Biofuels Sustainability Issues in an International Context: What we've been up to lately

Robert Handler
Sustainable Futures Institute
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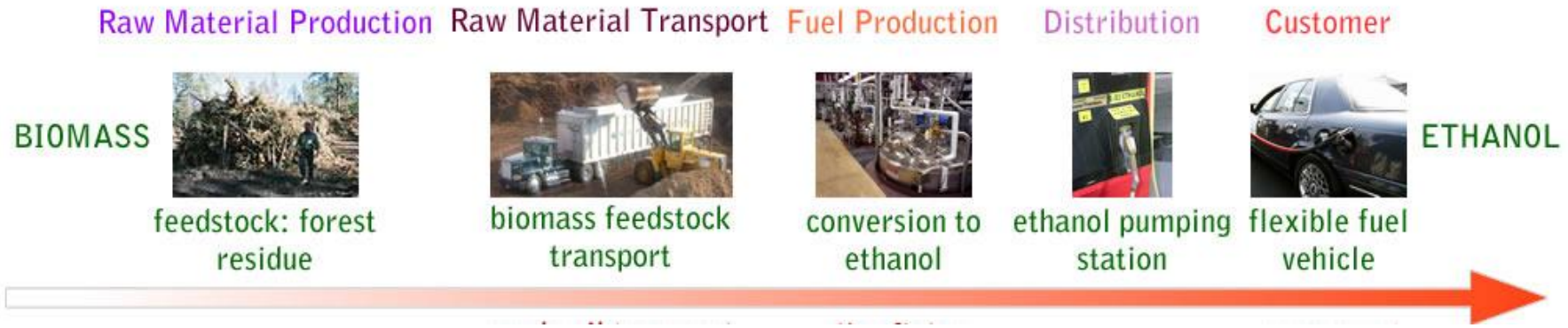
Michigan Tech Sustainable Futures Institute

Research, education leader in multidisciplinary sustainability:

- Energy, Materials/Manufacturing, Complex Systems, International Development

"**Wood to Wheels**" – evaluating the entire value chain of forest-based biofuels



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Prior biofuels sustainability work + International relationships =

NSF Research Coordination Network (RCN)

"RCN-SEES: A Research Coordination Network on Pan American Biofuels and Bioenergy Sustainability"

2012 - 2015

D. Shonnard, R. Donovan, K. Halvorsen, B. Solomon, (50 others)

Develop a research network of academic, industrial, government, and NGO partners interested in feedstock development across the Pan-American region

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Rationale:

PAN-AMERICAN BIOFUELS & BIOENERGY SUSTAINABILITY
AN NSF RESEARCH COORDINATION NETWORK

Why Biofuel / Bioenergy Sustainability?

The implications of large-scale biofuels and bioenergy production on environmental systems and social conditions are largely unknown,

… and yet….

there currently is a rapid movement toward development of biofuels and bioenergy production systems that will likely lead to changes in extant human and natural systems

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Rationale:

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Why Pan-American Focus?

- Countries in the region have large land areas, productive soils, favorable climate, and relatively low pop.density.
- Several developing countries in this region could benefit from biofuels production and export
- Some countries have large and growing biofuel and bioenergy industries, while other countries have active research and development programs. The potential of sharing sustainability knowledge is great.

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Rationale:

Research Themes

1. Community Impacts
2. Water / Energy Issues
3. Biodiversity / Ecosystems
4. Biogeochemical cycles
5. Energy Policy
6. Life cycle environmental assessment
7. Food and other systems
8. Biomass supply transportation logistics

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Approach:

Workshops + Conferences

2012: Merida, MX (W)
2013: Buenos Aires, ARG (W)
2014: Recife, Brazil (Conf)
2015: Houghton, MI USA (W)

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Approach:

Workshops + Conferences

2014 Pan-Am RCN Conference- Recife, Brazil

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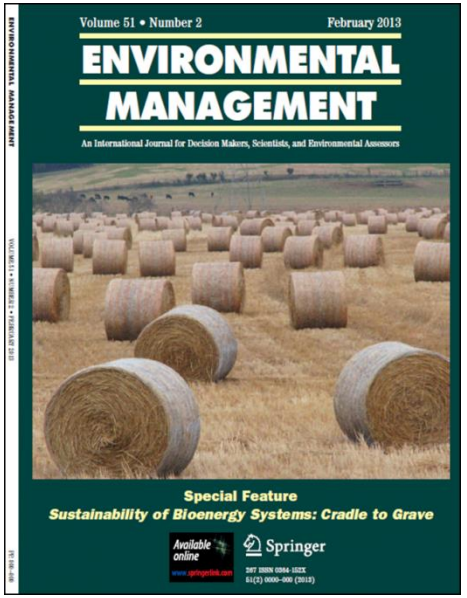
Approach:

Coordinated Journal Articles

Environmental Management, 2015 Special Feature



Biogeochemical Science – Gollany, Titus et al.
Hydrological Science – Watkins, Moraes et al.
Biodiversity Science – Kline, Mayer et al.
Policy / Sustainability – Solomon, Acevedo et al.
Social Sustainability – Selfa, Bain et al.
Biomass Supply Chains – Lautala, Hess et al.
Life Cycle Assessment (LCA) – Shonnard, Sacramento et al.

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Approach:

Research Roadmap Report

Lessons learned from Journal Articles +
Discussions from RCN Conference

Current Challenges, Research Opportunities, Case Studies

*Common Themes across disciplines, across countries

In Preparation – December 2015!

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Approach:

Education – Graduate Course

Faculty presentations, student-led discussion of assigned readings and other questions

16 Students: MTU(4), SUNY (3), UFPE-Brazil (2), UADY/other- Mexico (3), UTN- Argentina (2), N. Arizona, Purdue

Final Term Projects – multidisciplinary analysis of case / issue common to many bioenergy systems

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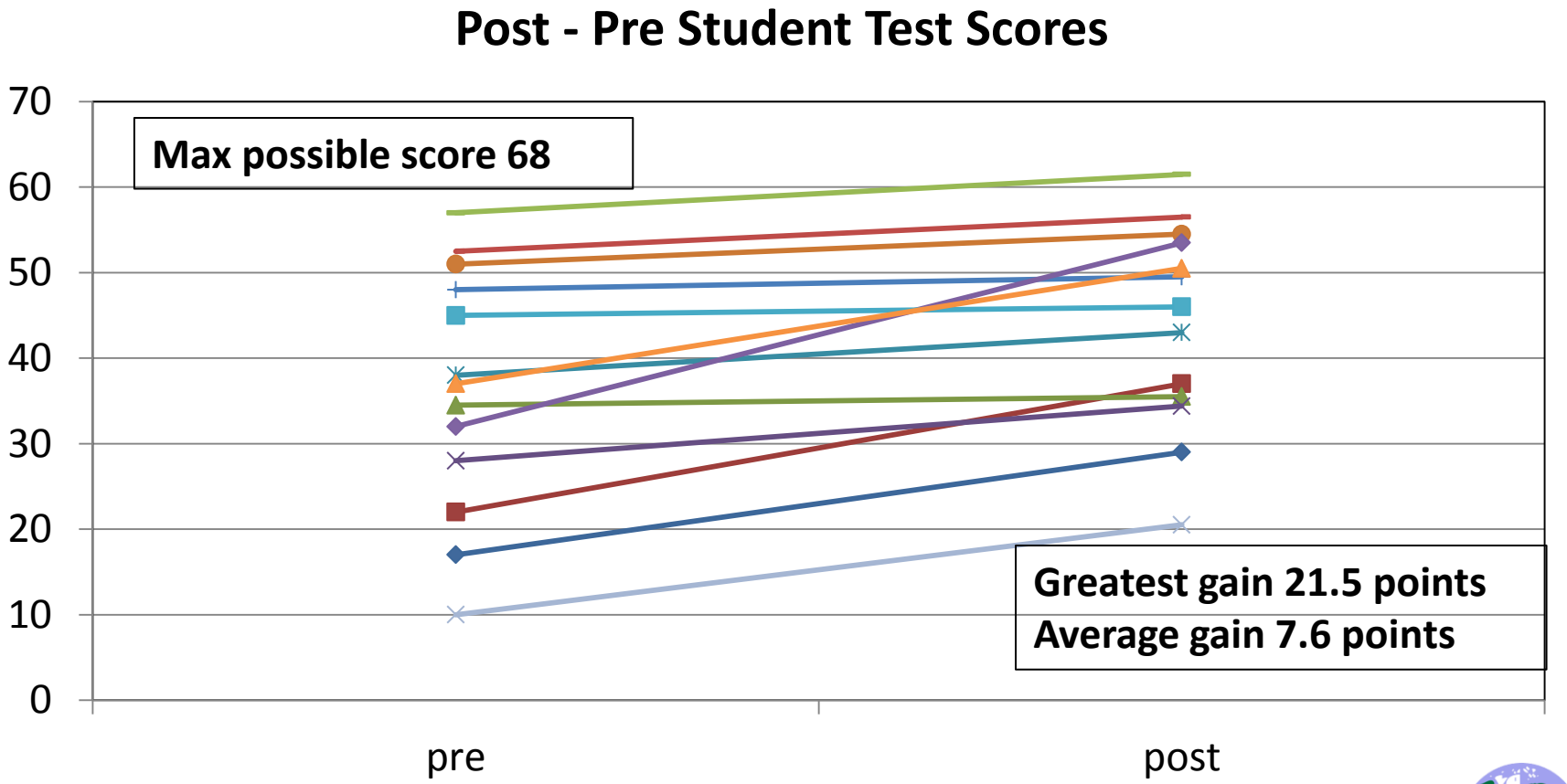
Approach:

Education – Graduate Course



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Major Outcome:

New Research Teams / Research Projects

NSF Partnerships for International Research and Education **(PIRE)**
"Sustainability, Ecosystem Services, and Forest-related Bioenergy Development across the Americas", 2013-2017

PI: Kathy Halvorsen (MTU), 50+ participants across region

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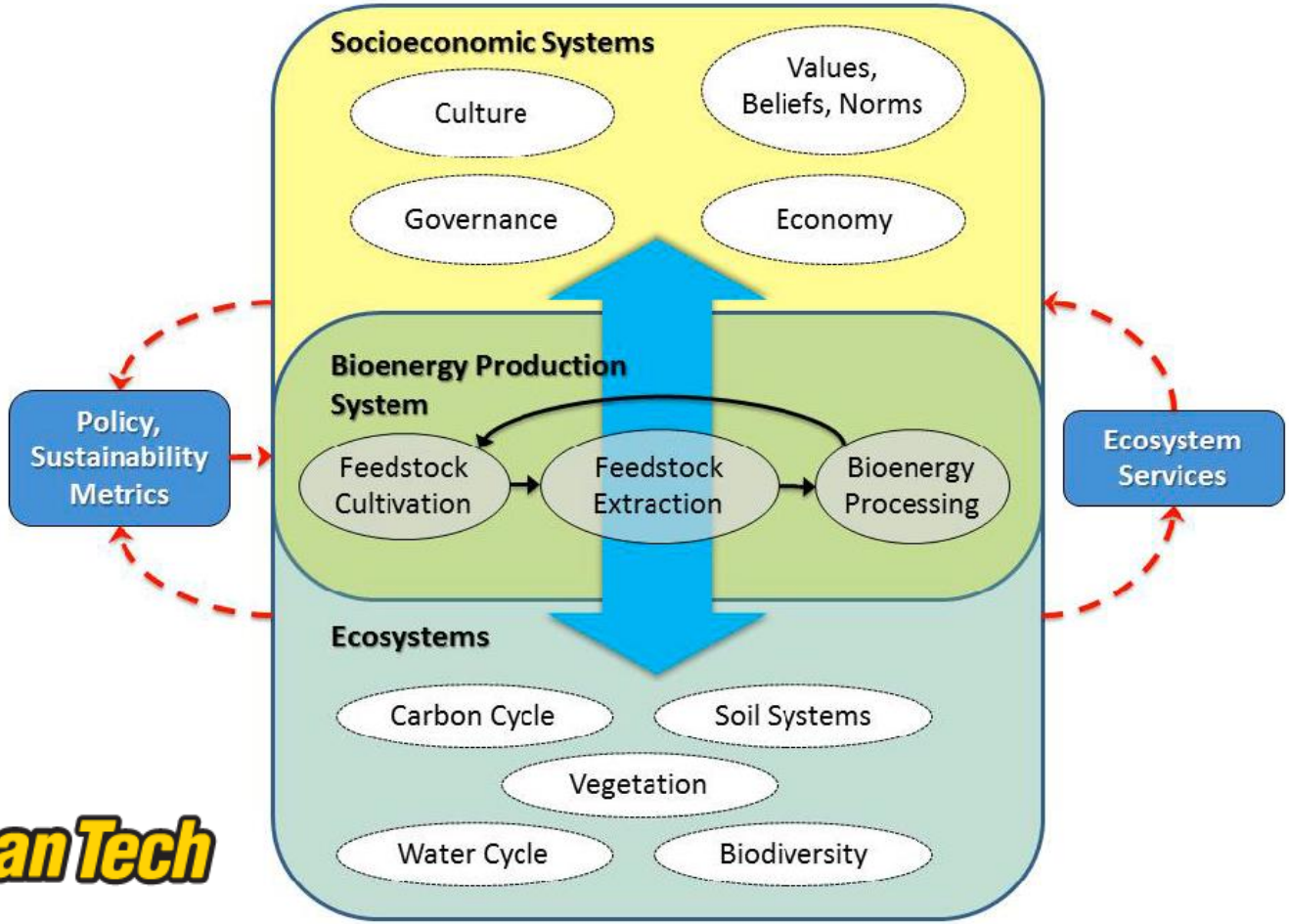
How is Pan American forest-related bioenergy development impacting socioecological systems, and associated ecosystem services, and how can those impacts best be measured, modeled, and mitigated?



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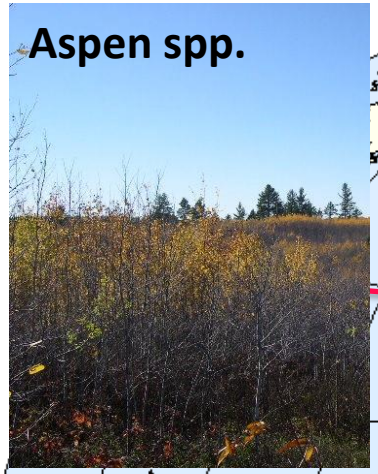
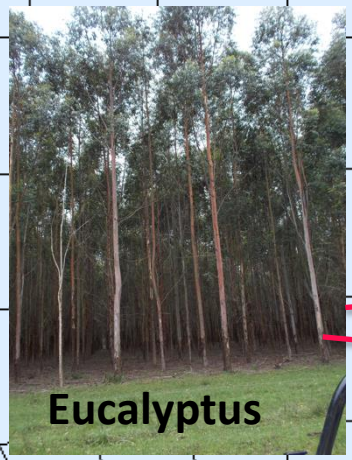


N. Hardwoods

Oil Palm



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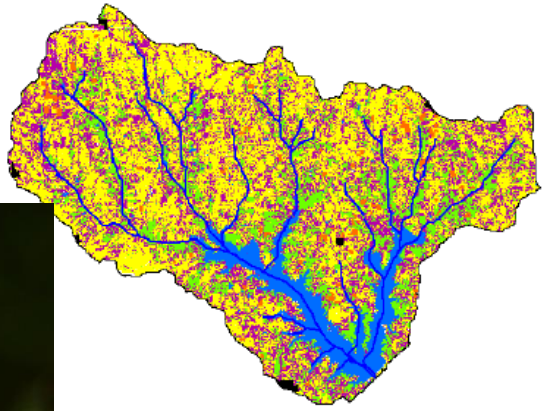
Ecosystem Science: Biodiversity, Hydrology, BioGeoChem



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Socio-economic:

Qualitative Interviews: over 550 completed, coding ongoing…

Survey Development – multiple languages, useful/practical !

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Policy Analysis:

Key informant interviews of governmental and non-state actors, along with bioenergy policy evaluation for sustainability

50+ interviews completed to date

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Metrics:

Ever-evolving integrated sustainability assessment modeling is planned, with inclusion of data collected from other PIRE teams + other data to support full suite of desired indicators

Case-specific transport logistics modeling, life-cycle assessment, techno-economic assessments

Integration of ecosystem, survey data (plus finding other data) will be hard!

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Thank you!

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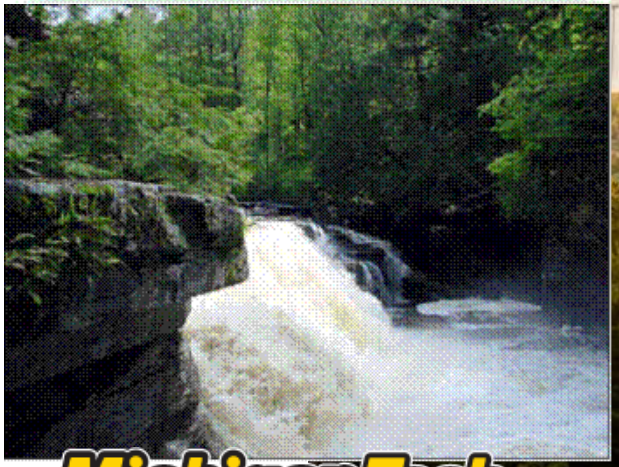

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