Bioenergy Sustainability

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Major collaborators:

- ORNL
  - Latha Baskaran (SWAT, modeling)
  - Rebecca Efroymson (Risk assessment)
  - Keith Kline (Land changes)
  - Esther Parish (GIS)
- University of Tennessee & Southeast Partnership for Integrated Bioenergy Supply System (IBSS) (empirical tests)

Focus of research

- Defining environmental and socioeconomic costs and benefits of bioenergy systems
- Quantifying opportunities and risks associated with sustainable bioenergy in specific contexts
- Communicating the challenges and paths forward for sustainable bioenergy to a range of stakeholders

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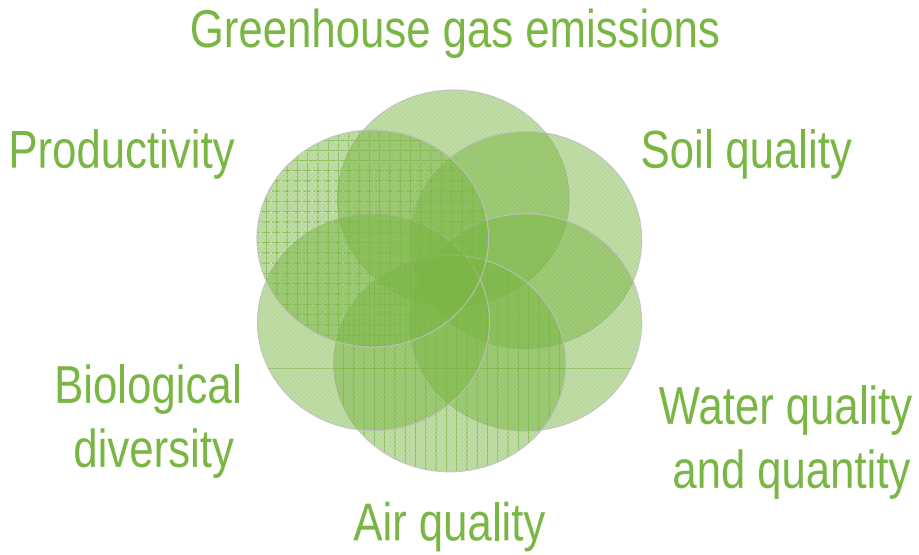
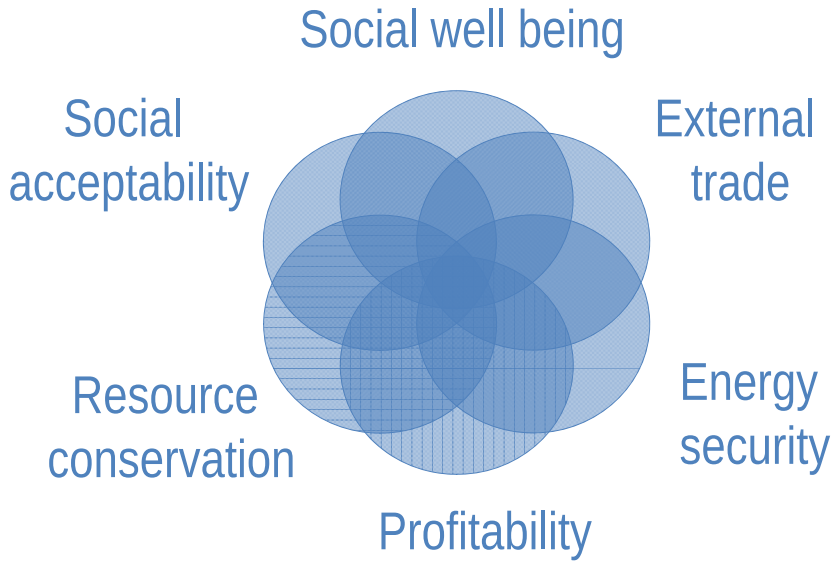
Categories for indicators of environmental and socioeconomic sustainability



McBride et al. (2011) *Ecological Indicators* 11:1277-1289



Dale et al. (In review) *Ecological Indicators*

Example of one category: soil quality

Indicator	Units
Total organic carbon (TOC)	Mg/ha
Total nitrogen (N)	Mg/ha
Extractable phosphorus (P)	Mg/ha
Bulk density	g/cm^3

Recognize that measures and interpretations are context specific [Efroymson et al. (In review) *Environmental Management]*

Effects of bioenergy choices

Questions	Tools
What are effects of bioenergy cropping on (1) Profit (2) Water quality and quantity (3) Others?	Biomass Location for Optimal Sustainability Model (BLOSM: http://blosm.ornl.gov) considers spatial implications using (1) Soil & Water Assessment Tool (SWAT) and (2) Policy Analysis System (POLYSYS)] [Parish et al. (2012) *Biofuels, Bioprod. Bioref*. 6:58-72]
How do changes in water affect habitat of aquatic macroinvertebrates?	BLOSM results feed into habitat model

Test case being deployed in East Tennessee where a biorefinery is producing ethanol from switchgrass

Land-use change

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Changes in water quality and quantity

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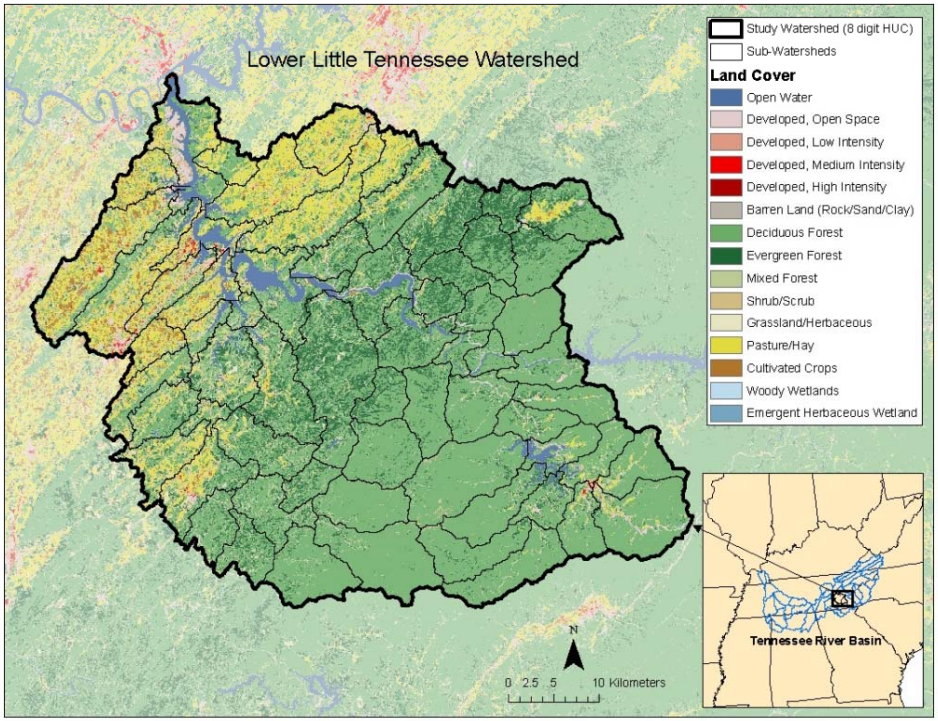
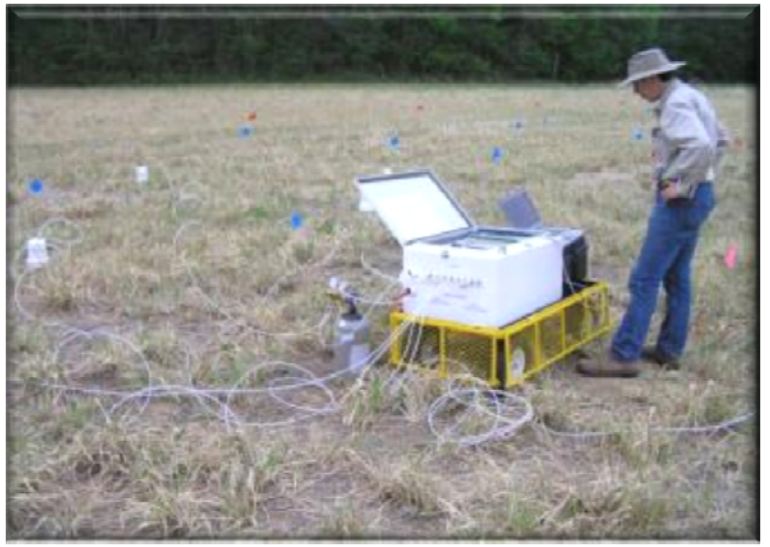
Changes in habitat



Contributions to RCN

- Contribution to RCN = Thinking about
  - Small set of sustainability indicators
  - Consistent ways to test concepts in diverse settings
- "Take away" from workshop
  - Better relations with collaborators
  - Comparable empirical tests of how bioenergy affects sustainability
- A question to spark discussion
  - How does RCN define bioenergy sustainability in a way that can be tested?



"Not everything that can be counted counts, and not everything that can be counted should be counted."

William Bruce Cameron