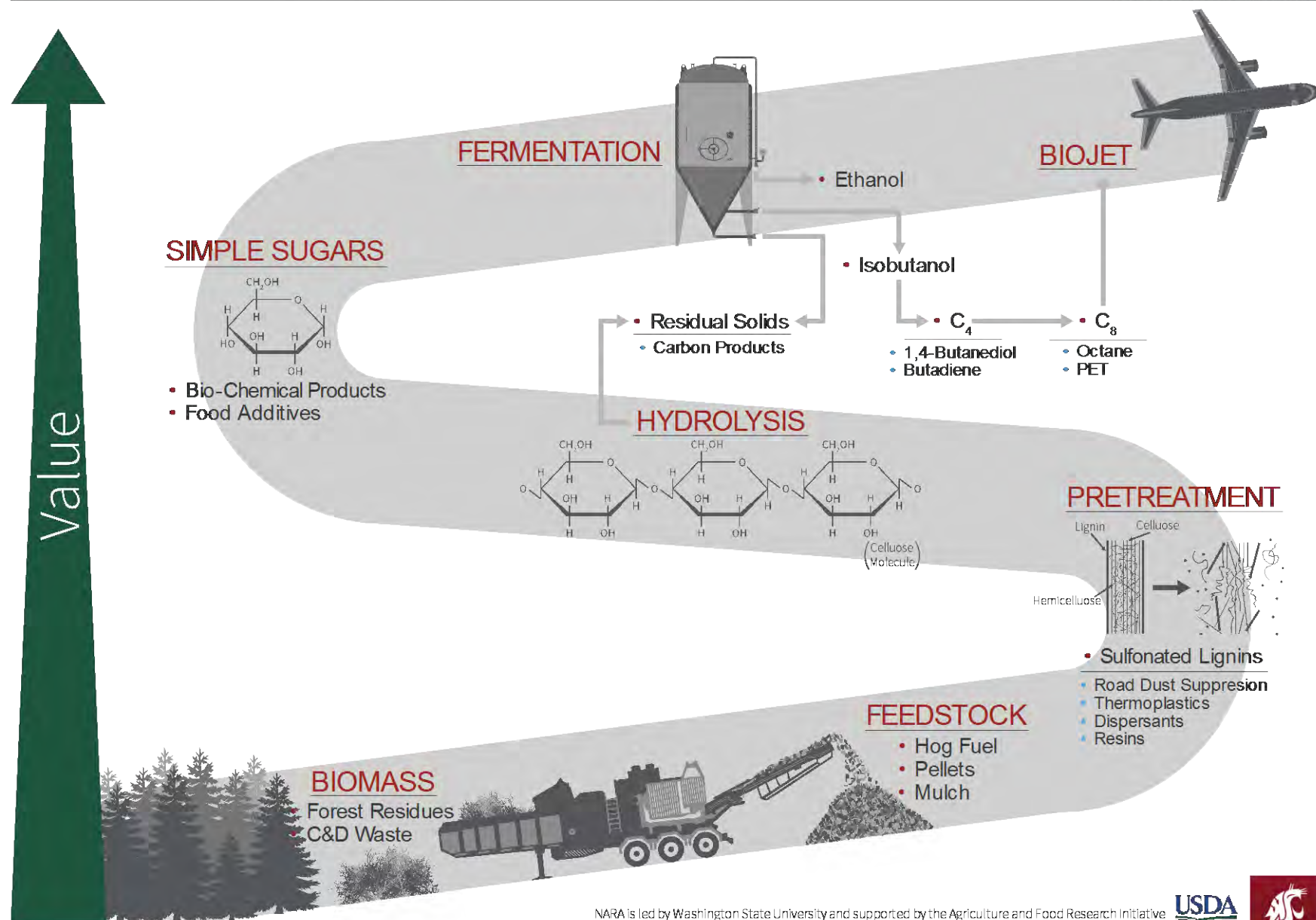
Sustainable BioJet
Valuable Lignin Co-Products
Rural Economic Development
Supply Chain Coalitions
Energy Literacy

NATIONAL MODEL

SUPPLY CHAIN PRODUCTS

NARA

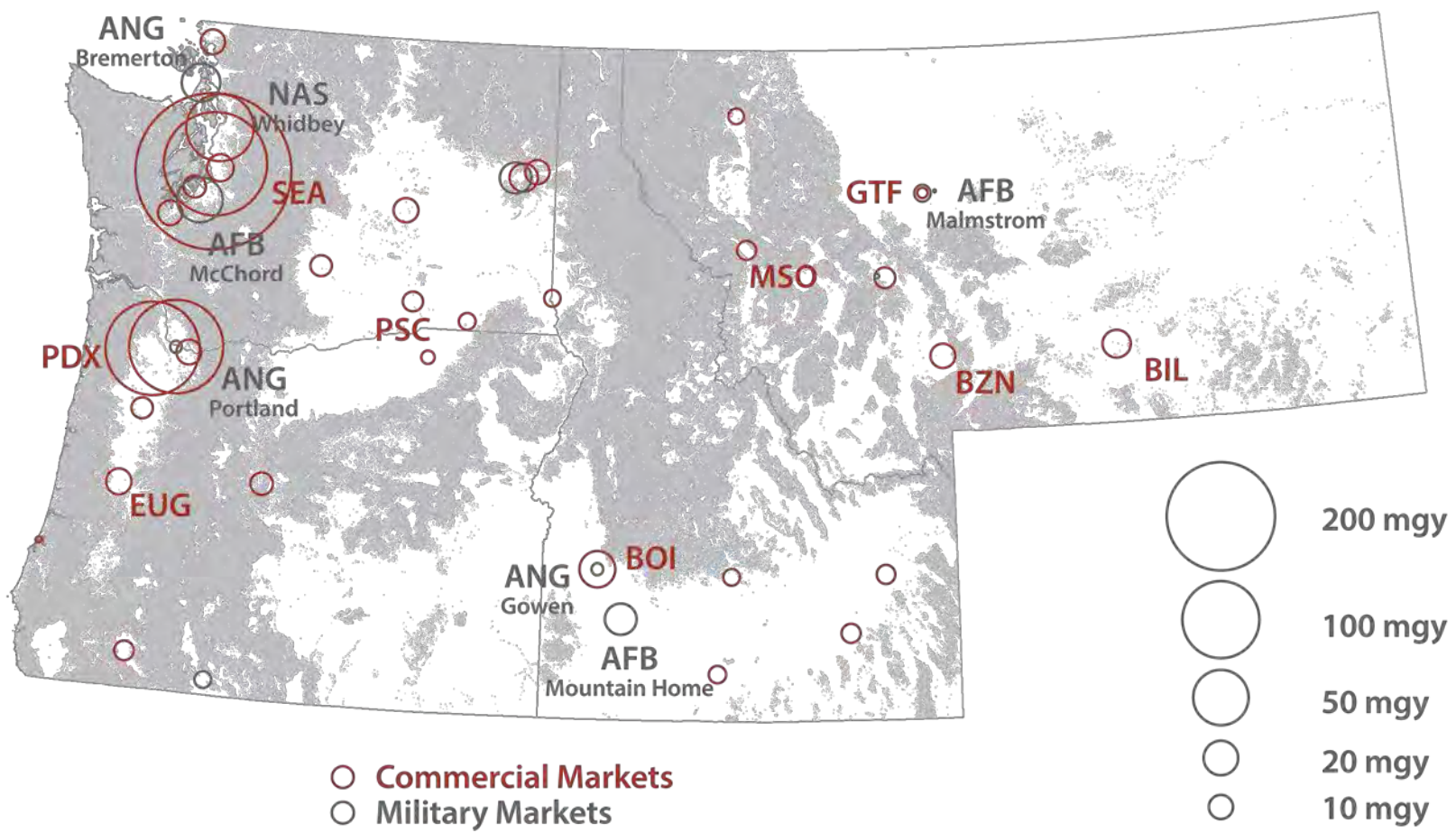
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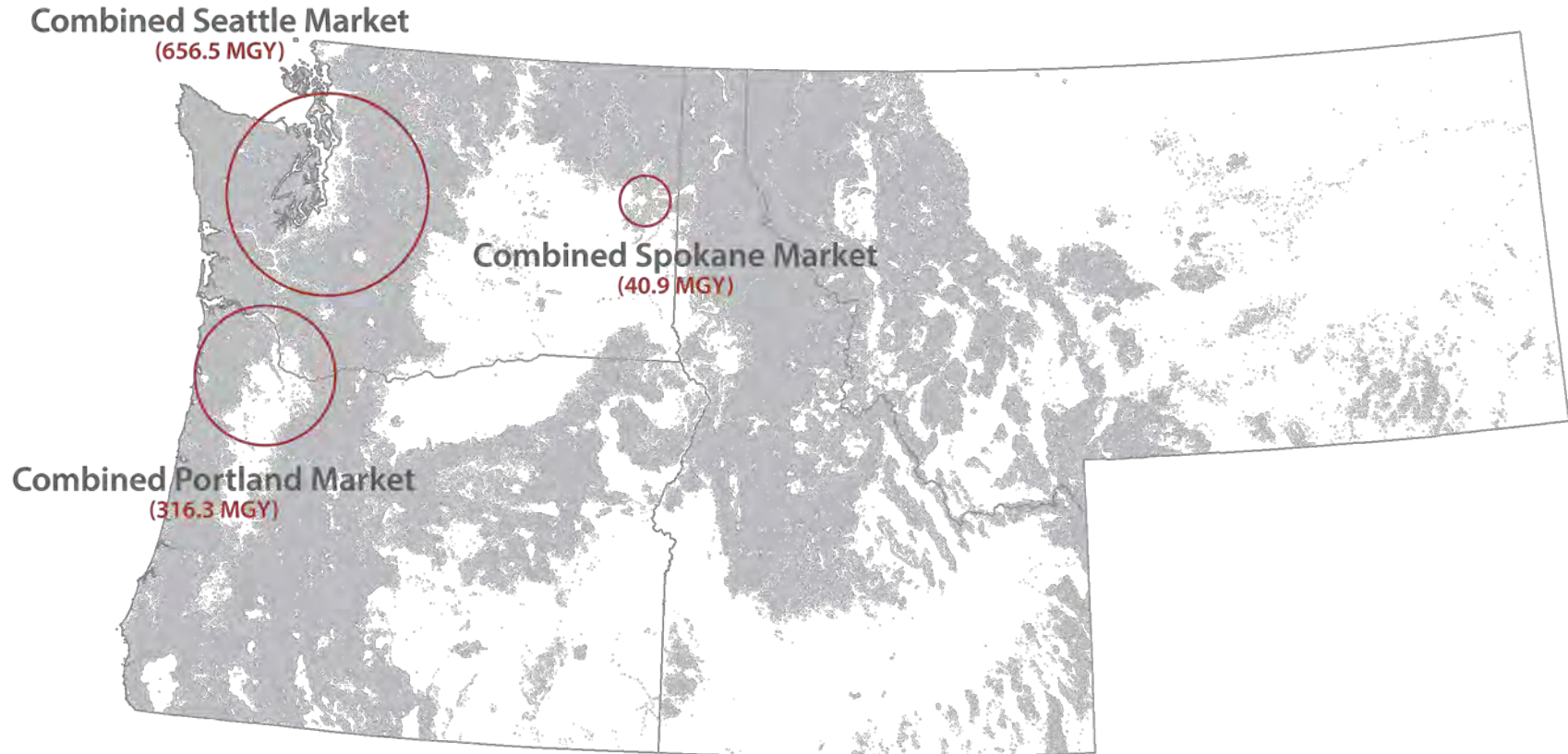
Commercial & Military Jet Fuel Consumption



Total Jet Fuel Consumption in 2010
743-million gallons



Aviation Fuel Demand Centers



NARA



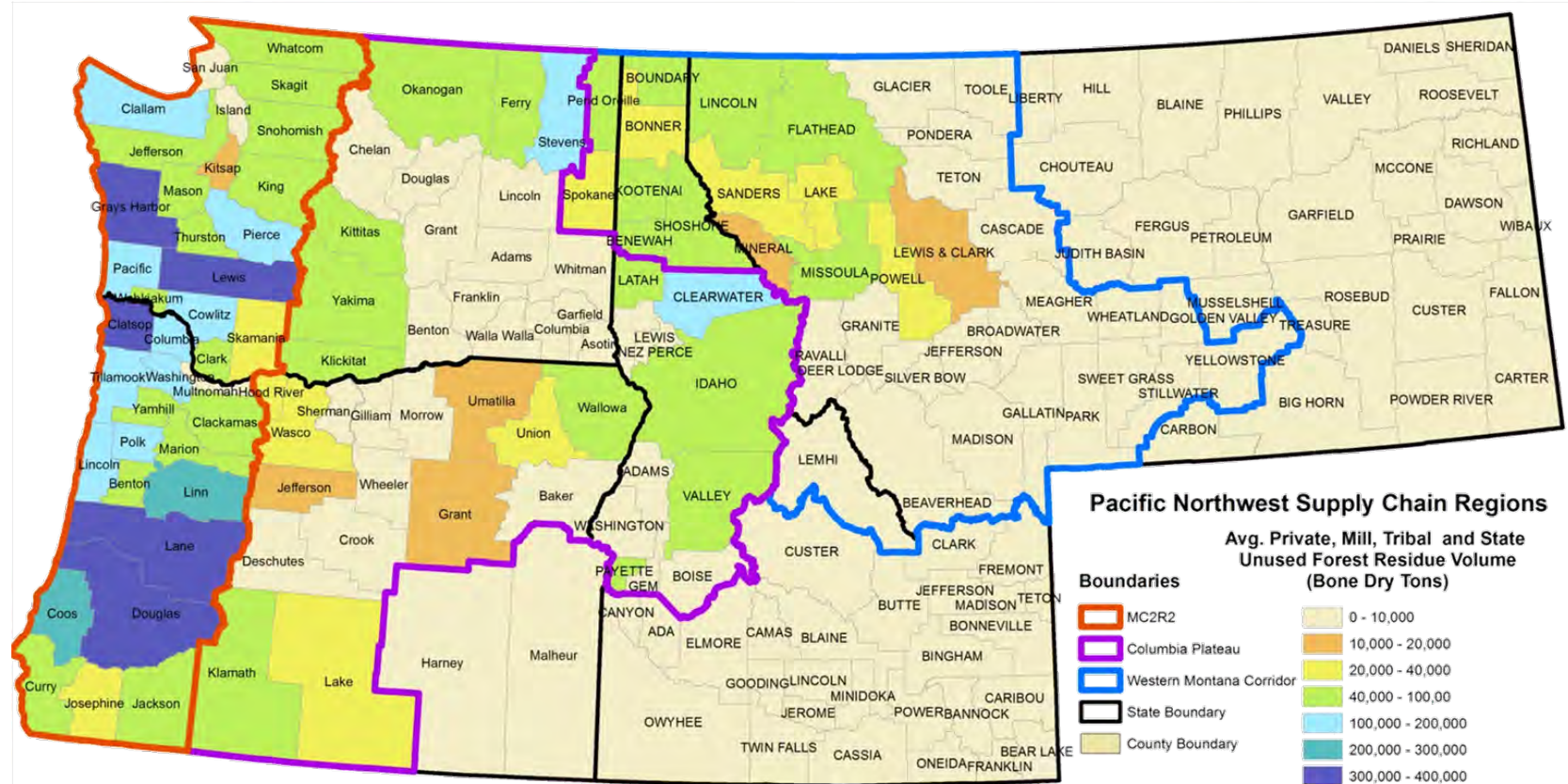
By the Numbers ...

- Boeing 747 uses 1 gallon/fuel every second
- 4 hour flight (60 sec x 60 min = 3,600 gal x 4 hours) = **14,550 gallons**
- **313 BDT** woody biomass (or 636,000 lbs) for 4 hour flight
- Standard chip van carries 12.5 BDT; **25 chip vans to fuel 4 hour flight**





NARA Supply Chain Regions



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

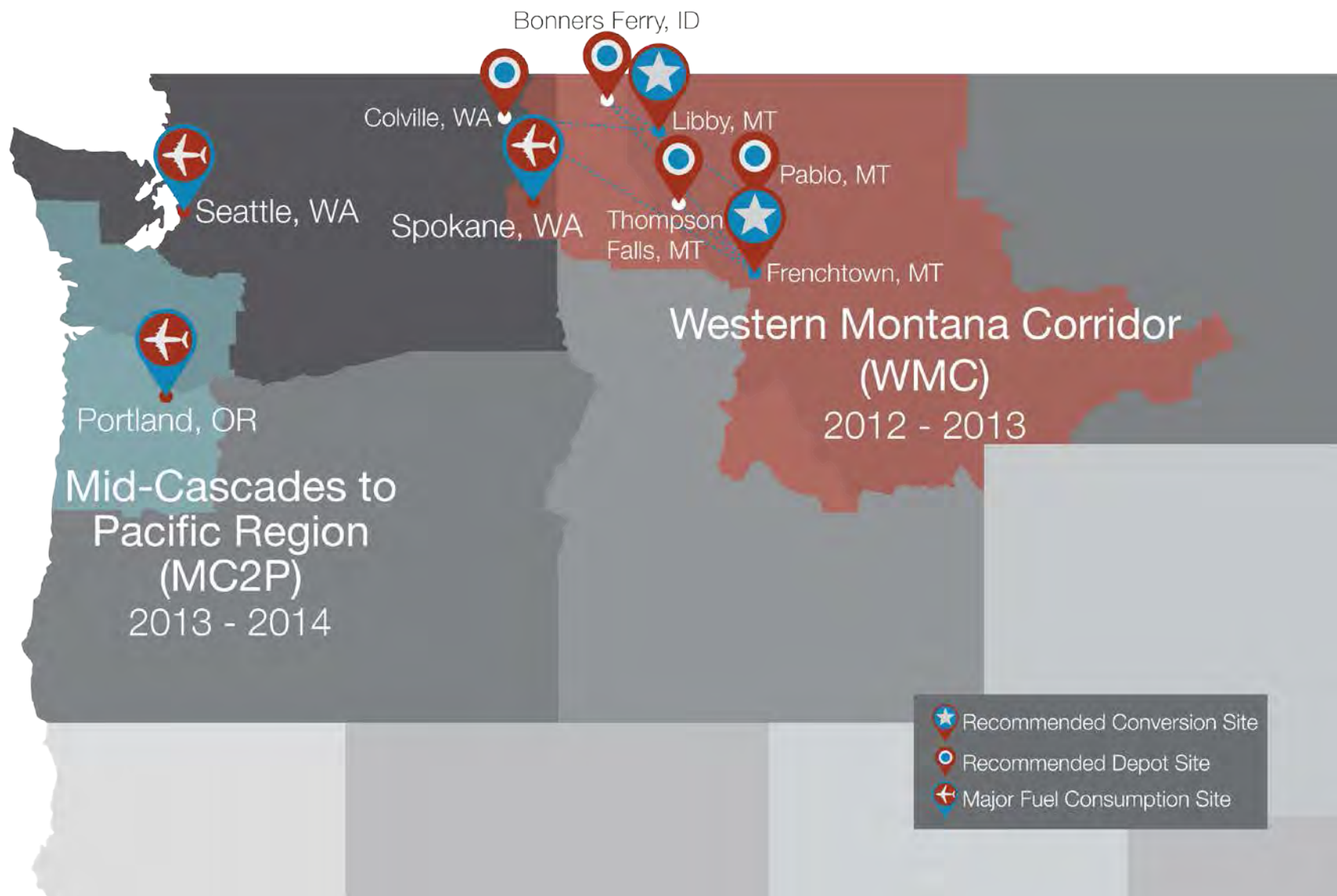


0 50 100 150 Miles



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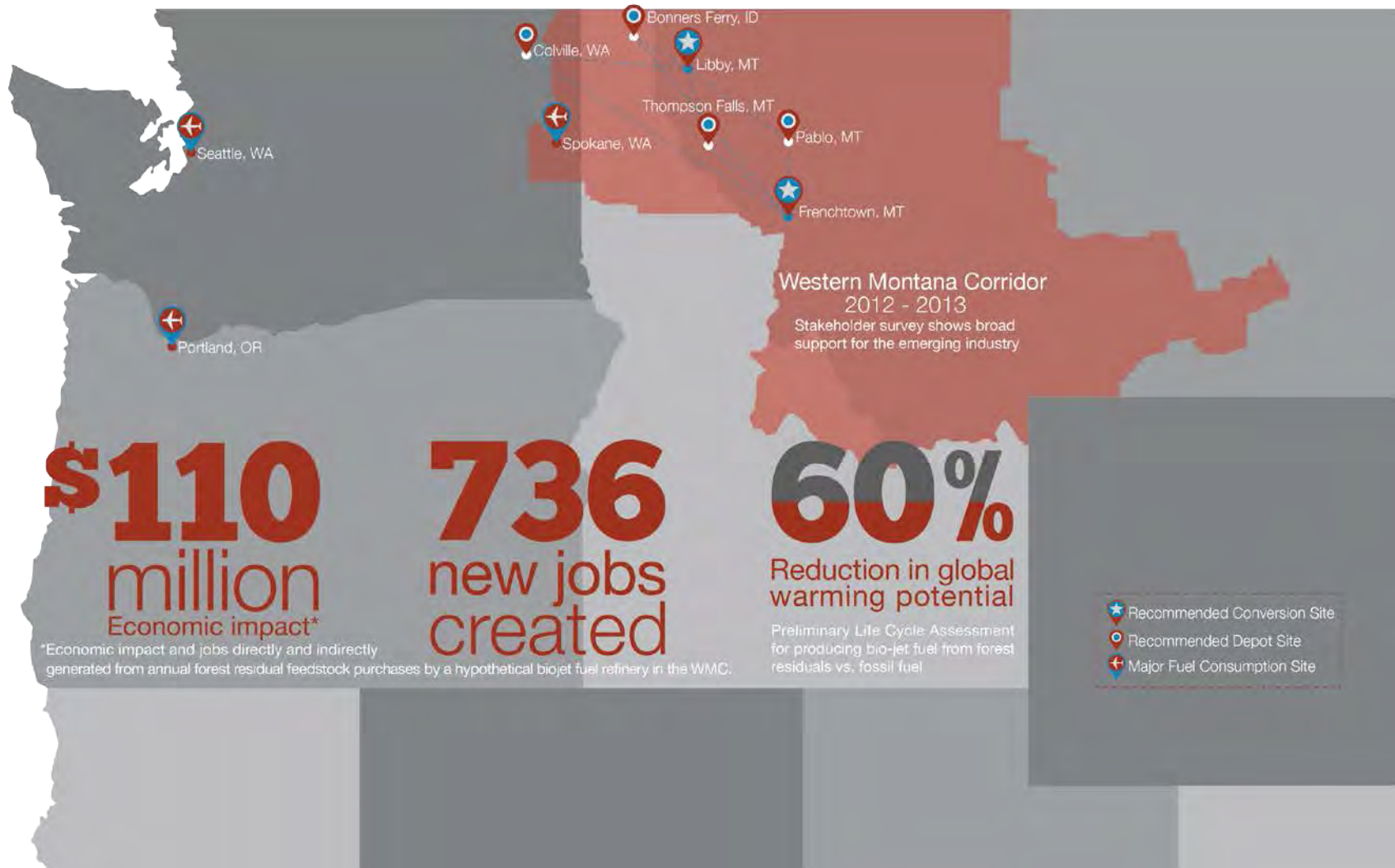
Supply Chain Analyses



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Estimated Overall Impact in WMC



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NODES

State Databases
Active Primary Wood
Processing Facilities

Depots and
Conversion Plants

Road and Rail Access



LINKAGES

Google Maps Travel time

ArcGIS

Roads and Rail

BNSF Rail distance
calculations



AREAS

ArcGIS Network Analyst
One-way travel time

Biomass

0.5, 1, 1.5, 2 HR radius





Solids Depot

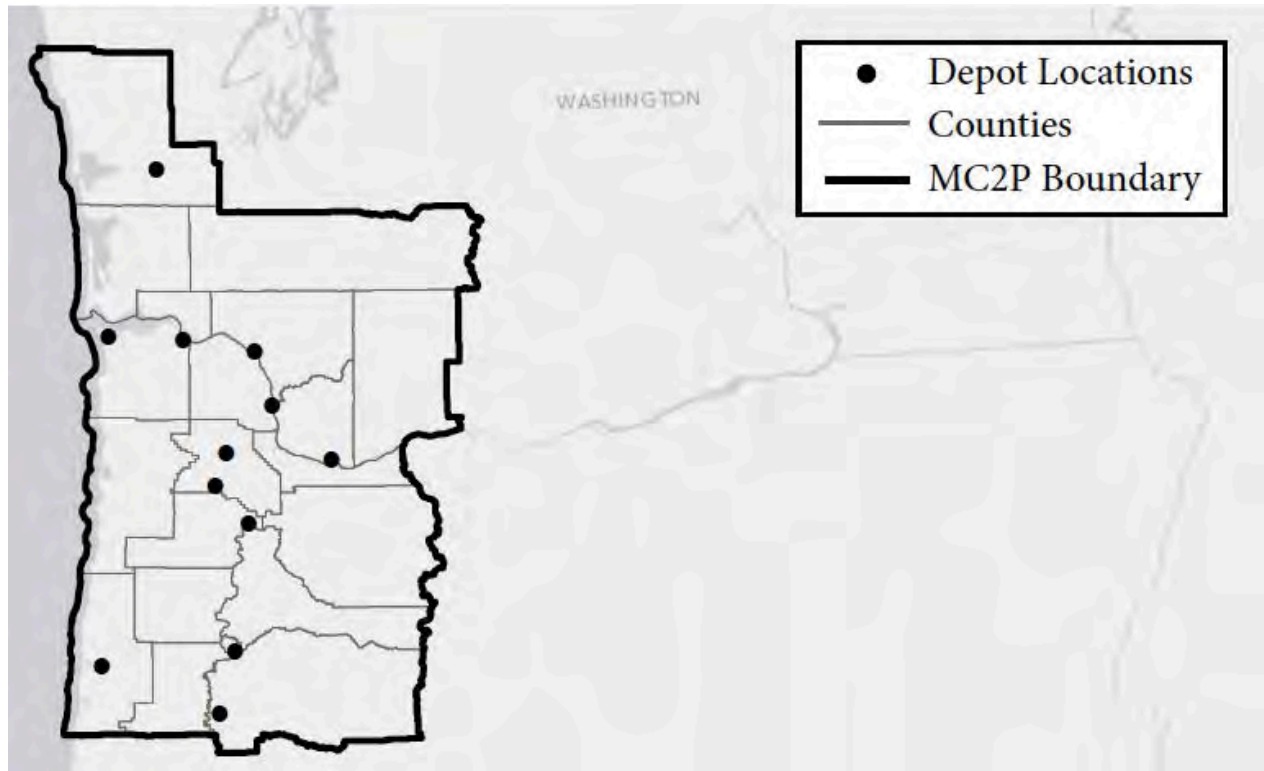


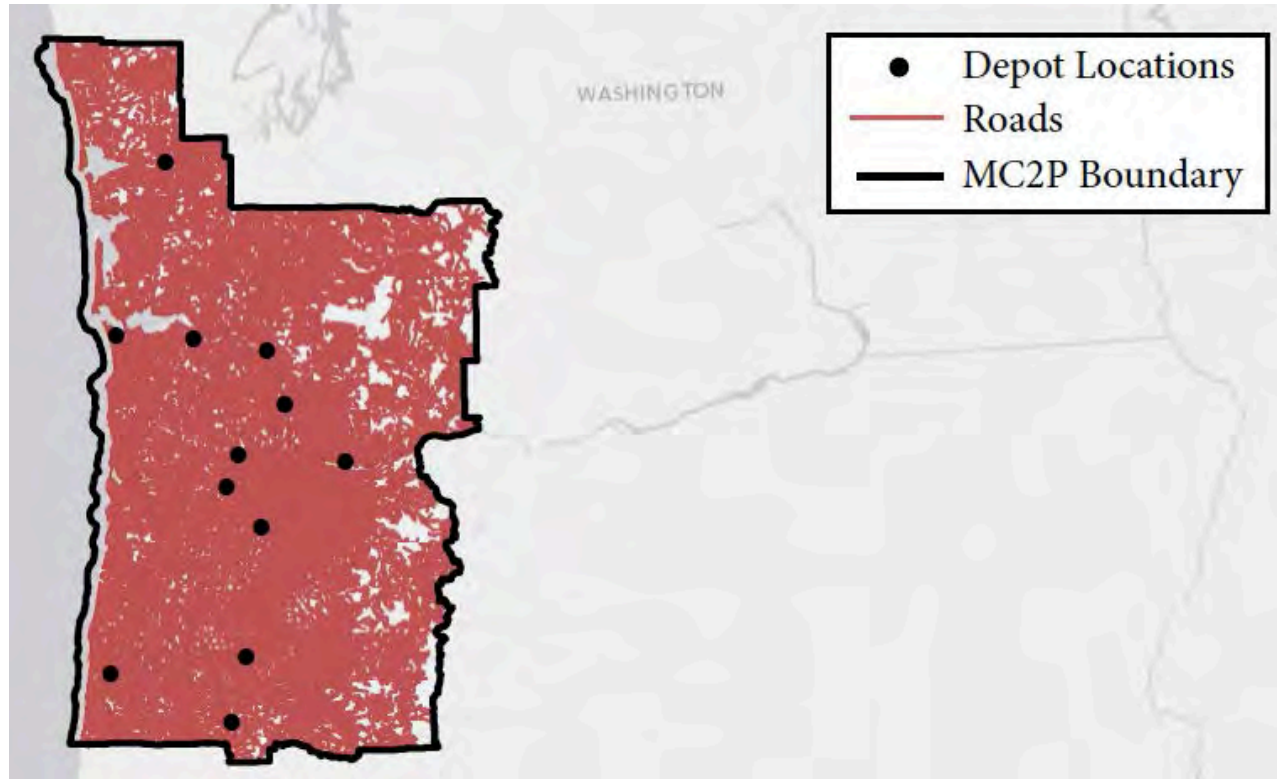
Liquids Depot



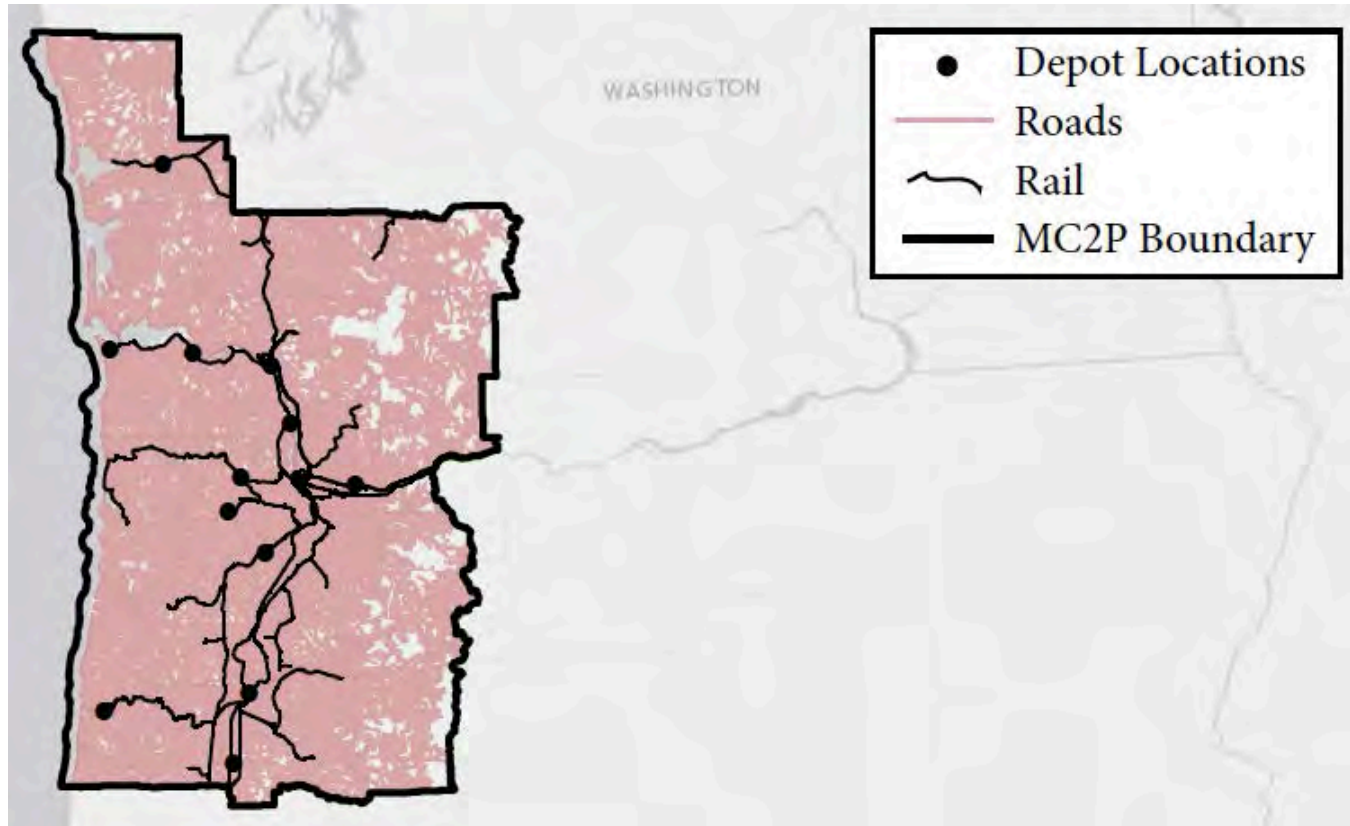
Integrated Bio-refinery (IBR)

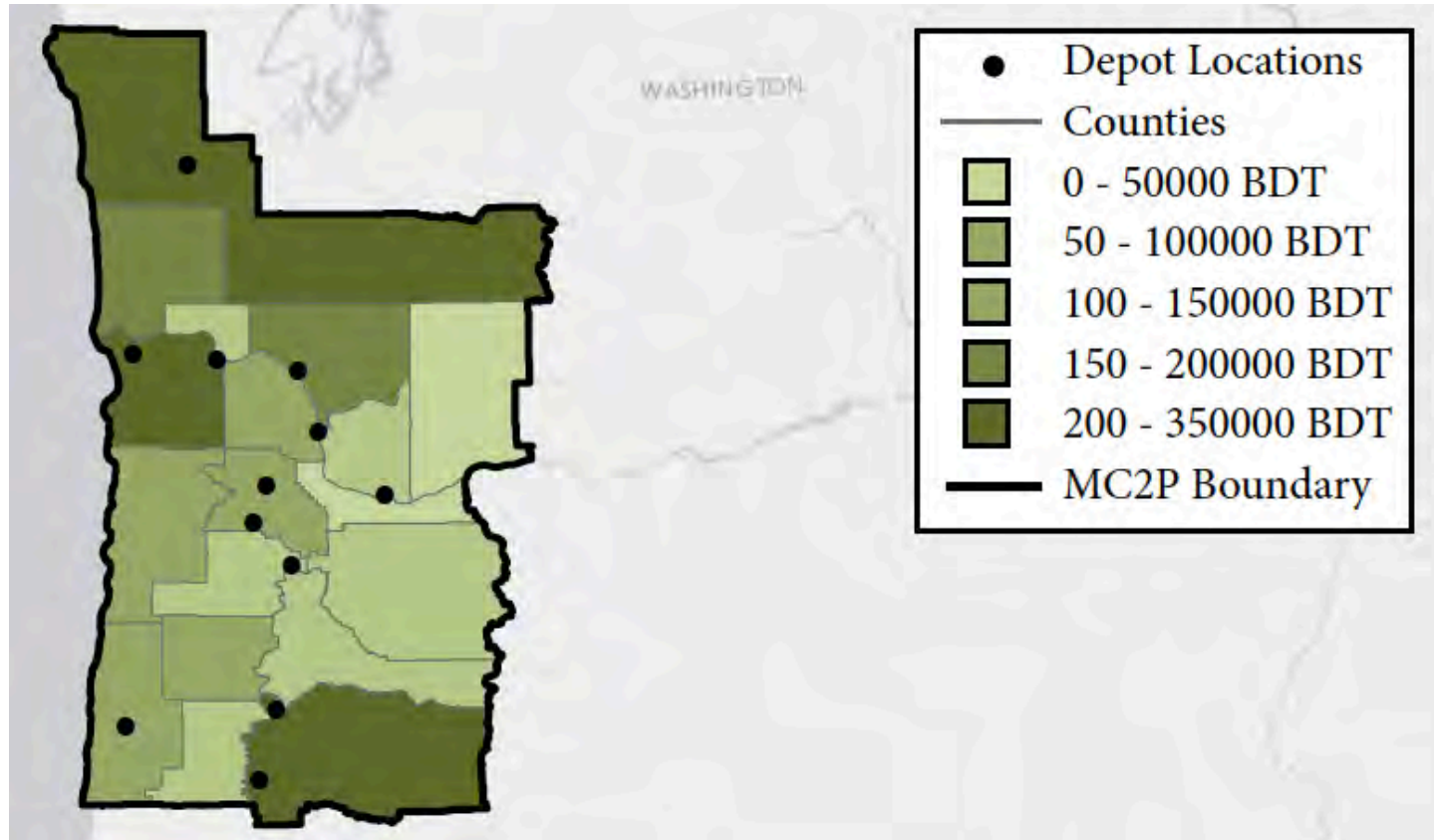




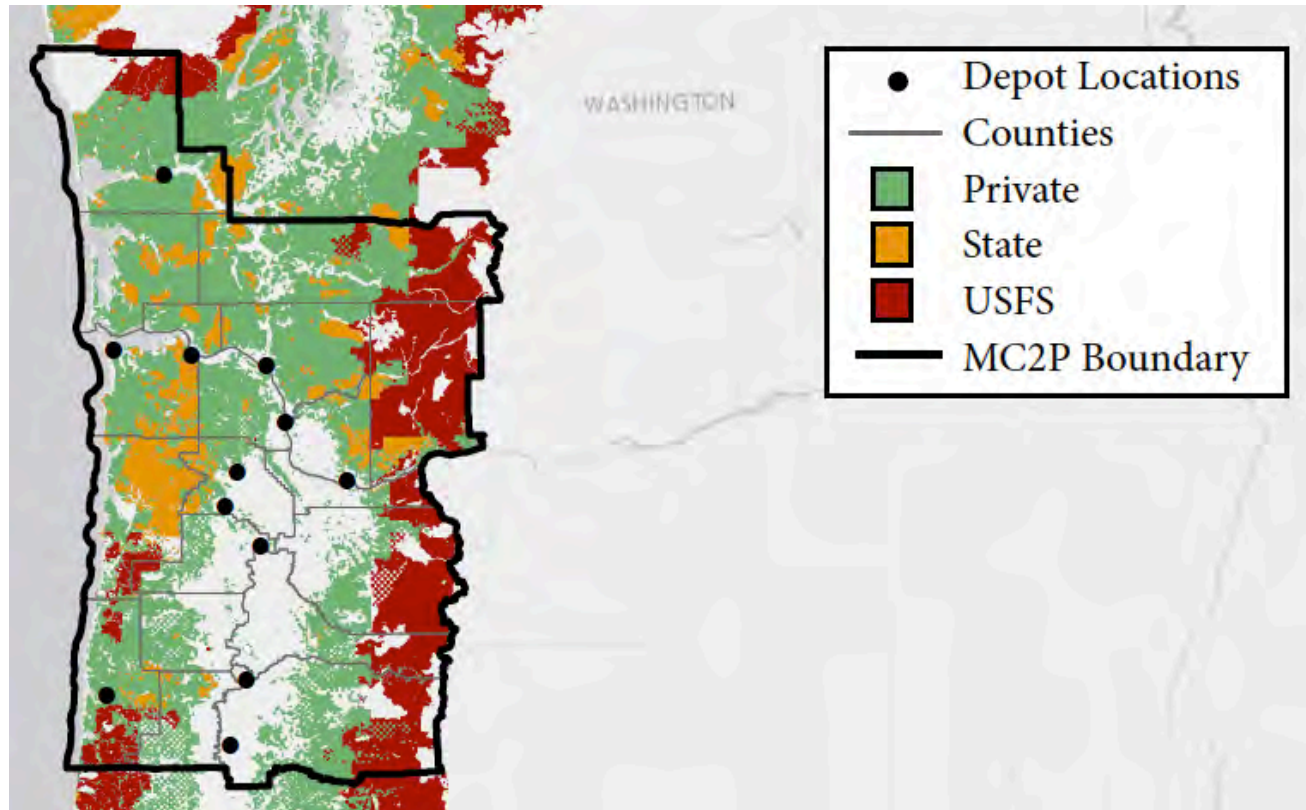


Linkages – Rail Transportation

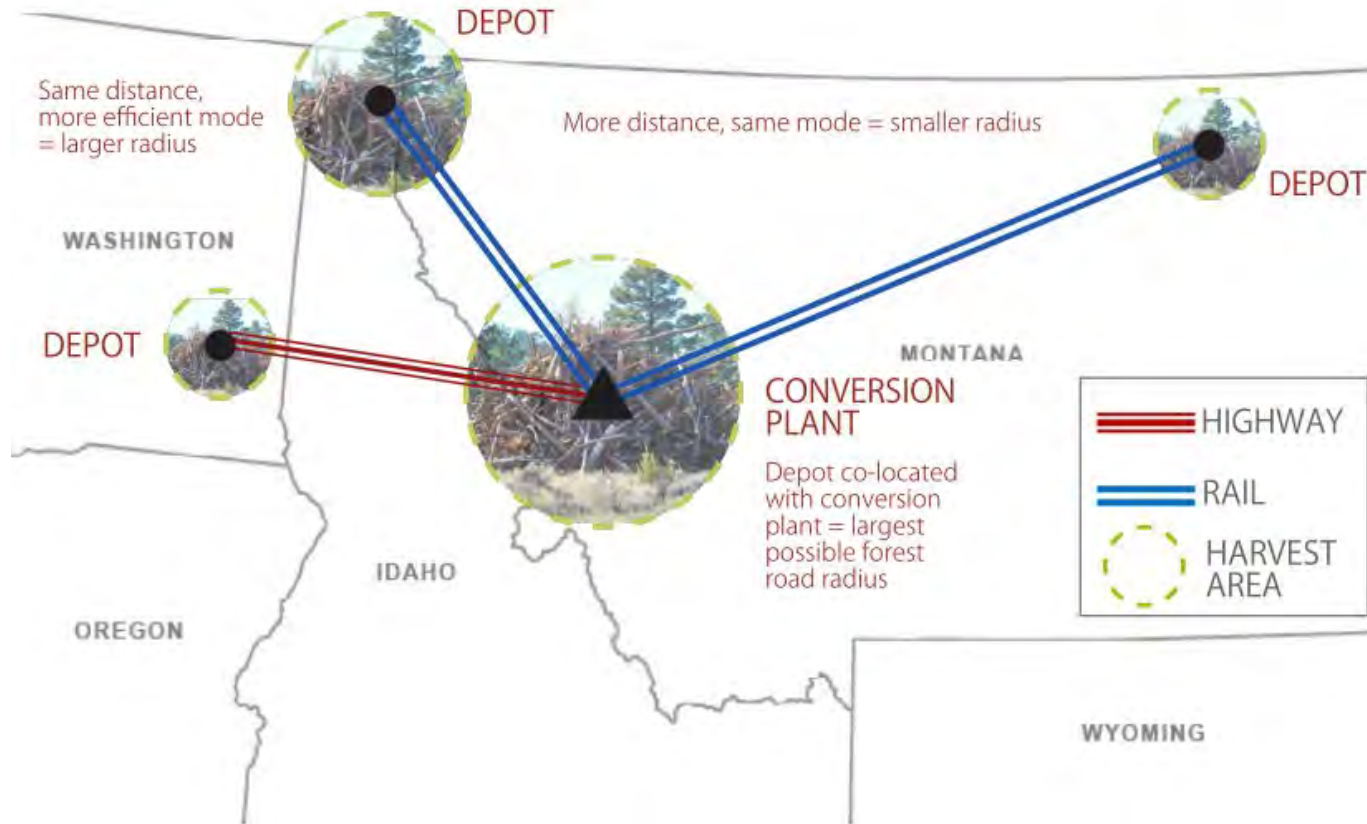




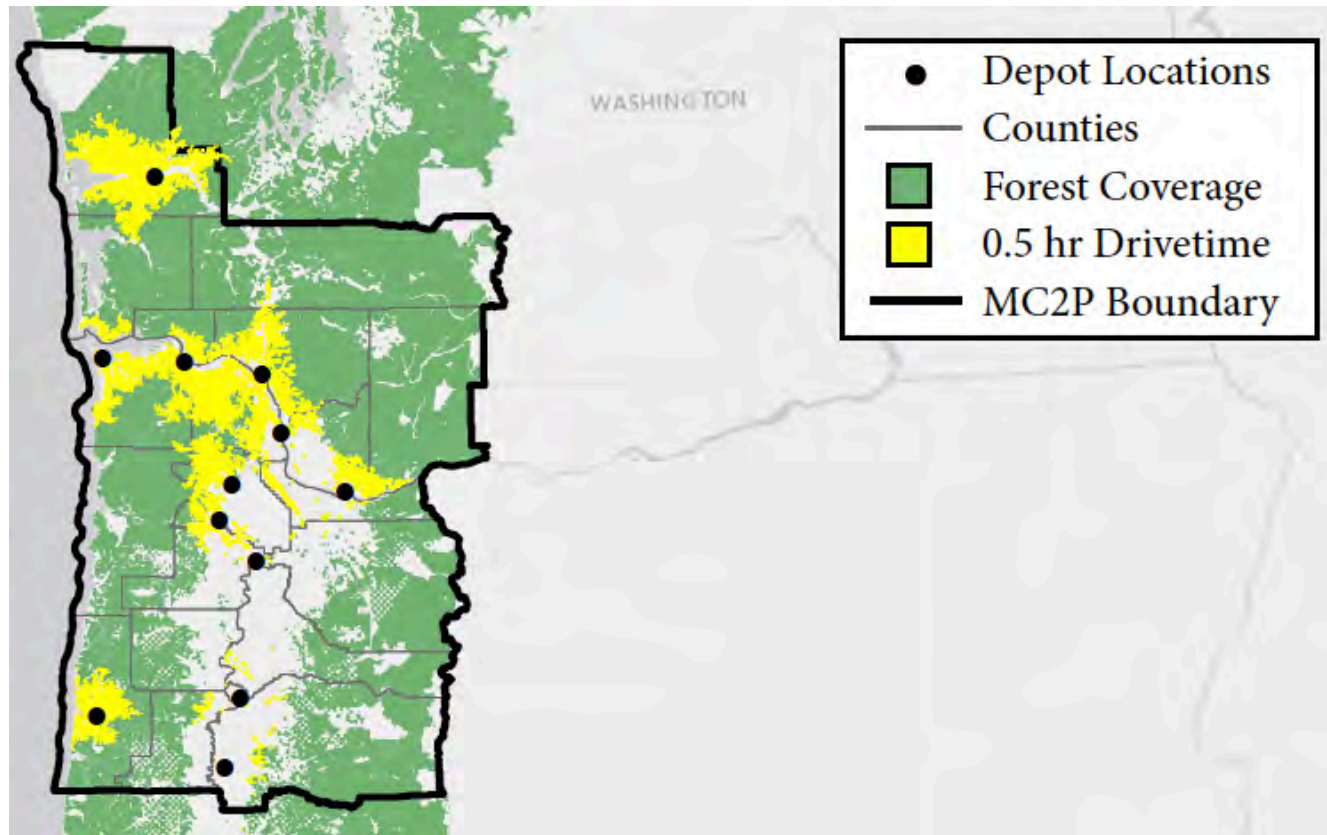
Areas - Available Forest Coverage (Ownership)



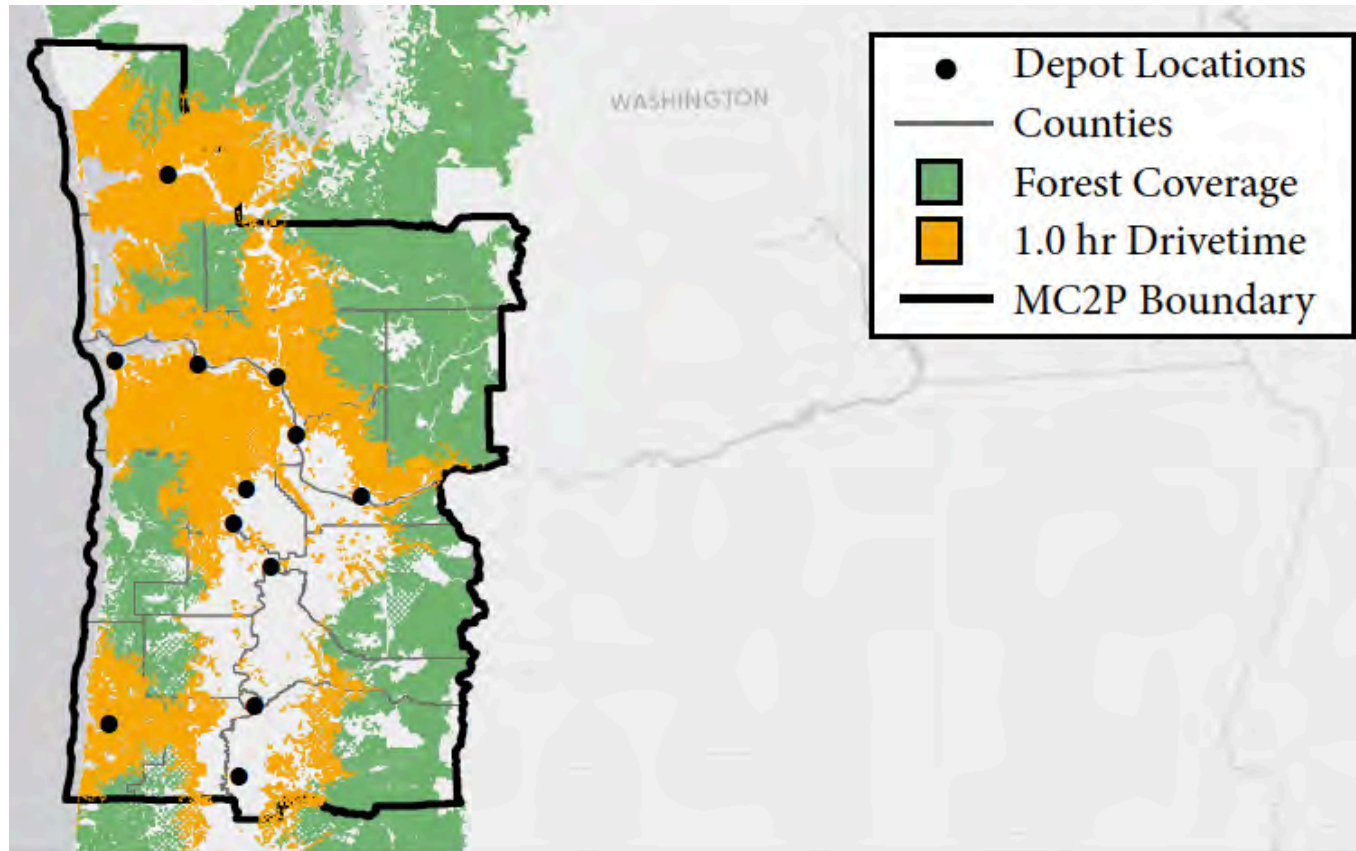
Relationship of Transportation and Depot Size



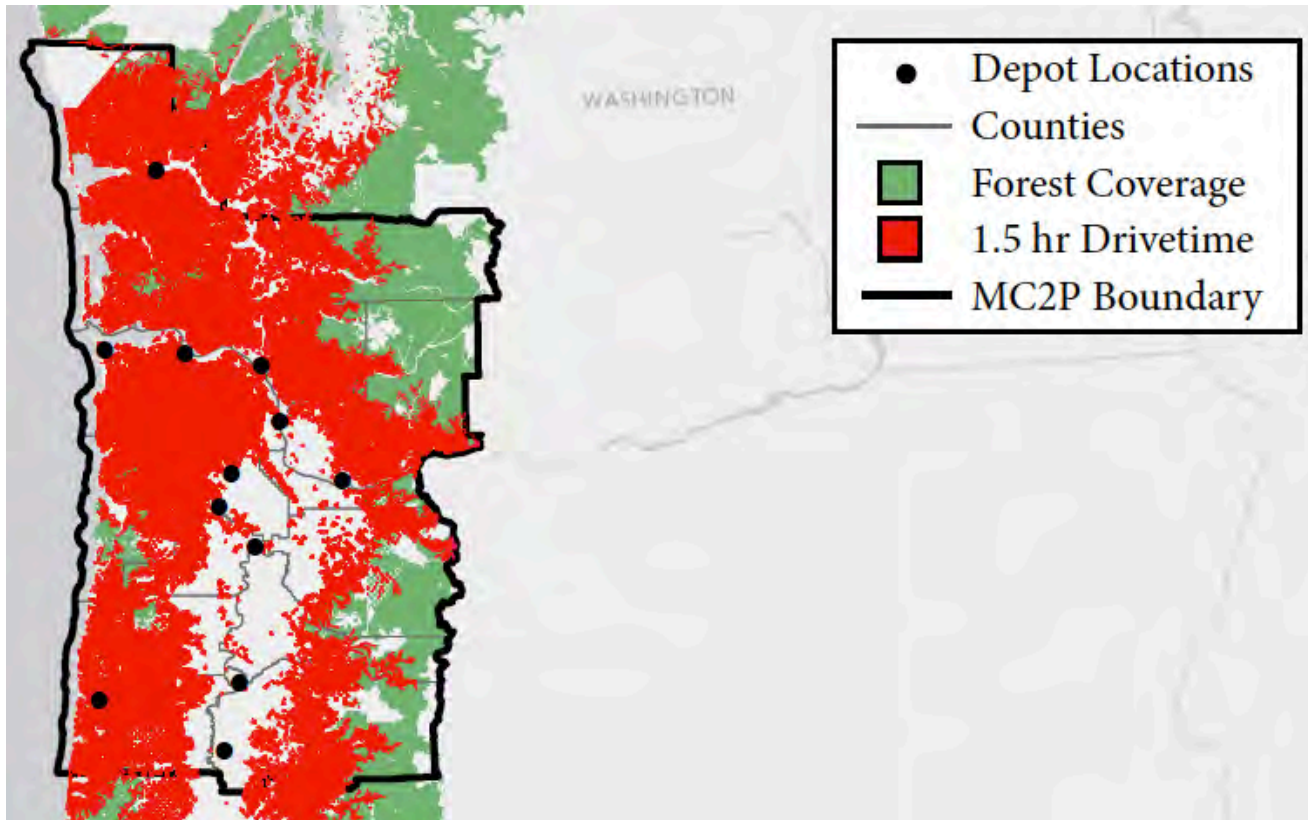
Depot – Direct Drive Time - 30 Minutes

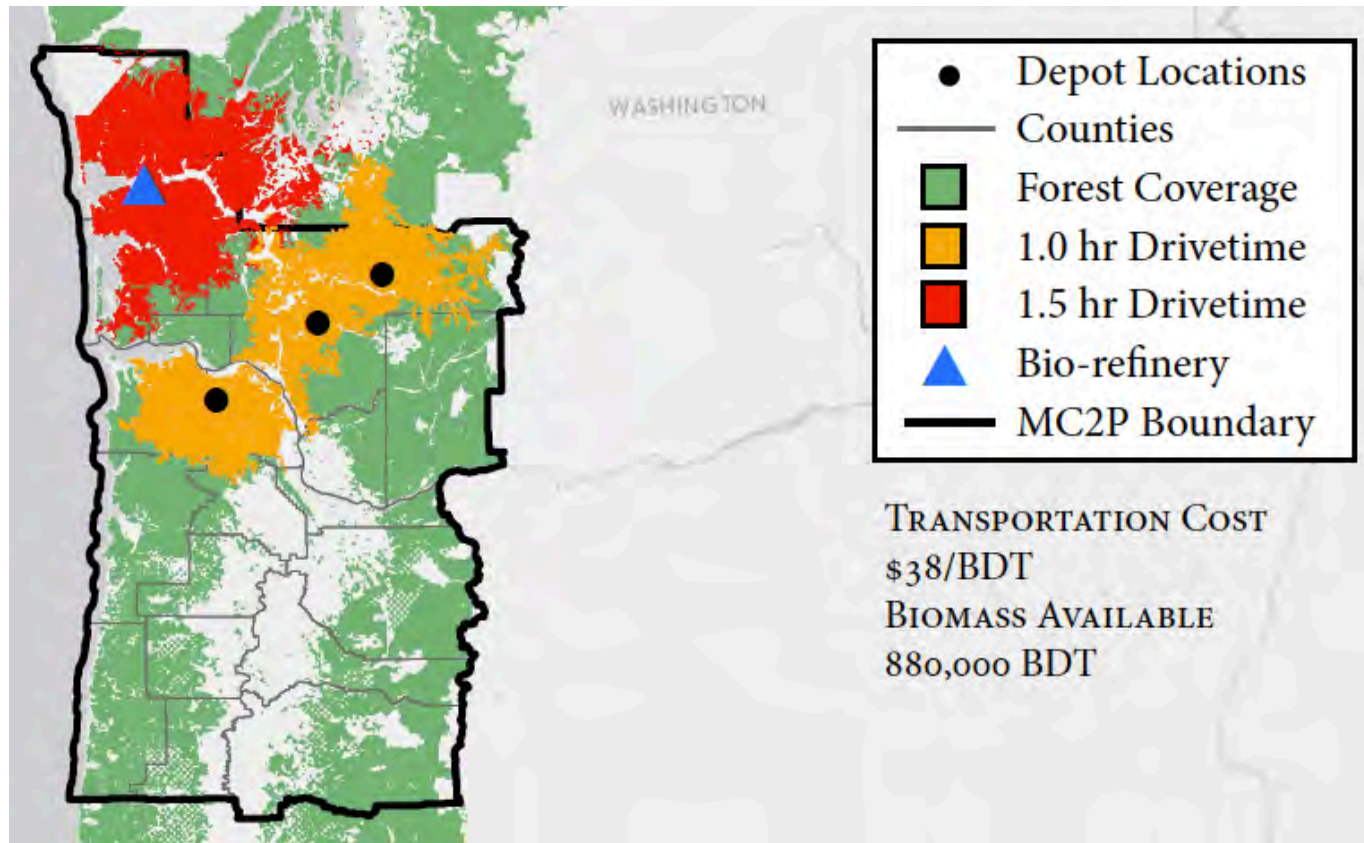


Depot – Direct Drive Time - 60 Minutes



Depot – Direct Drive Time - 90 Minutes







Supply Chain Analyses



Olympic Peninsula (OP)

[Supply Chain Analysis](#)

This site provides supply chain data and analysis generated by NARA research for the region identified as the Olympic Peninsula, located in Western Washington.



Pacific Northwest (PNW)

[Supply Chain Analysis](#)

This site provides supply chain data and analysis generated by NARA research for the region identified as the Pacific Northwest, which includes Montana, Idaho, Washington, and Oregon.



Mid-Cascades to Pacific (MC2P)

[Supply Chain Analysis](#)

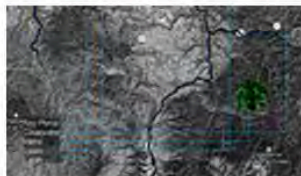
This site provides supply chain data and analysis generated by NARA research for the region identified as Mid-Cascades to Pacific, which includes the western sections of Washington and Oregon.



Western Montana Corridor (WMC)

[Supply Chain Analysis](#)

This site provides supply chain data and analysis generated by NARA research for the region identified as the Western Montana Corridor, which includes the western section of Montana, Northern Idaho and northeast Washington.



Clearwater Basin

[Supply Chain Analysis](#)

This site provides supply chain data and analysis generated by NARA research for the region identified as the Clearwater Basin, located in central Idaho.

IDX Webinars on YouTube



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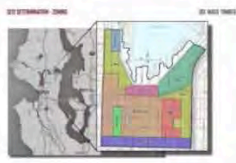
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MILLED WOOD DETAIL ANALYSIS



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IDX - OP - Final Presentation

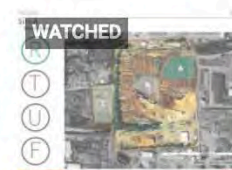
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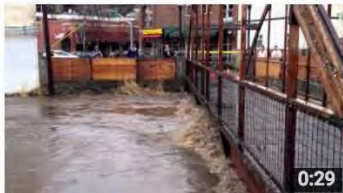


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