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IGDP in Ecology Newsletter

Notes from the Field

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Don't forget to bookmark the new Ecology page on the Huck website:
http://www.huck.psu.edu/education/ecology
There'll be more on the website and future developments in the next *Notes from the Field*

Bioenergy & the Environment Journal Club

In line with similar trends internationally, the U.S. is committed to an ambitious policy of expanding domestic biofuel and bioenergy production. Federally supported goals call for biofuels to replace 20% of current U.S. petroleum consumption by 2020. Whereas we are now accustomed to satisfying our enormous energy demand with fossil energy that represents millions of years of stored sunlight, transitioning to a "bioeconomy" means we will have to produce and harvest some of that energy from the landscape each and every year. If done wisely, biofuels have the potential to improve energy security, mitigate CO_2 emissions, and revitalize rural economies. However, rapidly increasing bioenergy production, while continuing to satisfy needs for food and fiber, will no doubt involve major consequences for agriculture and the environment.

In 2005, the USDA and the Dept. of Energy released a landmark inventory of domestic resources and concluded that the U.S. could sustainably harvest one billion tons of biomass each year. But not all production systems and technologies are equal in regards to their environmental impacts and the efficiency with which energy is harnessed from plant material. For instance, in the near term, bioenergy industries will rely predominately on corn grain for feedstock. The energetic yield from corn grain ethanol is modest, and continuous corn production involves substantial ecological costs. A recent study by the Chesapeake Bay Commission estimated that intensification of corn acreage stimulated by the ethanol boom will result in an increased 5 million lbs. of N being loaded into the Chesapeake.

Alternative bioenergy models are certainly possible. For instance, ecologist Dave Tilman has argued that species-rich plantings of native grassland plants can maximize primary productivity with low inputs and provide a sustainable biomass resource on marginal lands in the Midwest. By modestly increasing the diversity of their cropping systems by incorporating winter cover crops in their management plans, the Chesapeake Bay Commission reported that farmers in the watershed could reduce N loading by 17 million lbs. annually.

Ecologists can play an important role in evaluating the environmental impacts of various biofuel production strategies and informing policy and industry developments. Moderated by Dave Mortensen and myself, a bi-weekly discussion group will be meeting to review relevant literature and explore these issues. Anyone interested in participating should please contact Franklin Egan, jfe121@psu.edu.

Franklin Egan, graduate student, Ecology

What are you reading?

Kirsten Granger had the great idea of including brief book reviews in future issues of *Notes from the Field*. If you love or loathe an ecology related or popular science book that you have recently read, jot down a *short* one paragraph review and send it to: amw328@psu.edu

Biofuels from rangelands: Boon or bane?

Organized Oral Session at the Ecological Society of American Annual Meeting, San Jose, 9th August 2007.

A session of nine talks followed by an open-floor discussion was dedicated to the examining the energetic, ecological and economic costs and benefits behind the use of rangeland feedstocks in both ethanol and bioheat production. As the organizers point out: "The total area of native rangelands is diminishing at a rapid rate. Does the expanded interest in rangeland species as feedstocks for biofuels represent yet another hazard for this dwindling ecological resource, or would ecologically planned harvests offer another way in which these lands may be conserved or even restored?"

Several of the speakers discussed specific biofuel technologies. Jason Hill (University of Minnesota) showed the results of experiments using prairie biomass, Roger Samson (Resource Efficient Agricultural Production – Canada) and Rob Mitchell (USDA-ARS Nebraska) showed promising technologies that are already in place to use native grasses such as switchgrass, while Jim Ansley (Texas Agricultural Experiment Station) described some experimental harvesting of invasive honey mesquite in Texas. All of these biomass sources and more have the potential to produce biofuels - the potential to grow and harvest crops for biomass is clearly not restricted to the corn belt of the Midwest. While there may be some debate about which of these is the most efficient, it was interesting to note that the speakers universally condemned the current corn derived ethanol boom as being inefficient and backed largely for political reasons rather than for fuel security or environmental concerns. Grass biofuels have been shown to reduce net greenhouse gas emissions by as much as 16 times that achieved by corn ethanol. As one speaker bluntly put it, "if this is a horse race, the US government has bet on a donkey".

I was astounded to learn at this conference that Iowa is now a net importer of corn! The demand for corn for bioethanol has already caused inflation in food prices. This maybe not a huge problem for us rich westerners, but for people in less wealthy countries, where food costs are a significantly higher proportion of expenditure, the consequences are more keenly felt. The demand for corn also has implications for the small remnants of native rangelands – farmers who can get good prices for corn will be increasingly tempted to plough up the native rangelands. The use of native vegetation, be it grass or woody, has significant advantages over corn. Native biomass can often be grown with lower inputs and has the potential to provide other ecosystem services, such as reducing soil erosion and providing wildlife habitat. As David Sample (USGS Wisconsin) pointed out though, this is not such a sure thing. Grassland birds have declined more in North America than other guild during recent decades. Conservation grasslands have been important in stemming those declines in many areas, but these conservation grasslands are likely to come under threat as demand for land for biomass production increases. Although harvesting native grasses might be seen as a potential to retain grassland bird habitat while producing biomass for fuel, the reality may be very different – dense and tall monocultures of native grasses do not provide habitat for most grassland bird species.

Grasshopper Sparrow *Ammodramus savannarum* – will biofuels prove to be beneficial or detrimental to declining grassland wildlife?

The symposium left me feeling that policy on biofuels requires a great deal more joined up thinking. Biofuel technology is advancing rapidly and no doubt efficiency gains will make biofuels an increasingly viable substitute for some of our fossil fuel use. There is currently a great deal of exciting work in this area at Penn State. Let's hope that the implications of what could potentially be huge changes in land use are fully considered, such that ecological consequences are understood and mitigated for. If we get this right, there is the potential to combine conservation lands and biofuel croplands – a double benefit. The tragic alternative to that scenario would be to let our enthusiasm to secure alternative energy supplies create environmental problems that, gallon for gallon, are every bit as detrimental as those created by our reliance on fossil fuels.

Andy Wilson, graduate student, Ecology

Notes from the Field **was edited by Andy Wilson. Please send submissions and ideas for the next issue to: amw328@psu.edu**