Introduction to the Special Issue

Benefits and Costs of Natural Resources Policies Affecting Public and Private Lands: USDA W2133 Regional Research Project Legacy and Current Contributions

Michael D. Kaplowitz and John C. Bergstrom

In 1967, a group of resource and environmental economists from across the nation got together under the auspices of the United States Department of Agriculture (USDA) to form a multistate collaborative research project. The goal of this research initiative was to bring together natural resource and environmental economists from across land grant and non-land grant institutions in order to advance natural resource benefit and cost methods, collect primary data on pertinent natural resource policies, and develop applications for extending the usefulness of primary data on the benefits and costs of natural resource policy. Initially given the USDA project identification number WM-59, the Western Regional Research Project: Benefits and Costs of Natural Resources Policies Affecting Public and Private Lands has been a productive intellectual, professional, and policymaking endeavor for more than forty-two years. While the project indentifying moniker has been changed from time to time (from WM-59 to W133 to W1133 to W2133) and there has been the loss, sometimes untimely, of project participants over the years, the group continuously provides opportunities for some of the nation's most engaged resource and environmental economists to work together, share their ideas, provide feedback and support, and advance the state-of-the art in valuation methods and applications.

Although labeled as a Western Regional Project, the group has always included participants from across the United States. Current W2133 members are from the University of California, Berkeley; University of California, Davis; Colorado State University; University of Connecticut; Cornell University; University of Delaware; The University of Georgia; University of Illinois; Iowa State University; University of Kentucky; University of Maine; University of Massachusetts; Michigan State University; University of Minnesota; University of Nevada; University of New Hampshire; University of North Carolina; North Dakota State University; The Ohio State University; Oregon State University; The Pennsylvania State University; University of

Michael D. Kaplowitz is Professor in the Department of Community Agriculture, Recreation, and Resource Studies at Michigan State University in East Lansing, Michigan; John C. Bergstrom is Professor in the Department of Agricultural and Applied Economics at The University of Georgia in Athens, Georgia.

This paper was editor-reviewed.

Rhode Island; Texas Tech University; Utah State University; Washington State University; West Virginia University; and University of Wyoming. The project also includes economists from other universities, private firms, and governmental agencies as "friends" of W2133. Each year, W2133 members and friends get together to share their current research, work in progress, and ideas for future endeavors. Often W2133 meetings highlight collaborative efforts among group members and their institutions. Invariably, the W2133 meetings and the professional relationships provide opportunities for some great, friendly feedback that helps advance individual and collective goals and objectives. In fact, the proceedings from W2133 annual meetings, agency publications, and coauthored journal articles evidence the ongoing success of this group in advancing theory and applications in resource and environmental economics, important refinements, and new empirical applications.

The Policy-Research Connection

As would (or should) be expected from a USDA-sponsored research project in the spirit of the land-grant university system, W2133 research has always been responsive to practical problems and policy needs. In a recent Association of Environmental and Resource Economists (AERE) newsletter article, Bergstrom and Loomis (2006) review the close connection between natural resource and environmental policy and the W2133 (and its earlier manifestations) research agenda. We summarize the primary connections in this article to show the reader how present W2133 research, including the articles in this special issue, relate to the historical, policy-driven W2133 research agenda.

In the early days, W2133 research focused primarily on outdoor recreation and, in particular, *use values* associated with outdoor recreation trips taken to public land and water resources. There were at least two early major policy pushes into outdoor recreation valuation research. The first push was in the area of federally funded water resource projects initiated during the 1930s as part of President Franklin D. Roosevelt's "New Deal" public works program, designed to help pull the United States out of the Great Depression. In the 1940s, the need for abundant and cheap electricity to help support U.S. involvement in World War II led to more federally funded water resource projects. Federal funding and construction of water resource projects continued at a hefty pace after World War II in the 1950s and 1960s to support national economic development goals (e.g., opening up the arid western United States to more agriculture via abundant and cheap water from federally funded irrigation projects).

Eventually, all of the money being spent on federally funded water resource projects attracted the attention of policymakers concerned about the benefits and costs of such projects (sound familiar?). These concerns led to calls for benefit cost analysis of water resource projects that were first reflected in the Federal Flood Control Act of 1936. But it took almost another thirty years for benefit cost analysis of water resource projects to be more clearly articulated and formalized in the Federal Water Resources Planning Act of 1965. Of particular importance and relevance to W2133 research, this act officially recognized outdoor recreation as a primary water resource project or purpose. The need to conduct more formal benefit cost analysis of water resource project accounting for outdoor recreation values stimulated W2133 researchers, starting in the 1960s, to focus research on developing theory and techniques for estimating the economic value of outdoor recreation trips. Over the years, the federal government has continued to develop policies governing benefit cost analysis of water resource projects that have influenced the W2133 research agenda.[1]

On the land resource side, an event took place in 1947 that foreshadowed the direction of W2133 research for years to come. In that year, Harold Hotelling[2] wrote a letter to the Director of the

[1] For example, the U.S. Water Resources Council (1973) developed the well-known "Principles and Guidelines" for water and land-related projects, which apply to the U.S. Army Corps of Engineers, the U.S. Bureau of Reclamation, the Tennessee Valley Authority, the USDA Soil Conservation Service (now the USDA Natural Resource Conservation Service), the U.S. Fish and Wildlife Service, and the National Park Service. As this article is being written, as a response to legislation in the Water Resources Development Act of 2007, the U.S. Council on Environmental Quality is currently updating these "Principles and Guidelines."

[2] Letter documented in *An Economic Study of the Monetary Evaluation of Recreation in the National Parks*. U.S. Department of Interior, National Park Service and Recreation Planning Division, 1949.

National Park Service outlining an idea for valuing outdoor recreation at National Parks. His idea, which Marion Clawson[3] and others formalized in the late 1950s and 1960s, developed into the well-known travel cost method. Since its inception in 1967, a major part of the W2133 research agenda has focused on developing theory and techniques for strengthening and refining the travel cost method, including many variations (e.g., zonal, individual, RUM).

In the United States, the 1970s are often referred to as the "environmental decade." During this decade, the general public and policymakers became more aware of and concerned about air and water pollution and the impacts of this pollution on the environment and human well-being. Part of the policy response to this heightened awareness and concern was the establishment of the U.S. Environmental Protection Agency (U.S. EPA) in 1970. Congress then passed landmark legislation, including the 1972 Clean Water Act and 1970 Clean Air Act Amendments, directing the U.S. EPA, among other agencies, to take specific actions to improve and protect national air and water quality. These landmark legislative acts (and later amendments) generated a demand on the part of the U.S. EPA and other government agencies for estimates of the economic value of air and water quality, including human health benefits and the contributions of air and water quality to recreation value and property values. In response to this demand for value estimates from policymakers, W2133 researchers became heavily involved in applying "revealed preference techniques" to measure environmental quality, including application of the travel cost method to measure changes in recreation trip value with changes in environmental quality, and application of the hedonic price method to measure the economic benefits of environmental quality to human health and property. During the "environmental decade," W2133 members and friends also led in efforts to develop and establish new "stated preference techniques" methods for directly valuing environmental quality, including the contingent valuation method.

W2133 "stated preference technique" research has also been boosted over the years by recognition of the existence and importance of *nonuse values* (or *passive use values*) in the natural resource and environmental policy arena. For example, federal legislation giving special status to wilderness (Wilderness Act, 1964); wild and scenic rivers (Wild and Scenic Rivers Act, 1968); wetlands (Clean Water Act, Section 404, 1972); and endangered species (Endangered Species Act, 1973) generated interest in estimating the total economic value (which includes use and nonuse values) of these resources for inclusion in benefit cost analysis.

Comparing the benefits and costs of major resource conservation programs such as the Conservation Reserve Program (CRP), first established in the 1985 Federal Farm Bill, and the Wetlands Reserve Program (WRP), first established in the 1990 Federal Farm Bill, also contributed to the demand by policymakers for estimates of the total economic value of natural resources. The response by W2133 to help meet this demand (primarily from USDA agencies) modified the W2133 research agenda to include estimating the economic value of both public and private natural resources. In the early days of the project, the W2133 research agenda focused almost exclusively on public natural resources.

Research by W2133 members and friends into methods for estimating the total economic value of natural resources, both "pro" and "con," also received a big push through federal legislation allowing legal action to collect compensation for natural resources and environmental damages (e.g., Comprehensive Environmental Response, Compensation and Liability Act of 1980 or CERCLA). The application of CERCLA to the Exxon Valdez oil spill case in the late 1980s triggered a particularly spirited debate among economists (including W2133 members and friends) about the validity of measuring nonuse value using the contingent valuation method. To help settle the debate, the federal government convened the now famous "Blue Ribbon Panel" chaired by Kenneth Arrow, which eventually upheld the contingent valuation method and its application for measuring total economic value (under certain conditions and guidelines).[4] Many W2133 members and friends, in one way or

[3] For example, see Clawson (1959) and Clawson and Knetsch (1966).

[4] See Arrow et al. (1993).

another, contributed to the "Blue Ribbon Panel" outcome and recommendations.

Up to this point, we have primarily discussed the connection between actions of the legislative branch of the U.S. government (e.g., Congress) and W2133 research. Largely because of the CERCLA legislation discussed above, the U.S. court system has also become involved in influencing the research of W2133 members and friends, primarily through natural resource damage assessment court cases. For example, the legitimacy of the W2133 research agenda outside of the academic world received a major "shot in the arm" by a District of Columbia Court of Appeals ruling in 1989, which in the context of CERCLA upheld the validity of nonuse value as a component of total economic value and granted equal standing to revealed and stated preference valuation techniques.

The role of the U.S. executive branch in influencing the W2133 research agenda and activities also cannot be ignored. Presidential Executive Order 12291, issued in 1981 by President Ronald Reagan, and Presidential Order 12866, issued in 1993 by President Bill Clinton, continue to require federal agencies to compare the benefits and costs of major regulations. These executive orders greatly increased the demand for use and nonuse value estimates by agencies such as the U.S. EPA. At the same time, demand continued for use and nonuse value estimates from other federal agencies such as the U.S. Forest Service, U.S. Army Corps of Engineers, and U.S. Bureau of Reclamation, who needed these values for their own policy and project benefit and cost comparisons. In response to increased demand for value estimates and a shortage of time and money to conduct primary data valuation studies in each case, a major part of the W2133 research agenda starting in the early 1990s shifted to development of theory and techniques for "benefit transfer," which involves transferring existing value estimates or data to new policy and management applications.

The economic and associated housing construction boom in the 1990s stimulated increased public concern over the loss of "green and open space," including agricultural land. As a result, public programs to conserve and protect "green and open space" that included agricultural land proliferated in the 1990s and 2000s, especially at the state and local levels. The federal government also got into the act by providing money to state and local governments to help conserve and protect prime agricultural land through the Federal Farm and Ranchland Protection Program, first established in the 1996 Federal Farm Bill and reauthorized with funding in the 2002 and 2008 Federal Farm Bills. In addition to land conservation, the 1996, 2002, and 2008 Federal Farm Bills also reflect increased concern and emphasis on water quality, wildlife habitat, and other environmental benefits (and costs) of private lands. During the 1990s and 2000s, the U.S. EPA has also demonstrated increased interest in the environmental benefits (and costs) of private lands, including agricultural lands. In response, over the past two decades W2133 researchers have devoted considerable effort towards estimating the economic value of farmland amenities and the benefits of reducing nonpoint source pollution from private lands. The demand by government agencies for estimates of the economic value of different attributes of land conservation and environmental protection programs helped stimulate research by W2133 members and friends into the area of choice experiments (e.g., conjoint analysis).

Starting in the 1990s, federal land and water management agencies began touting ecosystem management as a new way to manage natural resources under their charge in a more holistic manner. Ecosystem management focuses on protecting the integrity and health of an ecosystem as a whole for the purpose of providing intrinsic values and ecosystem goods and services of use and value to people. Recognizing that protection of ecosystems contributes to better air and water quality, in the 1990s and 2000s the U.S. EPA also became a major supporter of the ecosystem management concept applied to both public and private lands (for example, seeing ecosystem management as a means for reducing nonpoint source pollution from private agricultural lands). More recently, the USDA has endorsed the ecosystem management concept through establishment of an official Office of Ecosystem Services and Markets. Because of the prospect of

payments for ecosystem goods and services, the private sector is also showing more interest in ecosystem management.

The upshot of increased public and private sector interest in ecosystem management is that demand for information on the economic value of ecosystem goods and services has been on the rise over the past two decades. The holistic nature of ecosystem management presents new challenges to natural resource and environmental valuation, the methods of which have traditionally emphasized a reductionist, piecemeal approach. W2133 researchers are currently in the process of exploring how the existing valuation technique "tool box," composed of revealed and stated preference techniques, can be applied to valuing an entire ecosystem and the complex set of ecosystem goods and services supported by that ecosystem. Surely modifications and perhaps entirely new approaches will be needed.

Related to the desire to protect the integrity and health of ecosystems under their charge, federal land and water management agencies in the 1990s and 2000s have been expressing growing concerns about major threats to ecosystems, including invasive species and "high impact" human activities such as off-road motorized vehicle use (e.g., ATVs, snowmobiles) and personal watercraft (e.g., jet skis). Management decisions to limit off-road vehicle and personal watercraft use in public land and water areas will be cheered by some stakeholders and booed by others. These management decision conflicts are classic economic tradeoffs (e.g., one party gains while another loses) that can be illuminated by estimates of the economic value of competing goods and services (e.g., less ATV use vs. more hiking use of the same trail). W2133 researchers help policymakers to address natural resource tradeoffs by quantifying alternative natural resource and environmental goods and services in commensurable (e.g., monetary) terms.

W2133 has been responsive to government needs and, at the same time, has also helped move the field of valuation forward through methods and problems. In doing so, W2133, to some extent, has helped set research and policy agenda. The work of the natural resource and environmental economists, such as those in W2133, disentangling and measuring use and nonuse values no doubt has impacted the manner in which U.S. EPA and other agencies go about making rules and setting research agendas. In turn, these rules and research results provide addition information and feedback for subsequent agency action and research funding.

As a result of its long legacy in economic valuation research and in responding to contemporary policy and management needs, the W2133 project is currently working in four principle areas: valuing ecosystem management of forests and watersheds, valuing changes in recreational access, assessing benefits and costs of agro-environmental policies, and assessing economic values of agricultural land preservation and open space.[5] In doing so, W2133 members and friends are making substantial progress in advancing the state-of-the-art in valuation methods; publishing books on valuation methods, nonmarket valuation, and theory and methods of measuring environmental and resource values; and publishing numerous articles in top peer-reviewed journals. For example, W1133 members and collaborators have authored widely used texts on valuation methods (e.g., Champ et al. 2003); books on statistical methods used in nonmarket valuation (e.g., Haab and McConnell 2002); a second edition on the theory and methods of measuring environmental and resource values (Freeman 2003); and contributions on state-of-the-art valuation survey design (e.g., Kaplowitz, Lupi, and Hoehn 2004). This special issue highlights some current work of W2133 members and friends.

In keeping with the multifaceted objectives of W2133, this special issue grew out of the 2009 W2133 meeting in Austin, Texas. As a result of shared interest in publishing together and highlighting some of what W2133 members and friends do, the joint decision was made to undertake this special edition. There are three types of articles authored/coauthored by W2133 members in this special edition. Virtually all of these articles benefitted from being shared with W2133 members and friends at some point in their devel-

[5] http://nimss.umd.edu/homepages/home.cfm?trackID=8676

opment. First, there is a set of articles that focuses on valuation methodology. Next, a set of articles focuses primarily on primary data/valuation applications. Finally, a set of articles center on benefit-transfer applications.

Methodology

Three articles in this special issue deal primarily with methodological issues and challenges. As resource and environmental economists, members and friends of W2133 not only use valuation methods but also identify methodological challenges as well as solutions to those challenges. The articles by Volinskiy et al.; von Haefen; and Kobayashi, Rollins, and Evans evidence W2133 members' efforts in advancing valuation methodology.

In "A Pseudo-Sequential Choice Model for Valuing Multi-Attribute Environmental Policies or Programs in Contingent Valuation Applications," Volinskiy et al. question the assumption of independence of irrelevant alternatives in a sequential contingent valuation format. In contrast to how most valuation studies treat nonindependence as a consequence of unobserved individual effects, the authors consider an inferential process in which any particular choice is part of a general choosing strategy of a survey respondent. Their work goes on to suggest a stochastic model that is consistent with the reflexivity, transitivity, and continuity axioms of utility analysis. By applying their theoretical model to a valuation of watershed ecosystem restoration, Volinskiy et al. demonstrate that an empirical model recognizing reflexivity and transitivity, and one that also allows for continuity, shows the highest in-sample predictive ability.

Von Haefen's "Incomplete Demand Systems, Corner Solutions, and Welfare Measurement" demonstrates how corner solutions raise difficulties for the specification, estimation, and use of incomplete demand systems for welfare measurement with disaggregate consumption data, as is common in the outdoor recreation literature. A simple analytical model of consumer behavior is used to elucidate the potential biases for welfare measurement arising from modeling the demand for M goods as a function of $M + N$ prices ($N > 1$) and income, when individuals do not consume all goods in strictly positive quantities. Results from a Monte Carlo experiment suggest that these biases can be substantial for large-scale policy shocks when prices are highly correlated.

The third primarily methodological article, by Kobayashi, Rollins, and Evans, "Sensitivity of WTP Estimates to Definition of 'Yes': Reinterpreting Expressed Response Intensity," examines coding issues relating to contingent valuation responses. Typically, willingness to pay estimation exercises involve some strategy for mapping non-dichotomous responses onto a dichotomous yes/no dependent variable. The authors propose a new approach to selecting which responses qualify as 'yes.' They go on to use the proposed method with polychotomous contingent valuation data for preventative land management programs in the Great Basin. Kobayashi, Rollins, and Evans estimate willingness to pay using their proposed method and other methods for response recoding found in the literature. By contrasting the results under different approaches, they demonstrate how and why WTP point estimates vary across recoding methods. They go on to discuss the comparative advantages of their more generalized recoding approach based on predicted probabilities of 'yes'responses.

Primary Data/Valuation Application

This special issue contains three articles that highlight efforts to collect primary data and estimate values associated with environmental and natural resources. The articles by Davis and Moeltner, Holmes and Englin, and Jakus et al. demonstrate several different approaches for collecting data and estimating value/demand.

In "Valuing the Prevention of an Infestation: The Threat of the New Zealand Mud Snail in Northern Nevada," Davis and Moeltner endeavor to provide important resource valuation information for an ecosystem under threat of grave harm from an invasive species. The Truckee/Carson/Walker River watershed in northern Nevada is under an imminent threat of infestation by the New Zealand mud snail, an aquatic nuisance species with the potential to harm recreational fisheries. Davis and Moeltner combine a

utility-theoretic system-demand model of recreational angling with a Bayesian econometric framework to provide estimates of trip and welfare losses under different types of regulatory control policies. Their work finds that trip and welfare losses associated with decreased fishing because of infestation can be substantial. The authors' results suggest that immediate investments in preemptive strategies via public outreach and awareness campaigns are warranted.

Holmes and Englin's "Preference Heterogeneity in a Count Data Model of Demand for Off-Highway Vehicle Recreation" is driven, in part, by a need for more information about demand for off-highway vehicle (OHV) recreation. OHV recreation on public land is rapidly growing despite the controversy engendered by its negative environmental impacts and incompatibility with other recreational uses. Holmes and Englin's study is aimed at collecting better information about the people who pursue this sport and the net economic values they derive, to help recreation managers develop better strategies for managing OHV sites. Holmes and Englin examine heterogeneity in the preferences for OHV recreation by applying the random parameters Poisson model to a data set of off-highway vehicle (OHV) users at four National Forest sites in North Carolina. The analysis develops estimates of individual consumer surplus and finds that estimates are systematically affected by the random parameter specification. There is also substantial evidence that accounting for individual heterogeneity improves the statistical fit of the models and provides a more informative description of OHV riders.

Jakus et al. also examine OHV. In "The Welfare Effects of Restricting Off-Highway Vehicle Access to Public Lands," Jakus et al. add to the relatively small, but growing, literature regarding the rapidly growing and controversial recreational use of OHVs. Jakus et al. estimate a version of a random utility model that accounts for unobserved heterogeneity across sites, a situation which is likely to hold in OHV modeling. The statistical models used by these authors were relatively robust, indicating that open acreage is most highly valued by OHV users. The model also indicates that limiting use of motorized vehicles to "trails only" has a relatively small impact on consumer welfare. At the same time, the complete loss of access to public land has the potential to cause large welfare losses to respondents who use OHV. The reported findings have implications for management of OHVs: the relatively small welfare losses associated with restricting OHV travel to existing trails and roadways suggest that agencies can assure access for OHV enthusiasts while simultaneously satisfying mandates for resource protection.

Benefit Transfer

The third set of articles that W2133 members coauthored focus on the growing literature on benefit transfer. In benefit transfer, valuation estimates from some previous studies are used to estimate the value of another similar resource. The articles by Braden et al. and Johnston and Thomassin explore two approaches for using meta-analysis in benefit transfer.

Braden et al., in "Meta-Functional Transfer of Hedonic Property Values: Application to Great Lakes Areas of Concern," explore the use of functional benefits transfer to forecast the effects of waste sites on property values. These authors couple the results of a meta-analysis of hedonic studies of waste sites with spatial analysis techniques to produce estimates of the effects of toxic contamination in Areas of Concern (AOCs) in the U.S. Great Lakes. Based on U.S. Census data for median home values, the methods the authors use suggest that approximately $5.2 billion (2005 dollars) have been lost in residential property values around twenty-three of the AOCs in the Great Lakes. The authors place their estimate into perspective by sharing the estimated remediation costs for AOCs, and they also identify issues surrounding the use of a meta-analysis with hedonic property value studies to support functional transfer.

In their paper, "Willingness to Pay for Water Quality Improvements in the United States and Canada: Considering Possibilities for International Meta-Analysis and Benefit Transfer," Johnston and Thomassin present a multinational meta-analysis estimated to identify systematic components of willingness to pay (WTP) for

surface water quality improvements. Their model was developed to support benefit transfer for Canadian policy development. The authors draw metadata from stated preference studies that estimate WTP for water quality changes affecting aquatic life habitats. Because there are few Canadian examples of such WTP studies, the authors assess the properties of a multinational (U.S./Canada) meta-analysis and compare it to that of a single-country (U.S.) analog. Their paper illustrates the potential information that may be derived, the analytical challenges, and the relative performance of resulting meta-functions for benefit transfer.

Conclusion

This special edition illustrates the legacy and continuing contribution that the W2133 project is making to state-of-the-art valuation methods, applications, and policymaking. In addition to the scholarly work presented here, the more than forty members of W2133 are hard at work on peer-reviewed manuscripts, grant applications, as well as getting prepared for the myriad courses they teach. For more information on W2133, its members, and research efforts, please visit: http://nimss.umd.edu/homepages/home.cfm?trackID=8676.

References

Arrow, K., R. Solow, P.R. Portney, E.E. Leamer, R. Radner, and H. Schuman. 1993. "Report of the NOAA Panel on Contingent Valuation." *Federal Register* 58(10, January 15): 4601–4614.

Bergstrom, J.C., and J.B. Loomis. 2006. "What Is W133, and How Has Non Market Valuation Research Responded to Environmental and Resource Problems and Policies?" *AERE Newsletter* 26 (1, May): 21-24.

Champ, P.A., K.J. Boyle, and T.C. Brown. 2003. *A Primer on Nonmarket Valuation.* Dordrecht/Boston/London: Kluwer Academic Publishers.

Clawson, M. 1959. *Methods of Measuring the Demand for and Value of Outdoor Recreation.* Reprint No. 10, Washington, D.C.: Resources for the Future.

Clawson, M., and J.L. Knetsch. 1966. *Economics of Outdoor Recreation.* Baltimore, Maryland: Johns Hopkins University Press.

Freeman, A.M., III. 2003. *The Measurement of Environmental and Resource Values: Theory and Methods.* (2nd edition). Washington, DC: Resources for the Future.

Haab, T.C., and K.E. McConnell. 2002. *Valuing Environmental and Natural Resources: The Econometrics of Non-Market Valuation.* Cheltenham, UK: Edward Elgar.

M.D. Kaplowitz, F. Lupi, and J.P. Hoehn. 2004. "Multiple-Methods for Developing and Evaluating a Stated Choice Survey to Value Wetlands." In S. Pressor, J.M. Rothgeb, M.P. Couper, J.T. Lessler, E. Martin, J. Martin, and E. Singer, eds., *Methods for Testing and Evaluating Survey Questionnaires.* Hoboken, NJ: John Wiley and Sons.

U.S. Water Resources Council. 1973. "Water and Related Land Resources: Establishment of Principles and Standards for Planning." *Federal Register* 38(174, III, September 10): 4.