Economic Tradeoffs of Stream Restoration

Danielle Schwarzmann
University of Maryland, Baltimore County
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Introduction

1. History of Stream Management
2. Environmental Perspective
3. Economic Perspective
4. Creating a Link
5. How to Create the Link
6. Future Directions

History of Stream Management

- Since the Roman Empire people have been managing streams to achieve various goals
- Between 1890 and the late 1920s the conservation movement within the United States considered the environment a resource that should be used in its entirety to promote efficient development (Hays, 1959)

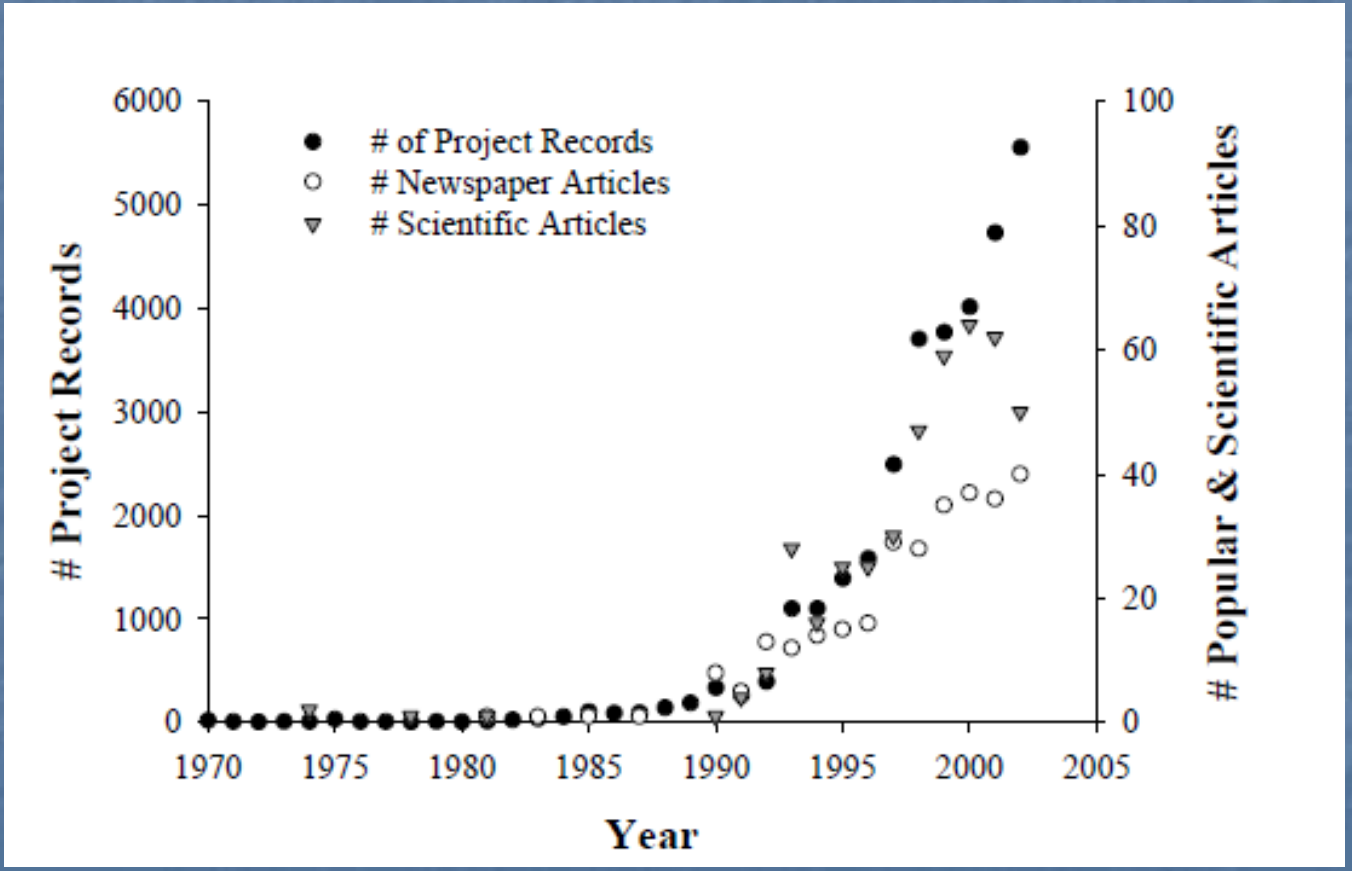
History of Stream Management

- John Muir believed that environmental resources should be managed to promote not only economic efficiency but to maximize the aesthetic, spiritual and nonmonetary values of the resource
- The American Fisheries Society was established in 1870. By 1934, 46 miles of trout stream habitat had been improved to promote fish populations (Greeley, 1935).

History of Stream Management

- In 1936, Congress passed the Flood Control Act following the major floods along the Mississippi River in 1927 in an effort to reduce flood damage (Riley, 1998).
- By 1972, 235,000 miles of waterways had been channelized or were slated to be channelized.

History of Stream Management



Bernhardt et al., 2005

Stream Restoration

- Definitions
  - "reestablishment of processes, functions, and related biological, chemical, and physical linkages between the aquatic and associated riparian ecosystems; it is the repairing of damage caused by human activities" (Kauffman, et al., 1997 pg 12)
  - Restoration projects are intended to reestablish 'natural' rates of certain ecological, chemical, and physical process and/or to replace damaged or missing biotic elements (Wohl et al., 2004)

Environmental Benefits

- Environmental Context
  - Erosion Control
  - Water Quality Management
  - Flood Control
  - Habitat Management

Economic View

- Restore valuable environmental services
  - Water filtration
  - Erosion control
  - Habitat for aquatic and terrestrial species
- Often not valued in markets
  - Ignored in policy decisions

Economic Benefits

- Use Values
  - Recreational opportunities
    - Bird watching or fishing
- Bequest Values
- Existence Values
- Aesthetic

Why Value?

- Valuing the services provided by ecosystems may provide justification for government intervention
- Helps policymakers in making educated decisions about the trade-offs between the uses of the environment
- Determine how individuals value the tradeoffs between various economic benefits that the environment provides

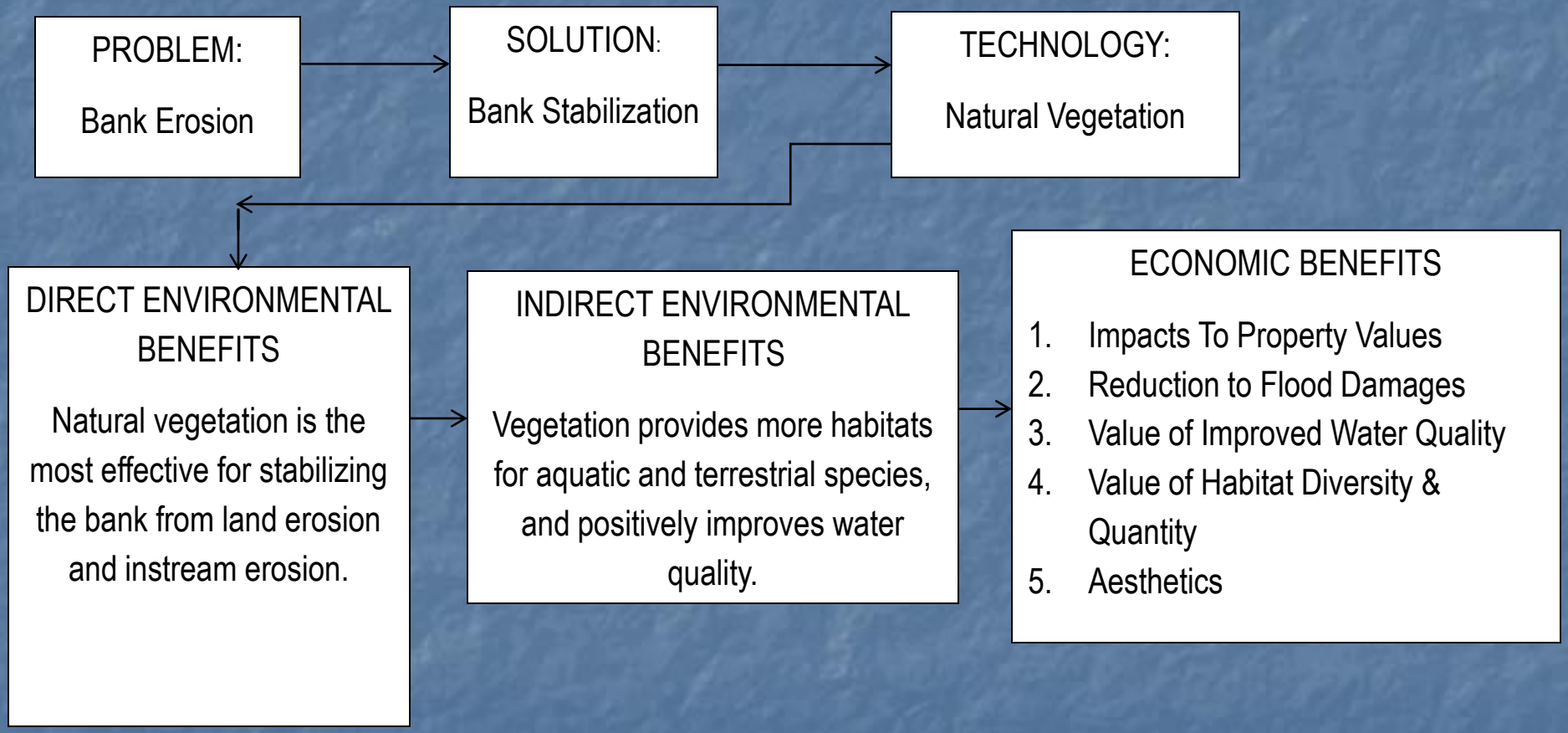
Creating the Link

- Where to start?
  1. Must identify the problem with the stream
  2. Identify a solution
  2. Approach to restore the stream
  3. Direct environmental benefits
  4. Indirect environmental benefits
  5. Maintenance requirements
  6. Economic benefits

Creating the Link

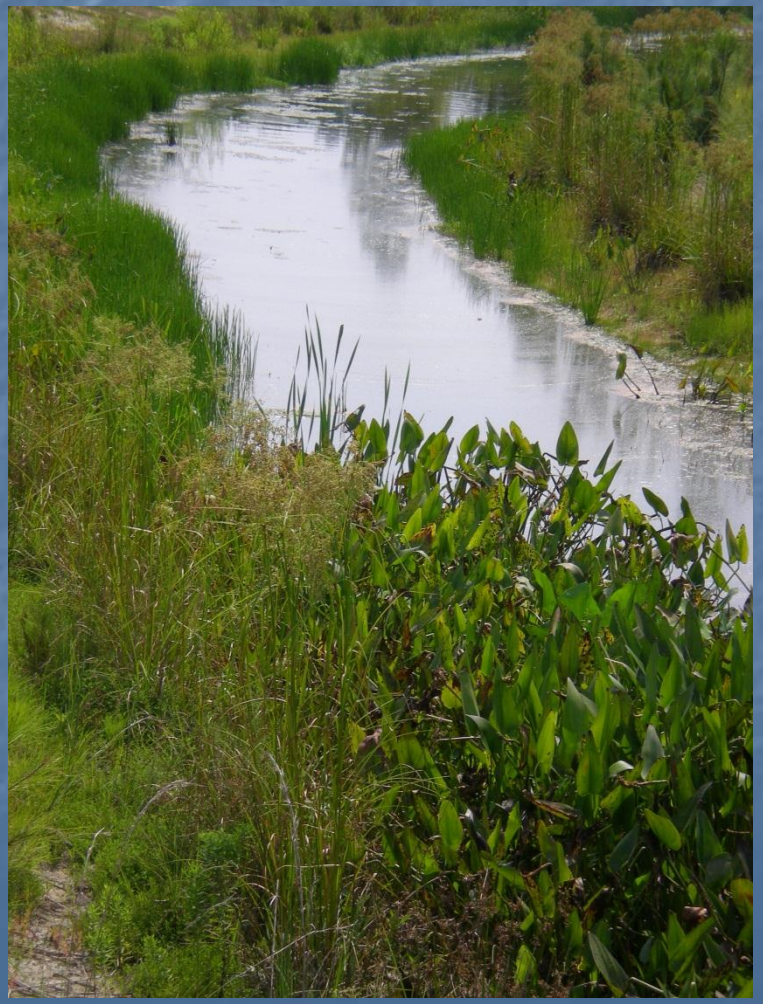
- Environmental to Economic Context
  - Erosion Control
    - Preservation of property
  - Water Quality Management
    - Increased use values
  - Flood Control
    - Reduction to property damage
  - Habitat Management
    - Use and existence values

Creating the Link



Creating the Link

- Identifying the environmental benefits can allow us to identify the proper methods to translate into economic terms
  - Need to know the type of environmental change to identify the economic method



Types of Economic Valuation

	Method	Calculate	Type of Value	Information needed
Revealed Preferences	Travel Cost Method	WTP	Use	Number of trips, cost of trips, and ICs
	Hedonic Pricing	WTP	Use	House's sales & structural data, neighborhood characteristics, ICs
	Expenditure Function	WTP	Use	Value of alternative man-made approach
	Production Function	WTP	Use	Impact of change on quantities, market value of those quantities
	Market Prices	WTP	Use	Market data
	Benefit Transfer	WTP	Use/Non-Use	Previous studies, and information on the applied market
Stated Preferences	Contingent Valuation	WTP/WTA	Use/Non-Use	Survey data collected
	Discrete choice models	WTP	Use/Non-use	Income, price of goods, and individual characteristics (IC)
	Benefit Transfer	WTP/WTA	Use/Non-Use	Previous studies, and information on the applied market

Research Questions

1. Do people have specific aesthetic preferences for structural and landscape features of stream restoration? If so, what are they?
2. How does the likelihood of choosing stream restoration vary with different revegetation and structural design characteristics?
3. Does additional information about the effectiveness of different restoration designs on other outcomes such as on erosion control and water increase the probability of choosing a more natural stream restoration or increase the willingness to pay for a stream restoration project?
4. Are there personal characteristics that influence a person's decision to choose restoration or not? What are they?

Economic Method

- Contingent valuation
  - CV presents respondents with a scenario and asks them to choose an alternative or value the improvement (Mitchell & Carson, 1989).
  - Recognized by (NOAA) as a reliable method to value natural resources (Arrow et al., 1993)
  - Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Superfund) recognized that CV is a valid method for measuring benefits and damages

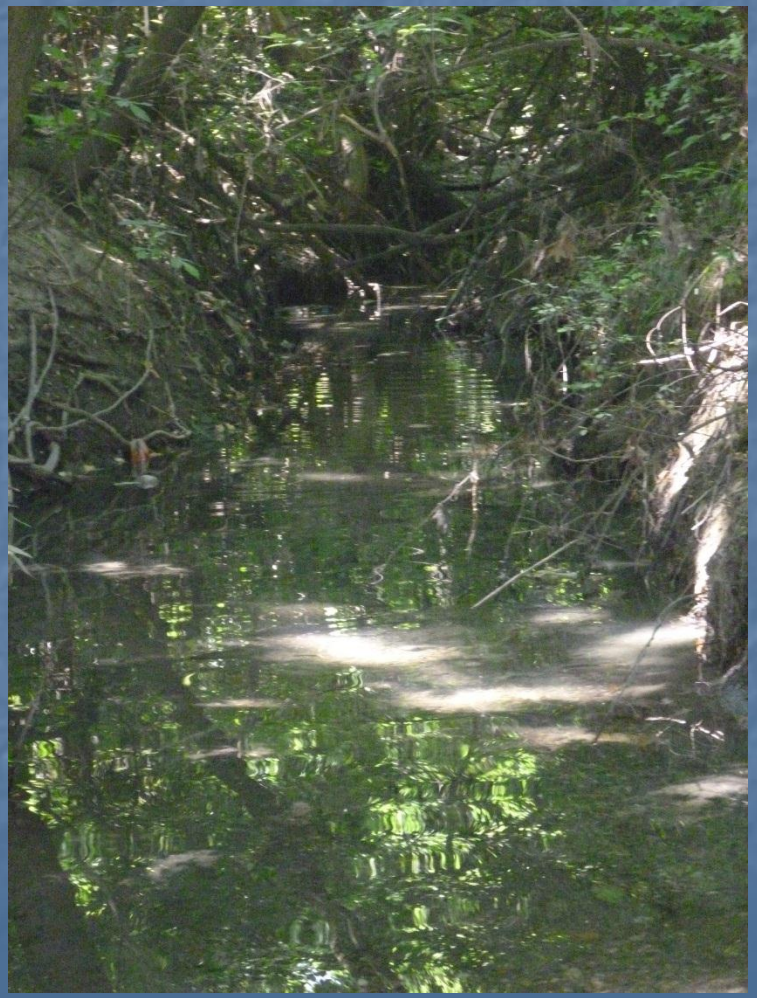
Sampling Procedure

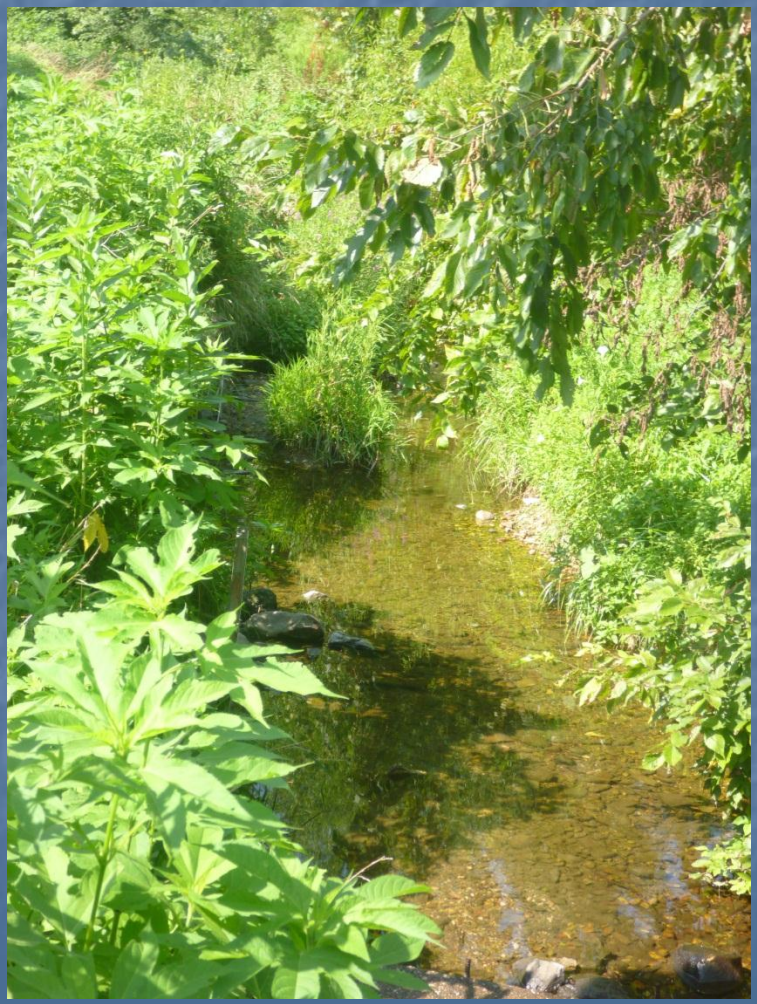
- Who has standing?
- Size is based on the amount of money for incentives
  - 801 households
- Random sample drawn from MD Property View
- Mailed in the beginning of January

Survey Development

- Review of CV studies/questionnaires
- Talked to experts in the field of CV
- Working with advisor
- Cognitive Interviews
- Focus Groups
- Review by scientists and survey practitioners

Example





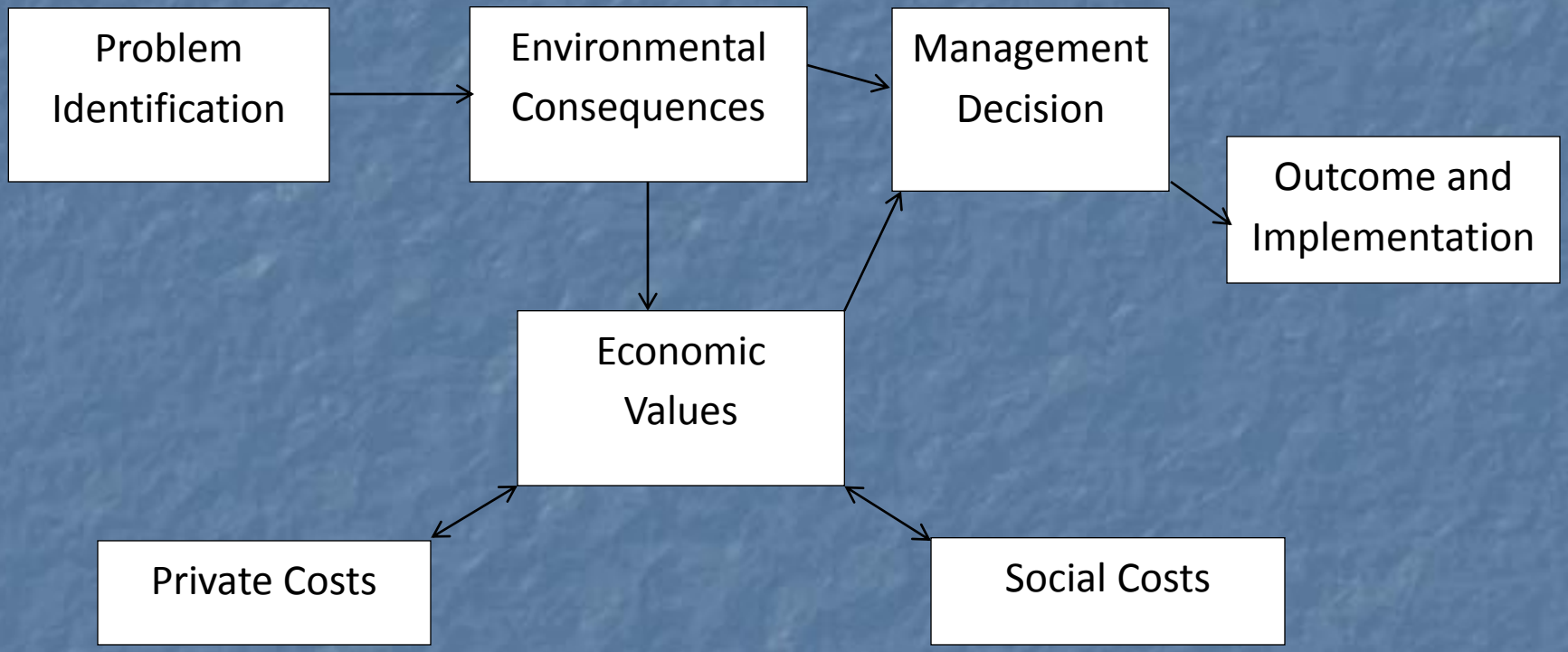
Environmental Scientists

- Evaluated pictures to be shown to respondents
  - Erosion control
  - Water quality
  - Habitat quality

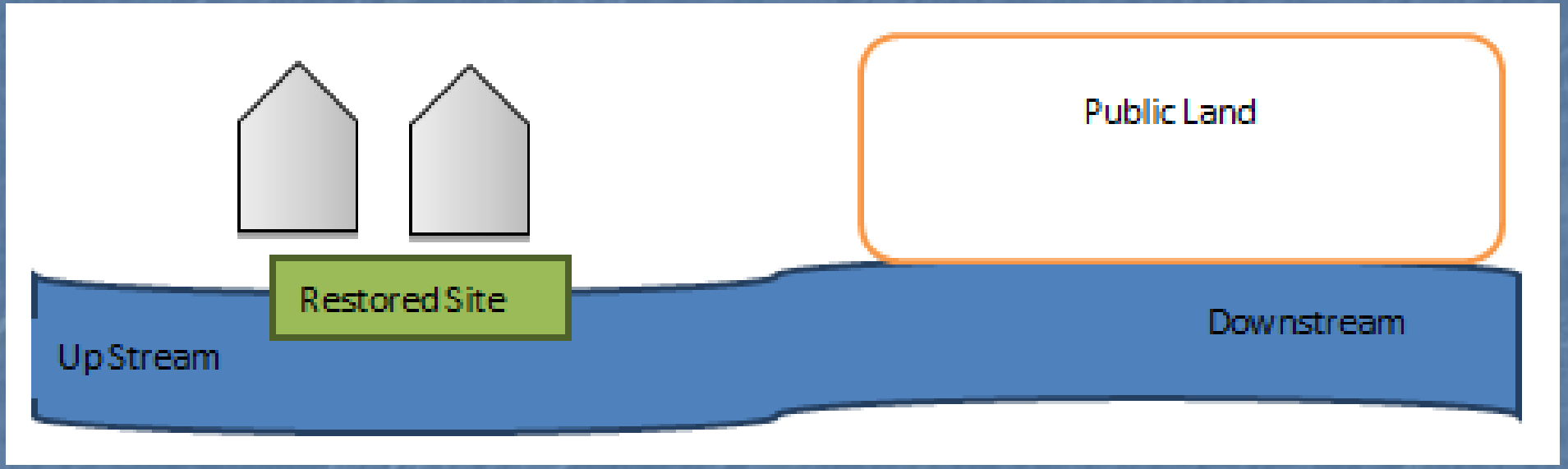
Cognitive Interviews & Focus Groups

- People are more likely to vote for a fee than a tax
  - Prefer it to be a one time annual fee
- Believe the ones with more vegetation cost more
- Prefer the pictures with clean edges

Decision Model

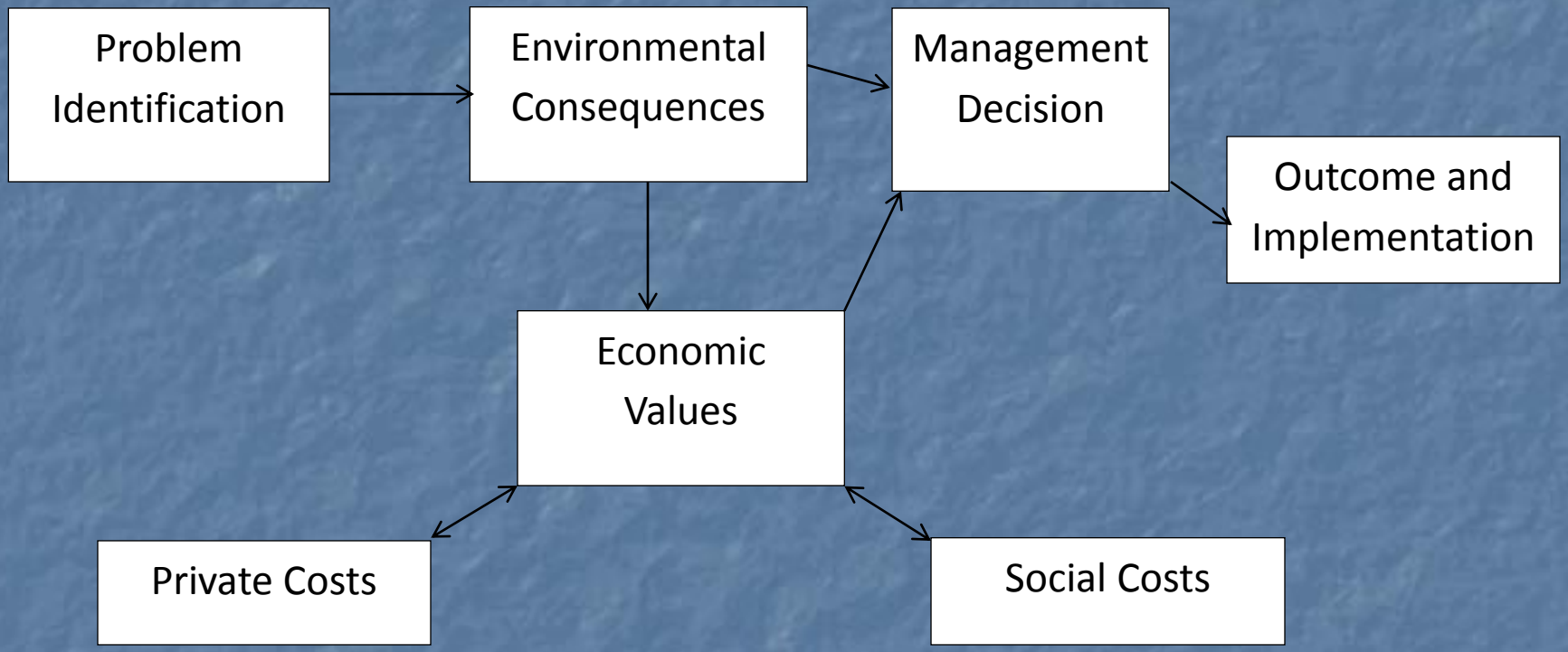


Private versus Public Benefits



- Private benefits accrue to restored site
- Downstream there are social benefits

Decision Model



Policy Implications

- Education may help to gain more acceptance of the environmentally beneficial restoration designs
- How much money do Marylanders support going to stream restoration?

Conclusion

- This research will help to further the integration of multiple disciplines into stream restoration ensuring outcomes that are both environmentally beneficial and economically justified

Thank You

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