

# ***Recovery Potential Screening: Tools for Watershed Planning and Prioritizing***

*Doug Norton, Watershed Branch AWPD/OWOW  
EPA Office of Water  
April 2014*



# What is Recovery Potential Screening?

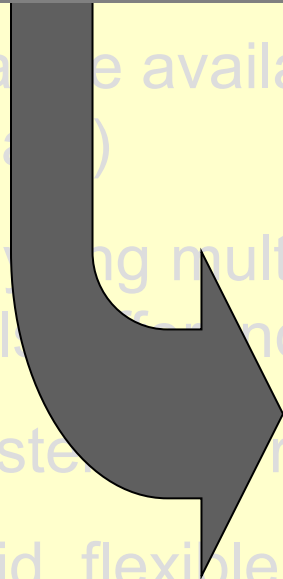
*A method to help  
states and restoration planners  
compare restorability across watersheds*

- Science-based, indicator-driven (GIS and field monitoring data)
- Scores and compares watersheds relative to their:

*ecological condition,  
exposure to stressors, and  
social context affecting restoration efforts*

# Where it started (2004)...

- Numerous ecological and social factors are associated with the relative ability to recover from impairment



## *Recovery Literature Review*

- Over 1700 published papers
- Identification of factors influencing or associated with impaired waters recovery
- In literature
- In practice

UNITED STATES • ENVIRONMENTAL PROTECTION AGENCY

### Restoration and Recovery Literature Database

This searchable database is an annotated bibliography of scientific literature compiled by the EPA Office of Water to help water quality managers improve the technical basis for watershed restoration efforts. Its main themes include Recovery Potential, Restoration Effectiveness, Critical Areas/Processes, Cumulative Impacts, and Invasive Species.

Database Last Updated 10/26/2009

- ☐ Instructions
- ☐ Open Citations Database
- ☐ Edit/Add Citations
- ☐ Exit Database

## Water: Recovery Potential

Water Home

Drinking Water

Education & Training

Grants & Funding

Laws & Regulations

Policy & Guidance

Laws & Executive Orders

Regulatory Information

Regulatory Info by  
Business Sector  
Tribal

Our Waters

Pollution Prevention &  
Control

Resources &  
Performance

Science & Technology

Water Infrastructure

What You Can Do

You are here: [Water](#) » [Laws & Regulations](#) » [Laws & Executive Orders](#) » [Clean Water Act \(303d\)](#) » [Recovery Potential Screening](#)

## Recovery Potential Screening

### *Tools for Comparing Impaired Waters Restorability*



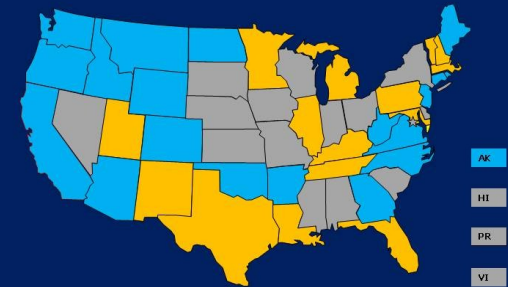
Monitoring programs under the Clean Water Act have identified tens of thousands of US water bodies that do not meet Water Quality Standards and are in need of restoration. This website provides technical assistance for restoration programs to help them consider where to invest their efforts for greater likelihood of success, based on the traits of their own geographic area's environment and communities. There are three main website components. [Step-by-step instructions in recovery potential screening](#) provide watershed managers with a methodology for comparing restorability differences among their waters. The steps in the methodology link to several online [tools and resources](#) that are used in recovery potential screening. A library of [recovery potential indicators](#) offers technical information on specific recovery-related factors (ecological, stressor, and social), how they influence restorability, and how to measure them. [More ...](#)

### Quick Links

[Home](#)  
[Overview](#)  
[Screening methodology](#)  
[Step-by-step screening example](#)  
[Example projects](#)  
[Other screening resources](#)

[Recovery tools & resources](#)  
[Literature database](#)  
[Indicators & reference sheets](#)  
[Scoring techniques](#)  
[Displaying screening results](#)  
[Publications & training materials](#)

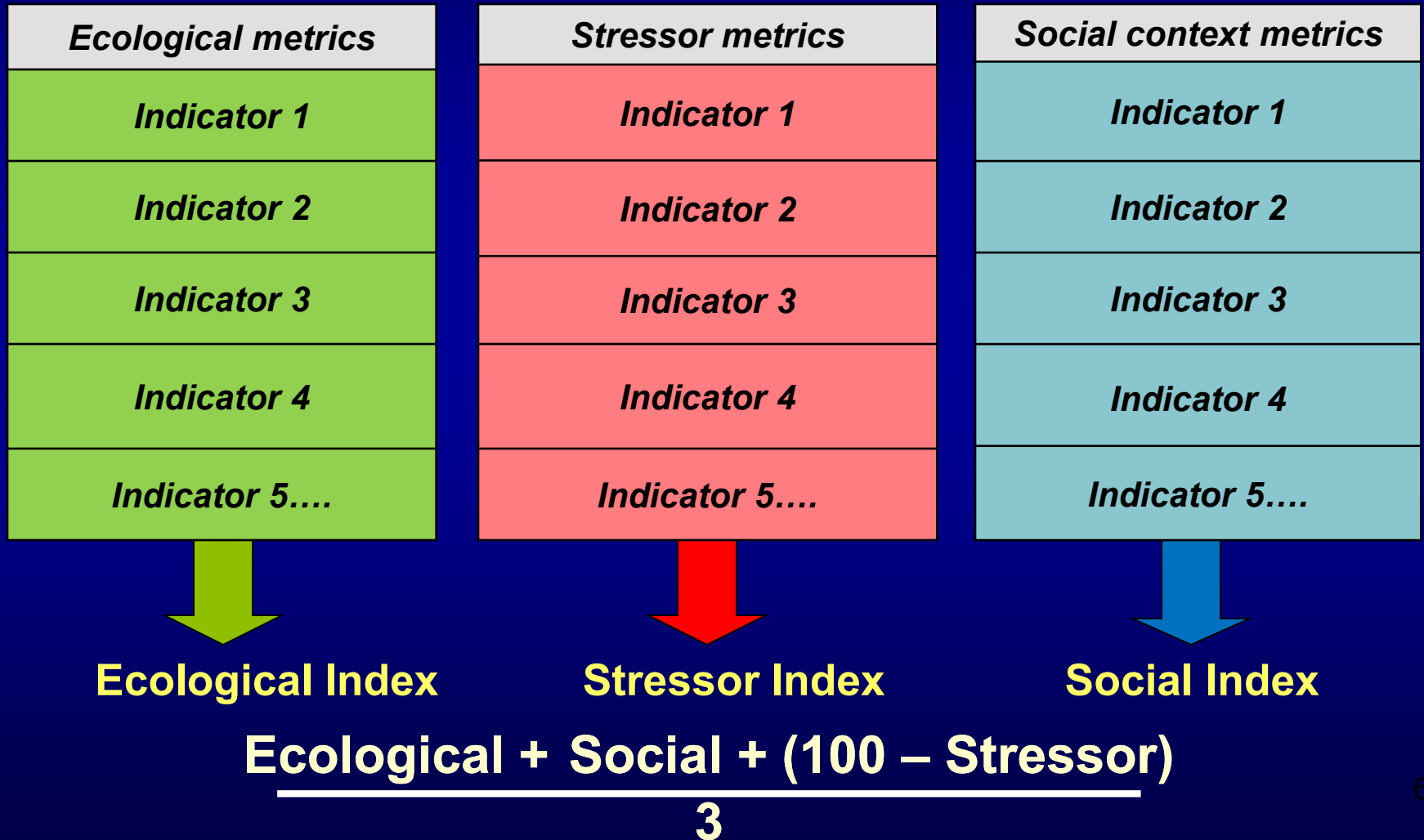
## Recovery Potential Screening Activity in States



Completed or ongoing RPS projects  
Expressed interest in RPS  
Activity unknown

How does it work?

## *Recovery Potential Screening - Basic Concept*



## Recovery Potential Screening: Example Indicator Selections

### RPS Indicator selection for screening based on prioritizing pathogen TMDLs

ECO	STRESSOR	SOCIAL
Percent natural cover	Percent pasture in watershed	Jurisdictional complexity
Percent forest in corridor	Percent impervious in watershed	TMDL count
Stream density	Percent septic in stream corridor	Percent protected lands
Stream order	Percent sewer	Active volunteers
Change in natural cover	Impairments count	

### RPS Indicator selection for screening based on development risks to watersheds

ECO	STRESSOR	SOCIAL
Percent_NaturalCover	Percent_Sewered	Percent_Stressors_Known
Percent_Forest_In_Corridor	Percent_Impervious	Percent_Length_Assessed
Percent_Wetlands	Percent_Impervious_>5_In Corridor	Percent_Watershed_Protected_Lands
Topo_Complexity	Percent_Length_Impaired	Low_Jurisdictional_Complexity
NFHAP_HCI_Condition	Road_Density	Low_Landuse_Complexity
Combined_Natural_Habitat_Index	Percent_Septic_In_Corridor	Active_Volunteers_Count
Percent_Change_Natural_Cover	Population_In_Corridor_With_Septic	Percent_Source_Water_Protection_Area
Percent_Natl_Eco_Framework	Population	Other_Priority_Recognition
	Stressor_Count	

*Recovery Potential Screening and the Watershed Index:  
Teaming to Create*

# ***Watershed Index Online***

- **TOOLS:** initially the RPS tool, others TBD
- **NATIONAL DATA:** HUC12 attributes library from WSI and others (300+ indicators)
- **PRE-COMPILED SCREENINGS:** examples showing the use of RPS on priority stressors
- **PROGRAMMATIC LINKS:** TMDL Vision Prio Support, HWI, 319 watershed prio, Measures



# *RPS Scoring Tool*

***Contains all the statewide data on indicators, watersheds  
Creates rank-ordering, maps, and bubble plots in minutes***

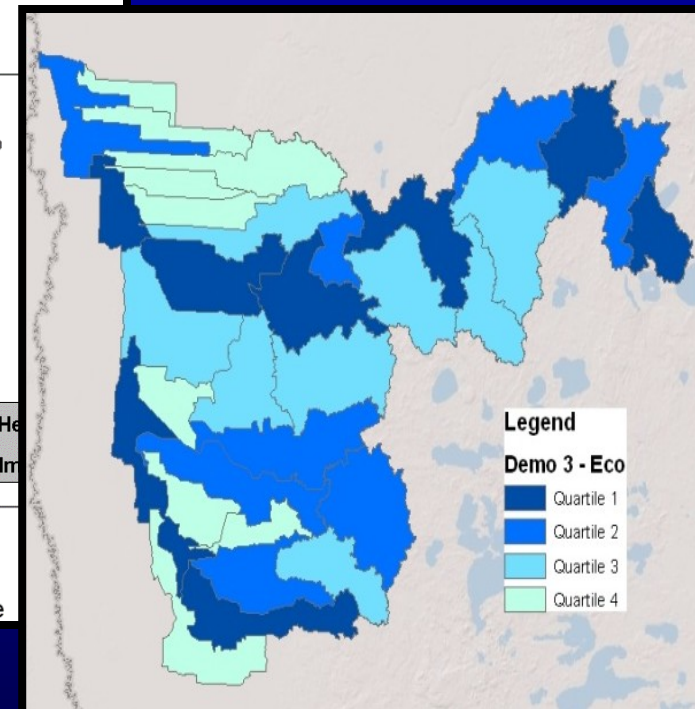
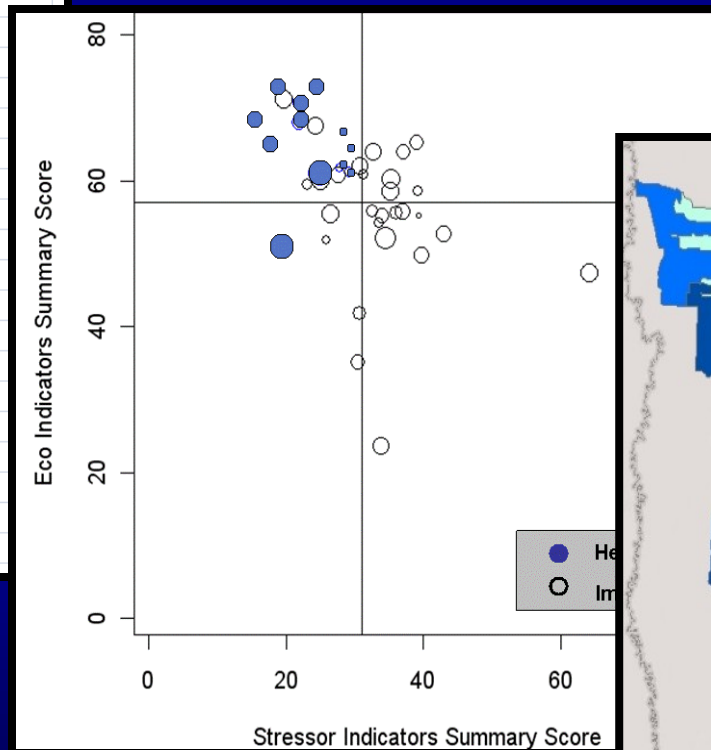
CREATE PROJECT		RESET WORKSHEETS																																																										
<p>Select Watersheds</p> <p>Add All Tennessee Watersheds</p> <table><thead><tr><th>HUC12 ID</th></tr></thead><tbody><tr><td>051301050101 (Headwaters East Fork Obey River)</td></tr><tr><td>051301050102 (Hurricane Creek)</td></tr><tr><td>051301050103 (Little Indian Creek-East Fork Obey River)</td></tr><tr><td>051301050104 (Big Piney Creek)</td></tr><tr><td>051301050105 (Big Laurel Creek-East Fork Obey River)</td></tr><tr><td>051301050106 (Buffalo Cove Creek)</td></tr><tr><td>051301050107 (Poplar Cove Creek)</td></tr><tr><td>051301050108 (Big Indian Creek-Little Crab Creek)</td></tr><tr><td>051301050109 (Big Indian Creek-East Fork Obey River)</td></tr><tr><td>051301050201 (Upper West Fork Obey River)</td></tr><tr><td>051301050202 (Middle West Fork Obey River)</td></tr><tr><td>051301050203 (Lower West Fork Obey River)</td></tr><tr><td>051301050301 (Franklin Creek-Obey River)</td></tr><tr><td>051301050302 (Big Eagle Creek)</td></tr><tr><td>051301050303 (Ashburn Creek-Obey River)</td></tr><tr><td>051301050401 (Delk Creek-Wolf River)</td></tr><tr><td>051301050402 (Rotten Fork Wolf River)</td></tr><tr><td>051301050403 (Lick Creek-Wolf River)</td></tr><tr><td>051301050406 (Sulphur Creek-Wolf River)</td></tr><tr><td>051301050502 (Mitchell Creek)</td></tr><tr><td>051301050503 (Irons Creek-Obey River)</td></tr><tr><td>051301050504 (Neely Creek-Obey River)</td></tr></tbody></table>		HUC12 ID	051301050101 (Headwaters East Fork Obey River)	051301050102 (Hurricane Creek)	051301050103 (Little Indian Creek-East Fork Obey River)	051301050104 (Big Piney Creek)	051301050105 (Big Laurel Creek-East Fork Obey River)	051301050106 (Buffalo Cove Creek)	051301050107 (Poplar Cove Creek)	051301050108 (Big Indian Creek-Little Crab Creek)	051301050109 (Big Indian Creek-East Fork Obey River)	051301050201 (Upper West Fork Obey River)	051301050202 (Middle West Fork Obey River)	051301050203 (Lower West Fork Obey River)	051301050301 (Franklin Creek-Obey River)	051301050302 (Big Eagle Creek)	051301050303 (Ashburn Creek-Obey River)	051301050401 (Delk Creek-Wolf River)	051301050402 (Rotten Fork Wolf River)	051301050403 (Lick Creek-Wolf River)	051301050406 (Sulphur Creek-Wolf River)	051301050502 (Mitchell Creek)	051301050503 (Irons Creek-Obey River)	051301050504 (Neely Creek-Obey River)	<p>Select Ecological Indicators</p> <p>Select the Ecological Indicators of interest below:</p> <table><thead><tr><th>Ecological Indicator</th><th>Weight</th></tr></thead><tbody><tr><td>Unimpaired Stream Length (mi.)</td><td>1</td></tr><tr><td>% Forest</td><td>1</td></tr><tr><td>Stream Corridor - % Natural Cover</td><td>1</td></tr></tbody></table>		Ecological Indicator	Weight	Unimpaired Stream Length (mi.)	1	% Forest	1	Stream Corridor - % Natural Cover	1	<p>Select Stressor Indicators</p> <p>Select the Stressor Indicators of interest below:</p> <table><thead><tr><th>Stressor Indicator</th><th>Weight</th></tr></thead><tbody><tr><td># of 303(d) listed causes</td><td>1</td></tr><tr><td>% Agriculture</td><td>1</td></tr><tr><td>Stream Corridor - % Impervious</td><td>1</td></tr><tr><td>Stream Corridor - Road Density (mi / sqmi)</td><td>1</td></tr><tr><td>Empower Density</td><td>1</td></tr></tbody></table>		Stressor Indicator	Weight	# of 303(d) listed causes	1	% Agriculture	1	Stream Corridor - % Impervious	1	Stream Corridor - Road Density (mi / sqmi)	1	Empower Density	1	<p>Select Social Indicators</p> <p>Select the Social Indicators of interest below:</p> <table><thead><tr><th>Social Indicator</th><th>Weight</th></tr></thead><tbody><tr><td>Ratio of TMDLs to Impairments</td><td>1</td></tr><tr><td>% of Waterbodies Assessed</td><td>1</td></tr><tr><td># of Water Withdrawals</td><td>1</td></tr><tr><td># of Surface Water Intakes</td><td>1</td></tr></tbody></table>		Social Indicator	Weight	Ratio of TMDLs to Impairments	1	% of Waterbodies Assessed	1	# of Water Withdrawals	1	# of Surface Water Intakes	1
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***Requires only spreadsheet skills to run screenings, create RPS products***

# Three Types of Recovery Potential Screening Products (from the indicator scoring)

	A	B	C	D
1	HUC12ID	NAME	SUMFORMULA	SUMRANK
2	010802040205	Ware River-Barre F	35.31	1
3	011000050203	Hubbard Brook	3.84	2
4	010900020206	Sagamore groundw	3.74	3
5	010802040102	East Branch Swift F	3.74	4
6	010802070204	West Branch Farmi	3.63	5
7	010802060101	Westfield River-hea	3.56	6
8	010700040205	Nashua River-Cata	3.44	7
9	010900020203	Chequeset ground	3.43	8
10	010802060103	Dead Branch Westi	3.39	9
11	010802040202	East Branch Ware f	3.38	10
12	010802060202	West Branch Westi	3.37	11
13	010802060201	West Branch Westi	3.35	12
14	010900020301	Sippican River	3.25	13
15	011000050105	Housatonic River-V	3.23	14
16	010802020206	Millers River-Orcut	3.23	15
17	010802070201	Otis Reservoir	3.23	16
18	011000050204	Housatonic mainst	3.21	17
19	010802020203	Tully River	3.21	18
20	010802040206	Muddy Brook	3.18	19

**Rank Ordering**



# Applying RPS in State Programs

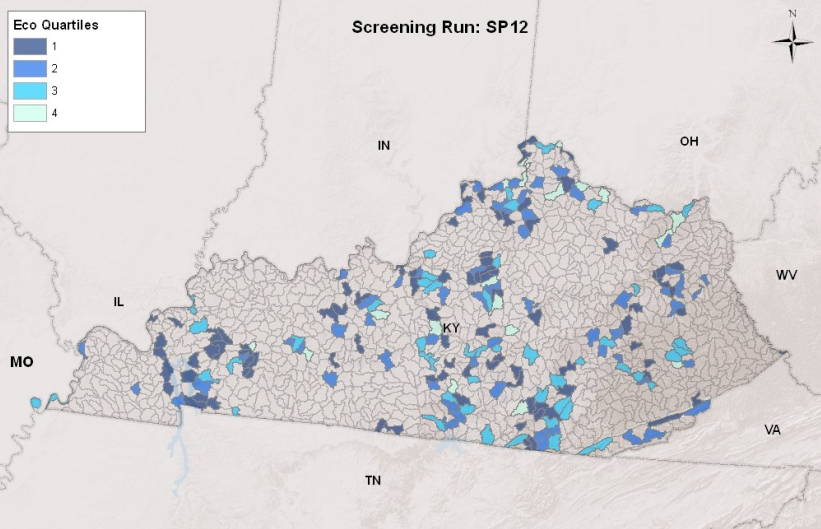
# KENTUCKY



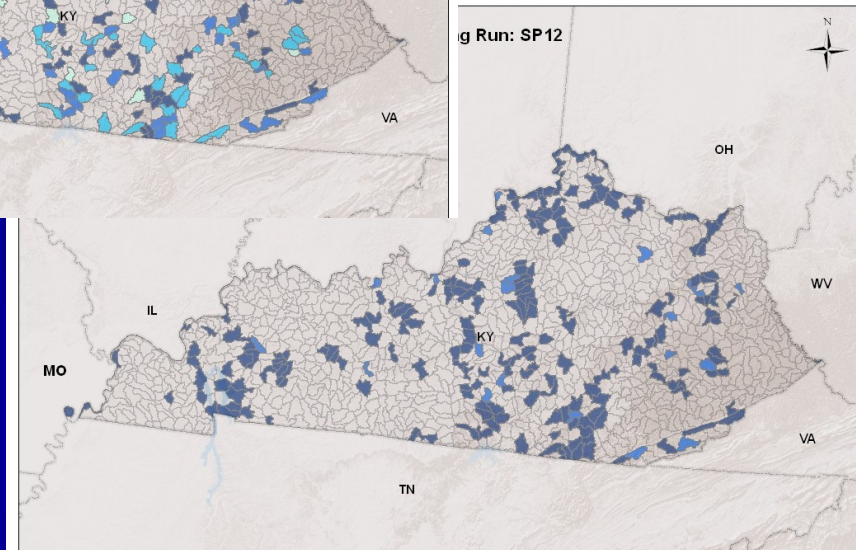
319 and TMDL applications,  
Pathogens prioritization,  
Potential Healthy Watersheds,  
Nutrients Prioritization

Eco Quartiles  
1  
2  
3  
4

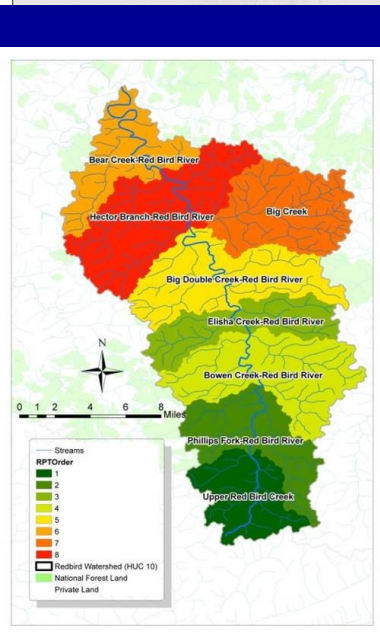
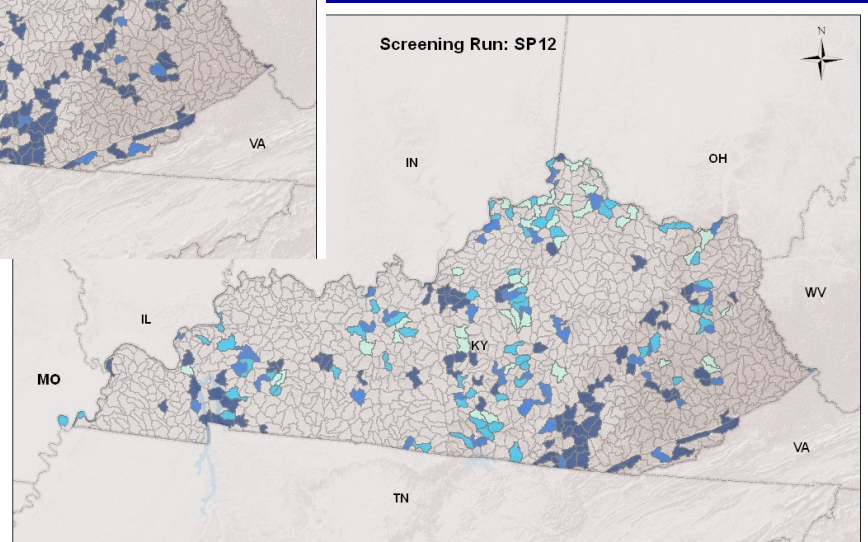
Screening Run: SP12



g Run: SP12



Screening Run: SP12



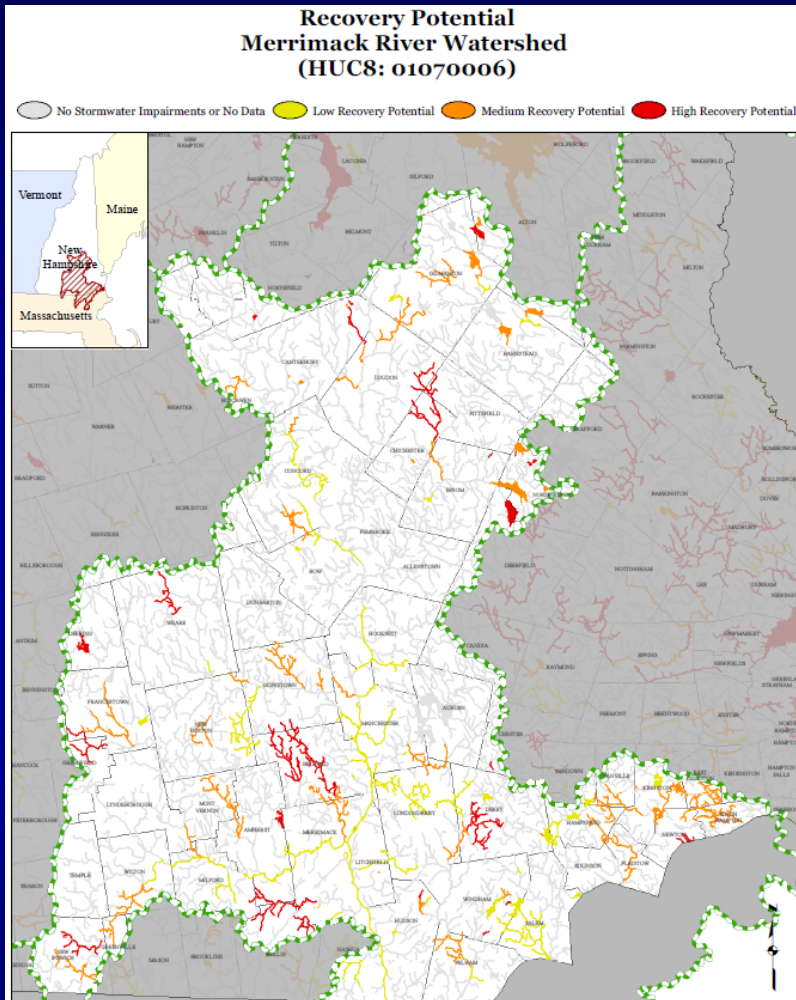
- *SP12 screening results of Eco, Stressor, and Social Indices relative to “improving watersheds” possible priority*



# NEW HAMPSHIRE

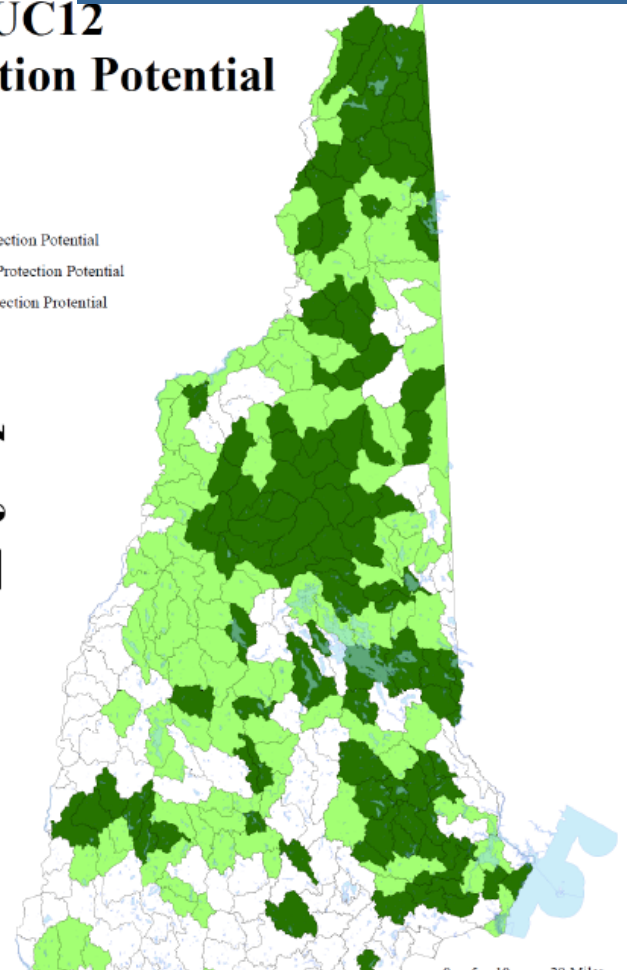


Restoration and protection



## NH HUC12 Protection Potential

○ Low Protection Potential  
● Medium Protection Potential  
● High Protection Potential



- *RPS at catchment scale for restoration priority setting*
- *RPS at HUC12 scale for healthy watersheds protection*


# A Comparative Analysis of Recovery Potential for Impaired Waters in the Buffalo River Watershed



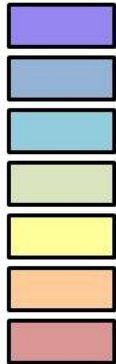
Pete Knutson, MPCA  
Peter Mead, NRCS

## Recovery Potential Integrated Study for Buffalo River, Minnesota sub-watersheds [courtesy of Minnesota Pollution Control Agency]

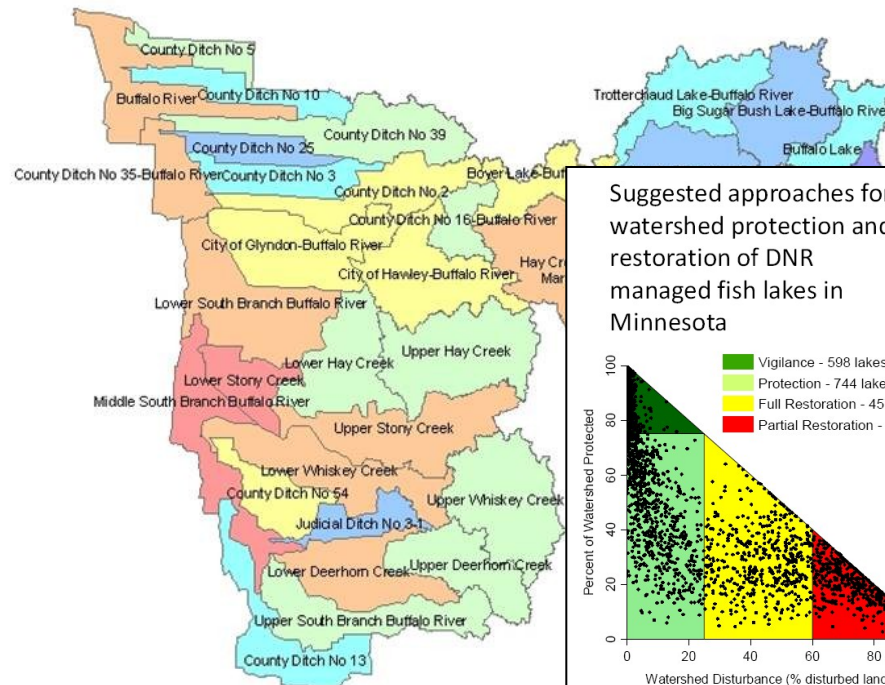
**MINNESOTA**

 - social indicators focus;  
partnering w/USDA, ND, CAN

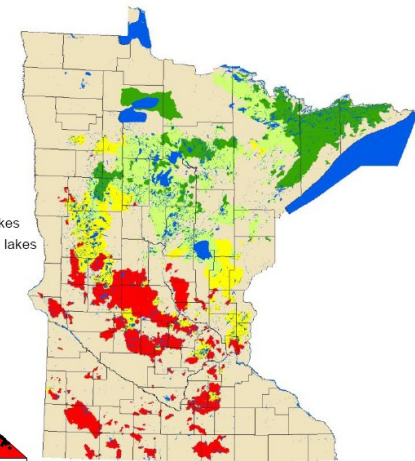
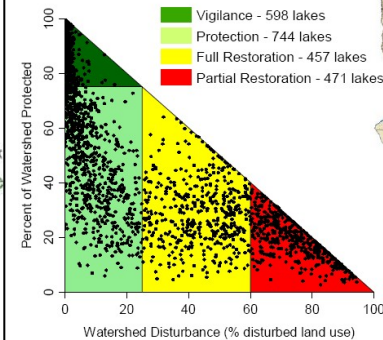
**HIGHEST**



**LOWEST**



Suggested approaches for watershed protection and restoration of DNR managed fish lakes in Minnesota



- *Evaluate restorability to inform dialogue on priority setting*
- *USDA, EPA, MPCA, MDNR involvement*



# Nutrients RPS Two-Stage Approach

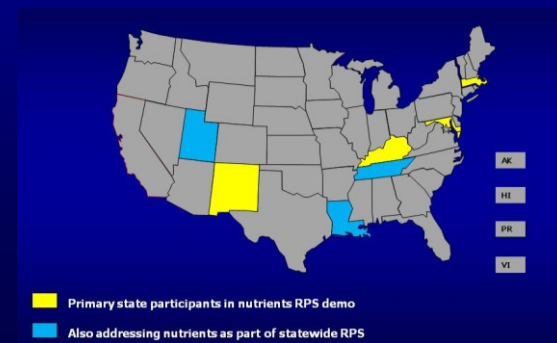
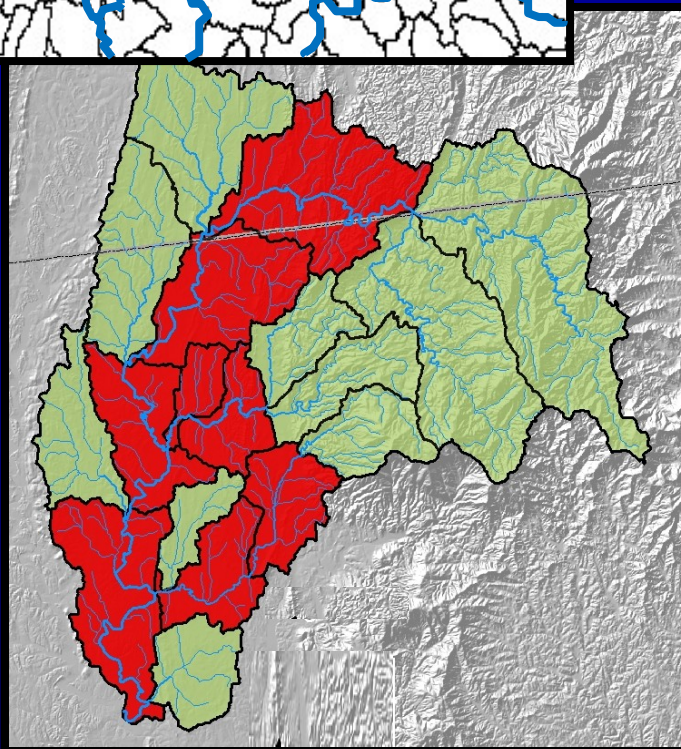
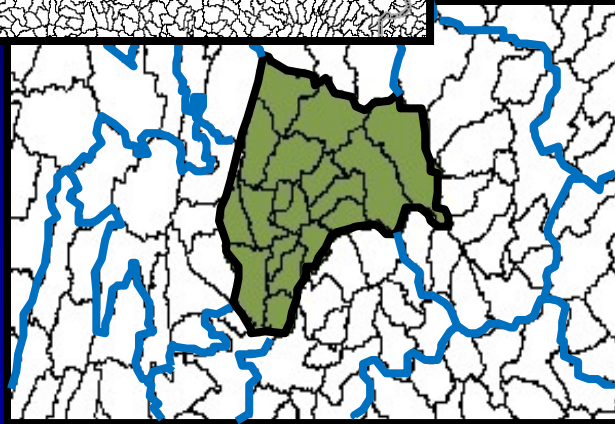
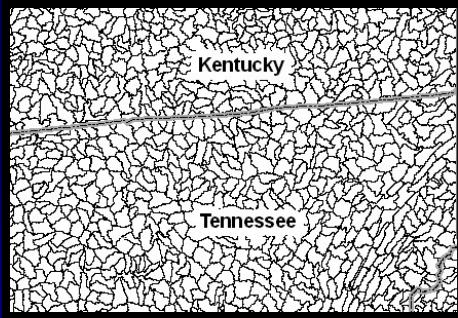
- Statewide 'coarse sort' of all HUC8s  
(Loading, sources, ecological condition, readiness)

(RPS targeting metrics)

- RPS Targeting stage: identify priority HUC8s  
(optimize for load reduction, good RP prospects)

(RPS implementing metrics)

- RPS Implementing stage: HUC12s in HUC8  
(where to take action within priority 8's)



# Comparing nutrients priorities

MARYLAND

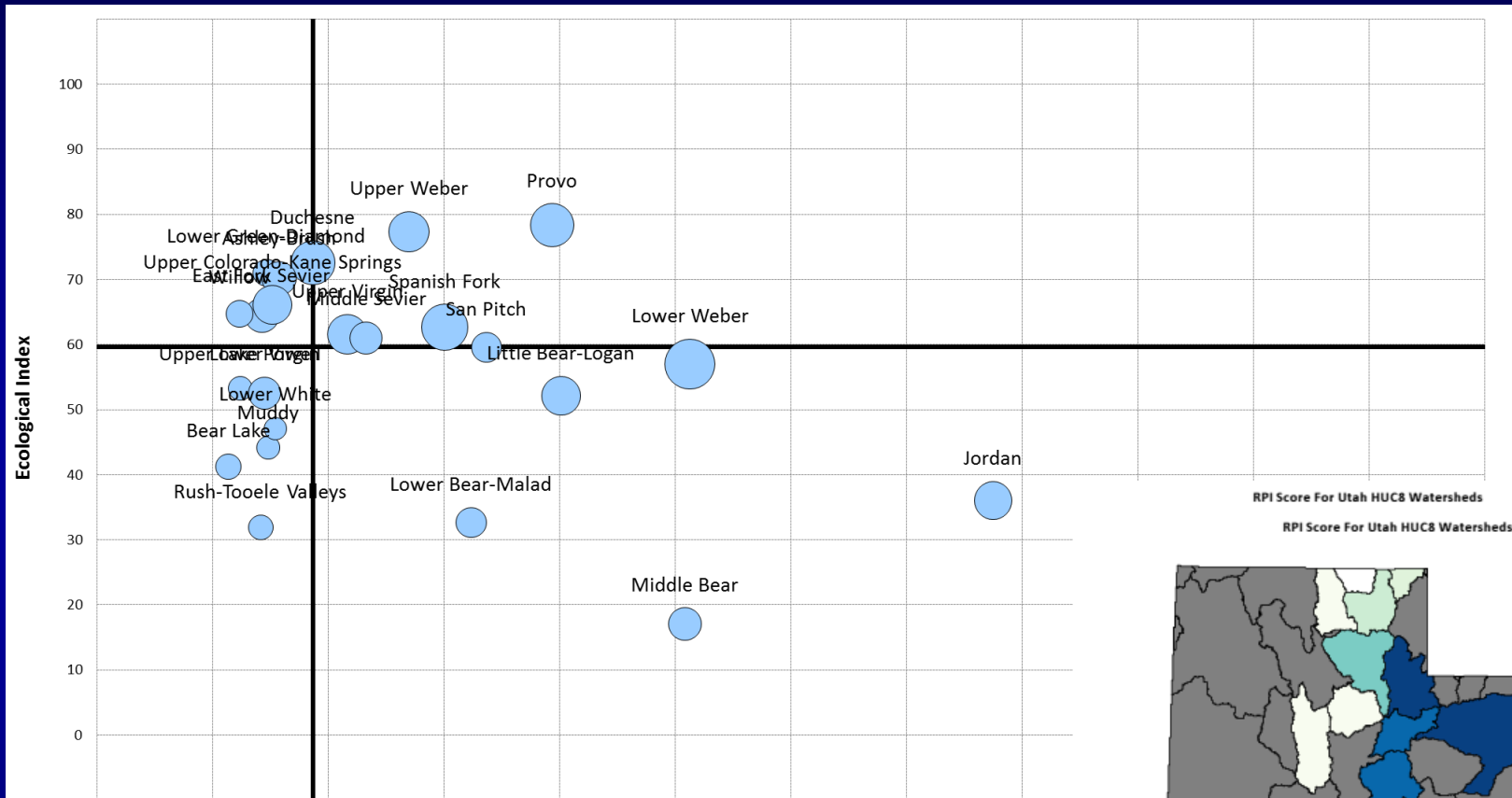
## Maryland RPS Nutrients-Based Watershed Screening Results

MDE8DIGT	MDE8NAME	S1	S2	S3	S4	S5	S6 TOTAL SCORE FROM SYNTHs	PASS/FAIL
02130609	Furnace Bay		1	1	1	1	5	Pass
02131108	Brighton Dam		1			1	3	Pass
02140504	Conococheague Creek			1		1	3	Fail
02130507	Corsica River		1			1	3	Pass
02120202	Deer Creek		1			1	3	Pass
02140302	Lower Monocacy River			1		1	3	Fail
02140503	Marsh Run			1		1	3	Fail
02130306	Marshyhope Creek			1		1	3	Fail
02140301	Potomac River FR Cnty			1		1	3	Fail
02130508	Southeast Creek			1		1	3	Fail
02140105	St. Clements Bay		1			1	3	Fail
02130308	Transquaking River			1		1	3	Fail
02130203	Upper Pocomoke River			1		1	3	Fail
02120502	Wye River		1			1	3	Fail
02140305	Catoctin Creek			1		1	3	Fail
02140304	Double Pipe Creek			1		1	3	Fail
02120201	L Susquehanna River		1			1	3	Fail
02130506	Langford Creek		1			1	3	Fail
02130804	Little Gunpowder Falls		1			1	3	Fail
02130805	Loch Raven Reservoir		1			1	3	Fail
02130202	Lower Pocomoke River			1		1	3	Fail
02130509	Middle Chester River			1		1	3	Fail
02131106	Middle Patuxent River			1		1	3	Fail
02120203	Octoraro Creek		1			1	3	Fail
02140202	Potomac River MO Cnty			1		1	3	Fail
02140501	Potomac River WA Cnty			1		1	3	Fail
02130806	Prettyboy Reservoir		1			1	3	Fail
02131107	Rocky Gorge Dam		1			1	3	Fail
02130510	Upper Chester River			1		1	3	Fail
02140106	Wicomico River					1	3	Fail
02140502	Antietam Creek			1			3	Fail
02130403	Lower Choptank			1			3	Fail
02130908	S Branch Patapsco		1				3	Fail

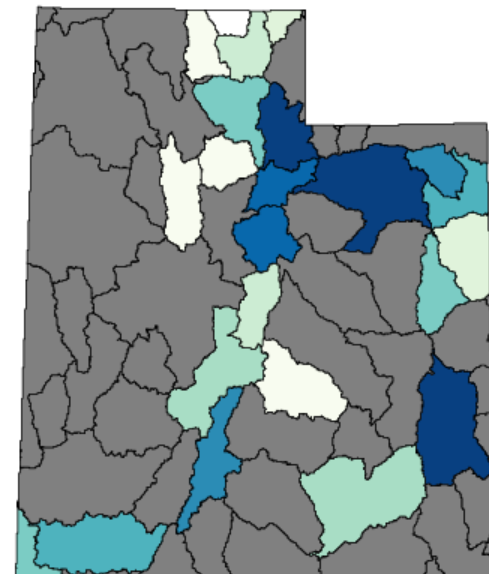
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# UT: a N-based scenario selection identifies 23 possible target HUC8s

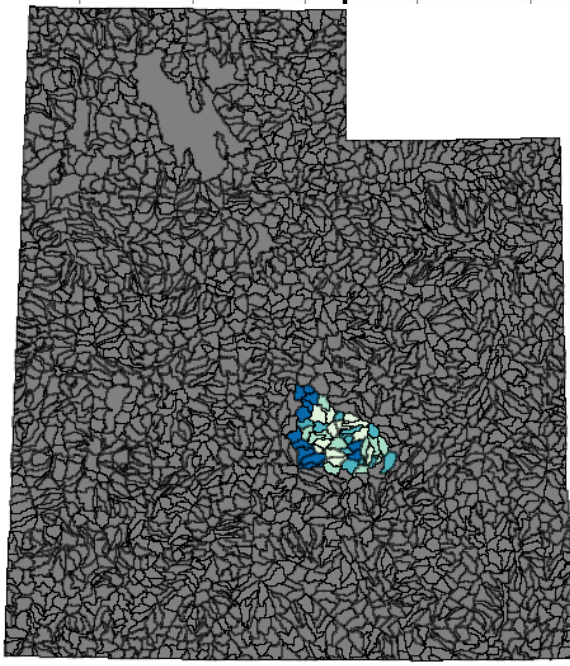
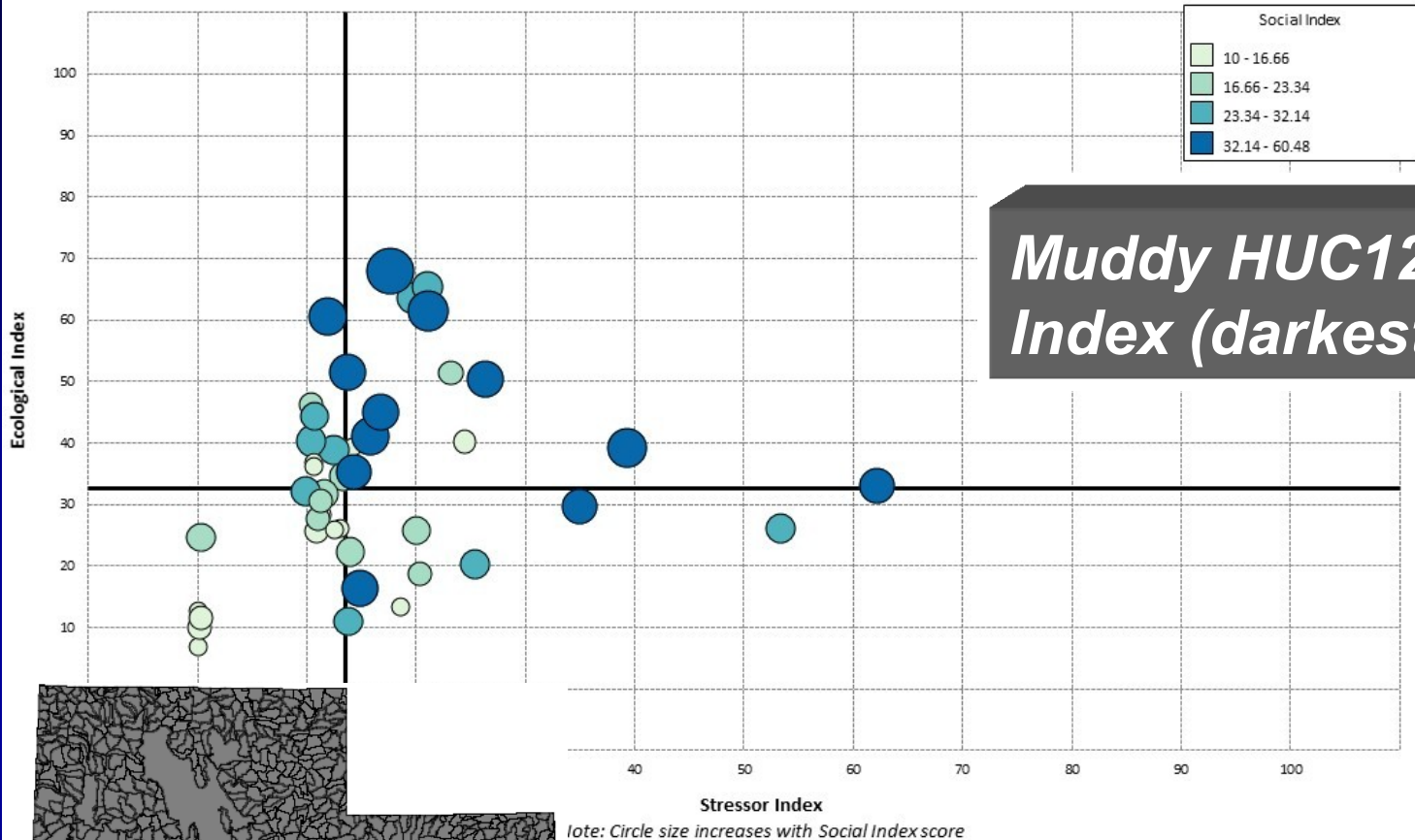


- Erosion\_Resistance1
- Percent\_NaturalCoverCorridor
- Percent\_NaturalCover
- **#UPDES**
- **percentUrban**
- **#Diversion**
- **percentCropland**
- **ReNANIAB**
- **# T&E spp**
- Major Fish Public Access (Km)
- 1C KM
- # Jurisdictions.1Inv
- TMDLRatio
- EducationPercent



Up

**UTAH**



**Compare HUC12s to each other for specific N&P management actions**

**(e.g., importance of social metrics and community support)**

# *Suggestions for all Recovery Potential Projects*

*you **DO** have the goals, the data, the tools, and the help....just do it.*

- **embrace the flexibility of RPS** – don't expect one rigid set of results; run multiple screenings with different indicators, then select or combine results.
- **screen all your subwatersheds** – at least at a basic level of common indicators; it's little difference in work to measure the indicators on all vs some of them.
- **use reference watersheds** – screen these along with your other subwatersheds so you have context with which to compare your results.
- **limit your indicators in screening, but not in compilation** – measure as many things as you can afford to – because they provide options for further screenings; but, select fewer/more important indicators for each screening run.
- **narrow down your screening purposes** – more focused screenings allow more specific indicator selection, receive clearer signals vs noise -- e.g., screen rural/ag vs urban vs mixed pathogen impairments separately instead of all at once.
- **use the RPS results display options** – the different techniques reveal different things and stimulate “discussion support.”

## A Method for Comparative Analysis of Recovery Potential in Impaired Waters Restoration Planning

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Timothy G. Wade · Kelly Kunert ·  
John V. Thomas · Paul Zeph

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**Abstract** Common decision support systems require a large body of knowledge about ecological systems to inform and guide large state and federal programs affecting thousands of impaired watersheds. The federal Clean Water Act (CWA), with its Water Quality Standards due to impairment, is one of the programs placed on the CWA Section 303(d) list.

Thank you for your time!

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