A West Coast Forest Biomass Assessment Database

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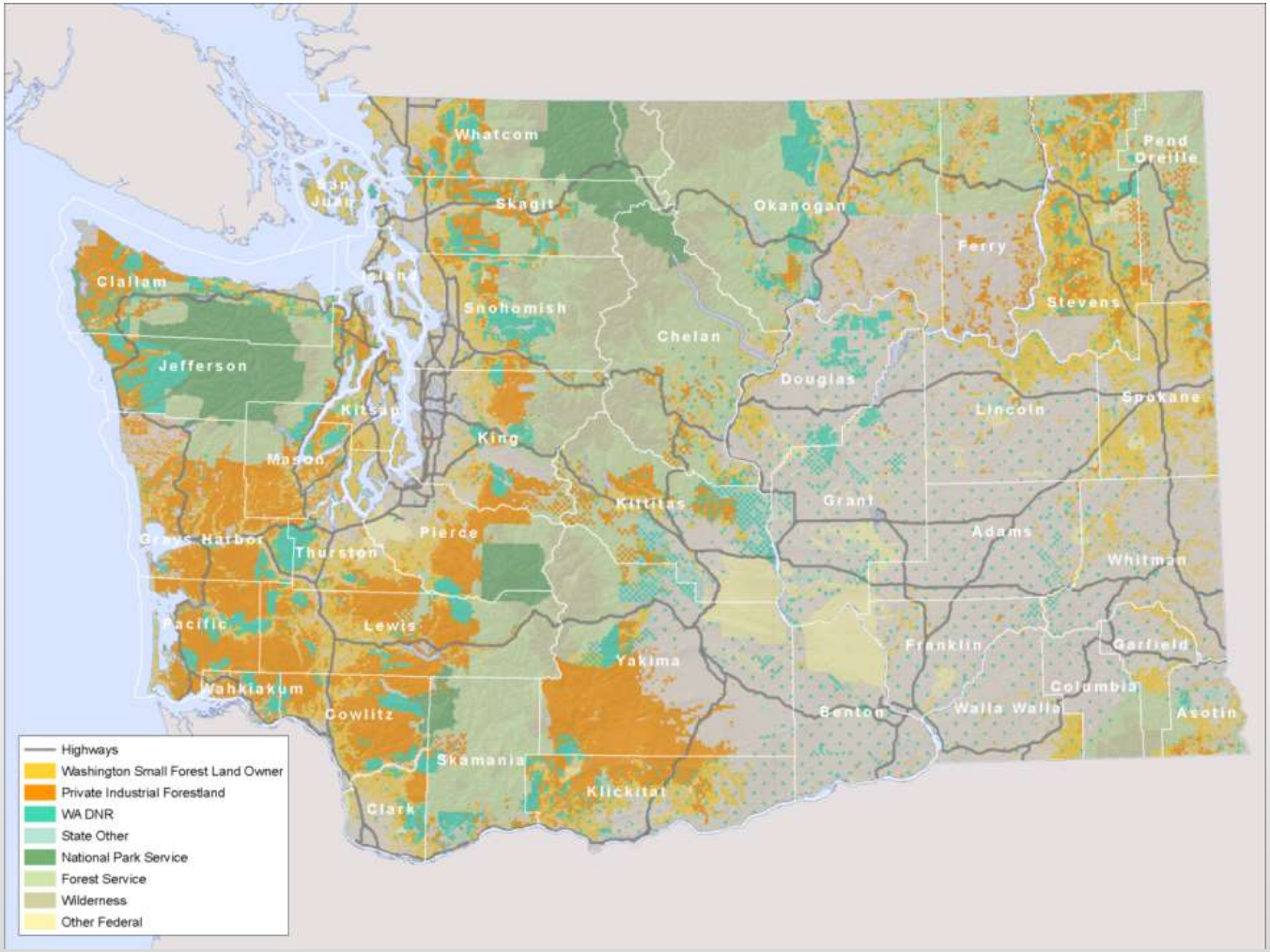
University of Washington

NRSIG

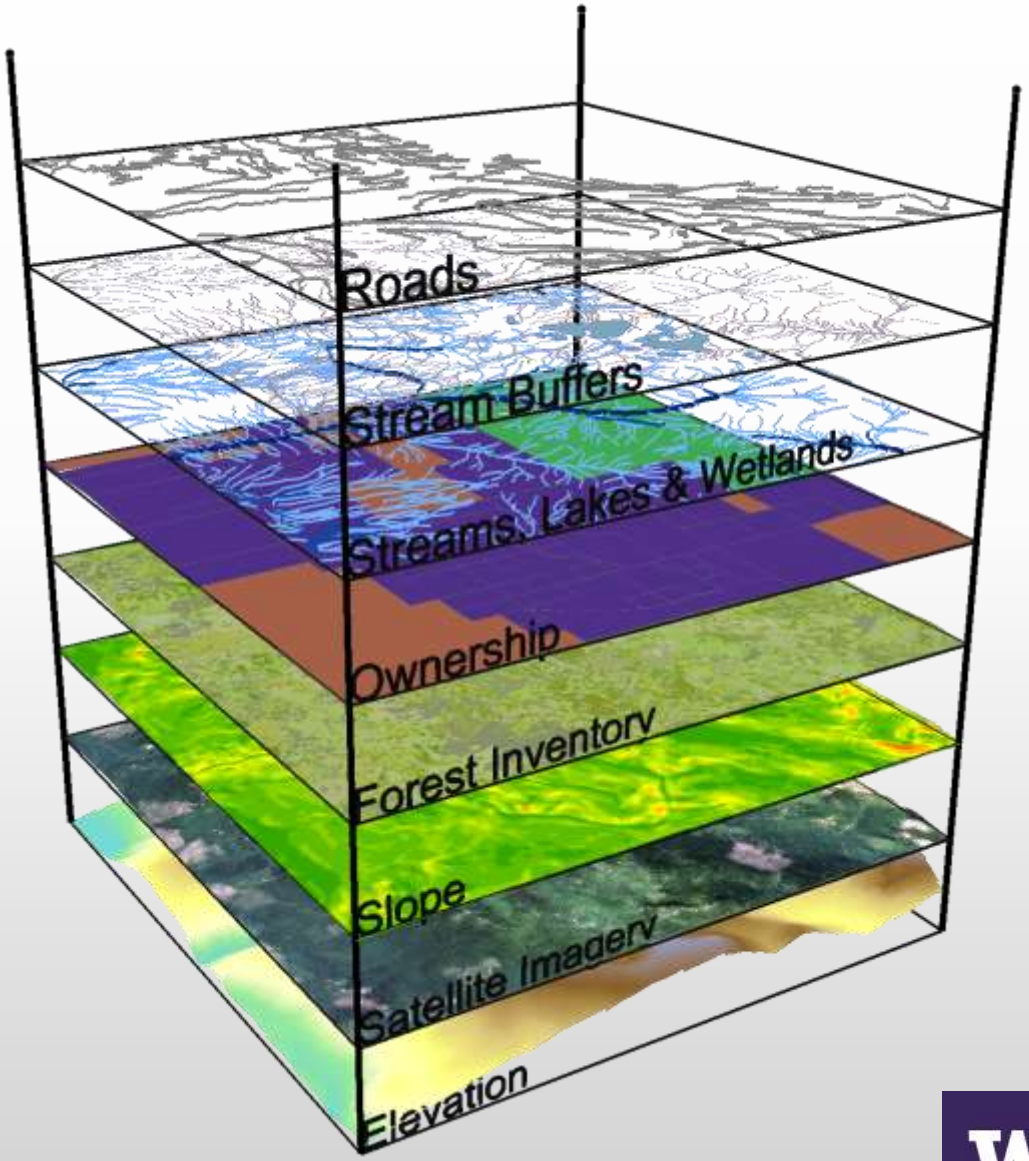
Projects


WASHINGTON FOREST BIOMASS SUPPLY ASSESSMENT
School of Environmental and Forest Sciences
WASHINGTON HARDWOODS COMMISSION
Institute of Forest Reso
UNIVERSITY OF WASHINGTON - COLLEGE OF FOREST RESOURCES
The 2007 Washington State Forestland Database
Final Report

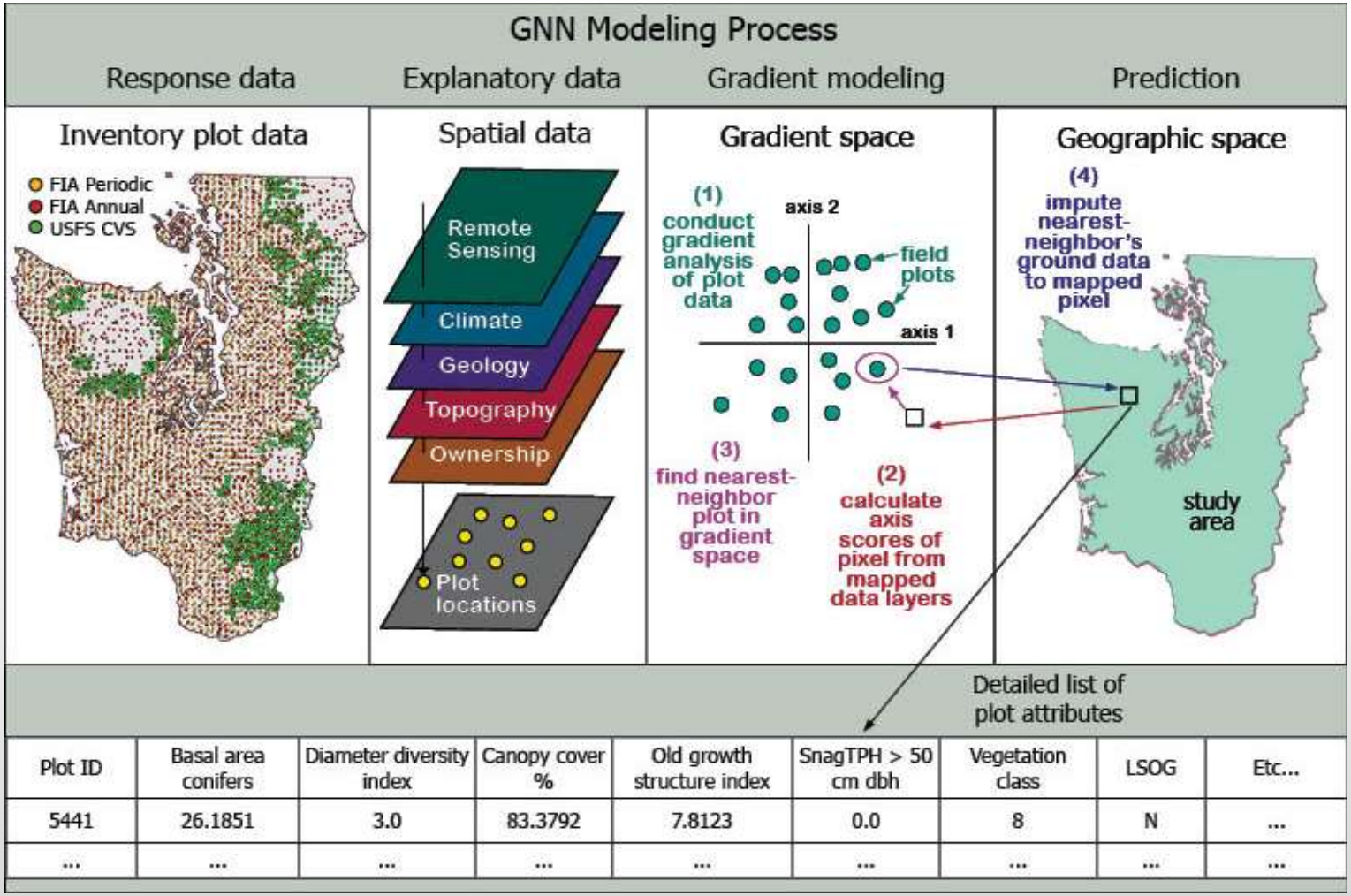
Forestland Database



Input Layers



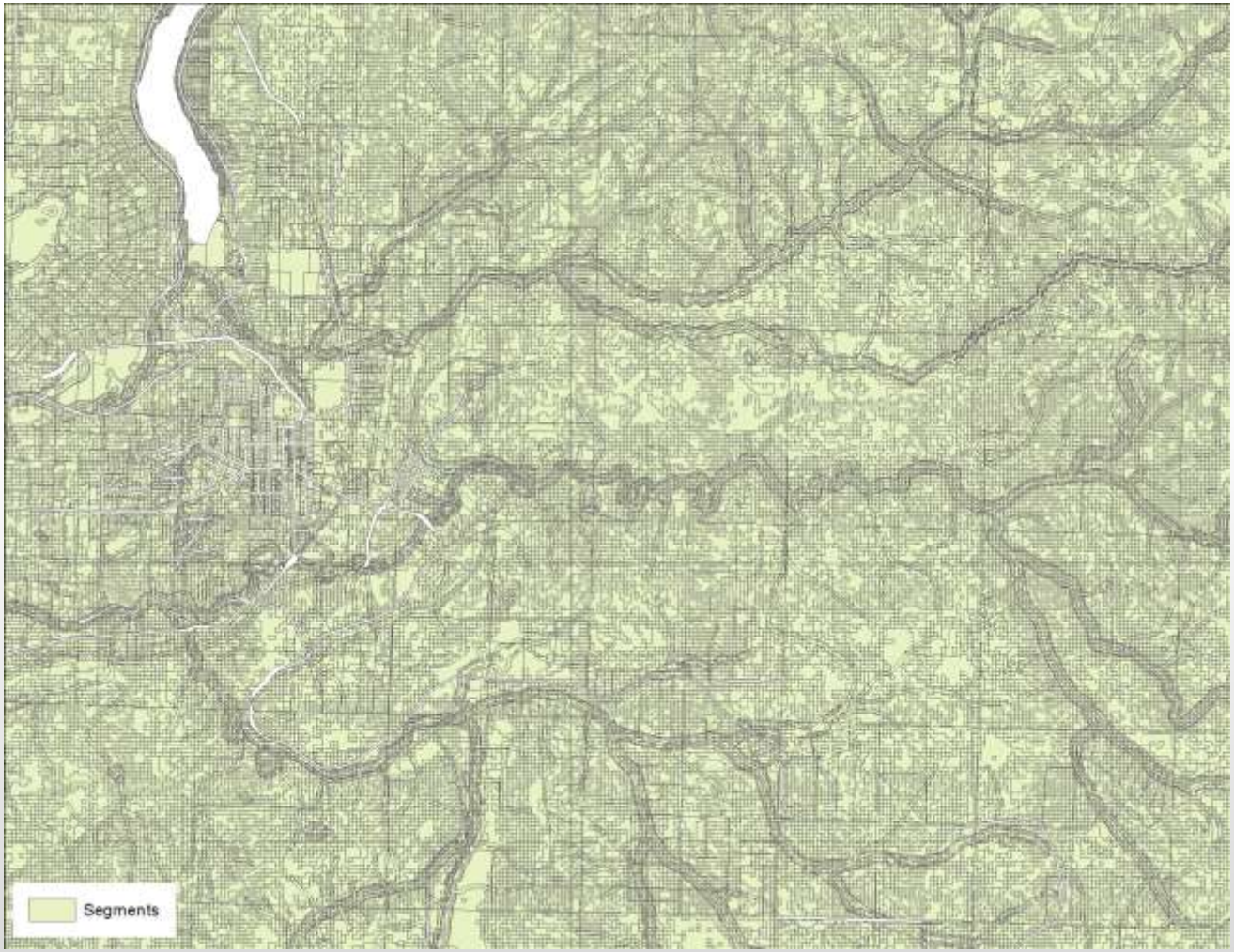
Forest Inventory



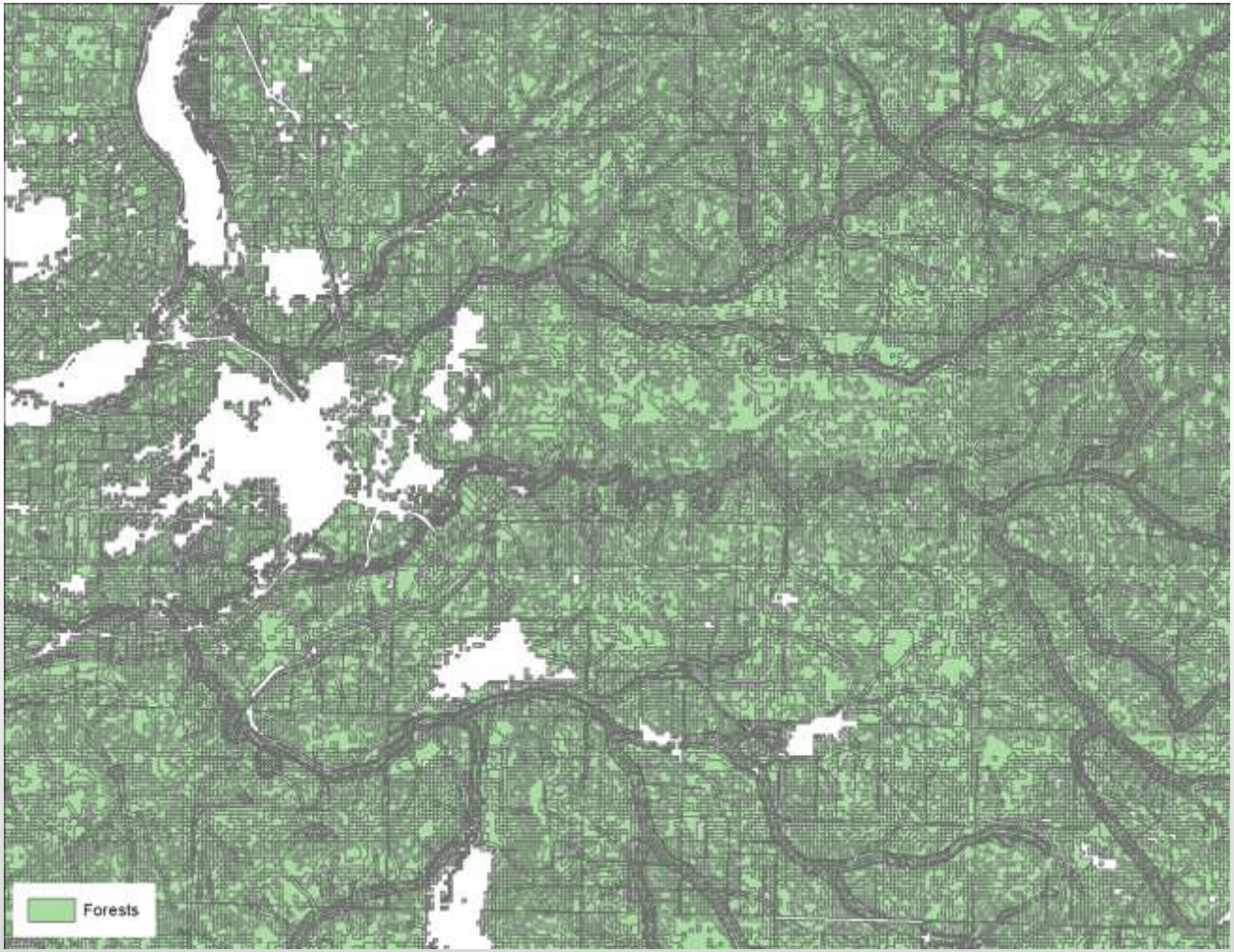
Plot ID	Basal area conifers	Diameter diversity index	Canopy cover %	Old growth structure index	SnagTPH > 50 cm dbh	Vegetation class	LSOG	Etc...
5441	26.1851	3.0	83.3792	7.8123	0.0	8	N	...
...	...	...	...	...	...	...	...	...

Credit: Ohmann et al

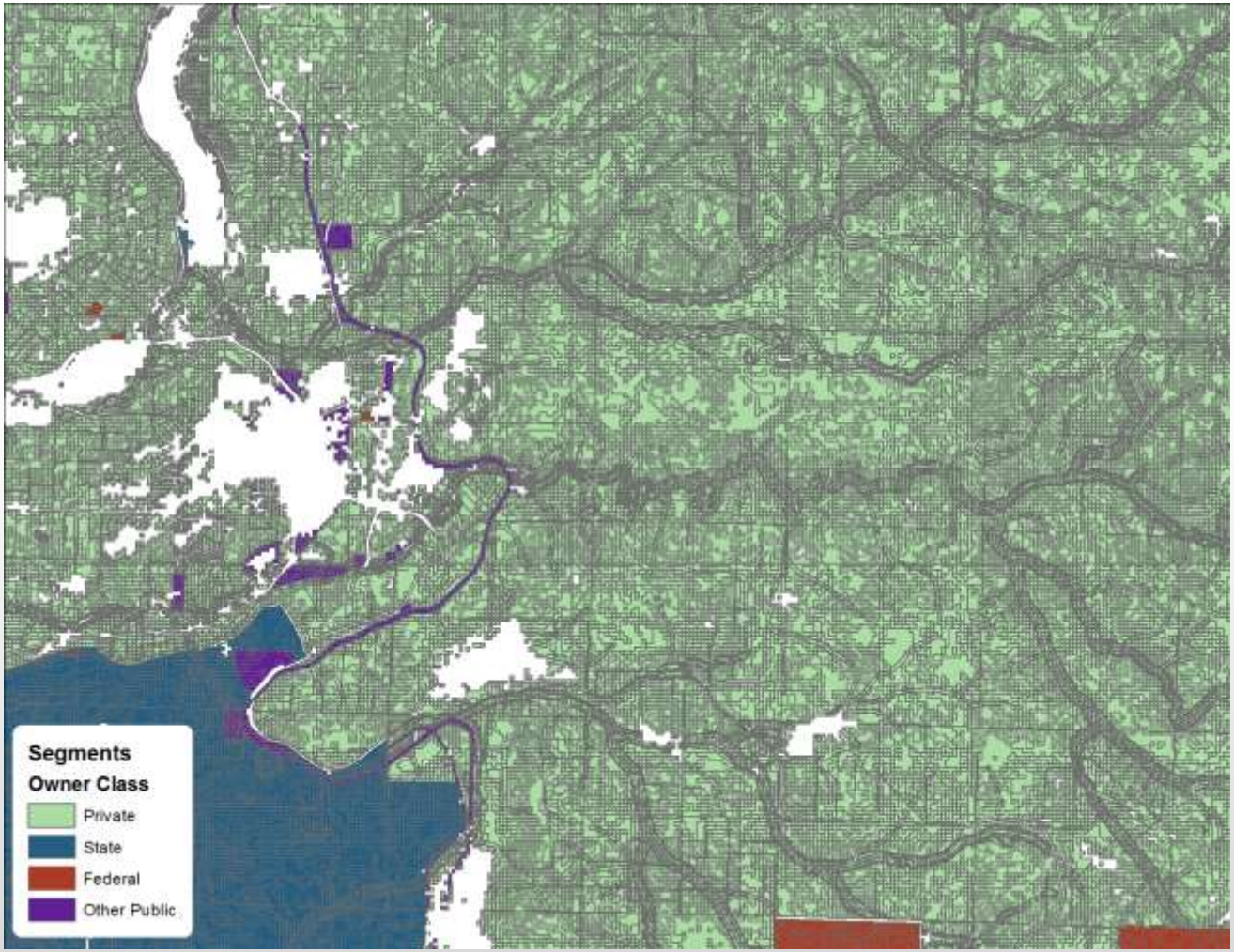
Segments



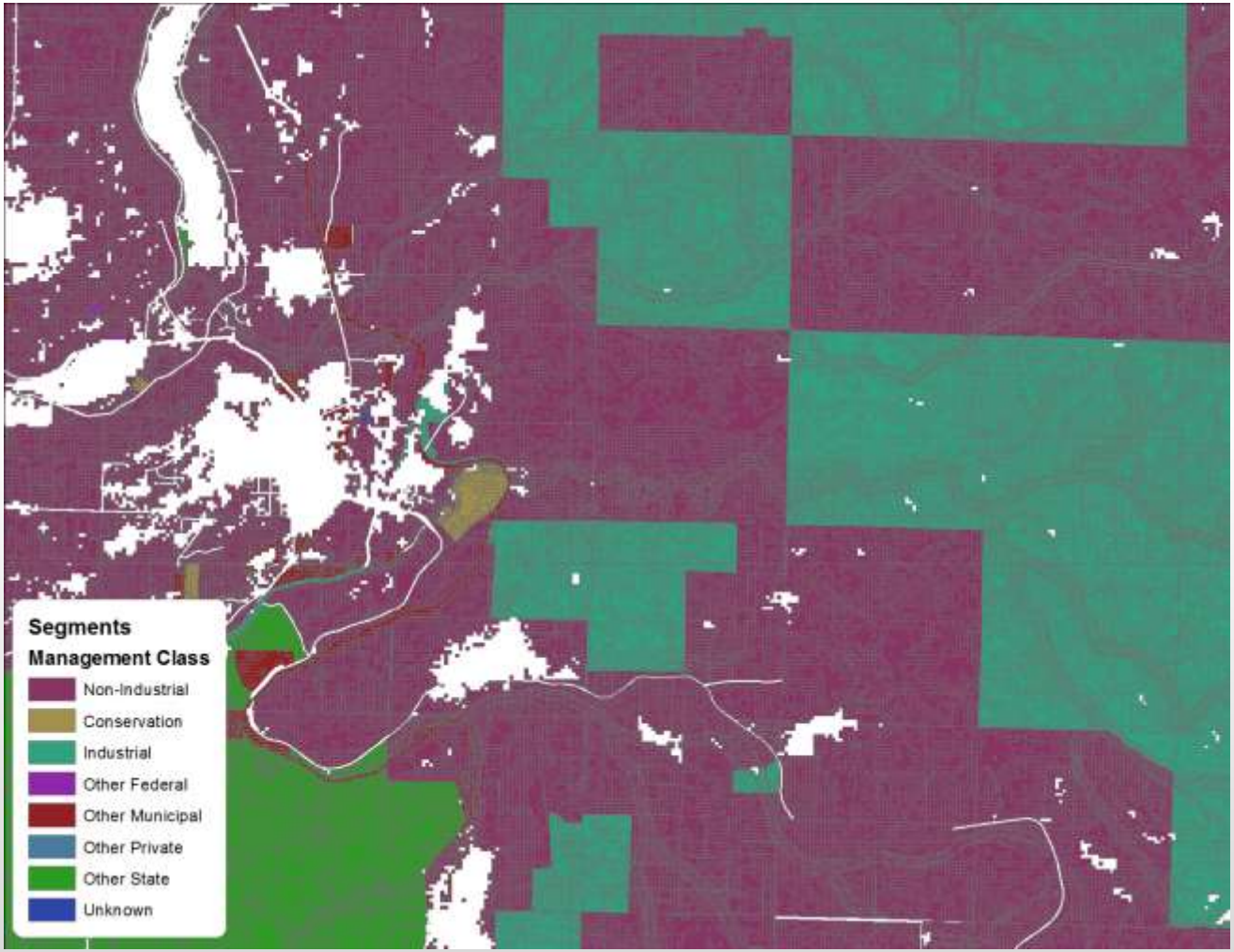
Forests



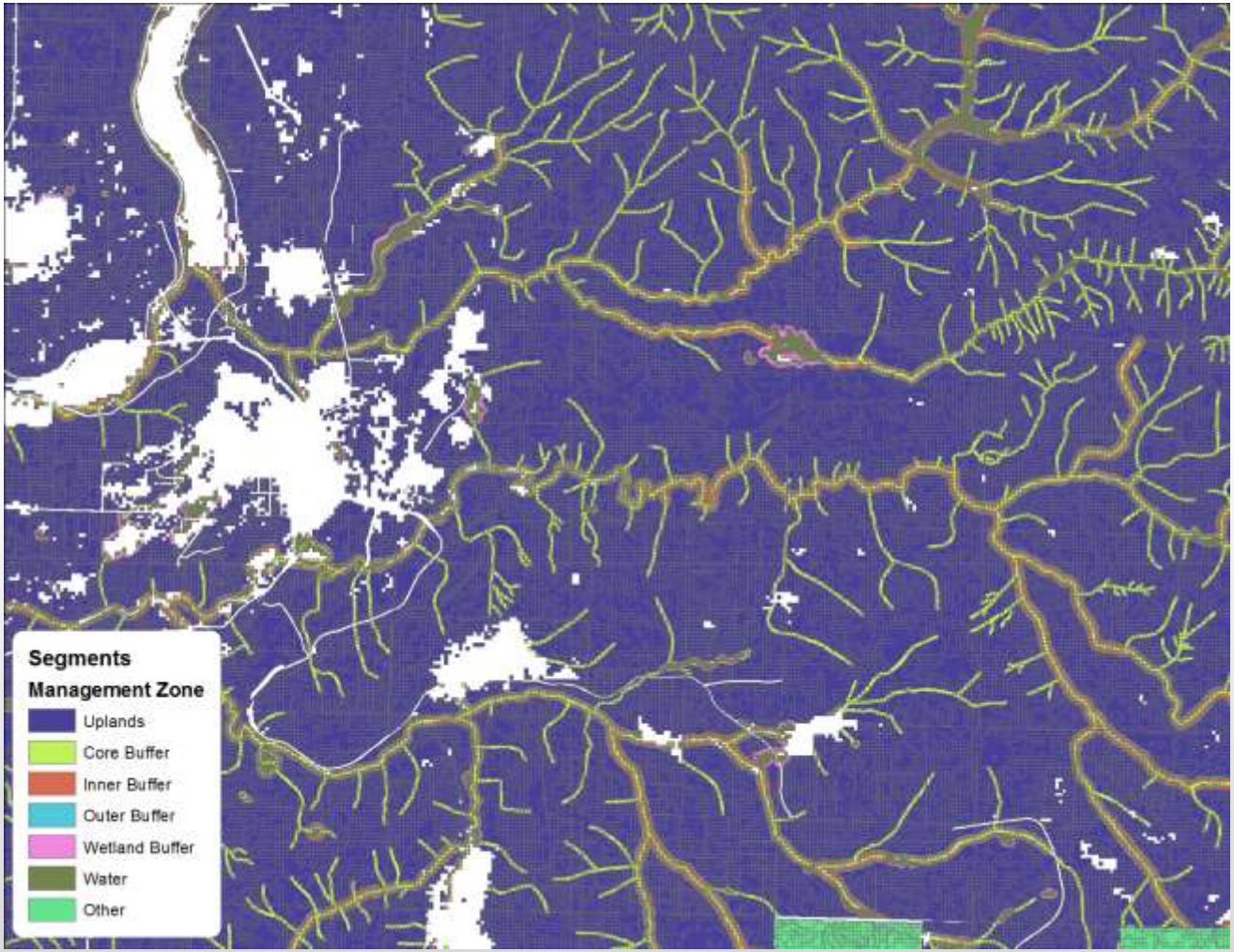
Owner Class



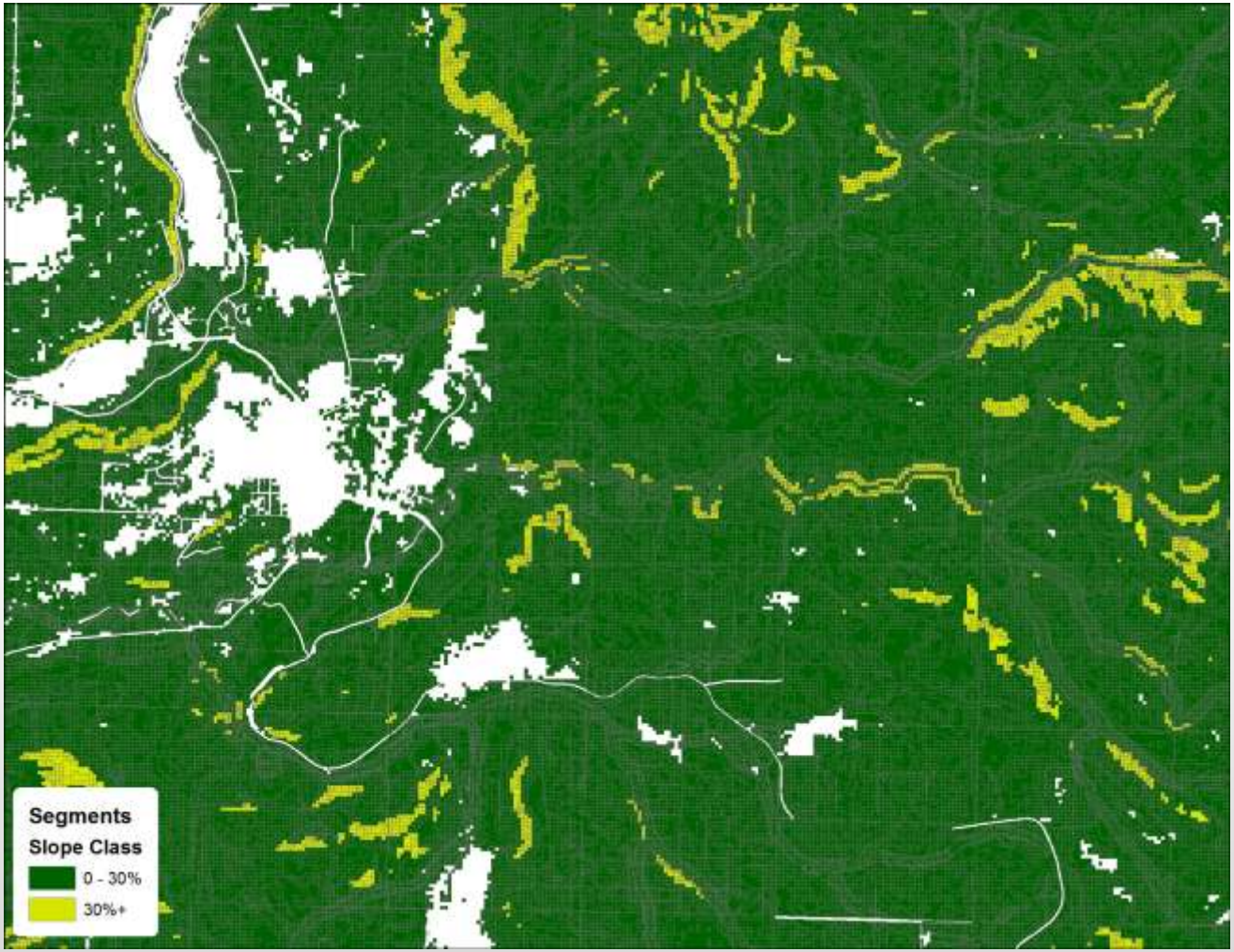
Management Class



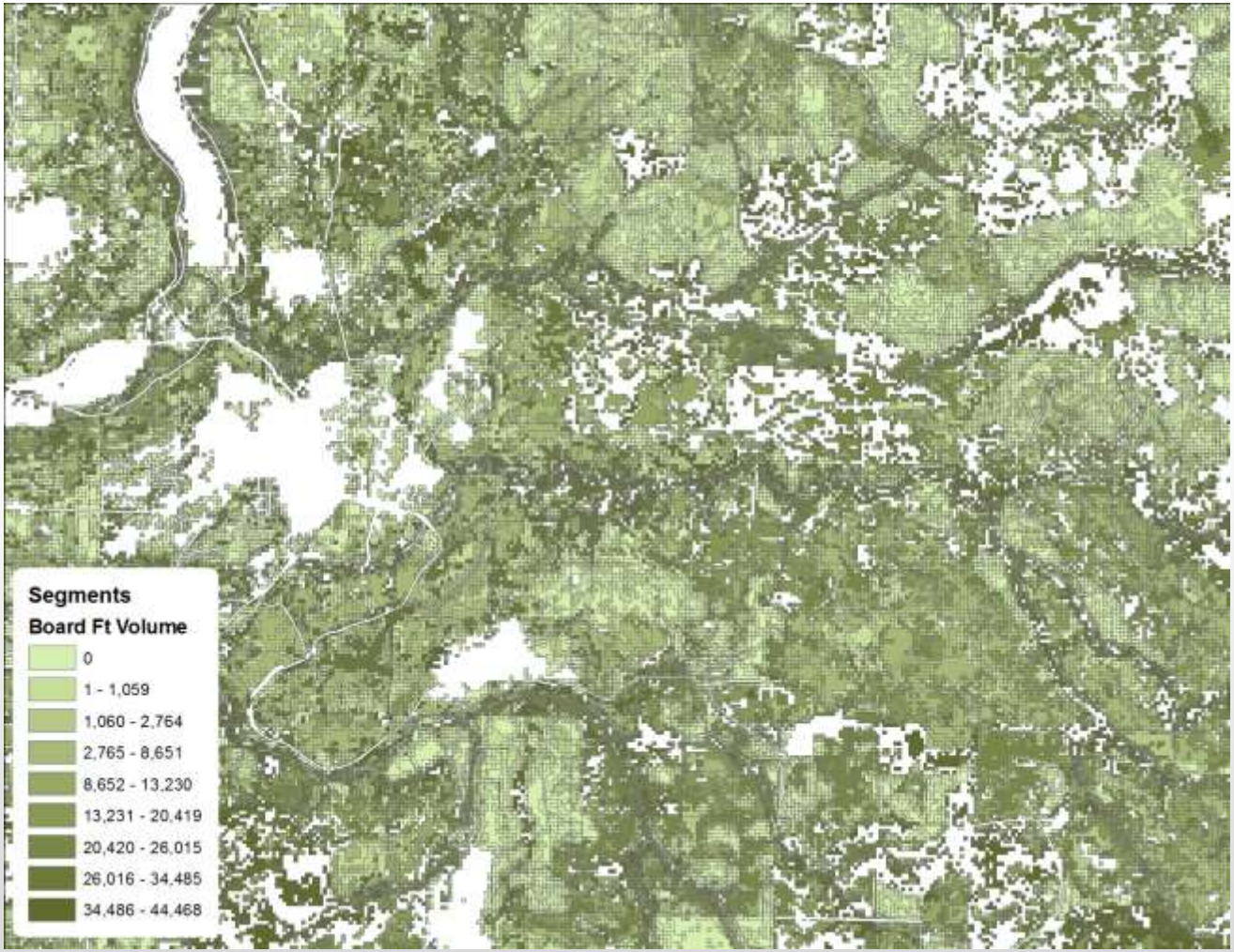
Management Zone



Slope Class



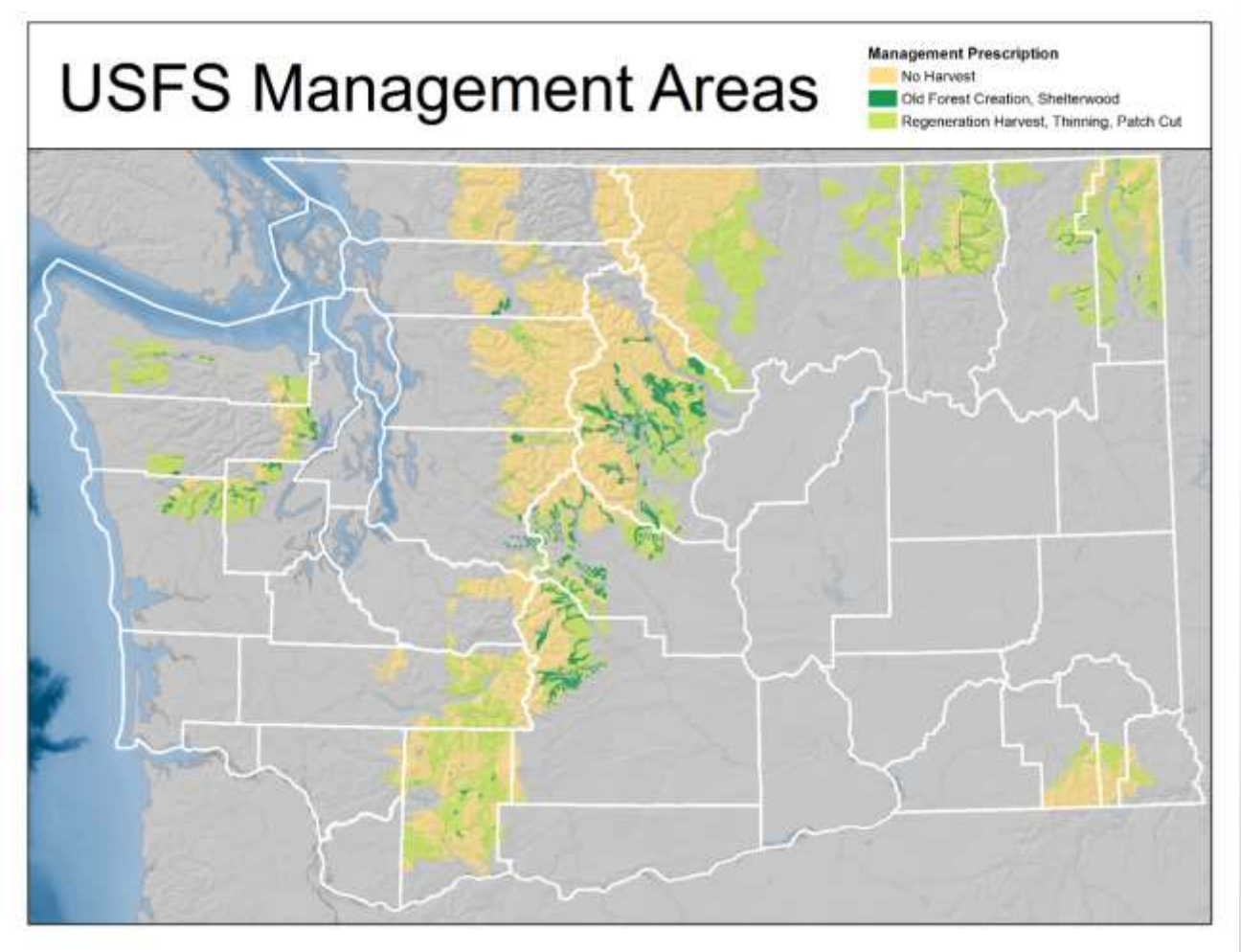
Standing Inventory



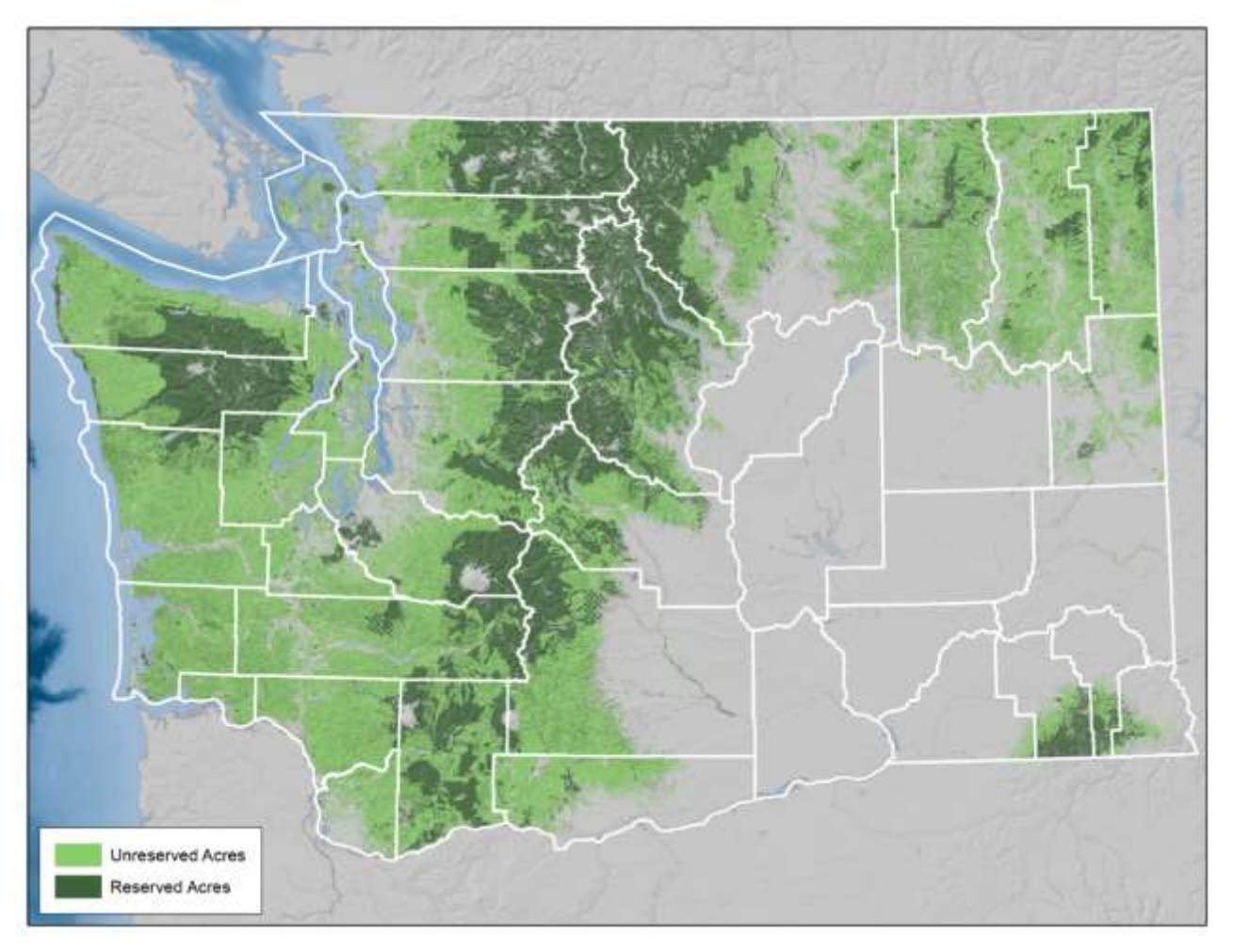
Roads


DNR Transportation
ESRI Streetmap North America 2010
DNR Transportation
ESRI Streetmap North America 2010

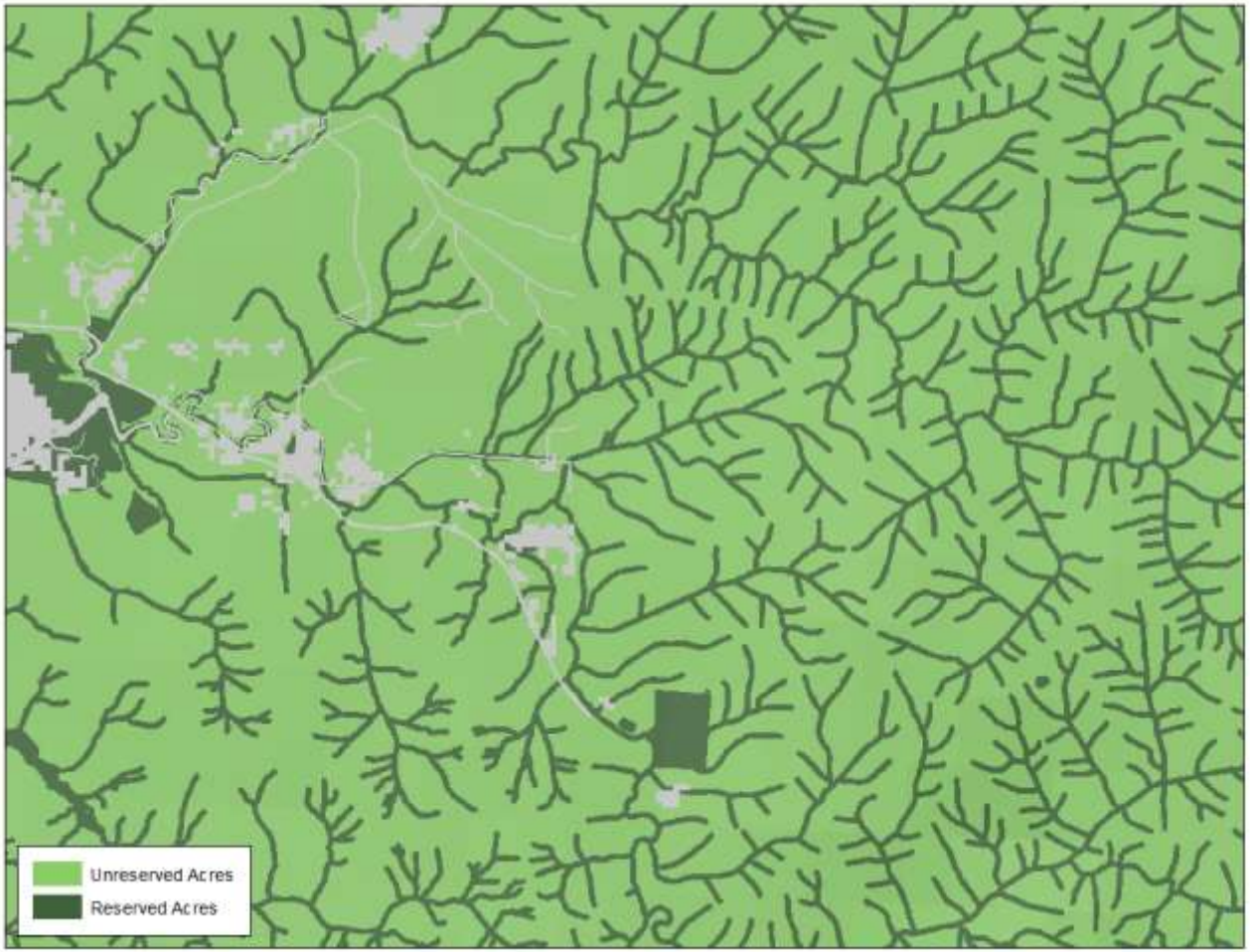
USFS Management Areas



Reserved Acres



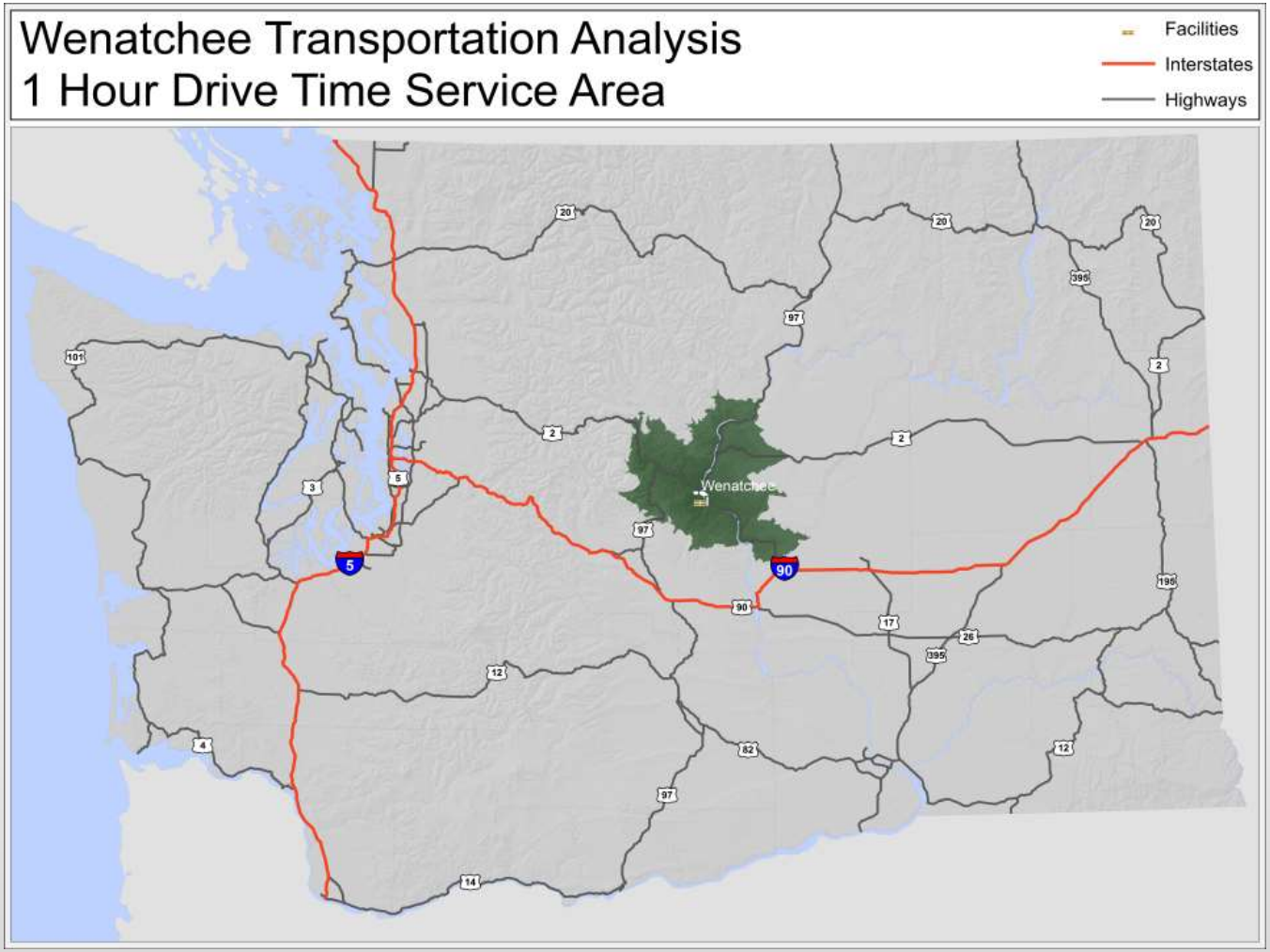
Site-Specific Detail…



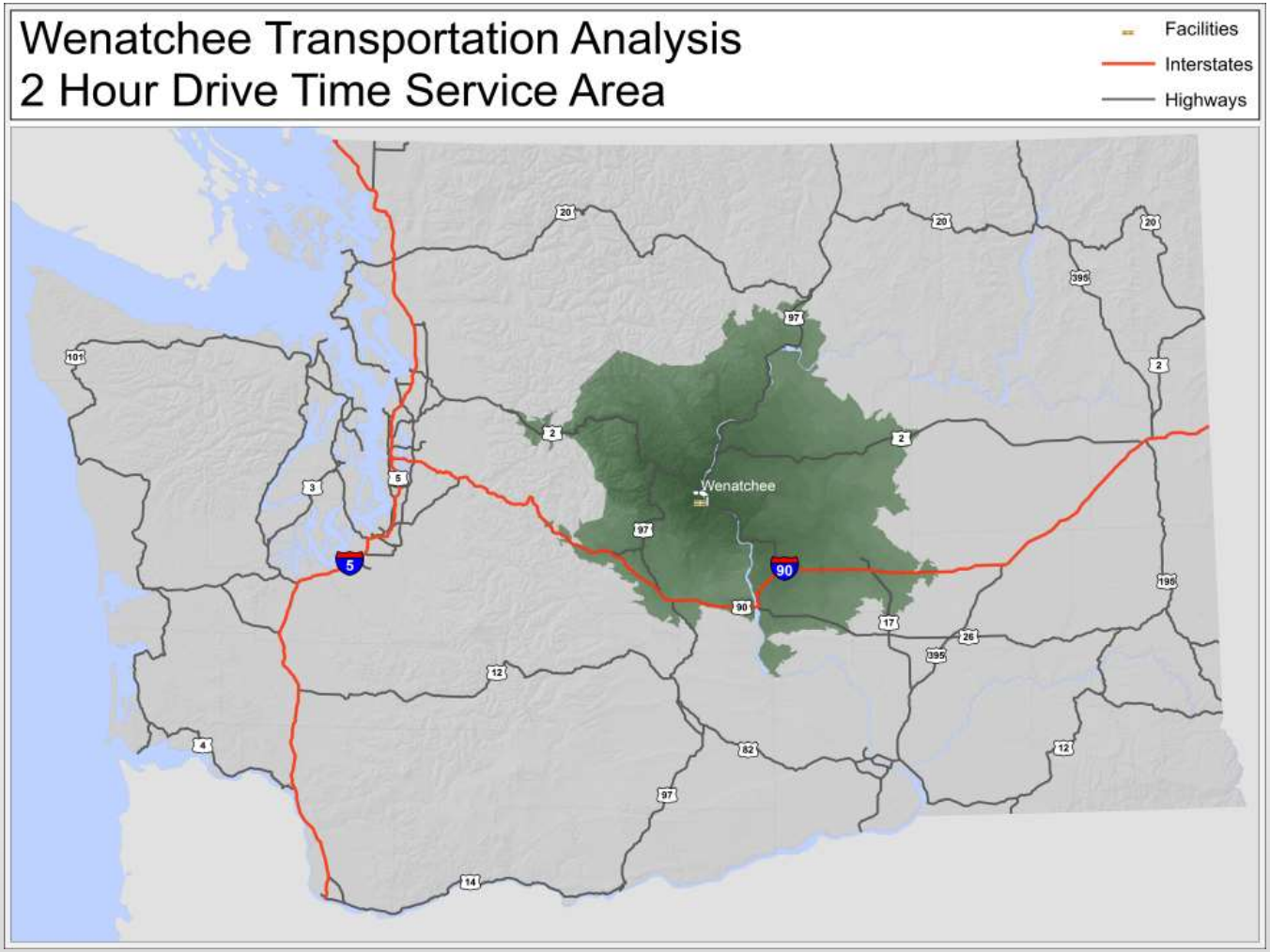
Facilities

- 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

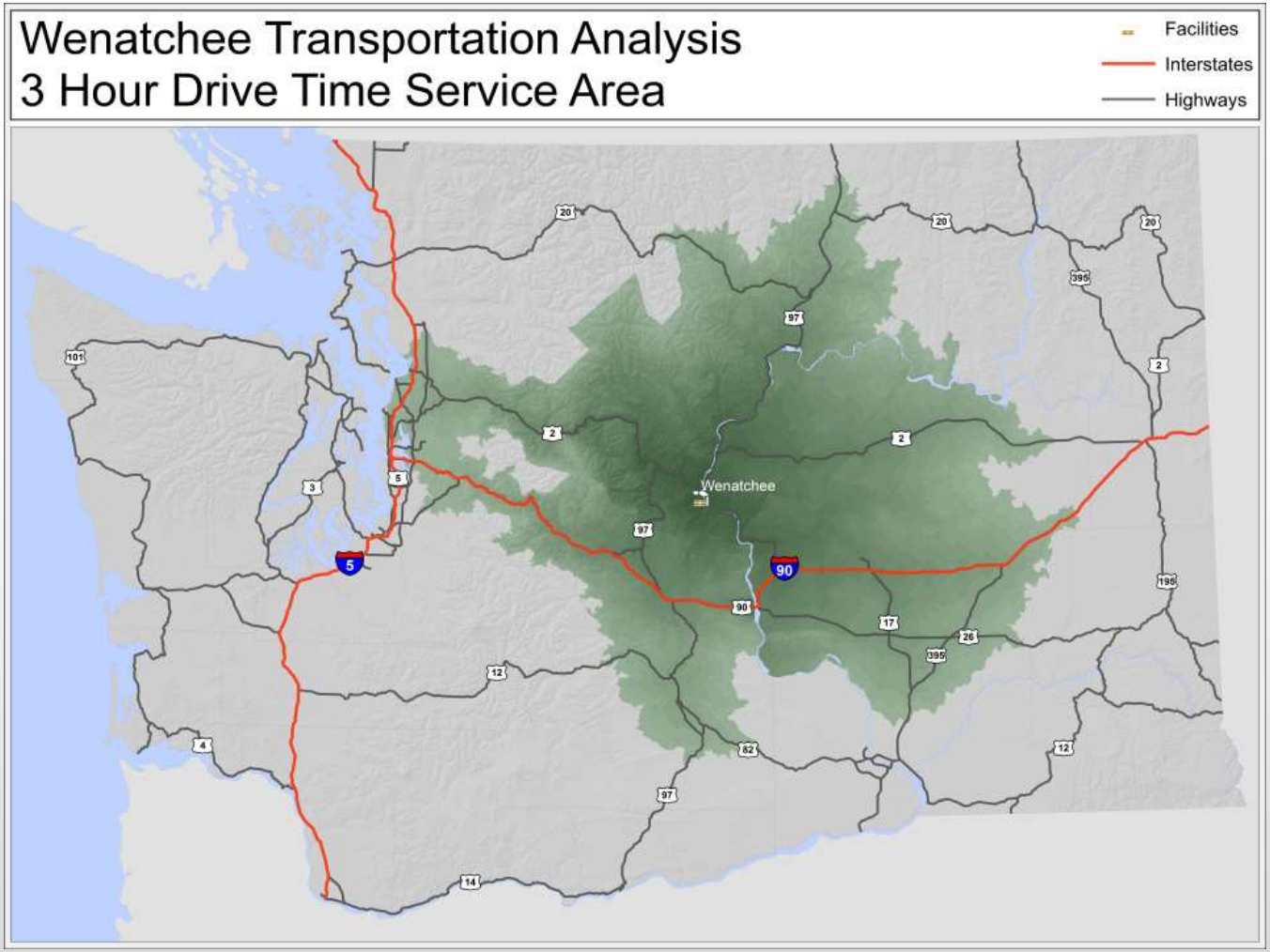
Transportation Modeling



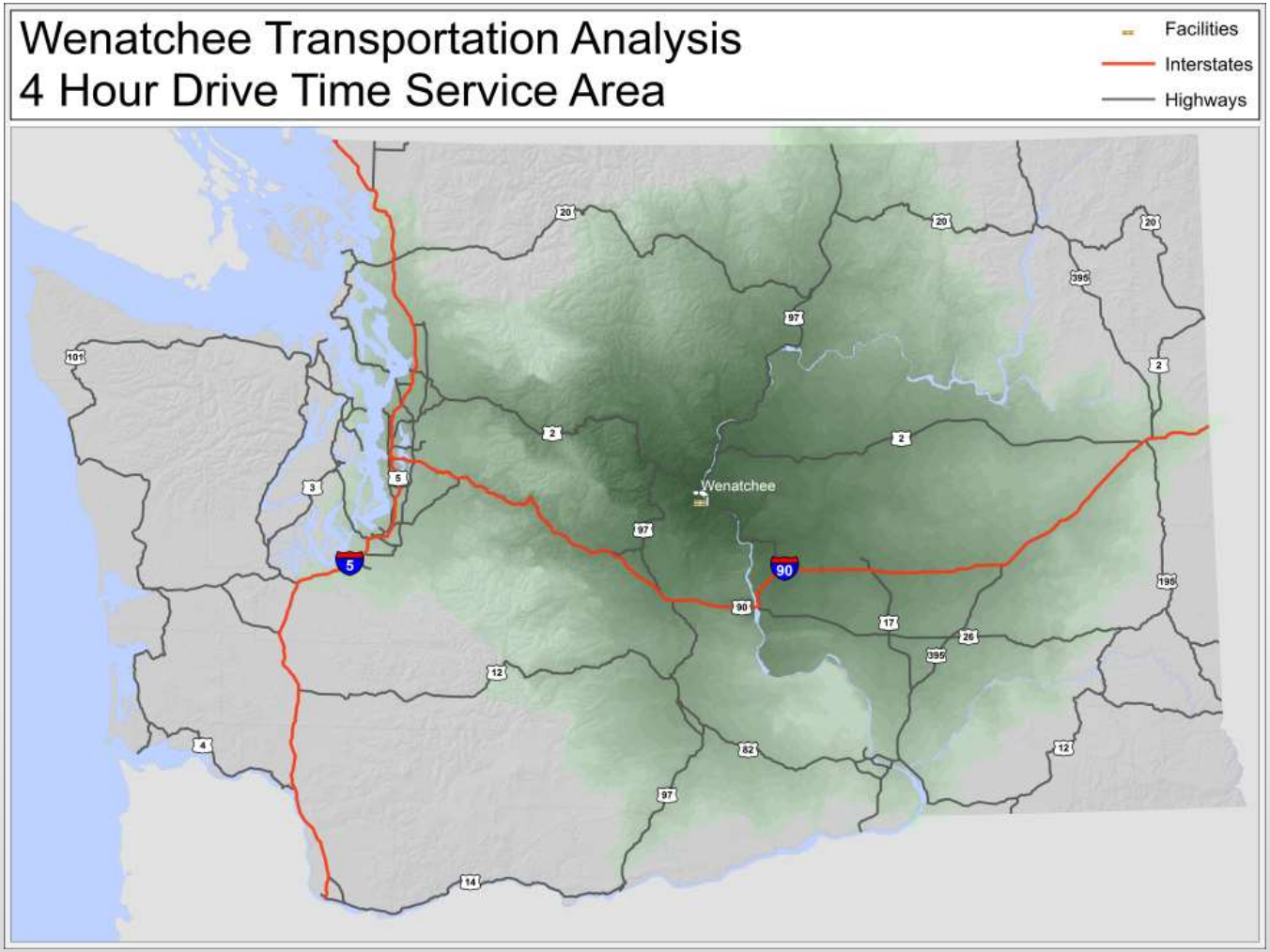
Transportation Modeling



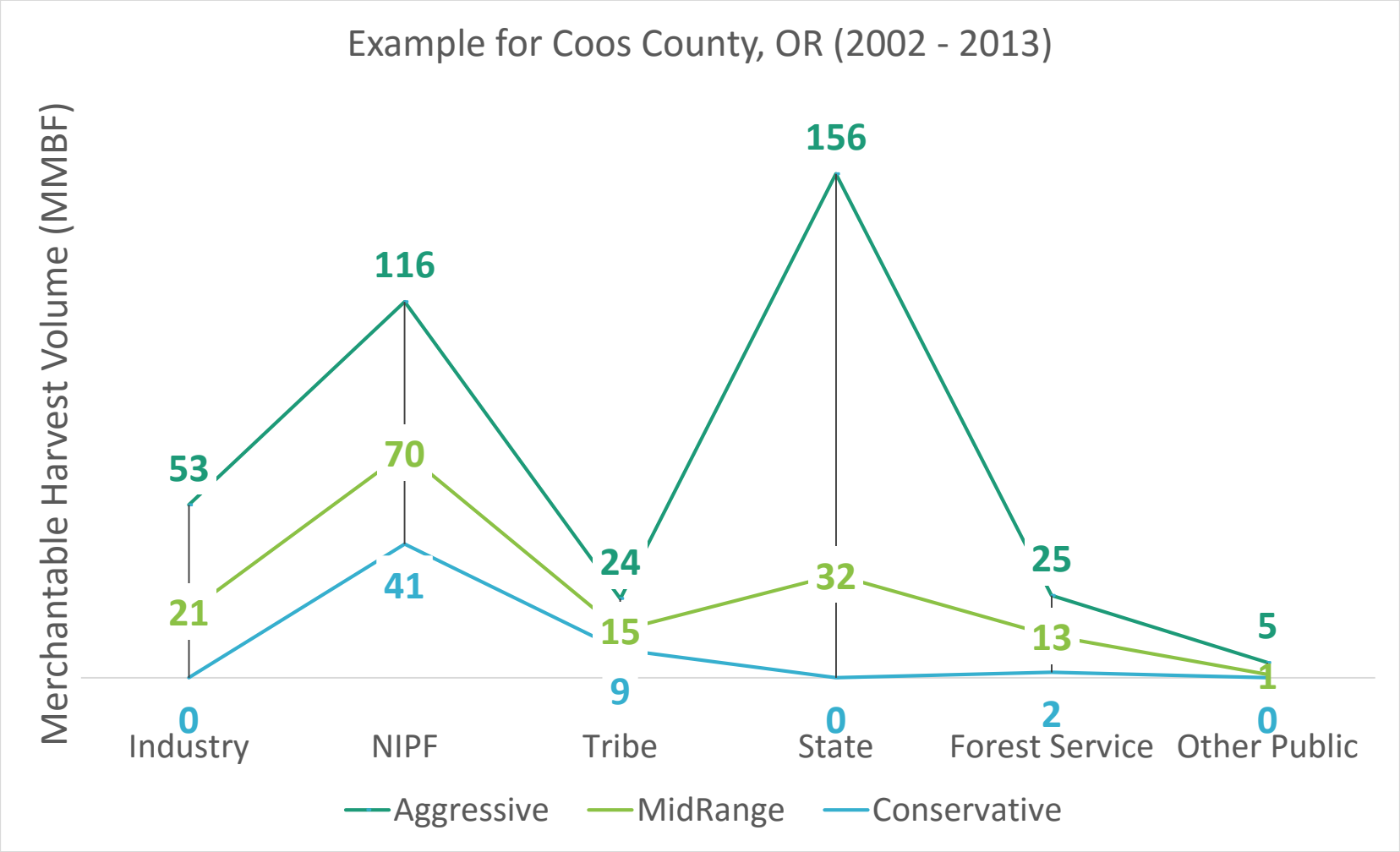
Transportation Modeling



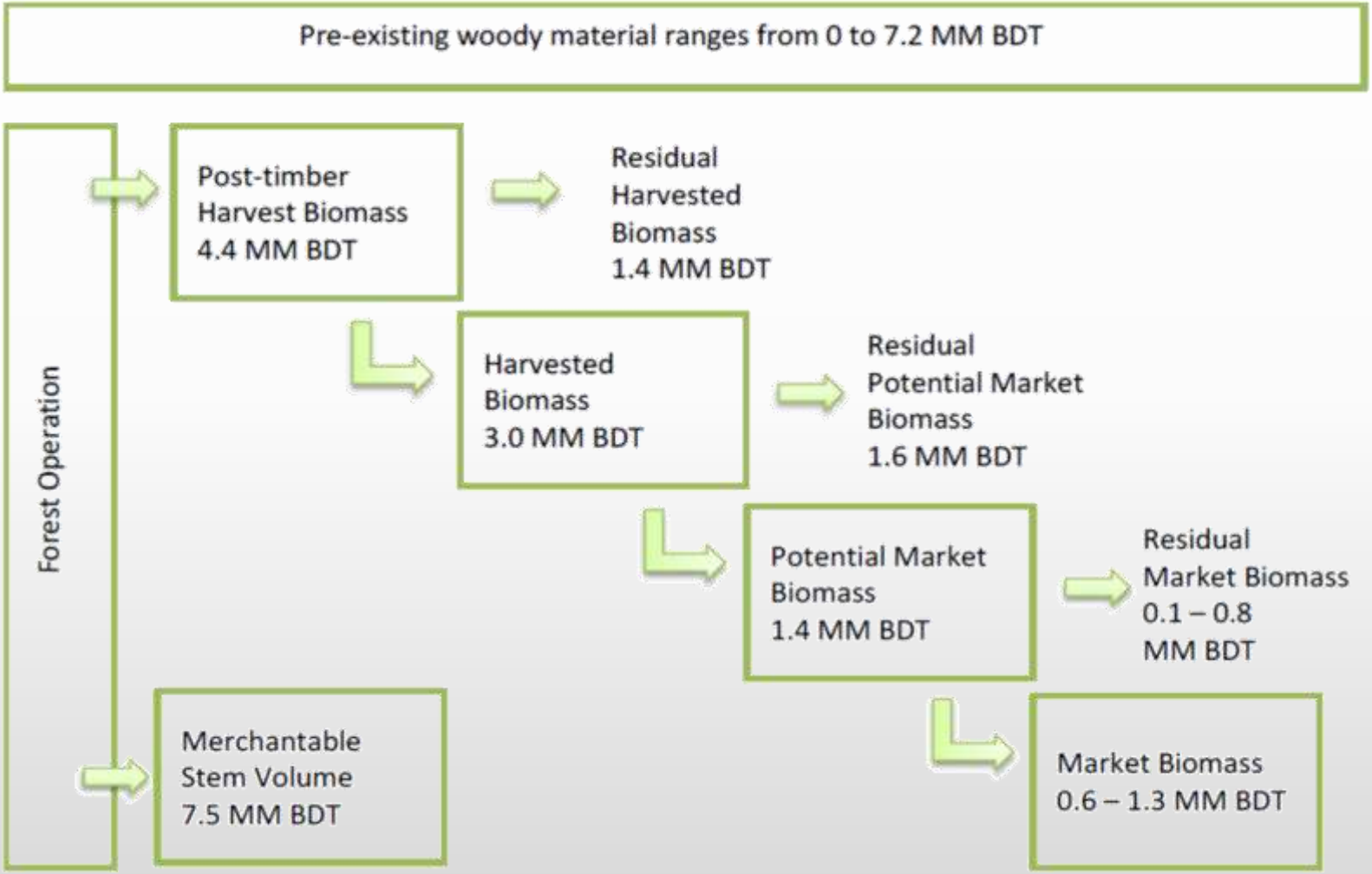
Transportation Modeling



Harvest Model



Biomass Harvest Model



Biomass Outputs

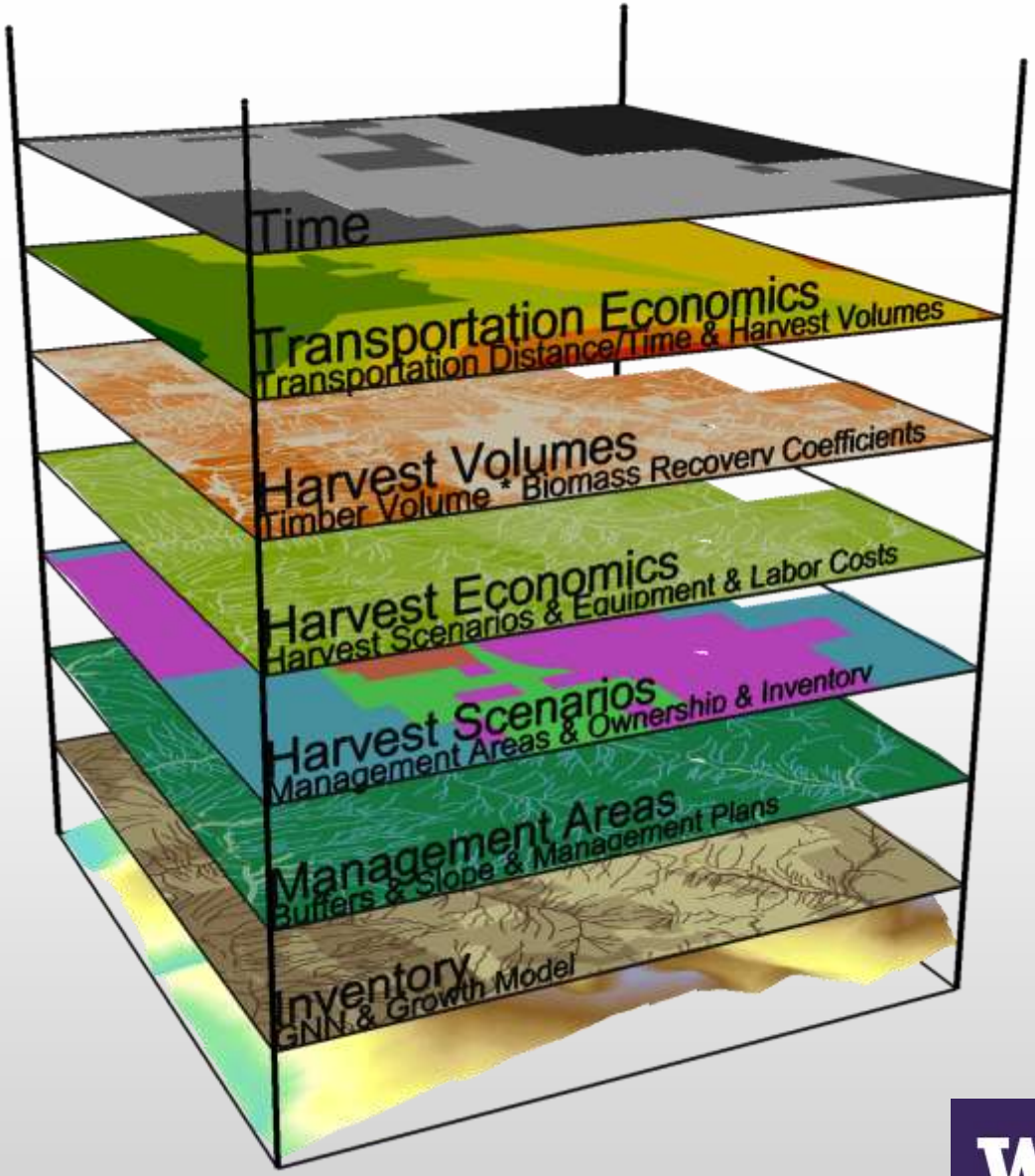
- ***Scattered biomass:*** volume that was left scattered in the woods as a product of having been broken off or tops and limbs cut when commercial logs were yarded to the landing
- ***Roadside biomass:*** portion that did not get loaded due to economics, operability constraints, other factors such as 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


Time
Transportation Economics
Transportation Distance/Time & Harvest Volumes
Harvest Volumes
Timber Volume * Biomass Recovery Coefficients
Harvest Economics
Harvest Scenarios & Equipment & Labor Costs
Harvest Scenarios
Management Areas & Ownership & Inventory
Management Areas
Buffers & Slope & Management Plans
Inventory
GNN & Growth Model

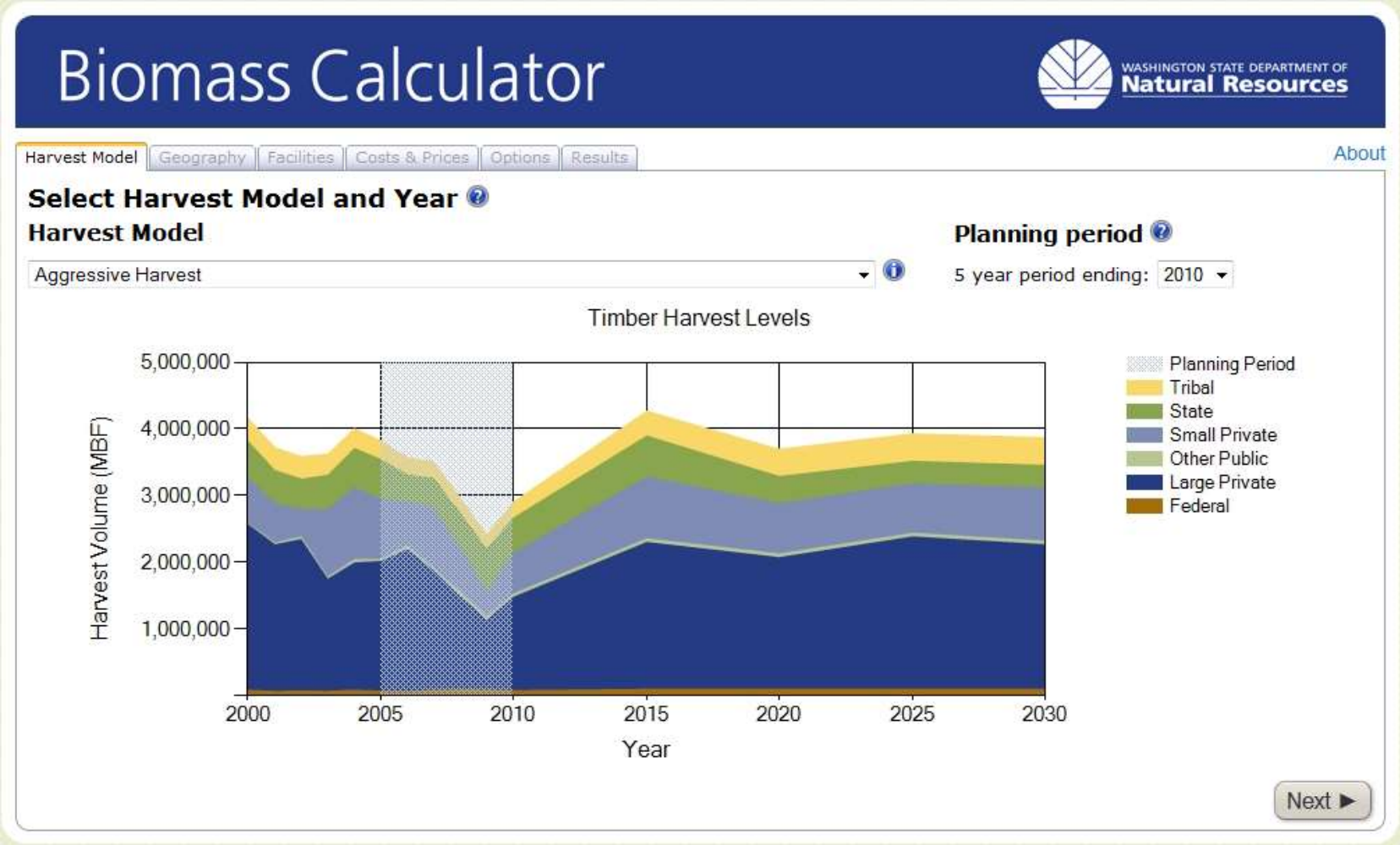
SQL Harvest & Biomass Functions

- 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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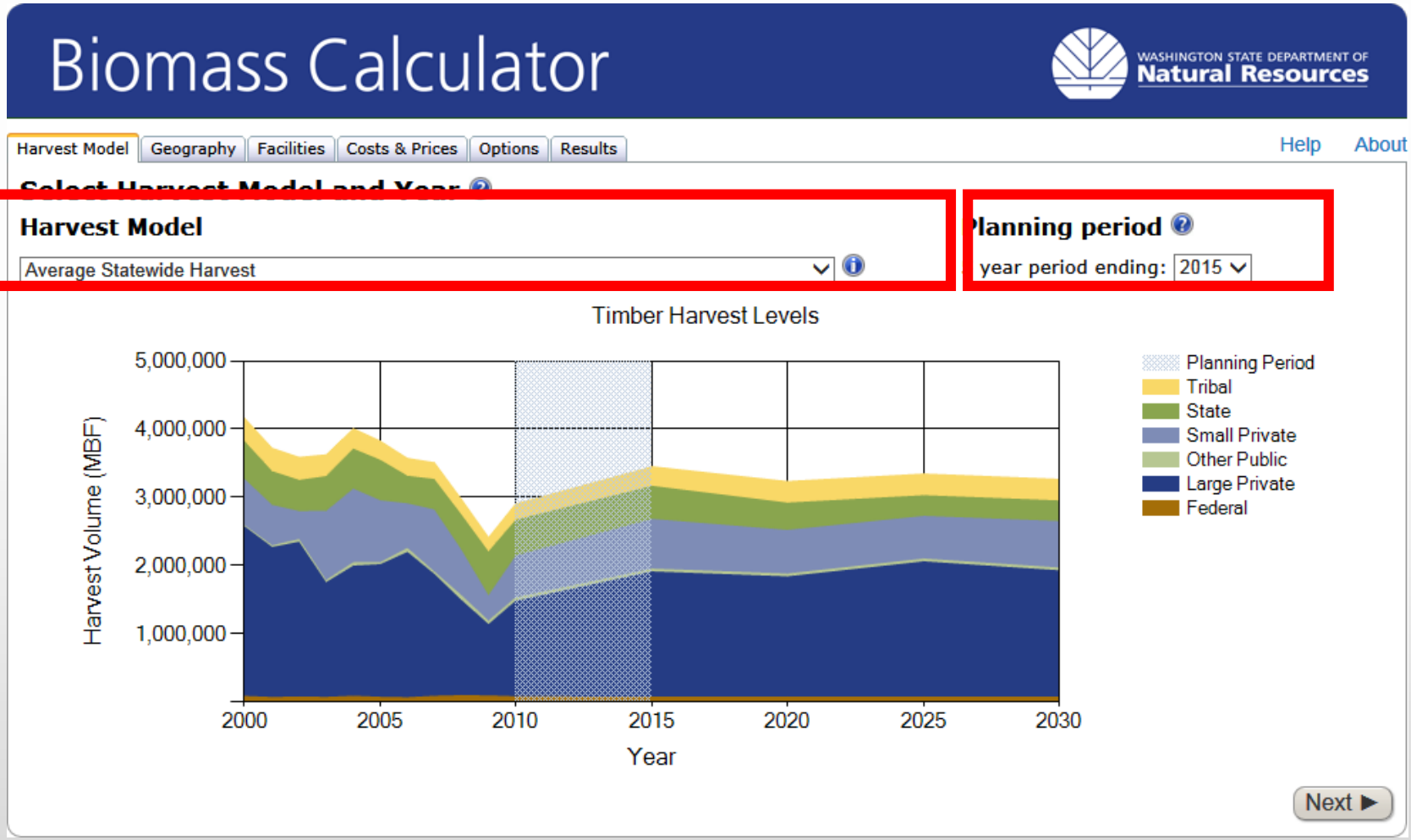
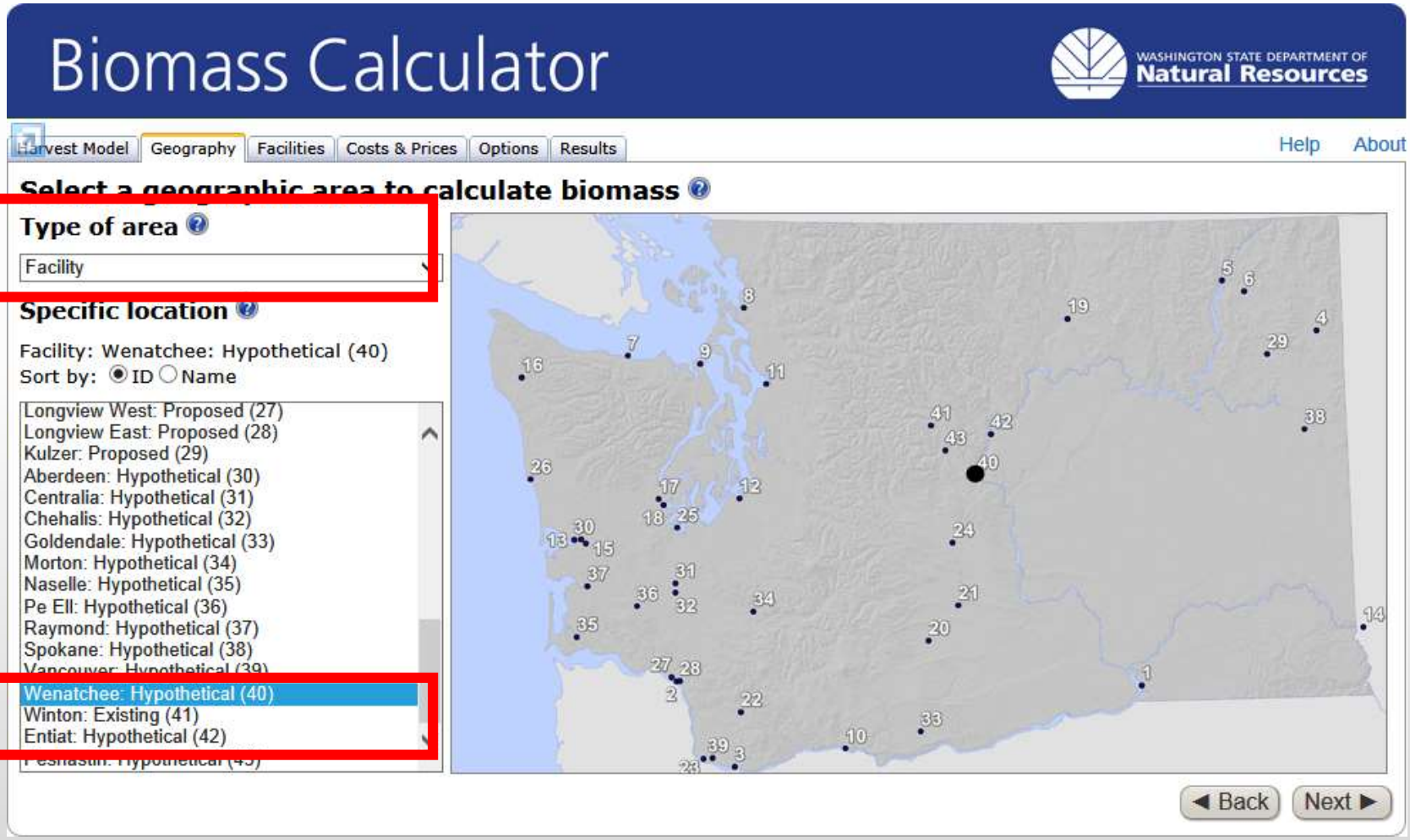
Use Case 1: Facility Fuelshed

- 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.

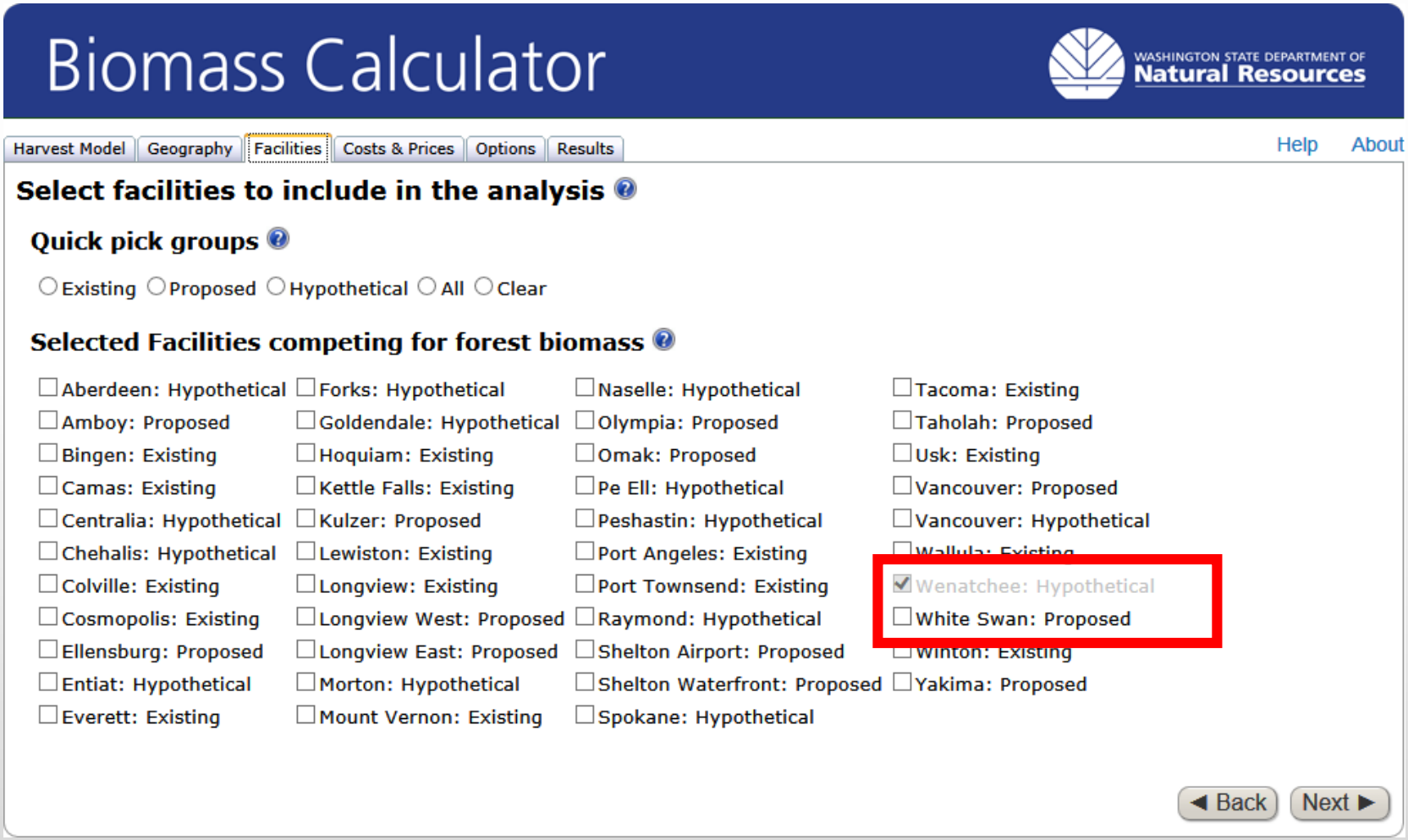
Use Case 1: Harvest Model Tab



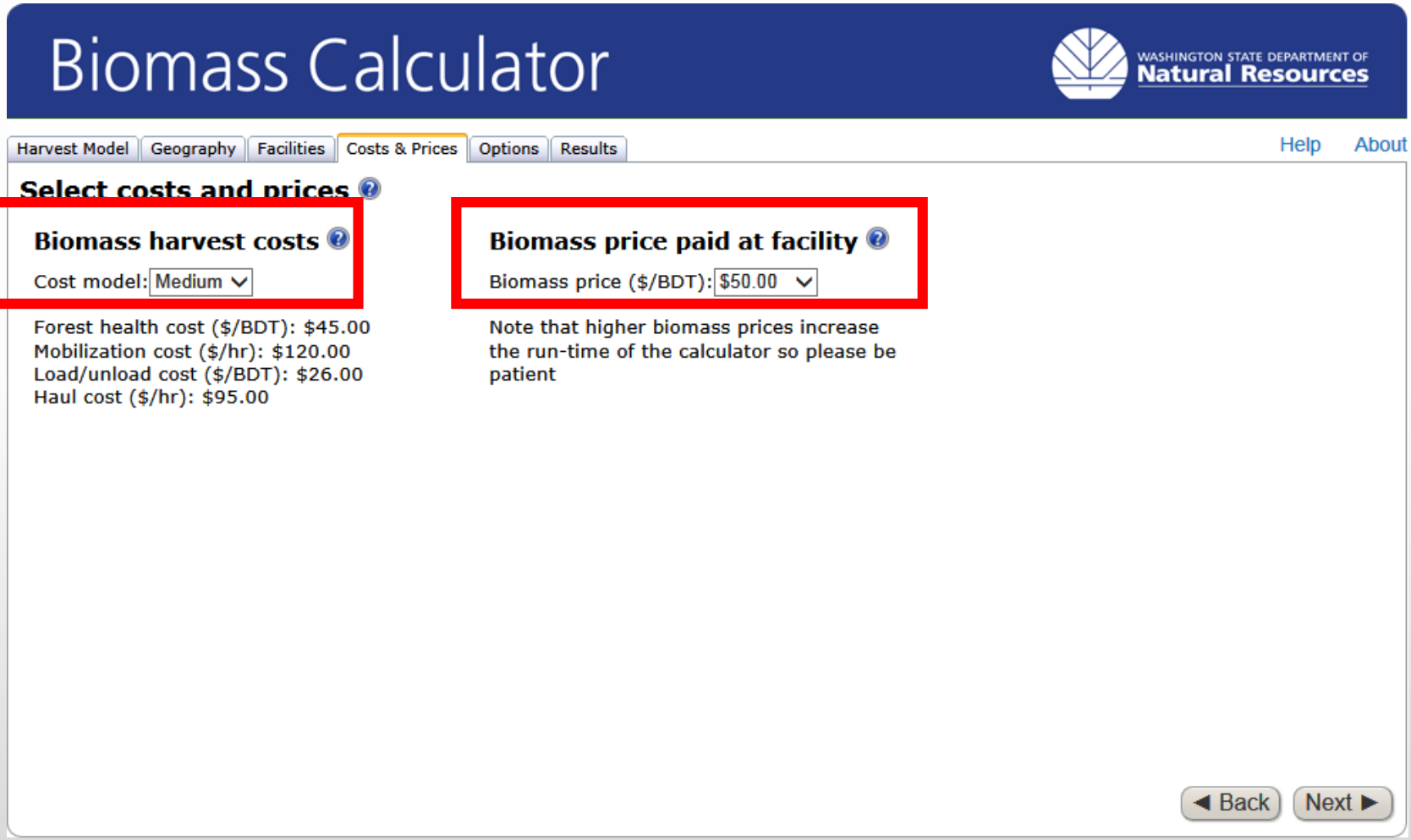
Use Case 1: Geography Tab



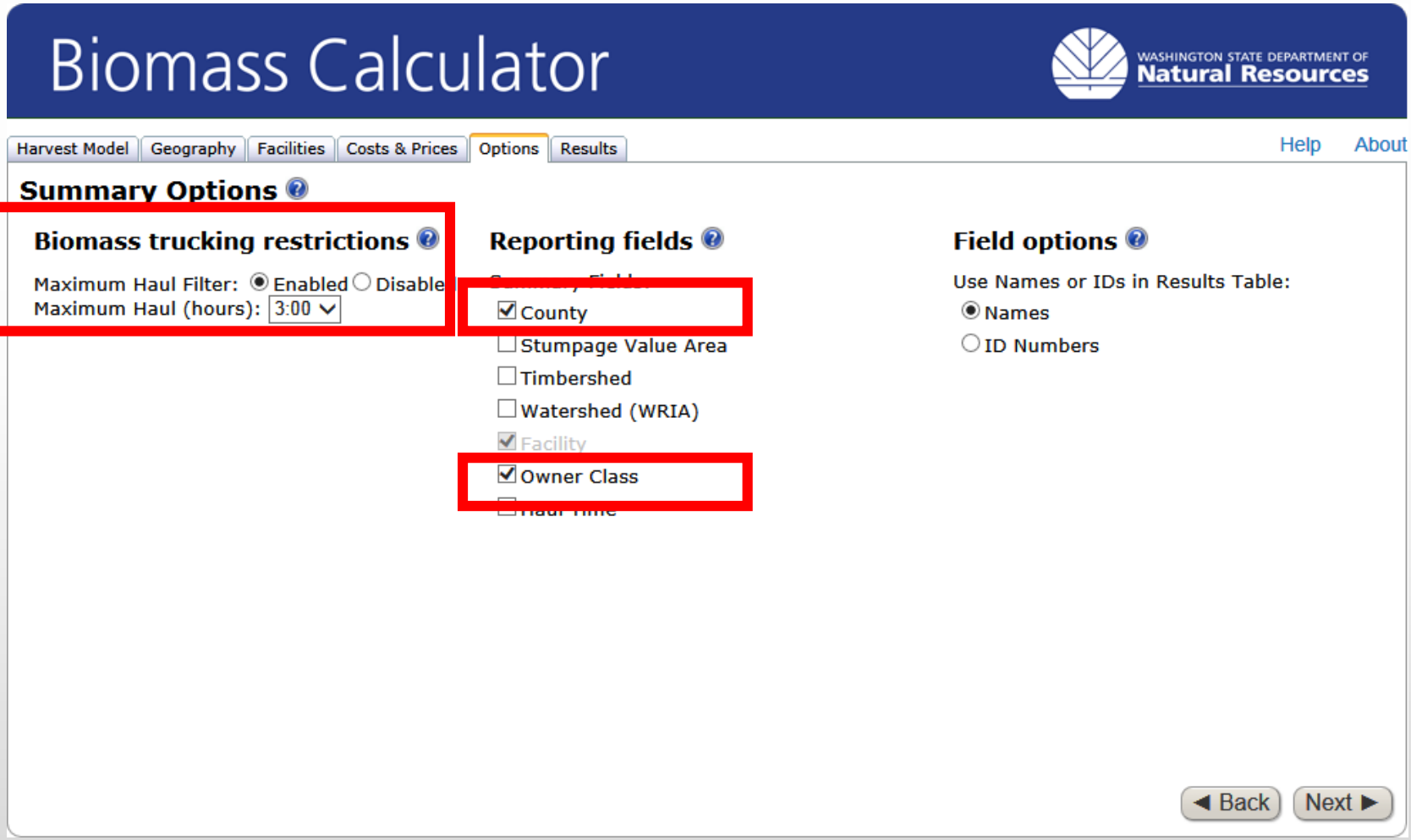
Use Case 1: Facilities Tab



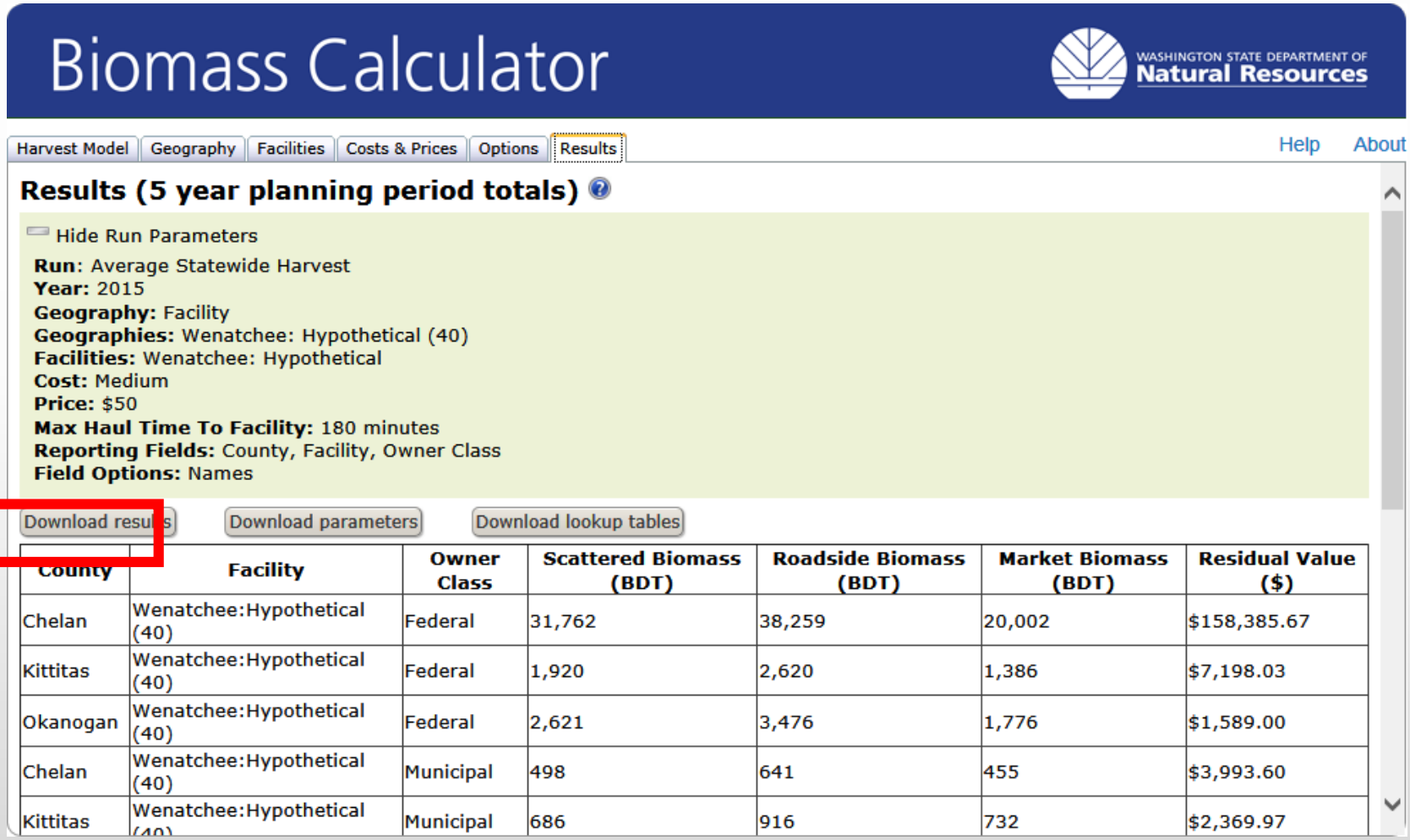
Use Case 1: Costs & Prices Tab



Use Case 1: Options Tab



Use Case 1: Results Tab

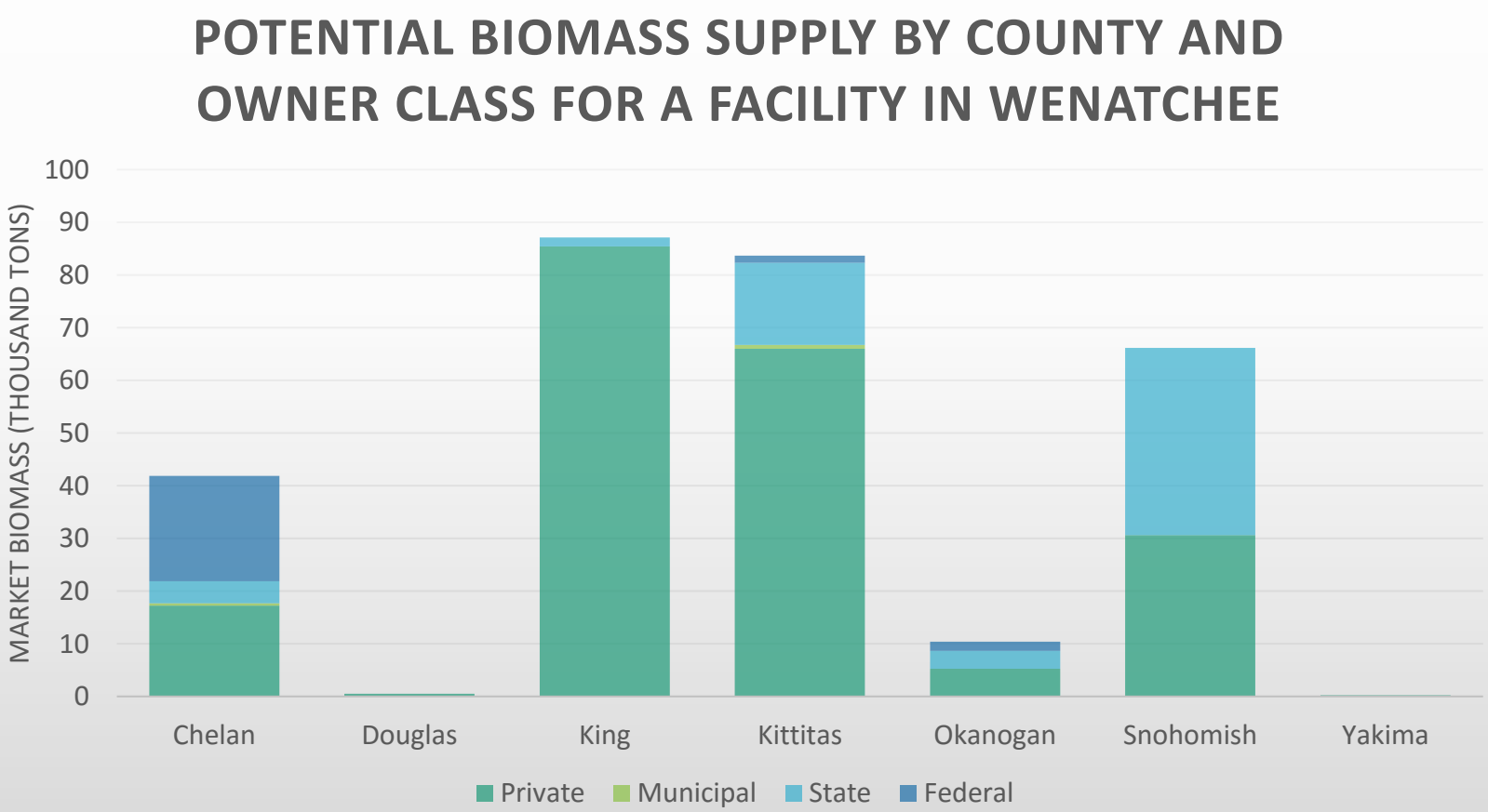


County	Facility	Owner Class	Scattered Biomass (BDT)	Roadside Biomass (BDT)	Market Biomass (BDT)	Residual Value ($)
Chelan	Wenatchee:Hypothetical (40)	Federal	31,762	38,259	20,002	$158,385.67
Kittitas	Wenatchee:Hypothetical (40)	Federal	1,920	2,620	1,386	$7,198.03
Okanogan	Wenatchee:Hypothetical (40)	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

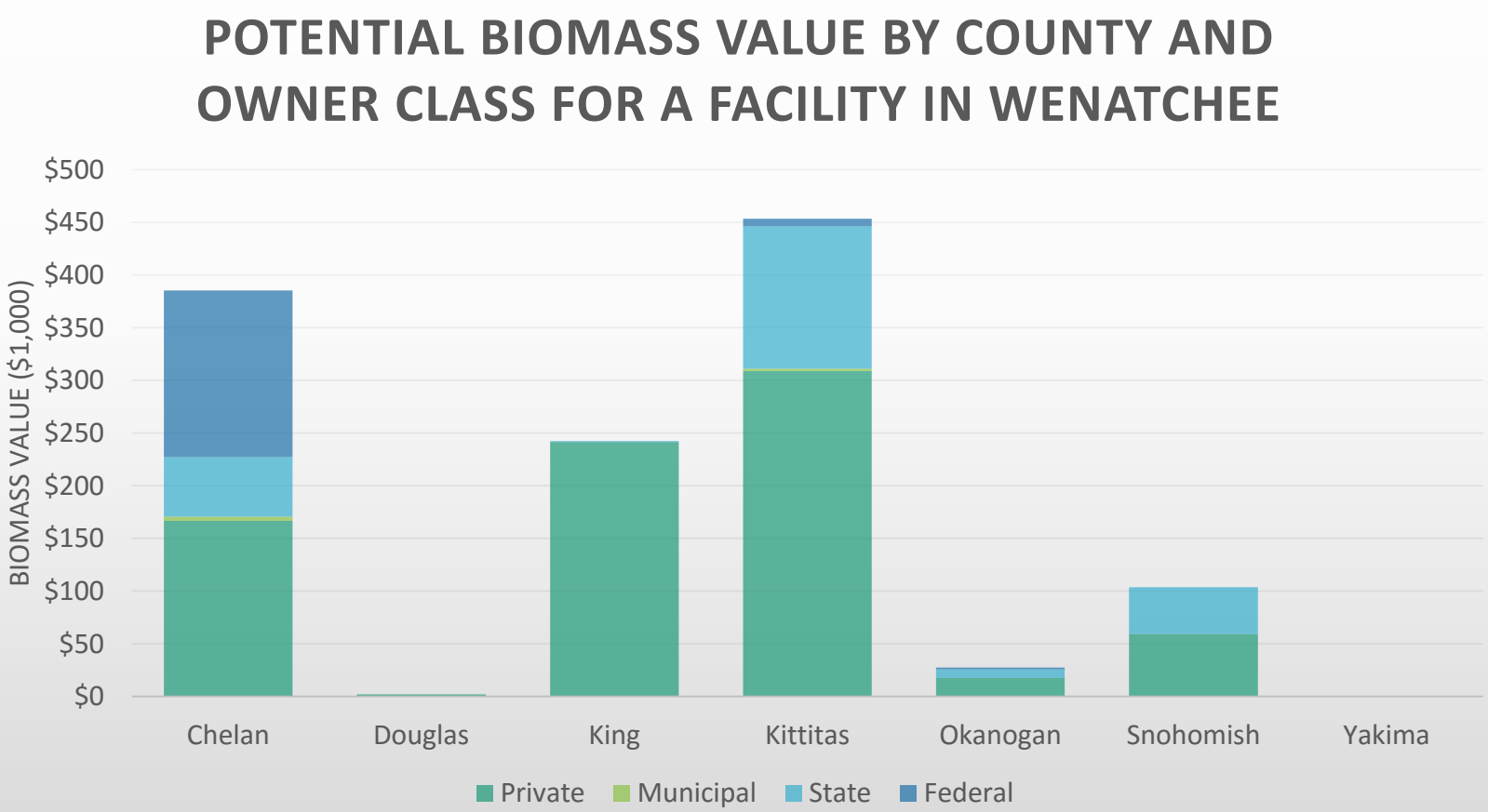
Use Case 1: Analyzing Results

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**

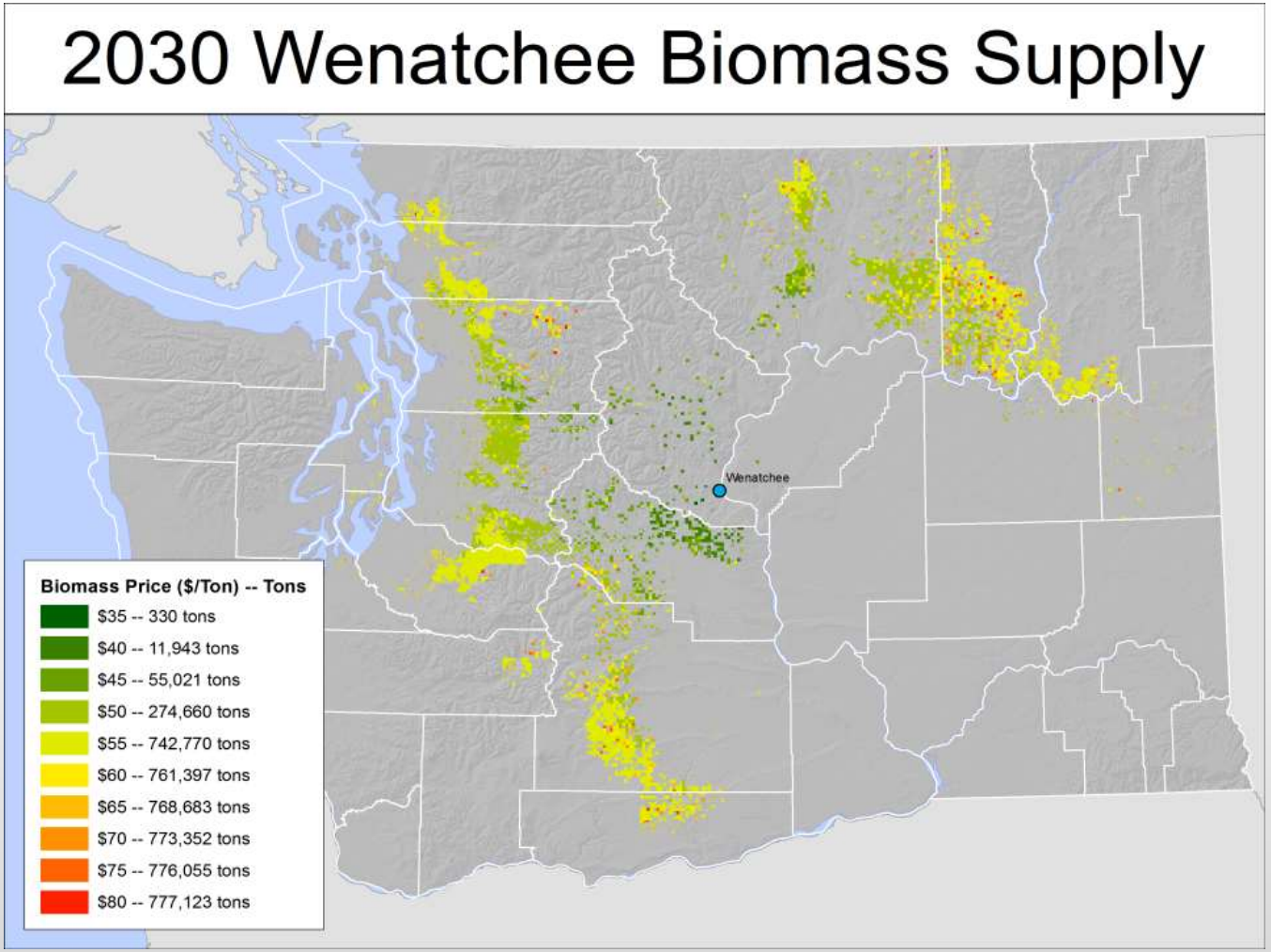
Use Case 1: Analyzing Results



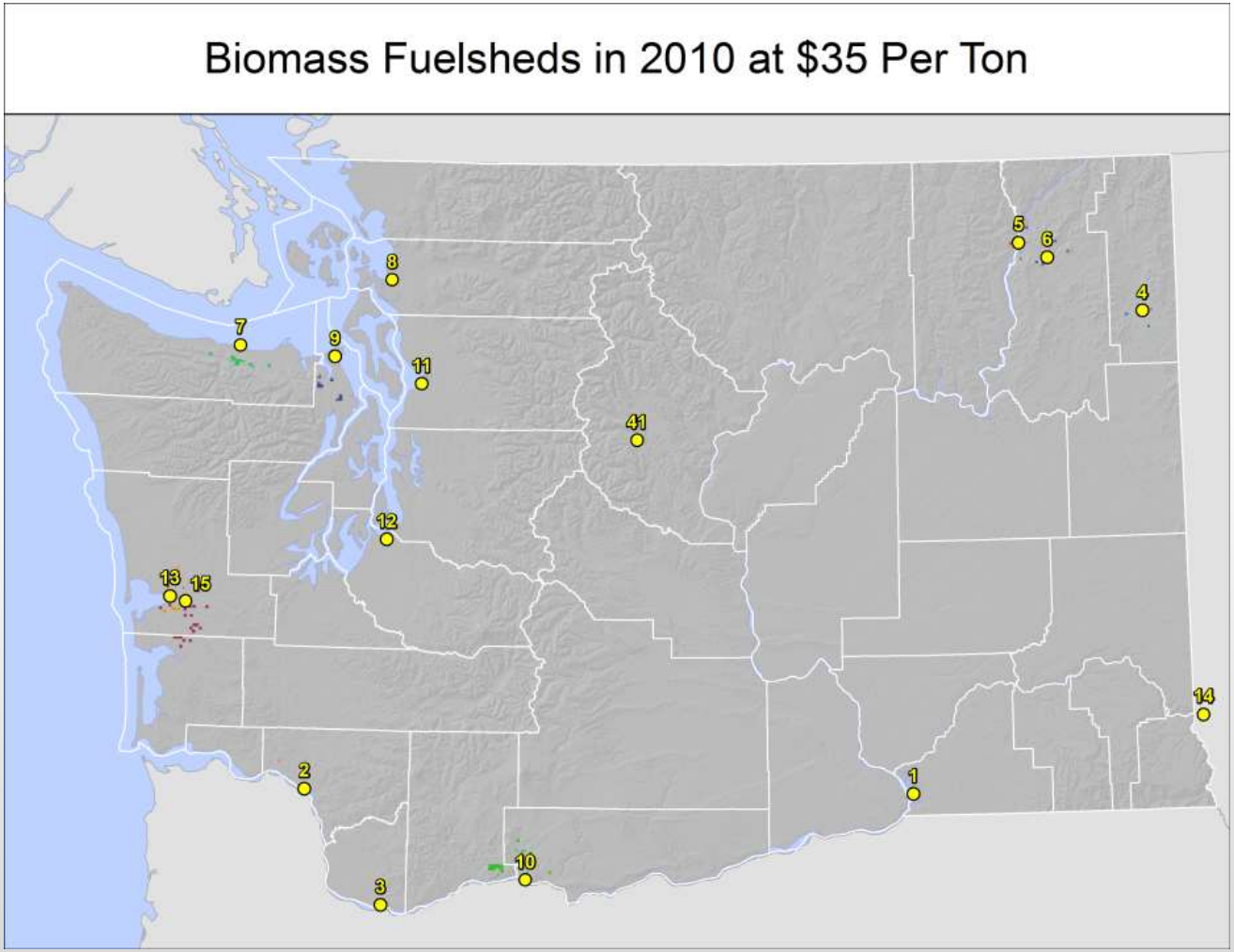
Use Case 1: Analyzing Results



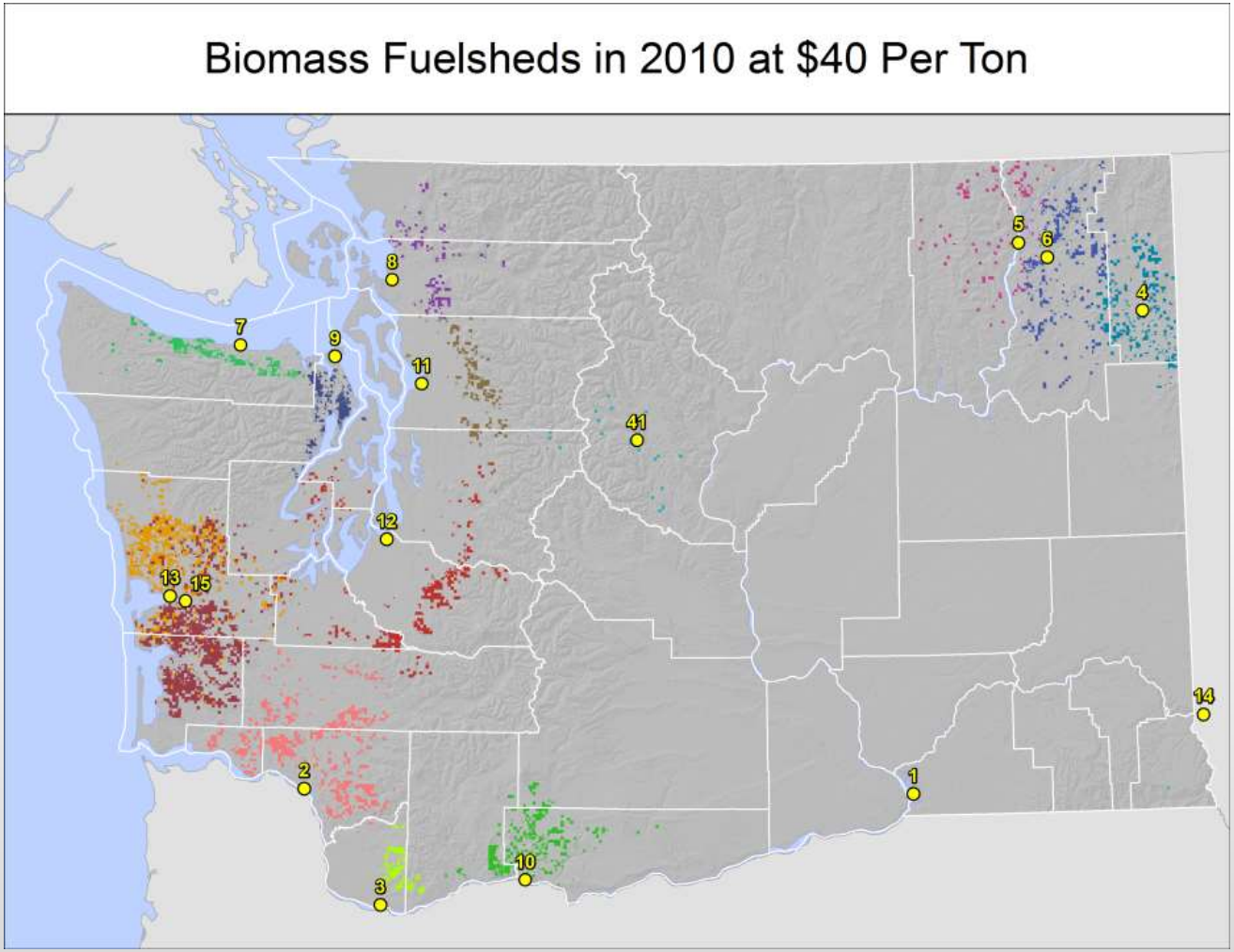
2030 Wenatchee Biomass Supply



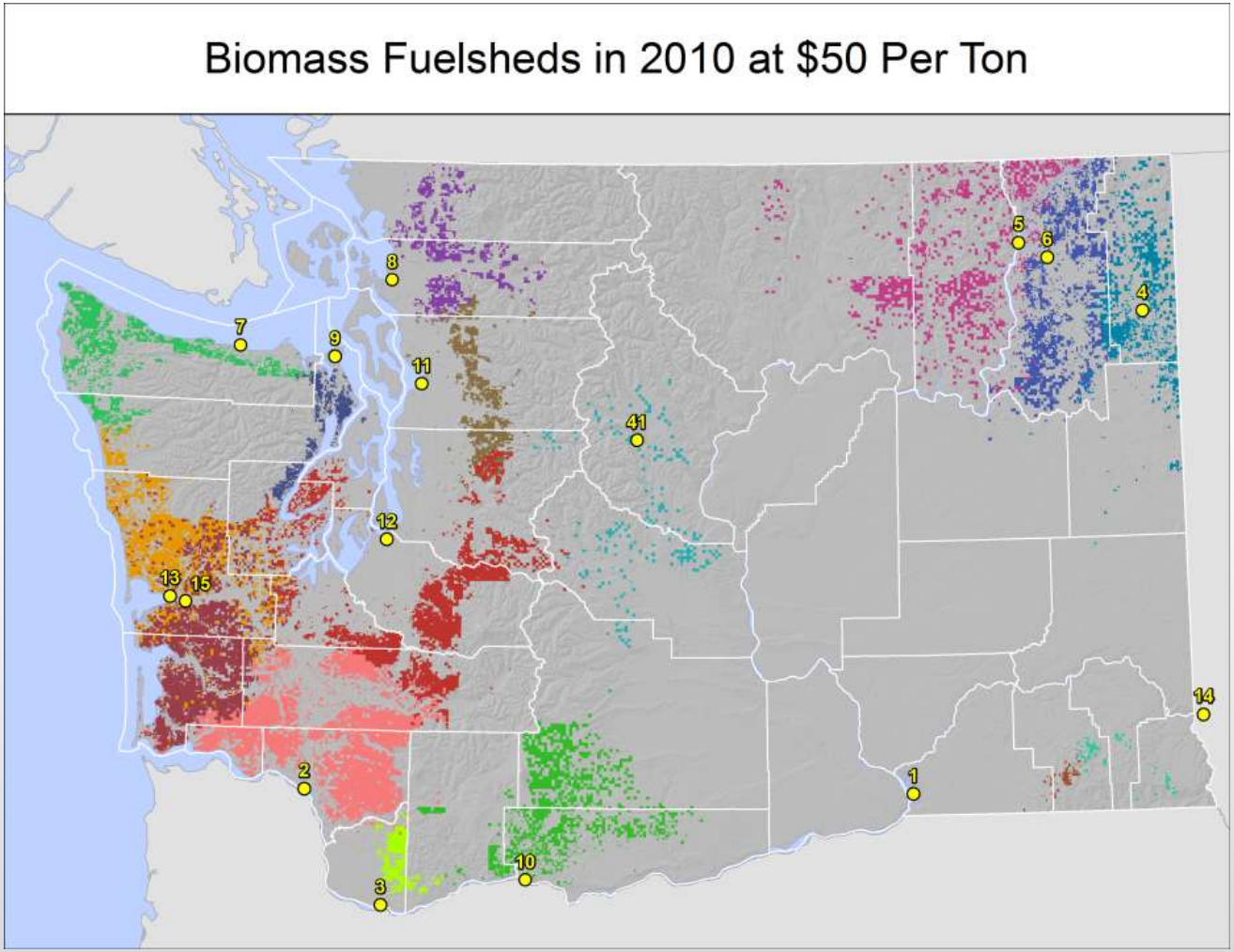
Biomass Fuelsheds



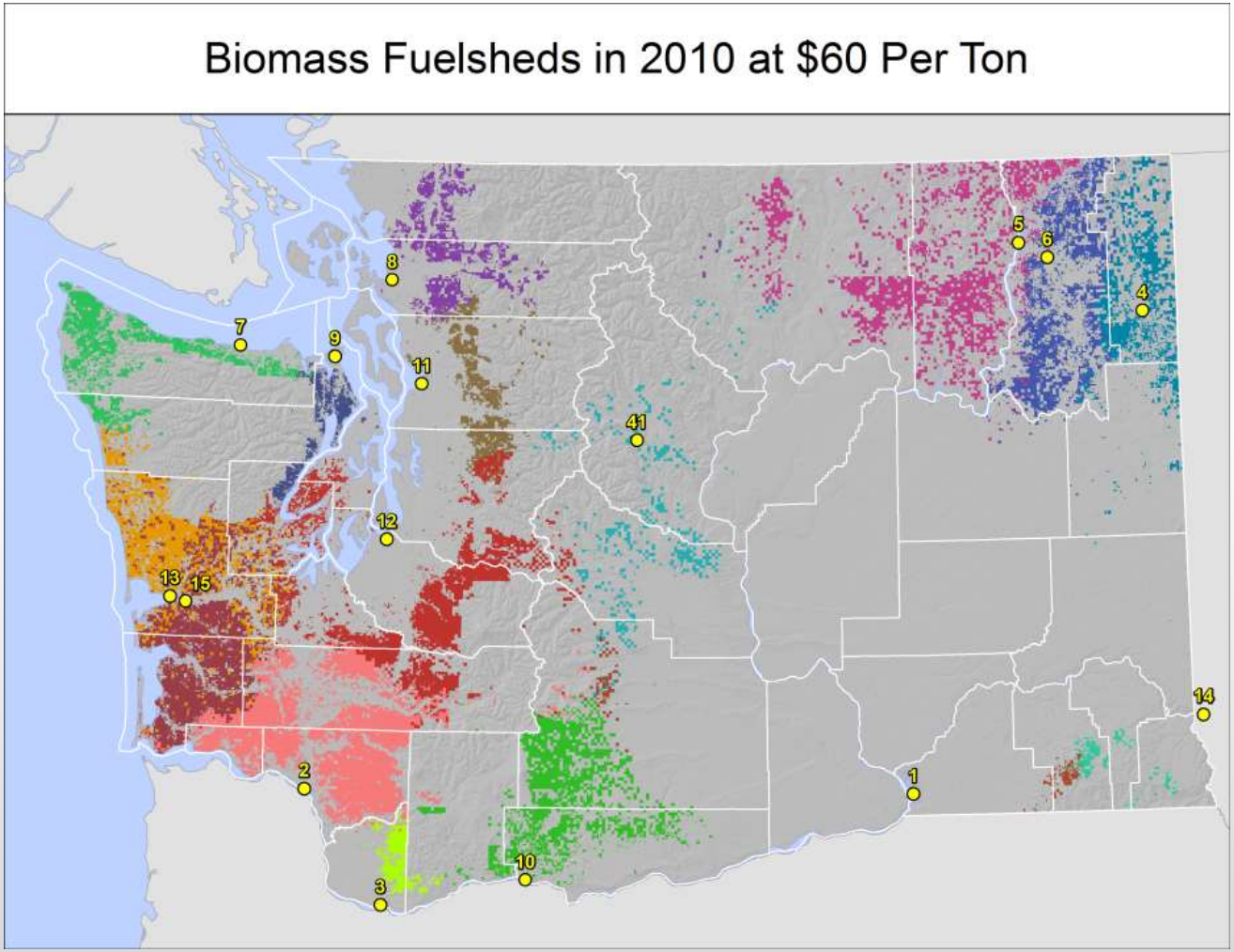
Biomass Fuelsheds



Biomass Fuelsheds



Biomass Fuelsheds



Biomass Fuelsheds