

A West Coast Forest Biomass Assessment Database

Luke Rogers & Jeff Comnick

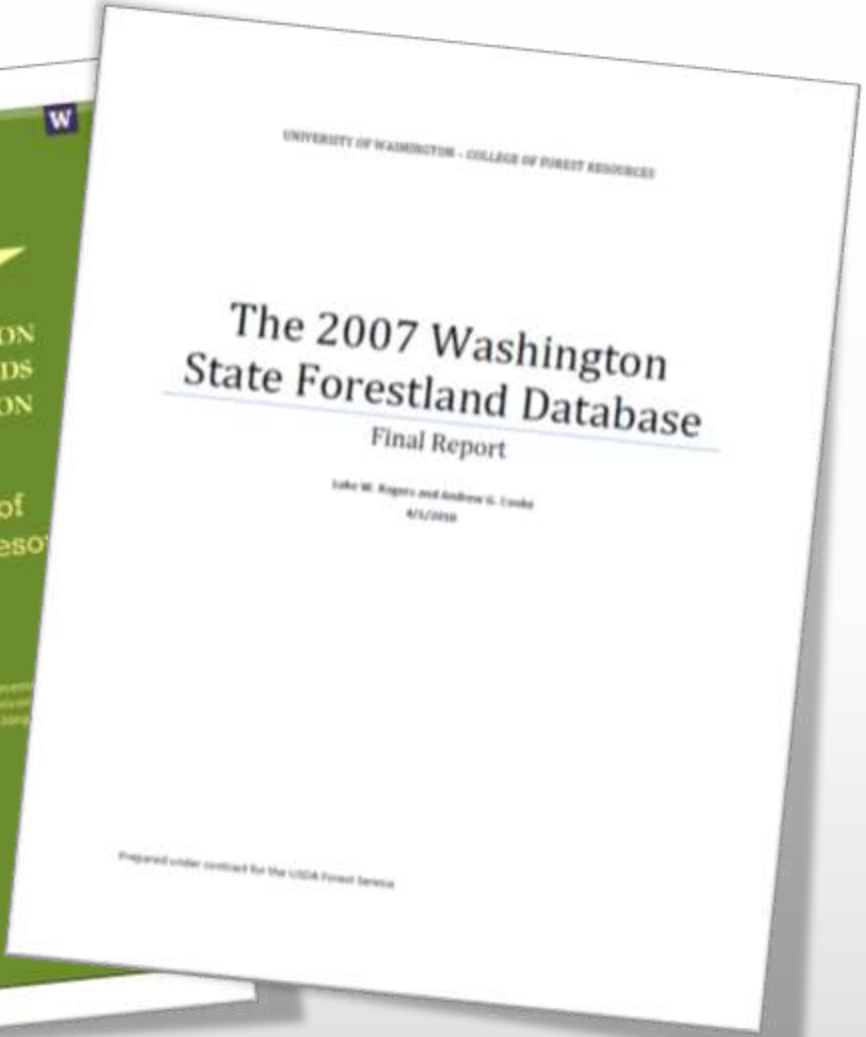
Natural Resources Spatial Informatics Group

University of Washington

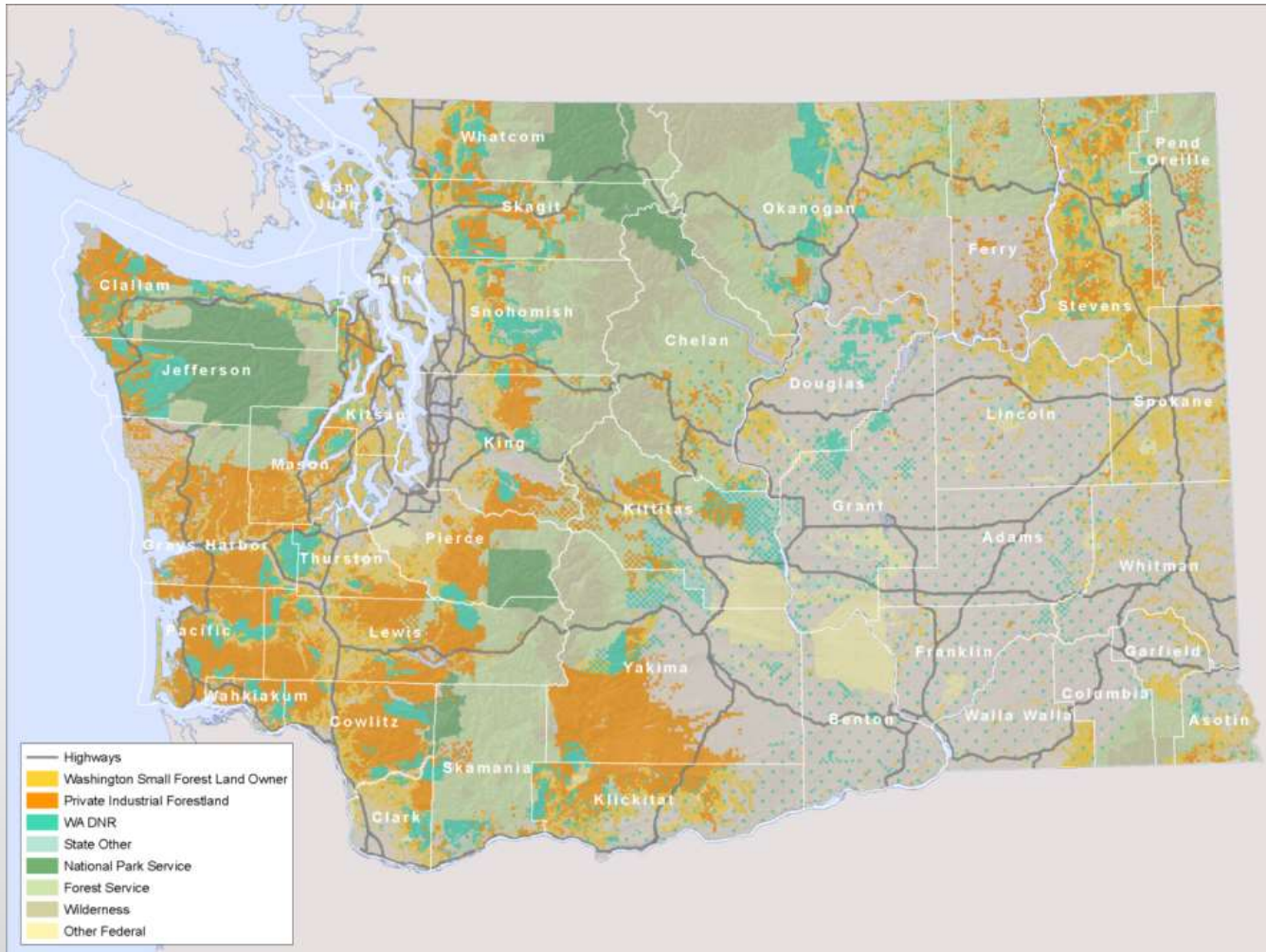


NRSIG

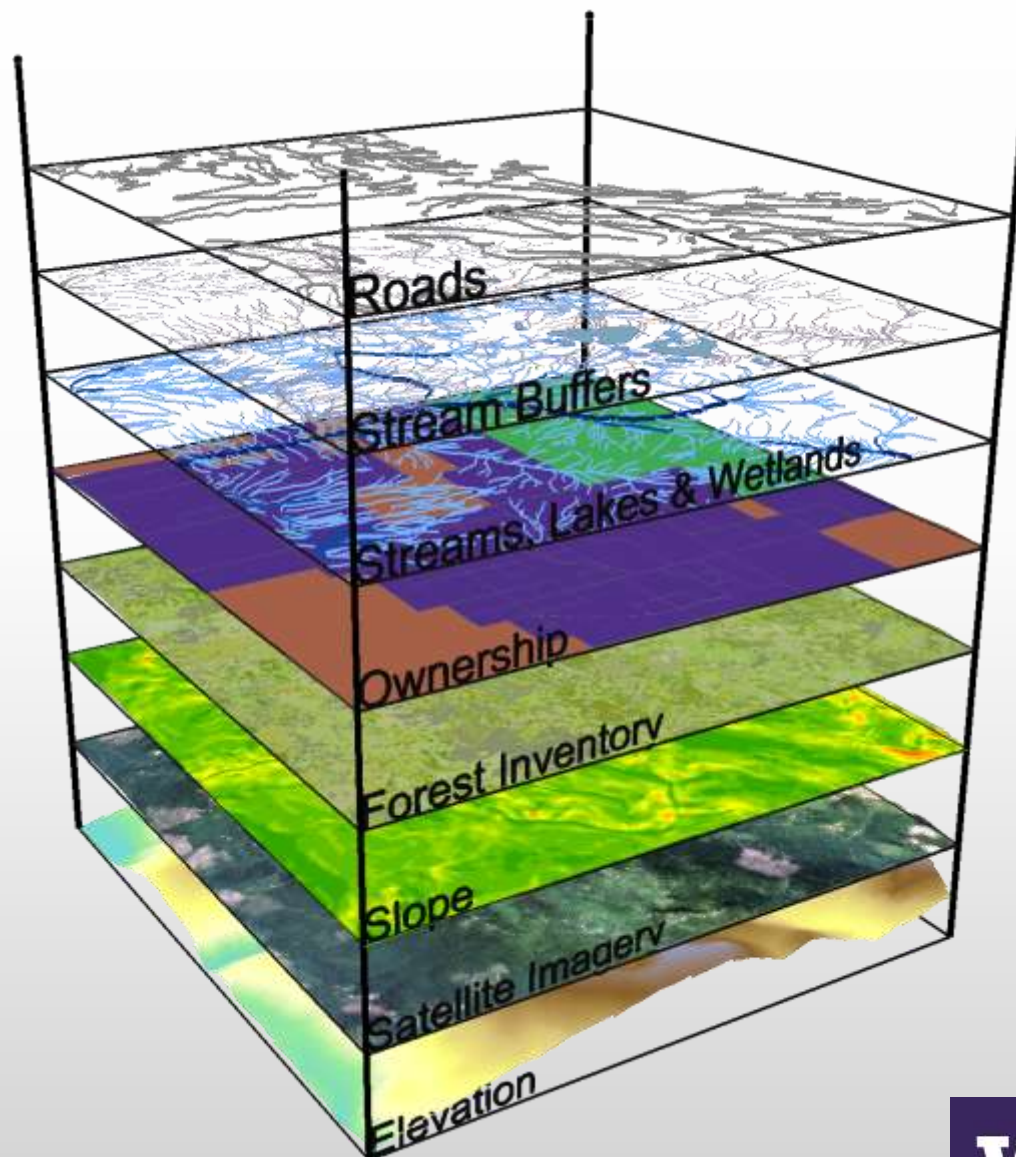
Projects



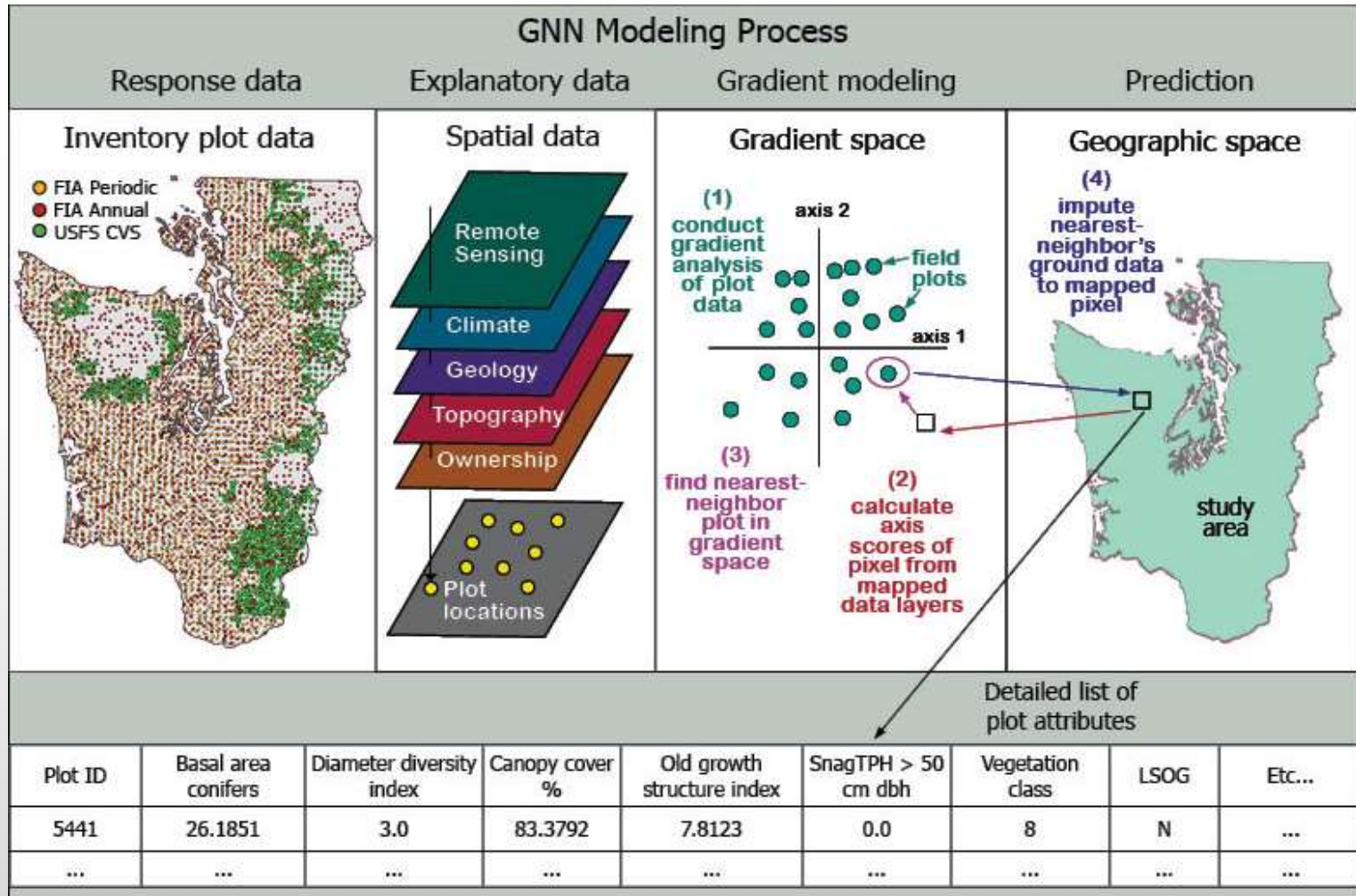
Forestland Database



Input Layers



Forest Inventory

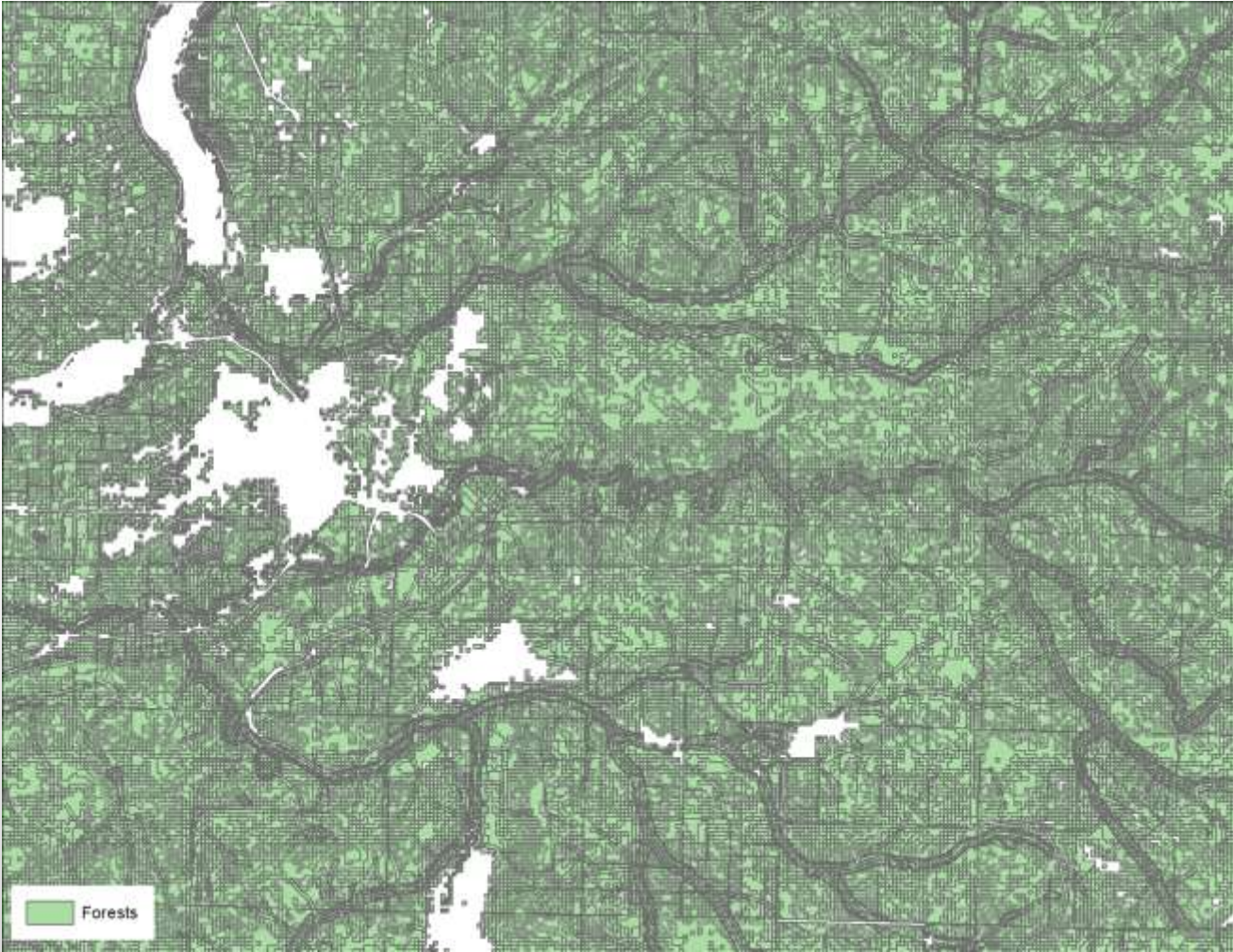


Credit: Ohmann et al

Segments



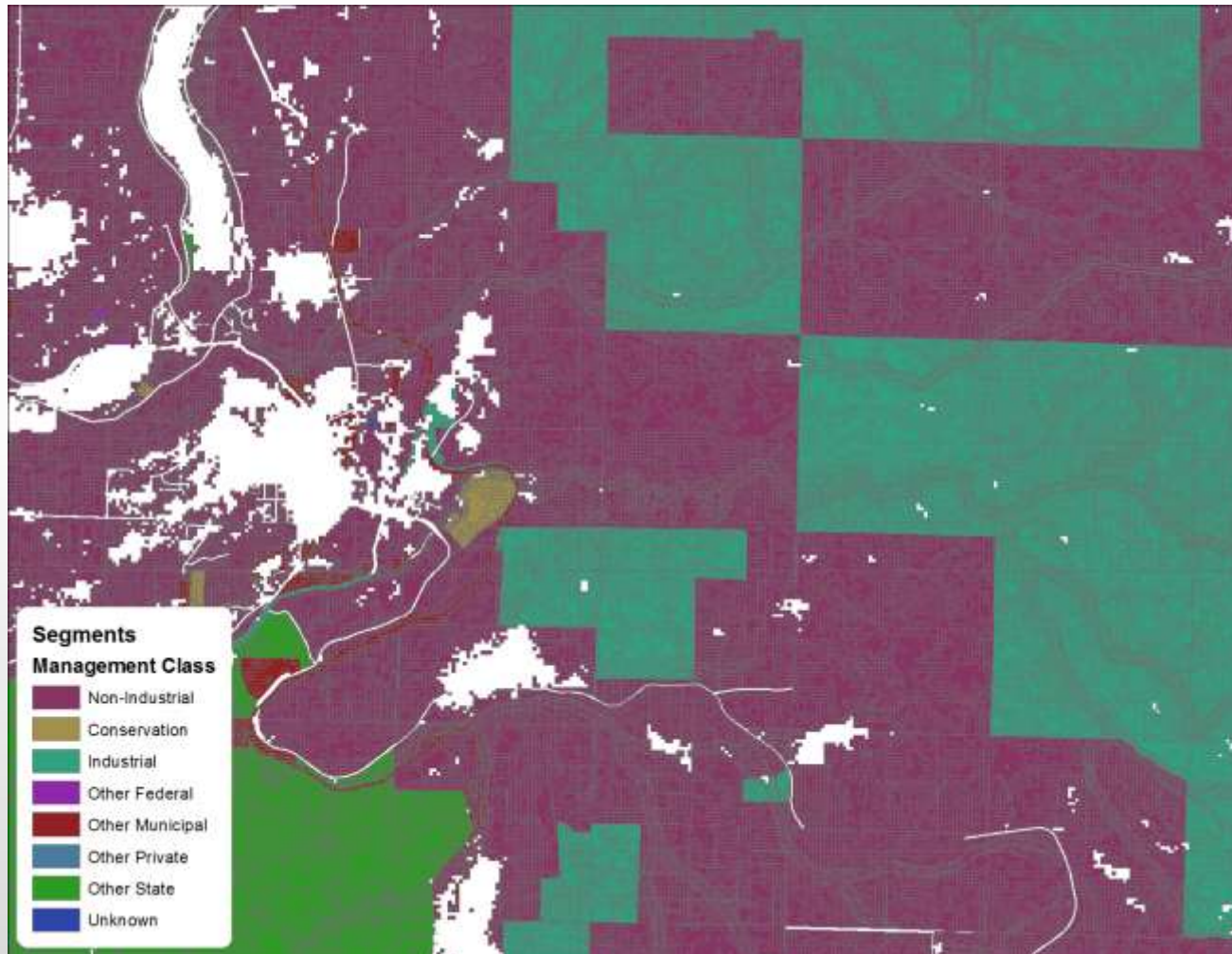
Forests



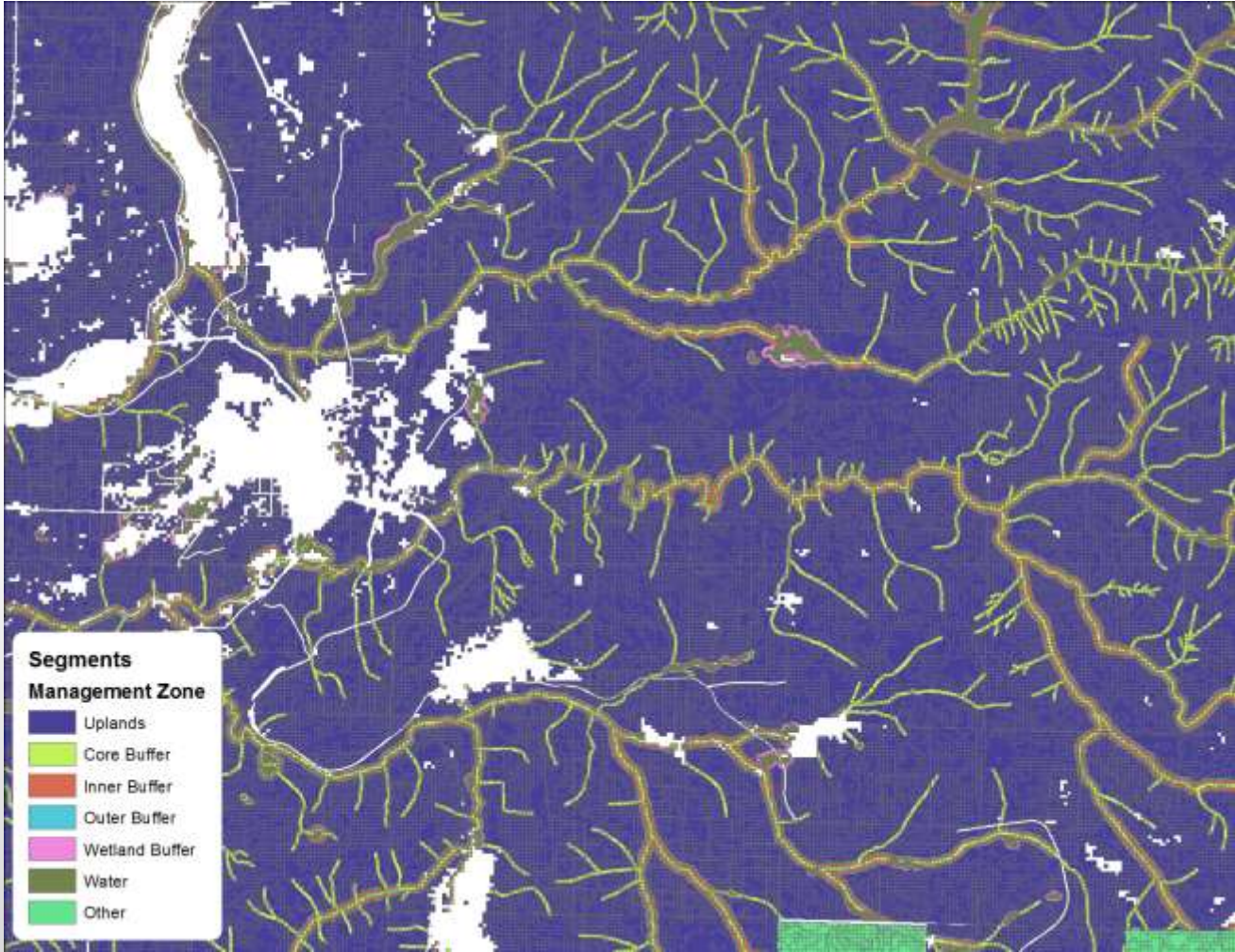
Owner Class



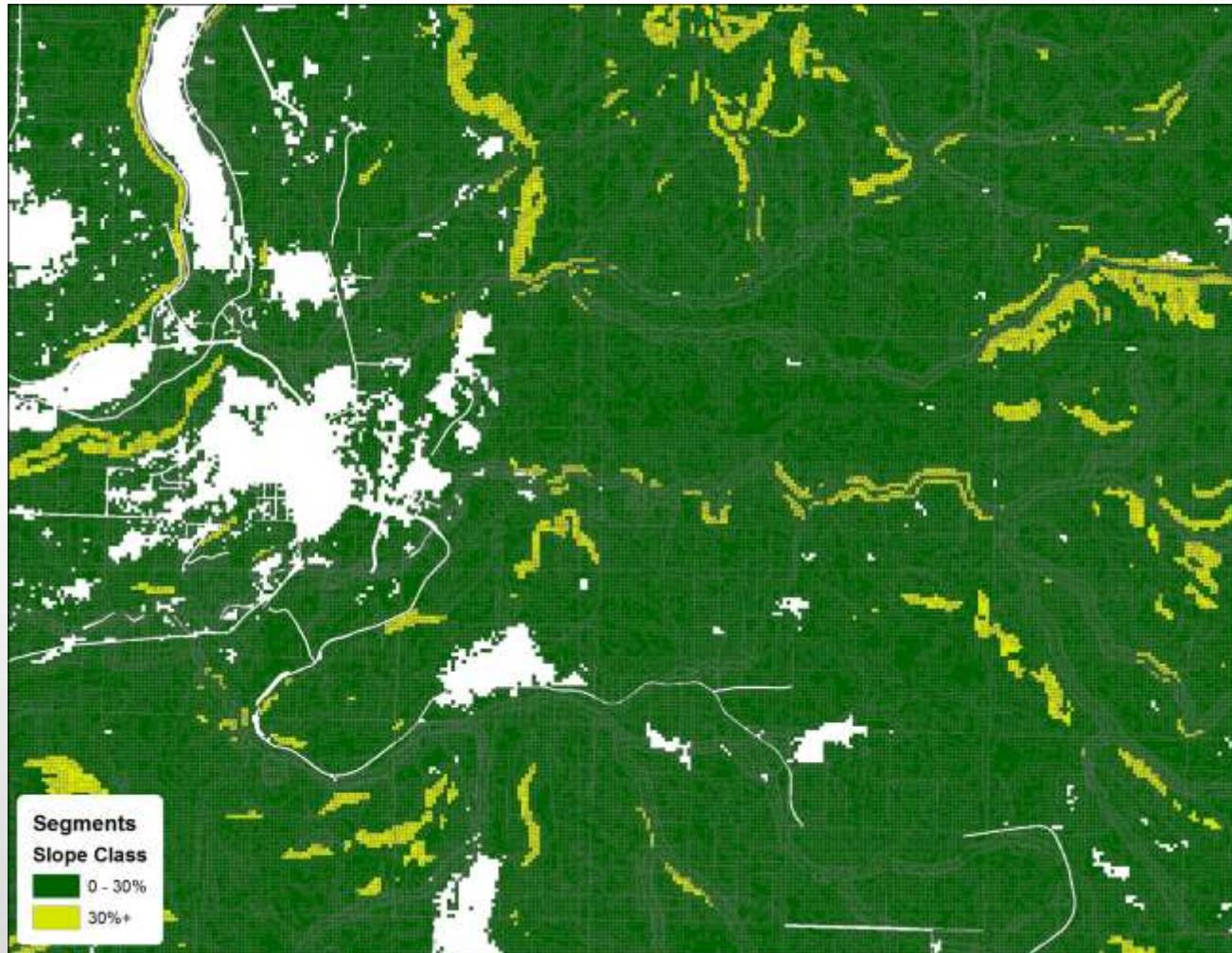
Management Class



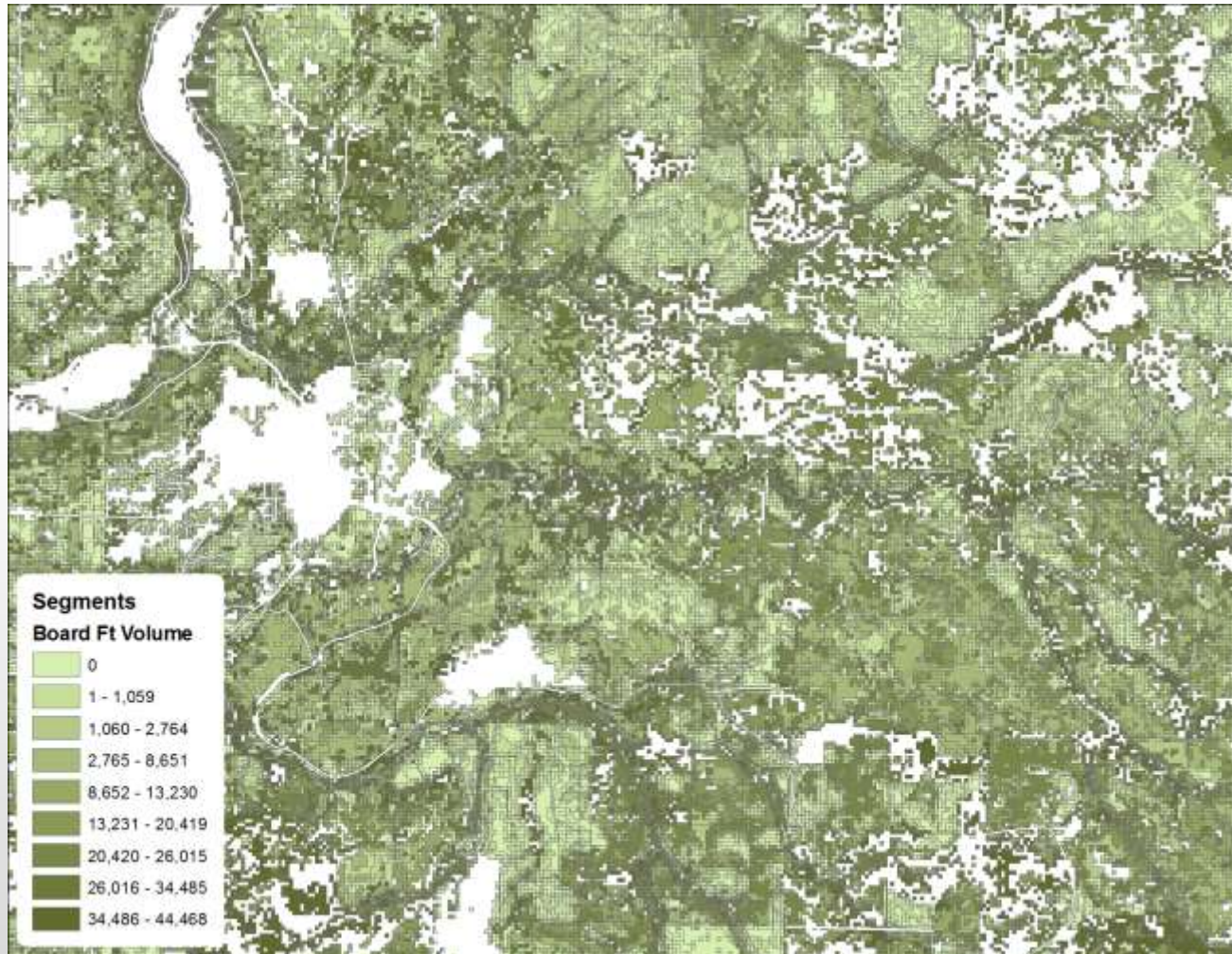
Management Zone



Slope Class



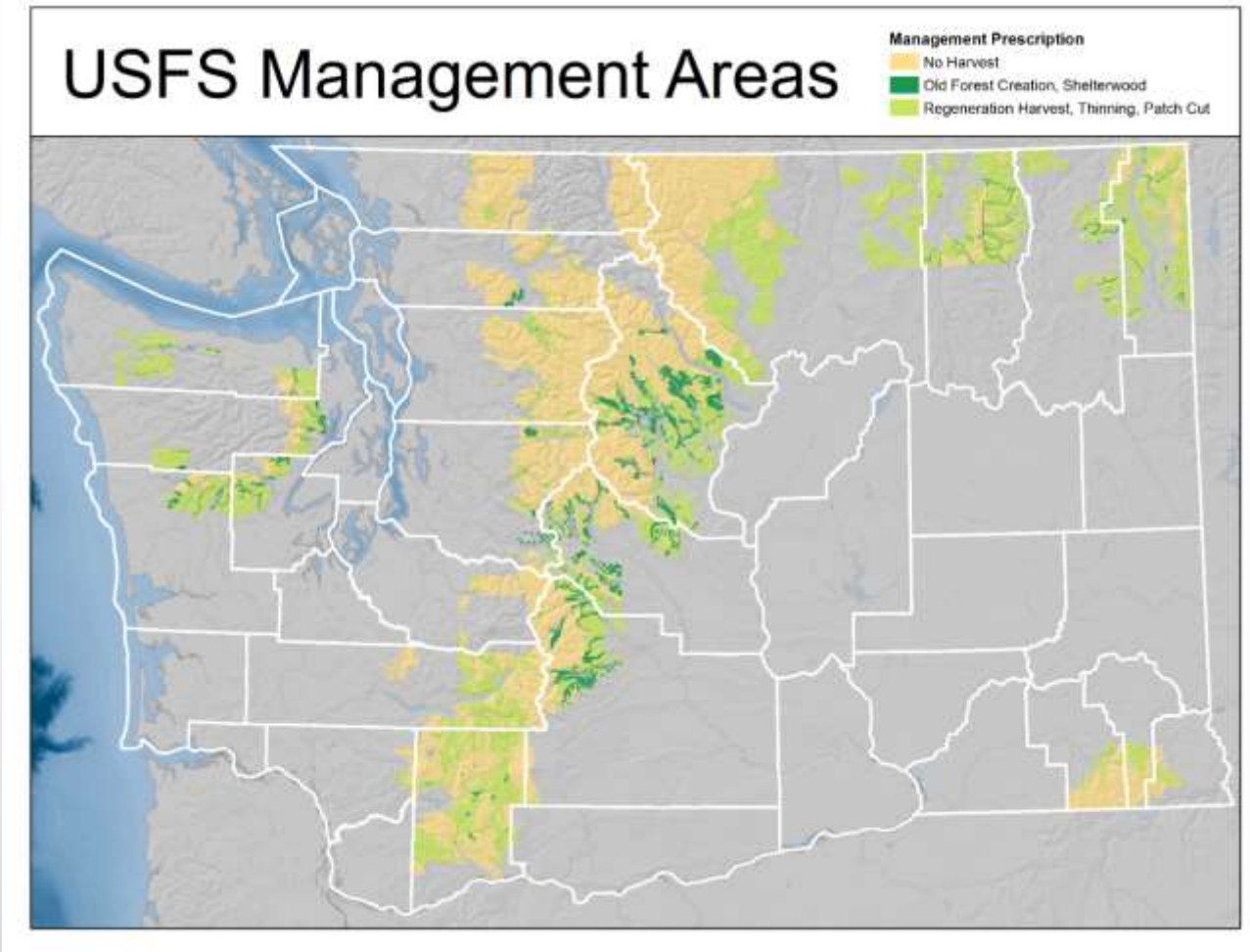
Standing Inventory



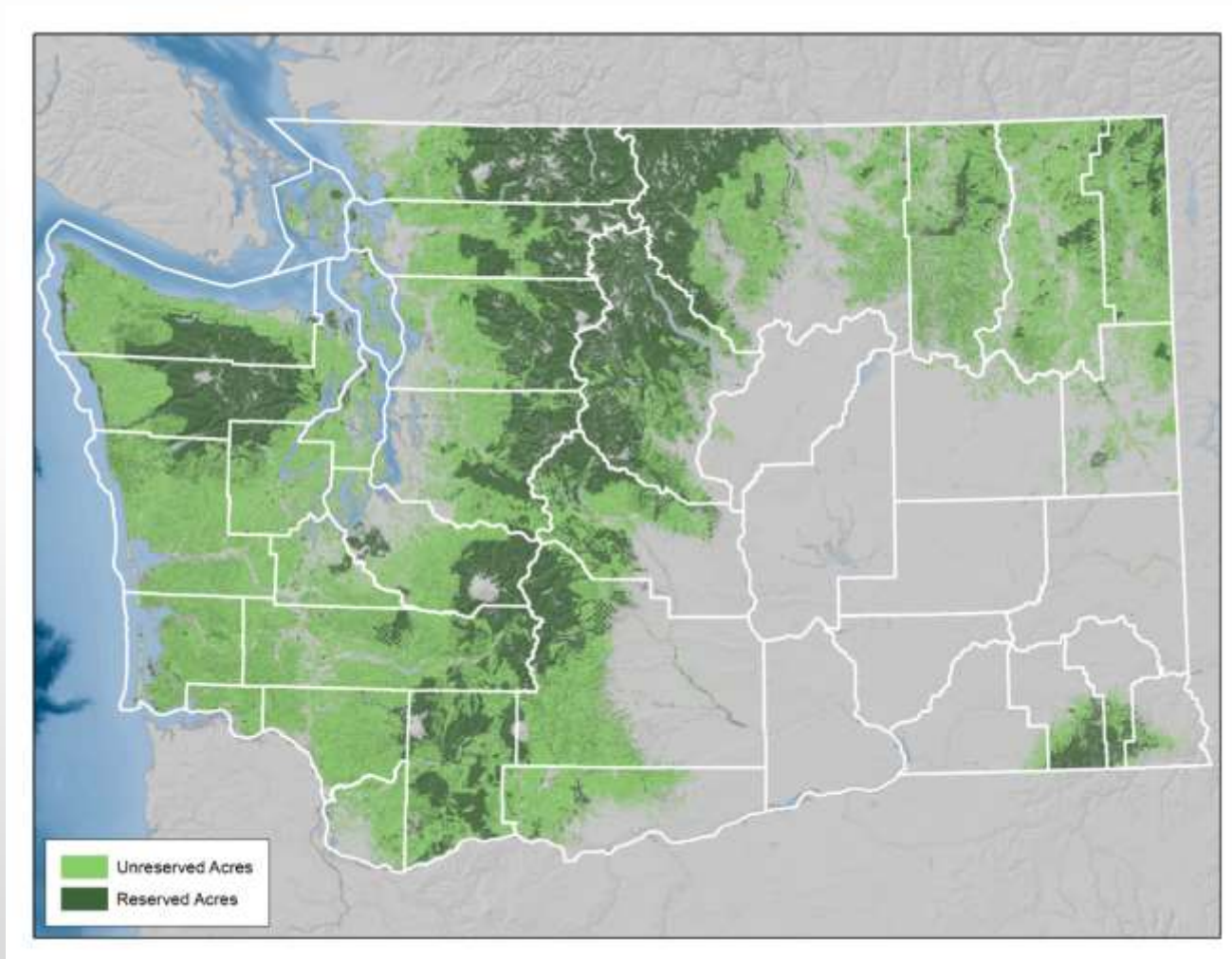
Roads



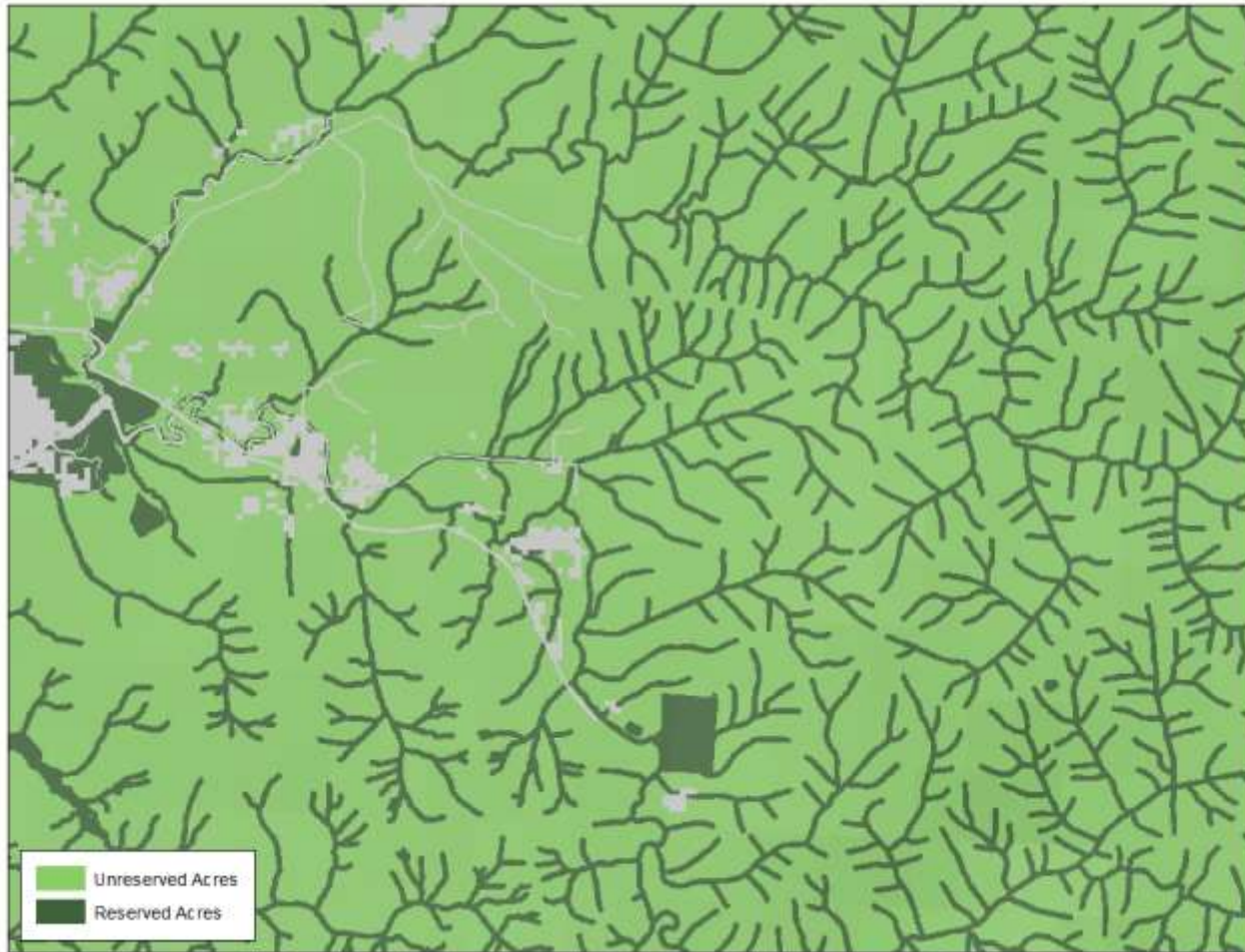
USFS Management Areas



Reserved Acres



Site-Specific Detail...

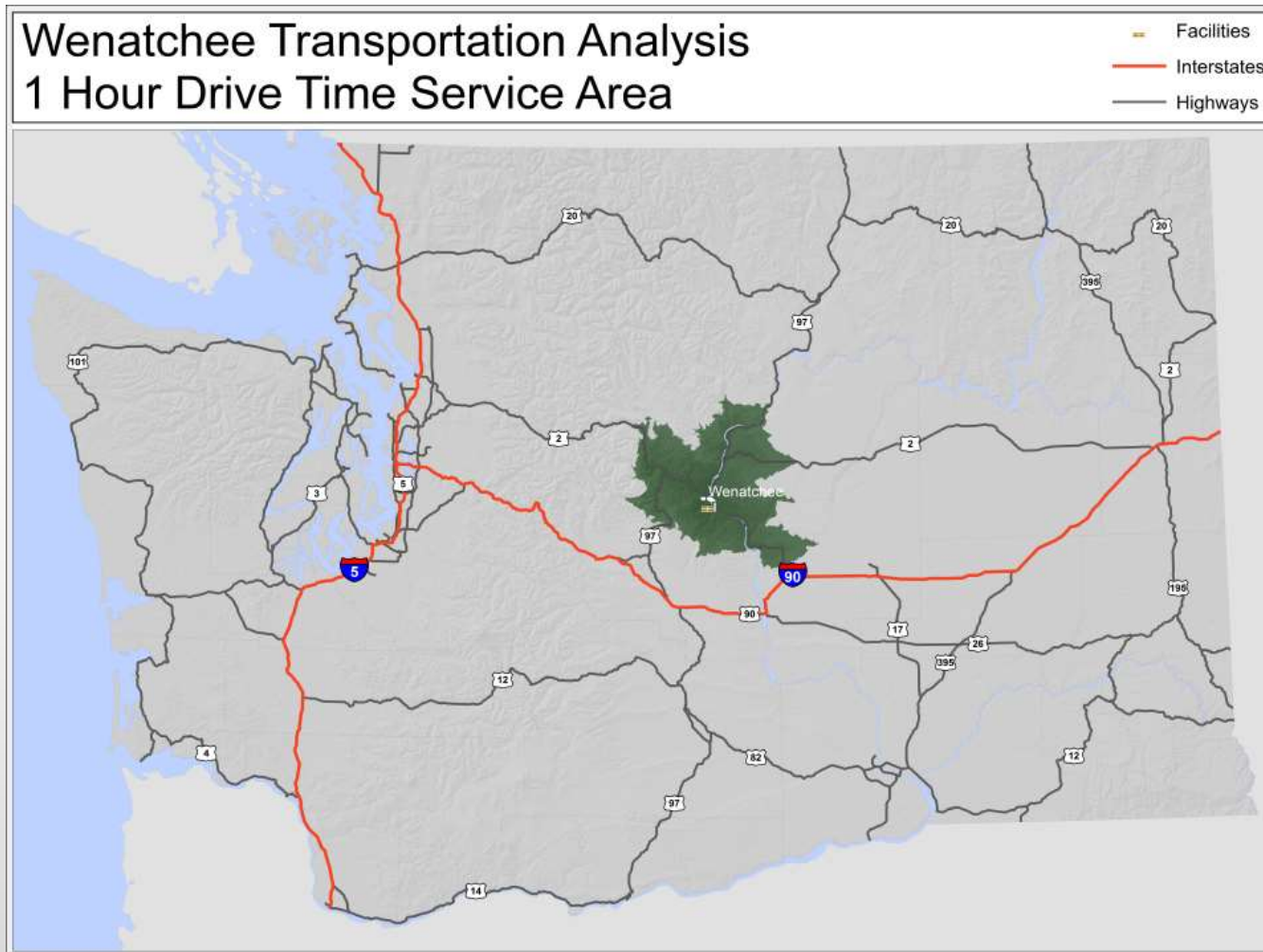


Facilities

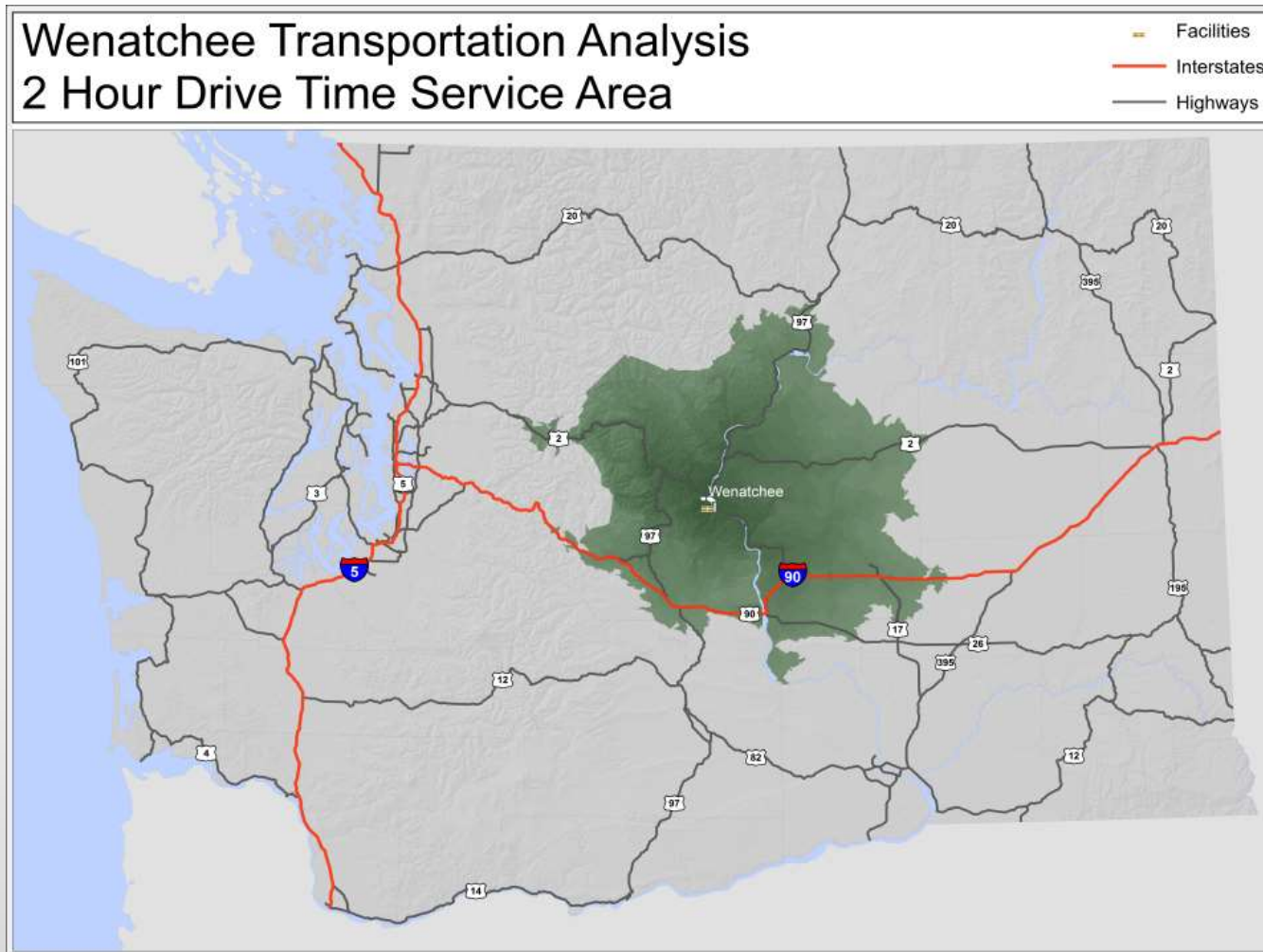
- Gathered 1,200 facilities from multiple sources and aggregated to the 440 nearest “Census Populated Places”
 - California Biodiesel Alliance
 - srs.fs.usda.gov/econ/data/mills
 - bioenergy.wa.gov
 - Oregon Forest Directory
 - Washington State Biomass Assessment
 - USFS Softwood Mill Survey
 - WA DNR Mill Surveys



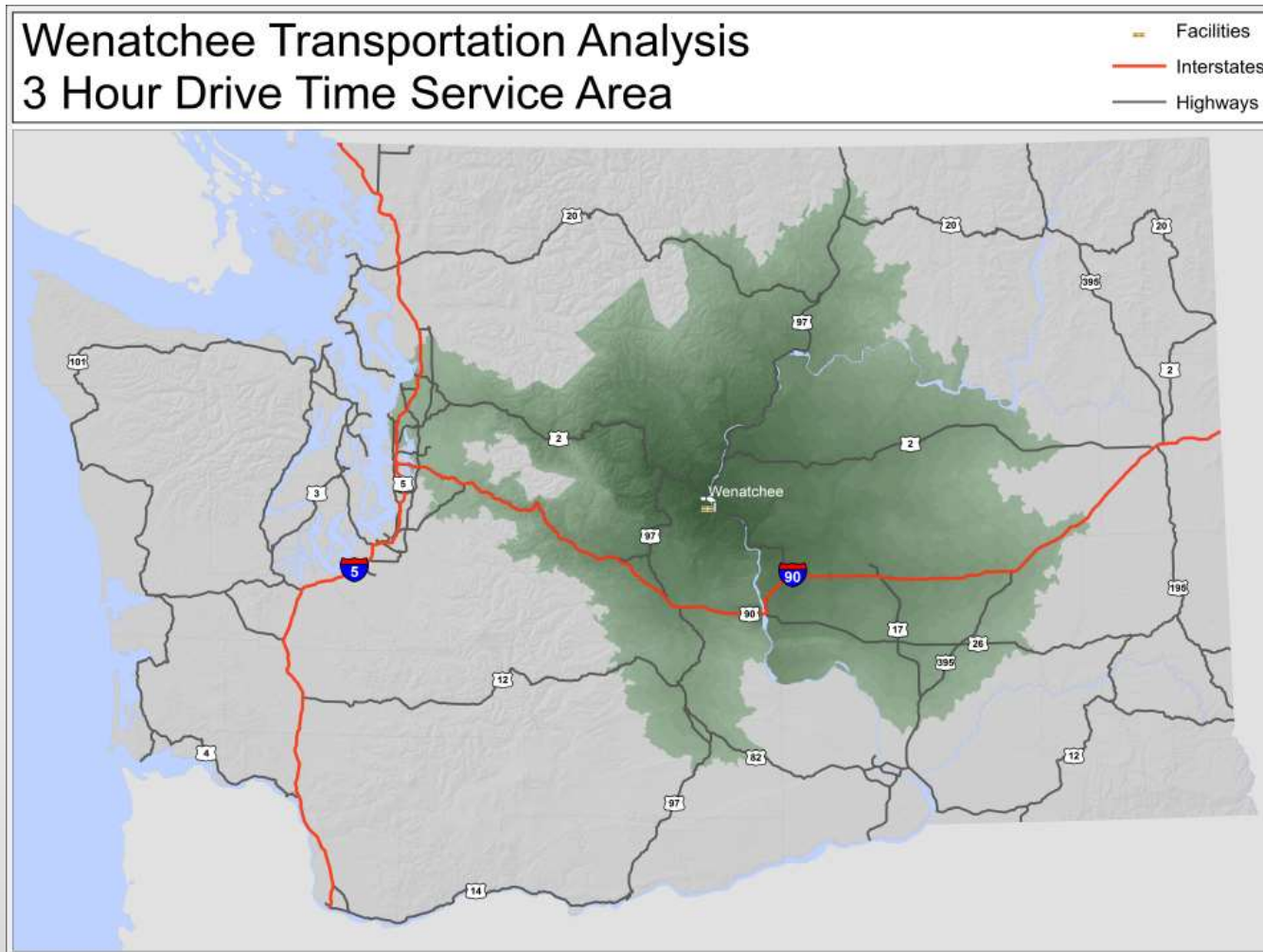
Transportation Modeling



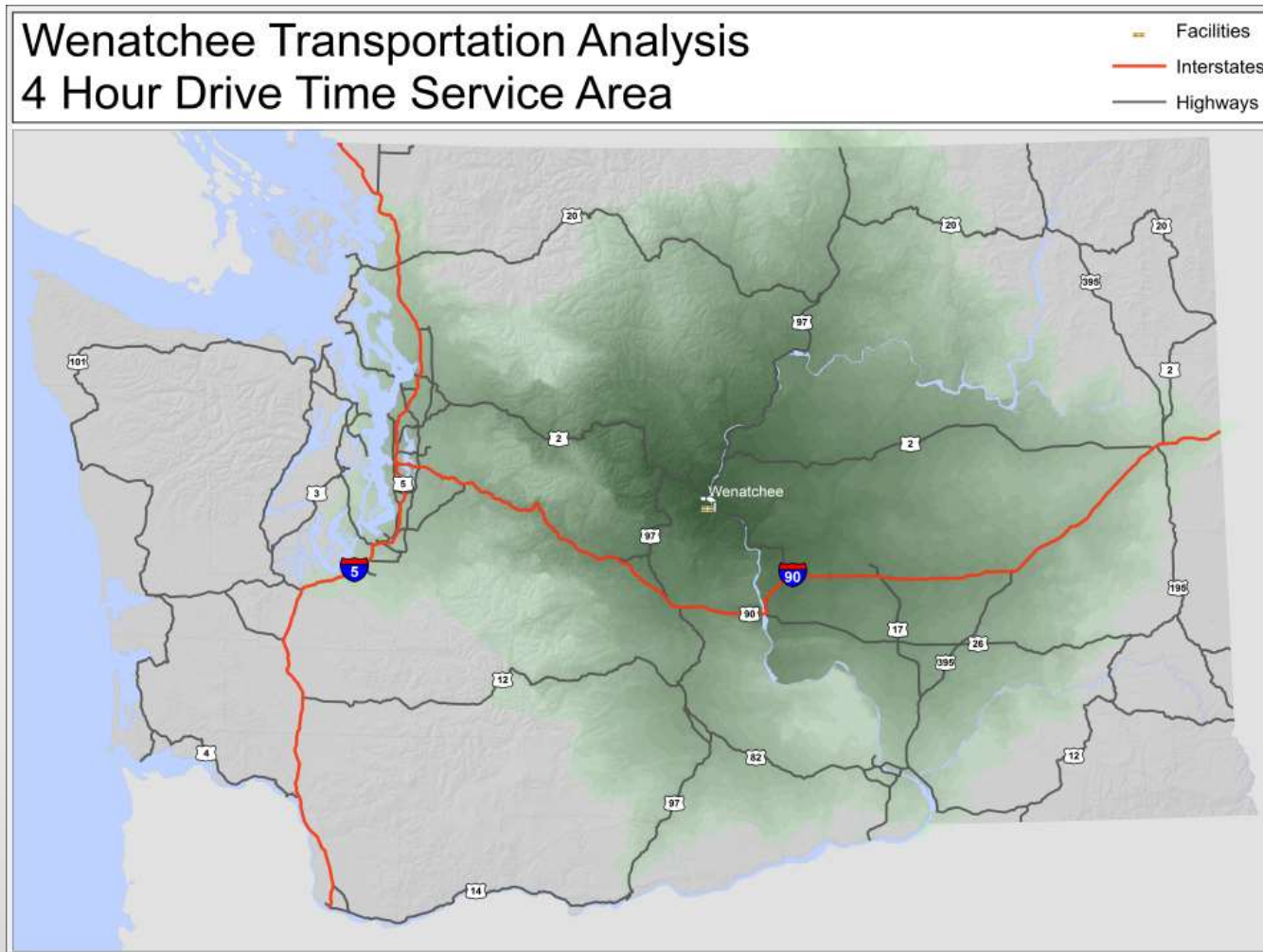
Transportation Modeling



Transportation Modeling

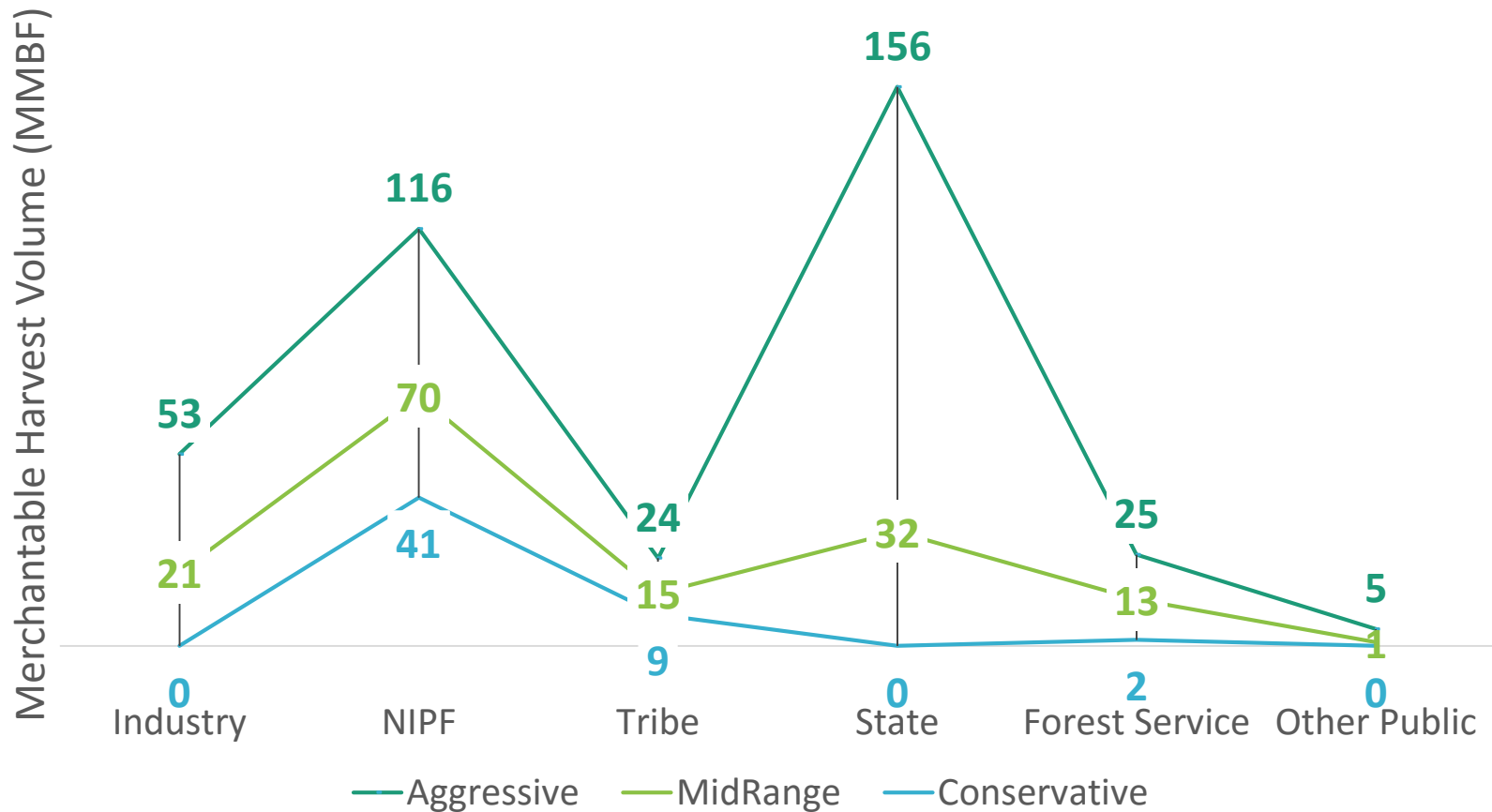


Transportation Modeling

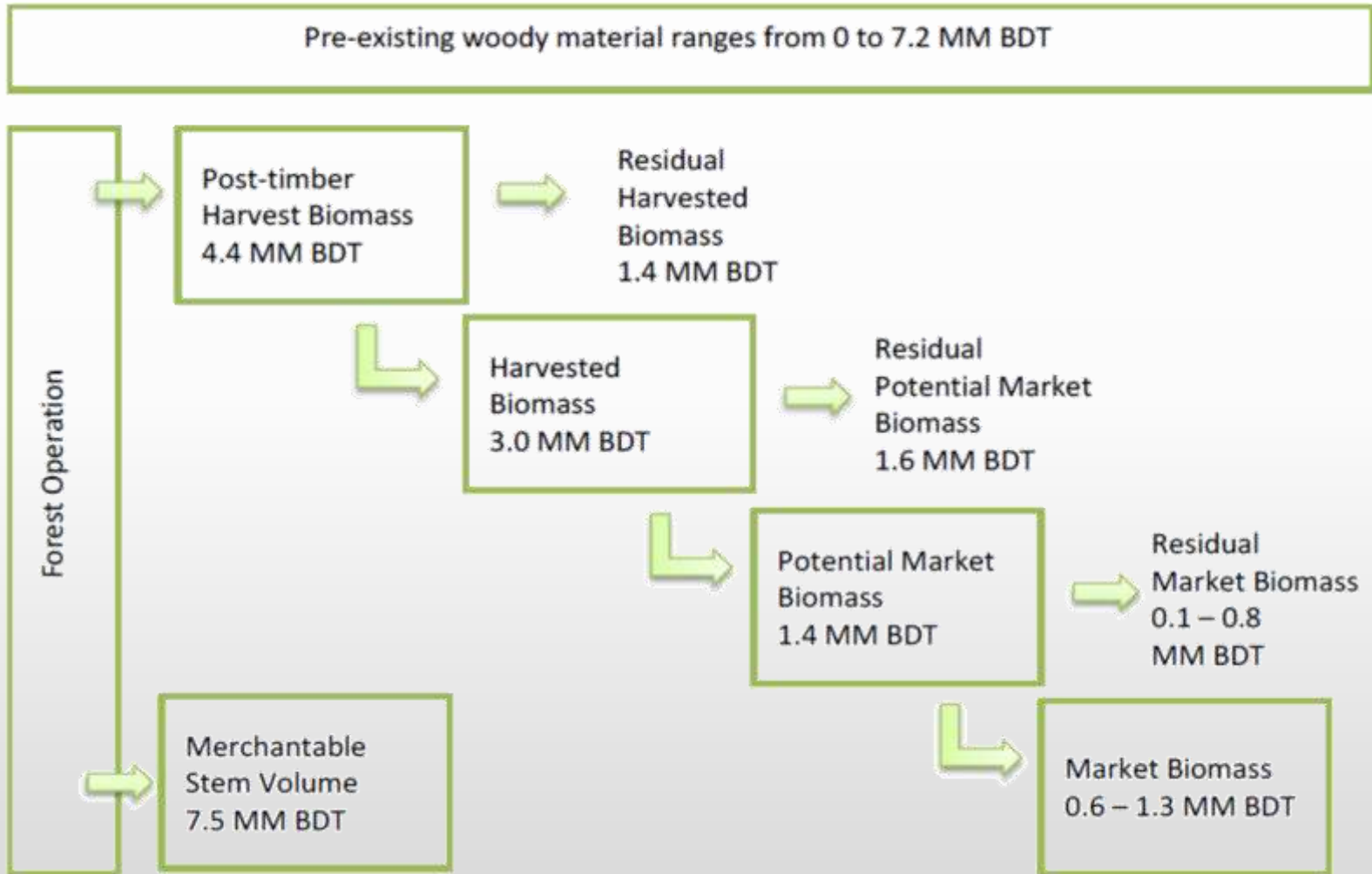


Harvest Model

Example for Coos County, OR (2002 - 2013)



Biomass Harvest Model



Biomass Outputs

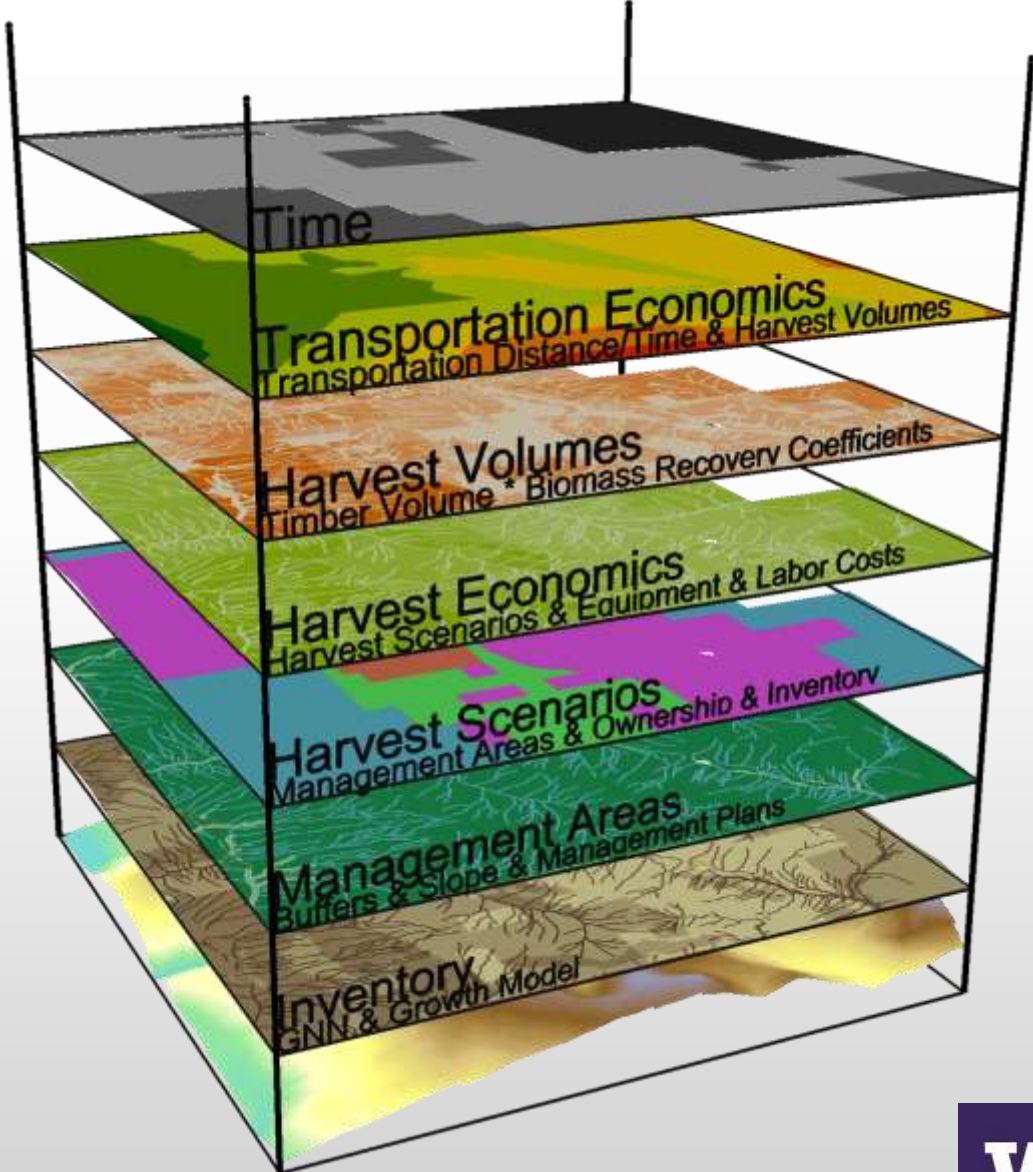
- **Scattered biomass:** volume that was left scattered in the woods as a product of having been broken off or tops and limbs cut when commercial logs were yarded to the landing
- **Roadside biomass:** portion that did not get loaded due to economics, operability constraints, other factors such as landowner preferences, it's too dirty, or it's a left since it wouldn't be enough to fill a truck
- **Market biomass:** the volume that is economically feasible to load on a truck and deliver to a facility
- **Residual value:** value of the market biomass at the given price, after all costs of getting the biomass to a facility have been taken into account

Economic Analysis

- 3 Cost Models
- 16 BDT trucks (default)
- Prices:
 - Minimum Price of \$27 / BDT
 - \$30 to \$100 by \$5 increments

	Forest Health (\$/BDT)	Mobilization (\$/hr)	Load / Unload (\$/BDT)	Haul (\$/hr)
Low	\$30	\$96	\$21	\$76
Medium	\$45	\$120	\$26	\$95
High	\$60	\$144	\$31	\$114

Outputs



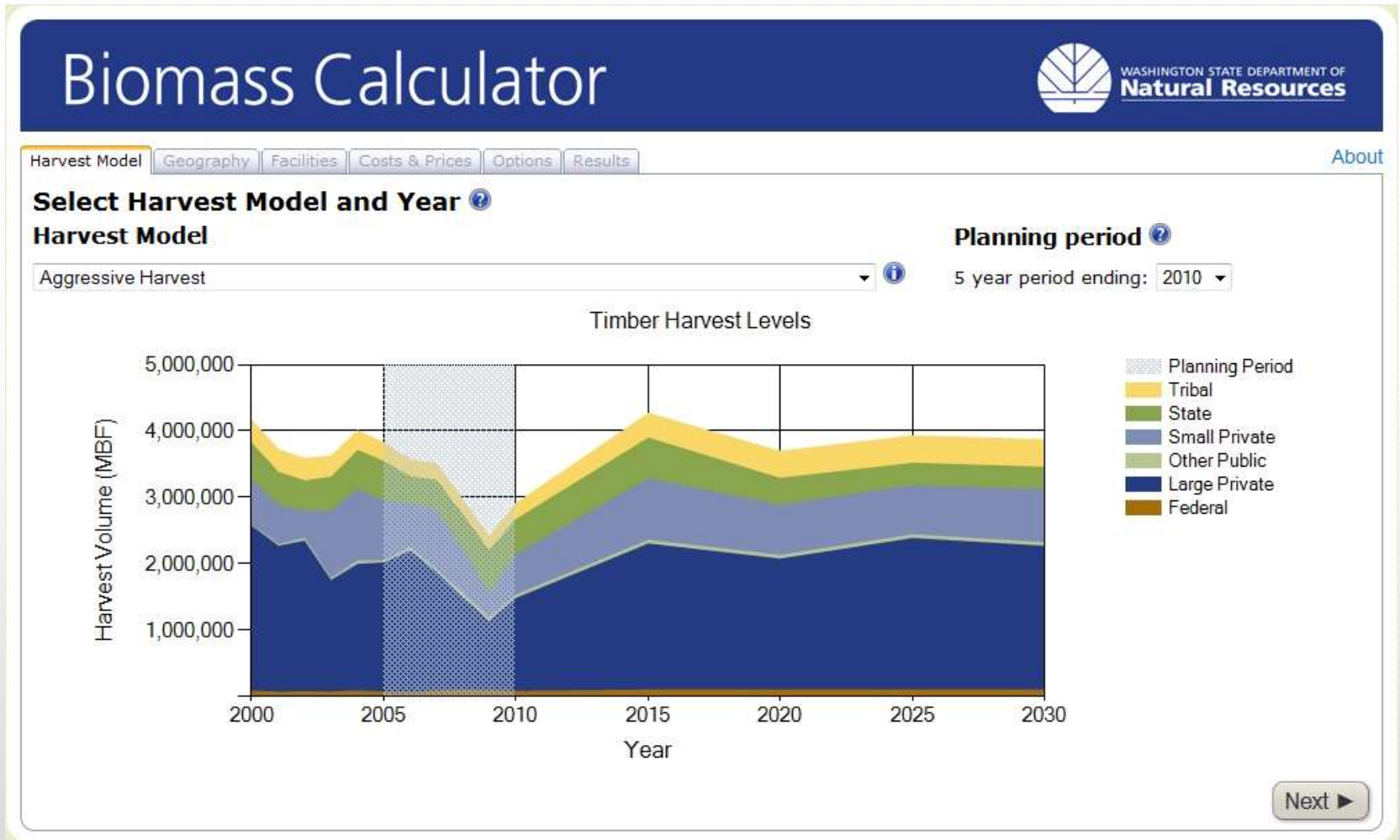
SQL Harvest & Biomass Functions

- Parallel Processing Infrastructure
- SQL Innovations
 - Implemented biomass estimates as computed columns
 - Implemented typical FVS forest treatments as database functions
 - Implemented harvests as a stored procedure
- Benefits
 - Reduced run times
 - Less data to store
 - Dynamic outputs (e.g. change an equation and hit “refresh” in Excel...)
 - Standard SQL API for researcher access to underlying model
 - Self documenting
 - Extremely efficient
 - processing 100’s of millions of “segments”
 - “segments” average ~1,000 sq. ft.

Utility

- Easy to expose SQL data and functions as API's for researchers
 - Optimization
- Carbon
- Life cycle assessments (timber, biomass, emissions...)
- Sustainable feedstock supply
- Air quality assessments (burn piles vs bio-anything vs wildfire)
- Makes possible a public interface to huge volumes of research data

Washington State Biomass Calculator



Thank you

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Thank you

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Use Case 1: Facility Fuelshed

- Determine the “fuelshed” for a facility
 - *Where could a new facility in Wenatchee expect to source biomass from?*
- In this use case we determine the amount of biomass available at a particular facility using the Average Harvest Model in the 2015 Planning Period, paying \$50.00 per bone dry ton.

Use Case 1: Harvest Model Tab

Biomass Calculator  WASHINGTON STATE DEPARTMENT OF **Natural Resources**

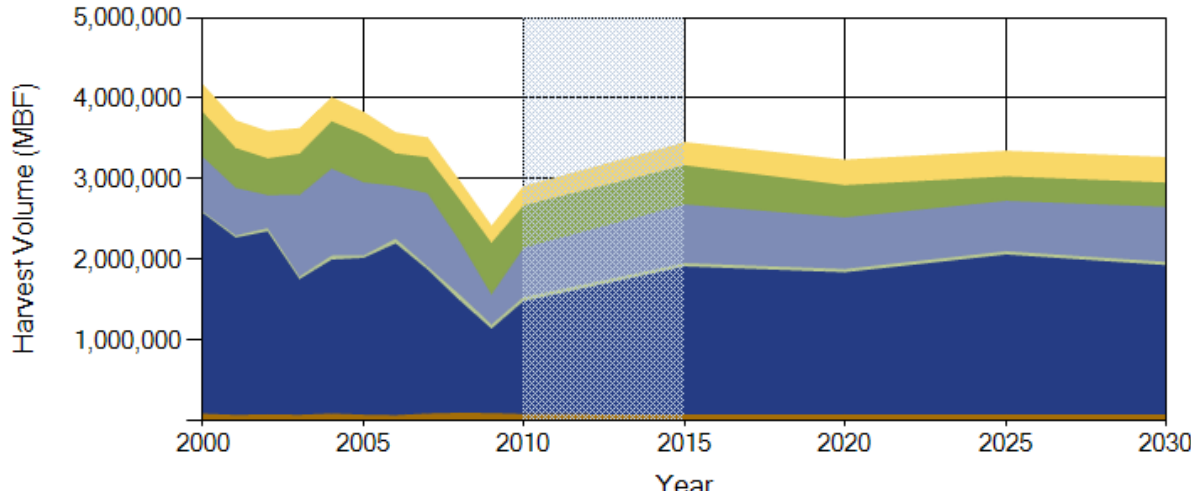
Harvest Model | Geography | Facilities | Costs & Prices | Options | Results [Help](#) [About](#)

Select Harvest Model and Year [?](#)

Harvest Model
Average Statewide Harvest [?](#)

Planning period [?](#)
year period ending: 2015


Timber Harvest Levels




Harvest Volume (MBF)

Year


- Planning Period
- Tribal
- State
- Small Private
- Other Public
- Large Private
- Federal


Next 

Use Case 1: Geography Tab


Biomass Calculator  WASHINGTON STATE DEPARTMENT OF **Natural Resources**

Harvest Model **Geography** Facilities Costs & Prices Options Results Help About

Select a geographic area to calculate biomass 

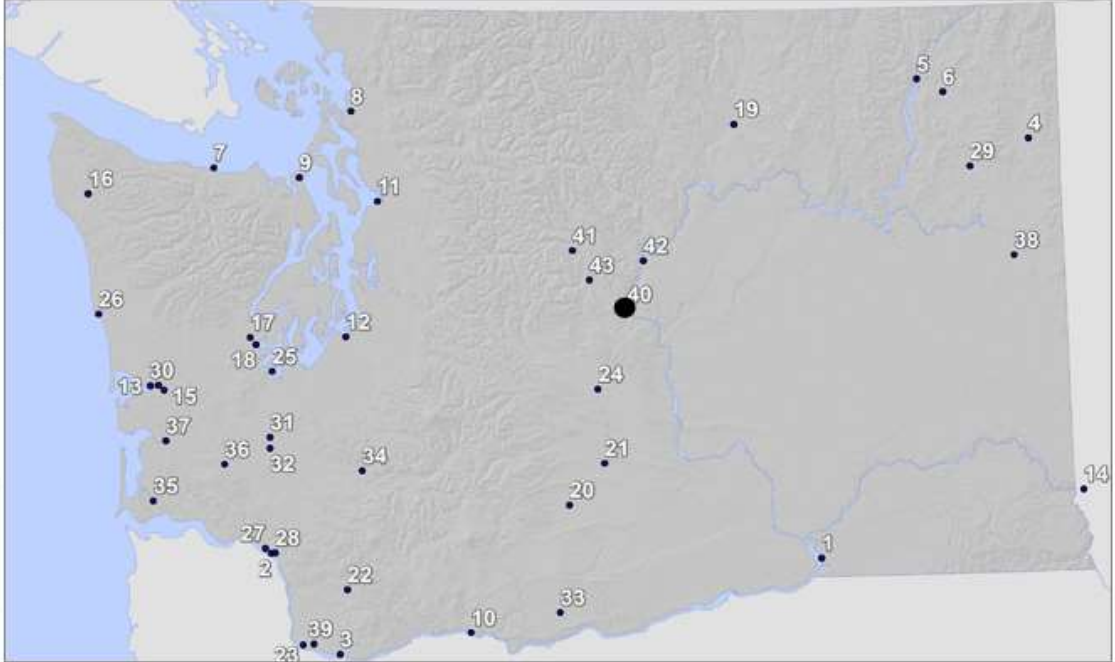
Type of area 

Facility

Specific location 

Facility: Wenatchee: Hypothetical (40)
Sort by: ID Name


- Longview West: Proposed (27)
- Longview East: Proposed (28)
- Kulzer: Proposed (29)
- Aberdeen: Hypothetical (30)
- Centralia: Hypothetical (31)
- Chehalis: Hypothetical (32)
- Goldendale: Hypothetical (33)
- Morton: Hypothetical (34)
- Naselle: Hypothetical (35)
- Pe Ell: Hypothetical (36)
- Raymond: Hypothetical (37)
- Spokane: Hypothetical (38)
- Vancouver: Hypothetical (39)
- Wenatchee: Hypothetical (40)**
- Winton: Existing (41)
- Entiat: Hypothetical (42)
- Leavenworth: Hypothetical (43)



◀ Back Next ▶

Use Case 1: Facilities Tab

Biomass Calculator



Harvest Model | Geography | **Facilities** | Costs & Prices | Options | Results [Help](#) [About](#)

Select facilities to include in the analysis ?

Quick pick groups ?


Existing Proposed Hypothetical All Clear

Selected Facilities competing for forest biomass ?

<input type="checkbox"/> Aberdeen: Hypothetical	<input type="checkbox"/> Forks: Hypothetical	<input type="checkbox"/> Naselle: Hypothetical	<input type="checkbox"/> Tacoma: Existing
<input type="checkbox"/> Amboy: Proposed	<input type="checkbox"/> Goldendale: Hypothetical	<input type="checkbox"/> Olympia: Proposed	<input type="checkbox"/> Taholah: Proposed
<input type="checkbox"/> Bingen: Existing	<input type="checkbox"/> Hoquiam: Existing	<input type="checkbox"/> Omak: Proposed	<input type="checkbox"/> Usk: Existing
<input type="checkbox"/> Camas: Existing	<input type="checkbox"/> Kettle Falls: Existing	<input type="checkbox"/> Pe Ell: Hypothetical	<input type="checkbox"/> Vancouver: Proposed
<input type="checkbox"/> Centralia: Hypothetical	<input type="checkbox"/> Kulzer: Proposed	<input type="checkbox"/> Peshastin: Hypothetical	<input type="checkbox"/> Vancouver: Hypothetical
<input type="checkbox"/> Chehalis: Hypothetical	<input type="checkbox"/> Lewiston: Existing	<input type="checkbox"/> Port Angeles: Existing	<input type="checkbox"/> Wallula: Existing
<input type="checkbox"/> Colville: Existing	<input type="checkbox"/> Longview: Existing	<input type="checkbox"/> Port Townsend: Existing	<input checked="" type="checkbox"/> Wenatchee: Hypothetical
<input type="checkbox"/> Cosmopolis: Existing	<input type="checkbox"/> Longview West: Proposed	<input type="checkbox"/> Raymond: Hypothetical	<input type="checkbox"/> White Swan: Proposed
<input type="checkbox"/> Ellensburg: Proposed	<input type="checkbox"/> Longview East: Proposed	<input type="checkbox"/> Shelton Airport: Proposed	<input type="checkbox"/> Winton: Existing
<input type="checkbox"/> Entiat: Hypothetical	<input type="checkbox"/> Morton: Hypothetical	<input type="checkbox"/> Shelton Waterfront: Proposed	<input type="checkbox"/> Yakima: Proposed
<input type="checkbox"/> Everett: Existing	<input type="checkbox"/> Mount Vernon: Existing	<input type="checkbox"/> Spokane: Hypothetical	

Use Case 1: Costs & Prices Tab

Biomass Calculator



WASHINGTON STATE DEPARTMENT OF
Natural Resources

Harvest Model | Geography | Facilities | **Costs & Prices** | Options | Results [Help](#) [About](#)

Select costs and prices ?

Biomass harvest costs ?

Cost model:

Forest health cost (\$/BDT): \$45.00
Mobilization cost (\$/hr): \$120.00
Load/unload cost (\$/BDT): \$26.00
Haul cost (\$/hr): \$95.00


Biomass price paid at facility ?

Biomass price (\$/BDT):

Note that higher biomass prices increase the run-time of the calculator so please be patient

Use Case 1: Options Tab

Biomass Calculator



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Natural Resources

Harvest Model | Geography | Facilities | Costs & Prices | **Options** | Results [Help](#) [About](#)

Summary Options ?

Biomass trucking restrictions ?

Maximum Haul Filter: Enabled Disabled
Maximum Haul (hours):

Reporting fields ?


County
 Stumpage Value Area
 Timbershed
 Watershed (WRIA)
 Facility
 Owner Class
 Haul Time

Field options ?

Use Names or IDs in Results Table:
 Names
 ID Numbers

Use Case 1: Results Tab

Biomass Calculator


WASHINGTON STATE DEPARTMENT OF
Natural Resources

Harvest Model | Geography | Facilities | Costs & Prices | Options | **Results**
Help | About

Results (5 year planning period totals) ?

Hide Run Parameters
Run: Average Statewide Harvest
Year: 2015
Geography: Facility
Geographies: Wenatchee: Hypothetical (40)
Facilities: Wenatchee: Hypothetical
Cost: Medium
Price: \$50
Max Haul Time To Facility: 180 minutes
Reporting Fields: County, Facility, Owner Class
Field Options: Names

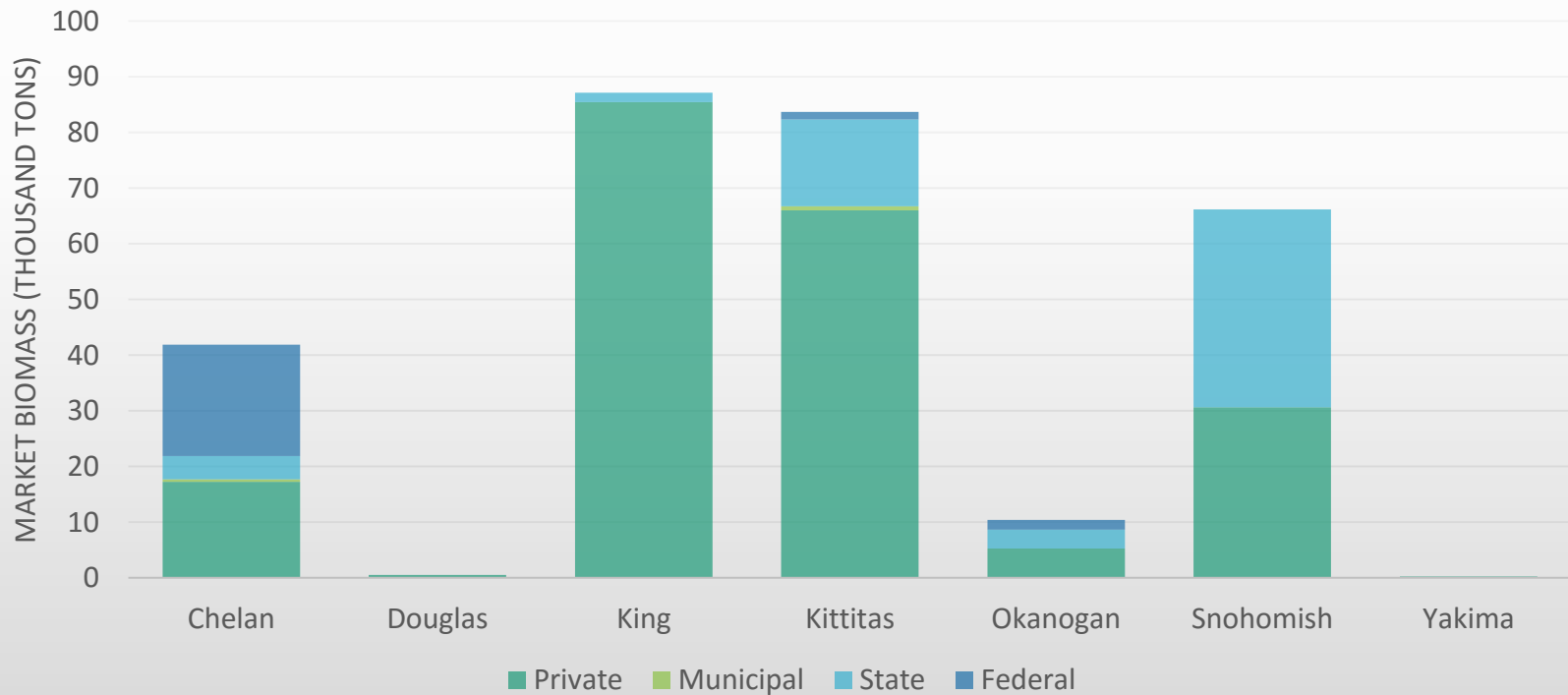
County	Facility	Owner Class	Scattered Biomass (BDT)	Roadside Biomass (BDT)	Market Biomass (BDT)	Residual Value (\$)
Chelan	Wenatchee:Hypothetical (40)	Federal	31,762	38,259	20,002	\$158,385.67
Kittitas	Wenatchee:Hypothetical (40)	Federal	1,920	2,620	1,386	\$7,198.03
Okanogan	Wenatchee:Hypothetical (40)	Federal	2,621	3,476	1,776	\$1,589.00
Chelan	Wenatchee:Hypothetical (40)	Municipal	498	641	455	\$3,993.60
Kittitas	Wenatchee:Hypothetical (40)	Municipal	686	916	732	\$2,369.97

Use Case 1: Analyzing Results

Market Biomass (Tons)	Private	Municipal	State	Federal	Grand Total
Chelan	17,235	455	4,190	20,002	41,881
Douglas	506				506
King	85,433		1,710		87,144
Kittitas	65,998	732	15,584	1,386	83,699
Okanogan	5,271		3,392	1,776	10,439
Snohomish	30,635		35,524		66,159
Yakima	224				224
Grand Total	205,302	1,187	60,399	23,164	290,052

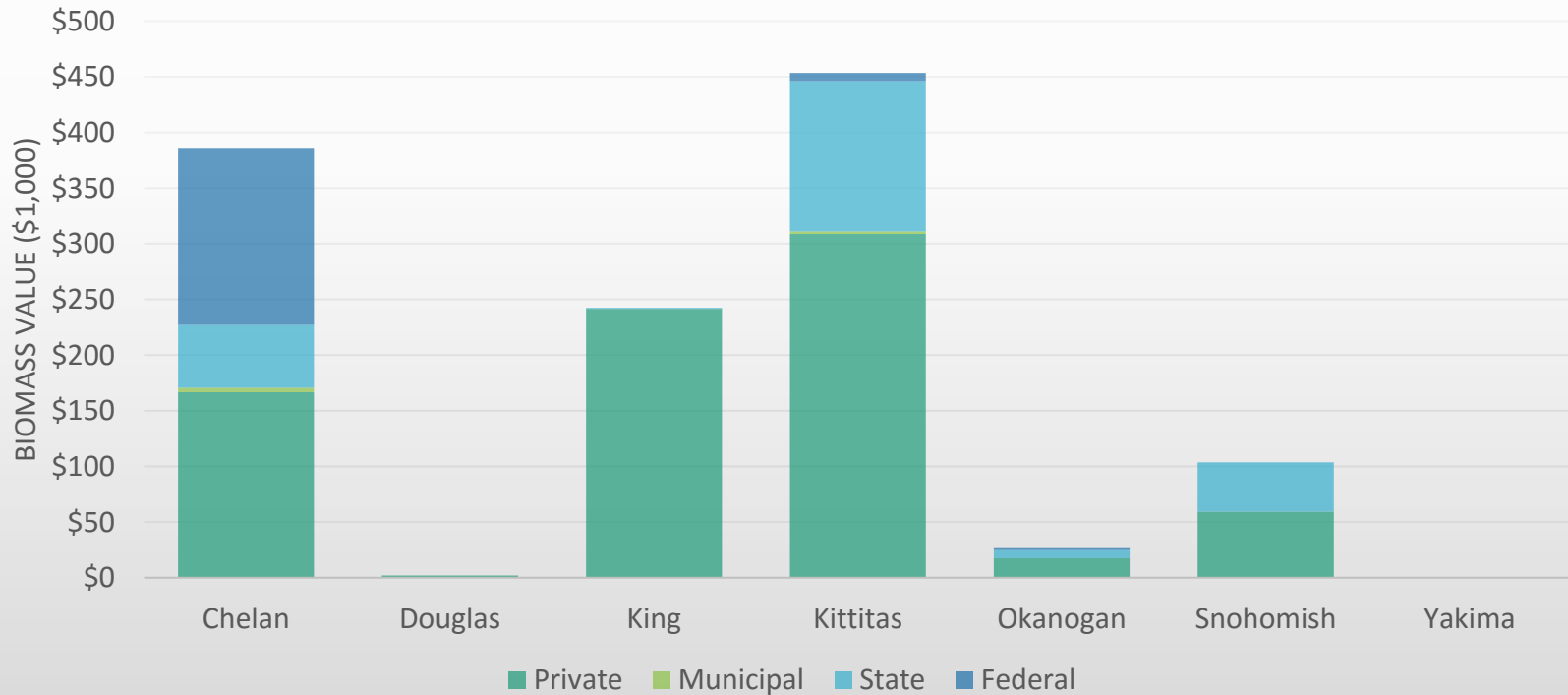
Use Case 1: Analyzing Results

POTENTIAL BIOMASS SUPPLY BY COUNTY AND OWNER CLASS FOR A FACILITY IN WENATCHEE

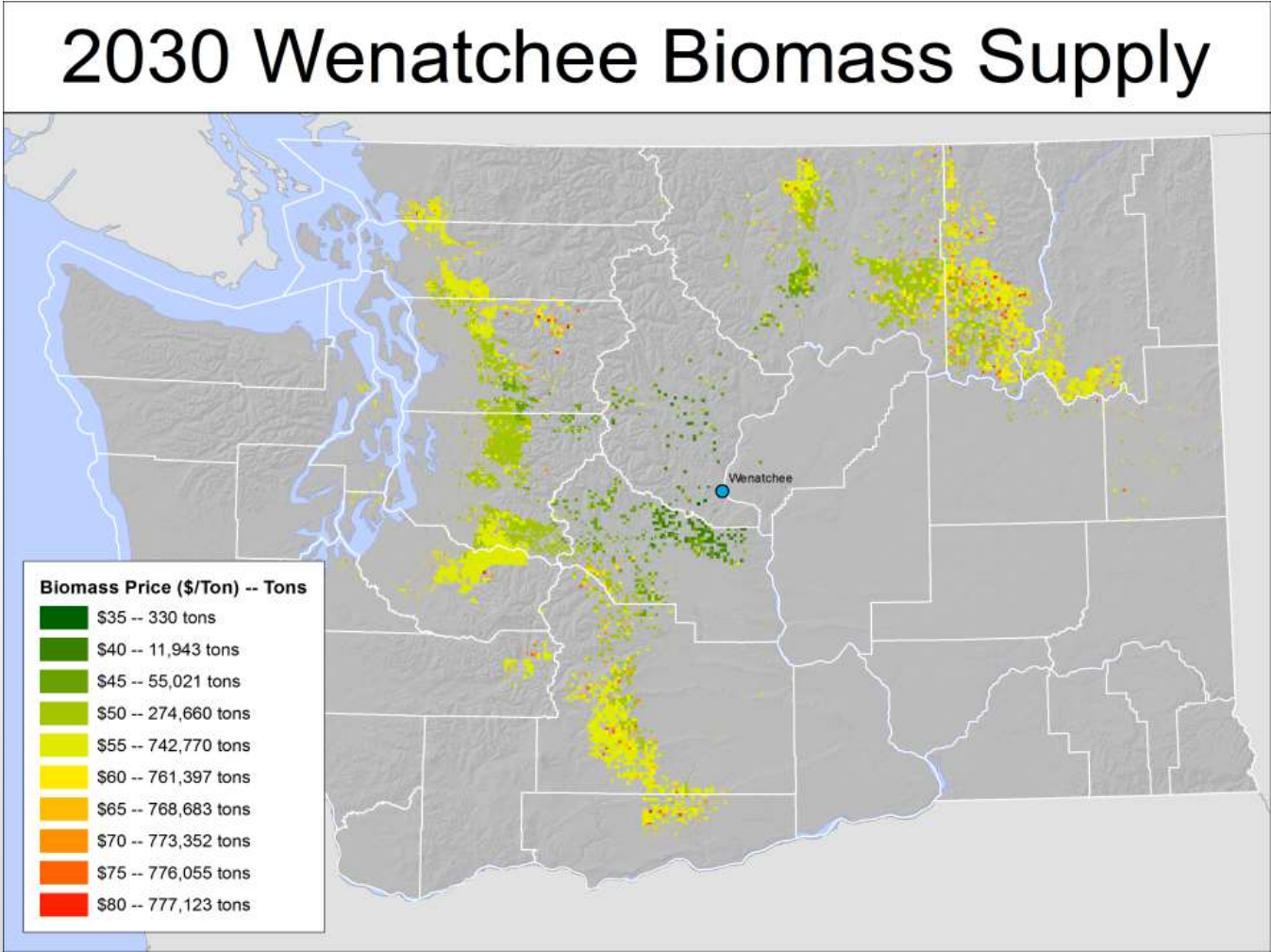


Use Case 1: Analyzing Results

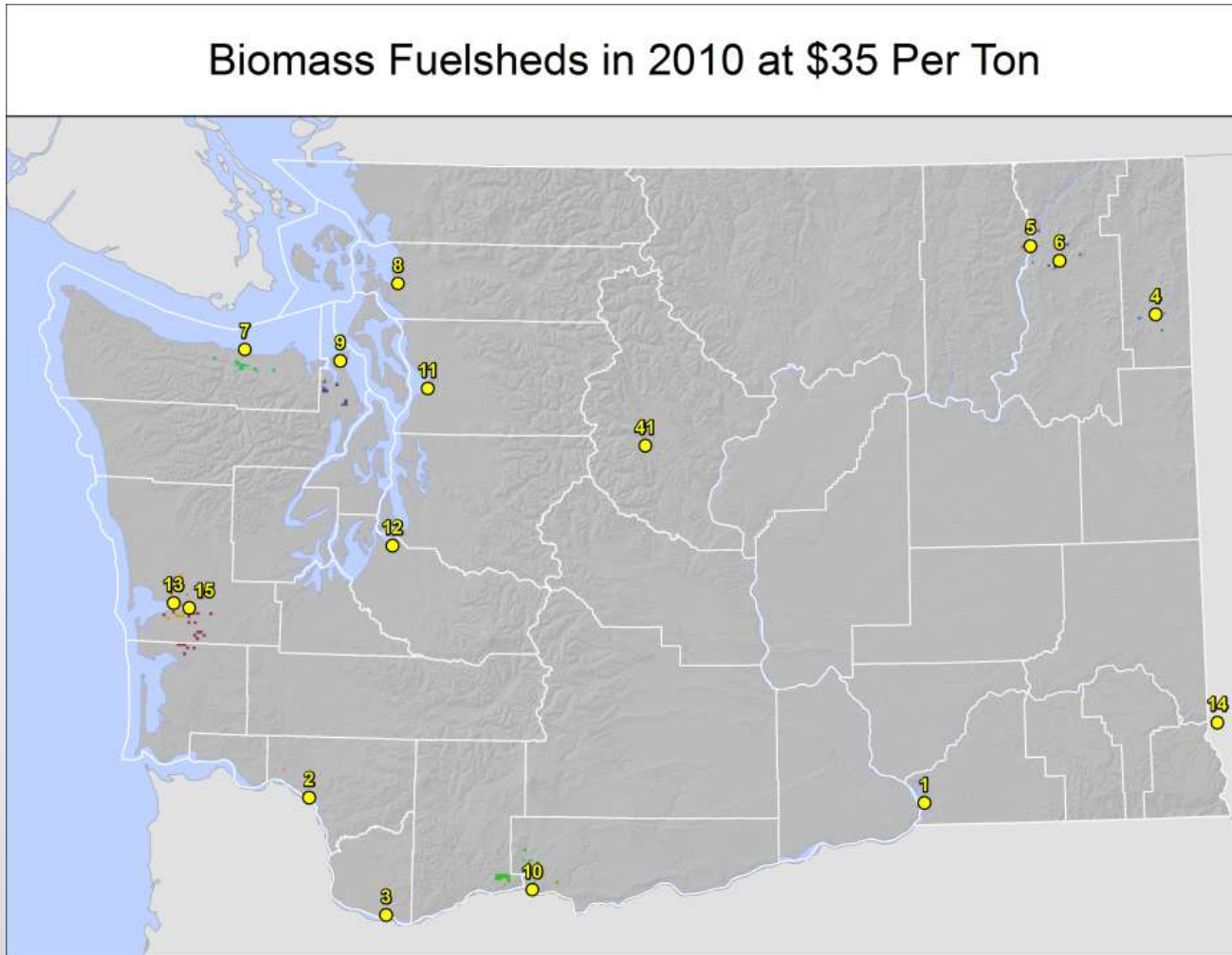
POTENTIAL BIOMASS VALUE BY COUNTY AND OWNER CLASS FOR A FACILITY IN WENATCHEE



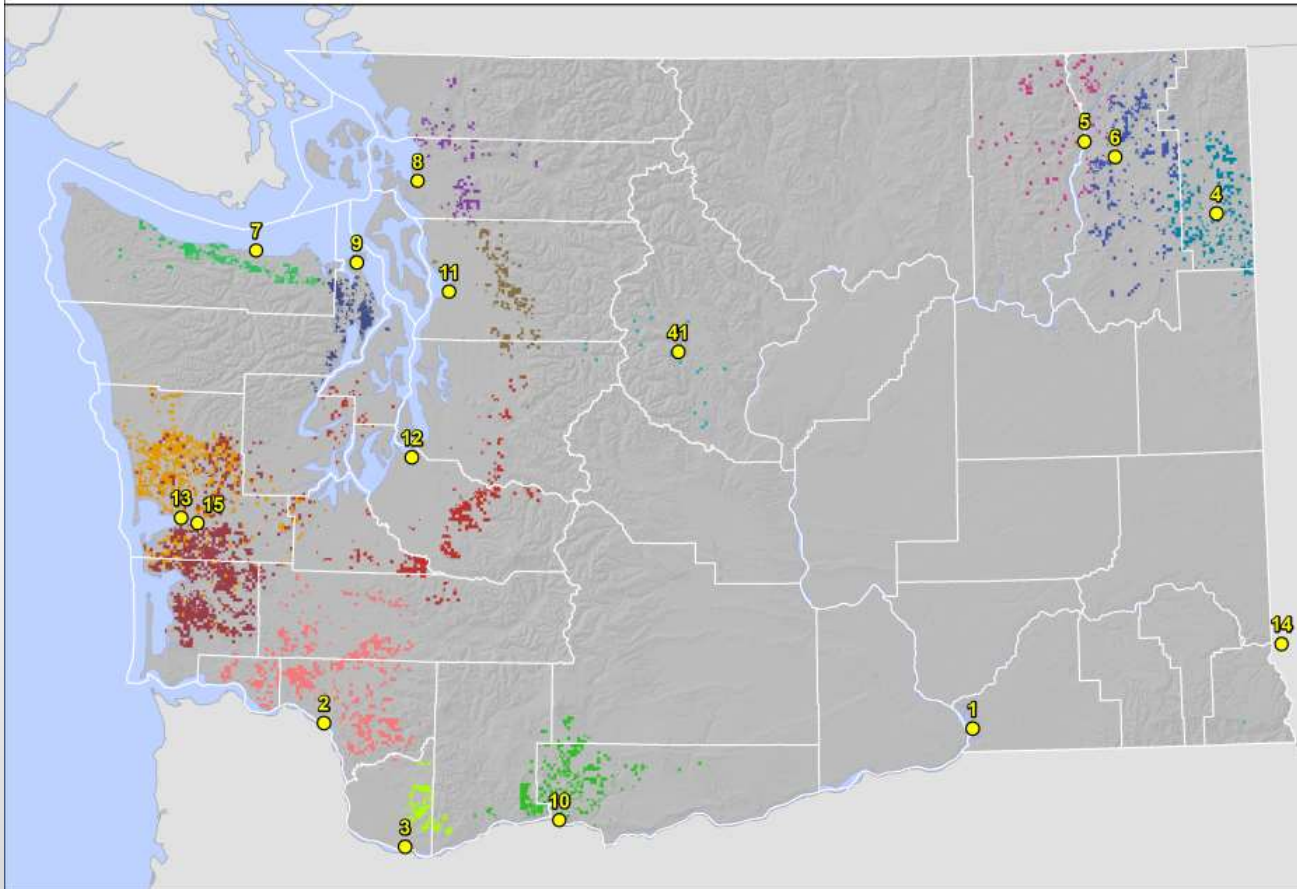
2030 Wenatchee Biomass Supply



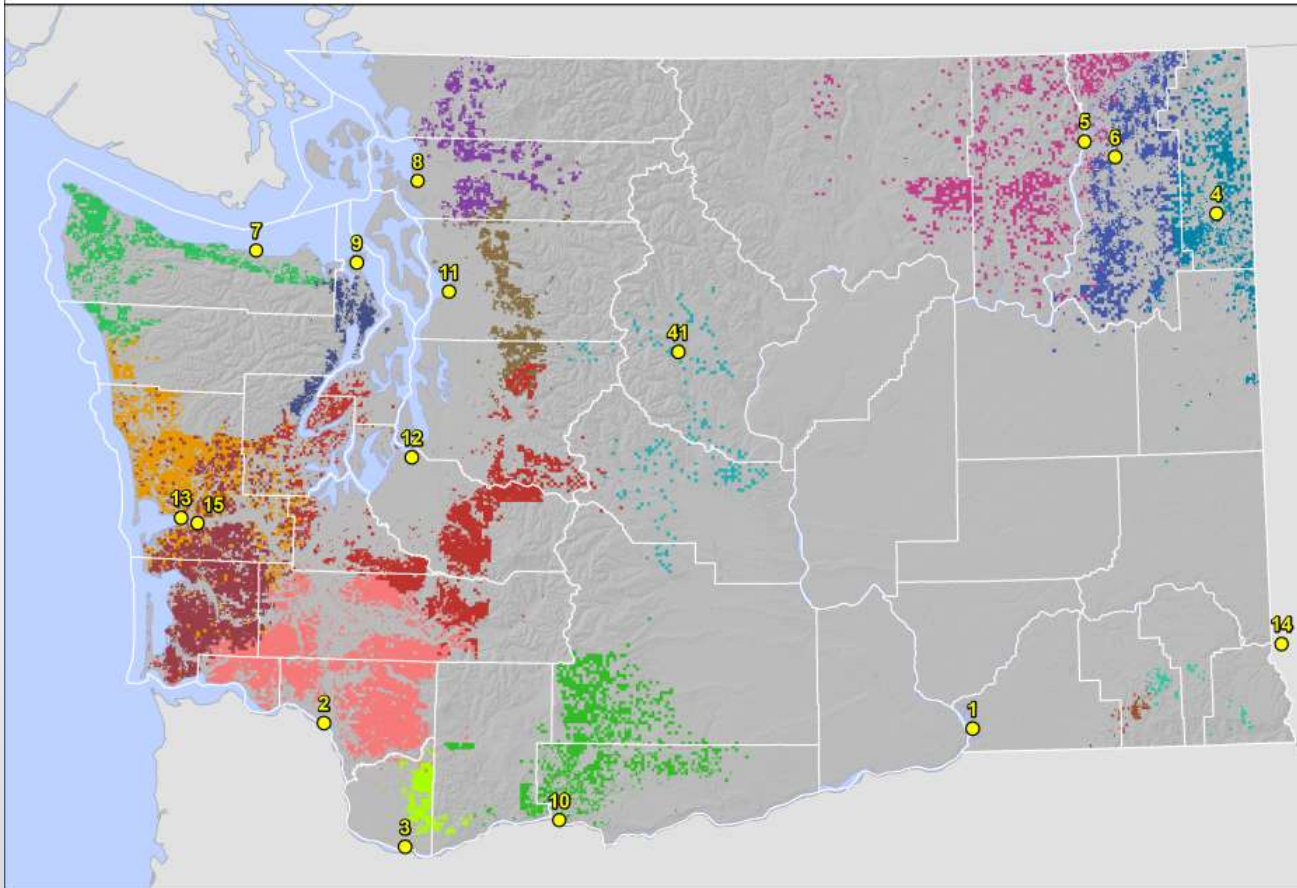
Biomass Fuelsheds



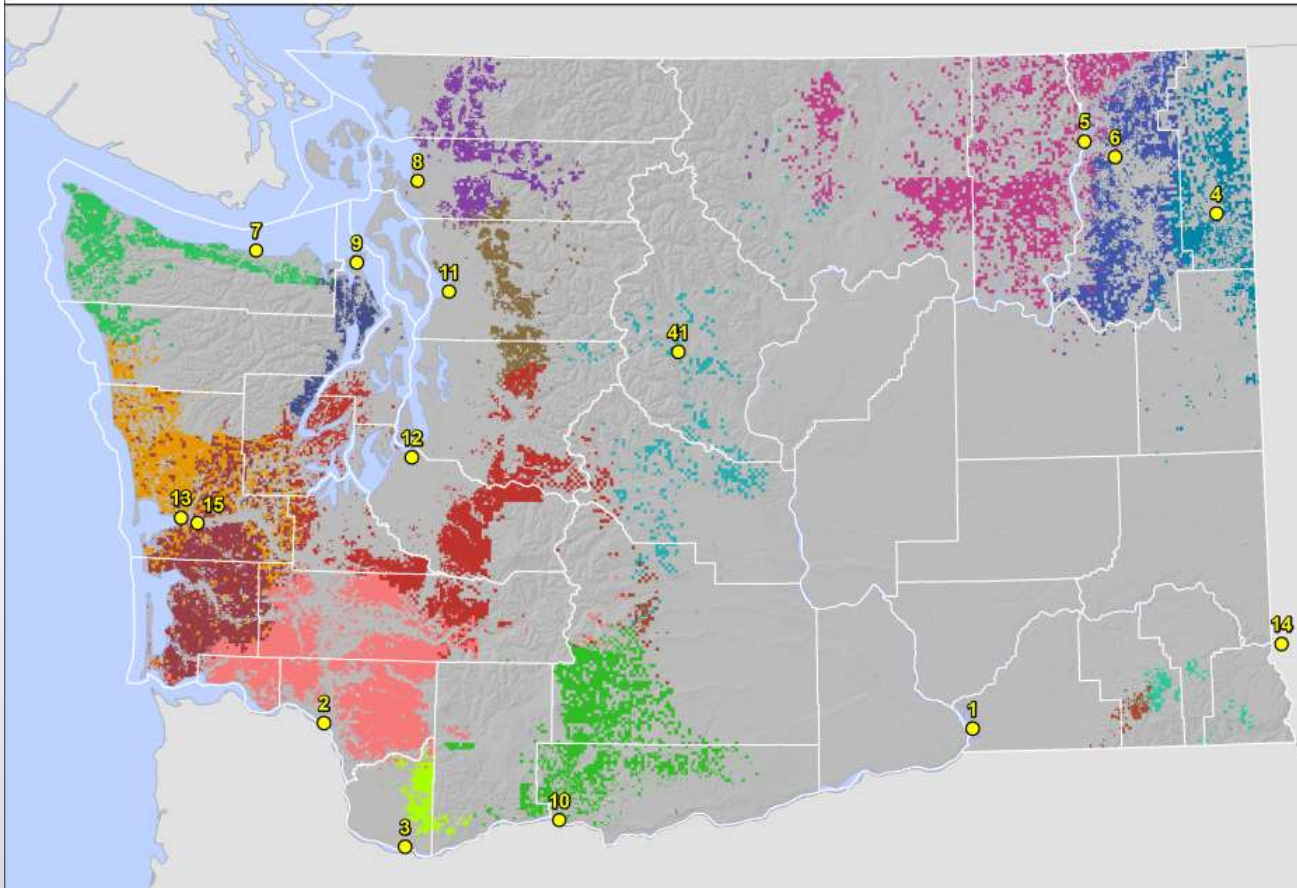
Biomass Fuelsheds in 2010 at \$40 Per Ton



Biomass Fuelsheds in 2010 at \$50 Per Ton



Biomass Fuelsheds in 2010 at \$60 Per Ton



Biomass Fuelsheds in 2010 at \$80 Per Ton

