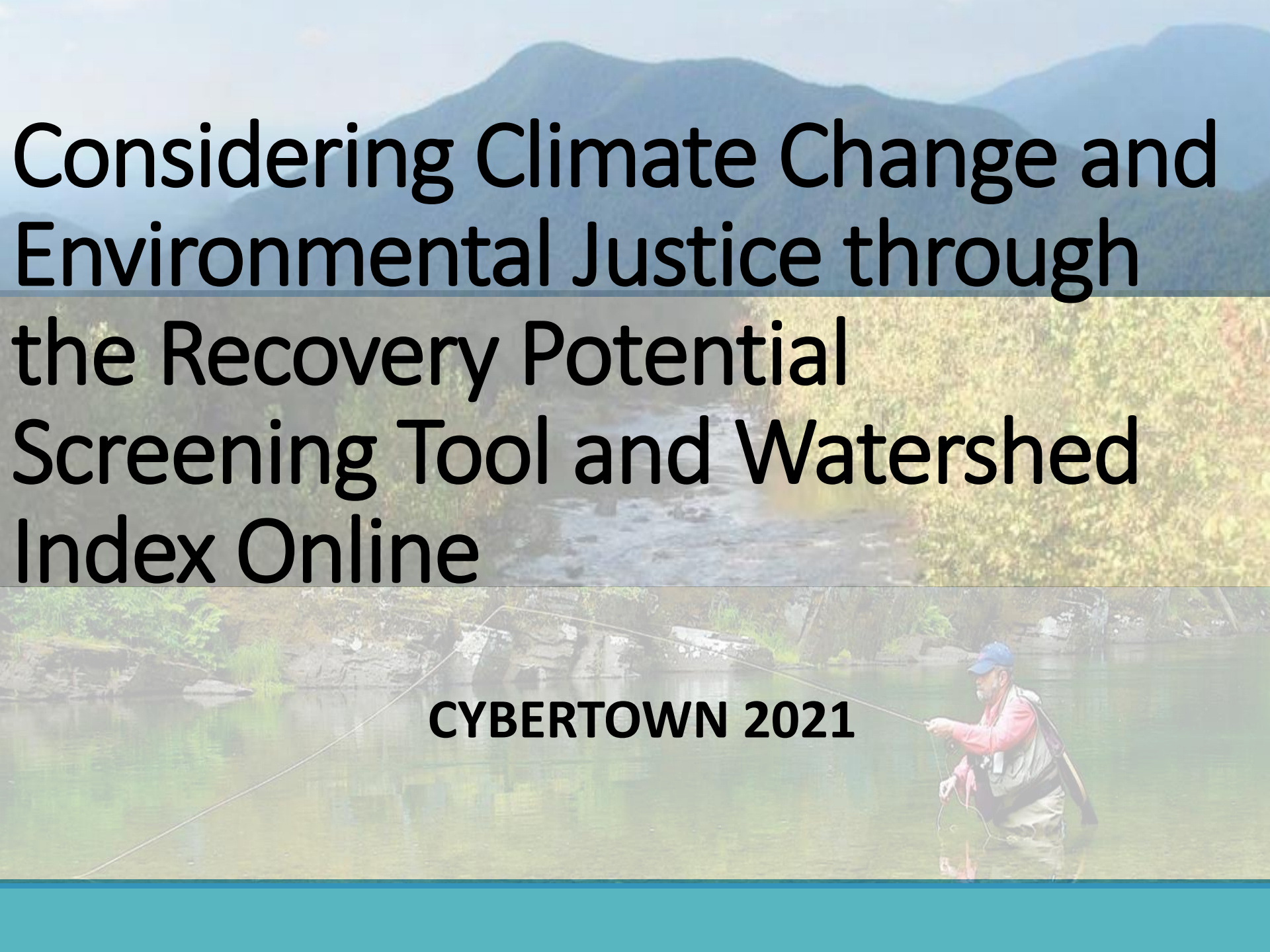
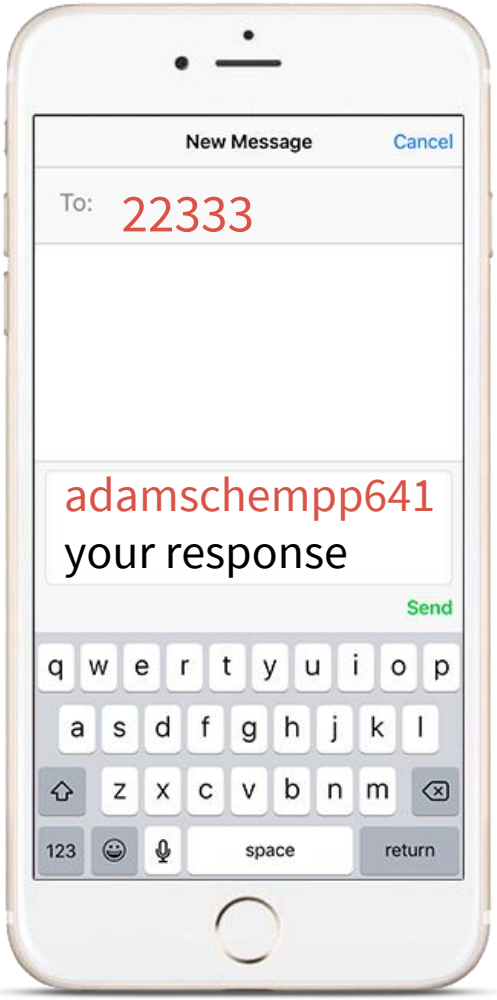
Considering Climate Change and Environmental Justice through the Recovery Potential Screening Tool and Watershed Index Online

CYBERTOWN 2021



Responding with Poll Everywhere

Web voting



Text voting

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SESSION AGENDA

1. Introduction
2. Watershed Index Online (WSIO) Data Updates
   - Overview
   - New environmental justice and climate-related indicators
3. Recovery Potential Screening (RPS) Tool
   - Overview
   - Application and Demo
4. Q&A and Closing

Introduction

EPA's Healthy Watersheds Program

- **Established Healthy Watersheds assessment framework and roadmap to integrate efforts in EPA and partner programs ('10-14)**
  - *Healthy Watersheds Concepts, Assessments, and Management Approaches* (2012)
- **EPA-supported HW integrated assessments ('13-16)**
  - ~12 projects, most state scale. E.g., California (2013), Tennessee (2015)
  - *Preliminary Healthy Watersheds Assessments* (2017)
- **Technical support to maintain and update EPA's Watershed Index Online (WSIO)**
- **Applying data through EPA's Recovery Potential Screening (RPS) Tool**

POLL 1

POLL 2

Assisting Practitioners through Assessment

- **WSIO: Watershed Index Online** - national library of watershed attributes used for comparing watershed characteristics anywhere in the conterminous United States

- **RPS Tool: Recovery Potential Screening Tool** - comparative method for identifying differences among watersheds (or watershed-based, hydrologic units such as HUC12s) that may influence their relative likelihood to be successfully restored, protected or managed in other ways.

WSIO Data Updates

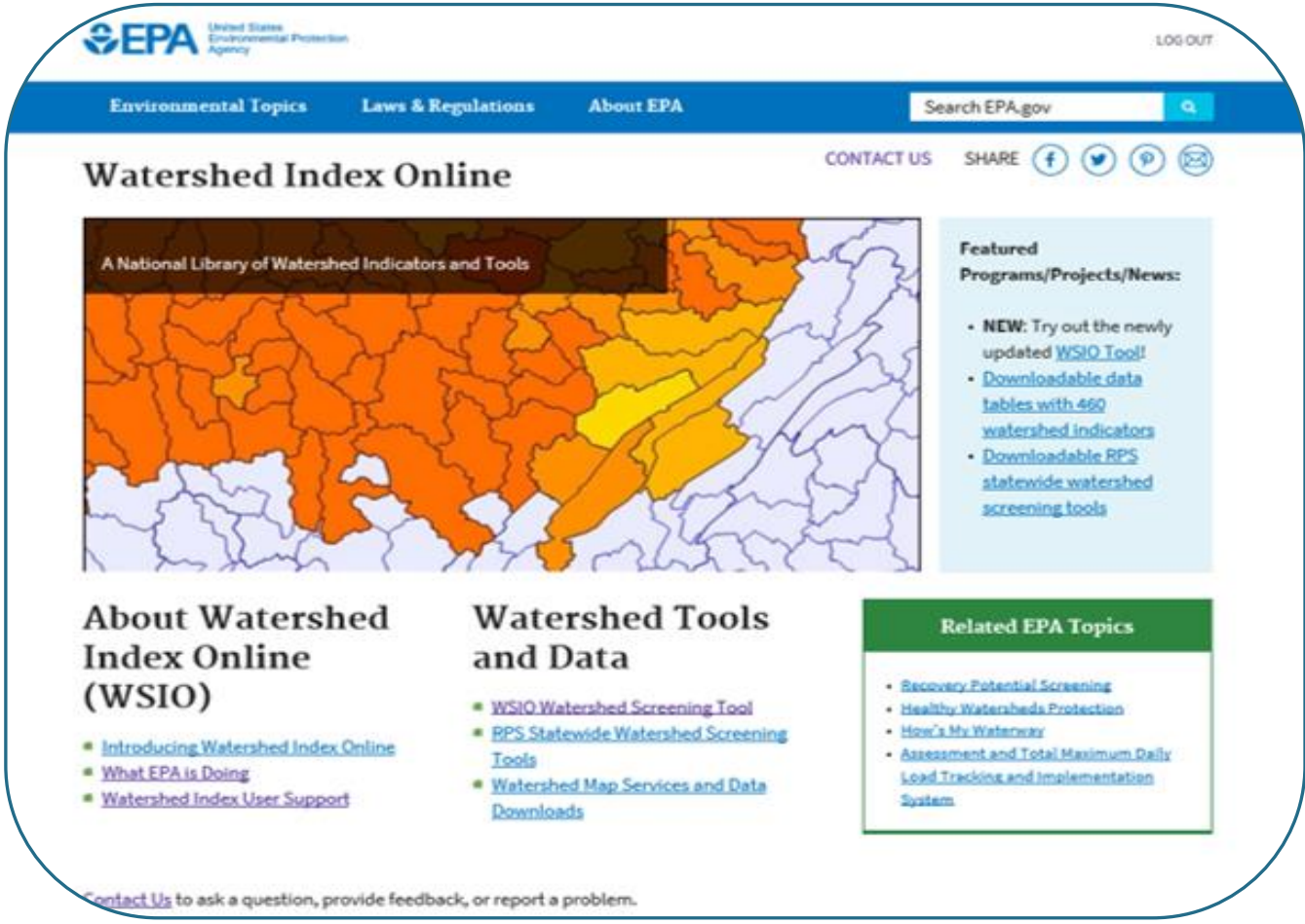
WATERSHED INDEX ONLINE (WSIO)

www.epa.gov/wsio

~400 watershed indicator national dataset download

Online customizable WSIO Tool to compare HUC12s

RPS Tools with embedded data for all states & territories



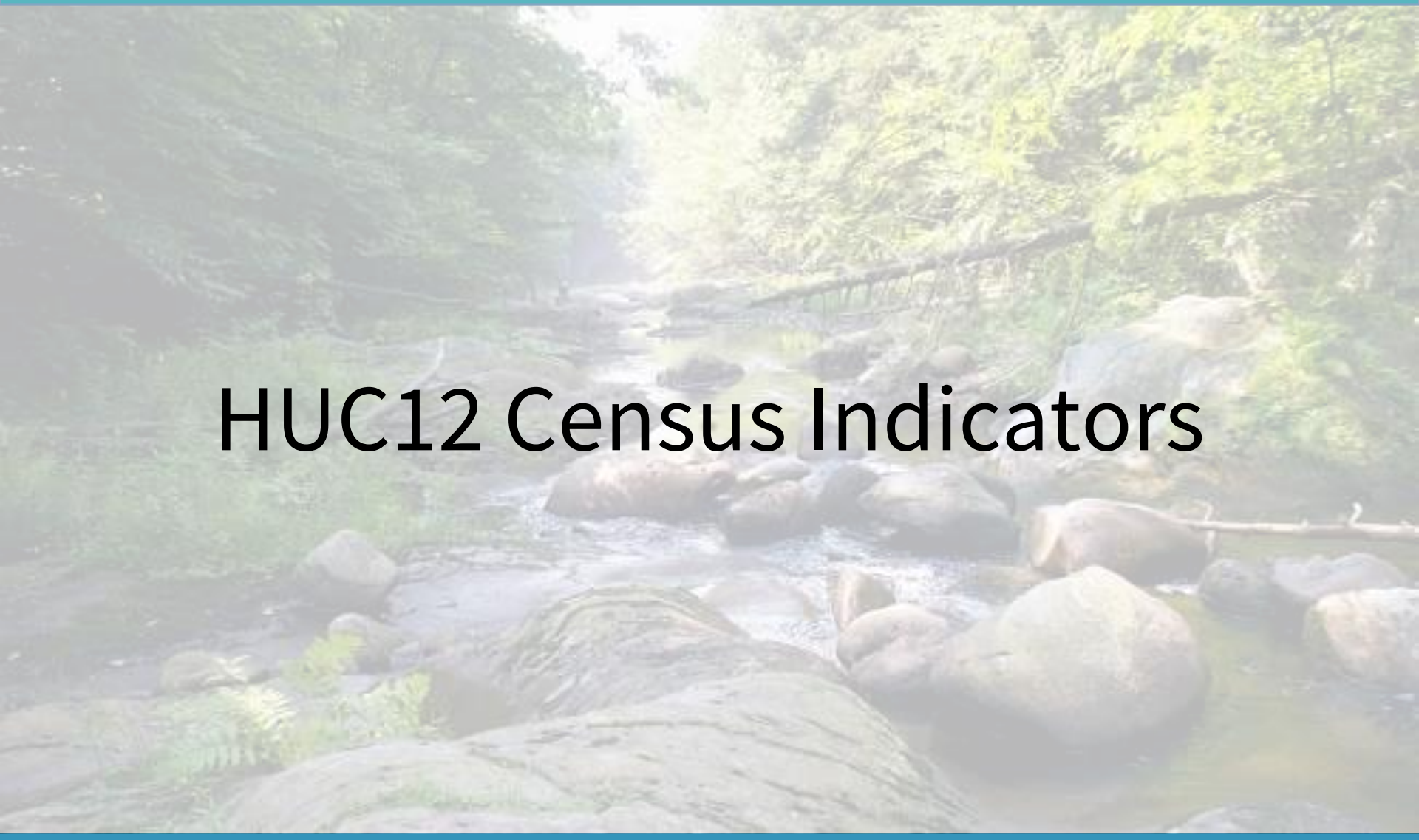
UPCOMING RELEASE, SUMMER 2021

New Social Indicators

- **Percent Low-Income Population in Watershed**
- **Percent Minority Population in Watershed**
- **Percent Linguistically Isolated Population in Watershed**
- **Percent Vulnerable Age in Watershed (under Age 5 or over 64)**
- Mobile Home Parks Count in Watershed
- % of Total Shoreline With Protected Status in Watershed
- Traffic Volume in Watershed

New Stressor Indicators

- **% Projected Change in Annual and Spring Surface Runoff (2061-2090)**
- **% Projected Change in Mean Annual and Summer High Temperature (and 10-year drought) (2061-2090)**
- **% Projected Change in Annual and Summer Precipitation (2061-2090)**
- **% Inundated by Sea Level Rise in Watershed**
- Nitrogen and Phosphorus Yield in Watershed
- % Hydrologic Soil Group
- % 100-Year Flood Zone in Watershed
- % Category Hurricane Storm Surge Zone



HUC12 Census Indicators

HUC12 Census Indicators

New WSIO Indicators

- Minority population
- Low-income population
- Linguistically isolated population
- Vulnerable age group population (<5 or >65)

Three Source datasets

1. EJScreen Census Block Group Demographic Data (2020 version)
   - Derived from 2014-2018 American Community Survey (ACS)
2. EnviroAtlas HUC12 Watershed Boundaries (2015 version)
3. EnviroAtlas Dasymetric Population Allocation Raster (2016 version)
   - Derived from 2010 census block total population and land cover from 2011 National Land Cover Dataset (NLCD)

Quick Methods

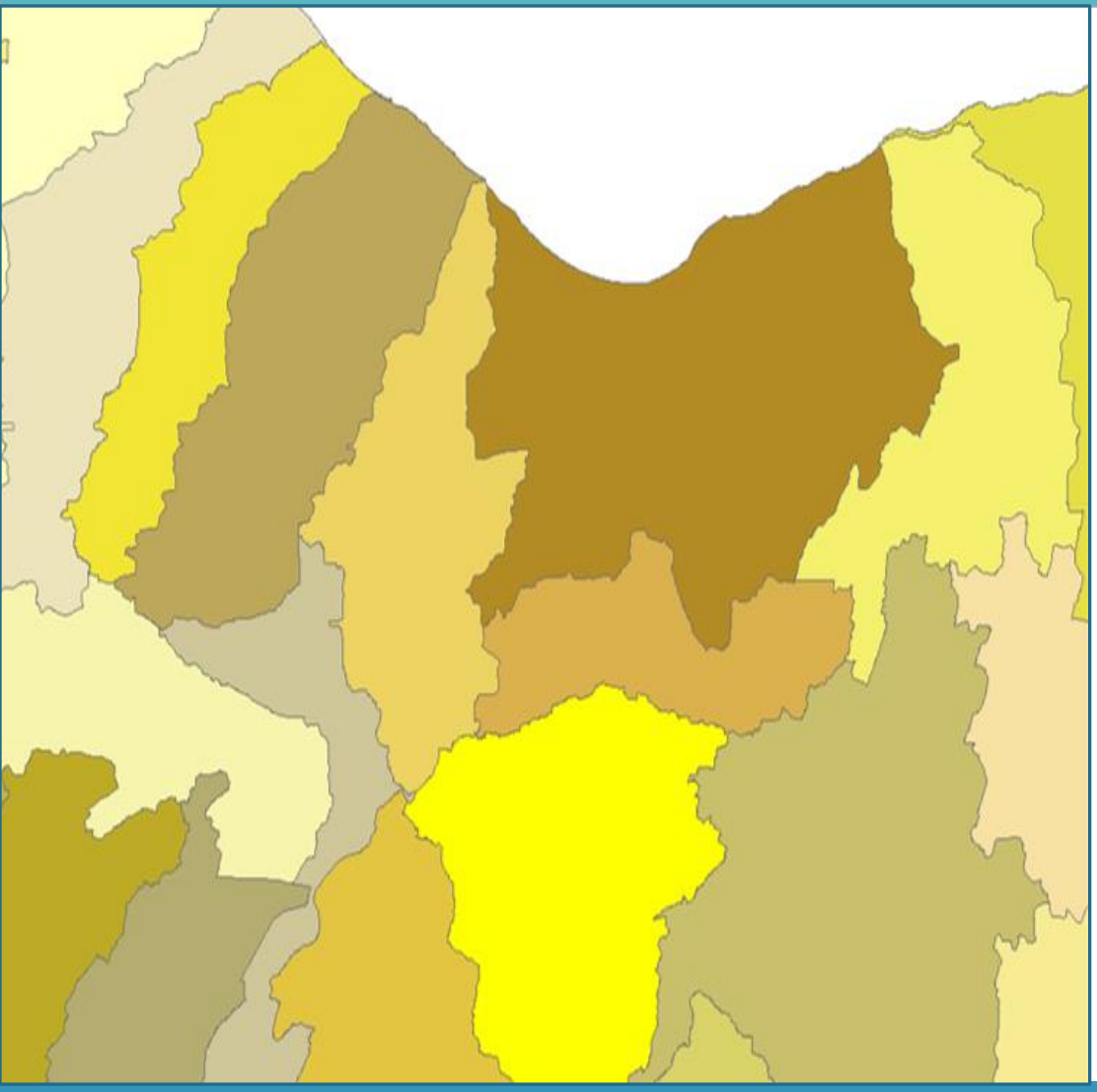
Process to disaggregate Census Block Group (CBG) data and summarize to HUC12s

1. Intersect HUC12 and CBG polygons
2. Determine the total population per intersection using the dasymetric population raster
3. Calculate HUC12 portion of the CBG demographic count
4. Completed by weighting the CBG demographic count by the proportion of total CBG population in the HUC12
5. Sum the CBG demographic counts per intersection by HUC12

Census Block Groups (CBGs)

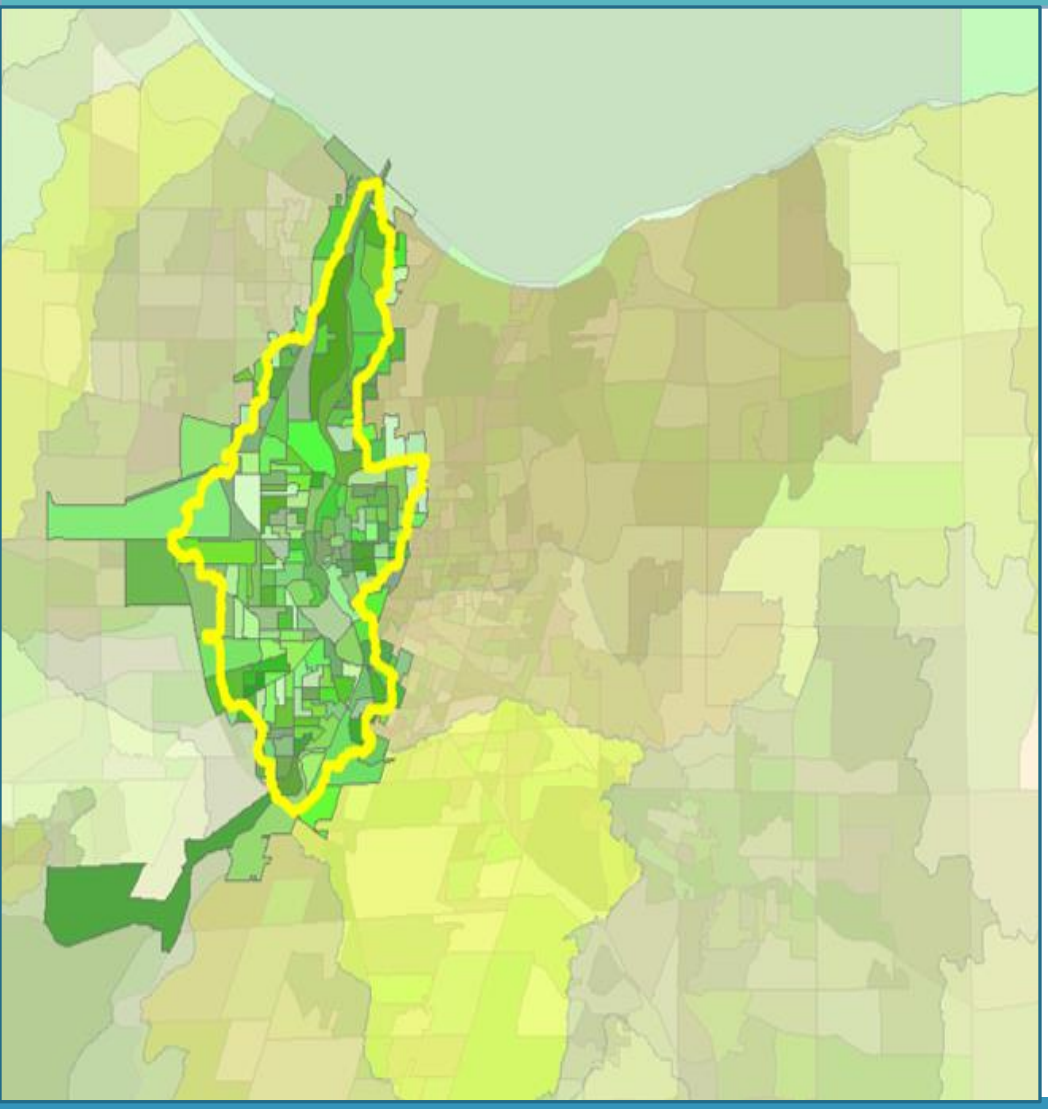
- Block groups tend to be smaller in urban areas & larger in rural areas
- Relevant demographic metrics reported for block groups:
  - Minority population
  - Low-income population
  - Linguistically isolated population
  - Vulnerable age group population (<5 or >65)

HUC12 Watersheds



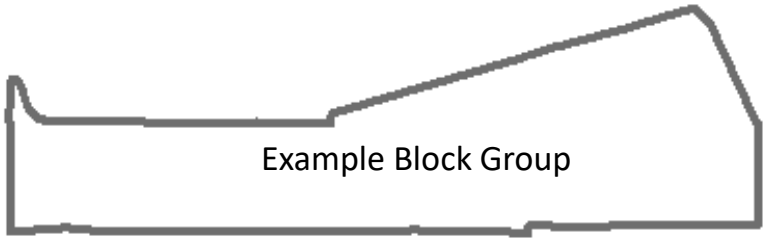
- Hydrologic units, delineated from topographic drainage patterns
- Average ~40 square miles in area

Overlay of HUC12s and Block Groups

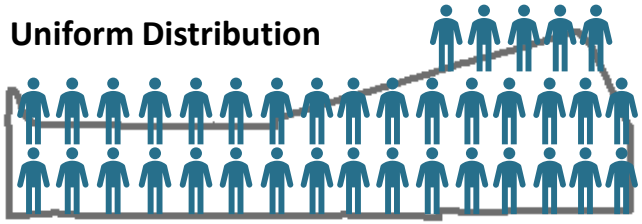


- Many CBGs are contained within a single HUC12
  - But some CBGs extend across HUC12 boundaries
- Need to distribute demographic data among intersecting HUC12s

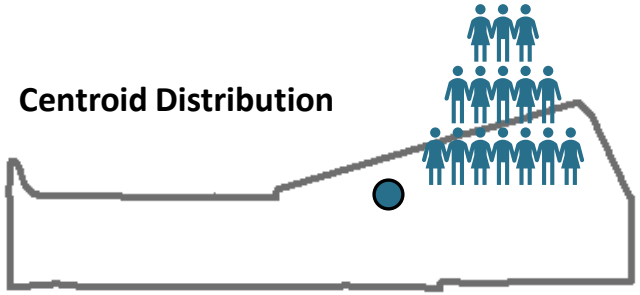
Population Allocation Options



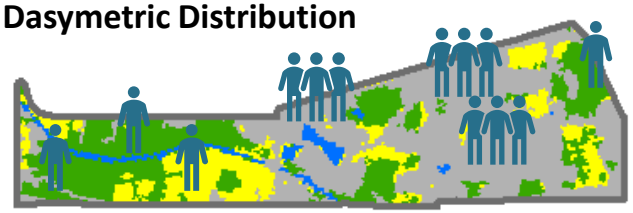
Uniform Distribution



Centroid Distribution

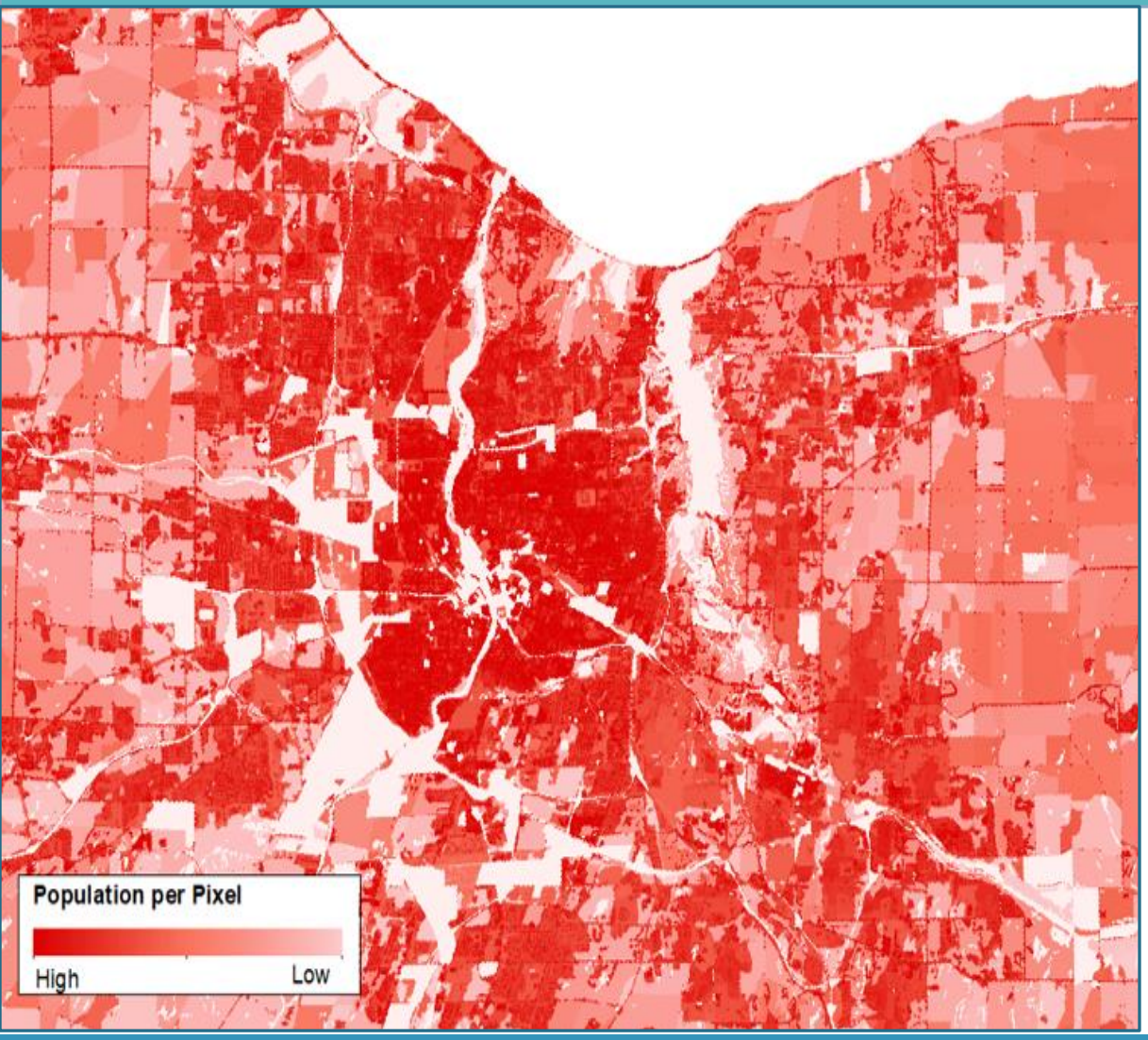


Dasymetric Distribution



- Agriculture
- Open Water
- Urban/Developed
- Forest/Wetland

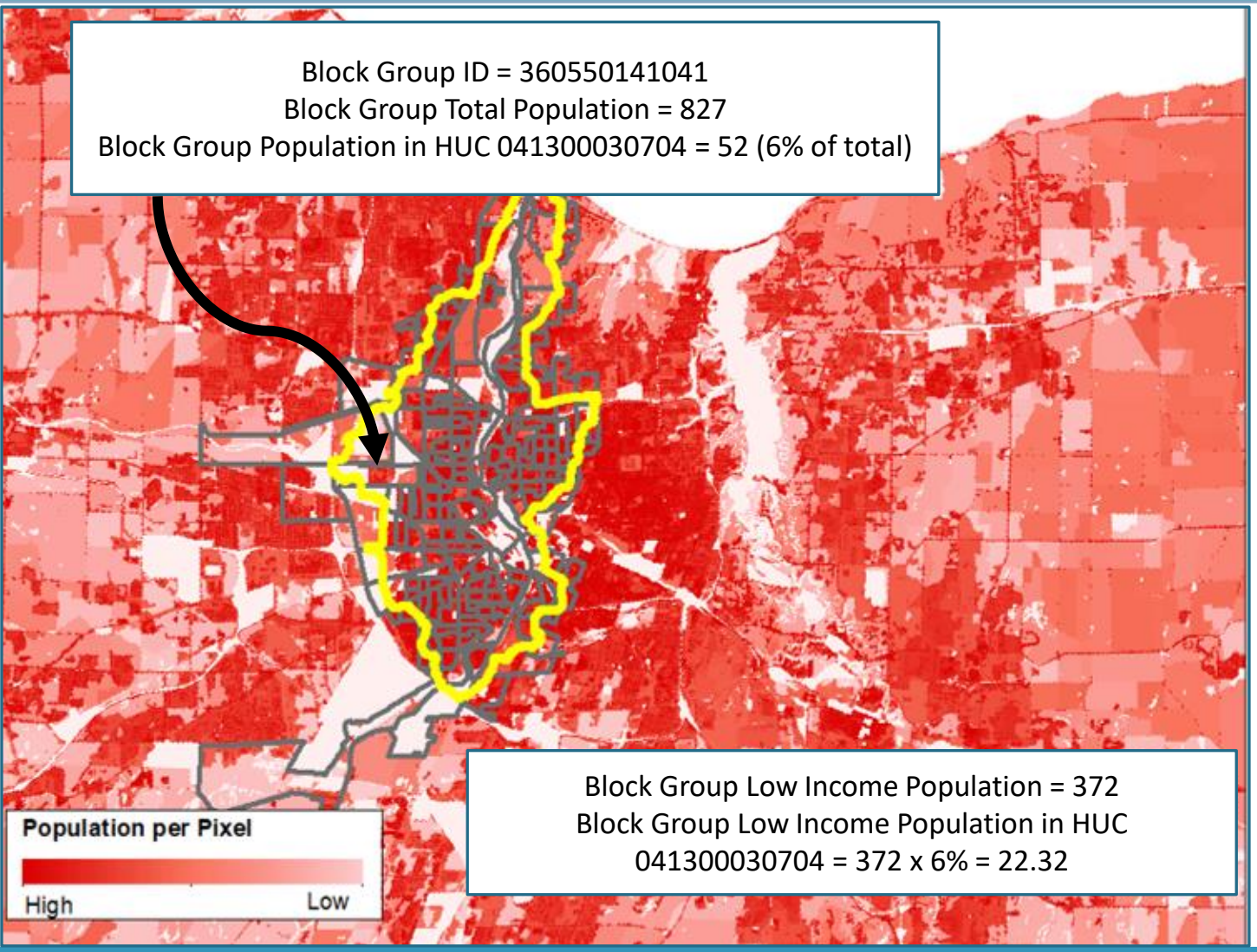
Dasymetric Population Grid



- Raster, 30x30 cell sizes
- Darker red = more population
- Distributes census block populations across landscape
- Distribution based on land cover and slope

You can find out more about the Dasymetric methodology here:
https://enviroatlas.epa.gov/enviroatlas/DataFactSheets/pdf/Supplemental/DasymetricAllocationofPopulation.pdf

Dasymetric Allocation Example



- Raster, 30x30 cell sizes
- Darker red = more population
- Distributes based on land cover classification
- Cannot distribute populations based on demographic features

Key Takeaways

1.This methodology estimates HUC12 values of demographic metrics using data from the 2014-2018 American Community Survey for Census block groups

2. Because Census block groups extend across HUC12 boundaries, the EPA EnviroAtlas dasymetric population grid is incorporated to determine the distribution of people across the landscape.

3. The dasymetric approach incorporates land cover and slope data to better estimate population distributions compared to an approach that assumes uniform distribution within a block group

Climate-Related Indicators

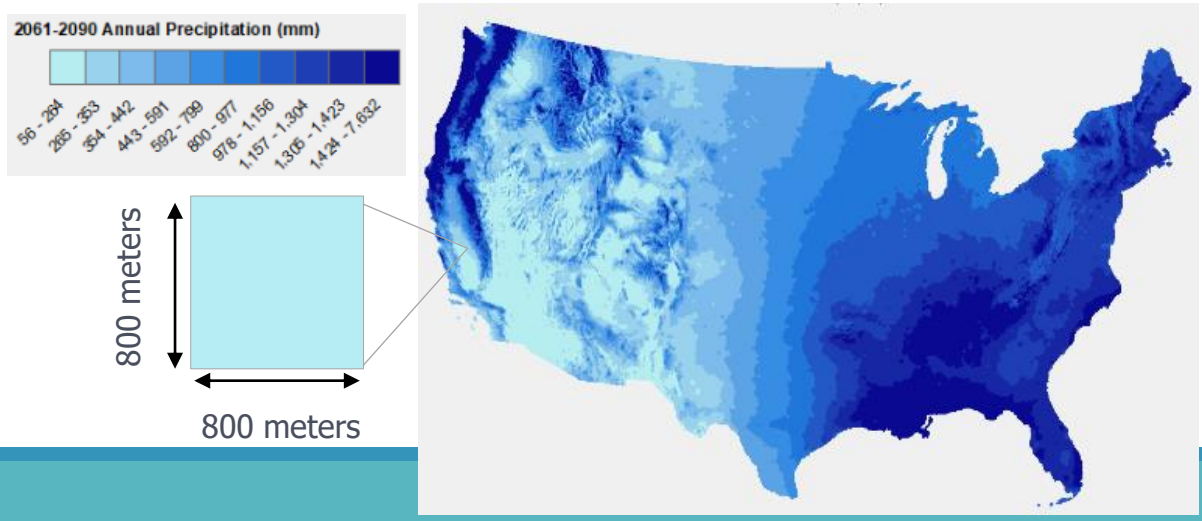
Overview of Climate-Related Indicators

- Indicators of climate change and corresponding changes to hydrology and sea level were calculated for HUC12 subwatersheds in lower 48 states

Climate	Hydrology	Sea Level Rise
▸ Projected Change in: • Annual Precipitation • Summer Precipitation • Annual Temperature • Summer Temperature	▸ Projected Change in: • Annual Runoff • Spring Runoff • March Snow Water Equivalence (SWE) • Annual Evaporative Deficit	▸ Projected Change in Inundated Area

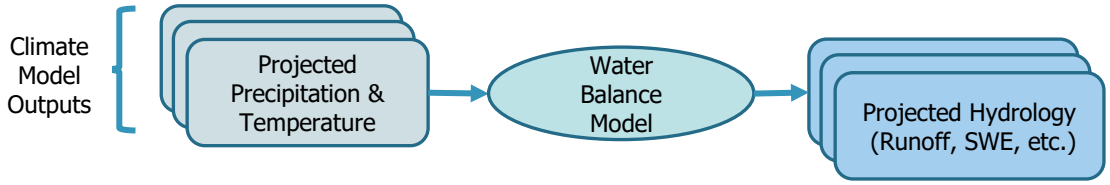
Data Sources – Climate

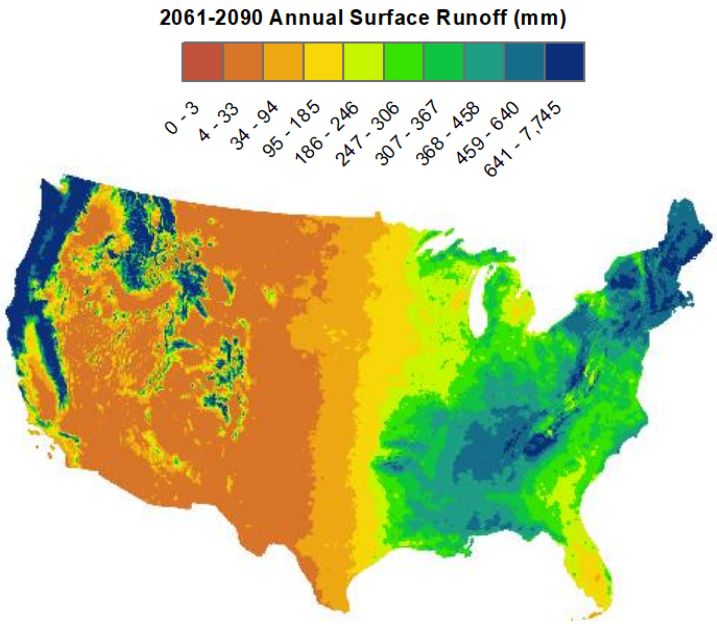
- Climate data were provided by the USGS National Climate Change Viewer (NCCV) program:
  - Projected precip and temp over 2061-2090 and historical conditions (1971-2000)
  - Average of 30 global climate models from the 2014 IPCC Fifth Assessment Report
  - Representative Concentration Pathway (RCP) 8.5 scenario
    - "High-risk" scenario with increased greenhouse gas emissions through 2100
  - Downscaled to grids with 800-meter resolution (~0.5 miles)



Data Sources – Hydrology

- Hydrology projections were also provided by the USGS NCCV:
  - Results of water balance modeling with downscaled precipitation and temperature projections from 30 global climate models
  - Model outputs averaged to quantify future runoff, snow water equivalence, and evaporative deficit over 2061-2090 and 1971-2000 historical conditions
    - 800-meter resolution grids (~0.5 miles)
    - "High-Risk" RCP 8.5 scenario



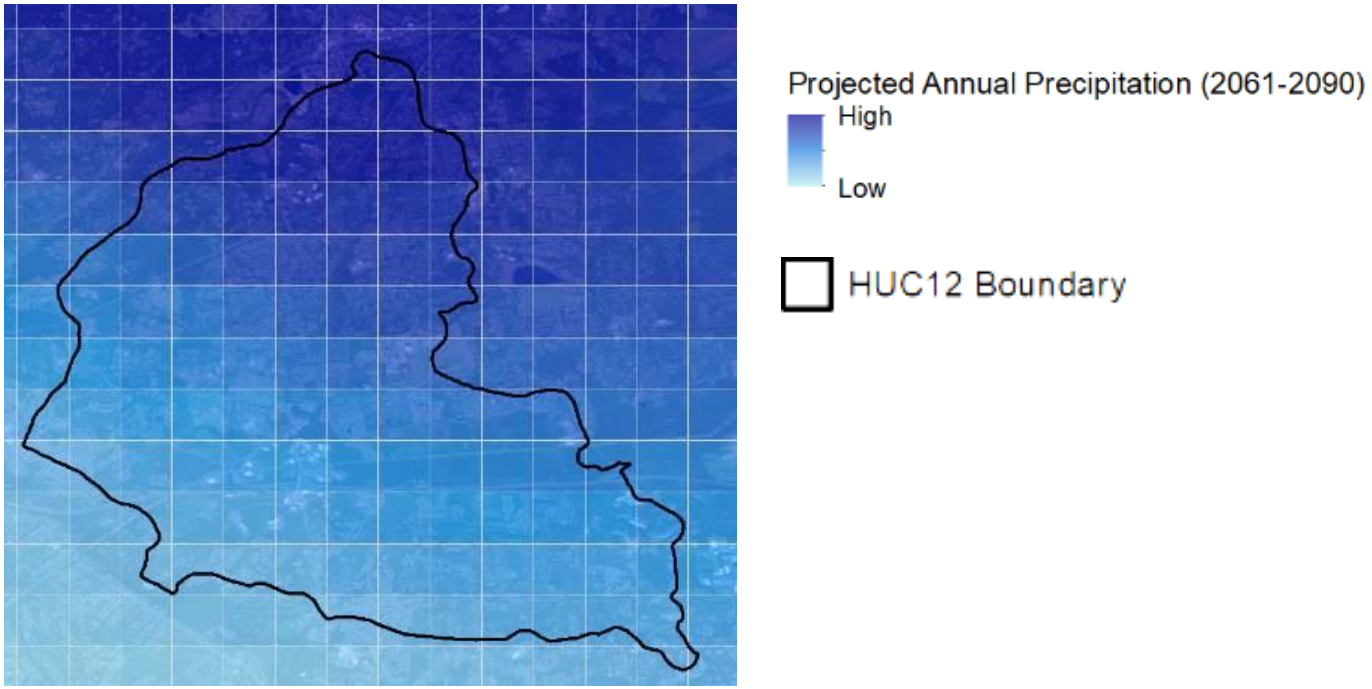


Data Sources – Seal Level Rise

- Projections of coastal inundation were acquired from the NOAA Office for Coastal Management
  - Maps of sea surface at 0 foot (existing conditions), 2 foot, and 10 foot sea level rise
  - Inundation maps are based on land surface elevation and reflect low lying areas near the existing sea surface
  - Grids with 5-meter resolution (~16 foot)

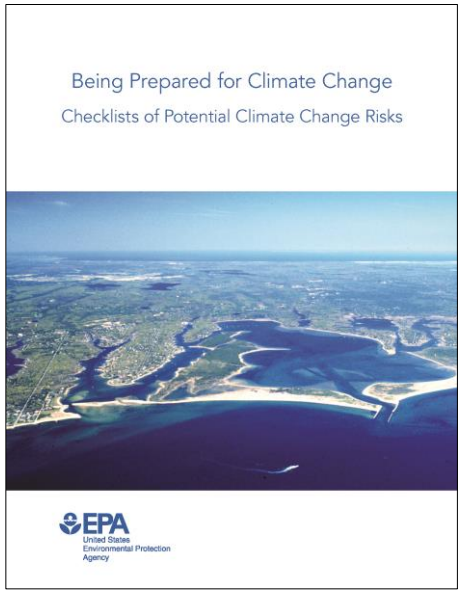
HUC12 Analysis

- Overlay HUC12s with grids depicting existing and future conditions in climate, hydrology, and sea-level rise
- Quantify change over time



Potential Uses of Climate-Related Indicators

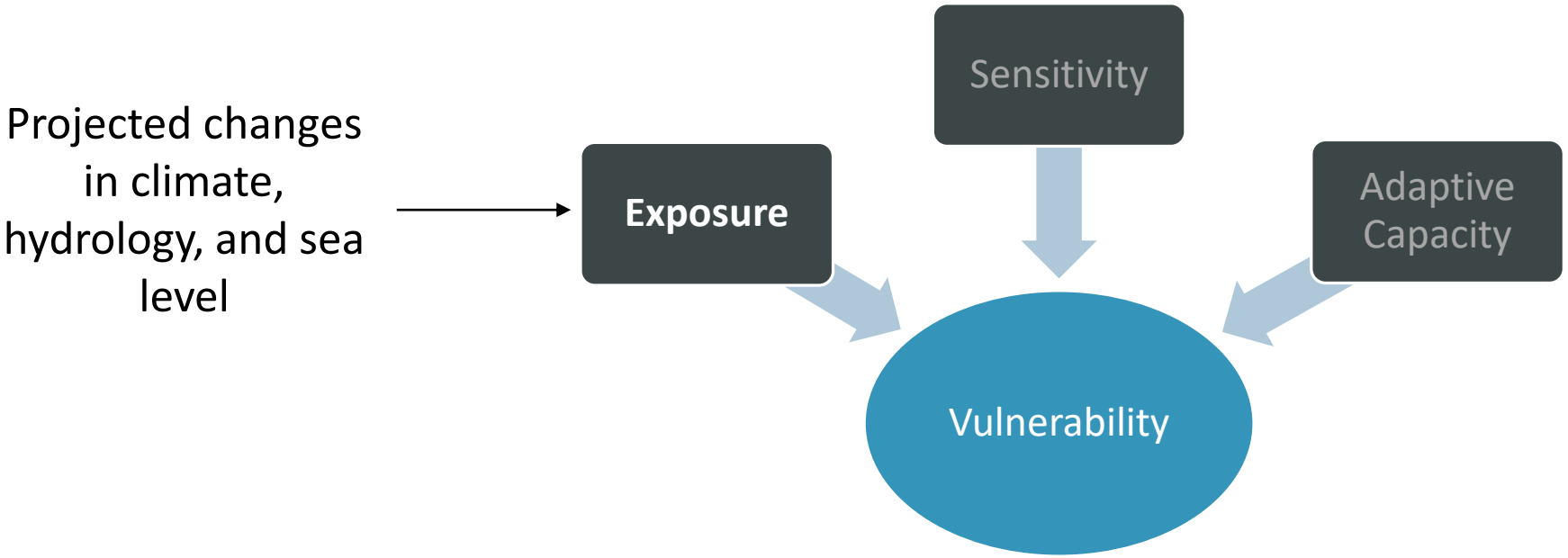
1. Build awareness of potential changes in climate, hydrology, and coastal inundation in one or more HUC12s of interest
   - What is the direction and magnitude of projected change (warmer & wetter, hotter & drier, etc.)?
   - Are greater changes projected for certain HUC12s?
2. Evaluate potential impacts to watersheds and aquatic ecosystems
   - How might projected changes affect pollutant loading and designated use attainment?



Climate Risks Checklist – EPA Climate Ready Estuaries

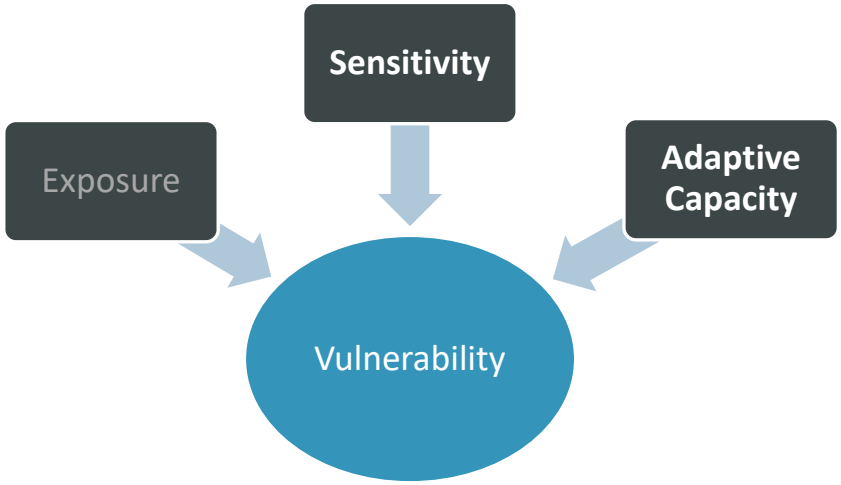
Potential Uses of Climate-Related Indicators

3. Identify high-priority HUC12s for efforts to reduce vulnerability and build resilience



Potential Uses of Climate-Related Indicators

- Other example HUC12 indicators in the RPS/WSIO dataset for assessing vulnerability and identifying priorities



Currently in RPS Tools/WSIO

- Land cover and land cover change
- Road density and road-stream crossings
- Wildfire potential
- At-risk aquatic species presence
- Dam density and storage volumes
- Protected lands

In Progress

- Extent of floodplains and hurricane storm surge zones
- Existing nutrient and sediment loads (SPARROW model)
- Critical habitat for aquatic species
- Assessed and impaired waters

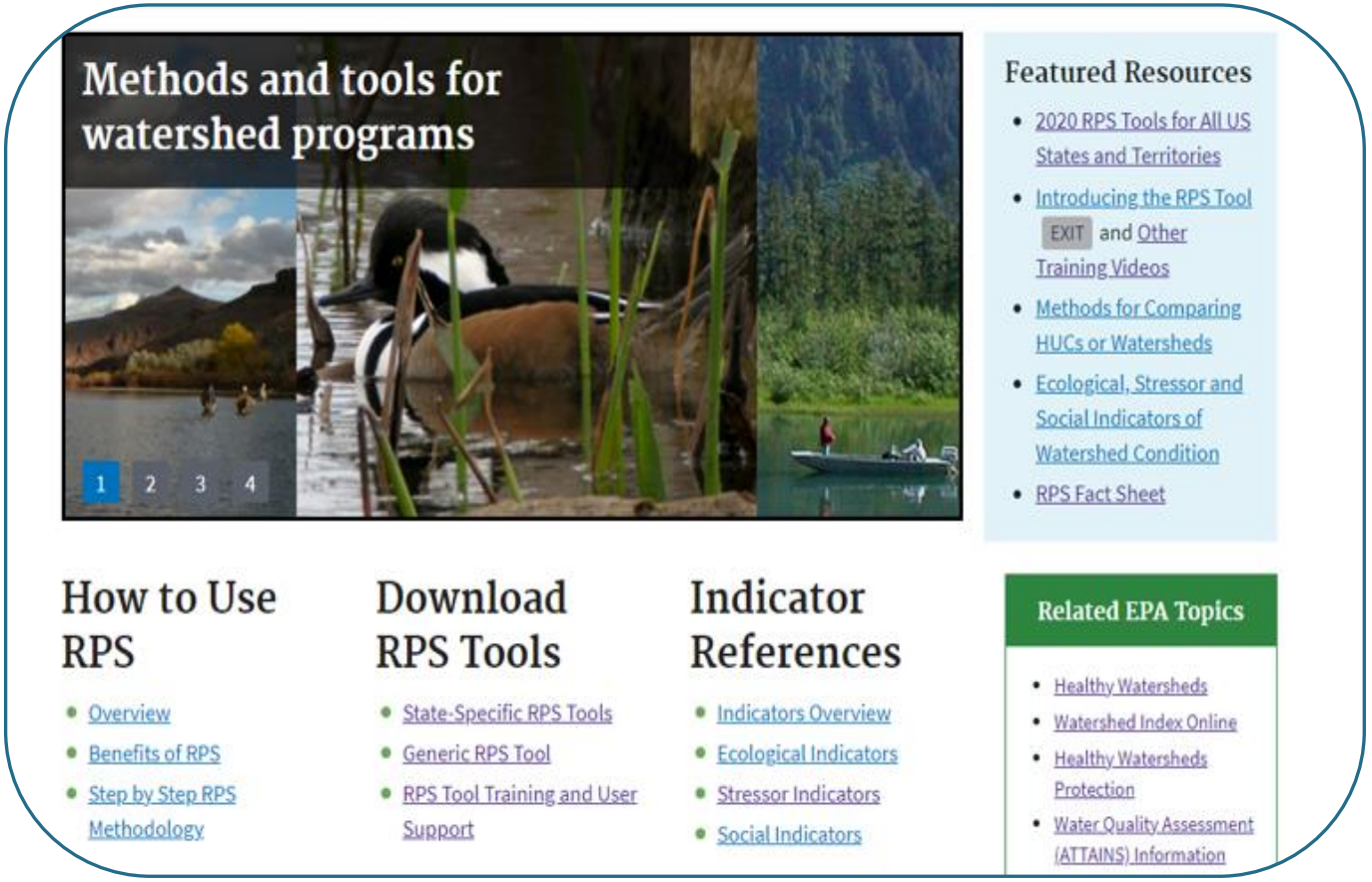
POLL 3

Recovery Potential Screening (RPS)

www.epa.gov/rps

Projects in 40+ states and territories

RPS data and tools for all states/territories



step by step instructions – indicators – tools

(for more watershed indicator data also see www.epa.gov/wsio)

What is Recovery Potential Screening (RPS)?

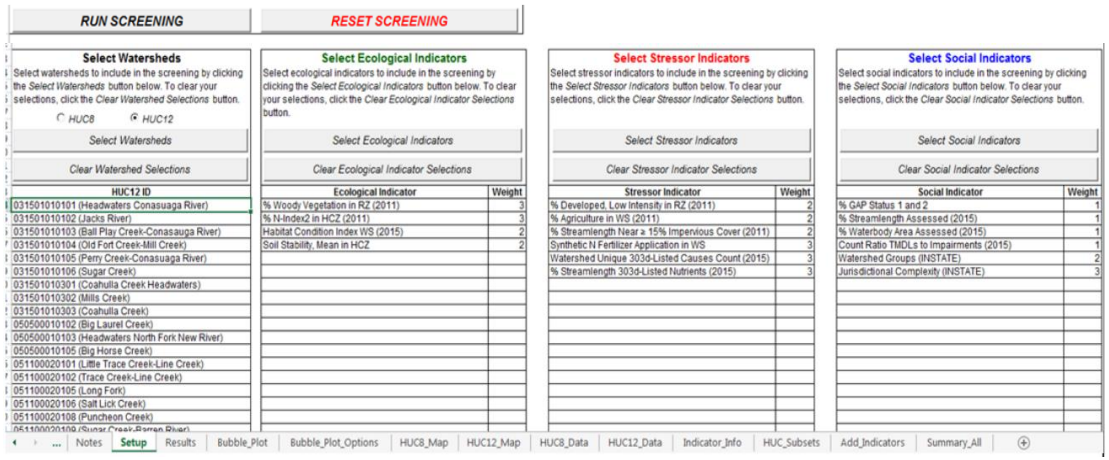
- Framework for comparing a group of watersheds based on environmental, stressor, and social factors relevant for priority-setting

- Developed by EPA in 2006 to provide a systematic method, data, and tool for comparing watersheds to inform management decisions and priorities

- Variety of applications, for example:
  - TMDL development
  - State nonpoint source program five-year plans & 319 grants
  - Healthy watersheds protection
  - Wetland and riparian buffer mitigation grants
  - Water quality monitoring strategies
  - Deepwater Horizon restoration funding

What is the RPS Tool?

- An Excel file with custom macros and menus for running a screening with pre-loaded watershed data
- Produced for all US states and territories
- Each tool is pre-loaded with HUC12 indicators calculated from national datasets
- Updates released every 1-2 years with new indicator data and tool functions



RUN SCREENING | RESET SCREENING

Select Watersheds

Select watersheds to include in the screening by clicking the *Select Watersheds* button below. To clear your selections, click the *Clear Watershed Selections* button.

○ HUC8 ◉ HUC12

Select Watersheds

Clear Watershed Selections

HUC12 ID
031501010101 (Headwaters Conasuaga River)
031501010102 (Jacks River)
031501010103 (Ball Play Creek-Conasauga River)
031501010104 (Old Fort Creek-Mill Creek)
031501010105 (Perry Creek-Conasauga River)
031501010106 (Sugar Creek)
031501010301 (Coahulla Creek Headwaters)
031501010302 (Mills Creek)
031501010303 (Coahulla Creek)
050500010102 (Big Laurel Creek)
050500010103 (Headwaters North Fork New River)
050500010105 (Big Horse Creek)
051100020101 (Little Trace Creek-Line Creek)
051100020102 (Trace Creek-Line Creek)
051100020105 (Long Fork)
051100020106 (Salt Lick Creek)
051100020108 (Puncheon Creek)

Select Ecological Indicators

Select ecological indicators to include in the screening by clicking the *Select Ecological Indicators* button below. To clear your selections, click the *Clear Ecological Indicator Selections* button.

Select Ecological Indicators

Clear Ecological Indicator Selections

Ecological Indicator	Weight
% Woody Vegetation in RZ (2011)	3
% N-Index2 in HCZ (2011)	3
Habitat Condition Index WS (2015)	2
Soil Stability, Mean in HCZ	2

Select Stressor Indicators

Select stressor indicators to include in the screening by clicking the *Select Stressor Indicators* button below. To clear your selections, click the *Clear Stressor Indicator Selections* button.

Select Stressor Indicators

Clear Stressor Indicator Selections

Stressor Indicator	Weight
% Developed, Low Intensity in RZ (2011)	2
% Agriculture in WS (2011)	2
% Streamlength Near a 15% Impervious Cover (2011)	2
Synthetic N Fertilizer Application in WS	3
Watershed Unique 303d-Listed Causes Count (2015)	3
% Streamlength 303d-Listed Nutrients (2015)	3

Select Social Indicators

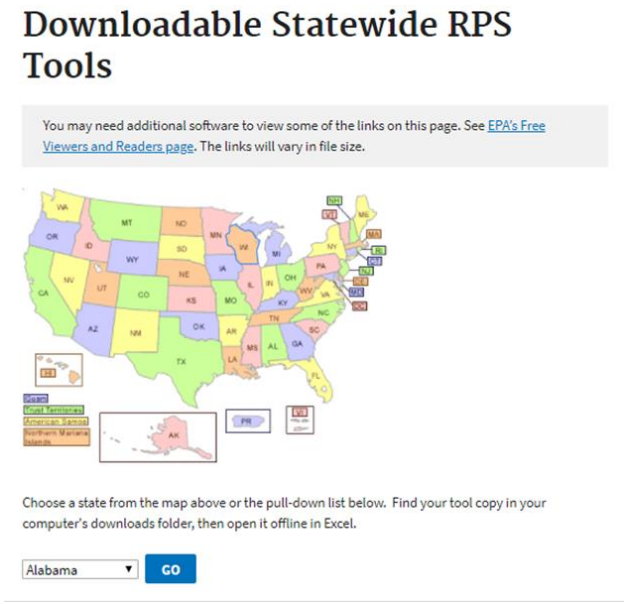
Select social indicators to include in the screening by clicking the *Select Social Indicators* button below. To clear your selections, click the *Clear Social Indicator Selections* button.

Select Social Indicators

Clear Social Indicator Selections

Social Indicator	Weight
% GAP Status 1 and 2	1
% Streamlength Assessed (2015)	1
% Waterbody Area Assessed (2015)	1
Count Ratio TMDLs to Impairments (2015)	1
Watershed Groups (INSTATE)	2
Jurisdictional Complexity (INSTATE)	3

Notes | Setup | Results | Bubble_Plot | Bubble_Plot_Options | HUC8_Map | HUC12_Map | HUC8_Data | HUC12_Data | Indicator_Info | HUC_Subsets | Add_Indicators | Summary_All



Downloadable Statewide RPS Tools

You may need additional software to view some of the links on this page. See EPA's Free Viewers and Readers page. The links will vary in file size.

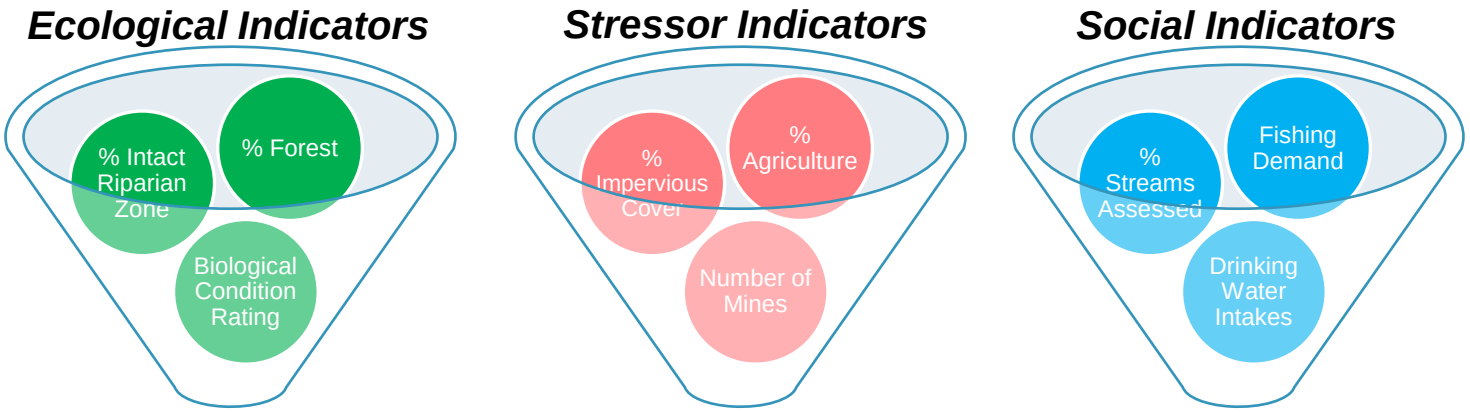
Choose a state from the map above or the pull-down list below. Find your tool copy in your computer's downloads folder, then open it offline in Excel.

Alabama ▾ GO

https://www.epa.gov/rps/downloadable-rps-tools-comparing-watersheds#Statewide

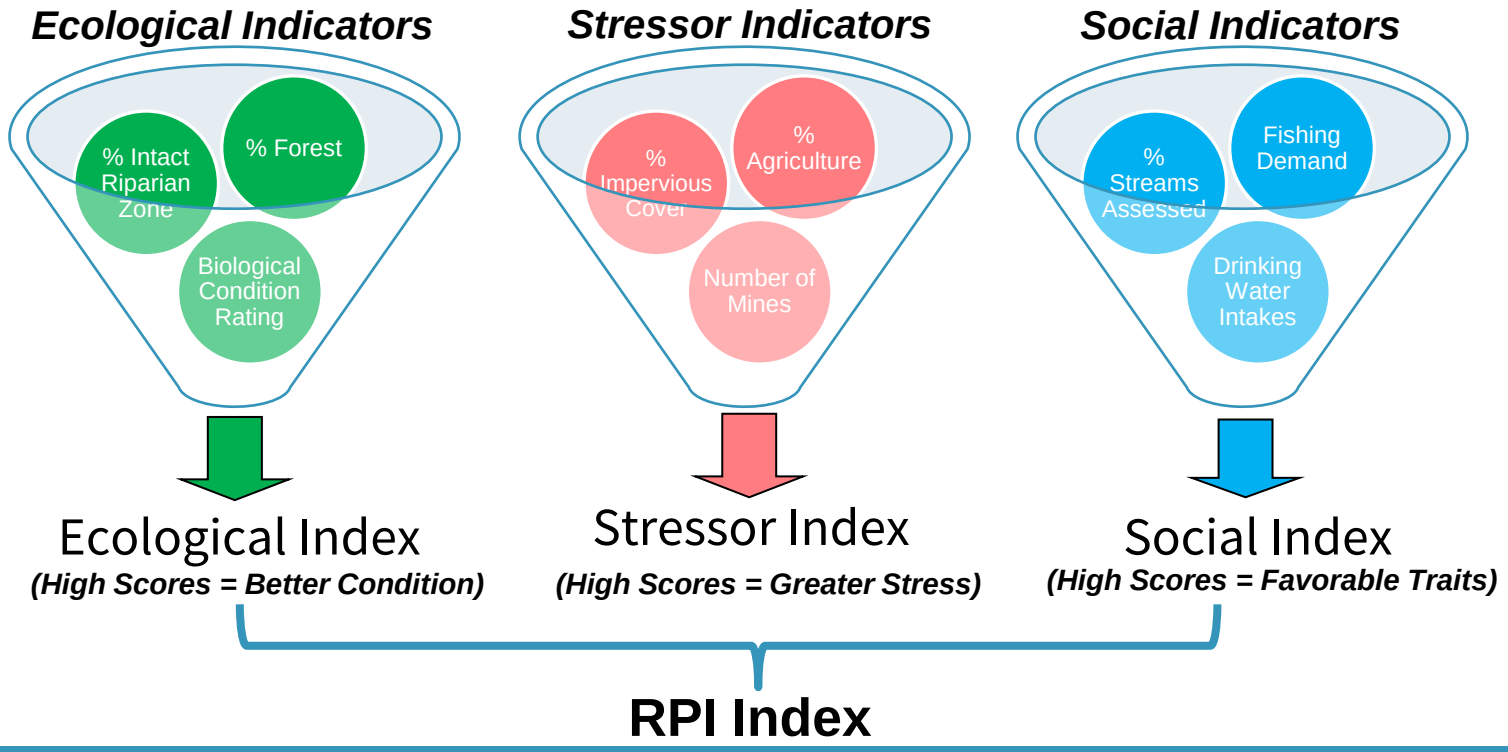
Watershed Indicators

- Indicator-based method for watershed comparison and priority-setting
- Indicators are measures of watershed attributes that are relevant to water quality restoration and protection



RPS Index Scores

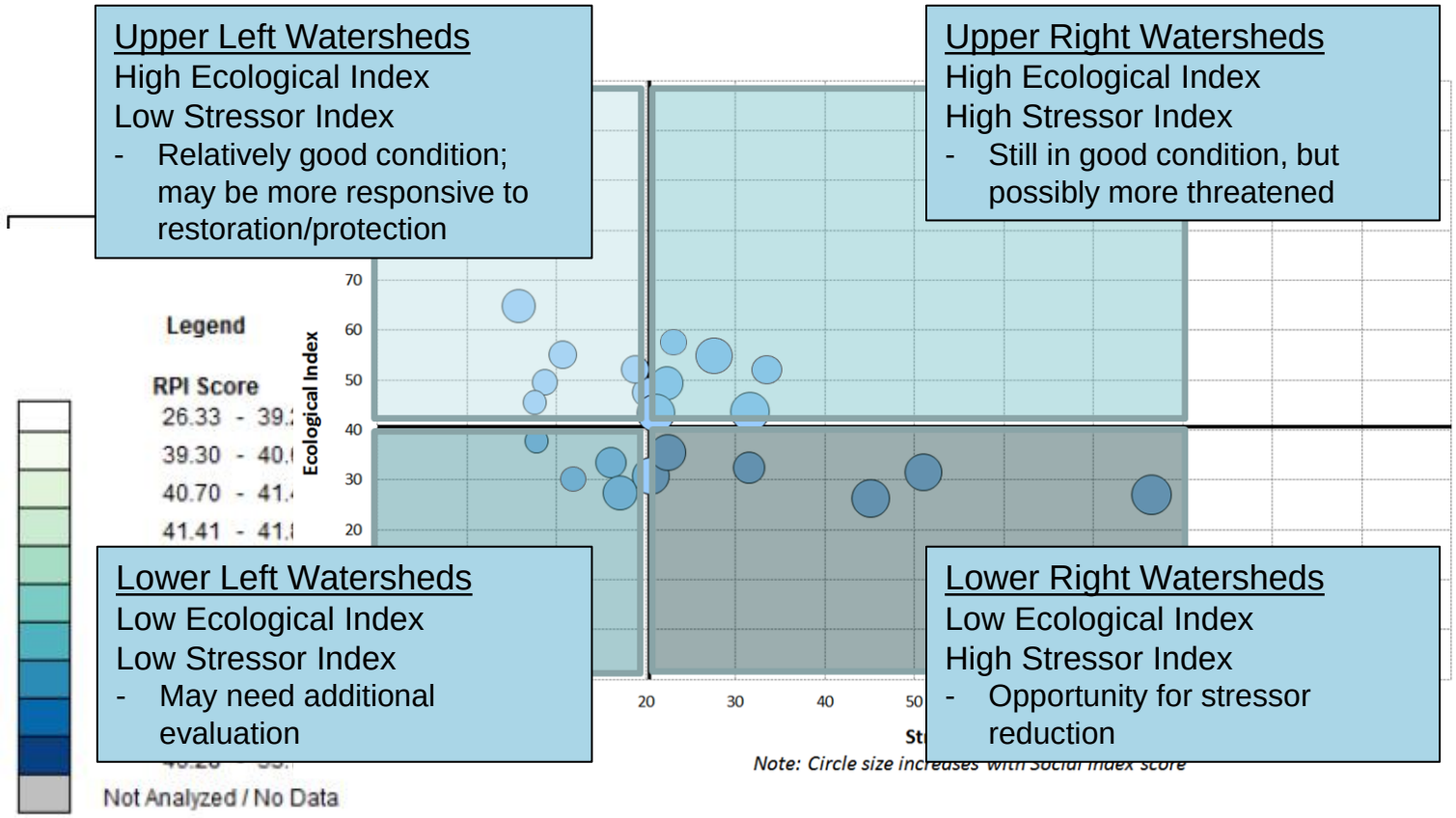
- Indicators are combined into **Index Scores** – offer overall picture of ecological, stressor, and social characteristics
- The **Recovery Potential Integrated (RPI) Index** combines the Ecological, Stressor, and Social Index



RPS Results

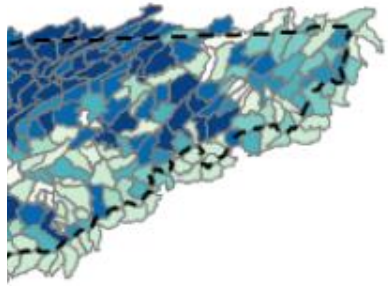
Upper Left Watersheds
High Ecological Index
Low Stressor Index
- Relatively good condition; may be more responsive to restoration/protection

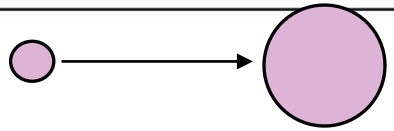
Upper Right Watersheds
High Ecological Index
High Stressor Index
- Still in good condition, but possibly more threatened



Lower Left Watersheds
Low Ecological Index
Low Stressor Index
- May need additional evaluation

Lower Right Watersheds
Low Ecological Index
High Stressor Index
- Opportunity for stressor reduction

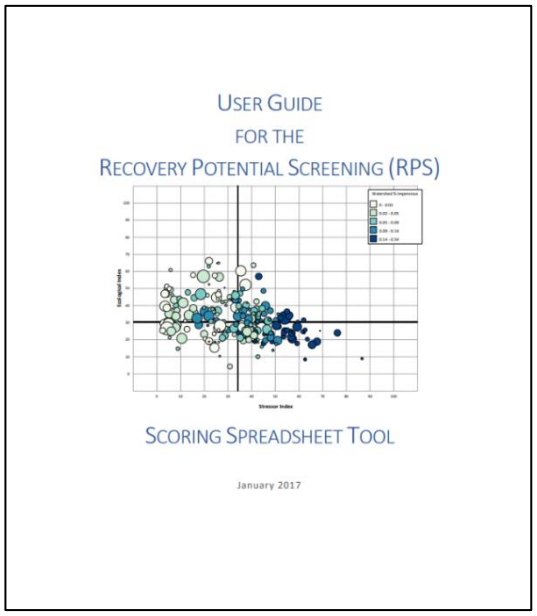




Bubble size
Larger bubbles = more favorable social traits based on screening objective

RPS Tool Training Resources

- User Guide with step-by-step instructions
- Video Training Series - short instructional videos that each focus on critical elements of the RPS Tool
- Reports from past projects



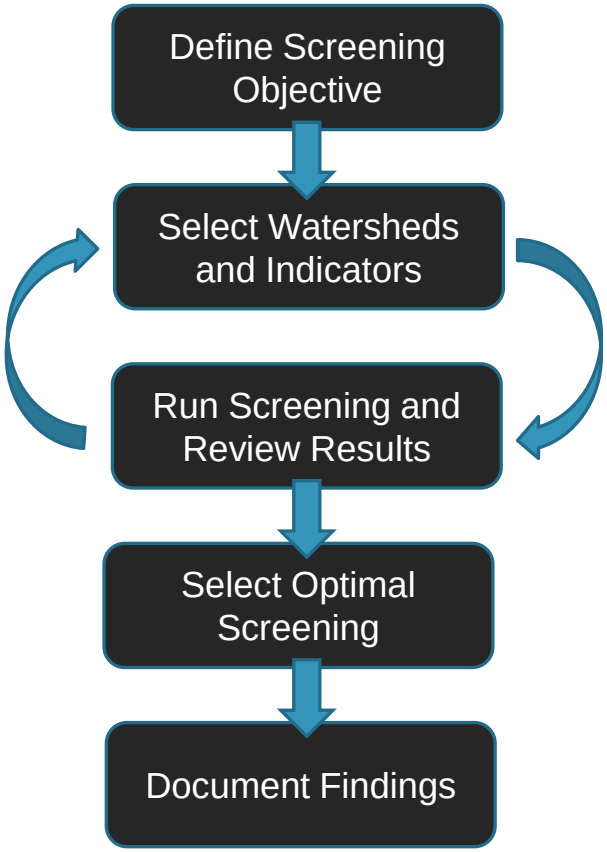
https://www.epa.gov/rps/rps-training-and-user-support

POLL 4

RPS Tool Demo

RPS Tool Demo

RPS screening process:



RPS Tool Demo

- The *State of Paradise* has allocated funding to the Department of Environmental Protection to support climate change resilience and address environmental justice concerns through nonpoint source management

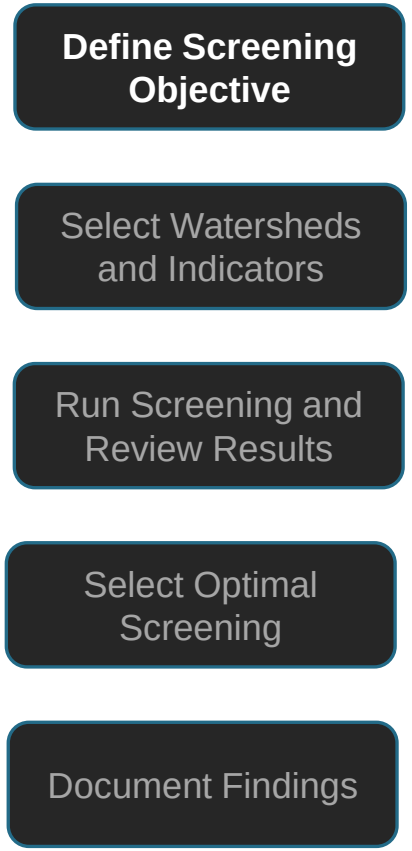
RPS Tool Demo

- This initiative requires DEP to consider both *climate vulnerability* and *environmental justice* factors in project decisions (new indicators!)
- The RPS Tool will be used to identify an initial group of priority HUC12s for further evaluation

RPS Tool Demo – Screening Objective

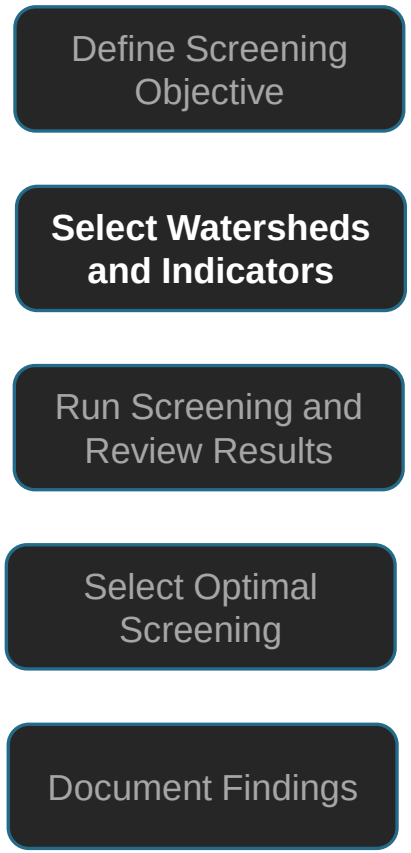
Hypothetical example:

"Identify target HUC12s for stormwater management practices to support climate change and community resilience"



RPS Tool Demo – Select Watersheds & Indicators

- Statewide screening – all HUC12s selected
- Characteristics of “target” HUC12s for improved stormwater management
  1) Indicators of a potential underserved community
  2) Presence of stormwater sources
  3) Increased pollutant loading and other climate impacts over time



RPS Tool Demo – Select Watersheds & Indicators

- Potential underserved communities

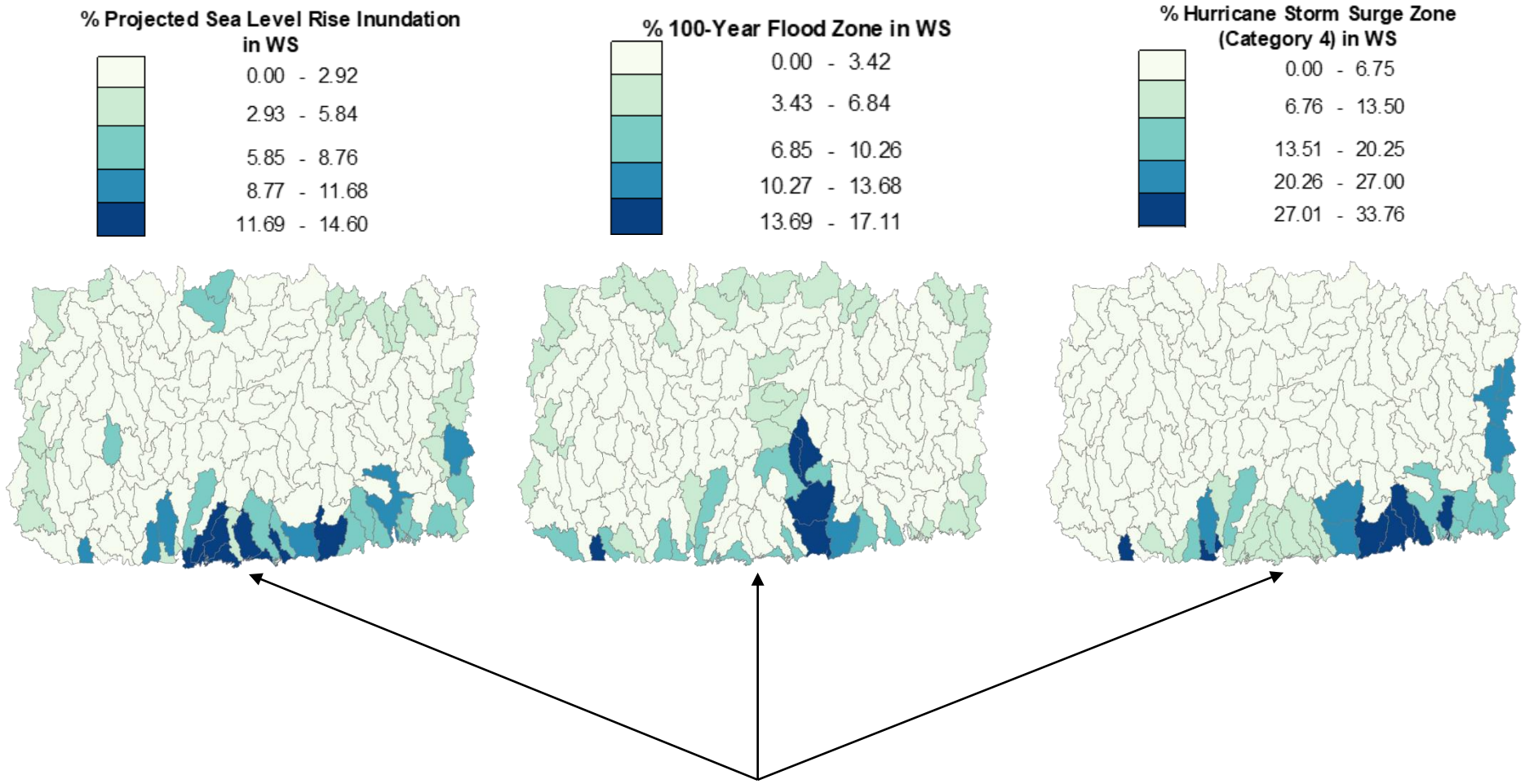
- Increased pollutant loading and other climate impacts over time

- Presence of stormwater sources

Social Indicators
% Low Income Population
% Minority Population
% < High School Educated Population
% Linguistically Isolated Population
% Vulnerable Age Groups

Stressor Indicators
% Projected Sea Level Rise Inundation
% Change in Annual Precipitation (2061-2090)
% Change in Annual Runoff (2061-2090)
% Hurricane Storm Surge Zone
% 100-Year Flood Zone
% Imperviousness (2016)
Density All Roads (2015)
% Urban Change (2001-16)

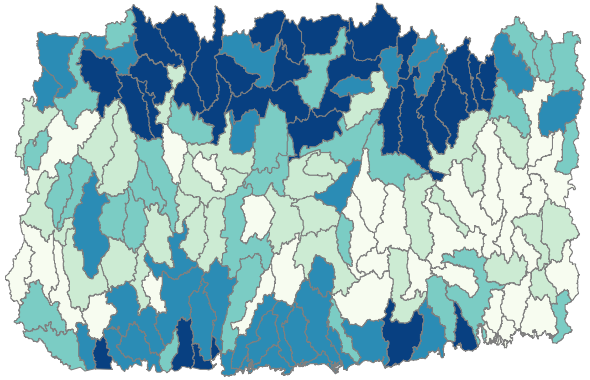
RPS Tool Demo – Run Screening and Review Results

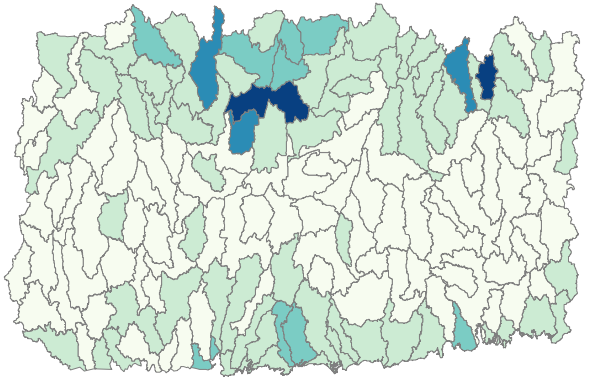


High potential for flood-related climate impacts in south coast HUC12s

RPS Tool Demo – Run Screening and Review Results

High density development concentrated in north coast HUC12s





% Imperviousness, Mean in WS (2016)

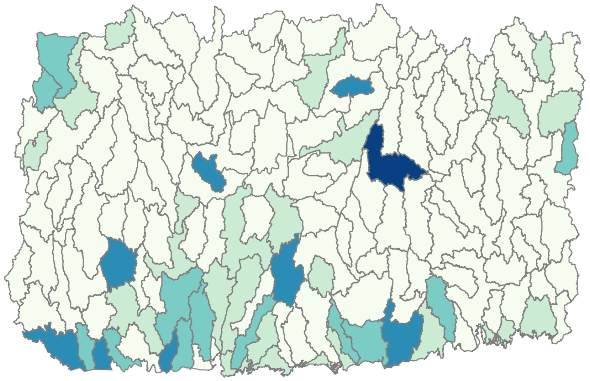
0.10	1.09
1.10	2.36
2.37	5.50
5.51	11.62
11.63	61.10

Density All Roads in WS (2015)

0.43	4.87
4.88	9.31
9.32	13.75
13.76	18.19
18.20	22.63

% Urban Change in WS (2001-16)

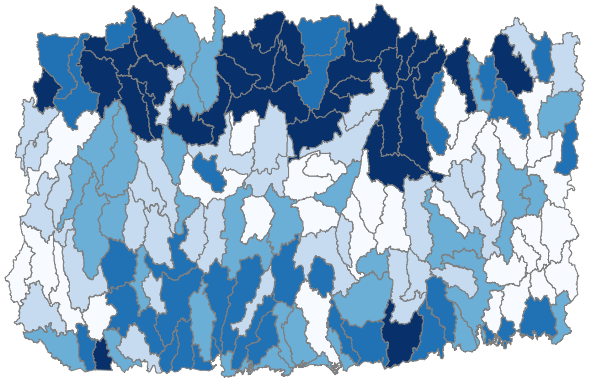
0.00	2.50
2.51	5.00
5.01	7.50
7.51	10.00
10.01	12.52



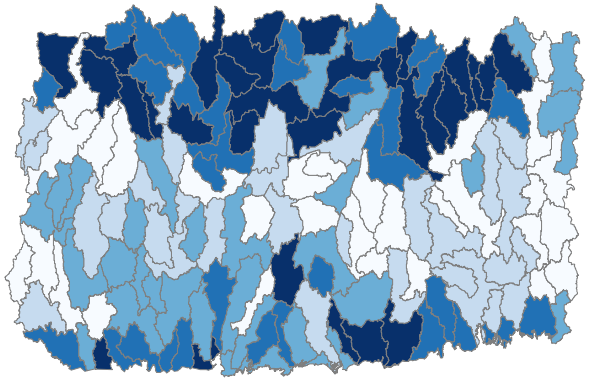
Signs of increasing development in south coast HUC12s

RPS Tool Demo – Run Screening and Review Results

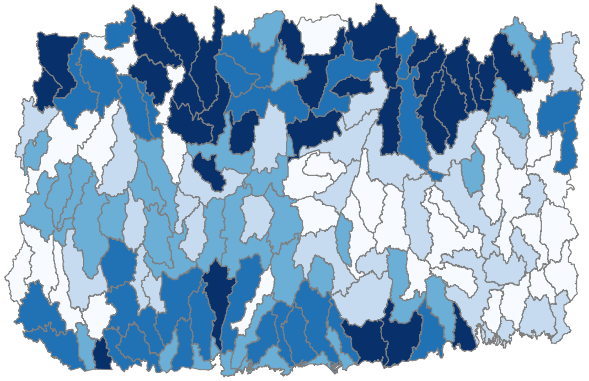
% Low-Income Population



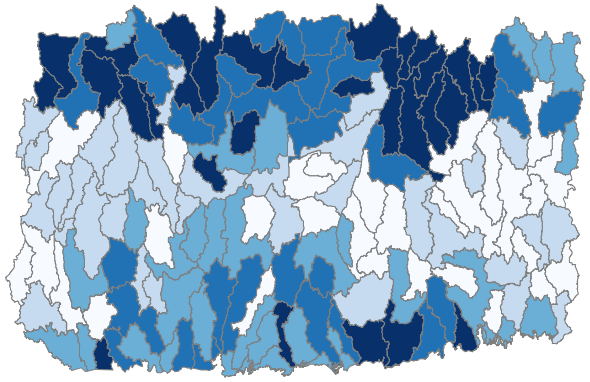
% Minority Population



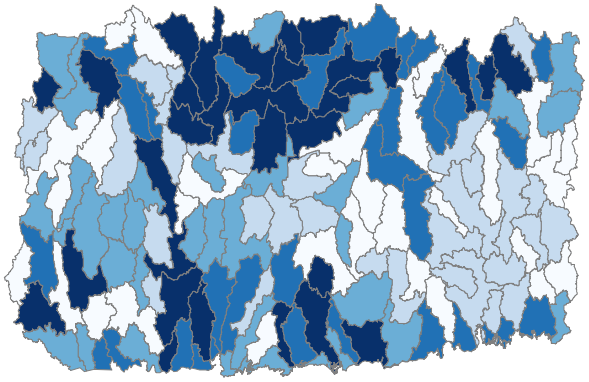
% < High School Educated

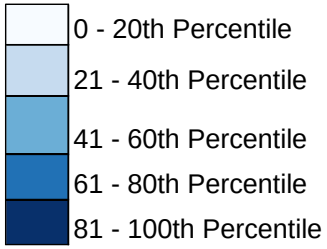


% Linguistically Isolated Population



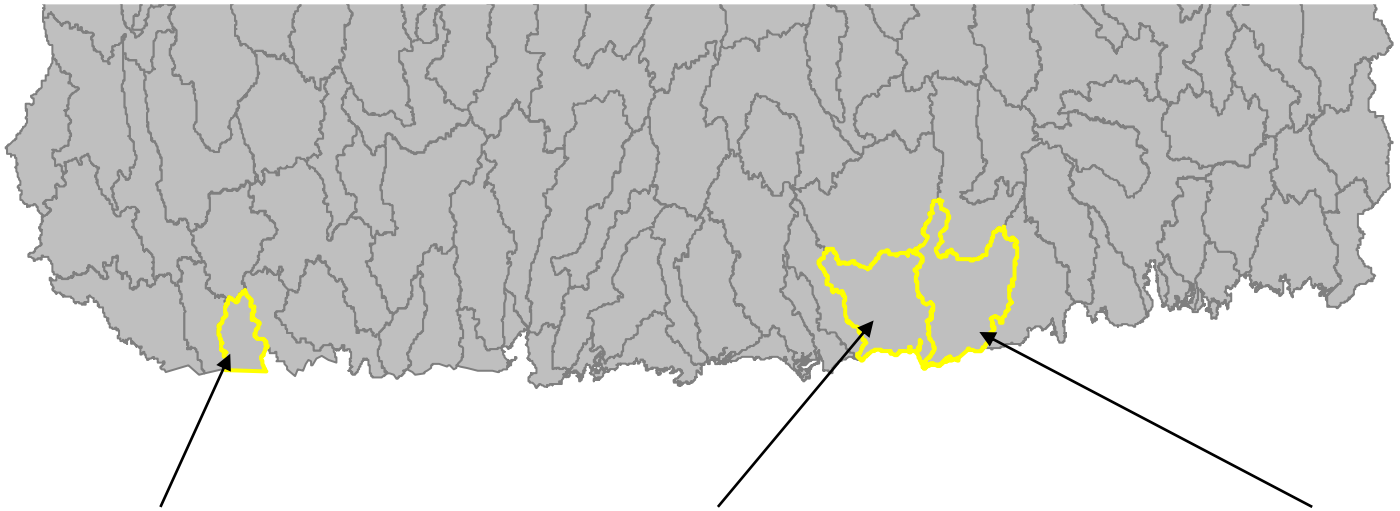
% Vulnerable Age Groups





RPS Tool Demo – Run Screening and Review Results

Priority HUC12s – South Coast



Spruce River
Stressor Rank = 149th
Social Rank = 6th

Cedar River
Stressor Rank = 148th
Social Rank = 5th

Pine River
Stressor Rank = 150th
Social Rank = 10th

RPS Tool Demo – Run Screening and Review Results

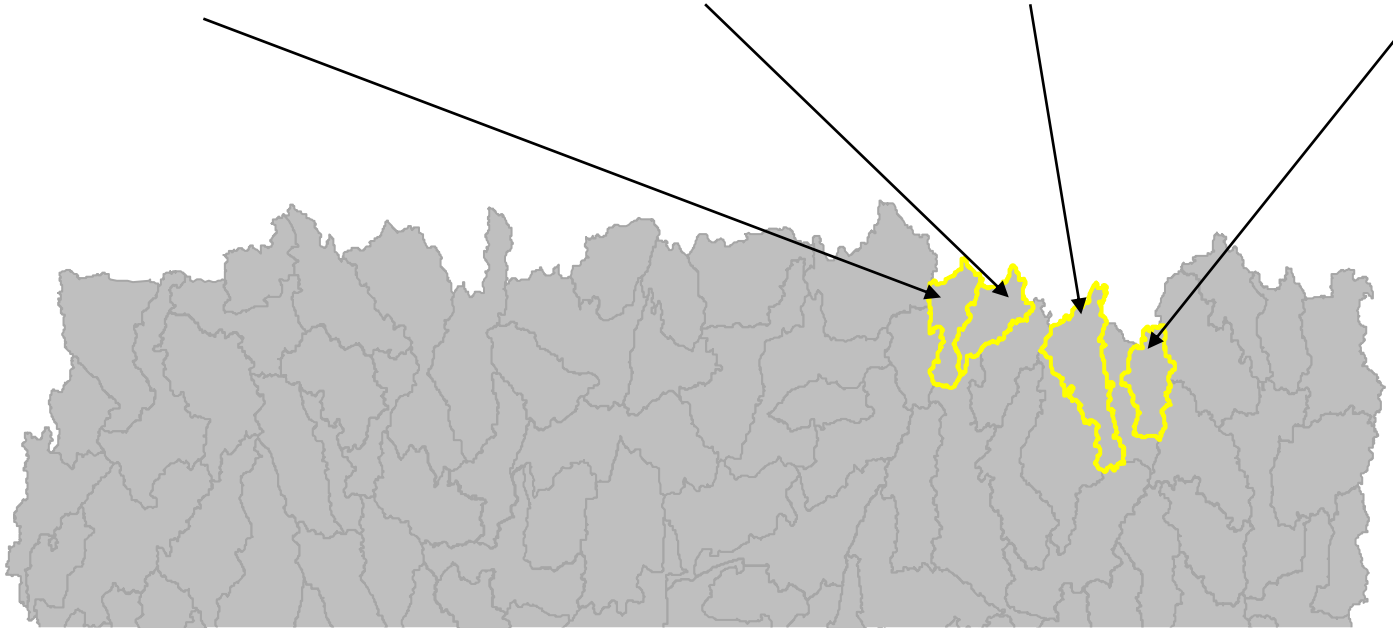
Priority HUC12s – North Coast

Middle River
Stressor Rank = 129th
Social Rank = 9th

Furnace Brook
Stressor Rank = 110th
Social Rank = 7th

Bigelow Brook
Stressor Rank = 133rd
Social Rank = 1st

Bungee Brook
Stressor Rank = 132nd
Social Rank = 8th



Moving Ahead

POLL 5

POLL 6

Thank you for joining us! Any questions?

For more information contact us at
HWP-Team@epa.gov

Watershed Index Online - https://www.epa.gov/wsio

Recovery Potential Screening Tool - https://www.epa.gov/rps