



## ECOSYSTEM SERVICES RESEARCH PROGRAM

### MIDWEST STUDY EXAMINES ECOSYSTEM SERVICES IN THE HEARTLAND

#### Issue:

The Midwest is an important supplier of ecosystem services including food, fiber and fuel to the nation and the world. But these benefits of nature have come with trade-offs such as degraded water quality in the Gulf of Mexico and Lake Erie, loss of migratory bird habitat, decreased natural storage of flood water, and declines in soil productivity. These impacts reduce other ecosystem services such as clean water, flood mitigation, hunting, fishing and climate protection.

Investments in erosion control and other conservation practices have significantly improved the protection of Midwest resources, but pressures are increasing with the growing demand for biofuel feedstocks such as corn.

New opportunities are now being recognized for improving rural economies and quality-of-life by better protecting the full array of natural resources that provide ecosystem services. Taking advantage of these opportunities will require a better understanding of how each kind of ecosystem service is produced across diverse landscapes so that conservation

efforts can be effectively targeted and leveraged.

The science required includes:

- Improving the analysis of available land cover data
- Quantifying the effects of different conservation practices
- Targeting the locations where these practices should be applied
- Linking environmental assessment models
- Relating projected environmental changes to ecosystem service use.

Scientists also must help decision-makers access the results of these analyses in a way that clarifies the trade-offs associated with land management choices.

#### Science Objectives:

The objective of EPA's Future Midwestern Landscapes Study by the Office of Research and Development (ORD) is to improve the understanding of the trade-offs among ecosystem services under alternative policy decisions that affect land use and management.

Figure 1. Map showing the Future Midwestern Landscapes study area and ethanol biorefineries.



The key questions to be addressed include:

- How might Midwestern landscapes change in response to scenarios of a) increased biofuel feedstock production or b) increases in conservation measures?
- What changes in ecosystem services would correspond to these scenarios?
- How and where will services change?
- Where and what kinds of improvements in conservation would bring the most benefit?

The study is using the integrated assessment approach defined by EPA's Regional Vulnerability Assessment Program (<http://www.epa.gov/rev>).

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Specific elements of this research effort include:

- Mapping of current and projected land use and land cover
- Broad-scale modeling of changes in soil, air, water, wildlife
- Estimation of ecosystem services using a “level of service” (i.e. supply and demand) approach
- Development of an online Environmental Decision Toolkit for visualizing and interpreting current and alternative-future landscapes
- Development of an online application, the Environmental Decision Analysis Support Heuristic (E-DASH), featuring values ranking and multiple objective optimization for broad-scale regional analysis
- Collaboration with other federal agencies

### Application and Impact:

It is anticipated that the results of this study and the resulting decision support tools will:

- Enable identification and targeting of prime opportunities for investing in conservation and/or leveraging of conservation funds
- Allow for the development of strategies for reducing flow of nutrients to the Gulf of Mexico and Great Lakes

- Provide methods for scoring land parcels based on the potential production of ecosystem services if conservation measures are applied
- Allow evaluation of broad-scale implications of policy alternatives
- Illustrate trade-offs in previously overlooked ecosystem services associated with policy decisions
- Improve understanding of the benefits provided by nature

To date, the study has produced enhanced land use/ land cover maps for a base year landscape and a projected future landscape reflecting biofuel increases.

In addition, a prototype version of the Environmental Decision Toolkit on the web is available for viewing at <http://reva.waratah.com> (username: [integrate@epa.gov](mailto:integrate@epa.gov), password: vulnerability).

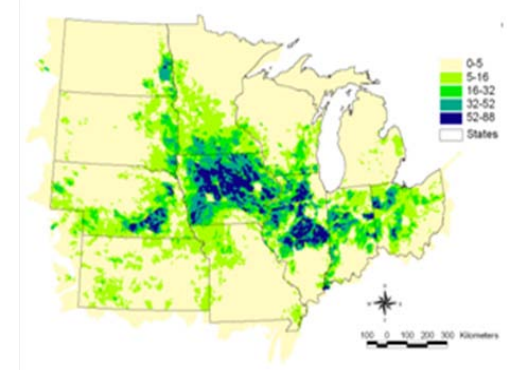
### References

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Figure 2. Expected percent increase in continuous corn between 2001 and 2022, as projected based on biofuel use requirements in the 2007 Energy Independence and Security Act (EISA).



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