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:

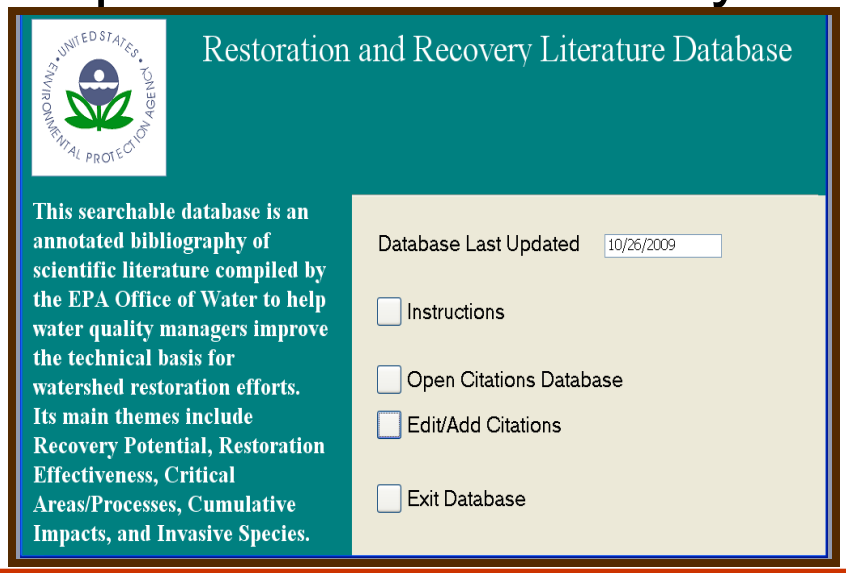
ecological condition,
exposure to stressors, *and*
social context *affecting restoration efforts*

Where it started (2004)…

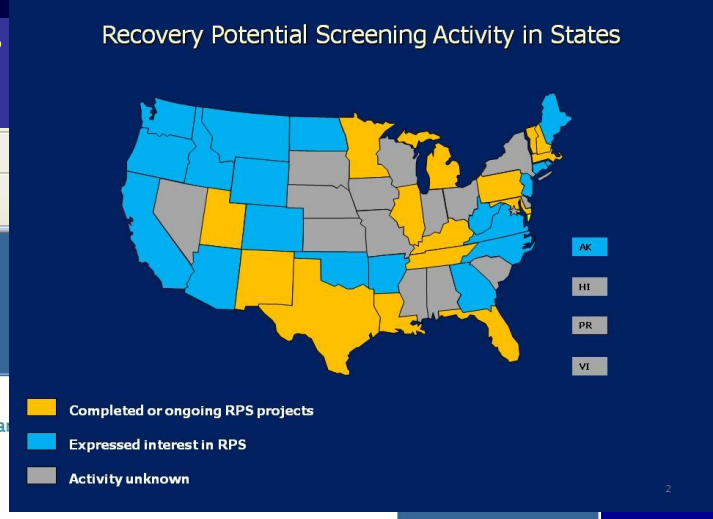
- **Numerous ecological and social factors are associated with the relative ability to recover from impairment**

Recovery Literature Review

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



www.epa.gov/recoverypotential/



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US EPA Recovery Potential Screening | Re...

EPA United States Environmental Protection Agency

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Water: Recovery Potential

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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 ...

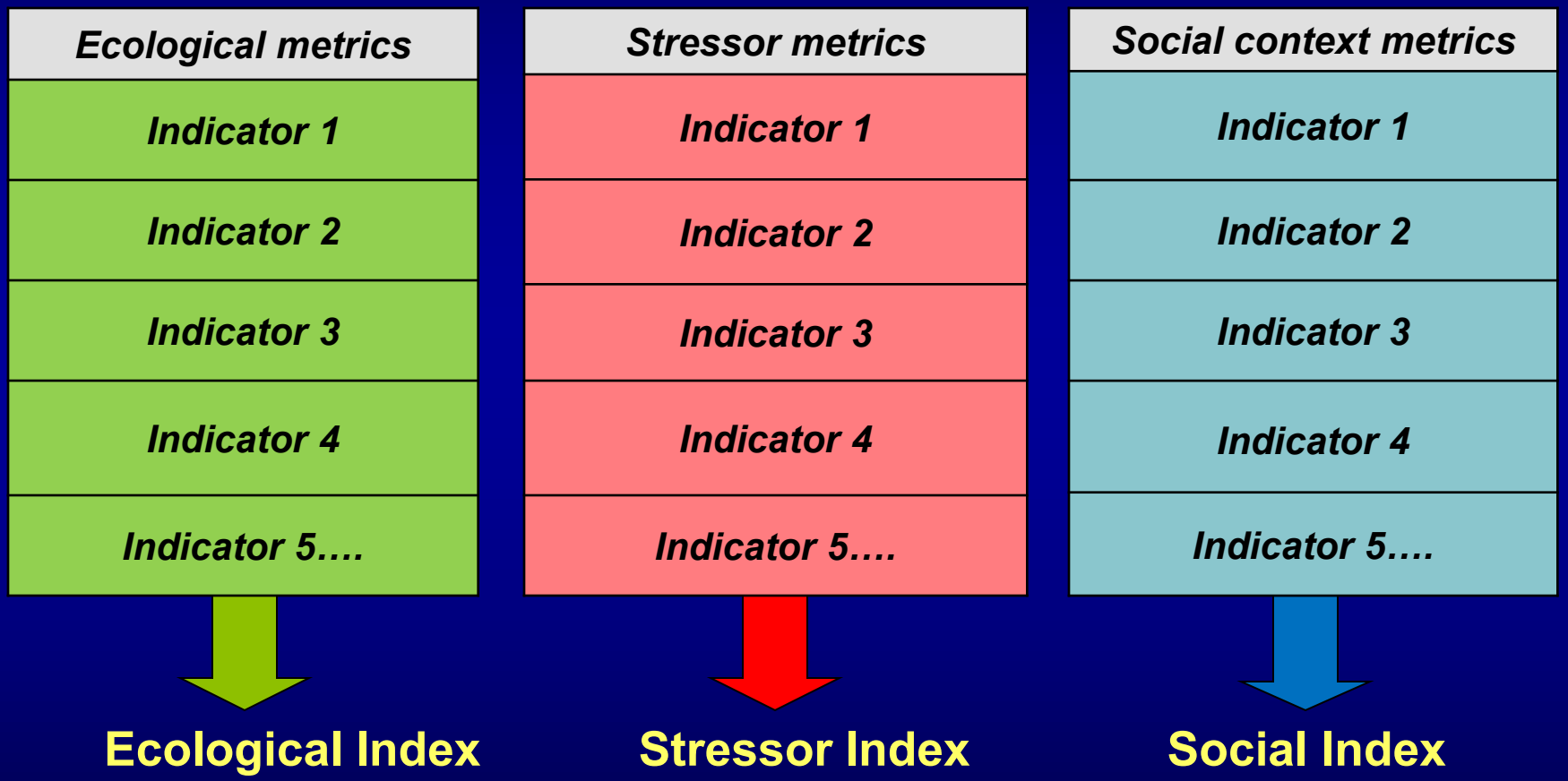
Quick Links

Home
Overview
Screening methodology
Step-by-step screening example
Example projects

Recovery tools & resources
Literature database
Indicators & reference sheets
Scoring techniques
Displaying screening results

How does it work?

Recovery Potential Screening - Basic Concept



$$\frac{\text{Ecological} + \text{Social} + (100 - \text{Stressor})}{3}$$

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 sewered	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 Click the *Reset Worksheets* button to clear workbook contents and I restart your project.

Select Watersheds

Add All Tennessee Watersheds

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)

Select Ecological Indicators

Select the Ecological Indicators of interest below:

Ecological Indicator	Weight
Unimpaired Stream Length (mi.)	1
% Forest	1
Stream Corridor - % Natural Cover	1

Select Stressor Indicators

Select the Stressor Indicators of interest below:

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

Select Social Indicators

Select the Social Indicators of interest below:

Social Indicator	Weight
Ratio of TMDLs to Impairments	1
% of Waterbodies Assessed	1
# of Water Withdrawals	1
# of Surface Water Intakes	1

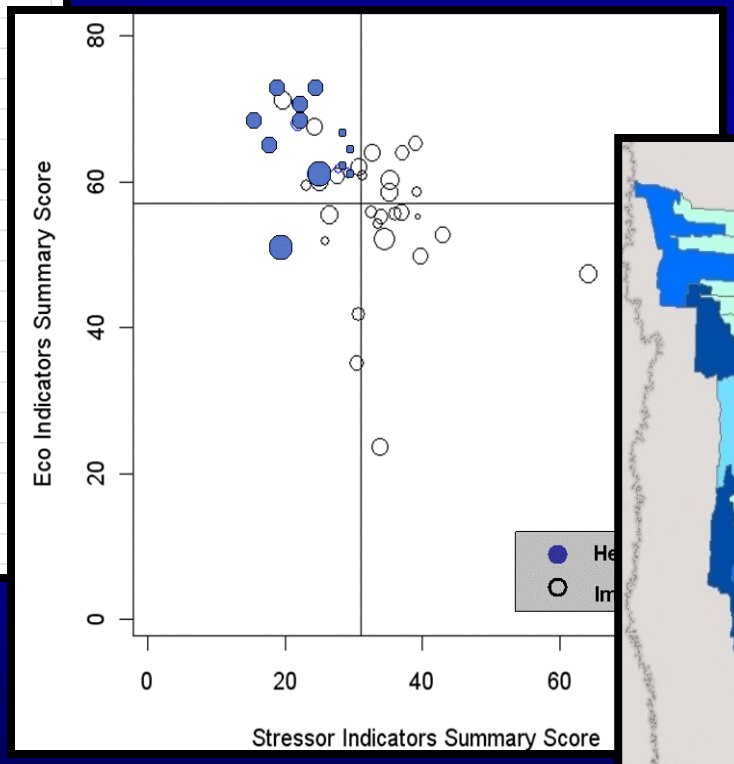
INSTRUCTIONS | Setup | Summary_Scores | Bubble_Plot | Bubble_Plot_Options | HUC12_Map | Indicator_Values | Normalized_Indicator_Map | Indicator_Values | Normalized_Indica

Requires only spreadsheet skills to run screenings, create RPS products

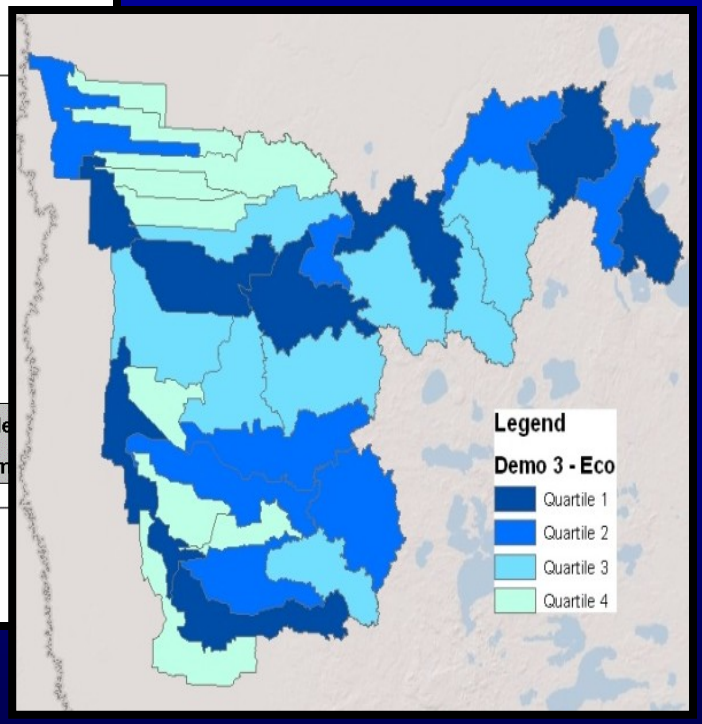
Three Types of Recovery Potential Screening Products (from the indicator scoring)

	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 R	3.74	4
6	010802070204	West Branch Farmi	3.63	5
7	010802060101	Westfield River-hea	3.56	6
8	010700040205	Nashua River-Catac	3.44	7
9	010900020203	Chequesset ground	3.43	8
10	010802060103	Dead Branch Westf	3.39	9
11	010802040202	East Branch Ware F	3.38	10
12	010802060202	West Branch Westf	3.37	11
13	010802060201	West Branch Westf	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



Bubble Plotting

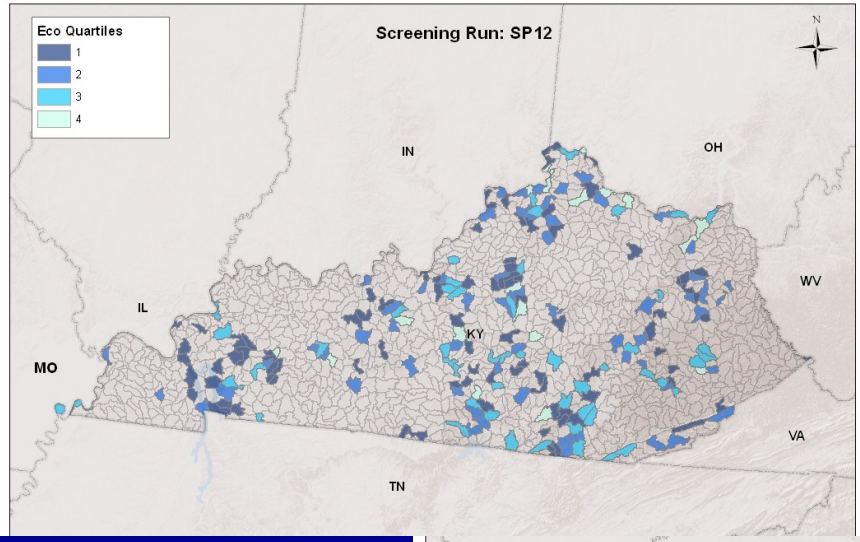


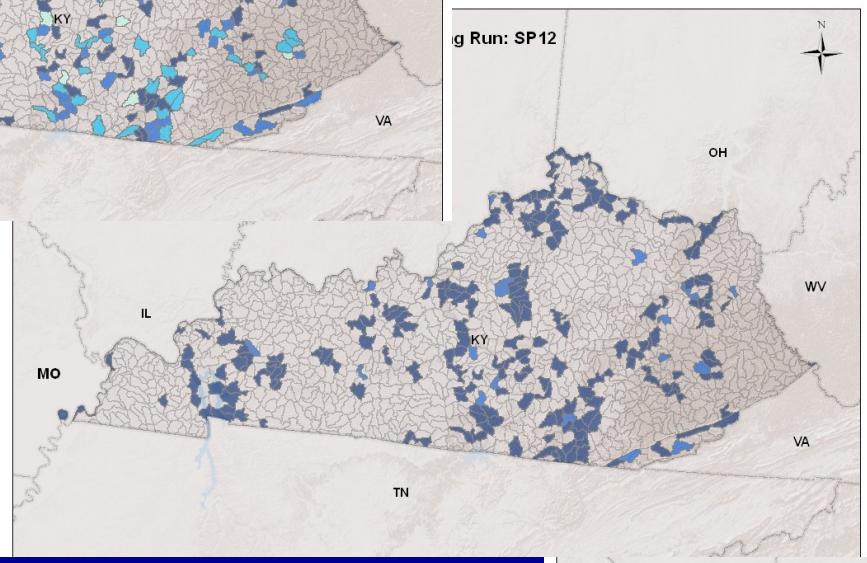
Mapping

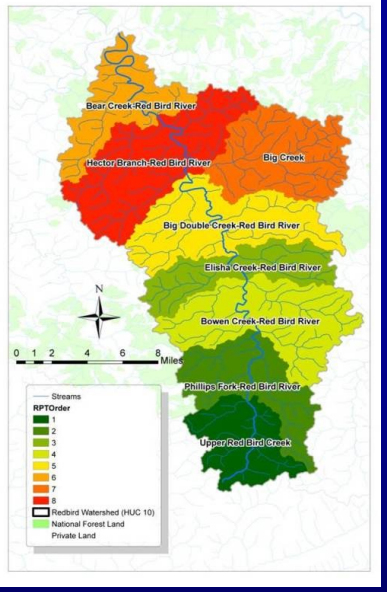
Applying RPS in State Programs

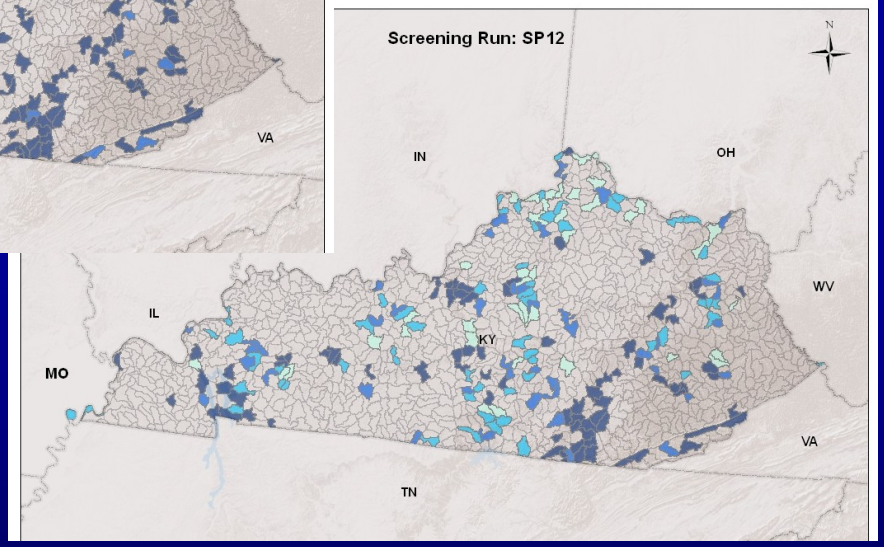
KENTUCKY

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





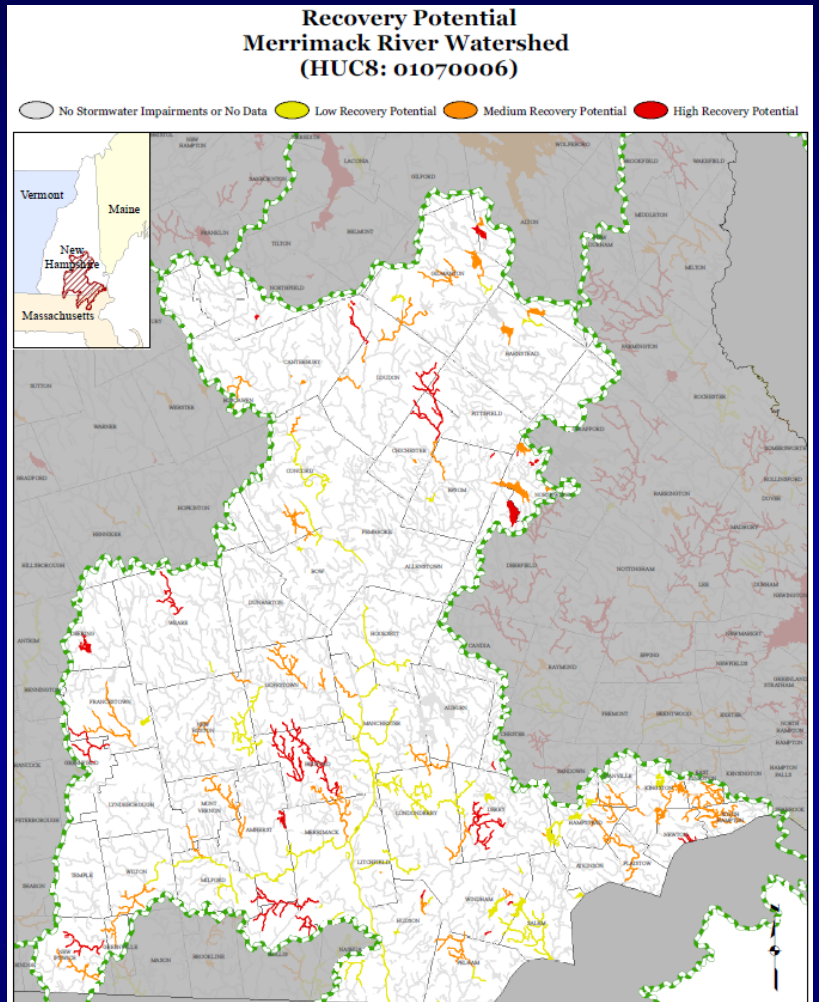


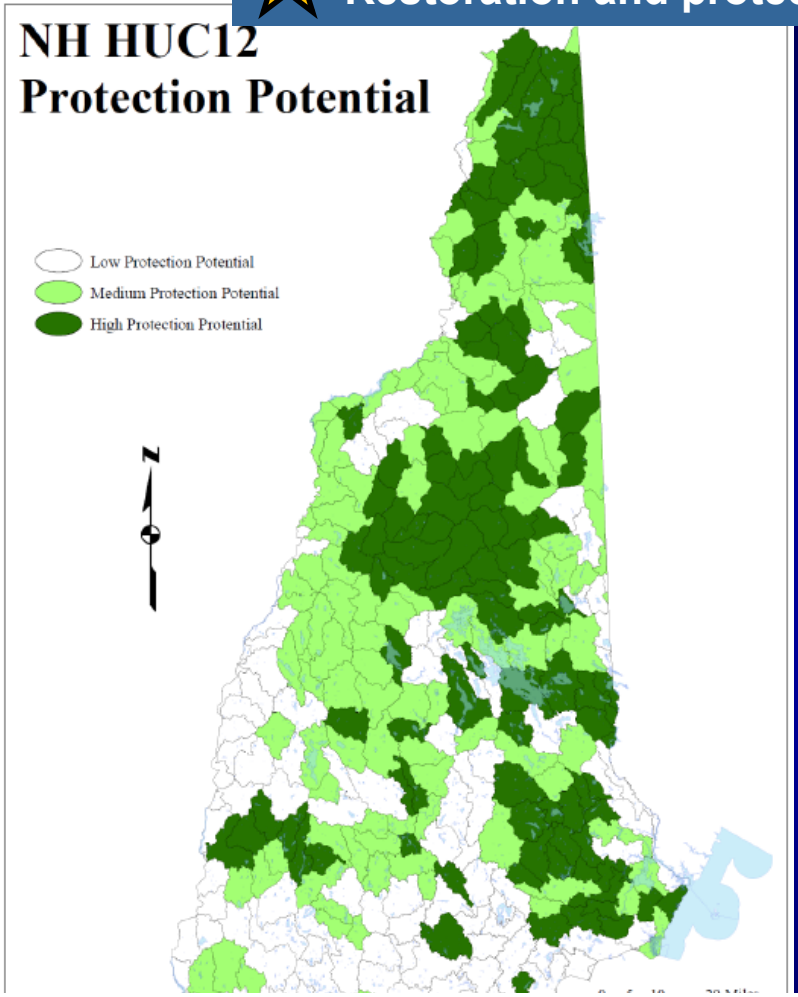


- *SP12 screening results of Eco, Stressor, and Social Indices relative to "improving watersheds" possible priority*

NEW HAMPSHIRE

Restoration and protection





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

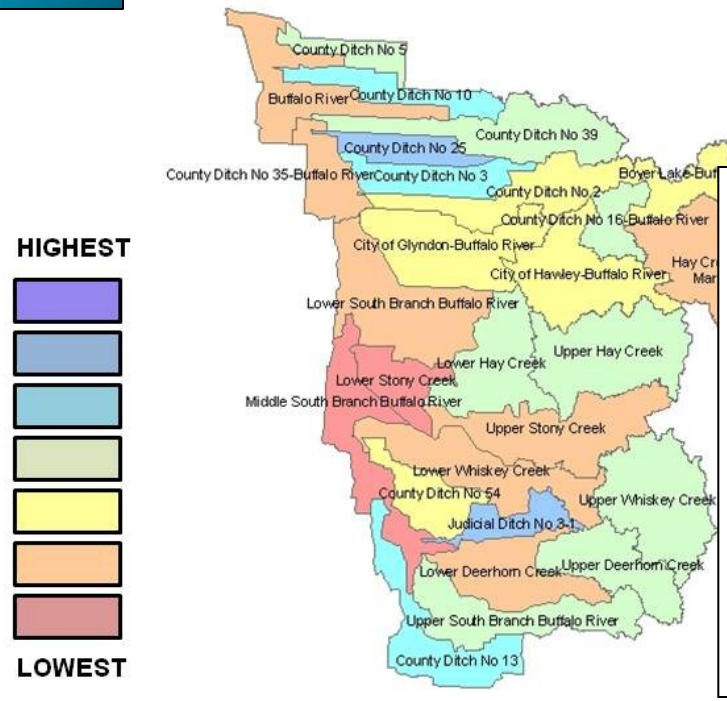
A Comparative Analysis of Recovery Potential for Impaired Waters in the Buffalo River Watershed

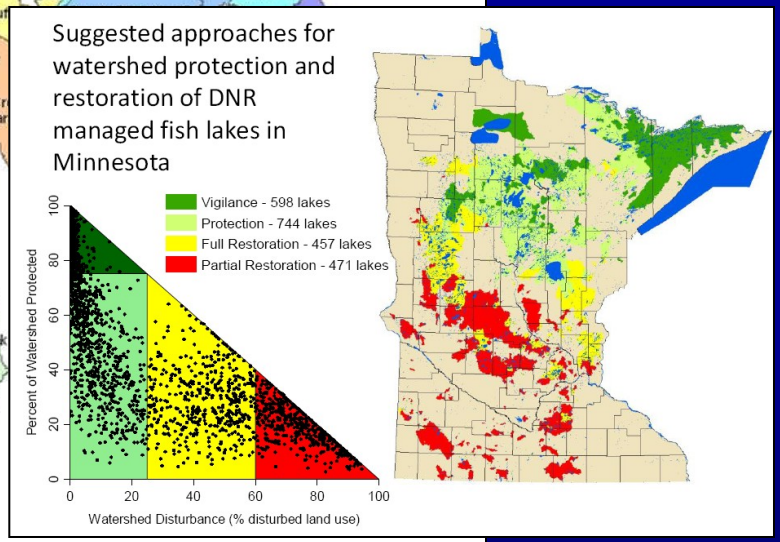
Pete Knutson, MPCA
Peter Mead, NRCS

MINNESOTA

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

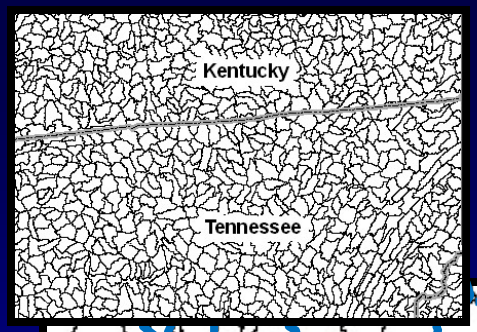
Recovery Potential Integrated S
or Buffalo River, Minnesota sub-watersheds
[courtesy of Minnesota Pollution Control Agency]

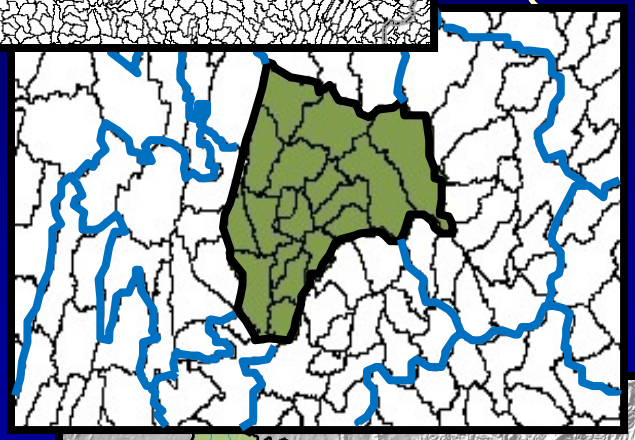


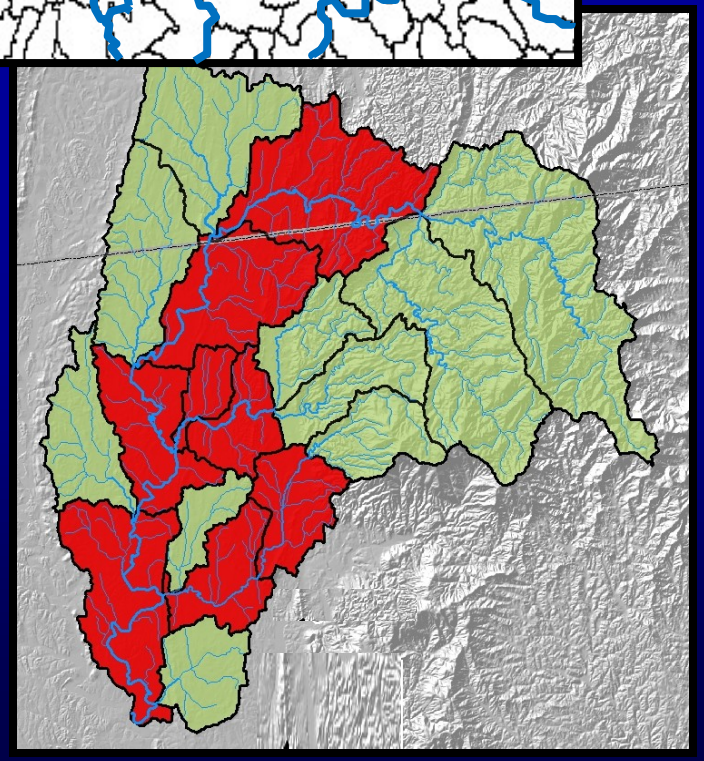


- *Evaluate restorability to inform dialogue on priority setting*
- *USDA, EPA, MPCA, MDNR involvement*

Nutrients RPS Two-Stage Approach







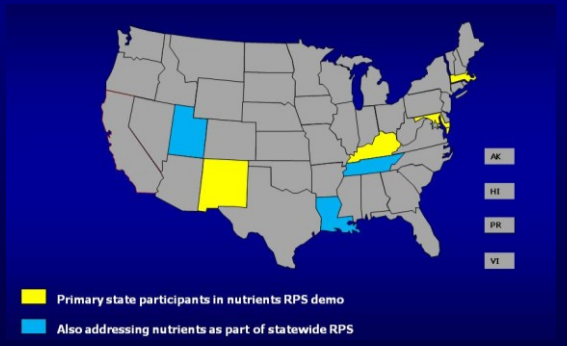
- Statewide 'coarse sort' of all HUC8s
(Loading, sources, ecological condition, readiness)

(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)



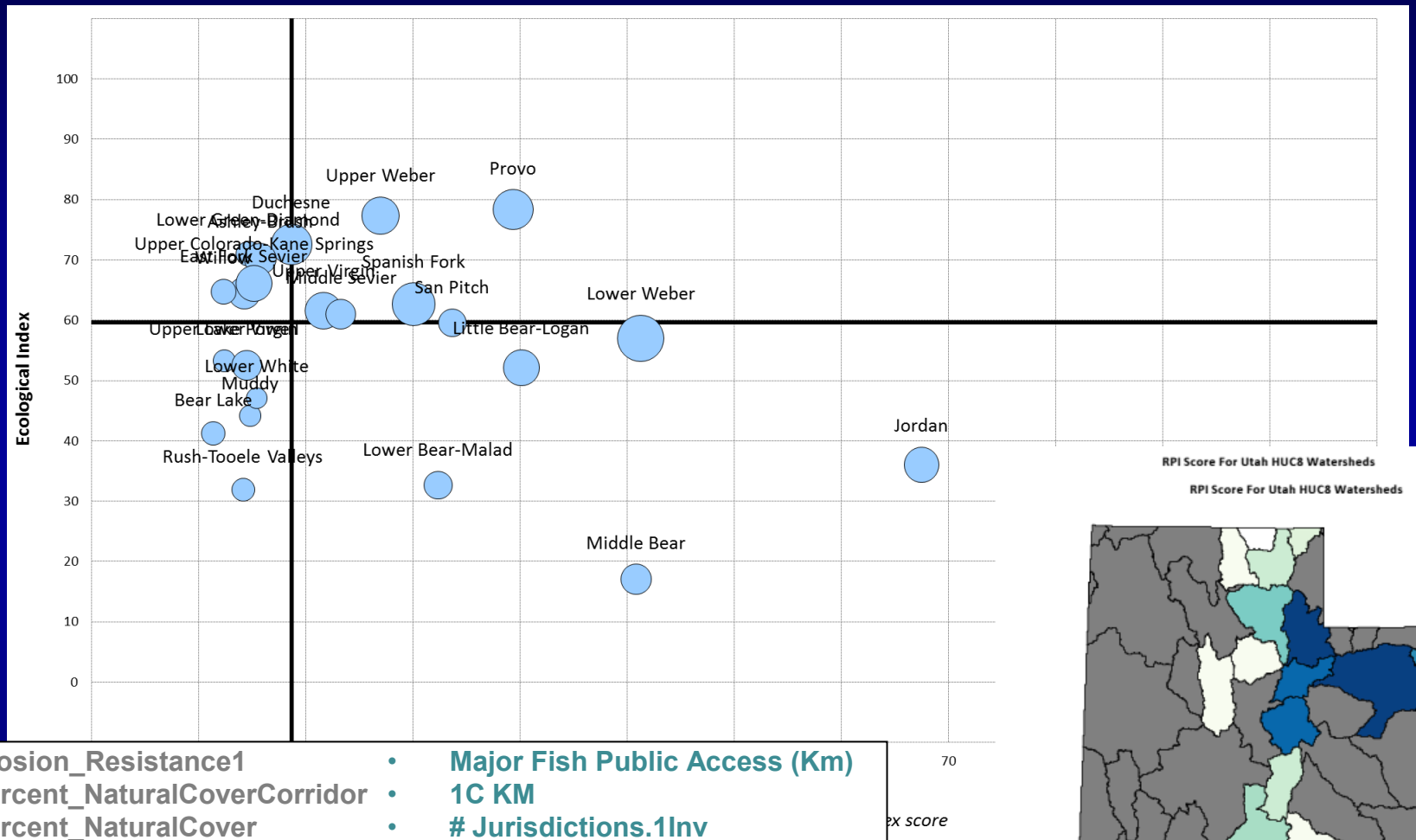
Comparing nutrients priorities

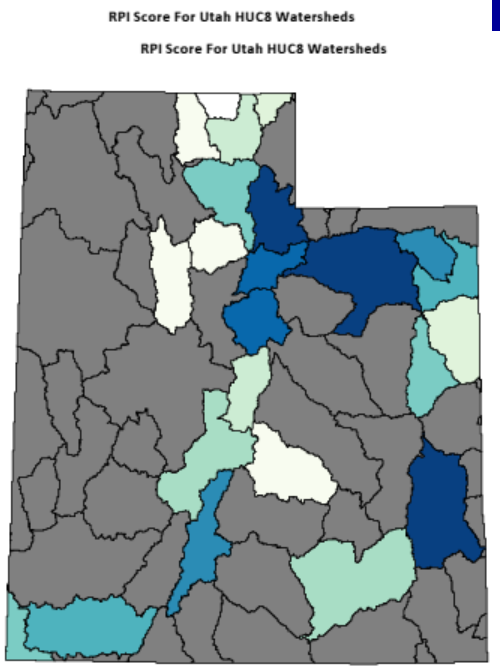
MARYLAND

Maryland RPS Nutrients-Based Watershed Screening Results

MDE8DIGT	MDE8NAME	S1	S2	S3	S4	S5	S6 TOTAL SCORE FROM SYNTHs	PASSFAIL
02130609	Furnace Bay	1	1	1	1	1	5	Pass
02131108	Brighton Dam	1			1	1	3	Pass
02140504	Conococheague Creek		1		1	1	3	Fail
02130507	Corsica River	1			1	1	3	Pass
02120202	Deer Creek	1			1	1	3	Pass
02140302	Lower Monocacy River		1		1	1	3	Fail
02140503	Marsh Run		1		1	1	3	Fail
02130306	Marshyhope Creek		1		1	1	3	Fail
02140301	Potomac River FR Cnty		1		1	1		
02130508	Southeast Creek		1		1	1		
02140105	St. Clements Bay	1			1	1		
02130308	Transquaking River		1		1	1		
02130203	Upper Pocomoke River		1		1	1		
02130503	Wye River	1			1	1		
02140305	Catoctin Creek		1		1			
02140304	Double Pipe Creek		1		1			
02120201	L Susquehanna River	1			1			
02130506	Langford Creek	1			1			
02130804	Little Gunpowder Falls	1			1			
02130805	Loch Raven Reservoir	1			1			
02130202	Lower Pocomoke River		1		1			
02130509	Middle Chester River		1		1			
02131106	Middle Patuxent River		1		1			
02120203	Octoraro Creek	1			1			
02140202	Potomac River MO Cnty		1		1			
02140501	Potomac River WA Cnty		1		1			
02130806	Prettyboy Reservoir	1			1			
02131107	Rocky Gorge Dam	1			1			
02130510	Upper Chester River		1		1			
02140106	Wicomico River				1	1		
02140502	Antietam Creek		1					
02130403	Lower Choptank		1					
02130908	S Branch Patapsco	1						

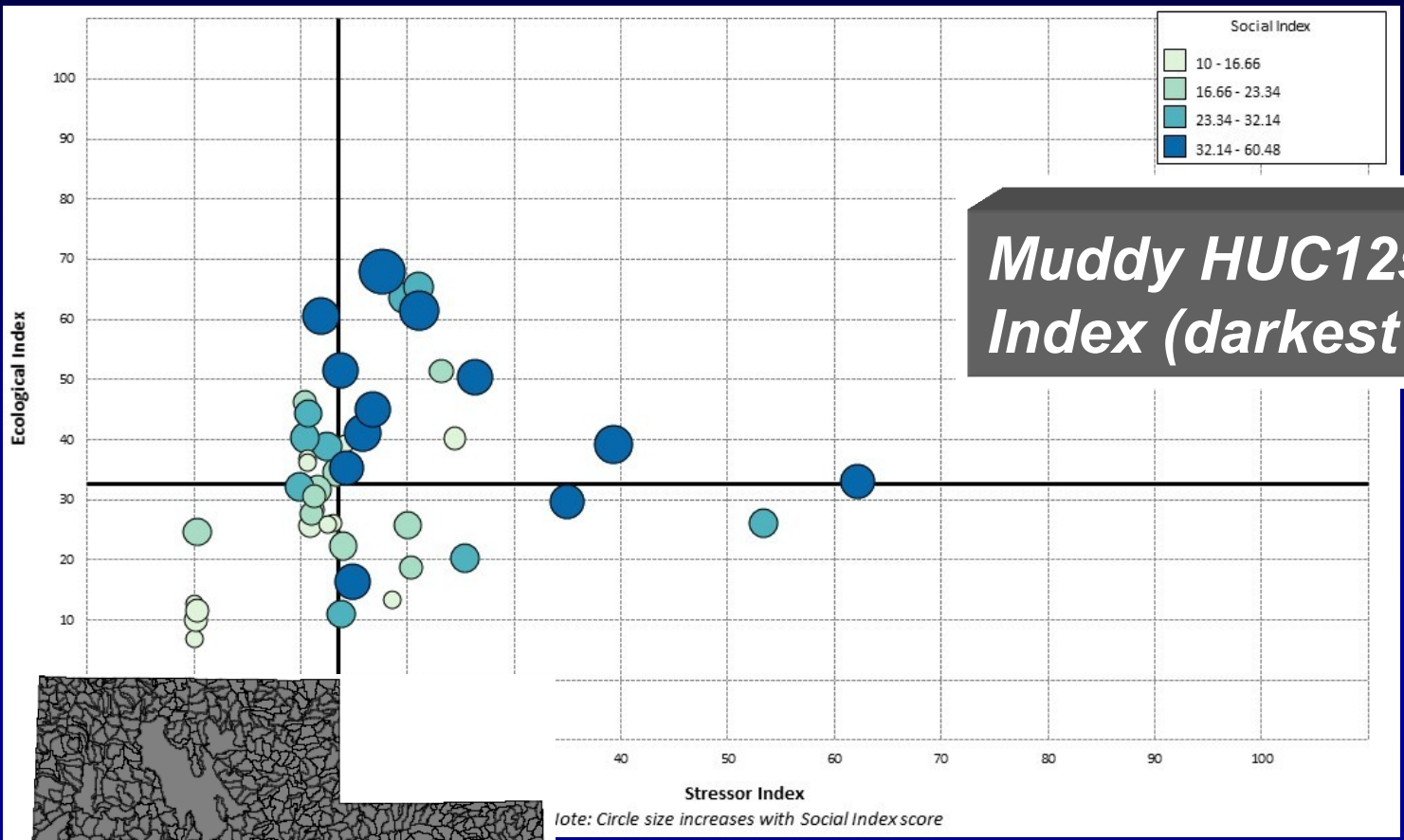
UT: a N-based scenario selection identifies 23 possible target HUC8s



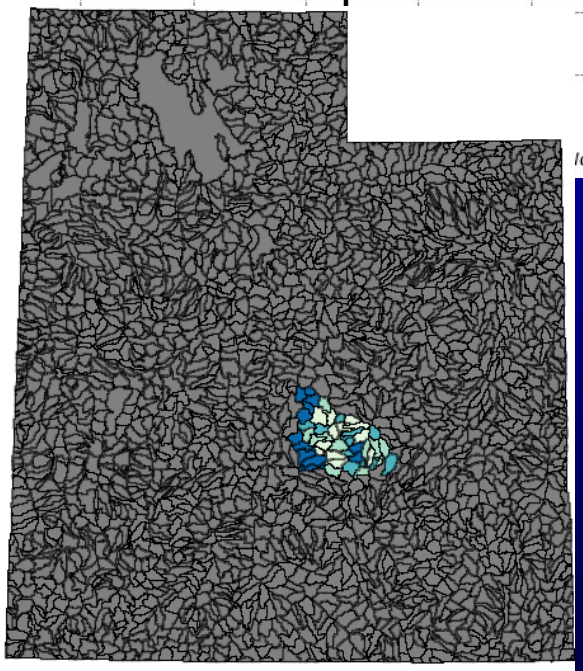


- Erosion_Resistance1
- Percent_NaturalCoverCorridor
- Percent_NaturalCover
- **#UPDES**
- **percentUrban**
- **#Diversions**
- **percentCropland**
- **ReNANIAB**
- **# T&E spp**
- **Major Fish Public Access (Km)**
- **1C KM**
- **# Jurisdictions.1Inv**
- **TMDLRatio**
- **EducationPercent**

UTAH



Muddy HUC12s by Social Index (darkest = highest)



<u>Compare HUC12s to each other for specific N&P management actions</u>

(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."

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

Douglas J. Norton · James D. Wickham · Timothy G. Wade · Kelly Kunert · John V. Thomas · Paul Zeph

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Abstract Common decision suppo
body of knowledge about ecologi
inform and guide large state and f
grams affecting thousands of impa
federal Clean Water Act (CWA), w
Water Quality Standards due to im
are placed on the CWA Section 30

Thank you for your time!

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