Bay County RESTORE 2015

Economic Framework for Benefit Maximization

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Project Purpose

- Maximize the economic benefits of RESTORE funds
- Identify full set of benefits by project type
- Prioritize projects that provide environmental and economic benefits
- Communicate benefits to promote long-term support and funding

Project Approach

- Utilize existing science
  - 2009 St. Andrew Bay Stormwater Management Plan
- Utilize existing economics
  - Regional and national studies
  - ECONorthwest benefit and impact models
- Develop metrics for benefits, costs, tradeoffs, and beneficiaries

Project Steps

- 1. Identify local environmental problems
- 2. Identify and categorize available solutions
- 3. Identify and describe benefits by solution
- 4. Align these benefits with beneficiary groups
- 5. Quantify benefits based on local demand and scarcity
- 6. Articulate long-term strategy principles
- 7. Highlight consistent and appropriate near-term actions

Project Deliverables

- Matrix of benefits, beneficiaries, and metrics by project type
- Communication of benefits in economic terms and economic impacts
- Summary report with documentation
- Guidance for use of matrix and data to evaluate projects and communicate benefits
- Near-term recommendations

An example

- Green Stormwater Infrastructure
  - Utilize natural systems and public space to provide multiple benefits from water quality and habitat projects
  - Part of a portfolio of approaches, multi-purpose use of public funds and public areas

Green Stormwater Infrastructure

- Green roofs, rain barrels
- Bioswales, rain gardens, filter strips
- Pervious pavement, pervious pavers
- Green streets, riparian areas,

GSI:
Infrastructure that takes advantage of natural systems to manage stormwater for water quality

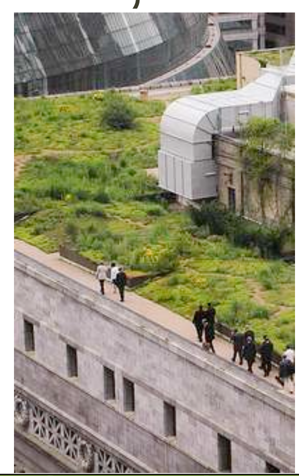

Photo Credits: University of Rhode Island, Flickr-Udall Legacy Bus Tour, Reich

Economic benefits of LID

Reduced flooding costs

Reduced stormwater control costs

Reduced filtration costs

Example

A basement flooding relief project using LID techniques is projected to cost 60% of the cost of traditional pipe upsize and replacement to handle the stormwater.
Portland Greenstreets Policy, 2007

Photo Credit: iSP

Economic benefits of LID

Reduced flooding costs

- Preserving over 9,000 acres of urban and suburban wetlands on the Charles River in the Boston metro area yields $17 million in flood control benefits each year.
- Benefits are highly localized, depend on type and extent of flooding avoided.

Economic benefits of LID

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Example

Portland's downspout disconnection program eliminates 1.2 billion gallons of stormwater each year from the city's combined sewer system, saving $250 mil. in infrastructure improvement costs.
(Kloss, 2007)

Photo Credit: Reich

Avoided stormwater management costs of trees

Location	Total Value
Houston, TX	$1.33 bil.
Atlanta, GA	$2.35 bil.
Washington, DC	$4.74 bil.
San Antonio, TX	$1.35 bil.
Puget Sound Metro, WA	$5.9 bil.
Chesapeake Bay Region	$1.08 bil.
Vancouver, WA - Portland & Eugene, OR	$20.2 bil.

(American Forests' Urban Ecosystem Analyses, 2000-2003)

Economic benefits of LID

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Reduced stormwater control costs

Reduced filtration costs

Example

Instead of using sand filters and storm drain structures to treat stormwater along a seawall on the Anacostia River, a bioretention filter strip was installed, saving $250,000. (Weinstein, 2002)

Photo Credit: NOAA

Economic benefits of LID

Reduced filtration costs

- Water systems save millions in filtration costs by protecting watershed integrity:
  - $180 million avoided in Boston, MA
  - $200 million avoided in Portland, OR
  - $150-200 million avoided in Seattle, WA

(Postel et al. 05)

Less Gray Infrastructure

Example system savings:
- Narrow streets, sidewalks
- Fewer curbs and gutters

2nd Ave. SEA Street, Seattle
Narrower street width and fewer sidewalks reduced paving costs by 49%.

More Buildable Lots

Somerset Subdivision, MD
Eliminated a stormwater pond, added six additional lots.

Gap Creek Subdivision, AR
Cluster development and LID techniques allowed developers to add 17 additional lots.

Lower Costs, Higher Value

Gap Creek Subdivision, AR
Lots sold for $3,000 more, cost $4,800 less to develop than conventional lots.

Mill Creek Subdivision, IL
Clustered site design, swales and reduced impervious surfaces saved about $3,500 per lot.

Developers benefit from conservation subdivisions in RI

Research from RI shows *conservation* subdivisions can be more profitable to developers than *conventional* subdivisions.

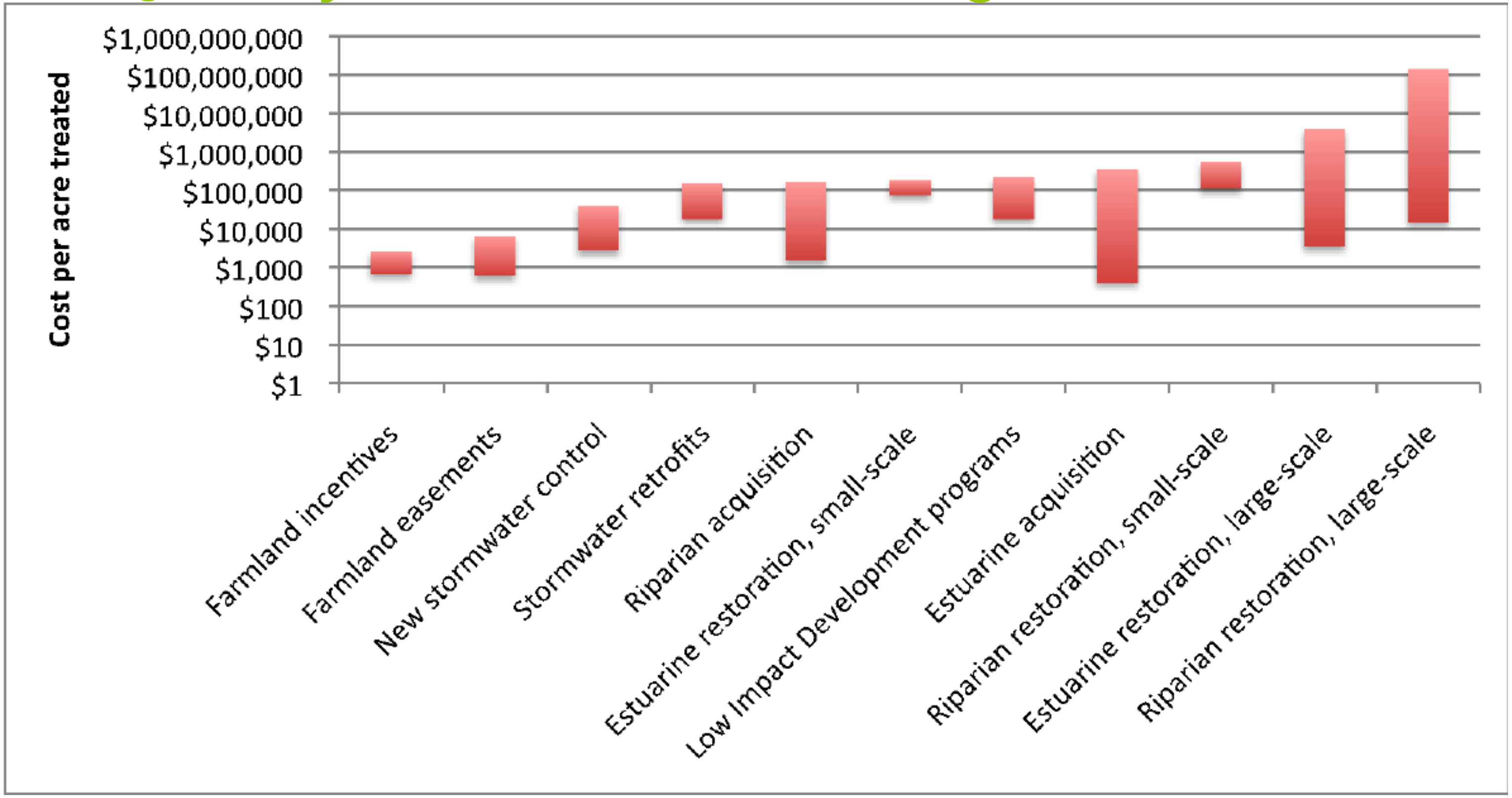
- Can charge 12-16% more per lot.
- Lots cost an average of $7,400 less to develop.
- Lots sold in about half the time of conventional lots.
- Ecological benefits translate into greater resident satisfaction.

(Mohamed, 2006)

Photo Credit: MA Department of Conservation and Recreation

Cost Variation

Water Quality Action Cost Ranges



Action	Low	High
Wastewater Treatment Plant Upgrades	$1 million/ million gallons/day	$11 million/ million gallons/day
New Wastewater Treatment Plants	$33 million/ million gallons/day	$41 million/million gallons/day
Combined Sewer Overflow Upgrades	$10 million/city	$700 million/city

Economic Considerations for GSI

- Diffuse, multiple benefits
- GSI goods and services poorly suited for markets
- Variety of potential benefits
  - Demand for benefits by type, level – community dependent
- Cost savings are scale, benefit-dependent
- Private onsite benefits alone typically insufficient motivation

Benefits

- Water-related benefits
- Energy-related benefits
- Air quality-related benefits
- Climate change-related benefits
- Heat island effect
- Community livability
- Habitat-related benefits
- Public education benefits

Water-related Benefits

- Avoided costs from reduced stormwater runoff
  - Capital costs
  - Treatment costs
  - Compliance costs

- Reduced flooding
  - Property value
  - Flood insurance

Energy-related Benefits

- Avoided energy consumption
  - Decrease treatment and conveyance costs
  - Decrease cooling and heating bills

Energy Savings Per Tree Per Year		
	Electricity	**Natural Gas**
Small tree	48 kWh ($6.32)	1.5 M Btu ($7.26)
Medium tree	67 kWh ($8.82)	2.1 M Btu ($9.94)
Large tree	136 kWh ($17.91)	3.4 M Btu ($16.24)

Air Quality-related Benefits

- Avoided costs of air pollution
  - Reduce emissions
  - Increase filtration

Annual Air Quality Benefits Per Tree				
	NO2	**SO2**	**O3**	**PM-10**
Small tree	$1.30	$0.77	$0.50	$0.57
Medium tree	$2.10	$1.40	$0.67	$0.87
Large tree	$3.71	$2.30	$0.94	$1.17

Annual Air Quality Benefits Per 1,000 SF of Green Roofs				
	NO2	**SO2**	**O3**	**PM-10**
Low	$1.00	$0.47	$1.96	$0.32
High	$1.59	$0.84	$3.07	$0.38

Heat Island Effect

- Avoided costs from heat island effect

  - Reduce energy consumption
  - Reduce health effects from ozone formation
  - Reduce heat-related illness and death

Community Livability

- Community-level benefits from green infrastructure

  - Increase home value ($5-$28 per tree)
  - Improve quality of nearby recreation ($950 per acre of nearby green space per year)
  - Reduce noise pollution (homes on busy streets typically have lower sale prices)

Habitat-related Benefits

- Small-scale habitat
  - Attract plants and animals to urban areas
- Increase in habitat area
  - Wetland Habitat
  - Riparian Habitat

Wetland Function	$Acre/Year
Flood	$645
Water quality	$684
Water quantity	$208
Recreational fishing	$585
Bird watching	$1,988
Amenity	$5
Habitat	$502
Storm	$389

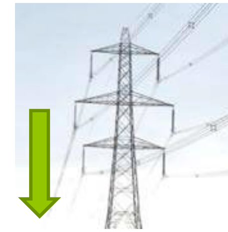
Illustrative Benefits

Natural Capital

Flooding Costs

Regulatory Costs

Habitat Value



Energy Costs

Property Values

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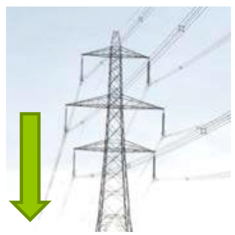
Physical Capital



Energy Costs

Safety

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Social Capital

Property Values

Health & Well-being

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Public vs. Private
Developers are (usually) motivated by benefits that <u>move their bottom line</u>.