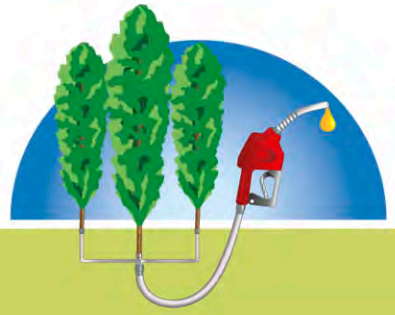


hardwoodbiofuels.org

Advanced **Hardwood Biofuels** Northwest

Supply Costs and Their Impact on Biorefinery Siting and Sizing

Nathan Parker


Feedstock


Conversion


Sustainability


Education

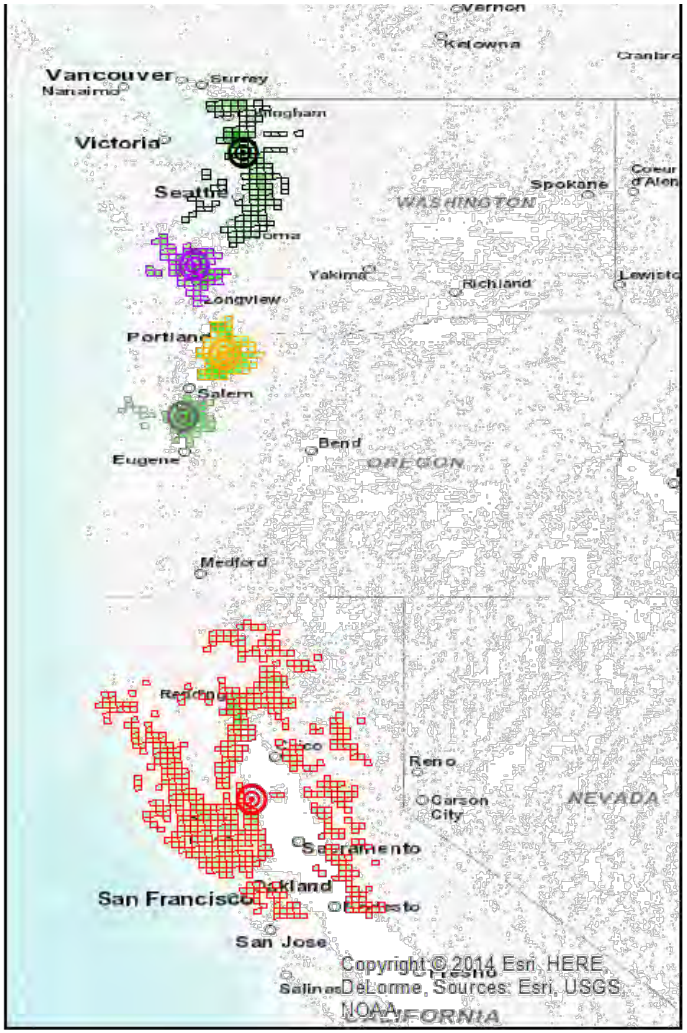

Extension

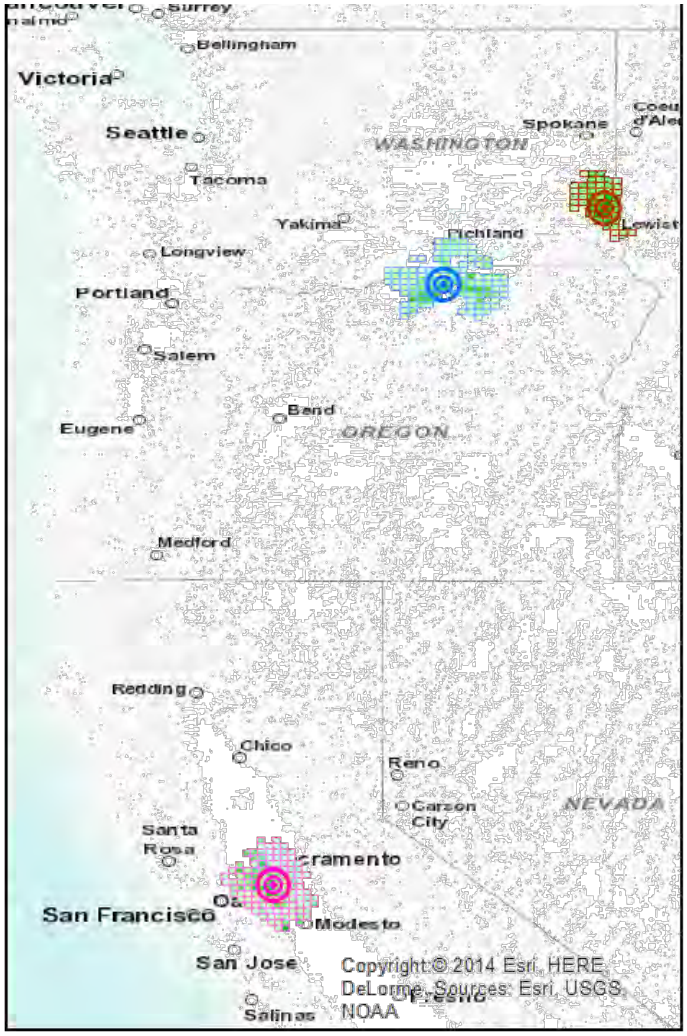
USDA United States Department of Agriculture

National Institute of Food and Agriculture

Rangelands only

Croplands only





250,000 tons/yr biorefineries

Location and feedstock sheds for biorefineries

Miles
0 40 80 160 240 320
0 85 170 340 510 680
Kilometers

N W E S

7,475 19,315 36,445 56,493 91,945

Annual Poplar Production (tons)

United States Department of Agriculture
National Institute of Food and Agriculture

Elements in the Supply Chain

Assessing economic and environmental sustainability of the hybrid poplar based biofuel systems in PNW region.

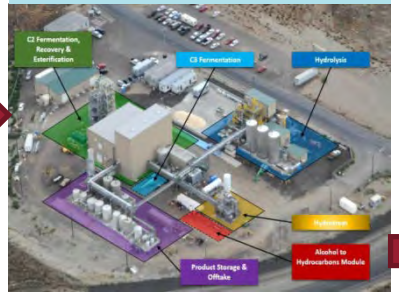
Feedstock Production

- Suitable lands and their feedstock potential.
- Competition with other crops.
- Ecological responses.

Feedstock Logistics

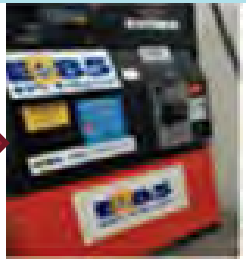
- Biomass and transportation costs.
- Biomass harvesting trends.
- Preprocessing and storage trends.
- Environmental impacts.

Biofuel Production



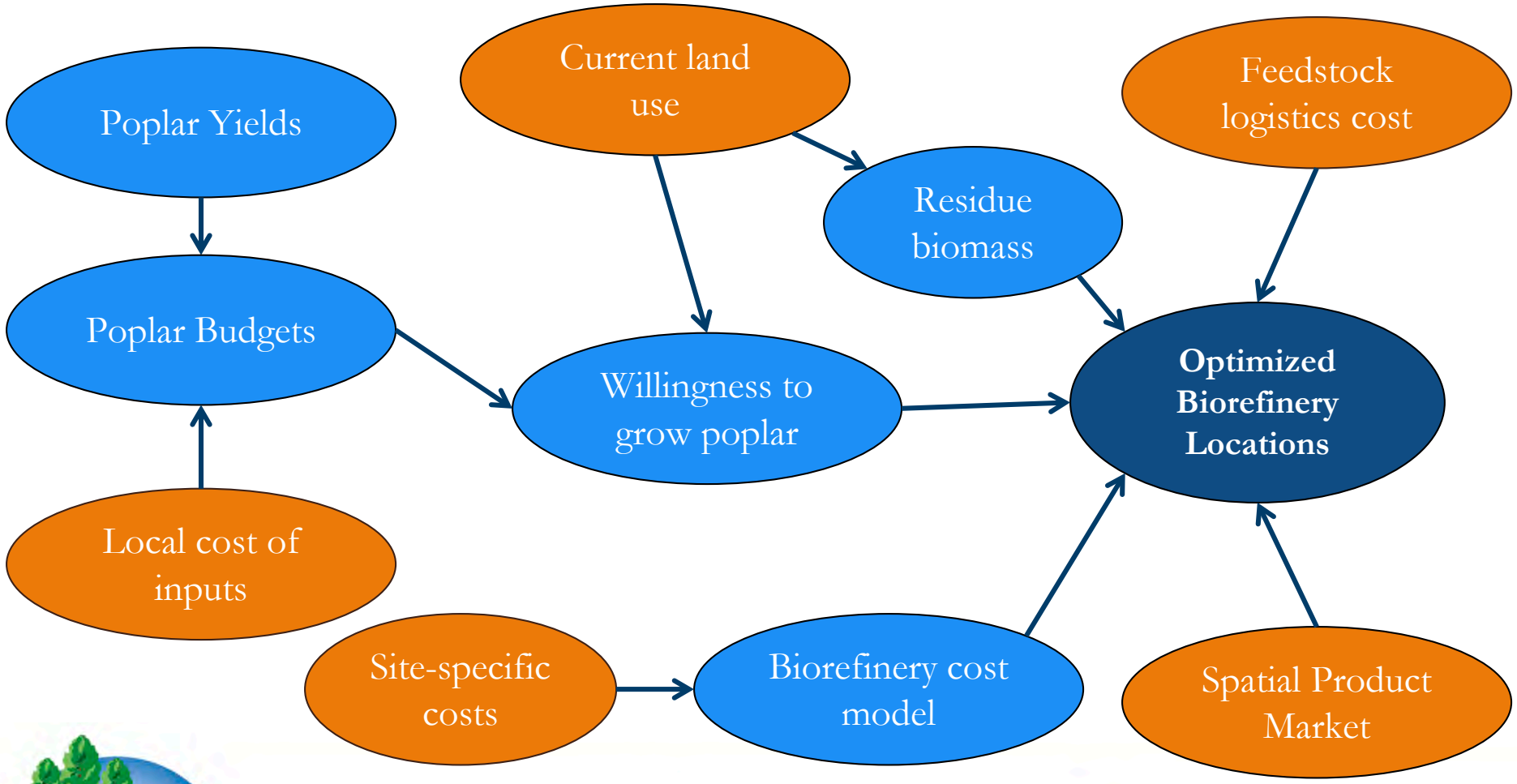
- Land &infrastructure needs.
- Operation costs.
- Technology differences.
- Environmental impacts

Biofuels Distribution



- Transportation
- Storage.
- Dispensing.

Framework for Biorefinery Siting

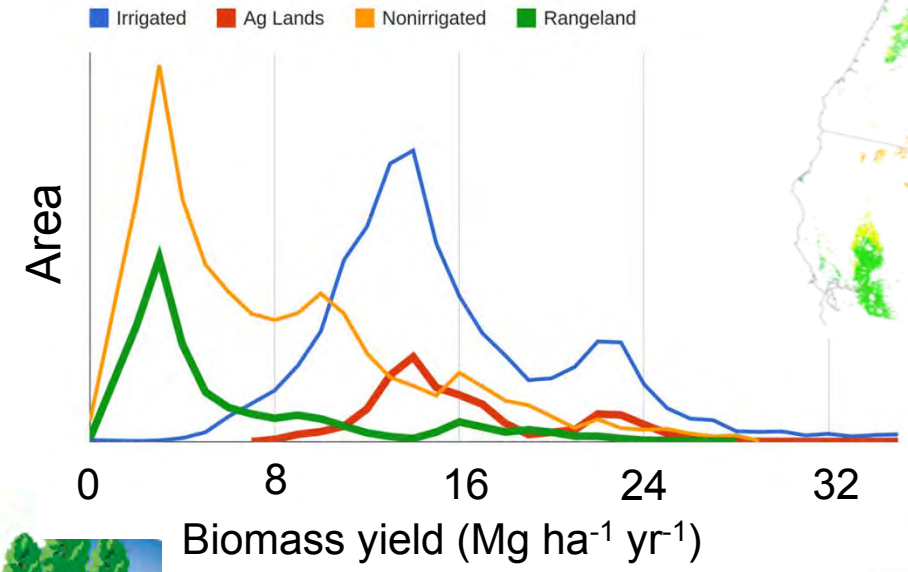


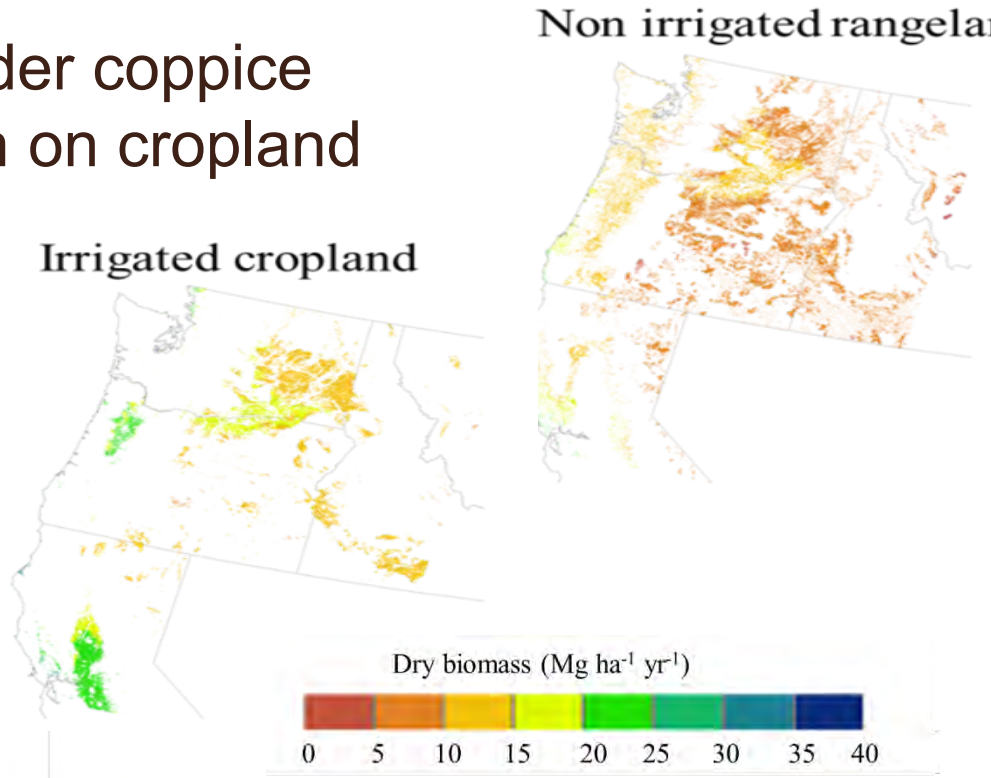
Siting biorefineries depends on…

- **Distribution of suitable land:** The distribution of lands capable of growing poplar limit where enough poplar can be grown to support a biorefinery
- **Distribution of hybrid poplar yields:** Higher yielding areas require less land and the cost of establishment/crop care are spread over a larger amount of biomass.
- **Competition for land:** The higher opportunity cost of displaced land uses the higher price biorefineries need to pay to induced poplar production.
- **Access to product markets:** The cost of transporting products to market lowers the potential price paid at the biorefinery
- **Size of the biorefinery:** Larger biorefineries require more biomass.
- **Localized cost:** Land values and infrastructure requirements vary across space impacting the cost of construction.

Poplar yield variation in PNW

- Modeled poplar growth under coppice management with irrigation on cropland and without irrigation on rangelands.

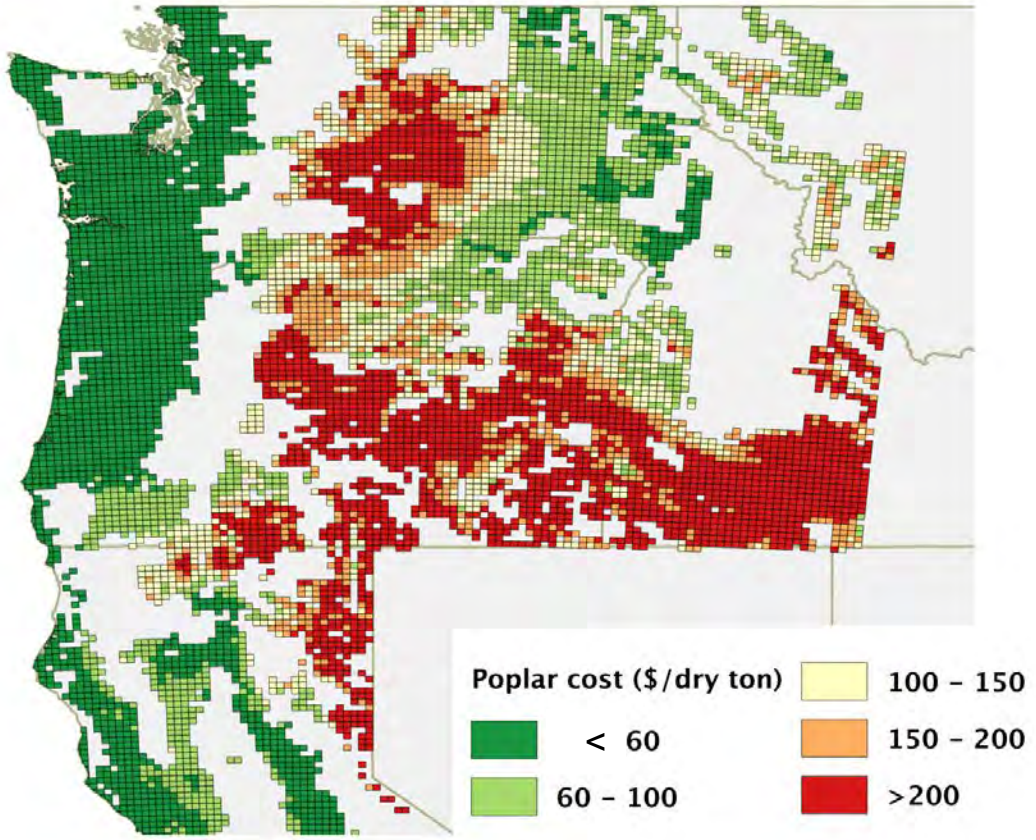




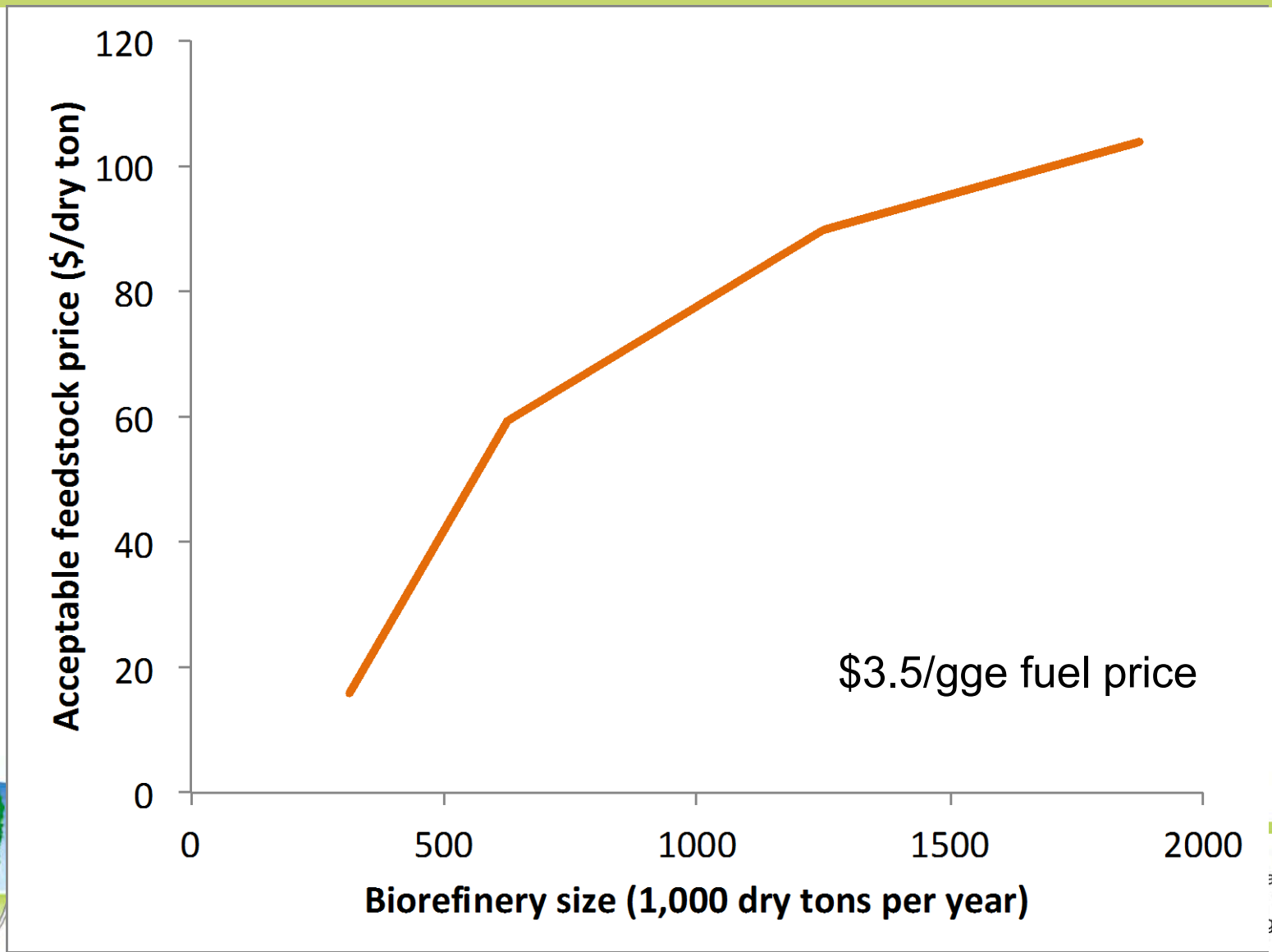
Potential biomass estimates of hybrid poplar on suitable agricultural lands

Cost of poplar from non-cropland

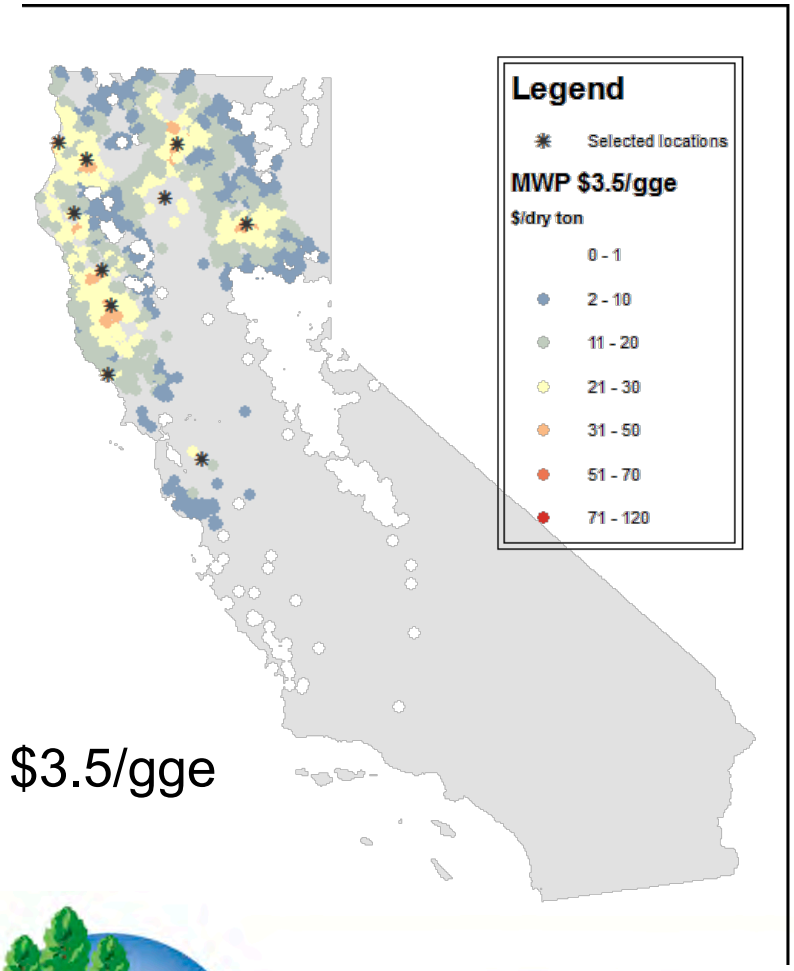
- Non-irrigated yields.
- Pastureland rent from NASS surveys.
- Restricted to land with less than 5% slope.
- Budget that requires more significant land preparation.



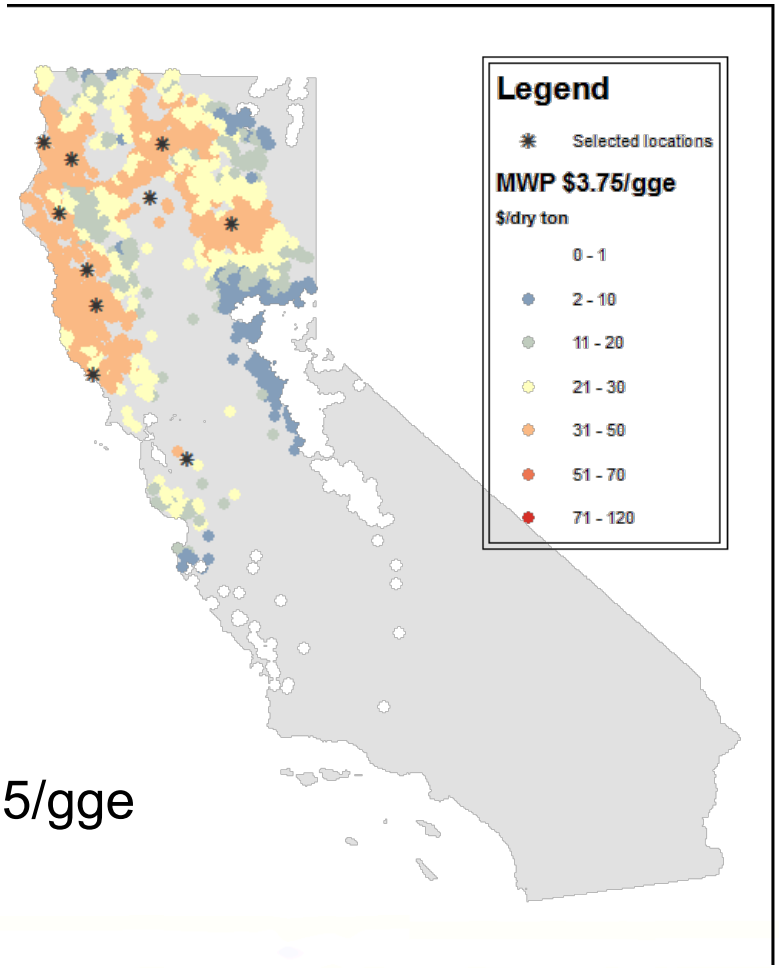
Impact of economies of scale on feedstock prices



Willingness to pay for feedstock

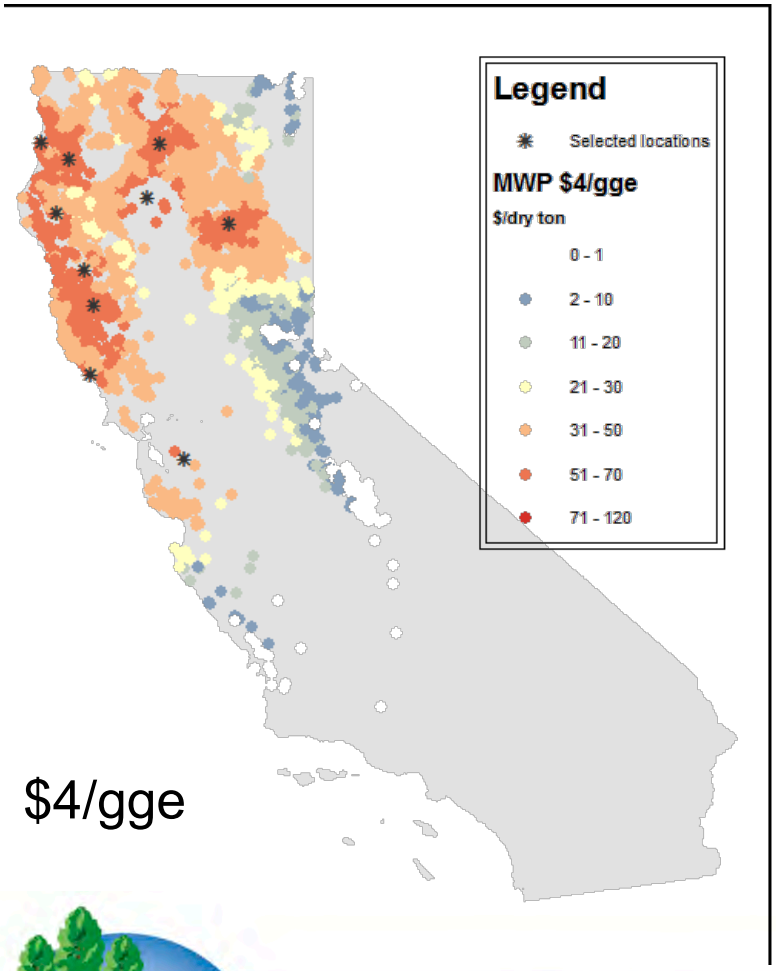


$3.5/gge

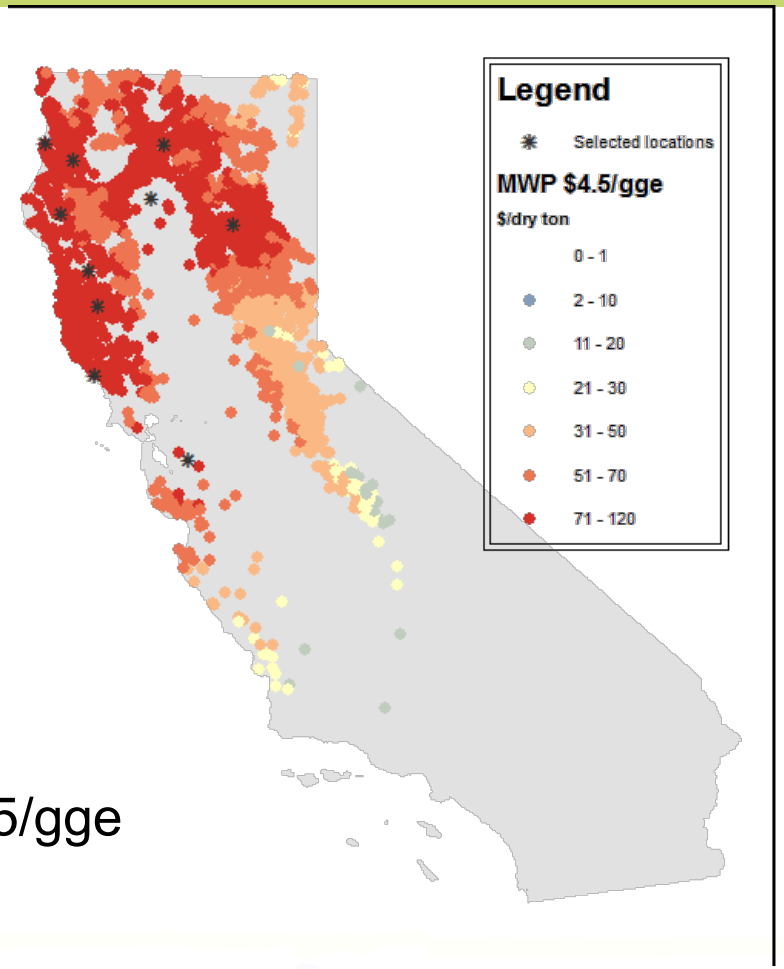


$3.75/gge

Willingness to pay for feedstock



$4/gge



$4.5/gge

There are a number of locations with costs comparable to the best locations

8 MGY

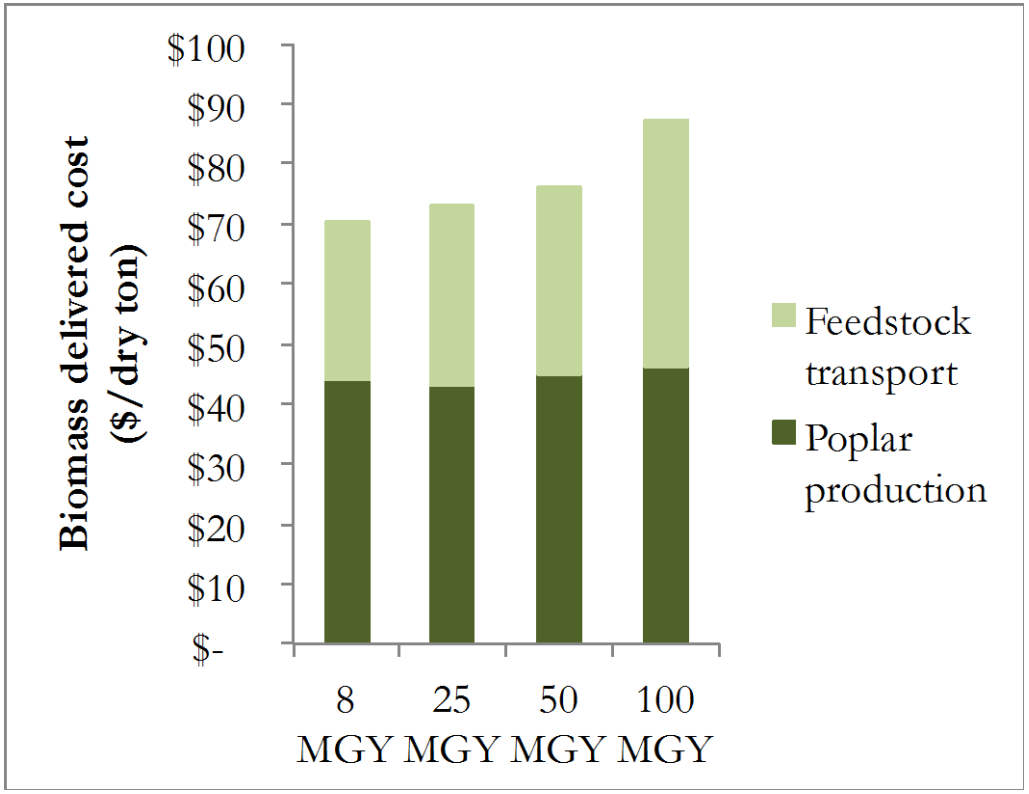
25 MGY

50 MGY

100 MGY

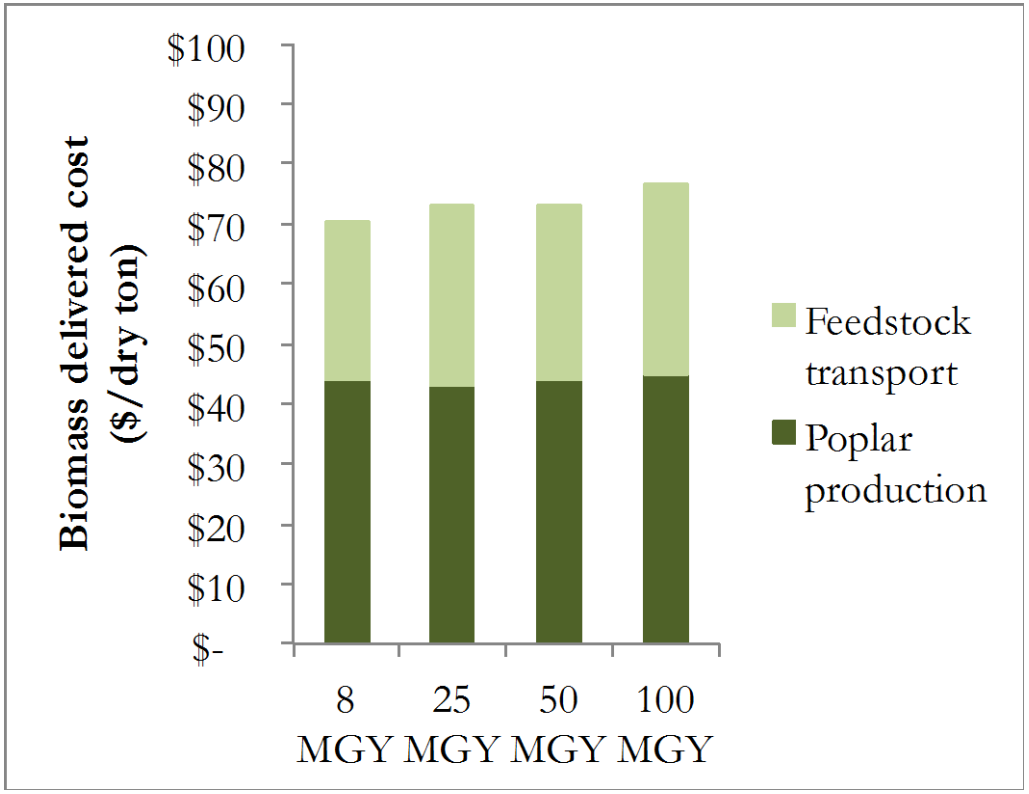
Delivered feedstock cost

For an given site, delivered feedstock can increase significantly as scale is increased.



Delivered feedstock cost

Optimally siting can mitigate this increase for the industry as a whole.



Thanks, any questions?