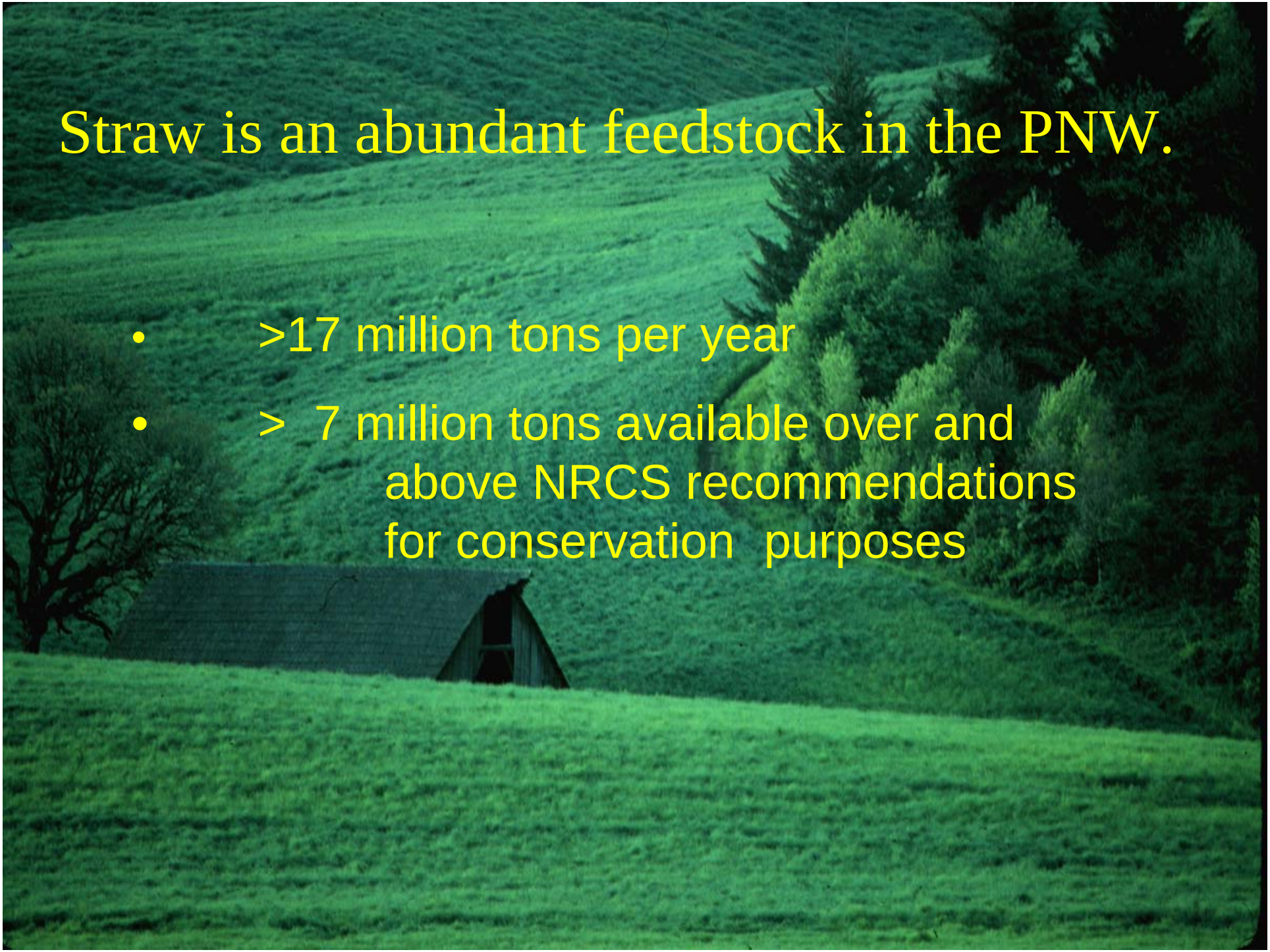
Bioenergy research in Corvallis

Personnel:

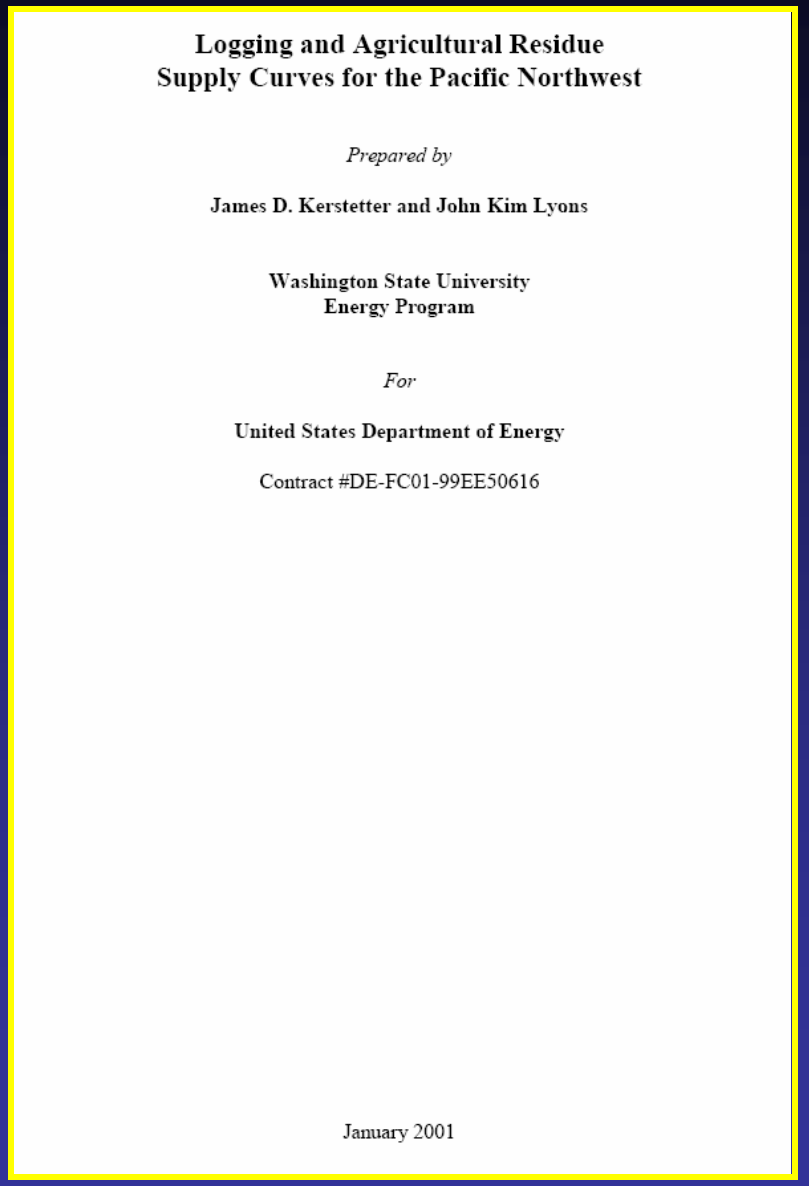
- Thermochemical technologies:
  - One postdoc – mineral composition/farm trials
  - One ag engineer (vacancy)
- Molecular improvement:
  - One postdoc (vacancy)


Straw is an abundant feedstock in the PNW.
• >17 million tons per year
• > 7 million tons available over and above NRCS recommendations for conservation purposes


PROBLEM: There isn't a big market
for most of it.
In the past, much of it went up in smoke

Previous efforts to convert straw to energy failed because:

- Collection/transportation costs were excessive
- Chemical constituents (Si, K, Cl) of straw were incompatible with thermochemical conversion technologies



Logging and Agricultural Residue Supply Curves for the Pacific Northwest

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For

United States Department of Energy

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Since transporting straw to a central conversion facility is expensive both in terms of $ and energy input, can technology can be developed to do conversion at a local- or farm-scale?

Our research addresses the following:

- **Can economic scalable technologies that enable on-farm thermochemical conversion be developed?**
- **Is on-farm thermochemical conversion of straw to energy feasible?**
- **Can we work (i.e. ,collect, transport, store) with loose (unbaled) straw?**
- **Is this approach economic ($ and energy input)?**
- **What is environmental cost of residue removal?**
- **Do genotypic differences in straw mineral composition exist which impact the suitability for thermochemical conversion?**

Approach:

- Form SCA with Western Research Institute to develop inexpensive gasification technology
- Collaborate with ERRC (Kwesi Aboateng) to evaluate gasification technologies
- Collaborate with Farm Power, a non-profit group to conduct on-farm trials of Kentucky bluegrass gasification
- Use in-house expertise to quantify feedstock characteristics relative to thermochemical conversion and the impact of straw removal on soil carbon, erosion, and water quality
- Collaborate with other ARS groups (Vogel, Casler, Anderson) and NRCS to characterize mineral composition of diverse grass feedstocks.

Results:

- Small scale gasifier was developed with WRI

  (Aboateng et al., 2006)

- Transported gasifier to bluegrass farm near Spokane for on-farm testing

- Quantified genotypic differences in mineral accumulation in native grasses (El-Nashaar et al., submitted 2006)

- Quantified genotypic differences in mineral accumulation in switchgrass (With Ken Vogel and Mike Casler; manuscript in prep)

- Quantified genotypic differences in mineral accumulation in cultivated cool-season grasses (manuscript in prep)

In progress:

- Recruit postdoc to identify promoters that are expressed in cut grass.
- Assemble and test on-farm gasification.
- Quantify impact of straw removal on soil and water quality.
- Seek partnerships to enable conversion of syngas into liquid transportation fuels.
- Evaluate economic and technical feasibility of on-farm conversion processes and integration of energy production into the annual farm operation cycle.