

WATERShed Characterization And Prioritization for Environmental Results



WATERSCAPE

A GIS-based Framework for Identifying Priority Watersheds

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Outline for Today

- Examples of tools designed to assist in setting locational priorities
 - Money Magazine: Best Places to Retire
 - USDA Forest Service Spatial Analysis Tool
- What is *WATERSCAPE*
 - How does it work
- What types of data does it consider
 - Designated Uses, Impairments, Drinking Water, Nutrient Yields, Socio-economic, Impervious Cover, ...
- Hypothetical sample applications
 - MA: Designated Uses
 - OH: Nutrients
 - VT: Protection

Where Would You Like to Retire?

- Many possible factors to consider
- Factors vary in importance from person to person

Best places to retire - Microsoft Internet Explorer

Address: <http://cgi.money.cnn.com/tools/bestplaces/bpretire.jsp>

Funds (Money 100)
[Places to Live](#)
[Places to Retire](#)
[Places to Vacation](#)
[Benefits](#)

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START **WEATHER** **HOUSING INCOME & TAXES** **TRAVEL & ENTERTAINMENT** **COLLEGE & EDUCATION** **HEALTH & SAFETY** **RESULTS**

HEALTH

Rate how important this is to you

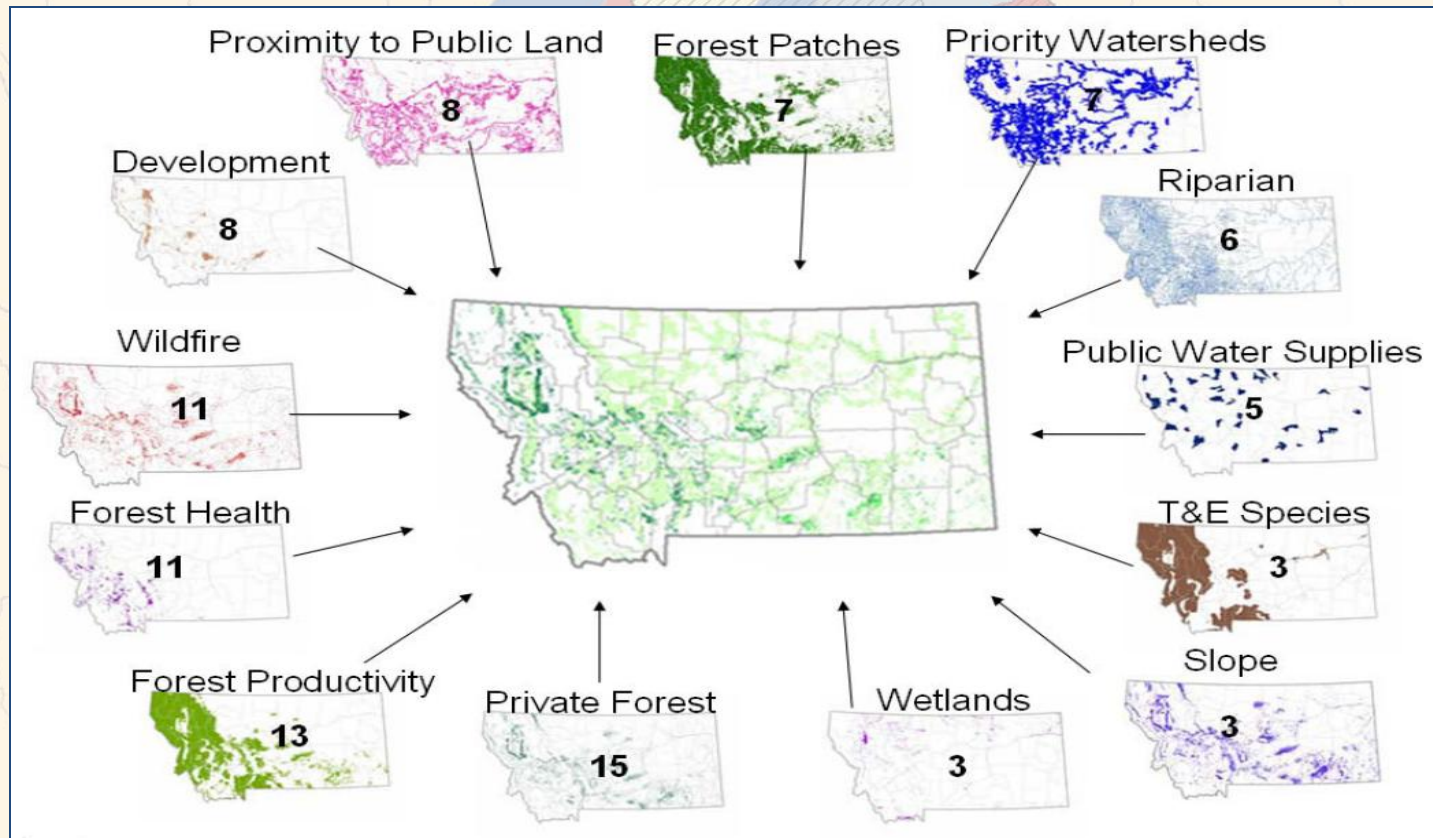
Number of doctor's offices and clinics	NOT	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	VERY
Number of medical and surgical hospitals	NOT	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	VERY
Number of nursing care facilities	NOT	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	VERY
Number of home care facilities	NOT	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	VERY
Few nearby superfund sites	NOT	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	VERY
Low air pollution	NOT	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	VERY

Select a level of importance for the factors that interest you. For some, you can also change the preferred value. Select as many different data fields under as many different tabs as you like before clicking the results button. After you've viewed your results list, you can always click on other tabs to make more changes.

Done Internet

USDA Forest Service Spatial Analysis Project

- Aid States in setting priorities for fuel treatment projects to reduce wildfire risks
- Esri contracted to develop GIS tool to engage public
- 13 key data layers developed by the Forest Service, States could add more
- Weightings assigned to layers by public/land managers to reflect relative importance



WATERSCAPE

WATERSCAPE Mission Statement: Recognizing resource limitations, *WATERSCAPE* facilitates public engagement and eases the setting of TMDL priorities by enabling States and Tribes to quickly visualize maps and compare alternative prioritization scenarios that **reflect their own value system**

How *WATERSCAPE* Works:

- Developed by Esri as add-on to ArcGIS
 - No additional cost to user beyond ArcGIS license
 - Full Esri GIS capabilities maintained, e.g. add roads or county borders as locational aids
 - Scale: HUC12 from Release 2 NHDPlus, clipped at State borders (coterminous US)
- Combines two types of “scored” State-normalized HUC12 data on properties (e.g., values/stressors) of interest in order to identify priority watersheds
 1. Relative Intrinsic Score - percentile ranking of the density of each property of interest in each HUC12 in the State compared to the density of that property in other HUC12s in that State
 2. Assigned Weighting Score – a value of 0-100% is assigned to each property by the user to reflect the desired extent to which that property should factor into the overall HUC12 selection vs. other properties, i.e. each property’s relative importance
- User then selects all or some of the HUC12s identified
 - Manual selection option available to supplement scored selection

WATERSCAPE

Data Layers for HUC12 Properties

- EPA developing core set of State-normalized data layers reflecting relative intrinsic density of values/stressors in HUC12s (clipped at State borders);
 - Drinking water
 - ★ • Source water protection area for surface intakes
 - ★ • Population served by surface drinking water systems
 - ★ • Ground water well density
 - ★ Designated use (Jan 2014 305(b) summaries) – parent categories
 - Drinking water, recreation, agriculture, aesthetic, aquatic harvest, industrial, fish/shellfish/wildlife, exceptional
 - ★ Impaired waters (Jan 2014 303(d) summaries)
 - All impairments, nutrient-related, all but nutrient-related, pathogens, all but pathogens, sediment, all but sediment, temperature, all but temperature
 - ☆ Nutrient yield – USGS SPARROW estimates for N and P from agricultural sources; other source groupings possible
 - ★ Category 1 waters (all designated uses being met) – useful for informing protection opportunities
 - ★ Impervious cover – 2010 and 2040, based on EPA ORD’s ICLUS Project (Integrated Climate and Land Use Scenarios)
 - ★ Environmental Justice – combination of % low income and % minority
 - ★ Economic stress - composite of families living in poverty, unemployment rate, educational attainment, per capita income, and housing affordability
 - ☆ Climate change – **NHDPlus Futures** - being developed in partnership with USGS
 - Habitat
 - ☆ • Aquatic and wetland T & E species
 - ☆ • Fish habitat degradation
 - ☆ Recovery Potential – first-order screening
- More to come; States/Tribes can add their own

Key to Data Availability

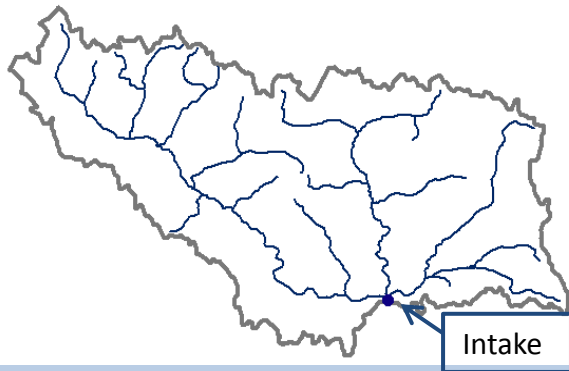
★ Completed

☆ Under development

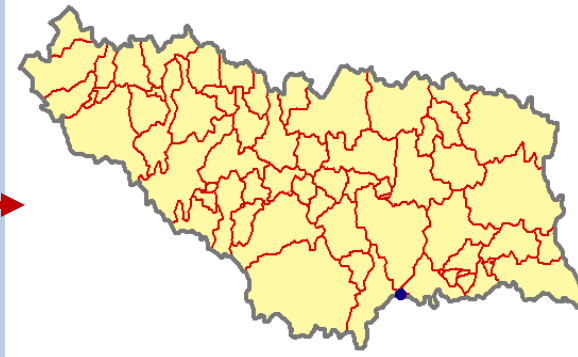
Example *WATERSCAPE* Intrinsic HUC12 Scoring: Drinking Water – Source Water Protection Areas

What are Source Water Protection Areas (SPAs)?

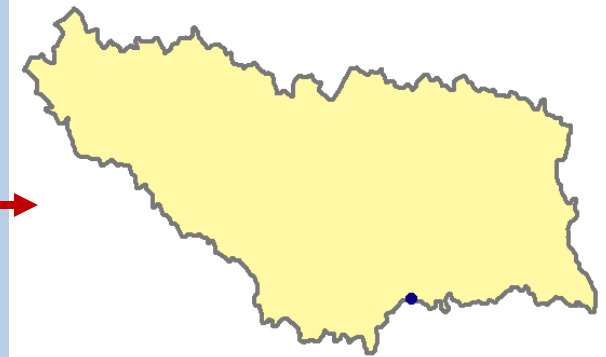
- Developed by EPA Office of Groundwater and Drinking Water (OGWDW) with locational information from fall 2010 SDWIS data
- NHDPlus used to identify catchments encountered by traveling 1 day upstream from surface drinking water intakes
 - Developed for > 9,300 intakes nationwide



(1) Navigate 24 hours time of travel (TOT) upstream from georeferenced drinking water facility points along NHDPlus flowlines



(2) Identify NHDPlus catchments related to the 24 hour TOT flowlines



(3) Dissolve catchment boundaries to create 24 hour TOT SPA

https://statusdw.rti.org/DWMA_Introduction.htm

Example *WATERSCAPE* Intrinsic HUC12 Scoring: Drinking Water – Source Water Protection Areas (cont.)

SPAs typically extend beyond the HUC12 containing the intake

HUC12s containing SPA area
(shown in gray)

- + EPA policy prohibits public dissemination of drinking water intake locations due to water security concerns
 - + Same concern for SPAs
- + EPA has released HUC12 summaries of intake density
- + Targeting only HUC12s that contain the intake often overlooks other upstream areas that immediately influence drinking water quality
- + Note too that the intake shown is in the upstream-most portion of the HUC12 containing it

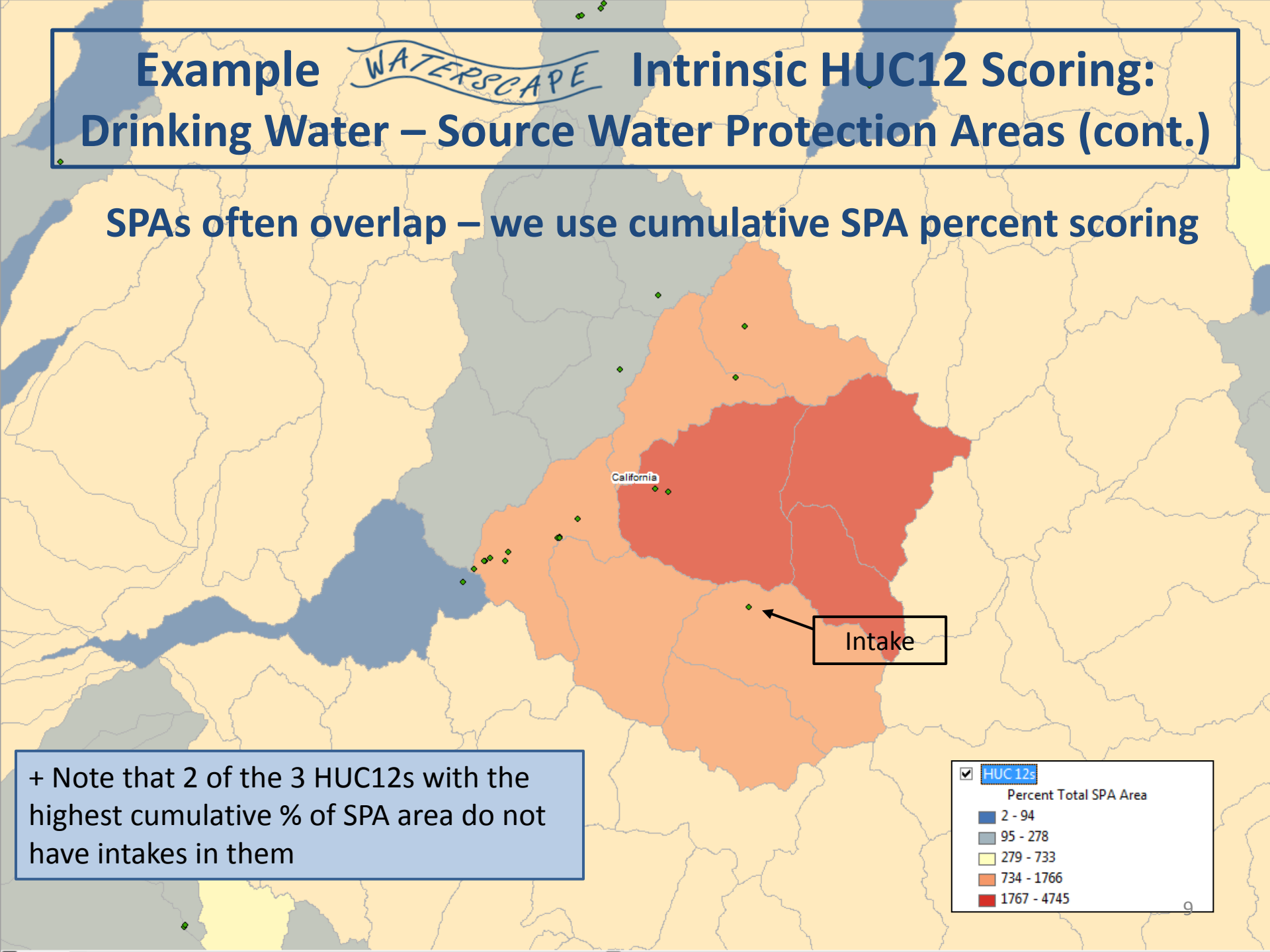
SPA (shown with diagonal lines)

Intake

HUC12 containing intake

**Example *WATERSCAPE* Intrinsic HUC12 Scoring:
Drinking Water – Source Water Protection Areas (cont.)**

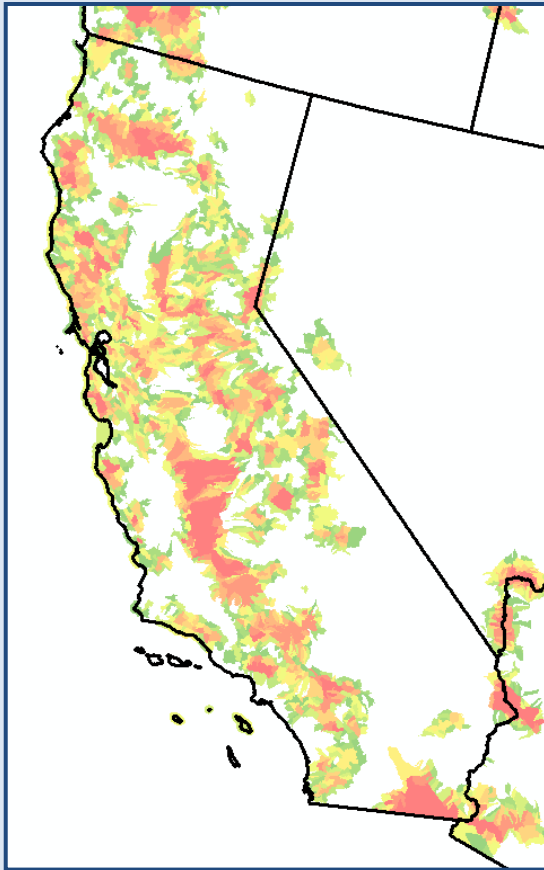
SPAs often overlap – we use cumulative SPA percent scoring



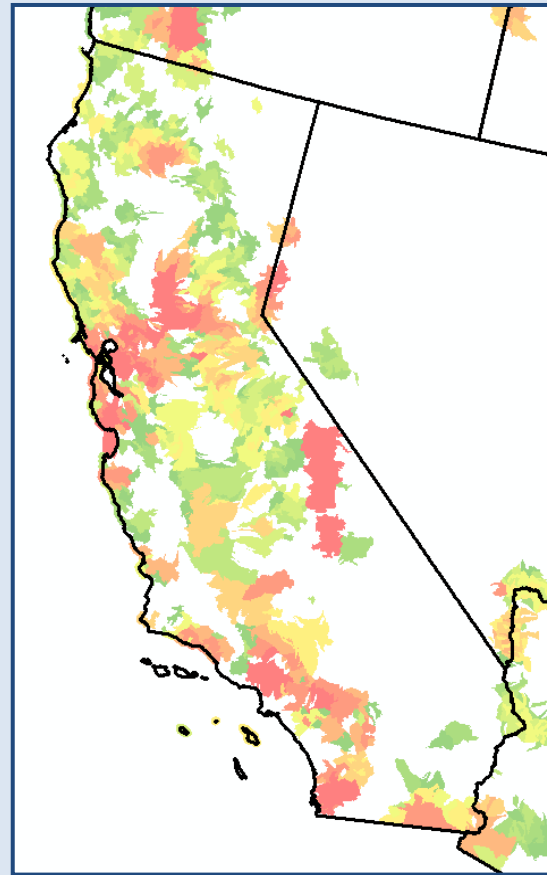
+ Note that 2 of the 3 HUC12s with the highest cumulative % of SPA area do not have intakes in them

Example *WATERSCAPE* Intrinsic HUC12 Scoring: Drinking Water – Source Water Protection Areas (cont.)

Decile Grouping of State-normalized HUC12s



Cumulative SPA Area Scoring

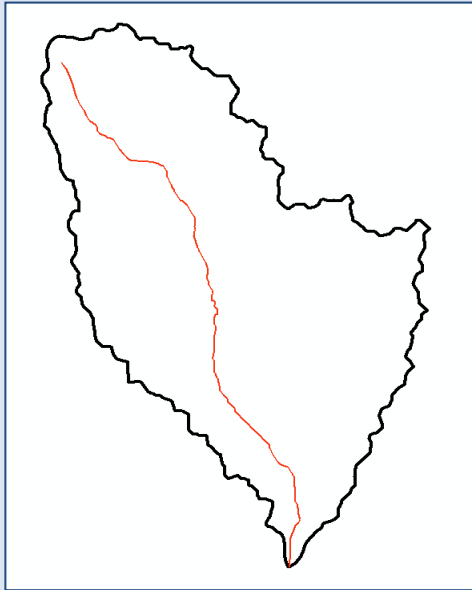


Drinking Water System
Population Served Scoring

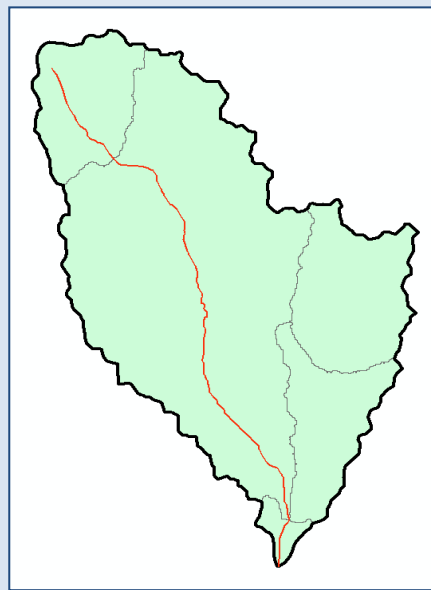
Example *WATERSCAPE* Intrinsic HUC12 Scoring: Designated Uses and Impaired Waters – Catchment Area

How many miles are in an acre?

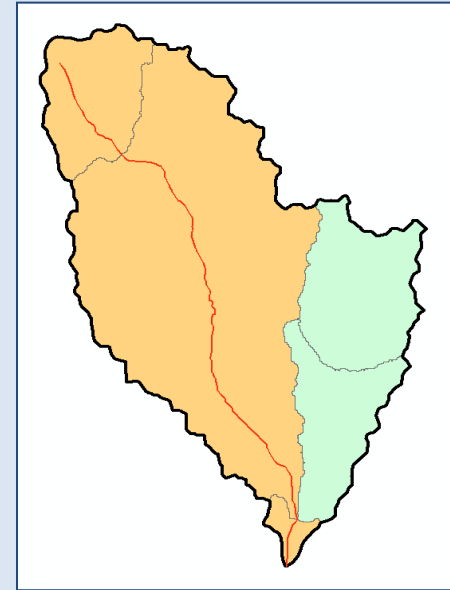
- Point, line (river/stream), and polygon (pond/lake) geometries are used by States to classify waters for designated uses and to report impairments
- Challenge to score HUC12s → Solution: catchment area



Impaired water (red)
inside a HUC12



Catchments shown in
green (5)



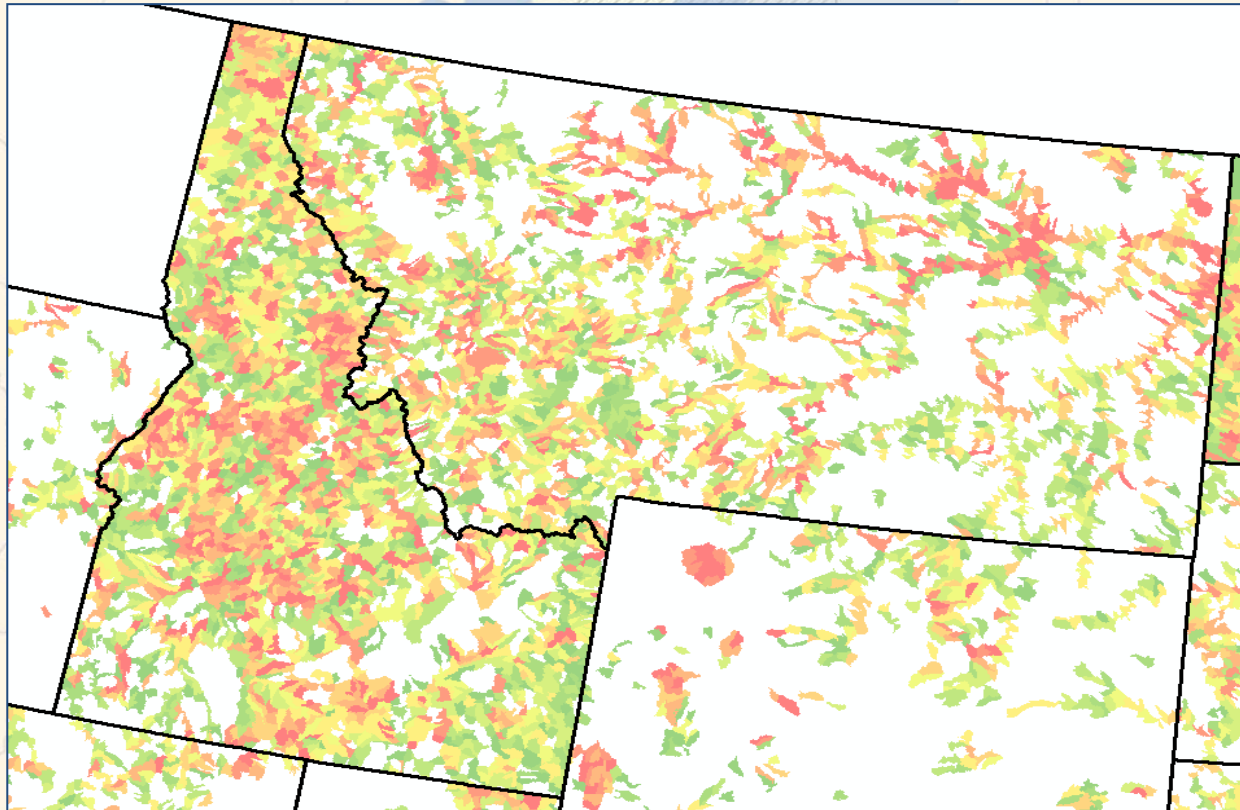
Impaired water intersects 3
catchments comprising
70% of HUC12 area



Thus, this HUC12 receives a raw intrinsic score of 70% that will be ranked against other HUC12s in that State

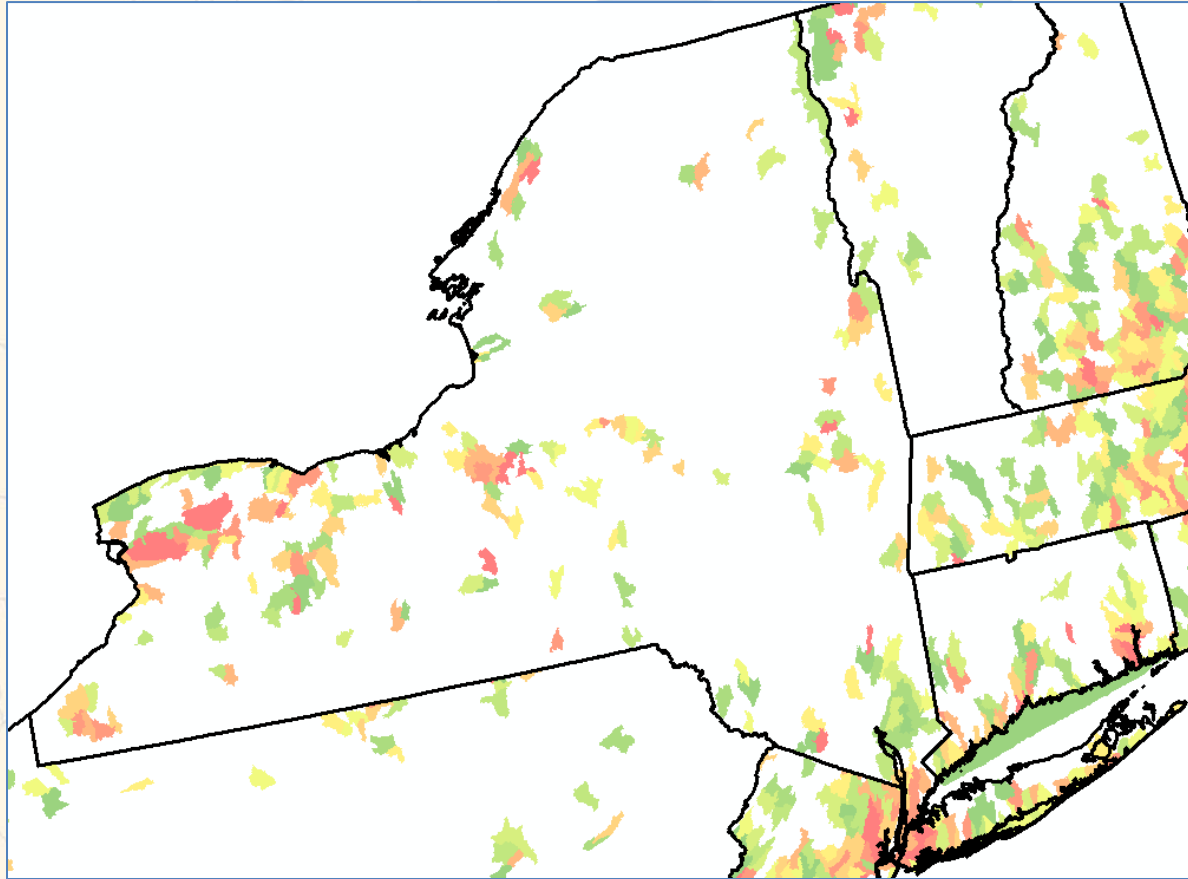
Example *WATERSCAPE* Intrinsic HUC12 Scoring: Designated Uses and Impaired Waters – Catchment Area (cont.)

- Process from previous slide repeated for all points, lines and polygons in each HUC12 in order to calculate total area of interest, i.e. sum of the intersecting catchments
- Decile groupings (intrinsic *WATERSCAPE* scores) then derived for each State



Decile groupings of ID and MT HUC12s based on waters with a “Recreation” designated use

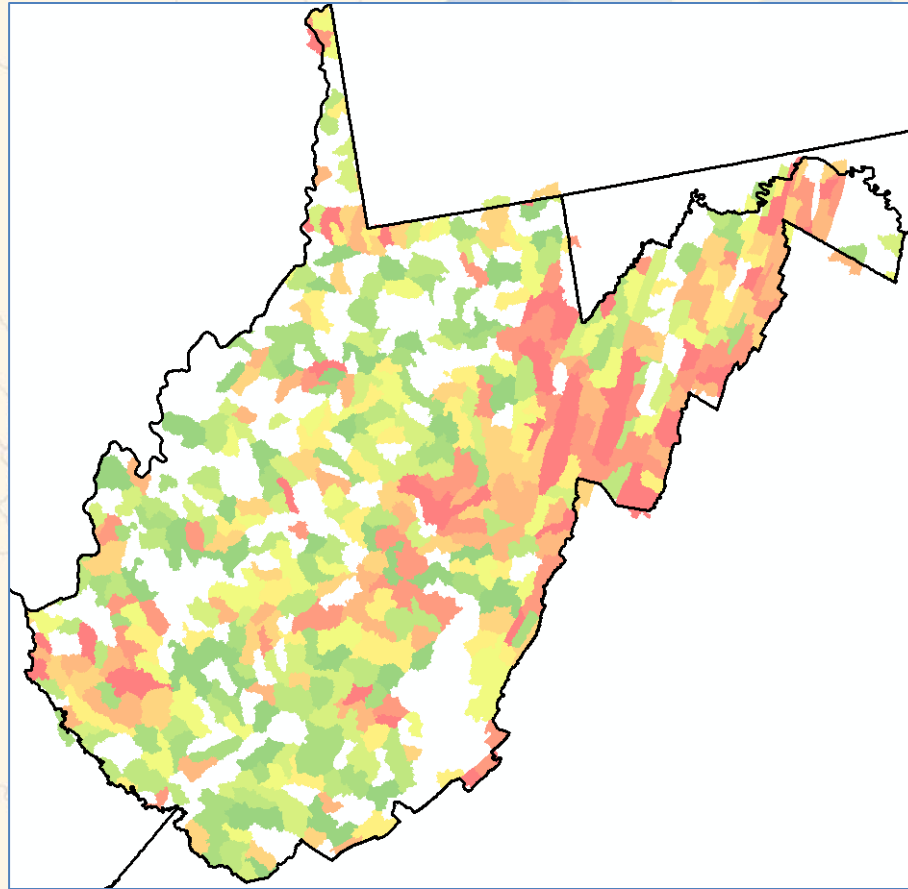
Example *WATERSCAPE* Intrinsic HUC12 Scoring: Designated Uses and Impaired Waters – Catchment Area (cont.)



Decile groupings of NY HUC12s based on waters with nutrient-related* impairments

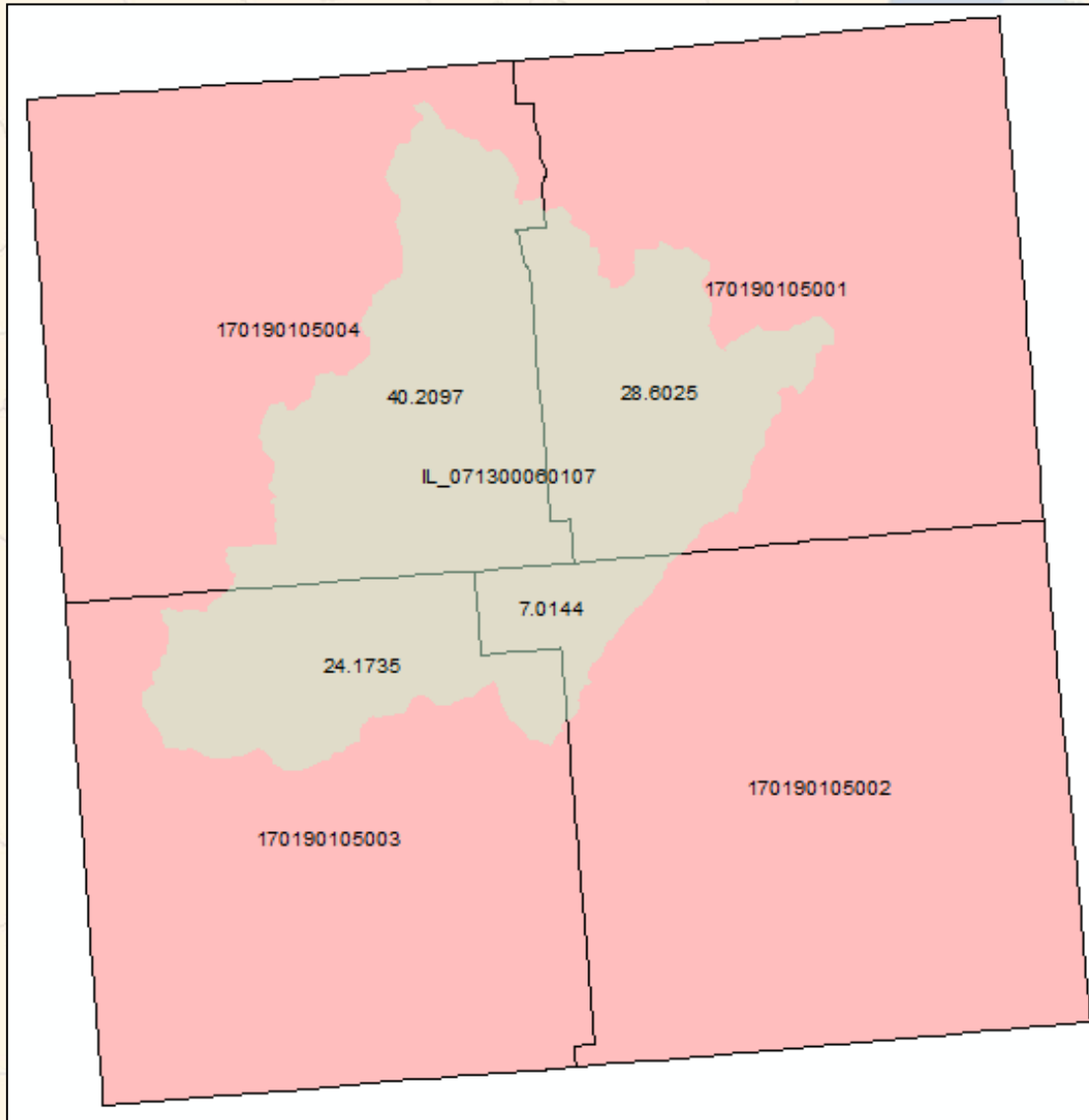
* Nutrient-related parent categories include: algal growth, ammonia, noxious aquatic plants, nutrients, and organic enrichment/ oxygen depletion

Example *WATERSCAPE* **Intrinsic HUC12 Scoring:**
Designated Uses and Impaired Waters – Catchment Area (cont.)



Decile groupings of WV HUC12s based on
Category 1 waters – meeting all designated uses

Example *WATERSCAPE* Intrinsic HUC12 Scoring: Census Data-based Properties – EJ and Economic Stress



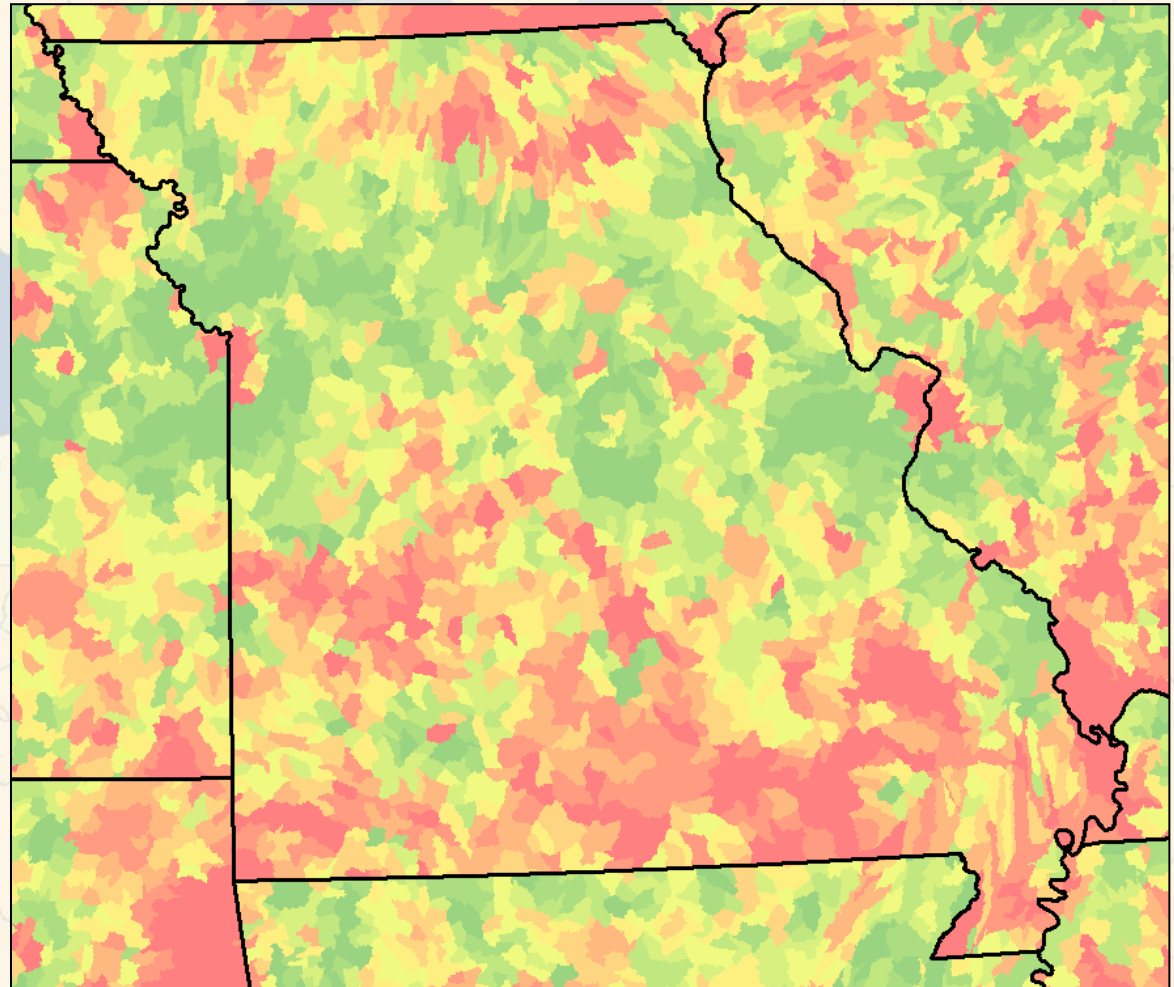
- HUC12 in IL shown in beige
- 4 intersecting block groups shown in rose
- Clockwise from upper left, HUC12 area comprised of 40.2% from block group 5004, 28.6% from block group 5001, 7.0% from 5002, and 24.2% from 5003
- These block group weightings are used to compute HUC12-scale properties from Census data

Note: There are approximately 216,000 block groups in the lower 48 States; they generally contain 600-3000 people

Example *WATERSCAPE* Intrinsic HUC12 Scoring: Census Data-based Properties – EJ and Economic Stress (cont.)

Environmental Justice (EJ)

- Comprised of block group % minority and % low income (2 times poverty level) from latest Census data
 - Primary socio-demographic from EPA's EJSCREEN tool*
- HUC12 scoring normalized for each State based on area weighting of block groups as outlined in previous slide



Decile groupings of MO HUC12s for EJ

* See: <http://www.epa.gov/environmentaljustice/plan-ej/index.html?>

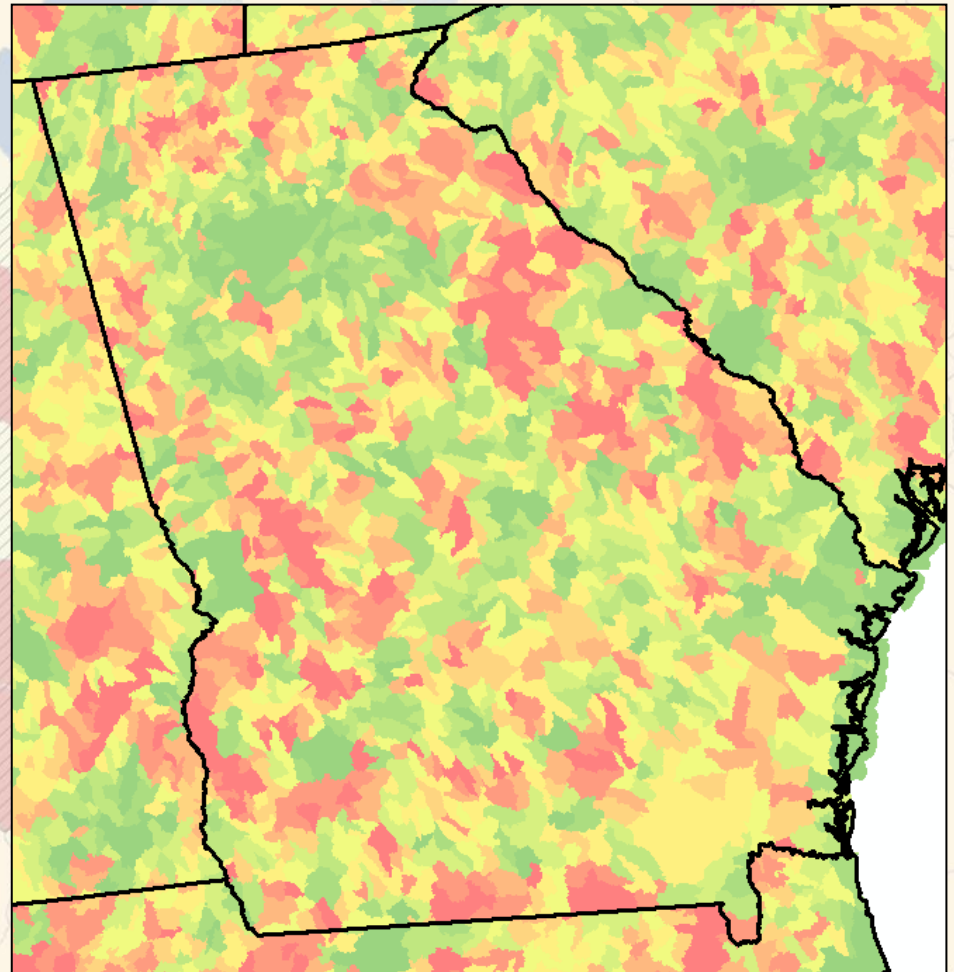
Example



Intrinsic HUC12 Scoring: Census Data-based Properties – EJ and Economic Stress (cont.)

Composite Economic Stress Index

- Based on process developed by the Sonoran Institute;* applied at block group scale and updated to reflect newer data
- Unemployment rate
- % of families living in poverty
- Educational attainment (% with college degree)
- Per capita income
- Housing affordability (mobility) – median family income divided by median house price in county



Decile groupings of GA HUC12s for Economic Stress

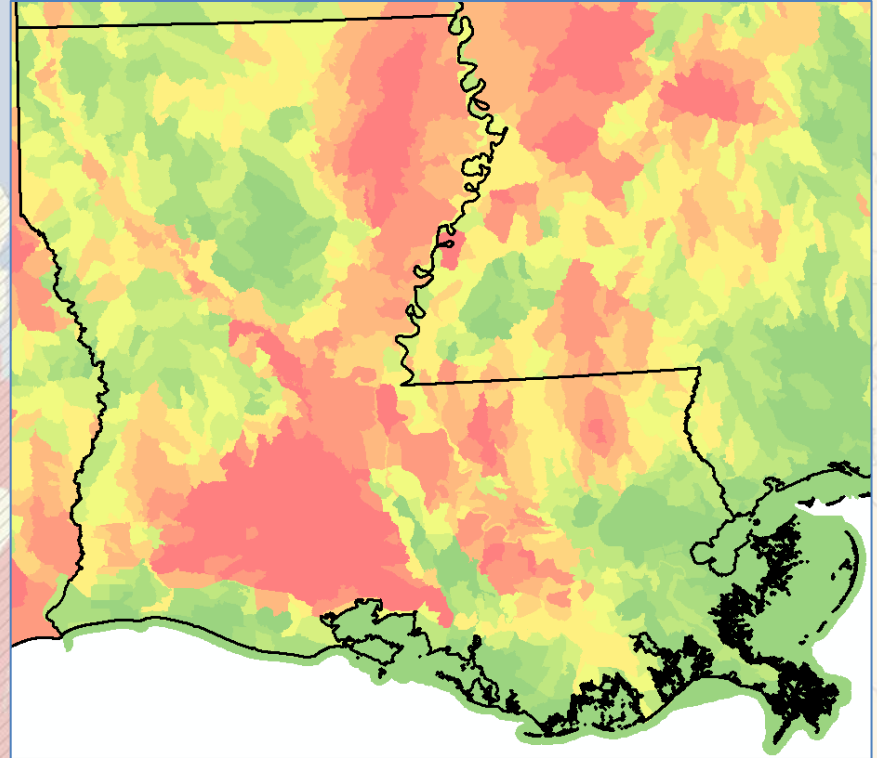
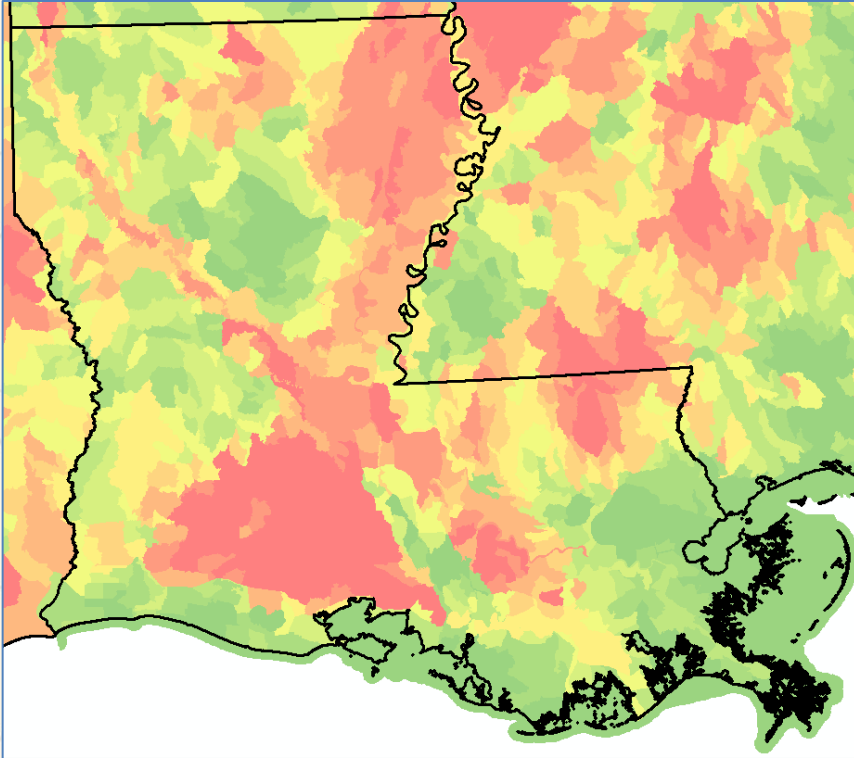
* Profile of the Rural Inland Northwest, Measures of Natural and Socioeconomic Distress. Sonoran Institute, Jan. 2005

Example



Intrinsic HUC12 Scoring:

SPARROW Incremental Agriculture N and P Yield*



Decile groupings of LA HUC12s based on SPARROW-derived incremental agriculture yields for N (left) and P (right)

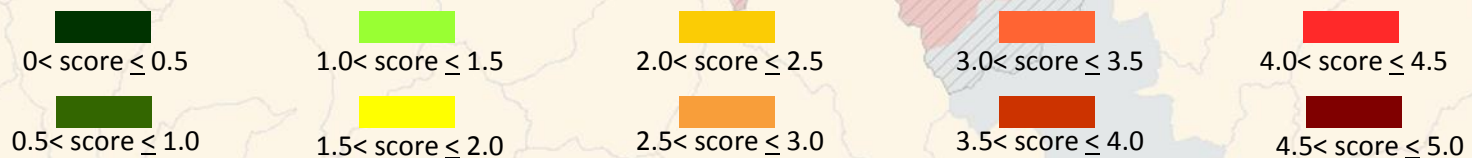
- How else would you like to see SPARROW yields grouped by source?
 - Point sources
 - Air deposition
 - ...?

* Provisional permission granted by USGS to use the SPARROW incremental agriculture N and P yield results pending further documentation on the methodology used to derive the HUC12 estimates

WATERSCAPE HUC12 Scoring Scheme

Property	User Assigned Weight (%)	HUC #1		HUC #2		HUC #3		HUC #4		HUC #5	
		Intrinsic HUC Score (0 - 10)	Total HUC Score (B)(C)/100	Intrinsic HUC Score (0 - 10)	Total HUC Score (B)(E)/100	Intrinsic HUC Score (0 - 10)	Total HUC Score (B)(G)/100	Intrinsic HUC Score (0 - 10)	Total HUC Score (B)(I)/100	Intrinsic HUC Score (0 - 10)	Total HUC Score (B)(K)/100
Property 1	20	0	0	4	0.8	5	1	0	0	0	0
Property 2	10	2	0.2	2	0.2	5	0.5	0	0	0	0
Property 3	0	1	0	5	0	3	0	0	0	0	0
Property 4	10	3	0.3	0	0	4	0.4	0	0	0	0
Property 5	5	0	0	2	0	2	0.1	0	0	0	0
Property 6	5	5	0.25	1	0.05	2	0.1	0	0	0	0
Property 7	10	5	0.5	0	0	5	0.5	0	0	0	0
Property 8	3	1	0.03	3	0.09	0	0	0	0	0	0
Property 9	2	4	0.08	3	0.06	0	0	1	0.02	0	0
Property 10	15	0	0	3	0.45	5	0.75	0	0	0	0
Property 11	10	0	0	2	0.2	3	0.3	0	0	0	0
Property 12	10	0	0	1	0.1	3	0.3	0	0	0	0
TOTAL			1.36		1.95		3.95		0.02		0

- A given HUC's total score is the product of the user assigned weight (0-100%) multiplied by the intrinsic HUC score (0-10) for each property
- In the above example, there are 12 properties, with non-zero weightings assigned to 11 of them (the user has chosen not to consider Property #3 in this case)
- The Total HUC score for HUC #1 = 1.36; HUC #2 = 1.95; HUC #3 = 3.95; and HUC #4 = 0.02. HUC #5's total = 0, thus it will not be displayed on the map with an assigned color.



Hypothetical Example *WATERSCAPE* Application: Designated Uses in Massachusetts

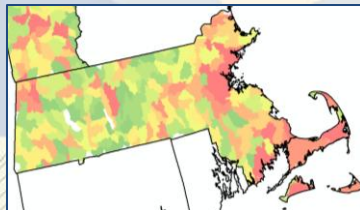
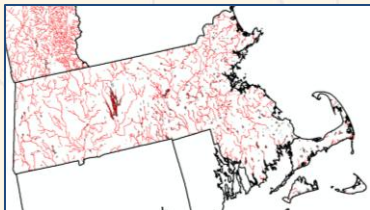
Designated Use

Raw Data

Intrinsic HUC12 Score

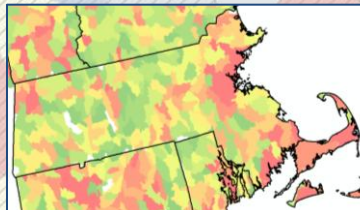
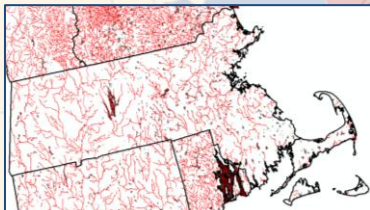
User Weighting to
be Assigned

Aesthetics



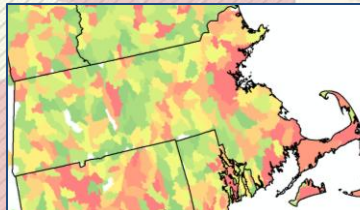
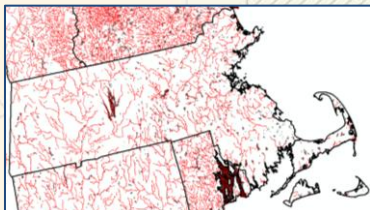
5%

Aquatic Life
Harvesting



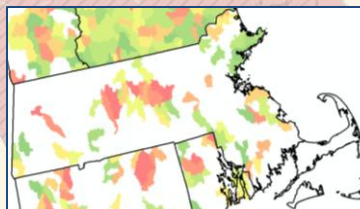
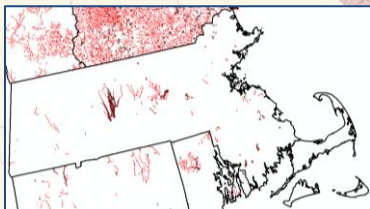
10%

Fish, Shellfish,
Wildlife
Protection



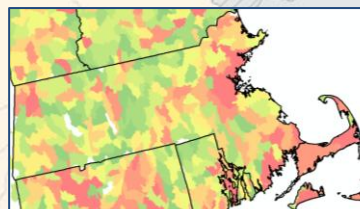
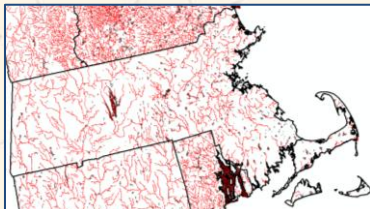
5%

Public Water
Supply



50%

Recreation



30%

Example *WATERSCAPE* Application: Designated Uses in Massachusetts (cont.)

WATERSCAPE User Interface

1. Select MA HUCs as study area

2. Select properties of interest from “Properties” dropdown; will populate in “Assign Property Weights” window

3. Assign weightings until reach 100% total

Note “Remaining weight to assign” feature lets you know when you’ve assigned 100% and turns from red to green

4. Hit “Calculate Scores” when ready to produce map

Assign Properties Weights

Group	Property	Invert	Weight	Step
Designated Use	Aesthetic Value	<input type="checkbox"/>	5	0
Designated Use	Agricultural	<input type="checkbox"/>	0	0
Designated Use	Aquatic Life Harvesting	<input type="checkbox"/>	10	0
Designated Use	Fish Shellfish and Wildlife Protection and Propagation	<input type="checkbox"/>	5	0
Designated Use	Industrial	<input type="checkbox"/>	0	0
Designated Use	Other	<input type="checkbox"/>	0	0
Designated Use	Public Water Supply	<input type="checkbox"/>	50	0
Designated Use	Recreation	<input type="checkbox"/>	30	0
Designated Use	Category 1	<input type="checkbox"/>	0	0

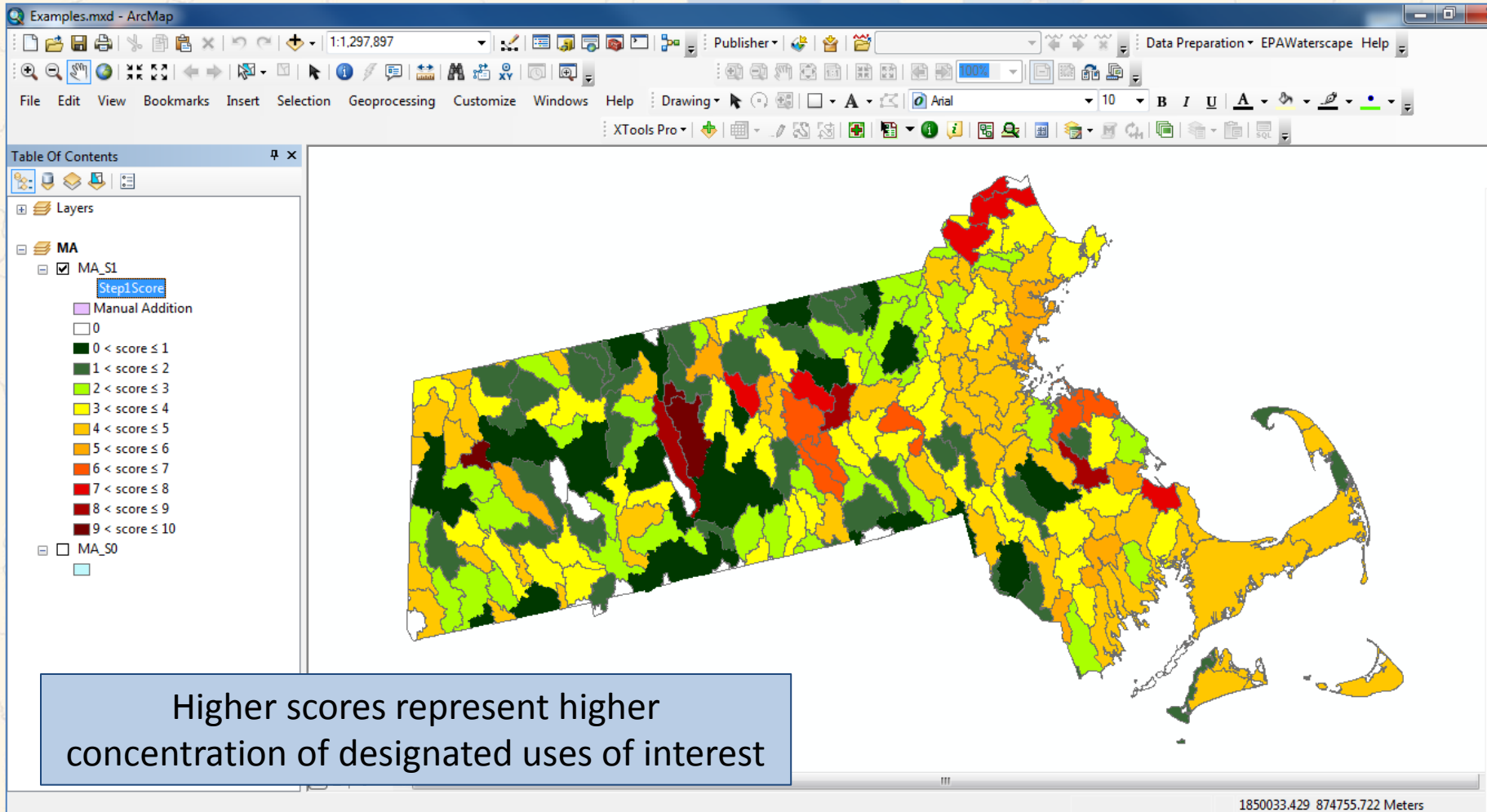
Remaining weight to assign: 0

Analysis Summary

Step	Action	Layer	Description
0	Source Layer Copy	MA_S0	Copy MA_HUC12->MA_S0

Example *WATERSCAPE* Application: Designated Uses in Massachusetts (cont.)

Map of MA HUC12s from Designated Use Prioritization Assigned on Previous Slide



Example *WATERSCAPE* Application: Designated Uses in Massachusetts (cont.)

In addition to a map, a report can be generated to document steps and resulting HUC12 scores

	A	B	C	D	E	F
1	AnalysisZoneID	AnalysisZoneName	Step1Score			
2	MA_010802040101	10802040101	10			
3	MA_010802040104	10802040104	9.6			
4	MA_011000050102	11000050102	9.5			
5	MA_010700040203	10700040203	9			
6	MA_010900040101	10900040101	8.5			
7	MA_010802040106	10802040106	8.05			
8	MA_010700040202	10700040202	8			
9	MA_010700061403	10700061403	8			
10	MA_010900020106	10900020106	7.55			
11	MA_010700061402	10700061402	7.5			
12	MA_010700061404	10700061404	7.5			
13	MA_010802040203	10802040203	7.5			
14	MA_010900020103	10900020103	6.6			
15	MA_010700040201	10700040201	6.5			
16	MA_010700050102	10700050102	6.5			
17	MA_010900030101	10900030101	6.5			
18	MA_010900030102	10900030102	6.5			
19	MA_010900010902	10900010902	6.05			
20	MA_010802020204	10802020204	6			
21	MA_010802040201	10802040201	6			
22	MA_010802060104	10802060104	6			
23	MA_010900010402	10900010402	6			
24	MA_010900040803	10900040803	6			
25	MA_010900010302	10900010302	5.5			
26	MA_010900020105	10900020105	5.5			
27	MA_010900040202	10900040202	5.5			
28	MA_010700061207	10700061207	5			
29	MA_010700061301	10700061301	5			
30	MA_010700061303	10700061303	5			
31	MA_010802030105	10802030105	5			
32	MA_010802030301	10802030301	5			
33	MA_010802040202	10802040202	5			

EPA Waterscape Report

4/16/2014 3:32 PM

Analysis Summary

Title MA
 Study Area MA
 Type All Properties
 Description MA Designated Use Prioritization

Steps

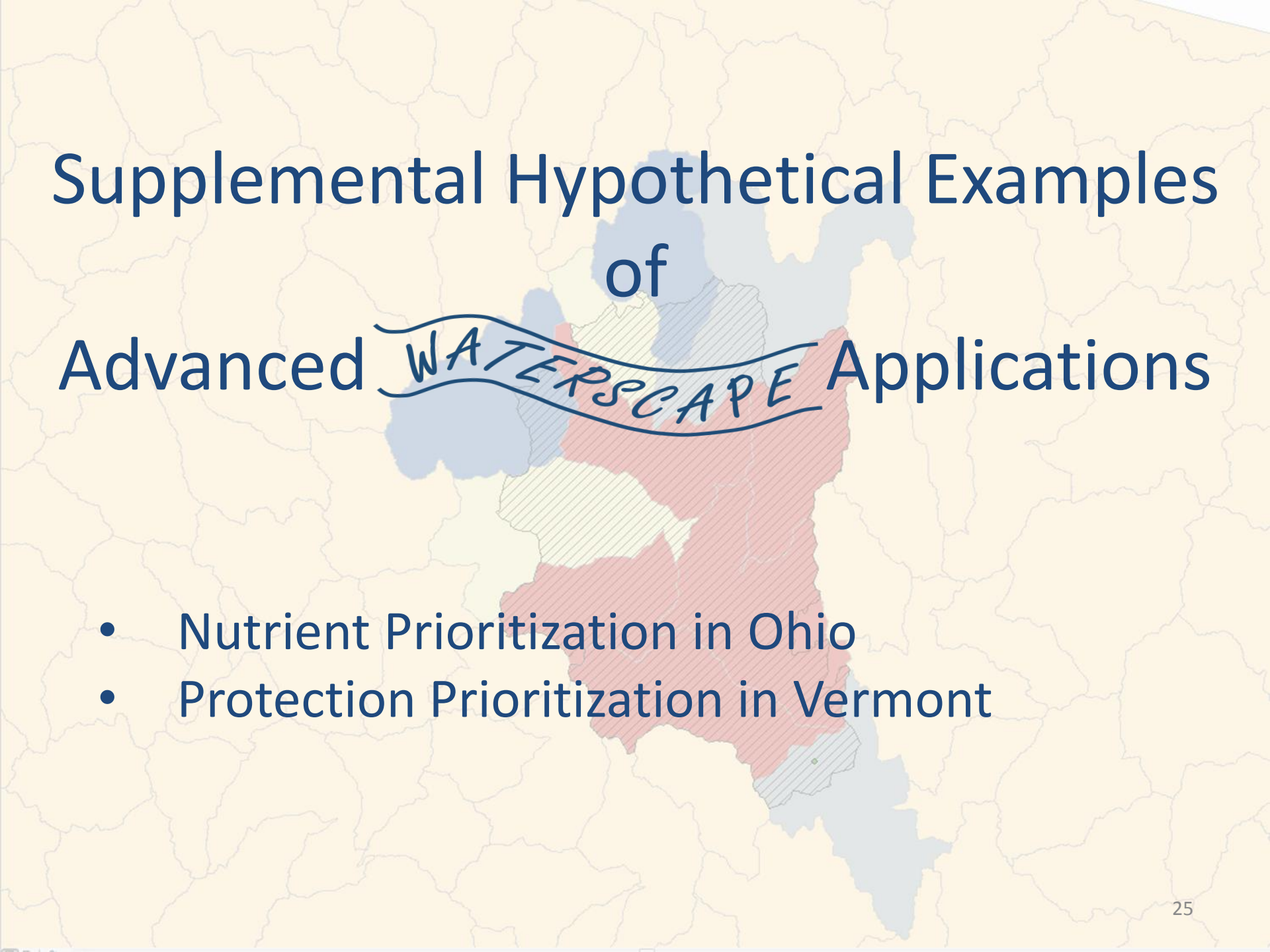
Step	Action	Description
1	Score Calculation	Designated Use Weights

Weights

Group	Property	Invert	Weight	Step
Impaired Waters	All Impairments	0	0	0
Impaired Waters	All Impairments minus Nutrients related	0	0	0
Impaired Waters	Nutrient related Impairment	0	0	0
Impaired Waters	All Impairments minus Pathogens	0	0	0
Impaired Waters	Pathogen Impairment	0	0	0
Impaired Waters	All Impairments minus Sediment	0	0	0
Impaired Waters	Sediment Impairment	0	0	0
Impaired Waters	All minus Temperature	0	0	0
Impaired Waters	Temperature	0	0	0
Socio-Economic	EJSCREEN PrDemInd	0	0	0
Socio-Economic	Economic Indicator	0	0	0
SPARROW	SPARROW N ag yield	0	0	0
SPARROW	SPARROW P ag yield	0	0	0
Impervious Cover	ICLUS2010	0	0	0
Impervious Cover	ICLUS2040	0	0	0
Designated Use	Aesthetic Value	0	5	1
Designated Use	Agricultural	0	0	0
Designated Use	Aquatic Life Harvesting	0	10	1
Designated Use	Fish Shellfish and Wildlife Protection and Propagation	0	5	1
Designated Use	Industrial	0	0	0
Designated Use	Other	0	0	0
Designated Use	Public Water Supply	0	50	1
Designated Use	Recreation	0	30	1
Designated Use	Category 1	0	0	0
Drinking Water	PCT Overlapping SPA Area	0	0	0



- See GIS “Dealer” in the Lobby for a Demo in your State
- Volunteer to test in your State
 - Pre-loaded *WATERSCAPE* can be downloaded from Esri website
 - No cost beyond your existing Esri license
 - User’s Manual, “how-to” webinars to follow



Supplemental Hypothetical Examples of Advanced *WATERSHAP* Applications

- Nutrient Prioritization in Ohio
- Protection Prioritization in Vermont

Hypothetical Example *WATERSCAPE* Application: Nutrient Prioritization in Ohio

A Multi-step Example – can narrow domain after each step

1. Find HUC12s with concentrated “Values” -
 - Identify HUC12s that are either designated for drinking water or recreation use or have surface drinking water SPA area in them
2. Evaluate nutrient “Stressors” –
 - A) Select HUC12s that have nutrient-related impairments
 - B) Identify HUC12s that rank in the top 20% based on agriculture-related N incremental yields from SPARROW
3. Find subset of HUC12s from Step 1 that are also in Step 2A
4. From Step 3, find subset of HUC12s that are also in Step 2B

Example *WATERSCAPE* Application: Nutrient Prioritization in Ohio (cont.)

- Find HUC12s with concentrated “Values” -
 - Identify HUC12s that are either designated for drinking water or recreation use or have surface drinking water SPA area in them

EPA Waterscape

Analysis
 Title: Ohio Nutrient Prioritizati... Study Area: OH Properties: All Properties
 Ohio Nutrient Prioritization using EPAWaterscape Tool [New] [Open]

Analysis Step
 Source: OhioNutrientPrioritization_S4 Target: OhioNutrientPrioritization_S5

Generate Subset
 Select Features: 0 [Step1Score] [Apply Score Selection] [Switch Selection]
 Selection Type: Add [Manual Selection] [Save Selection]

Add Features
 Source: OhioNutrientPrioritization_S [Select] [Add Features]

Assign Properties Weights

Group	Property	Invert	Weight
Designated Use	Fish Shellfish and Wildlife Protection and Propagation	<input type="checkbox"/>	0
Designated Use	Recreation	<input type="checkbox"/>	33
Drinking Water	PCT Overlapping SPA Area	<input type="checkbox"/>	34
Designated Use	Public Water Supply	<input type="checkbox"/>	33

Remaining weight to assign: 100 [Calculate Scores] [Save Scores]

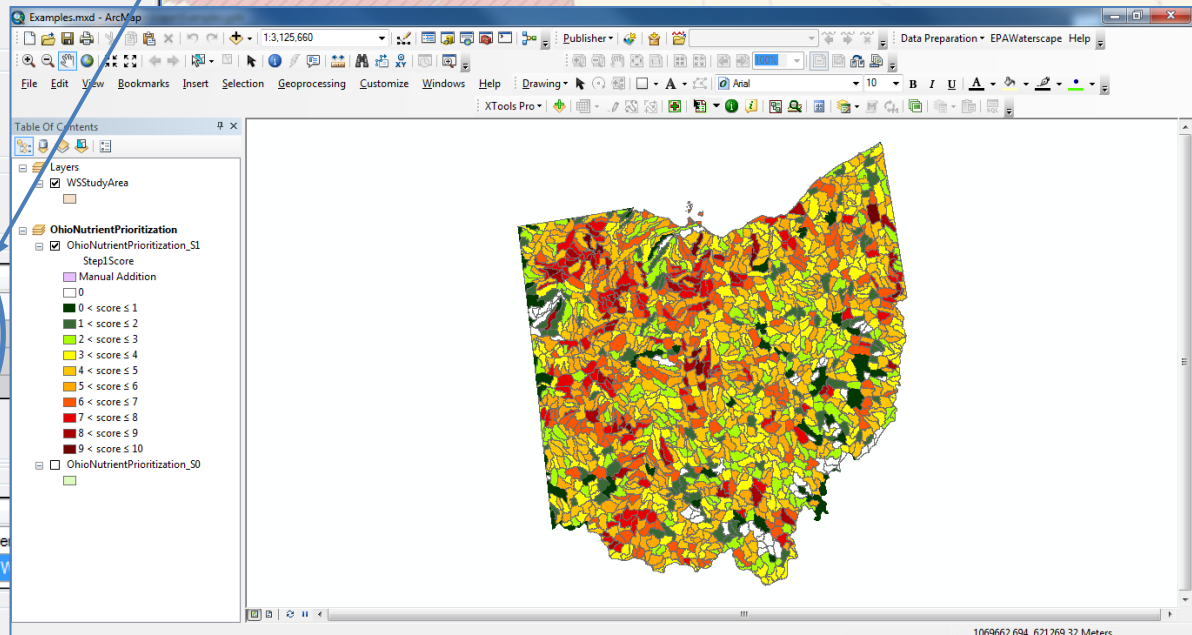
Analysis Summary

Step	Action	Layer	Description
0	Source Layer Copy	OhioNutrientPrioritization_S0	Copy OH_HUC12->OhioNutrie
1	Score Calculation	OhioNutrientPrioritization_S1	Step 1 - HUC12s with Public V

[Generate Report] [Export Tables to Excel] [Help] [Close]

Save Manual Selection

Perform “Or” logic in 1 step by assigning weights among desired properties



Example *WATERSCAPE* Application: Nutrient Prioritization in Ohio (cont.)

2A. Select HUC12s with nutrient-related impairments

Assign 100% Weighting to Nutrient Impairment Property

EPA Waterscape

Analysis
 Title: OH
 Study Area: OH
 Properties: All Properties

OH Nutrient Prioritization
 [New] [Open]

Analysis Step
 Source: OH_S2 Target: OH_S3

Generate Subset
 Select Features: 0 [Step2Score] 10 [Apply Score Selection] [Switch Selection]

Selection Type: Add [Manual Selection] [Save Selection]

Add Features
 Source [Select] [Add Features]

Assign Properties Weights

Group	Property	Invert	Weight	Step
Impaired Waters	Nutrient related Impairment	<input type="checkbox"/>	100	2
Impaired Waters	All Impairments minus Pathogens	<input type="checkbox"/>	0	0
Impaired Waters	Pathogen Impairment	<input type="checkbox"/>	0	0
Impaired Waters	All Impairments minus Sediment	<input type="checkbox"/>	0	0
Impaired Waters	Sediment Impairment	<input type="checkbox"/>	0	0
Impaired Waters	All minus Temperature	<input type="checkbox"/>	0	0
Impaired Waters	Temperature	<input type="checkbox"/>	0	0

Remaining weight to assign: 100 [Calculate Scores] [Save Scores]

Analysis Summary

Step	Action	Layer	Description
0	Source Layer Copy	OH_S0	Copy OH_HUC12->OH_S0
1	Score Calculation	OH_S1	Step 1 - HUC12s with Public Water Supply or Recreation or S

[Generate Report] Export Tables to Excel [Help] [Close]

Calculate scores done.

Examples.mxd - ArcMap

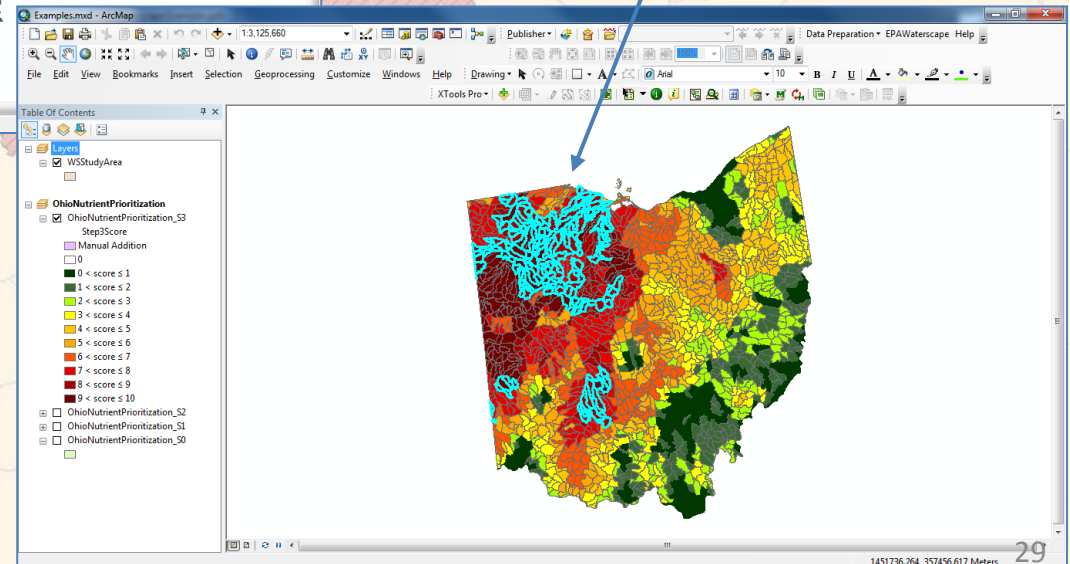
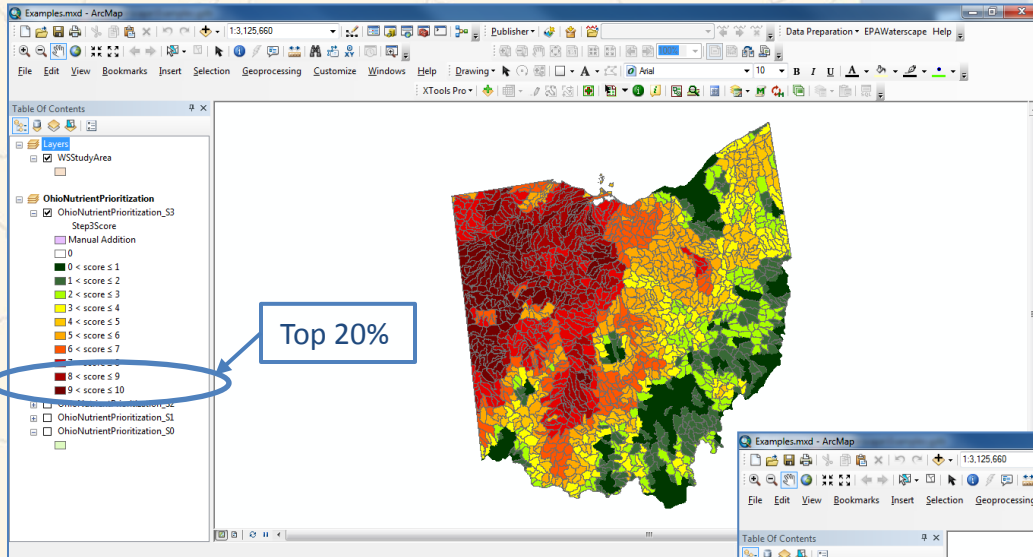
Table of Contents

- Layers
 - WSStudyArea
 - OhioNutrientPrioritization
 - OhioNutrientPrioritization_S2
 - Step2Score
 - Manual Addition
 - 0
 - 0 < score ≤ 1
 - 1 < score ≤ 2
 - 2 < score ≤ 3
 - 3 < score ≤ 4
 - 4 < score ≤ 5
 - 5 < score ≤ 6
 - 6 < score ≤ 7
 - 7 < score ≤ 8
 - 8 < score ≤ 9
 - 9 < score ≤ 10
 - OhioNutrientPrioritization_S1
 - OhioNutrientPrioritization_S0

843064.95 626231.314 Meters

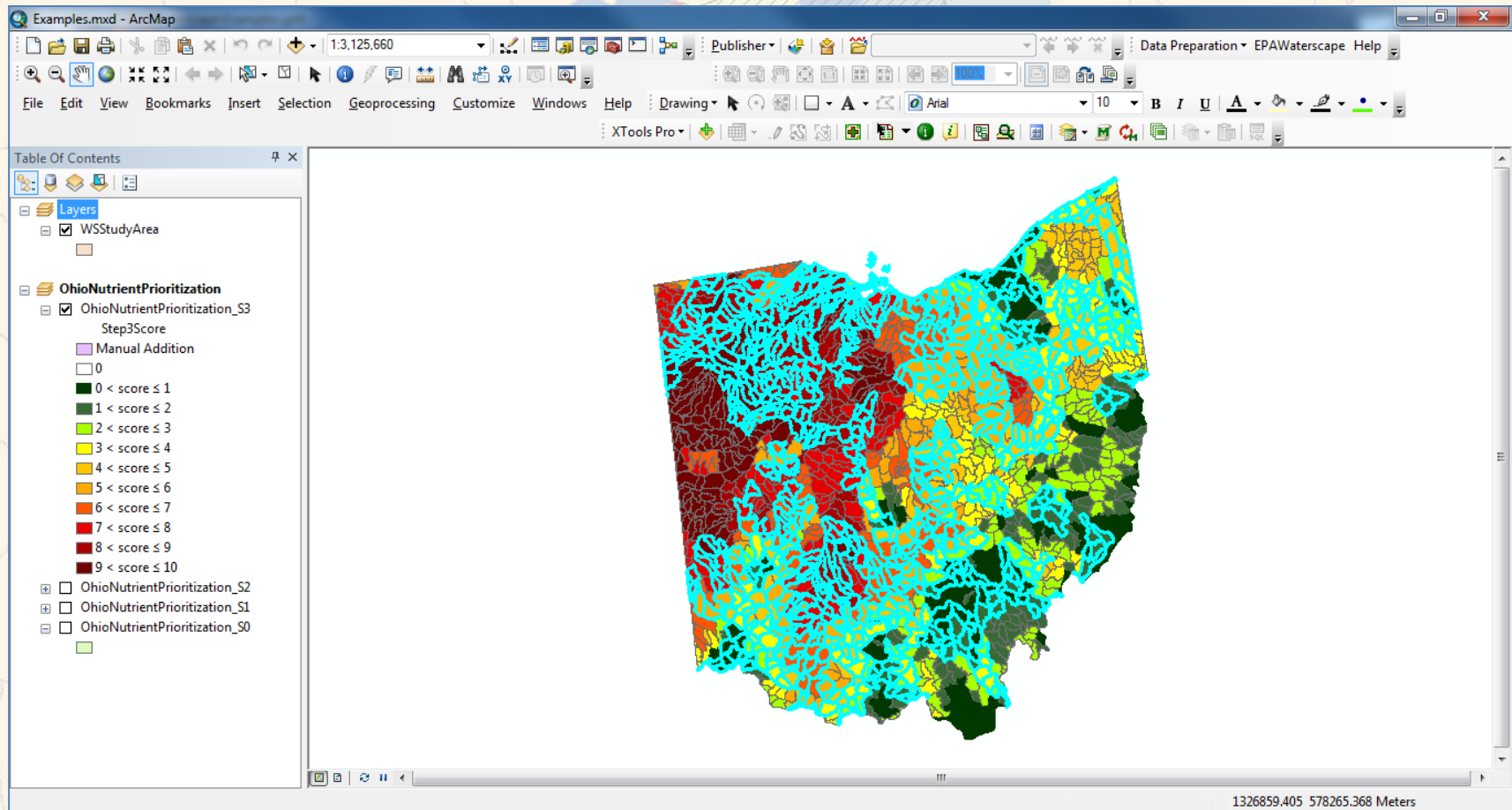
Example *WATERSCAPE* Application: Nutrient Prioritization in Ohio (cont.)

2B. Identify HUC12s in top 20% of Incremental Agriculture N Yield



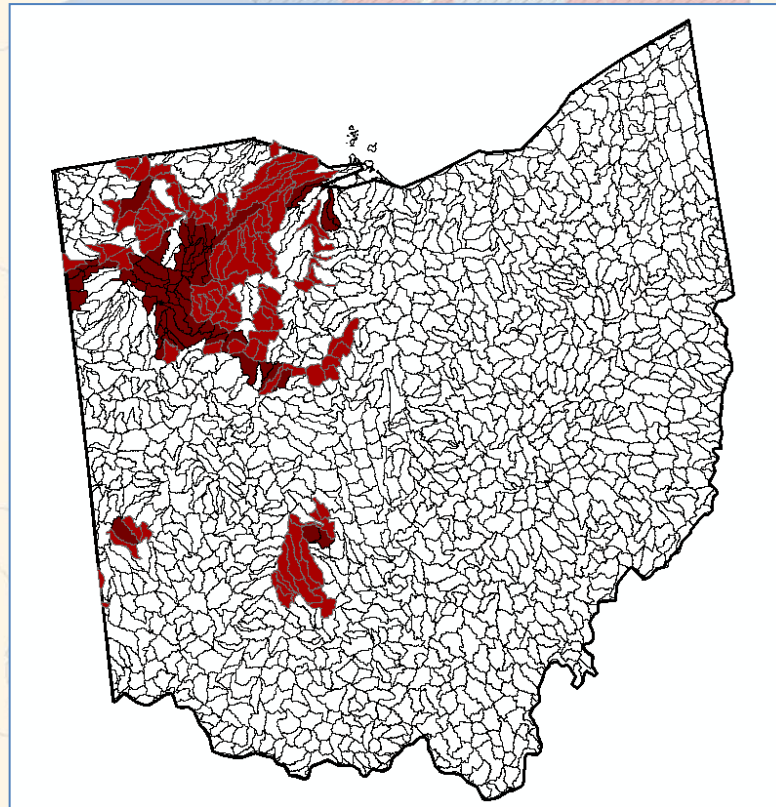
Example *WATERSCAPE* Application: Nutrient Prioritization in Ohio (cont.)

3. Find subset of HUC12s from Step 1 that are also in Step 2A, i.e., those that have either a drinking water or recreation designated use or have SPA area in them **AND** have nutrient-related impairments



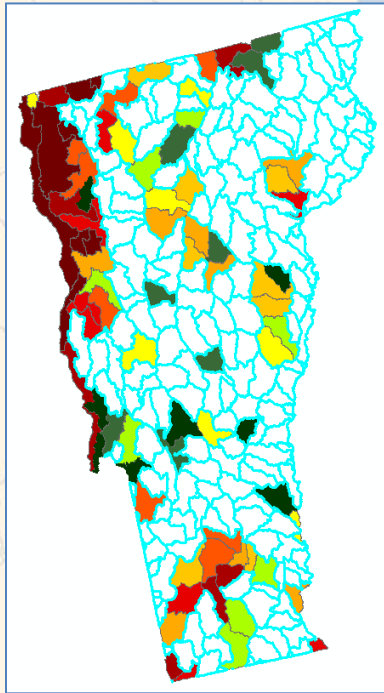
Example *WATERSCAPE* Application: Nutrient Prioritization in Ohio (cont.)

- From Step 3, find subset of HUC12s that are also in Step 2B, i.e., those that have either a drinking water or recreation designated use or have SPA area in them and have nutrient-related impairments **AND** rank in the top 20% of agriculture incremental N yield

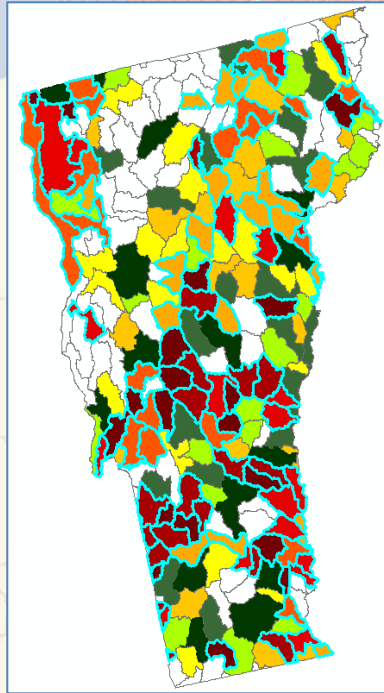


Hypothetical Example *WATERSCAPE* Application: Protection in Vermont

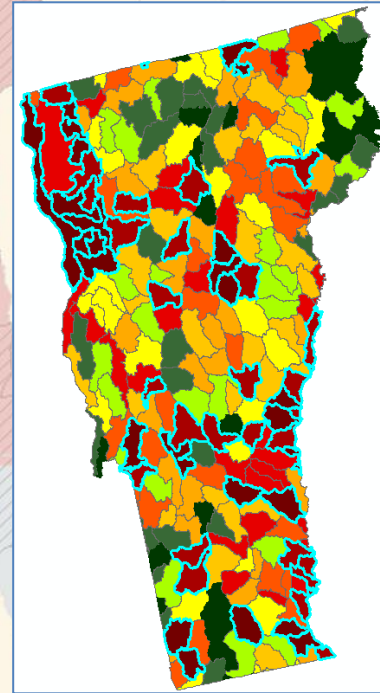
1. Identify HUC12s with impairments
 - Make a “Switch” selection to identify watersheds with no known/georeferenced impairments, i.e. select HUC12s not colored in below left image
2. From HUC12s identified in Step 1, select those ranking in top 50% in terms of waters meeting all designated uses, i.e. “clean” waters
3. From HUC12s identified in Step 2, identify those projected to receive the highest 20% of impervious cover stress in 2040



All Impairments
(Switch selection to identify Values)



Top 50% of Category 1 Waters
(Value)



Top 20% of 2040 Impervious Cover
(Stress)

Example *WATERSCAPE* Application: Protection in Vermont (cont.)

