VALUING ECOSYSTEM QUALITY THROUGH ENVIRONMENTAL INDICATORS

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Abstract. In response to the challenges facing the growing communities of the Upper Etowah River Basin, the proposed research will 1) explore the ability of indicators to capture individual preferences for environmental quality and 2) elicit individuals' willingness to make trade-offs. To complete the research objectives, a random sample of property owners in two counties of the Upper Etowah River Basin will be surveyed. Survey respondents are asked to make judgments about the desirability of hypothetical development scenarios based on differing levels of water quality and associated trade-offs.

INTRODUCTION

The process of urbanization has been found to alter stream hydrology and water quality. Increasing impervious surface coverage, land clearing, removal of stream side vegetation are all factors in decreasing water quality and degrading aquatic habitats. Regulating land use is one means of protecting stream quality. Land use regulation can include limiting development within a watershed, establishing stream-side buffer zones, and zoning areas for appropriate use. In addition, voluntary best management practices (BMPs) can be encouraged, and programs that offer incentives can be adopted.

Regulations and BMPs that protect water quality require some trade-offs. Therefore, one relevant consideration is: what is the public willing to give up in order to maintain or improve water quality? This study proposes to evaluate the public's desired level of water quality for the Upper Etowah River Basin given hypothetical development scenarios and the associated trade-offs. To determine trade-offs and measure the value of clean water we are using of form of contingent valuation known as contingent choice.

METHODS

This research has been designed to closely examine some of the trade-offs between a county's growth and water quality. A contingent choice survey instrument was developed in a focus group setting with individuals that represent different stakeholder groups in the Upper Etowah River Basin. A preliminary study of this region identified several groups including new and long-term residents, the business community, land and housing developers, outdoor recreation industry and organizations, timber, farming, and citizen river conservation groups (Paladino, et al., 1995).

Focus group participants were given information on several environmental indicators that are commonly used by scientists to monitor water quality and stream health. The participants where then asked to choose three environmental indicators that were most meaningful to them for describing water quality. After selections were made, participants were asked what factors affected their choices. This helped use to understand what kinds of written, quantitative, or visual representations of indicators and supporting explanation are most useful to stakeholders. Indicator votes were compiled and the top three indicators were used in the survey to describe varying levels of water quality.

The survey questions are presented in a format known as contingent choice. The respondents are first given information on the indicator(s) and a hypothetical development scenario. They are then asked to rank three potential policies based on the predicted levels of the indicator(s) and the action required to obtain the results. Policy A represents the projected levels of water quality in 2020 given current development trends, while policies B and C are hypothetical scenarios that provide improved levels of water quality (Figure1).

Trade-offs for an improvement in water quality include restrictions to property rights and a payment mechanism to elicit the respondent's willingness to pay. We decided to use a utility fee assessed to households per annum as our payment mechanism based on prior research (Carson and Mitchell, 1989; Brent Keller, Spalding County Public Works, pers. com.). Property rights restrictions are expressed as impervious surface limits, development location constraints, increased stormwater management, and restrictions on lawn-care. In this way, we hope to cover restrictions that affect the watershed as a whole as well as individual property owners.

In addition to the contingent choice questions, the survey also asked respondents' about their environmental attitudes and knowledge, recreational use of the area's waters, and characteristics (e.g., age, sex, education, income, etc.) to determine if they are significant in influencing their preferences.

RESULTS AND DISCUSSION

Results from the focus groups indicate that participants respond to indicators that are visual (i.e. sedimentation) or that are currently in the news (i.e. pollutants). Indicators of biological integrity were considered too "scientific." The three indicators used in the survey are percent impervious surface, average sediment load, and chemical contaminants which was broken down into average metal concentrations in bed sediments and average summed pesticide concentrations.

Although data are not yet available from the survey there are some expectations as to the results of the study. One potential result will be an understanding of how individuals' value improvements in water quality through changes in indicators. We will also be able to say something about the kinds of property rights people are willing to forgo to protect water quality. In addition, we believe that this process will be instrumental in involving ecologists and economists in a process were they will be able to observe and receive direct feedback on how their research is understood and used as part the decision-making process by the public. Natural resource managers and government officials will also benefit from knowing how their constituency values water quality and they can use this information in planning for the future.

LITERATURE CITED

Paladino, S., K. Anderson, B.R. Dubrow, M. Paul, and T. Schofield, 1995. Intercounty Cooperation on the Upper Etowah: A Window of Opportunity. University of Georgia and the Georgia Institute of Technology.

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Survey Question 3:

When rain falls on exposed soils, the topsoil is eroded and carried to nearby streams. When the soil settles in the stream it covers the stream bottom destroying aquatic habitat and filling in stream channels, drainage ditches, lakes, and reservoirs. This is known as *sedimentation*. Excessive *sedimentation* increases water-treatment costs, damages structures (e.g. bridges, dams, and water-intake equipment), harms fish and other aquatic life, and reduces recreational use.

Rain falling on pavement picks up pollutants, like metals, that have collected during periods of dry weather. The runoff carries the metals directly to streams where they attach to sediments. Exposure to high concentrations of metals in river sediments is a health risk to both aquatic life and humans who eat fish or other species collected from our streams.

One way to prevent sedimentation and metals contamination is to leave an undisturbed strip of land next to streams. This strip is called a *buffer strip* or *buffer zone*. A wider strip provides more area for runoff to absorb into soil, thus providing more protection for streams and water quality. The county is currently reviewing a proposed ordinance that would increase the current *buffer* width from 50 feet to 100 feet on all *perennial* streams. A *perennial* stream is a stream that flows all year round.

However, land that can no longer be developed (like these *buffer strips*) is taxed at a lower rate reducing the county's tax revenue. To make up for the loss in tax revenue and to pay for management of the buffer, a surcharge will be added to all utility bills.

Please rank the following three proposed policies (1 being the best and 3 being the least):

Current policy and water quality	**Proposed** Policy and resulting water quality in **2020**		
	Policy A :	**Policy B** :	**Policy C** :
no development within 50 feet of a perennial stream	no future development within 50 feet of a perennial stream	no future development within 75 feet of a perennial stream	no future development within 100 feet of a perennial stream
average sediment load	average sediment load will increase by 50%	average sediment load will increase by 30%	average sediment load will increase by 5%
average metal concentrations in sediments	average metal concentrations in sediments will increase by 30%	average metal concentrations in sediments will increase by 20%	average metal concentrations in sediments will decrease by 5%
	$0 per year no change in utility fees	**$20** per year increase in utility fees per household	**$40** per year increase in utility fees per household
RANKING			

If you do not understand the question, please check this box ☐

Figure 1. Example survey question.