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Subproject: 004

Center: The Atlantic Slope Consortium - Developing Ecological Indicators for Aquatic Ecosystems of the Atlantic Slope Region

Center Director: Robert Brooks

Title: Socioeconomic and Institutional Research

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Project Period: March 1, 2001 through February 28, 2005

Project Amount: See main project abstract

Research Category: Environmental Indicators

Objective

This is the fourth of four subprojects under the Atlantic Slope Consortium (ASC) center. The goal of this subproject is to provide scientific results that support the choice and communication of suites of environmental indicators that will be meaningful to and relevant for environmental managers and other intended audiences. Specific objectives are to examine: (a) human perceptual and attitudinal dimensions of the types of indicators that different audiences find useful, (2) risk communication methods for presenting indicator information, (3) institutional and jurisdictional obstacles to indicator use, (4) their value for environmental management, and (5) their relationships to socioeconomic indicators at multiple scales.

Progress Summary

The Human Dimensions group's data collection and data analysis activities fell into four areas during the 2003 reporting period.

Theme I: Integration of Economic and Environmental Information for Environmental Decision Making

The objectives of research under this theme are to:

- Develop and demonstrate decision frameworks for managing aquatic resources that integrate environmental and socio-economic information.
- Develop policy results related to socio-economic and environmental information.
- Provide theoretical constructs to guide the use of socio-economic and environmental information in integrated assessment.
- Develop and demonstrate methodologies for integrated assessment of quality of life.

Progress was made on each of these objectives. Our most notable contribution was in the development of methodologies for the integrated assessment of quality of life.

Specifically, we developed two innovative approaches for ranking the relative efficiency of communities in the region in producing a high quality of life and environment. One is based on data envelopment analysis and uses minimal value judgments. The second imposes stronger value judgments derived from observed human residential (i.e., human habitat) choices. We used secondary data for proof-of-concept and are currently moving toward an application to communities in ASC watersheds.

We also (1) produced frameworks for combining economic and environmental data water quality policy analysis in the specific context of designing pollution trading programs for point and nonpoint sources of water pollution and managing invasive species that threaten aquatic resources; (2) developed theory to guide the interpretation of economic and environmental data for sustainability analysis; and (3) explored the used of stochastic frontier analysis for assessing the efficiency of land use change.

Theme II: Value of Socio-Economic and Environmental Information in Environmental Decision Making.

In this theme we are exploring methods and results to estimate societal value of various types of economic and environmental information for water quality management, and methods for data collection. We developed methods and results on the value of information for managing nitrogen loads in the Susquehanna River Basin of Pennsylvania and continue to refine the methods and apply them to ASC watersheds.

Theme III: Human Dimensions of Environmental Indicators

Theme III addresses a set of hypotheses concerning the use of indicators in community-based watershed management. Issues include:

- The relationship between perceived environmental quality and ‘actual’ environmental quality (as revealed via the indicator approach), and perceived versus actual stressors (as revealed by ASC indicators).
- The role of potential mediating variables or sets of variables in the relationships above. Mediating variables include: (a) social choice scenarios, (b) which indicators we choose to represent environmental quality, and their nature, and (c) personal characteristics, such as environmental attitudes.
- Ranking and willingness to make tradeoffs between attributes of aquatic ecosystems as measured by indicators (as a measure of value).
- The effectiveness of different types of indicators in communicating water quality conditions and risks.

These issues are being addressed through a set of general population surveys in ASC watersheds. The survey instrument is now being developed. We expect the survey to be completed by mid-summer 2004.

Theme IV: Institutional Issues in the Choice and Use of Water Quality Indicators

The role of federal and state laws and institutions in shaping the choice and use of indicators is the fourth theme. This theme is being addressed collaboratively with ELI as well as with other ASC researchers. Data collected by ELI in Year 2 is being used to prepare a paper in collaboration with Lyle Varnell (VIMS) on institutional and legal obstacles to effective integration of ecological indicators into decisionmaking.

Future Activities

A set of general population surveys is being conducted in ASC watersheds on the following issues:

- The relationship between perceived environmental quality and ‘actual’ environmental quality (as revealed via the indicator approach), and perceived versus actual stressors (as revealed by ASC indicators).
- The role of potential mediating variables or sets of variables in the relationships above. Mediating variables include: (a) social choice scenarios, (b) which indicators we choose to represent environmental quality, and their nature, and (c) personal characteristics, such as environmental attitudes.
- Ranking and willingness to make tradeoffs between attributes of aquatic ecosystems as measured by indicators (as a measure of value).
- The effectiveness of different types of indicators in communicating water quality conditions and risks.

The survey instrument is now being developed and should be completed by mid-summer 2004.

Publications and Presentations

Publications

Balog, A. 2003. User perspectives on environmental indicators for aquatic ecosystems: Results from water quality officials in the Mid-Atlantic states. M.S. Environmental Pollution Control.

Borisova, T. 2003. Coping with uncertainty in water quality management through choices of policy instruments and information investments, Ph.D., Agricultural, Environmental, and Regional Economics. December.

Cai, Y. 2003. Integrating environmental and socioeconomic indicators of quality of life assessment using data envelopment analysis, M.S., Agricultural, Environmental, and Regional Economics.

Horan, R., and J. Shortle. When two wrongs make a right: Second best point-nonpoint trading ratios. Revise and resubmit from the *American Journal of Agricultural Economics*.

Horan, R., J. Shortle and D Abler. Forthcoming. The coordination and design of point-nonpoint trading programs and agri-environmental policies. Resubmission in review for publication in *Agricultural and Resource Economics Review*.

Jamro, E, R. Stedman, J. Shortle and others. Correspondences between perceived and measured environmental condition and environmental stressors.

Jamro, E, R. Stedman, J. Shortle and others. Communicating about water quality: matches and mismatches between expert and lay concepts of water quality and what they mean for community-based water quality programs.

Marshall, E., Y. Cai, and J. Shortle. The efficiency of quality of life provision in the Mid-Atlantic states. *Agriculture and Resource Economics Review*. Under review.

Marshall, E., and J. Shortle. Forthcoming. Urban development impacts on ecosystems. In S. Goetz, J. Shortle, and J. Bergstrom Eds., *Land Use Problems and Conflicts: Causes, Consequences and Solutions*. Routledge Publishing.

McElfish, J. with Lyle Varnell (VIMS), Manuscript under development about institutional and legal obstacles to effective integration of ecological indicators into decision making.

Molineros, J. 2003. Land allocation inefficiency in four South American countries: The problem of deforestation, M.S., Agricultural, Environmental, and Regional Economics.

Ranjan, R., L. Marshall, and J. Shortle. Optimal renewable resource management in the presence of endogenous risk of invasion. Revise and resubmit for publication in *Environmental and Resource Economics*.

Ranjan, R., L. Marshall, and J. Shortle. The relevance of the environmental Kuznets Curve under non-linearities: A hysteresis based approach. Soon to be submitted to *Environment and Development Economics*.

Presentations

Abrahams, N. and J. Shortle. 2003. The performance of compliance measures and instruments in nitrate nonpoint pollution control under uncertainty. Presented at the NAREA workshop, Linkages Between Agricultural and Conservation Policies, Portsmouth, NH, June 2003.

Balog, A., J. Kipp, J. Shortle, A. Fisher, R. O'Connor, J. Finley, and E. Marshall. 2003. Human dimensions of ecological indicators. Presented at the U.S. EPA workshop on Tools for Assessing Regional Environmental Vulnerability, Valley Forge, PA, May 2003.

Balog, A., J. Kipp, J. Shortle, A. Fisher, R. O'Connor, J. Finley, and E. Marshall. 2003. Human dimensions of ecological indicators. Presented at the Annual Meeting of the Ecological Society of America, Atlanta, GA, August 2003.

Borisova, T. J. Shortle, R. Horan, and D. Abler. 2003. The value of information for water quality risk management. Presented at Annual Meeting of the Risk Society, Washington, DC, October 2003. Revised and to be submitted soon to *Water Resources Research*.

Borisova, T. J. Shortle, R. Horan, and D. Abler. 2003. The value of ecological and economic information in water quality management. Presented at the Annual Meeting of the American Agricultural Economics Association, Montreal, Canada, July 2003.

Horan, R., J. Shortle, and D. Abler. 2003. The coordination and design of point-nonpoint trading programs and agri-environmental policies. Presented at the NAREA workshop on Linkages Between Agricultural and Conservation Policies, Portsmouth, NH, June 2003.

Ranjan, R., J. Shortle, and E. Marshall. 2003. Optimal renewable resource management in the presence of endogenous risk of invasion. Presented at the Annual Meeting of the Northeastern Agricultural and Resource Economics Association, Portsmouth, NH, June 2003.

Ranjan, R., J. Shortle, and E. Marshall. 2003. The environmental Kuznets Curve: When the environment exhibits hysteresis. Presented at the Annual Meeting of the American Agricultural Economics Association, Montreal, Canada, July 2003.

Shortle, J. 2003. The theory of performance based policy instruments. Invited Presentation at the workshop on Performance Based Environmental Policies for Agriculture, sponsored by the Farm Foundation, Winrock International, and USDA-ERS, Washington, DC, March 2003.