# Biodiesel Use in Madison's Diesel Fleet

## Charting a Path to a Sustainable Future

# Biodiesel?

- Diesel fuel made from non-fossil materials
  - Soy, Sunflower, Canola
  - Waste oil
  - Alternative feedstocks
- Blended with petrodiesel in varying mixes:
  - B2, B5, B20, B100

# Madison is taking a leadership position

- Exploring biodiesel use in fleet vehicles
- Partnering with biodiesel producers
- Developing and supporting biodiesel markets
- We're not alone:
  - Boston, MA - B5
  - Keene, NH - B20
  - San Francisco, CA - B20
  - Dallas, TX - B20 w/ NOx-reducing additive
  - Nevada, IA exploring B100
  - San Jose, CA – Garbage trucks burn B100

# Why does Madison's participation matter?

- Biofuels are coming
  - 30% of liquid transportation fuels by 2030
  - Governor Doyle is pushing to develop Wisconsin's bioeconomy
- Production pathways and market development will strongly impact benefits
  - Biodiesel vs. corn ethanol

# Why is biodiesel "green"?
## *Emissions*

- Reduced $CO_2$ footprint
  - Switching to B20 (20% biodiesel) could cut Madison's $CO_2$ output by over 3000 tons/year
- Greatly reduced tailpipe emissions
  - Reduced VOCs, CO, particulates, and more
  - Slight increase in NOx

# Why is biodiesel "green"? *Production*

- Per net energy gain, biodiesel results in…
  - 99% less nitrogen,
  - ~92% less phosphorus, and,
  - 87% less pesticide release than corn ethanol
- However, agro-chemicals are still used to grow soybeans in WI

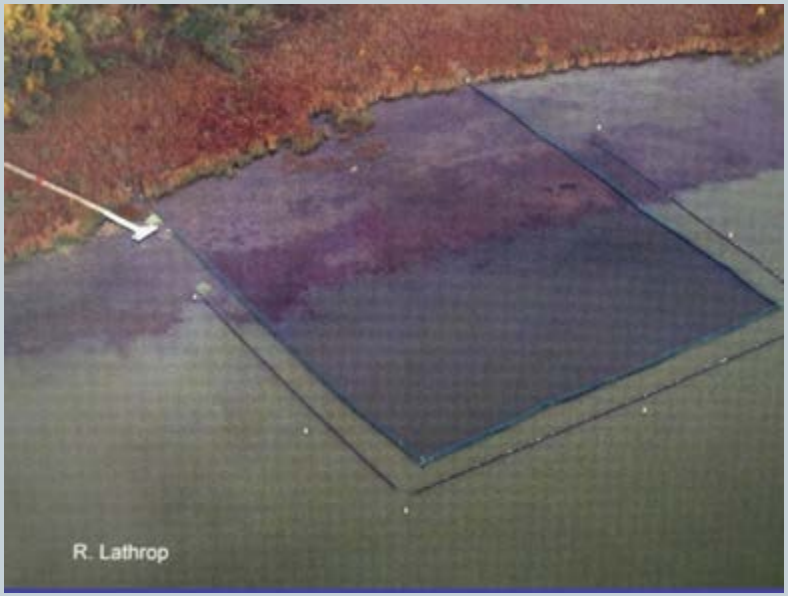
  For example …
  - Phosphate (fertilizer): applied to 55% of soybean acres
  - Glyphosphate isopropylamine (herbicide): applied to 97% of soybean acres
- Within soybean production, there are better management practices
  - Production as part of a larger soybean-non-soybean crop rotation

# What does this mean for public health?

- Reduction in emissions contributes to:
  - Less cancer risk due to air toxics—3 of the national and regional drivers of cancer risk would be reduced by a shift to biodiesel
  - Potential reductions in:
    - Acute respiratory hospital admissions
    - School and work absences
    - Medication use among asthmatics and others with compromised respiratory conditions
    - Chronic bronchitis, irregular heartbeat, heart attacks
  - In the Southern California Air Basin (SoCAB) study, a 100% penetration of B20 in the HDDV fleet would result in a 5% reduction in premature mortality due to air toxics exposure
  - Health risks as a result of fuel spills are attenuated (but not eliminated) by the use of biodiesel

# Environmental advantages: water quality

- Soy production uses less irrigation water than corn (in the Midwest)
- Reduced phosphorus use could improve water quality in Madison lakes



# But – what are the risks?

- Food security
  - Transportation fuels competing with food supply
- Agricultural intensity
  - Will we move marginal lands into production?
- Economic risks
  - Relatively small soy oil market is relatively volatile
- $NO_X$
  - Increases cardiopulmonary injury, inflammation, and exacerbate allergies

# Minimize risks

- Encourage local development
  - Minimize transportation costs
  - Keep costs, benefits “close to home.”
- Encourage waste oil recycling
  - Cooking oil dropoff planned
  - Incentives (UK bus passes)
- Encourage conservation
- $NO_X$ controls (fuel additives)
- Watch the market!

# Scenarios

| Mix | Carbon Reduction (Tons) | Percent |
|---|---|---|
| B5 | 800 | ~4% |
| B20 | 3,000 | ~15% |
| B100 | 17,000 | ~78% |

# Questions, comments, discussion?

# Change in emissions (SoCAB study)