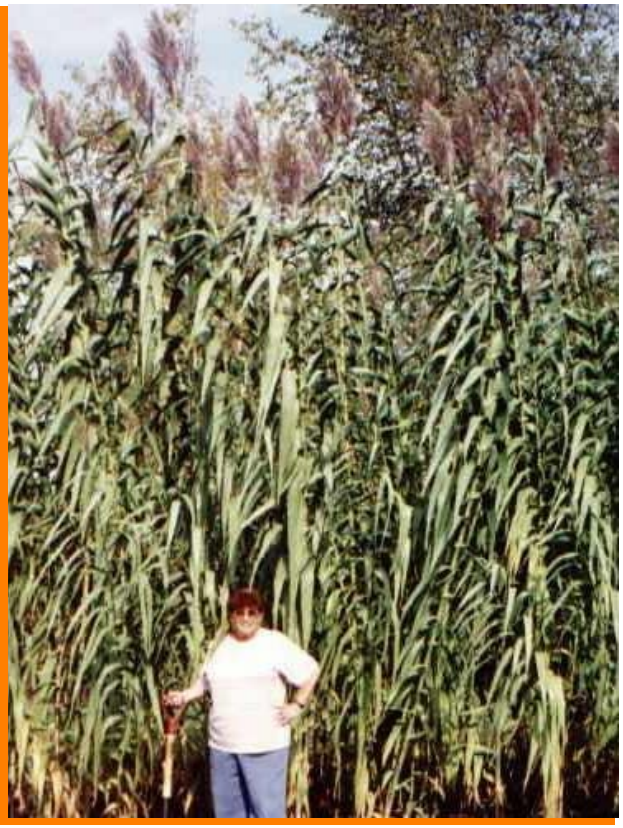
REACCH
Regional Approaches to Climate Change –
PACIFIC NORTHWEST AGRICULTURE



Assessing the Feasibility of Cultivating Arundo in the Mid-Columbia River Basin

Ashley Vandehey
OSU-Corvallis REACCH Intern
Department of Applied Economics
5 August2015

Research Questions

- Is Arundo a good choice of bio-energy crop given its highly invasive nature?
- What is of key significance in assuring Arundo cultivation succeeds?

Background

- How Green is Oregon

	State Energy Efficiency	Overall Ecological Footprint (U.S.A.)
Rank	3rd	5th

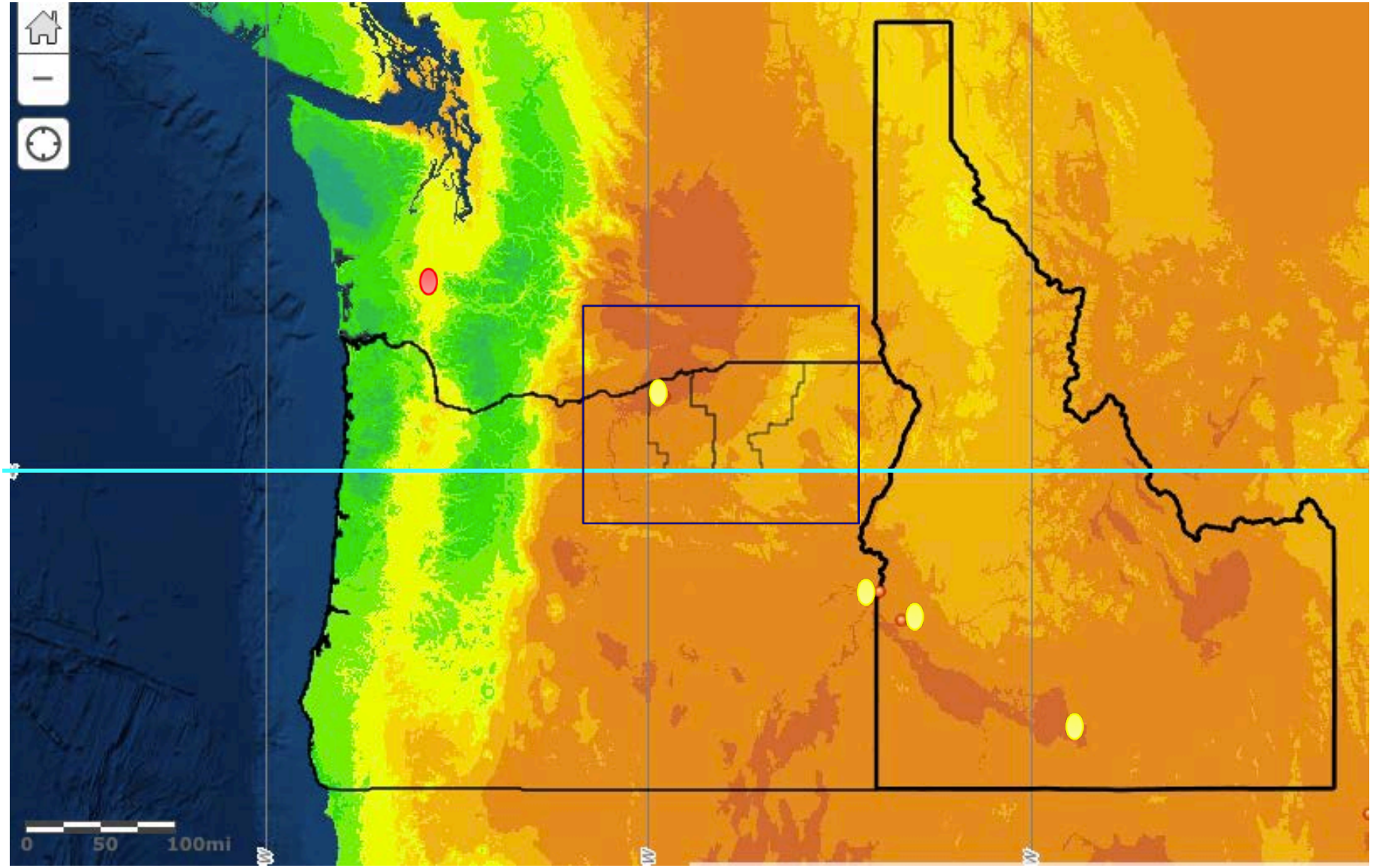
	Hydro	Wind	Solar	Biomass	Nuclear	Fossil	Other
% energy Consumption	44.7	5.2	0.02	0.54	2.8	45.2	1.6

- PGE Boardman
  - Roughly 15% of PGE Electricity Production
    - 585-MW coal-fired electricity generating plant
  - Transferring to biomass by 2020
  - Biomass Crops:
    - Juniper, Pine, Corn Stover, Poplar, etc
    - Arundo

What is Arundo?

- *Arundo donax*
  - Perennial cane
  - Asexual reproduction
  - Native to Mediterranean
  - Similar to bamboo
  - Already in Oregon (Ornamental Plant)
- Why is there an issue?
  - (Highly) Invasive in U.S.
  - Highly resilient (CA)

Why Invasion is a non-issue



Average Annual Precipitation (2009)

Land Viable for Production of Arundo

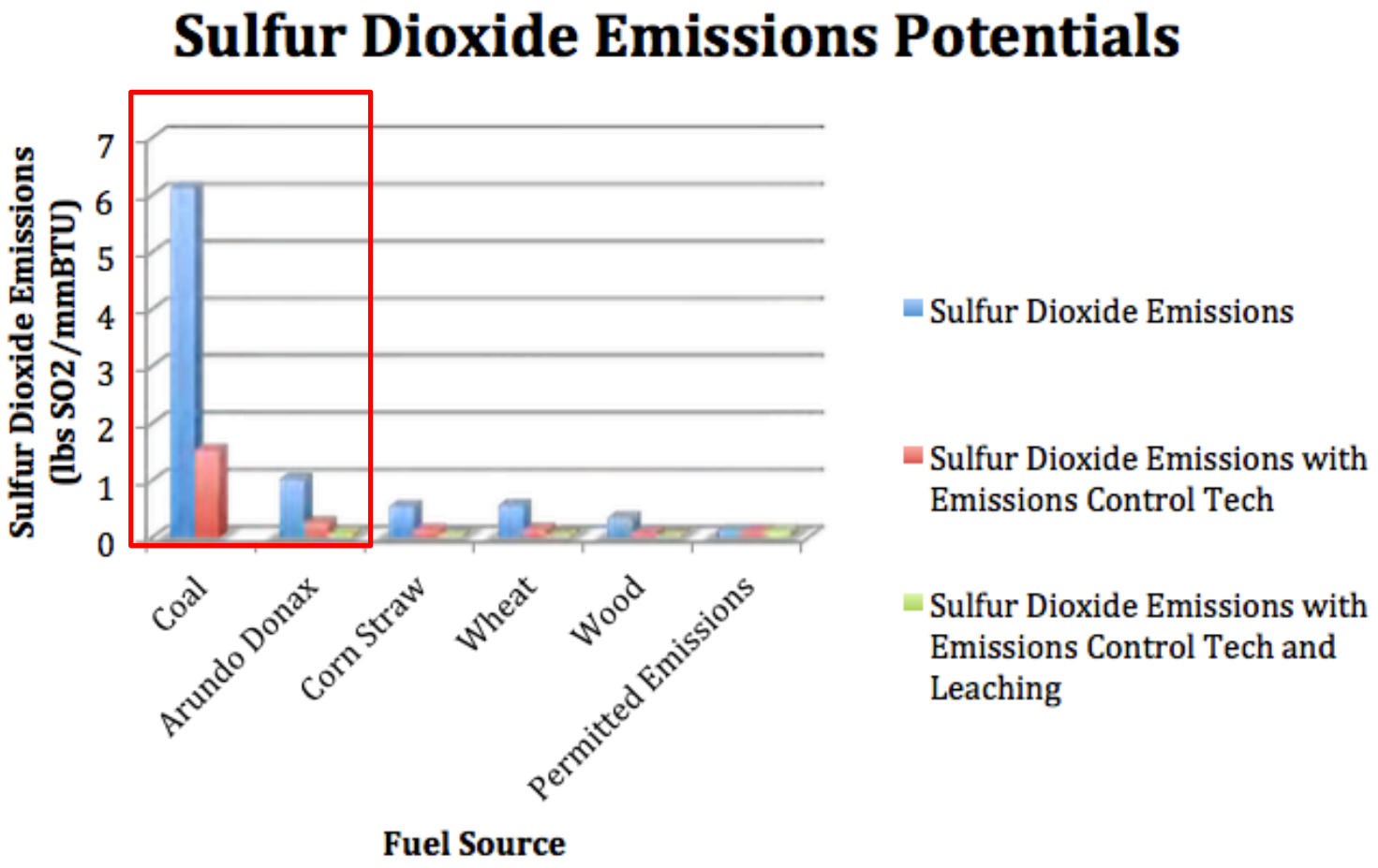
Boardman

Hermiston

Cultivation & Harvest

- Water
  - Up to 25 in. year/acre
- Nutrients
  - N: 0-60 lbs/acre
- Pesticides
  - Little to none (Round-Up Ready applied at start)
- Man Hours
  - Intensive
  - 1 man-hour/acre
  - Replanting bald spots 20 man-hours per acre
- Tons /acre by year
  - 1st: ~12-14
  - 2nd: ~22
  - 3rd: ~30+
- Price: 65-70 USD/t
  - Coal: ~30 USD/t
- Market: Competitive with Corn but cannot exceed price of wood pellets
- Business Plan:
  - 5 year contracts
  - Easiest for Potato & Onion Farmers, Possible for Wheat
    - PGE potentially helping cover initial startup costs

Energy Production



Enough Land to Meet Demand?

- Boardman requires 1.8 million tons before the plant fires up
  - Burns 8,000 t/hour
- Viable land near Boardman
  - 495,868.8 acres
  - At lowest 1st year production (12 t/acre) = 5,950,425.6 t/acre
    - Theoretical maximum of over 30 t/acre
  - 35% loss in mass with torrefaction
    - Still Enough
    - Only requires 62,000 acres
- Energy Production
  - Only 6 months/year
    - Off-time spent on torrefaction and maintenance

Boardman without Arundo?

- While feasible, not economically lucrative
- Other sources of biomass
  - Use rail to transport timber from other states
- Downside
  - Dependency
  - Not supporting local economy
    - Unemployment rate in Morrow and Umatilla

Why this project matters

- Oregon state law
  - 10 Year Plan
- Climate Change
- Renewable energy
  - Cost-efficient competitor to coal
- International Scale
  - Creates global opportunity to harness Arundo biomass and convert from coal
- EXTENSION
  - Works with all stakeholders
  - Collaboration between Farmers, Land Grant University, and Private Owned Utility

Conclusions

Limitations

- Unfinished Enterprise Budget
  - Conflicting work schedules
  - Estimated prices of Arundo

Results

- Arundo is a good and viable bioenergy crop
  - Chances of invasion are very slim when following strict guidelines for cultivation
- In order for this plan to work, PGE must convince farmers to grow Arundo

Acknowledgements

- Dr.Susan Capalbo
- Dr. John Talbot
- Laurie Houston
- Clark Seavert
- Wayne Lei (PGE)

Sources

- Bechtoldt, Nick, Donald Horneck, and Don Wysocki. *Agronomy of Arundo Donax in North-Central Oregon*. Hermiston, Oregon, 2014.
- Brumbaugh-Smith, Claire, Adriana Escobedo-Land, Marisa Hazell, G Luhman, Riley McMath, Rennie Meyers, Helen Spencer-Wallace, and Austin Weisgrau. *Fields of Fuel: Environmental and Economic Considerations of Transitioning Boardman to Biomass Using Corn and Wheat Residue in a Three State Area*. Portland, OR, 2014.
- ESRI 2011. ArcGIS Desktop: Release 10. Redlands, CA: Environmental Systems Research Institute.
- Kelly, Ronna, Susan Burns, and Mathis Wackernagel. *State of the States: A New Perspective on the Wealth of Our Nation*, 2015. footprintnetwork.org.
- "Oregon's Electric Power Mix," 2015. http://www.oregon.gov.
- "The State Energy Efficiency Scorecard," 2015. http://aceee.org/state-policy/scorecard.

Thank you

Questions?