

Benefit Indicator Tools for Assessing Restoration Projects Based on who Benefits from Restored Ecosystem Services

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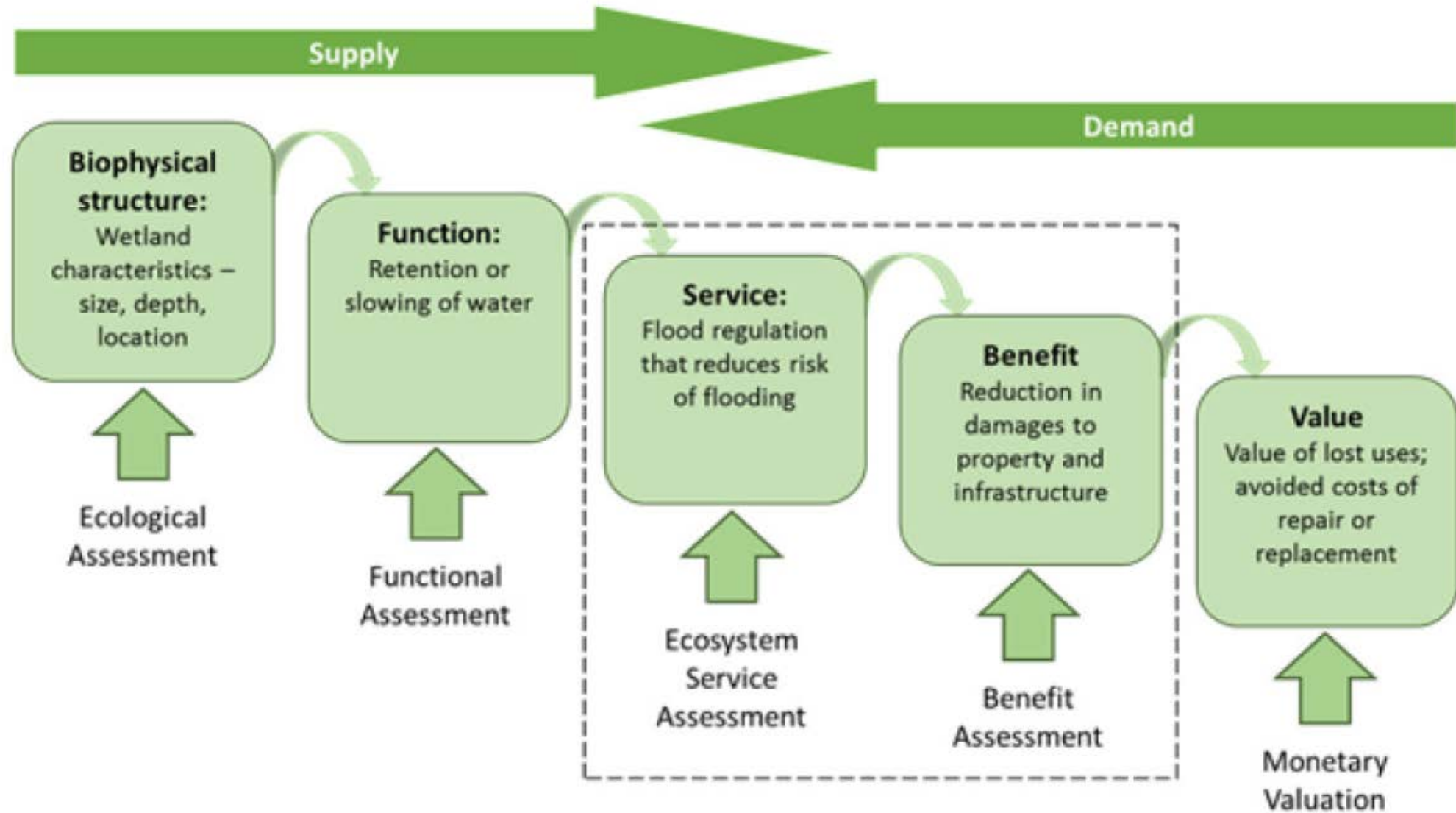
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Environmental decisions require tradeoffs

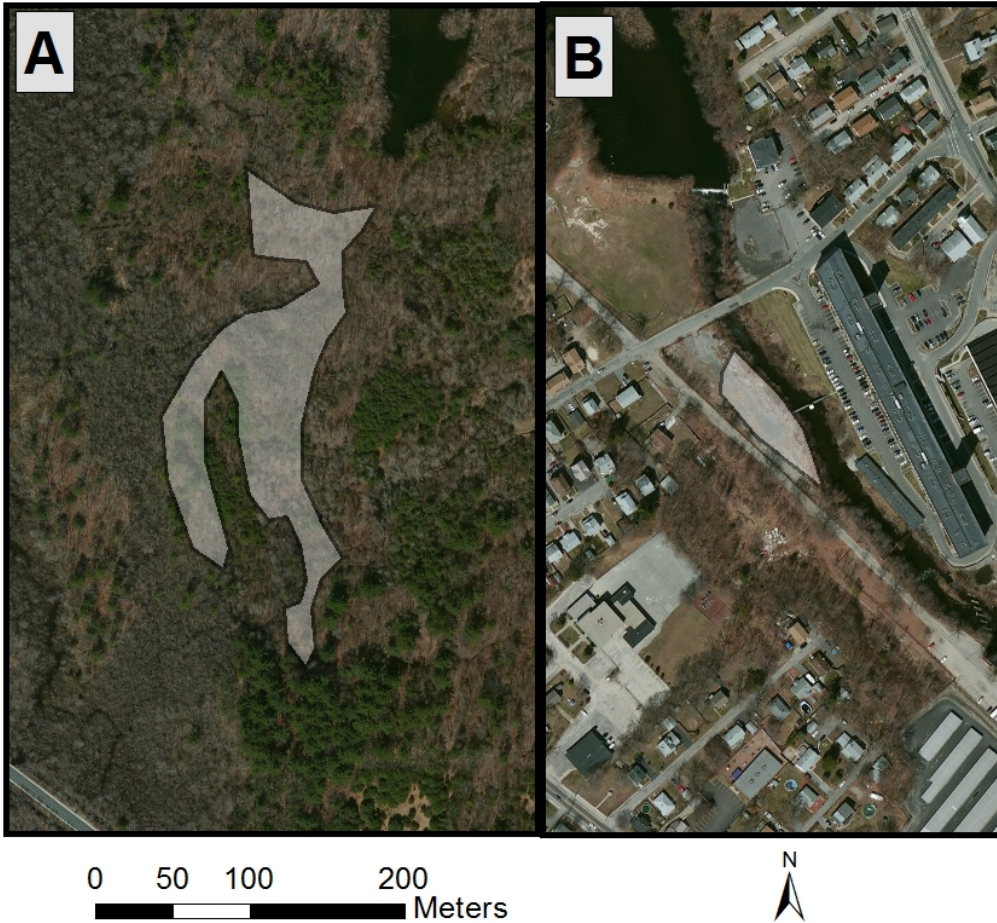


Which of these sites should we spend money on?

Both ecological and social criteria are important.

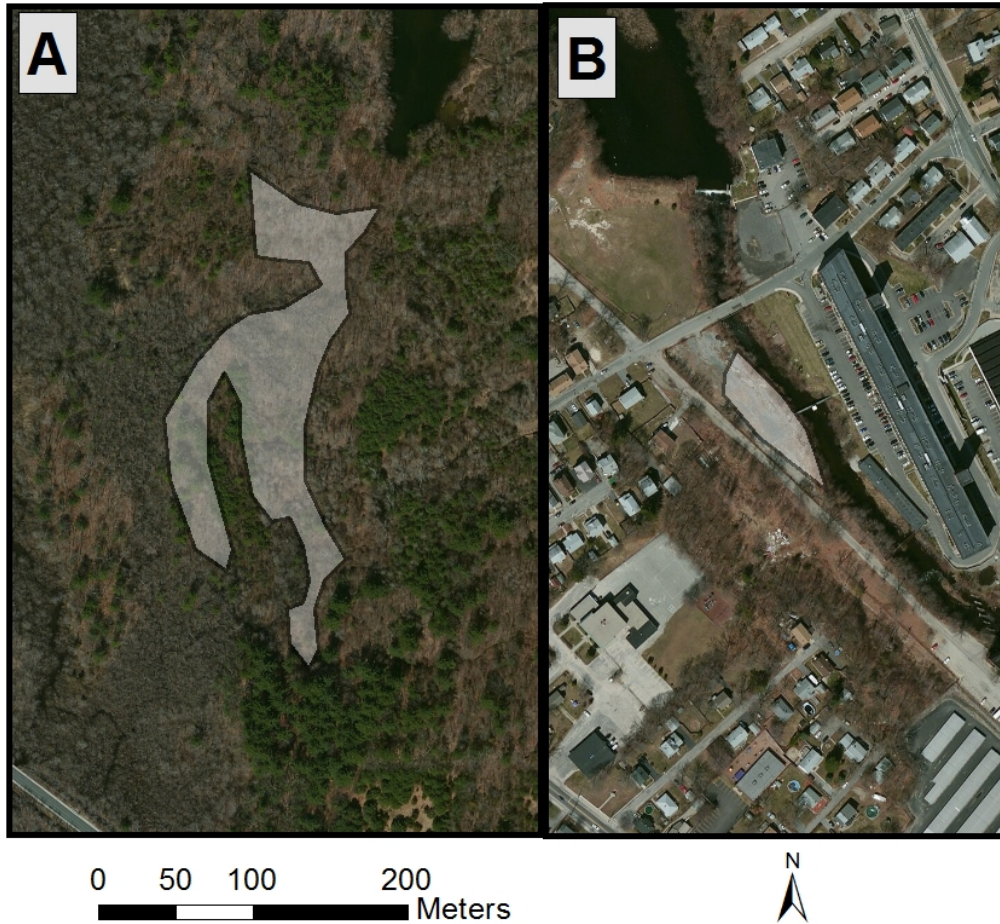


Example Site - Biophysical



❖ **Structure:** Site A is larger

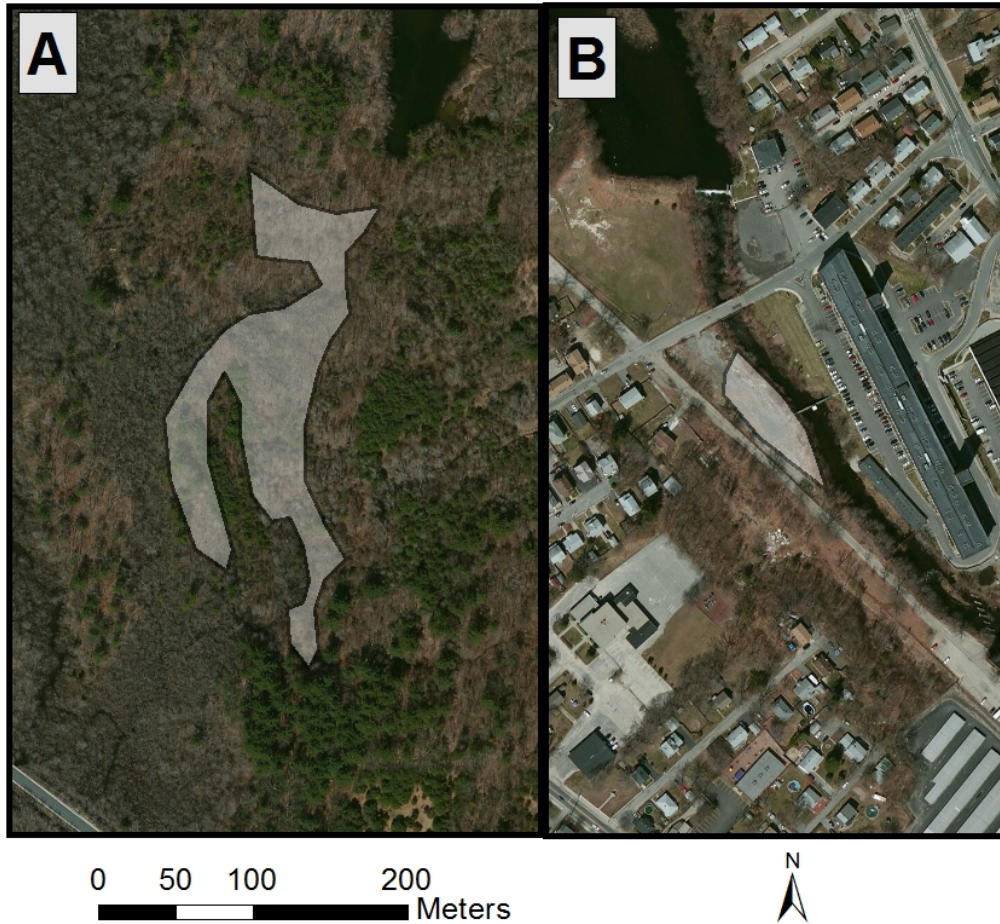
Example Site - Function



❖ **Structure:** Site A is larger

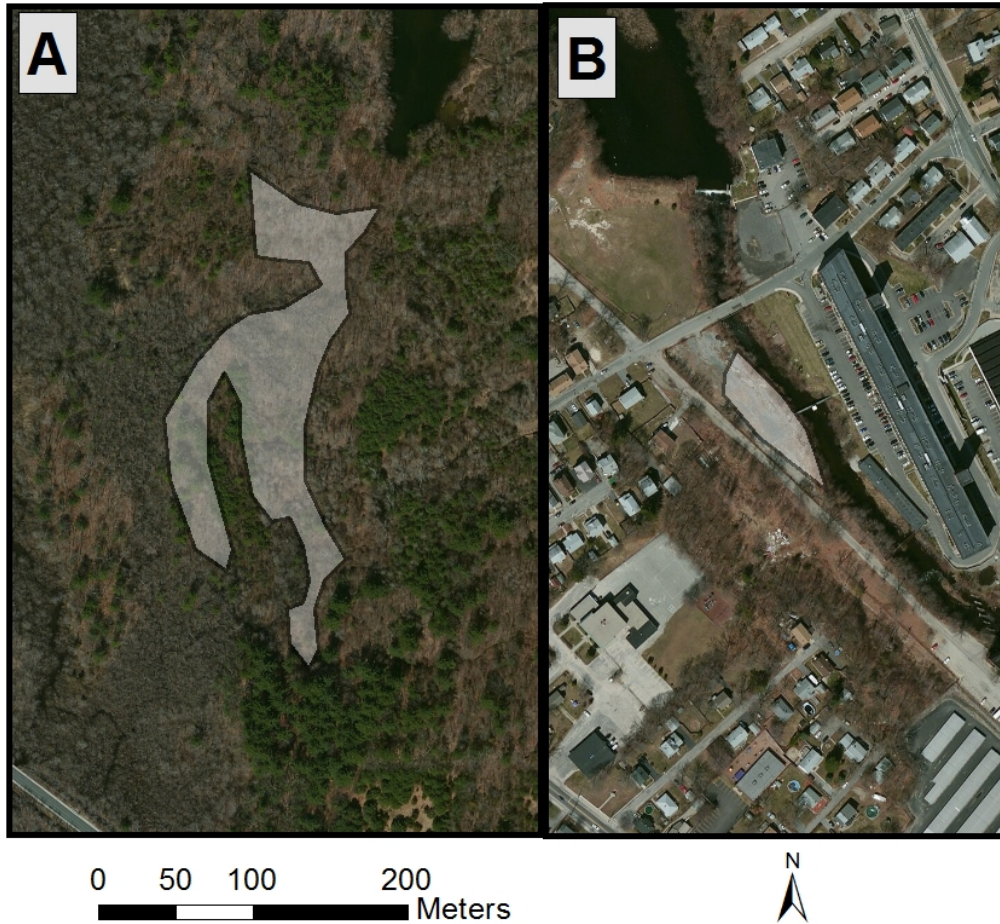
❖ **Function:** Site A retains more water than Site B

Example Site - Service



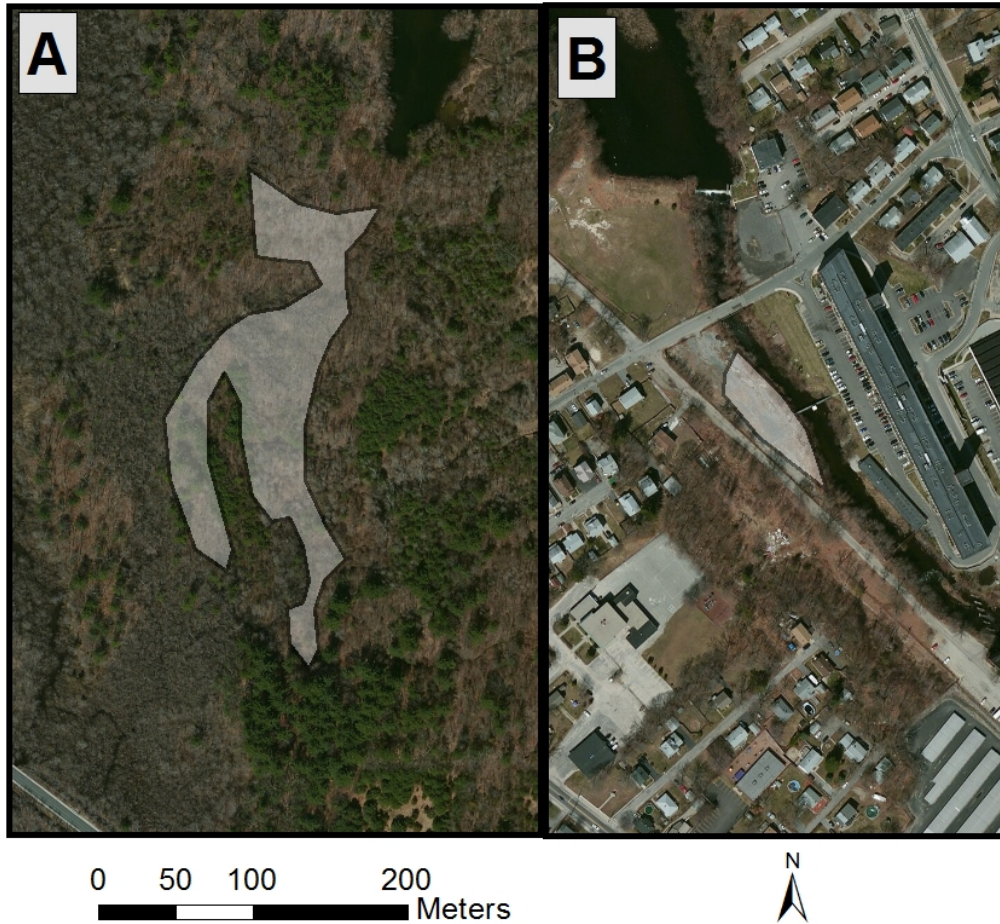
- ❖ **Structure:** Site A is larger
- ❖ **Function:** Site A retains more water than Site B
- ❖ **Service:** Site A reduces floodwaters (service production) more than Site B

Example Site - Value



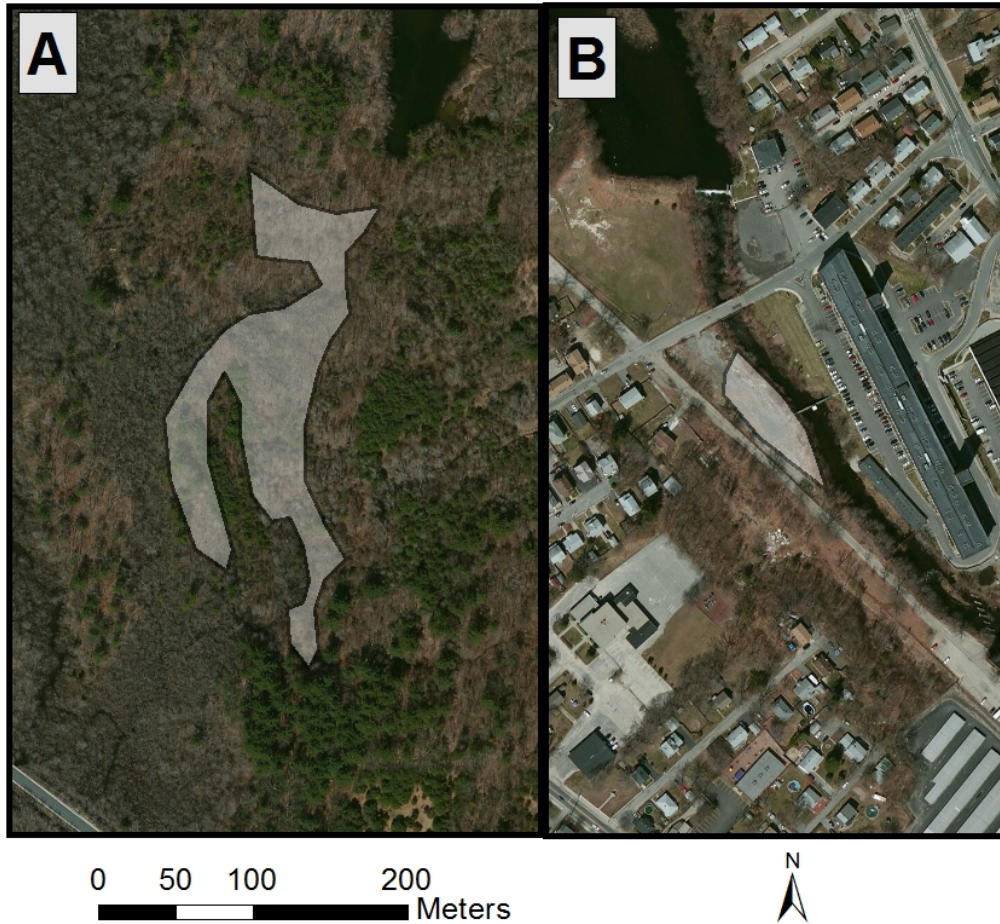
- ❖ **Structure:** Site A is larger
- ❖ **Function:** Site A retains more water than Site B
- ❖ **Service:** Site A reduces floodwaters (service production) more than Site B
- ❖ **Value:** What is Site A restored worth?
 - Benefits Transfer – uses a value estimated somewhere else to assign a \$/area of wetland
 - Replacement Cost - estimates the cost to replace the same service production (e.g. with gray infrastructure)

Example Site - Value



- ❖ **Structure:** Site A is larger
 - ❖ **Function:** Site A retains more water than Site B
 - ❖ **Service:** Site A reduces floodwaters (service production) more than Site B
 - ❖ **Value:** What is Site A restored worth?
- Monetary measures are not always the solution:
- ❖ Does it fit the decision?
 - ❖ Decision maker may lack resources
 - ❖ Decision may be able to be made without
 - ❖ Does it tell the right story?
 - ❖ “Total value” is elusive
 - ❖ Distribution of benefits/ environmental justice

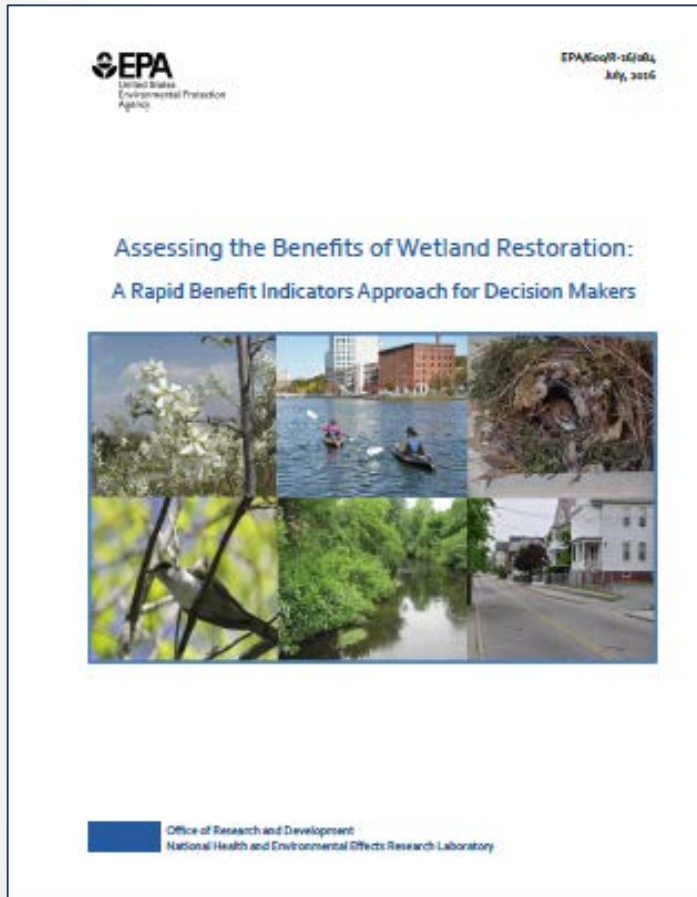
Example Site - Benefit



- ❖ **Structure:** Site A is larger
- ❖ **Function:** Site A retains more water than Site B
- ❖ **Service:** Site A reduces floodwaters (service production) more than Site B
- ❖ **Benefit:** How much would each site reduce flood damages (service delivery)?



A rapid assessment approach using benefit indicators



- ❖ A framework for compiling and using benefit indicators
- ❖ Rapid and User Friendly, but can be applied with different levels of detail depending on the context
- ❖ Focus is on benefits to people
- ❖ Designed to be used along with a biophysical/functional assessment
- ❖ Initial application to freshwater wetlands in a watershed ranging from urban to rural
 - ❖ May be applied, with modifications, to other ecosystems



Benefit indicators answer these questions:



1. Can people benefit from an ecosystem service?
2. How many people benefit?
3. How much are people likely to benefit?
4. What are the social equity implications?
5. How reliably will services be provided over time?



❖ The Guidebook includes examples of 5 Ecosystem Services:

❖ Flood water regulation

❖ Scenic landscapes

❖ Learning opportunities

❖ Recreational opportunities

❖ Birds






Checklist and Spatial Analysis Tools are set up to assess benefits for these same 5 ecosystem services.

Services and Benefits Addressed in this Guide

This guide addresses the following important services and benefits provided by wetlands in urbanized areas. We selected these because:

- They may be provided by relatively small, urban sites
- They are relevant to our example watershed
- They were mentioned in our interviews with managers

Wetlands can provide other services, and multiple types of benefits may result from each service. We are not providing indicators for a comprehensive set of freshwater wetlands' benefits, but are focusing on this subset of possible benefits. The approach we illustrate can be applied in a similar way to other services and benefits.

Ecosystem Service	How people benefit
 Flood water regulation	Reduced Flood Risk: The risks from floods to people and structures are reduced.
 Scenic landscapes	Scenic Views: People can enjoy scenic views.
 Learning opportunities	Environmental Education: People can benefit from studying nature or from enhanced connection to nature.
 Recreational opportunities	Recreation: People can enjoy recreation
 Birds	Bird Watching: People can watch or hear birds.



Checklist & Spatial Analysis Tools

Scenic Views - Site B

A. Is the site visible from homes, roads or trails? Yes No

B. Will site restoration improve the scenic quality of the landscape? Yes No

C. Scenic View benefits do not require Complementary Inputs (NA) Yes No NA

1. How many people or homes within 160 feet of the site? UNITS?

2. How many people or homes within 325 feet of the site? UNITS?

3. Do trails or roads pass within 325 feet of the site? Yes No

A. 1 Does the site have features or characteristics of aesthetic interest? Yes No

Note the features or characteristics

B. How much wetlands and open water are within 650 feet of the site? (number or percent cover) UNITS?

C. How many different natural land cover types are within 650 feet of the site? (number of types)

D. Does the site meet these people's visual preferences? Yes No



GUI_demo.mxd - ArcMap

Full Tier 1 Assessment

Table Of Contents

- Layers
 - restoration_Sites
 - e911_14_Addresses
 - schools08
 - RIPTAstops0116
 - bikepath
 - e911Roads13q2
 - NWI14
 - rilu0304
 - SoVI0610_RI
 - LandUse2025
 - FEMA_FloodZones_clp
 - dams

Social Equity (optional)

Reliability (optional)

Flood Zone Polygons (optional)

Dams/Levees (optional)

Educational Institution Points (optional)

Bus Stop Points (optional)

Trails (hiking, biking, etc.) (optional)

bikepath

Roads (streets, highways, etc.) (optional)

e911Roads13q2

Wetland Polygons (optional)

NWI14

Land use or greenspace Polygons (optional)

rilu0304

Landuse Field (optional)

Greenspace Field Values (optional)

1. Can people benefit from an ecosystem service?

Yes, if:

There is demand



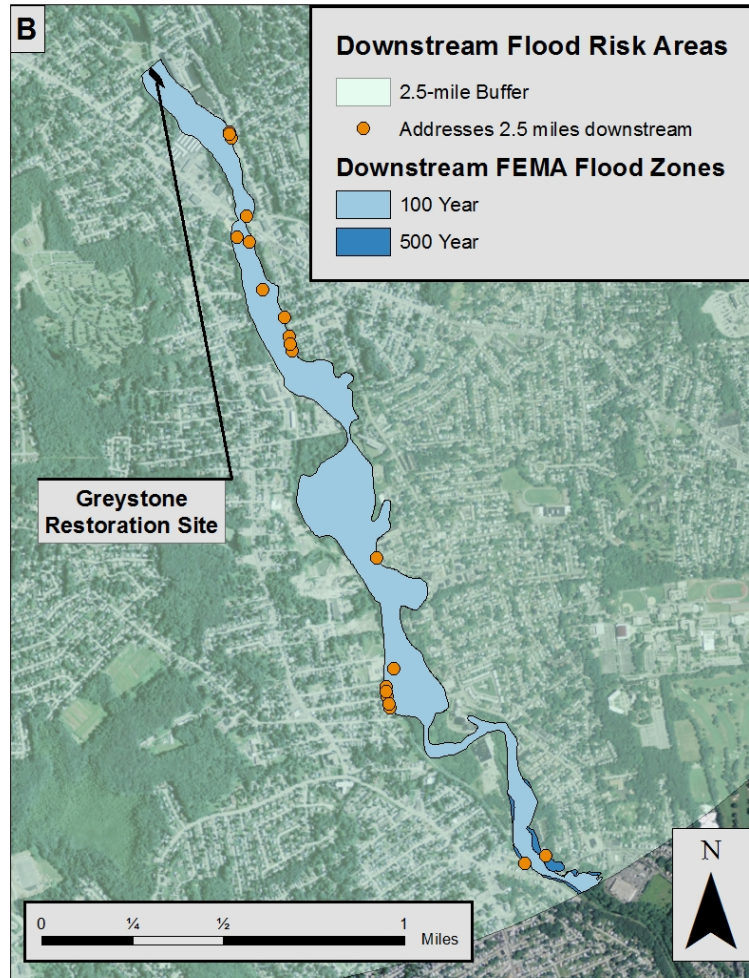
If required, complementary inputs are available



There is sufficient quantity and quality of the service

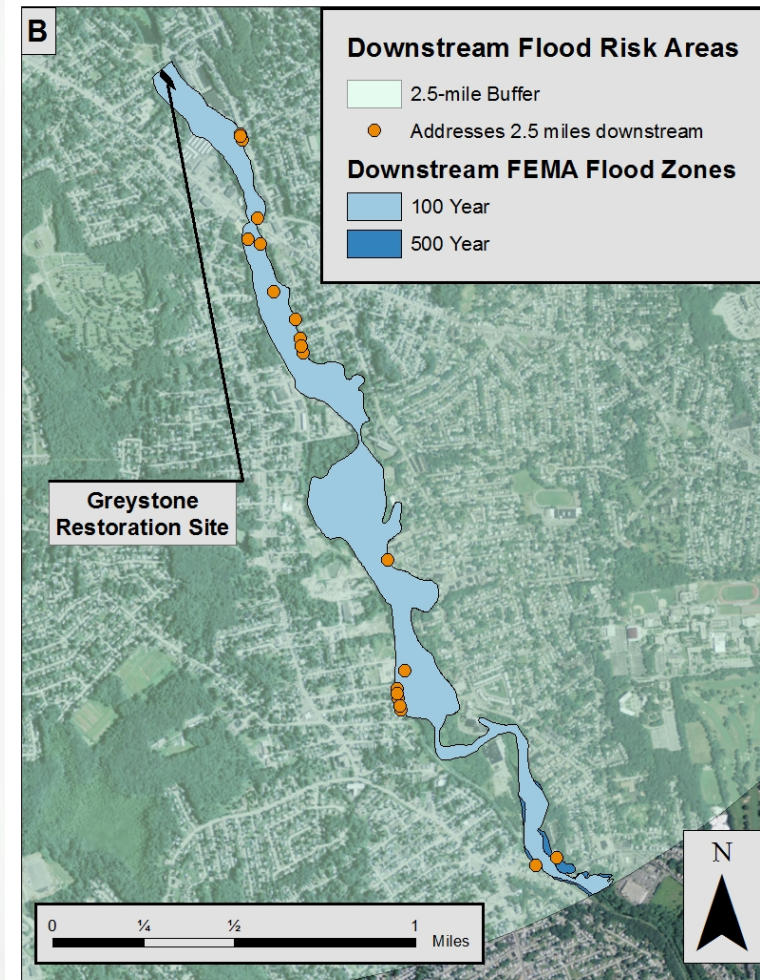


2. How many people benefit?



- ❖ **Structure:** Site A is larger
 - ❖ **Function:** Site A retains more water than Site B
 - ❖ **Service:** Site A reduces floodwaters (service production) more than Site B
 - ❖ **Benefit:** Site B benefits more people
- (1) Map flood zones downstream from the sites within the distance benefits are expected to travel (e.g. 2.5 miles)

2. How many people benefit?



- ❖ **Structure:** Site A is larger
 - ❖ **Function:** Site A retains more water than Site B
 - ❖ **Service:** Site A reduces floodwaters (service production) more than Site B
 - ❖ **Benefit:** Site B benefits more people
- (1) Map flood zones downstream from the sites within the distance benefits are expected to travel (e.g. 2.5 miles)
 - (2) Map who benefits by identifying houses, people, and/or infrastructure within the downstream flood zones

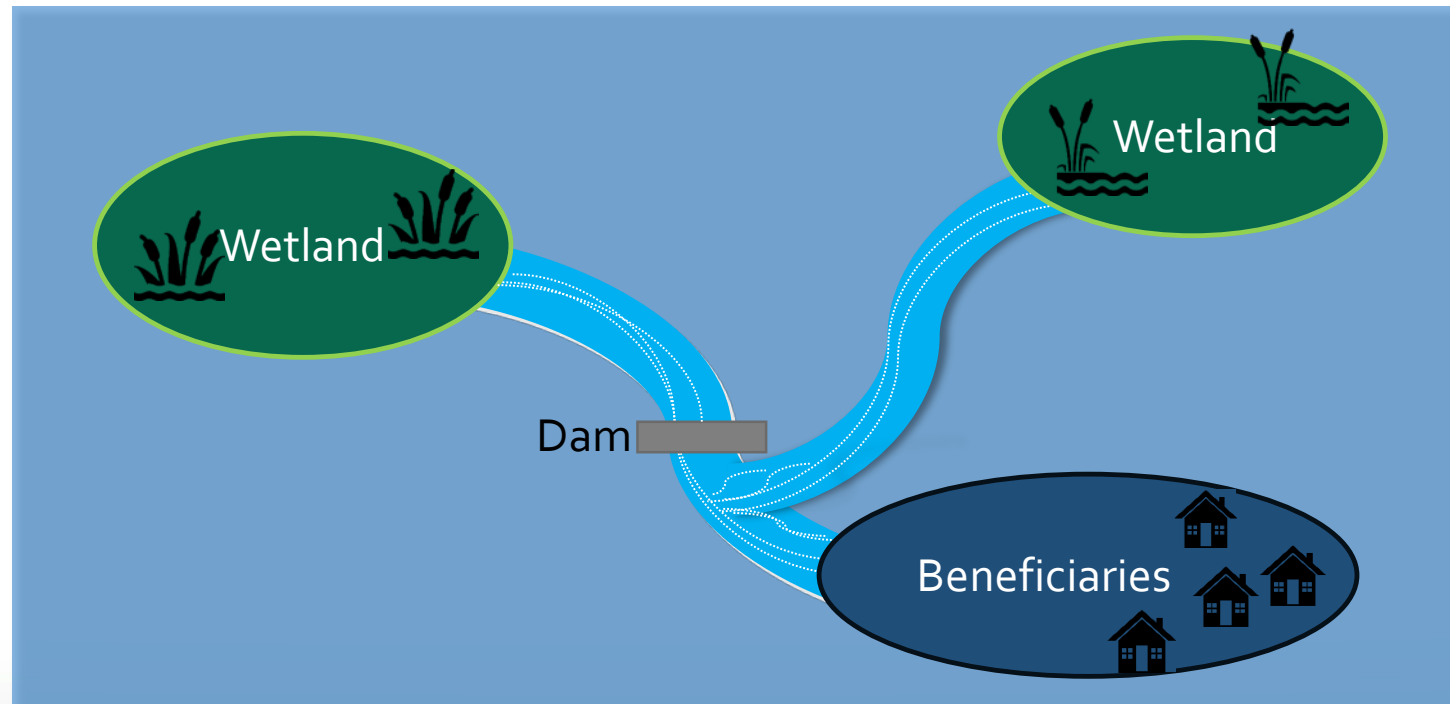
More people who benefit → Greater value

3. By how much do people benefit?

3.1 Substitutes:

How many natural and technological substitutes are there?

Fewer substitutes or lower quality substitutes → Greater value

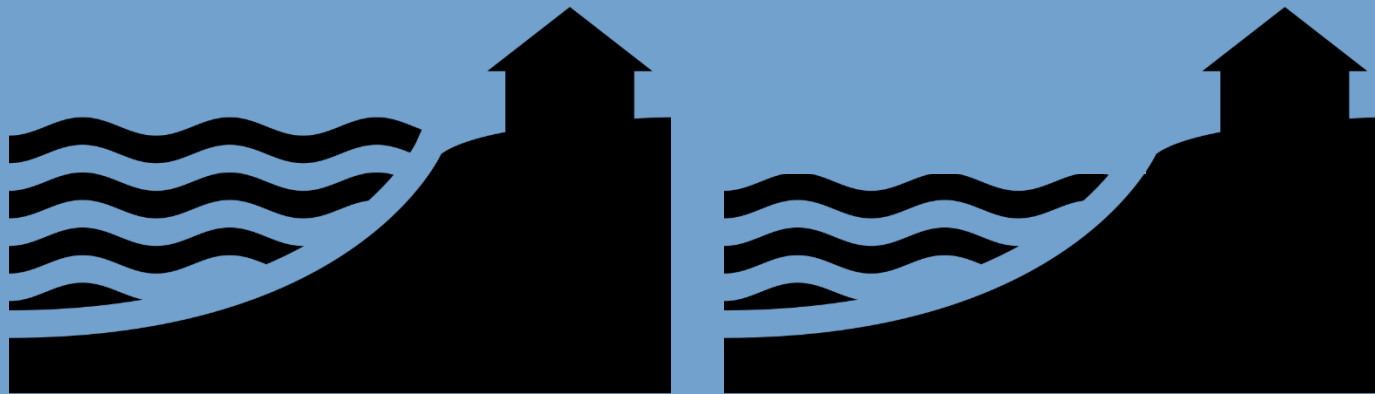


3. By how much do people benefit?

3.2 Quality:

Higher quality service → Greater value

How much is flood risk reduced?



3. By how much do people benefit?

3.3 Quality of complements:

Higher quality complements → Greater value



3. By how much do people benefit?

3.4 Strength of Preferences:

Includes factors such as avidity, willingness/ability to adapt



not so avid angler



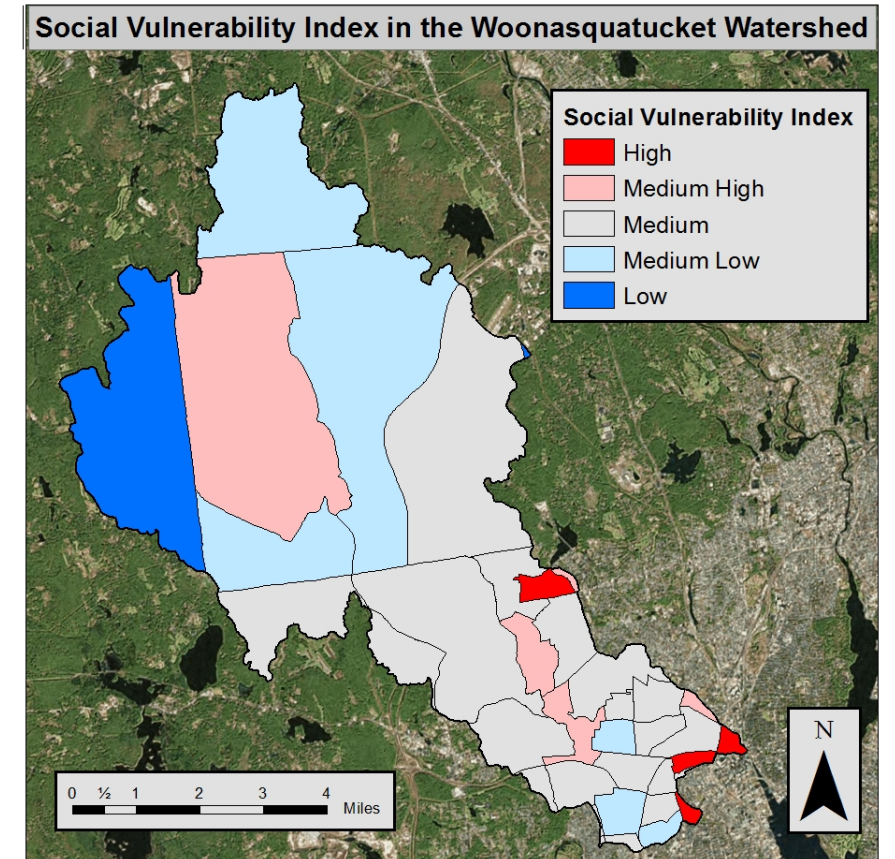
avid angler

4. What are the social equity implications?

Social Equity:

Are groups that are particularly socially vulnerable affected?

More vulnerable → Greater value

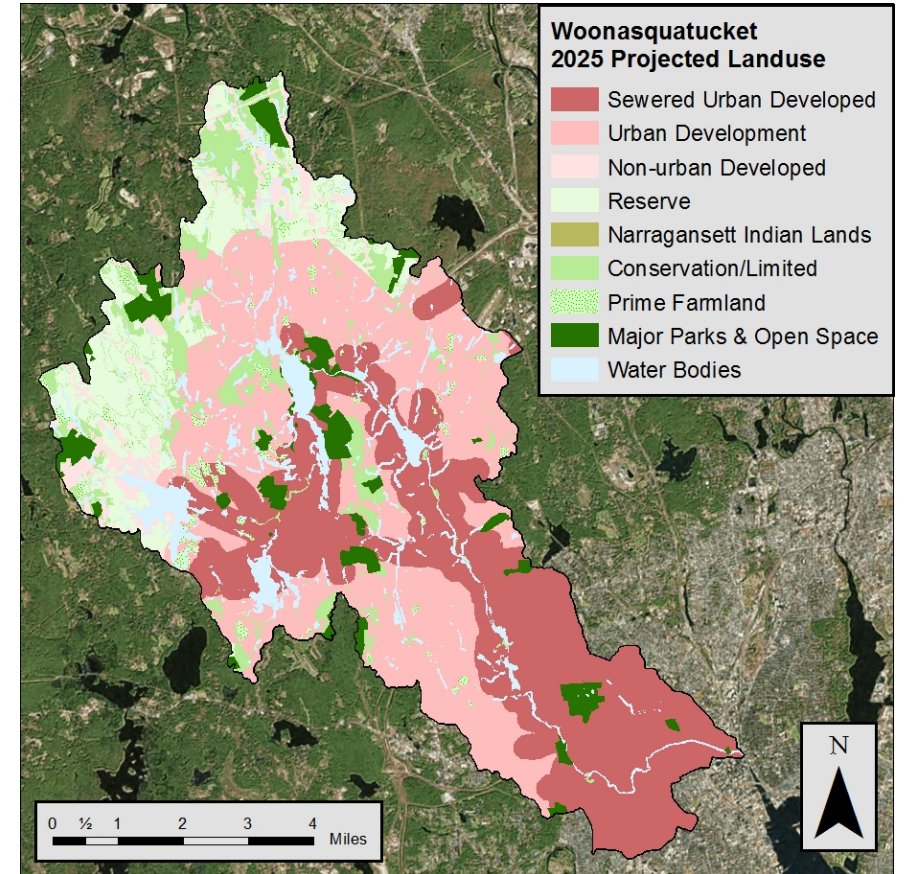


5. How reliably will services be provided over time?

Reliability:

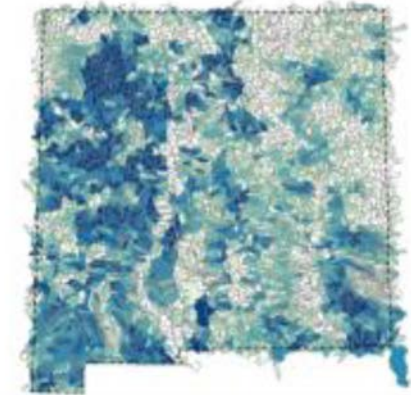
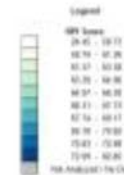
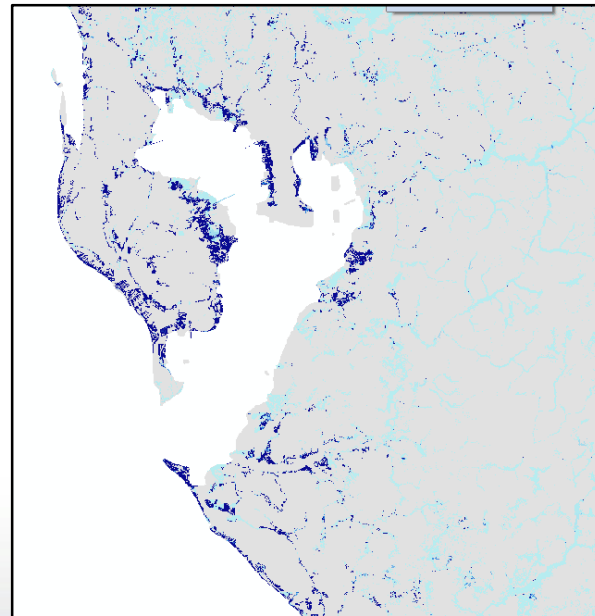
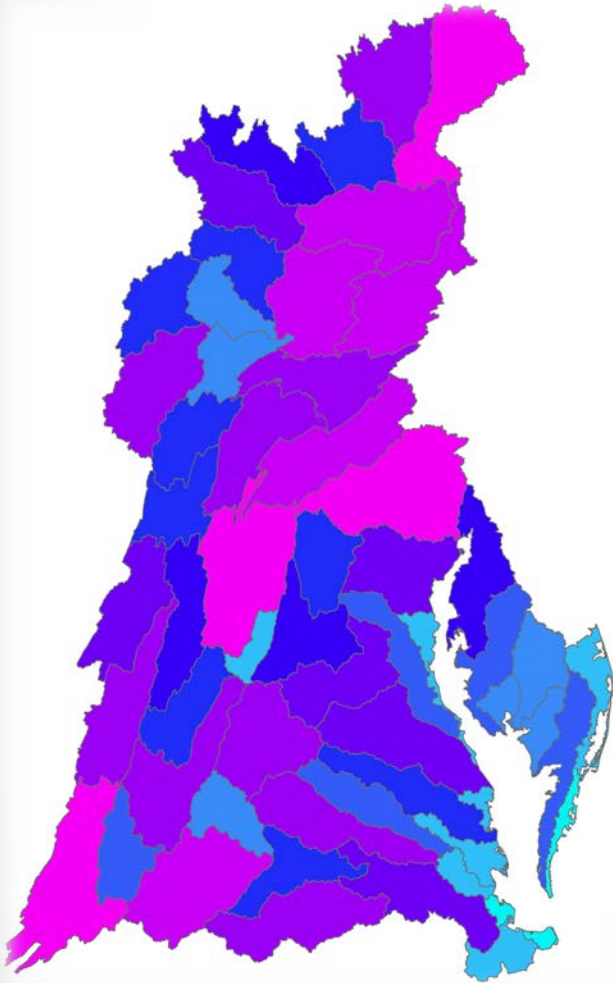
How sure are we that benefits will continue?

More reliable → Greater value



Streamlining Geoprocessing

- ❖ Automated data download (e.g. NHDPlus data)
- ❖ Use of EPA EnviroAtlas datasets (e.g. Raster flooding)
- ❖ Use of webservices in place of downloaded data (e.g. NWI)
- ❖ Harmonization with other tools (e.g. H2O, RPS, etc.)





Tool Transferability

- ❖ Benefits of proposed restoration in Mobile Bay, AL
- ❖ Co-benefits of green infrastructure in San Juan, PR
- ❖ Use of EnviroAtlas Communities data in Tampa, FL
- ❖ National assessment of flood benefits
- ❖ Comparison to ecosystem service based prioritization in Great Lakes





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Questions?

<https://www.epa.gov/water-research/rapid-benefit-indicators-rbi-approach>