

Benefit Indicator Tools for Assessing Restoration Projects Based on who Benefits from Restored Ecosystem Services National Conference on Ecological Restoration August 29, 2018 Justin Bousquin, M. Mazzotta, M. Russell, d. Martin and L. Sharpe



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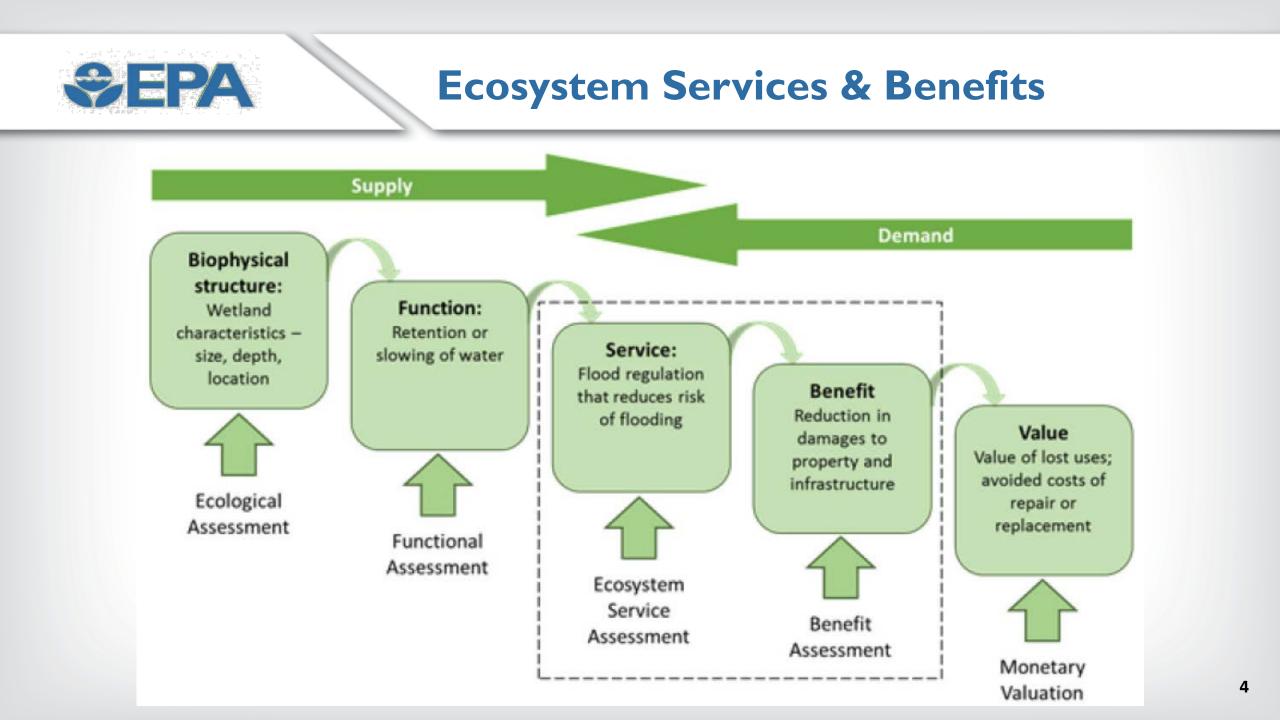
Challenges and Motivation

Environmental decisions require tradeoffs



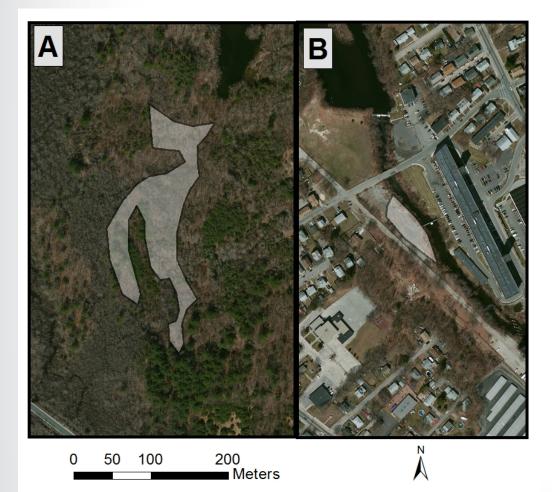
Which of these sites should we spend money on?

Both ecological and social criteria are important.





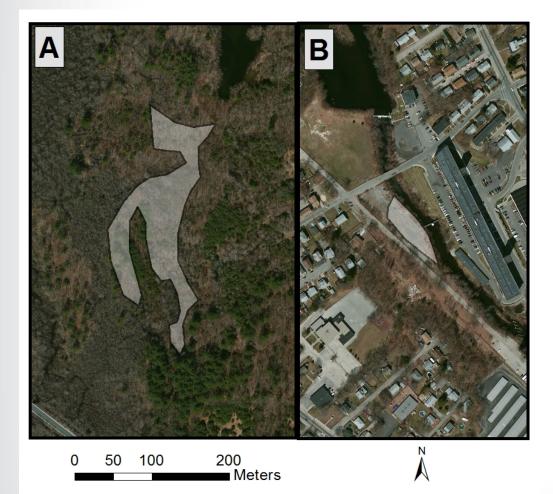
Example Site - Biophysical



Structure: Site A is larger



Example Site - Function

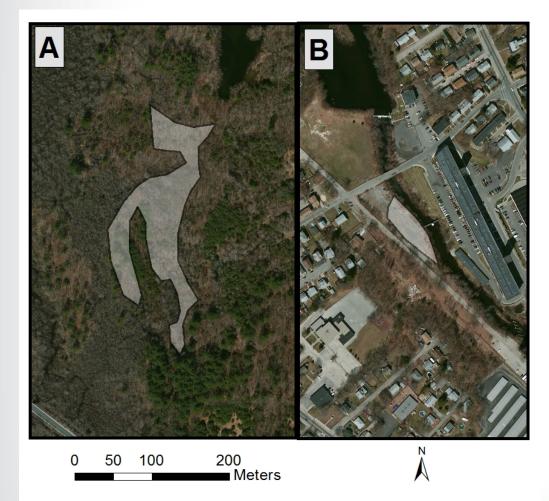


Structure: Site A is larger

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



Example Site - Service



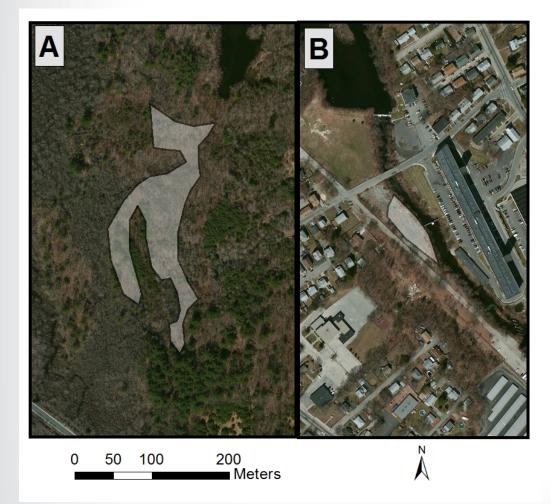
Structure: Site A is larger

***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

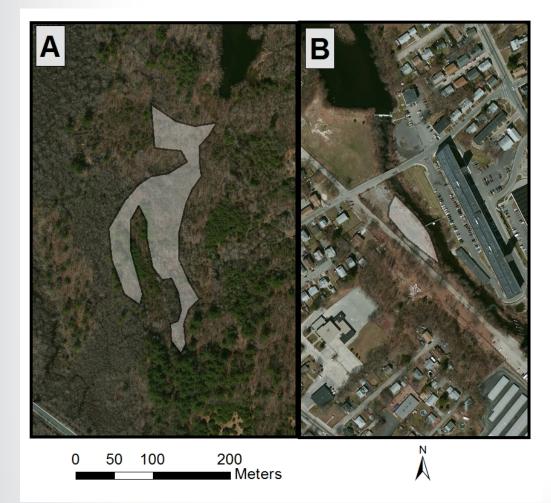
Value: What is Site A restored worth?

Benefits Transfer – uses an 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?

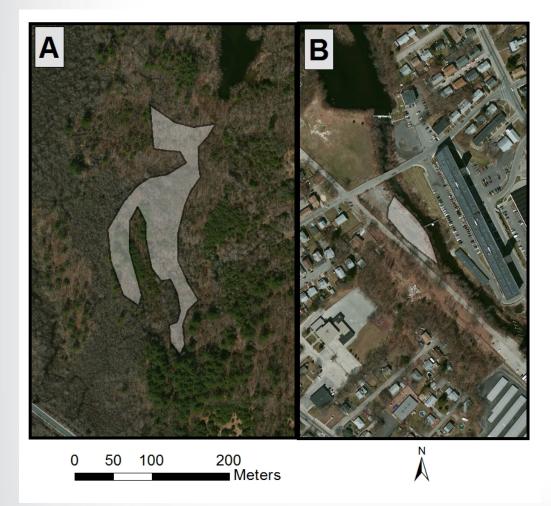
Monetary measures are <u>not</u> always the solution:

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

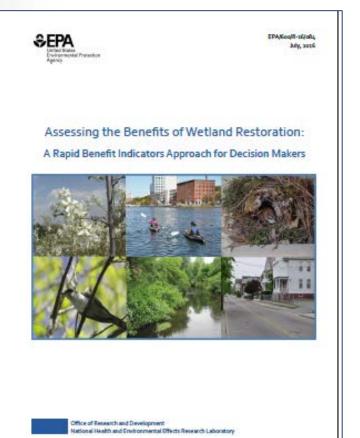
***Function:** Site A retains more water than Site B

Service: Site A reduces floodwaters (service production) more than Site B

Senefit: How much would each site reduce flood damages (service delivery)?



A rapid assessment approach using benefit indicators

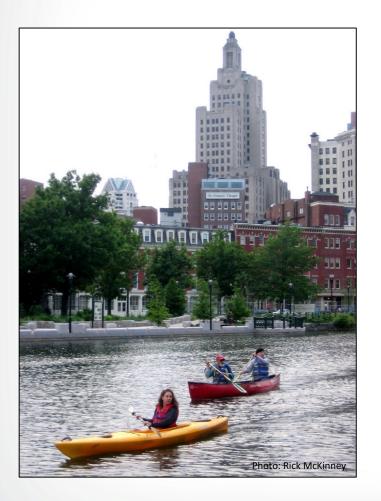


✤ A framework for compiling and using benefit indicators

- 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.				
Ī	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.				
1	Recreational opportunities	Recreation: People can enjoy recreation				
×	Birds	Bird Watching: People can watch or hear birds.				



Checklist & Spatial Analysis Tools

Scenic Views - Site B			×		N
A. Is the site visible from homes, roads or trails?	Yes	C No)S	
B. Will site restoration improve the scenic quality of the landscape?	• Yes	C No			'
C. Scenic View benefits do not require Complementary Inputs (NA)	C Yes	C No		V	
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?		C Yes	C No	- 1980. 3007	
A.1 Does the site have features or characteristics of aesthetic interes	t?	C Yes	с No Е	B	STONE
Note the features or characteristics					
B. How much wetlands and open water are within 650 feet of the site (number or percent cover)	?		UNIT		
C. How many different natural land cover types are within 650 feet of (number of types)	f the site?				
D. Does the site meet these people's visual preferences?		C Yes	C No		N.
				-	
			0	50 100) 200 Meters

😡 GUI_demo.mxd - ArcMap	
File Edit View Bookmarks Insert Selection Geoprocessing Cust	🛐 Full Tier 1 Assessment
rile call View Bookmarks Inser Selection Geoprocessing Cust Composed and the selection of	Social Equity (optional)



<u>1. Can people benefit from an ecosystem service?</u>

Yes, if:

There is demand



If required, complementary inputs are available

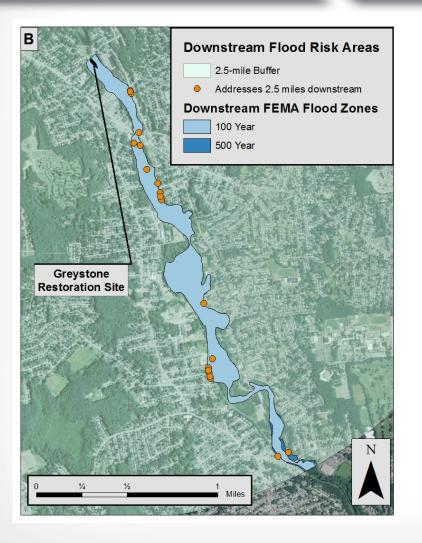


There is sufficient quantity and quality of the service





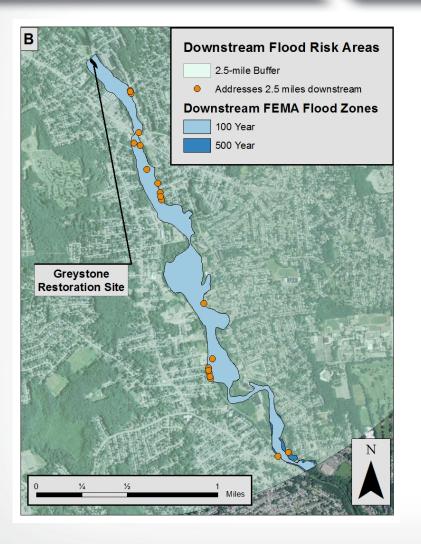
2. How many people benefit?



- 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
- Senefit: 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?



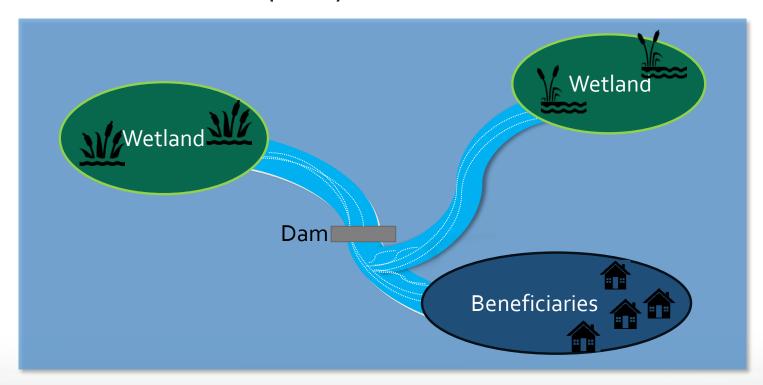
- **Structure:** Site A is larger
- ***Function:** Site A retains more water than Site B
- Service: Site A reduces floodwaters (service production) more than Site B
- Site B benefits more people
- (1) Map flood zones downstream from the sites within the distance benefits are expected to travel (e.g.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

More people who benefit \rightarrow Greater value



3.1 Substitutes:

How many natural and technological substitutes are there? Fewer substitutes or lower quality substitutes \rightarrow Greater value





3.2 Quality:

Higher quality service \rightarrow Greater value





3.3 Quality of complements:

Higher quality complements \rightarrow Greater value









3.4 Strength of Preferences:

Includes factors such as avidity, willingness/ability to adapt



not so avid angler

avid angler

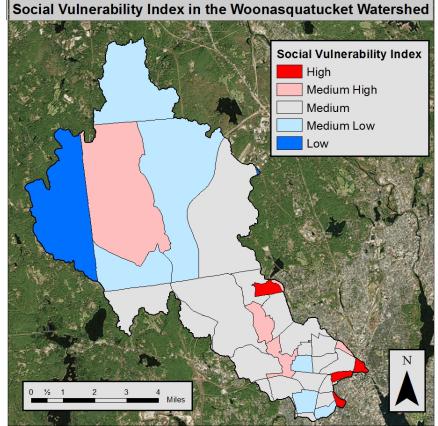


4. What are the social equity implications?

Social Equity:

Are groups that are particularly socially vulnerable affected? More vulnerable \rightarrow Greater value





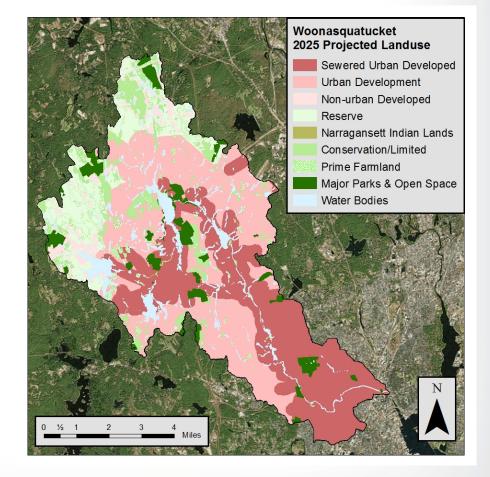


5. How reliably will services be provided over time?

Reliability:

How sure are we that benefits will continue? More reliable → Greater value







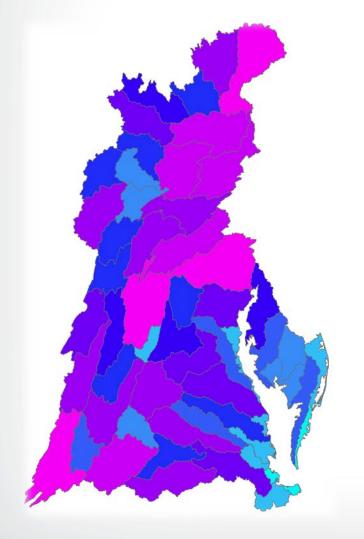
Tool Outputs - Summarize Indicators

✤ PDF

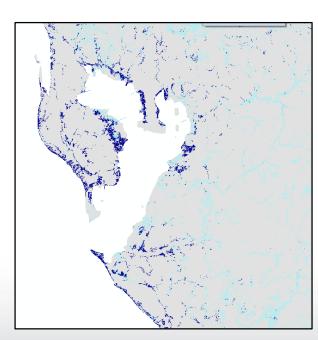
	PDF			Spatial Tool							
Step 4	Summarize the Indicators		Site			Step 4		Summar	ize the Indicators	Site	
Benefit		Indicators	В	A		Benefit]	indicators	Site 1 B	Site 2
Flood Risk	3.2 How Many Benefit?	2.5 mi downstream of site and in flood zone					3.2 How Many Bene	efit?	2.5 mi downstream of site and in flood zone		
	3.3.A Service Quality	Area of restoration site (acres)				sk	3.3 A Service Quality		Area of restoration site (acres)		
		Features that increase retention volume?				Risk			Features that increase retention volume?		
p	3.3.B Scarcity	Dams and levees 2.5 mi downstream?				p	3.3.B Scarcity 3.3.C Complements		Dams and levees 2.5 mi downstream?		
8	S.S.D Scarcity	Wetlands within 5 mi (number or % area)				Flood			Wetlands within 2.5 mi (percent area)		
Ē	3.3.C Complements	NA	NA	NA					NA	NA	NA
	3.3.D Preferences	Are people worried about flood risk?							Are people worried about flood risk?		
		Number within 160 ft of site	1	0				Number within 160 ft of site	1	0	
(n)	2.2 Llow Many Danafit?	Number within 325 ft of site	9	0		N.S.	3.2 How Many Benefit?		Number within 160-325 ft of site	9	0
ev.	3.2 How Many Benefit?	Weighted number who benefit	3.4	0		iew			Weighted number who benefit	3.4	0
Views	seanna eanaire d	Are there roads or trails within 325 ft of site?	Yes	No		>		6	Are there roads or trails within 325 ft of site?	Yes	No
lic	3.3.A Service Quality	Aesthetic features or characteristics?	Yes	Yes		cenic	3.3.B Scarcity W 3.3.C Complements N		Aesthetic features or characteristics?		
Scenic	3.3.B Scarcity	Wetlands or water within 650 ft (number or %)	7.7	35		- Cel			Wetlands or water within 650 ft (percent area)	30.8	35.0
	3.3.C Complements	Natural land use types within 650 ft (types)	4	2	Checklist				Natural land use types within 650 ft (types)	4	2
	3.3.D Preferences	Will people find it aesthetically pleasing?	Yes	Yes					Will people find it aesthetically pleasing?		
a	3.2 How Many Benefit?	Education institutions within 0.25					Site		lucation institutions within 0.25 mi of site		
Environmental Education	3.3.A Service Quality	Features/habitat/wildlife of educat Step 4		Summa	narize the Indicators				atures/habitat/wildlife of education interest?		
atio							88. 88 		etlands within 0.5 mi of the site (percent area)		
ncion	3.3.B Scarcity	Wetlands within 0.5 mi of the site							lucational facilities or infrastructure on site?		
Edi	3.3.C Complements	Educational facilities or infrastruct Benefit	Indic	ators for V	Voonasquatucket Ex	ample	Site B	Site A	ill people prefer characteristics of the site?		
<u>ш</u> –	3.3.D Preferences	Will people prefer charcteristics of							amber within 1/3 mi of the site		
	3.2 How Many Benefit?	Number within 1/3 mi of the site			Number within 160 ft of site		1 0		e there bike paths within 1/3 mi of site?		
tion		Are there bike paths within 1/3 mi	12534257864		Number within 160- 325 ft of site	60- 325 ft of site		0	te there bus stops within 1/3 mi of site?		
		w Many Benefit? Are there bus stops within 1/3 min Number within 0.3 to 0.5 mi of site Number within 0.5 to 6 mi of site Service Quality Scarcity Scar	Many Benefit?	fit? Weighted number who benefit		9 3.4	0	amber within 0 to 0.5 mi of site			
							-	amber within 0.5 to 6 mi of site			
		Number within 0.5 to 6 mi of site			Are there roads or trails within 32	o it of site?	Yes	No	tal area of green space around site		
	3.3.A Service Quality	Total area of green space around	3.3.A Service Quality		Aesthetic features or characteristics?		Yes		een space within 2/3 mi of site		
oc		green space within 2/3 mi of site	3.3.B Scarcity		Wetlands or water within 650 ft (number or %)		7.7		een space within 1 mi of site		
R	3.3.B Scarcity	green space within 1 mi of site		omplements	Natural land use types within 650		4	2	een space within 12 mi of site		
0.060		green space within 12 mi of site							-		
	3.3.C Complements	Infrastructure supporting recreatio	3.3.D Preferences		Will people find it aesthetically pleasing?		? Yes				24
	3.3.D Preferences	Are there additional features on th	3.2 How	Many Benefit?	ENTER QUESTION						
5		Number within 0.2 mi of site		1							

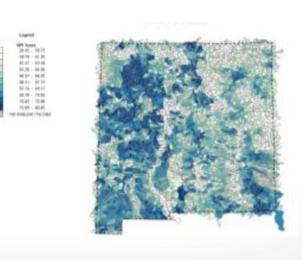






Automated data download (e.g. NHDPlus data)
Use of EPA EnviroAtlas datasets (e.g. Raster flooding)
Use of webservices in place of downloaded data (e.g. NWI)
Harmonization with other tools (e.g. H2O, RPS, etc.)







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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Team & Collaborators

Questions?

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