

# Integrating Equity and Environmental Justice into Nonpoint Source Management Planning with the Recovery Potential Screening Tool

---

## 1. Introduction and Purpose

In September 2021, the U.S. Environmental Protection Agency (EPA) Nonpoint Source (NPS) program issued the memo titled [Near-term Actions to Support Environmental Justice in the Nonpoint Source Program](#) which encouraged state and territorial NPS programs to assess and advance delivery of NPS benefits to disadvantaged communities.<sup>1</sup> The memo identified a number EPA of actions in support of this goal, including providing analytical assistance to state NPS programs to use data layers that characterize disadvantaged communities for informing decisions on watershed projects, capacity building, outreach and education, and other NPS management activities.

This report summarizes methods and takeaways of pilot analytical assistance projects with three state NPS programs: Kentucky, California, and West Virginia. Each project applied the EPA Recovery Potential Screening (RPS) Tool to identify subwatersheds where NPS issues and disadvantaged communities co-occur. The subwatersheds identified with the RPS Tool can be further evaluated for designation as priorities for NPS management.

This document was prepared to provide state NPS programs with insight on how the watershed, water quality, and demographic data available in the RPS Tool can be analyzed as part of efforts to integrate equity and environmental justice into NPS management planning. This document can be supplemented with training resources available through the [RPS Training and User Support](#) page which provide step-by-step instructions for using the RPS Tool.

## 2. RPS Tool Overview

Watersheds have ecological, stressor, and social characteristics that can affect their suitability for restoration and protection initiatives and which influence the potential for successful management outcomes. The RPS Tool provides a systematic approach to compare watersheds to help planners make deliberate and informed decisions about where to focus restoration and protection activities and resources.

Customized RPS Tool files have been created and are available for all US states and territories. Each file is a custom-coded Excel spreadsheet that is configured for a state or territory which stores pre-calculated watershed indicators for that area. Indicators measure distinct watershed characteristics and serve as the basis for watershed comparisons in the RPS Tool. The RPS Tool uses three categories of indicators to compare watersheds: Ecological, Stressor, and Social.

Interactive menus in the RPS Tool allow a user to set up a screening to compare a group of watersheds by choosing relevant indicators. The tool then calculates and assigns Ecological, Stressor, and Social Index scores to watersheds that are based on the user-selected indicators. Results are displayed in table, graph, and map form to identify high and low scoring watersheds and evaluate the characteristics of those watersheds.

---

<sup>1</sup> The Office of Management and Budget (OMB) Justice40 interim guidance includes a broad definition of disadvantaged communities <https://www.whitehouse.gov/wp-content/uploads/2021/07/M-21-28.pdf>

Most RPS Tool files allow for the comparison of 12-digit Hydrologic Unit subwatersheds (HUC12s) from the National Watershed Boundary Dataset maintained by USGS and the Natural Resources Conservation Service. Alternative watershed scales, such as state-specific watershed delineations, are available in some RPS Tool files based on information provided by state or territory water programs.

State and territory RPS Tool files can be downloaded from <https://www.epa.gov/rps/downloadable-rps-tools-comparing-watersheds#Statewide>. A list of available indicators that are pre-loaded in each file is provided in the “Indicator\_Info” tab of the tool.

### 3. Pilot Project Process

Pilot analytical assistance projects were completed with three state NPS programs: Kentucky, California, and West Virginia. The pilot projects used the screening process depicted in Figure 1 and described below.

- **Step 1 - Define the Screening Objective.** A screening objective establishes the purpose for using the RPS Tool and guides subsequent screening decisions. The following screening objective was defined for the pilot projects:

*“Identify HUC12 subwatersheds where NPS issues and disadvantaged communities co-occur which could be further assessed and prioritized for NPS Program equity and environmental justice initiatives.”*

- **Step 2 - Select Watersheds and Indicators.** Within the RPS Tool, a screening is configured by choosing a group of watersheds to screen and selecting indicators that are relevant to the screening objective. Statewide screenings of HUC12 subwatersheds were completed for all three pilot projects (i.e., every HUC12 subwatershed in each state was screened).

Indicator selection involved reviewing definitions of pre-loaded indicators in the RPS Tool, choosing an initial list of indicators that aligned with the screening objective, and refining the list by exploring indicator data characteristics such as the level of correlation between indicators. *Section 4.1 Indicator Selection* provides further detail on indicator selection steps and guidelines.

- **Step 3 - Run Screening and Review Results.** The RPS Tool calculates and assigns Ecological, Stressor, and Social Index scores to subwatersheds based on the user-selected indicators. These scores are reviewed to determine if the initial screening is adequate or if adjustments to indicator selections are needed.

In each pilot project, the initial screening results were evaluated by NPS program staff, and the screenings were adjusted by adding or removing indicators. For example, in the Kentucky project, NPS program staff found that some HUC12s had lower than expected Stressor Index scores and an indicator of coal and mineral mining activity was added to the screening in response.

- **Step 4 - Select Optimal Screening(s).** The process of refining a screening continues until an optimal screening is identified which meets user needs. Users may also find that two or more screenings each provide useful information for priority-setting and may consider results from multiple

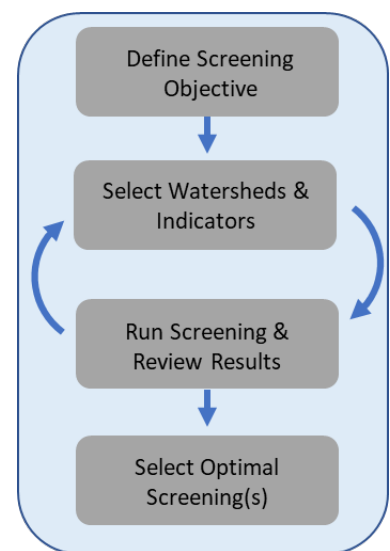


Figure 1. Process for applying the RPS Tool.

screenings as part of prioritization decisions. Results of the optimal screening(s) are used to identify HUC12 subwatersheds of interest by examining index scores and choosing HUC12s with preferred traits for prioritization. RPS Tool users can choose to prioritize any combination of high or low scoring HUC12s depending on their screening objective and preferences. Screening results can also be combined with data and information from other tools or resources to further refine priorities. Additional discussion of how screening results were applied in the pilot projects is provided in *Section 4.2 Interpreting Results*.

## 4. Key Concepts from Pilot Projects

### 4.1. Indicator Selection

#### **Indicator Overview**

The RPS Tool uses three categories of indicators to compare watersheds:

- *Ecological* indicators describe the existing condition of aquatic ecosystems and related watershed functions. Ecological indicators can also reflect the capacity of a watershed to regain degraded functions. Example Ecological indicators include percent natural land cover in the watershed or the biological condition rating of streams in the watershed.
- *Stressor* indicators measure the presence and amount of human activity in the watershed that can increase pollutant loading and degrade aquatic ecosystems. Stressor indicators can also reflect additional threats to the health and resilience of aquatic ecosystems and people. Example stressor indicators include percent impervious cover in the watershed, percent agricultural cover in riparian zones of the watershed, or the number of National Pollutant Discharge Elimination System (NPDES) permits issued in the watershed.
- *Social* indicators address community, regulatory, economic, and/or behavioral factors that influence watershed management approaches and planning. Example social indicators include the number of drinking water intakes in the watershed or the number of Clean Water Act (CWA) Section 319 grant projects previously completed in the watershed.

Example indicator selections from the pilot projects are listed in Table 1 and are discussed in the following sections.

Table 1. Example indicators selected for pilot projects to identify HUC12 subwatersheds where NPS issues and disadvantaged communities co-occur.

Indicator Category	Subcategory	Indicator Name	
Ecological	Integrated Watershed Health Index & Sub-Indices	Preliminary Healthy Watersheds Assessment (PHWA) Watershed Health Index, State (see Figure 2)	
Stressor	Agricultural Cover	% Agriculture in HUC12	
		% Pasture/Hay in Riparian Zone in HUC12	
		% Agriculture on > 10% Slope in HUC12	
		Livestock Density in HUC12	
	Impervious Cover	% Impervious Cover in HUC12	
		% Streamlength Near >5% Impervious Cover in HUC12	
	Urban/Developed Cover	% Urban Change in HUC12 (2001-19)	
	Human Use Land Cover (All Types)	% Human Use Land Cover (U-Index) in HUC12	
		% Human Use Land Cover (U-Index) in Riparian Zone in HUC12	
	Wildfire Risk	% High or Very High Wildfire Hazard Potential in HUC12	
	Mining Activity	Mining Site Count in HUC12	
	Pollutant Loading Severity	Nitrogen Yield in HUC12	
		Phosphorus Yield in HUC12	
		Suspended Solid Yield in HUC12	
	Impaired Waters	Impaired Waters, % of HUC12	
		Nutrient Impaired Waters, % of HUC12	
		Sediment Impaired Waters, % of HUC12	
		Pathogen Impaired Waters, % of HUC12	
		Metals Impaired Waters, % of HUC12	
	Hazardous Waste & Wastewater	NPDES Permit Count in HUC12	
		Hazardous Waste Management Site Count in HUC12	
		Toxic Release Inventory Site Count in HUC12	
		Toxic Release and Exposure Potential in HUC12	
		Superfund Site Count in HUC12	
		Risk Management Plan Site Count in HUC12	
	Social	Community Context	% Low-Income Population in HUC12
			% Low-Income Population, Maximum in HUC12
% Unemployment Rate in HUC12			
% Unemployment Rate, Maximum in HUC12			
% Minority Population in HUC12			
% Minority Population, Maximum in HUC12			
% Less Than High School Educated Population in HUC12			
% Less Than High School Educated Population, Maximum in HUC12			
% Linguistically Isolated Population in HUC12			
% Linguistically Isolated Population, Maximum in HUC12			
% Vulnerable Age Group Population			
% Vulnerable Age Group Population, Maximum in HUC12			
Low Life Expectancy in HUC12			
Low Life Expectancy, Maximum in HUC12			
Participation in Conservation Programs		% Conservation Easement in HUC12	
		NPS Pollution Control Project Count in HUC12	
		Sediment NPS Pollution Project Presence in HUC12	
		Metals NPS Pollution Project Presence in HUC12	
		Pathogen NPS Pollution Control Project Presence in HUC12	
Water Quality Assessments & TMDLs		Nutrient NPS Pollution Control Project Presence in HUC12	
		Assessed Waters, % of HUC12	

## Ecological Indicators

The Watershed Health Index was selected as an Ecological indicator in all three pilot projects. The Watershed Health Index is a pre-calculated, integrated measure of watershed condition that is available in RPS Tools for contiguous US states. The Watershed Health Index combines 20 indicators which were selected to reflect six key attributes of watershed health: Landscape Condition, Geomorphology, Habitat, Water Quality, Hydrology, and Biological Condition. The [Overview of the Preliminary Healthy Watersheds Assessments Project](#) contains additional background information on the Watershed Health Index.

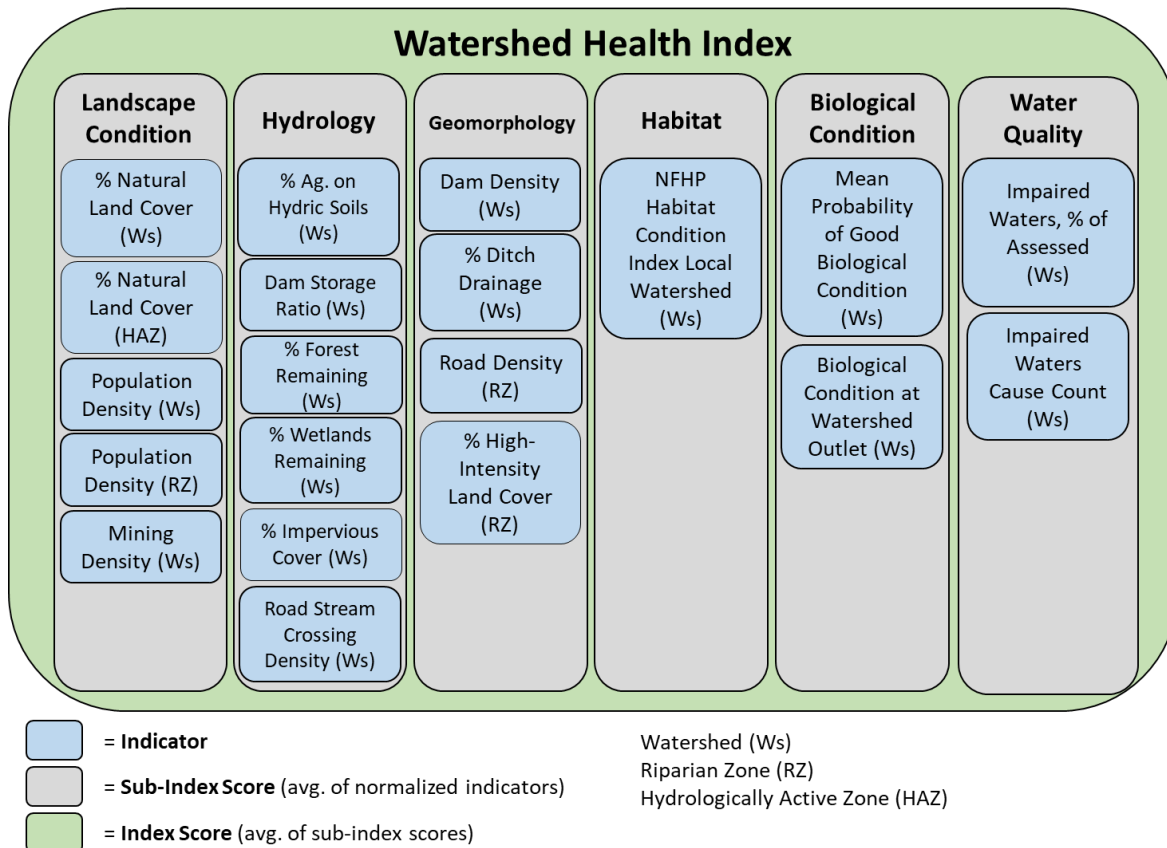


Figure 2. Diagram of indicators included in the Watershed Health Index from [Overview of the Preliminary Healthy Watersheds Assessments Project](#).

By including the Watershed Health Index in a screening, readers can factor overall watershed condition into the identification of priority HUC12s for equity and environmental justice initiatives. Higher Watershed Health Index scores correspond to greater potential for a watershed to have the structure and function in place to support healthy aquatic ecosystems and provide important ecosystem services to surrounding communities. HUC12s with poor watershed health scores could signal environmental health issues that may disproportionately affect certain communities.

Because the Watershed Health Index already integrates several indicators, no other Ecological indicator selections are required for a screening. However, readers may choose to select additional or alternative Ecological indicators if the Watershed Health Index does not fit their specific needs and interests.

### **Stressor Indicators**

The Stressor indicators selected in the pilot projects reflect the prevalence of NPS pollution in a HUC12 and associated water quality impacts. Examples are listed in Table 1 and include indicators that characterize the extent of agricultural lands, livestock populations, impervious cover, impaired waters, and the magnitude of pollutant loading. Readers can use the pilot project selections as a starting point but should customize the selections based on state-specific water quality issues and priority pollutants or pollution sources for NPS management.

Pilot project states also selected Stressor indicators that reflect additional pollution burdens faced by communities which are not directly related to NPS management. Examples include counts of National Pollutant Discharge Elimination System (NPDES) permits to discharge wastewater or stormwater in the HUC12 or counts of facilities that manage hazardous or toxic materials (see the “Hazardous Waste & Wastewater” subcategory of Table 1. These additional indicators were incorporated into the pilot projects by running two separate screenings: one screening with NPS-focused indicator selections and one screening with indicators of additional pollution burden. This provided two Stressor Index scores for each HUC12 subwatershed to differentiate between high stress due to NPS issues and high stress due to other pollution burdens.

### **Social Indicators**

Social indicators selected for the pilot projects included demographic metrics that relate to a community’s potential susceptibility to be impacted by pollution, environmental degradation, and/or environmental justice concerns. The demographic indicators available in the RPS Tool are listed in Table 1 (see the “Community Context” subcategory) and measure the same demographic characteristics used in the EPA Environmental Justice Mapping and Screening Tool (EJSCREEN). Additional details can be found in the [reference sheet](#) for demographic indicators.

Each demographic characteristic listed in Table 1 is expressed with two indicators. All demographic indicators are calculated from demographic data reported for distinct geographic units called Block Groups that are used by the US Census Bureau for publishing population and demographic data. The first indicator listed in each row of Table 1 aggregates data from all Block Groups in a HUC12 and reflects the total HUC12 value. The second indicator in each row reports only the maximum Block Group value in the HUC12. The "maximum in HUC12" indicators can be useful for identifying potentially disadvantaged communities in HUC12s with wide-ranging demographic attributes. For example, a HUC12 may contain Block Groups where low income households predominate but that HUC12 could still have an average “% Low-Income Population in HUC12” indicator value due to the presence of both low and high income Block Groups across the HUC12. In contrast, that HUC12 would stand out with the "% Low-Income Population, Maximum in HUC12" because only the maximum Block Group value is reported.

The pilot projects also included Social Indicators that reflect the existing level of investment in water quality assessment and management activities in a HUC12. Examples include the extent of waters that have been assessed for attainment of surface water quality standards and the number of NPS pollution control projects funded through Section 319 grants (see the “Participation in Conservation Programs” and “Water Quality Assessments & TMDLs” subcategories of Table 1). Because pilot project participants were interested in prioritizing HUC12s with lower historic investment, values of these indicators were inverted for the screenings. Instructions for how to invert indicator data are provided in Appendix A.

## Other Considerations for Indicator Selection

RPS Tools are pre-loaded with hundreds of indicators for HUC12 subwatersheds. While the wide variety of indicators provides flexibility for users with different screening objectives, identifying relevant indicators for a screening can be challenging. In addition to the concepts described in previous sections, the following strategies can be used to help select indicators.

- *Review data sources.* As potential indicators are identified, readers are encouraged to review the data sources for pre-loaded indicators on the “Indicator\_Info” tab of the RPS Tool to understand data characteristics, such as the time period represented by the data, the spatial scale or resolution, or any data gaps and limitations.

Readers may be aware of additional data sources which may be more complete, up-to-date, or higher resolution compared to pre-loaded indicators in the RPS Tool. In these cases, analysis can be completed to calculate new indicators from the datasets and the indicators can be added to the tool using steps described in the [RPS Tool user guide](#) and the [Adding Your Own Indicator Data](#) instructional video.

- *Consider indicator correlation.* Correlation is a measure of the similarity between two indicators. Highly correlated indicators may introduce redundancy and bias to RPS results. RPS users can consider correlation when choosing between two or more indicators to include in a screening. When the correlation statistics (e.g. coefficient of determination, or R squared) displayed on the correlation tab of the data exploration menu are very high, users may choose to only use one indicator for the screening in order to streamline indicator selections and reduce redundancy.

Indicator correlation can be reviewed using the “Explore Indicator Data” feature of the RPS Tool using steps described in the [RPS Tool user guide](#) and [Exploring RPS Indicator Statistics](#) instructional video.

- *Evaluate the range of indicator values.* If the difference between the minimum and maximum values of an indicator is very small, then all HUC12s have similar values and the indicator may not be helpful for distinguishing priority subwatersheds. A threshold for describing the data range as “too small” for meaningful comparisons will depend on the specific indicator. Indicator ranges can be checked using the “Explore Indicator Data” feature of the RPS Tool.
- *Evaluate the number of blank/missing values.* When indicator data are not available for a HUC12, the RPS Tool stores a blank cell for the HUC12 in the indicator data table. If the proportion of HUC12s with blank values of an indicator is high, users may elect to remove the indicator from the screening and find indicators with better coverage. The number of blank values is reported in the “Explore Indicator Data” feature of the RPS Tool.
- *Check for outliers.* Outlier HUC12s have very different values of an indicator compared to the rest of the group. Outliers can skew RPS results. For example, a single stressor indicator with extreme values in a few HUC12s may skew the Stressor Index. As a result, HUC12s with high (but not extreme) stressor indicator values be misinterpreted as having minimal stressor presence. Outliers can be identified using the “Explore Indicator Data” feature of the RPS Tool. Look for outliers in histograms by reviewing the low and high ends of the chart to determine if extreme values are present.

## 4.2. Interpreting Results

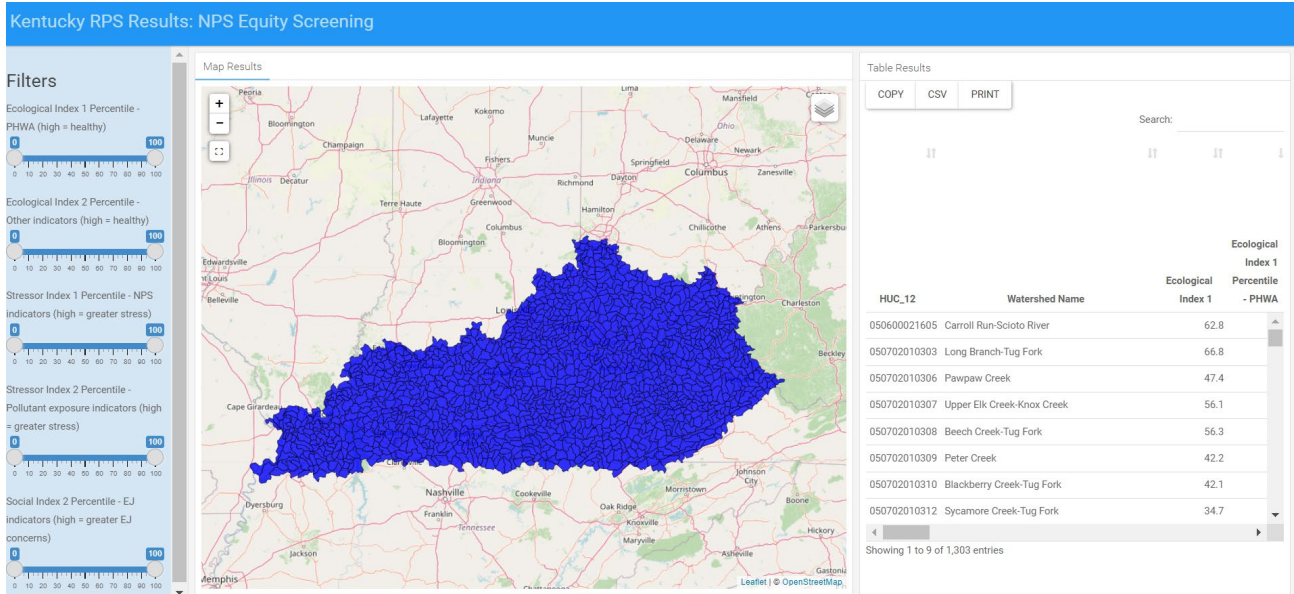
The results of pilot project screenings consisted of Ecological, Stressor, and Social Index scores for all HUC12 subwatersheds in each state. The scores combine indicators from each category into values that range from 0 to 1. In general, higher Ecological Index scores correspond to healthier watersheds and aquatic ecosystems, higher Stressor Index scores correspond to greater presence and extent of pollution sources or other threats to the health and resilience of aquatic ecosystems and people, and higher Social Index scores correspond to greater presence of community, regulatory, economic, and/or behavioral characteristics that are favored for prioritization. When reviewing index scores, it is essential to remember that the results will reflect only those indicators used in the screening. For example, if a screening only included stressor indicators related to urban development, the Stressor Index would not reflect any potential degradation from other sources such as agriculture or mining.

The Ecological Index, Stressor Index, and Social Index scores are intended to help identify HUC12 subwatersheds which have preferred traits for prioritization. Readers may choose to prioritize any combination of high or low scoring HUC12s depending on the screening objective and program preferences. Pilot project states focused on identifying and evaluating HUC12s with high Stressor Index scores and high Social Index scores (i.e., HUC12s which experience NPS issues and also contain potentially disadvantaged and overburdened communities). Ecological Index scores were used in the pilot projects to further refine priorities by identifying HUC12s that also had low Ecological Index scores (i.e., HUC12s with degraded aquatic ecosystems and watershed functions) or to provide additional context for HUC12s with high Stressor Index and Social Index scores.

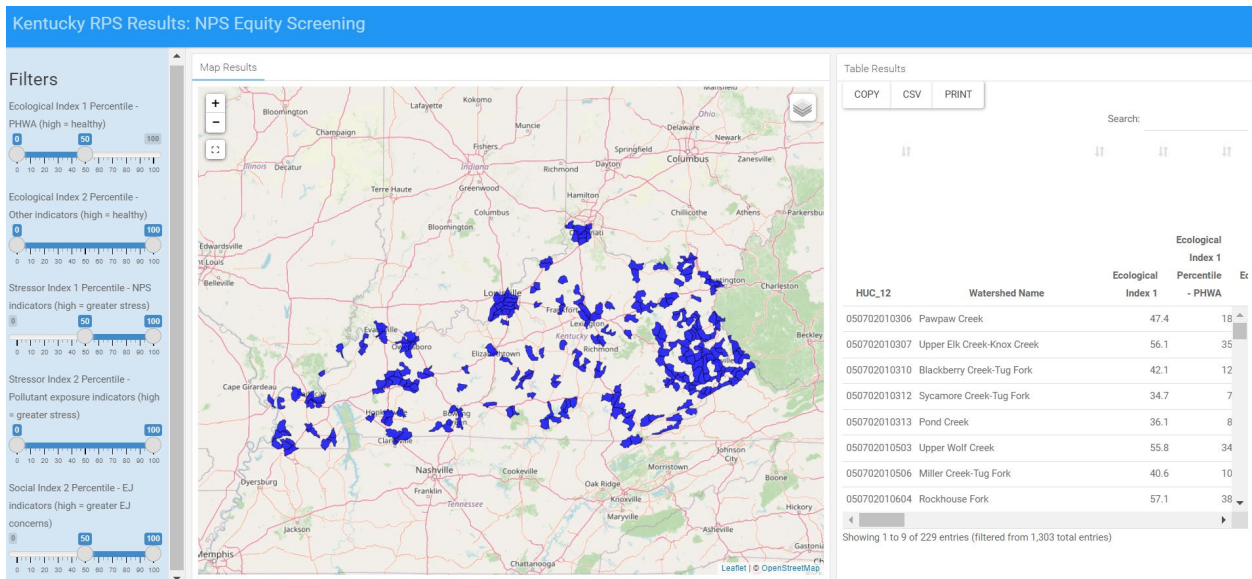
During the pilot projects, several additional state and federal tools and datasets were identified by project participants that could be combined with screening results to further refine priority HUC12 selections and determine suitable next steps in the selected HUC12s. For example, a map layer of candidate priority HUC12s from the RPS Tool could be uploaded to the EPA [EJScreen mapping tool](#) to evaluate additional pollution burdens faced by the communities in each HUC12 and further refine priorities. Readers can consider other tools and datasets that may be relevant to NPS pollution, equity, and environmental justice when applying the results of an RPS Tool screening.

The following screenshots show a custom data viewer developed for the pilot project conducted in the state of Kentucky. This interactive tool allows the user to set desired index score thresholds for each indicator type (based on the individual indicators selected for the RPS screening):





In the following example, the sliding scales on the lefthand side are used to identify watersheds with a 50% or lower ecological index score, a 50% or greater stressor index score, and a 50% or greater social index score. In this scenario, the watersheds identified and displayed below are likely to have lower quality ecological conditions, a higher risk of NPS stressors within the watershed, and a greater likelihood of covering communities with EJ concerns. *Please note, the purpose of this example is to demonstrate how pilot project results could be displayed and interpreted and does not reflect preferences or index score thresholds being used by Kentucky’s NPS program.*



## 5. Conclusions

This document provides state NPS programs with information on how the RPS Tool can be applied to support the integration of equity and environmental justice into NPS management planning. Additional resources for readers interested in using the RPS Tool are available on the [RPS Training and User Support](#) page and readers can contact the EPA NPS Program with questions about the contents of this

report or the EPA Healthy Watersheds Program ([HWP\\_Team@epa.gov](mailto:HWP_Team@epa.gov)) with questions about the RPS Tool.

**NPS Program Contacts:**

Ellie Flaherty ([flaherty.ellie@epa.gov](mailto:flaherty.ellie@epa.gov))

Cyd Curtis ([curtis.cynthia@epa.gov](mailto:curtis.cynthia@epa.gov))

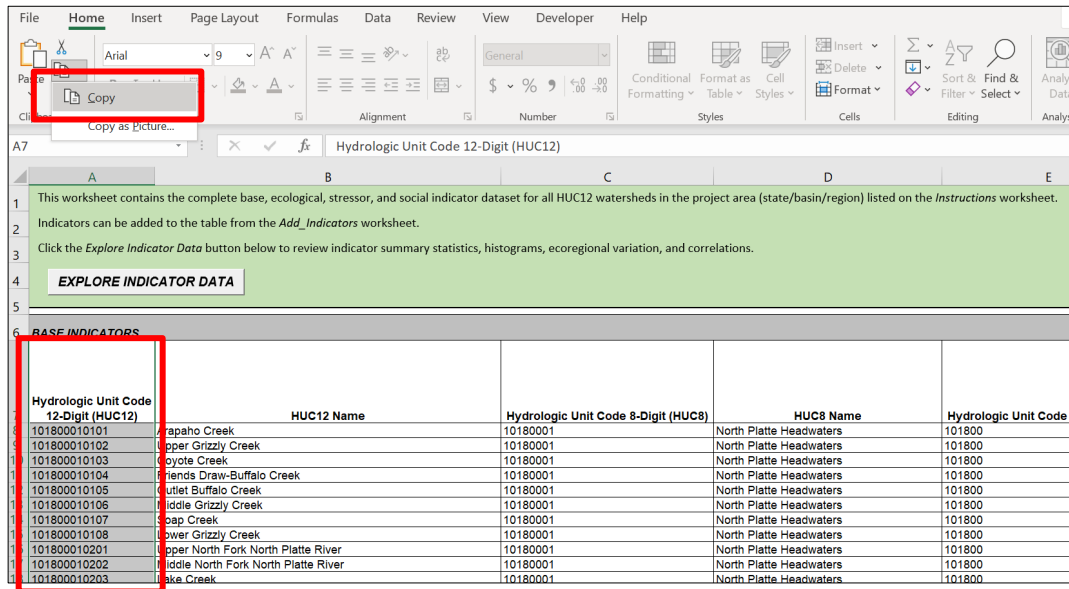
**Appendix A – Inverting Indicator Data**

This appendix contains instructions on how to invert the values of existing indicators in the RPS Tool. Indicator data must be inverted when smaller values of the indicator are preferred for priority-setting. For example, in the pilot projects described in this document, participants expressed interest in prioritizing HUC12s with fewer assessed waters. Values of the “Assessed Waters, % of HUC12” indicator were therefore inverted so that fewer assessed waters contributed to higher Social Index scores.

1. Open the RPS Tool file for your state and a second new Excel spreadsheet file.
2. Go to the *HUC12\_Data* sheet.



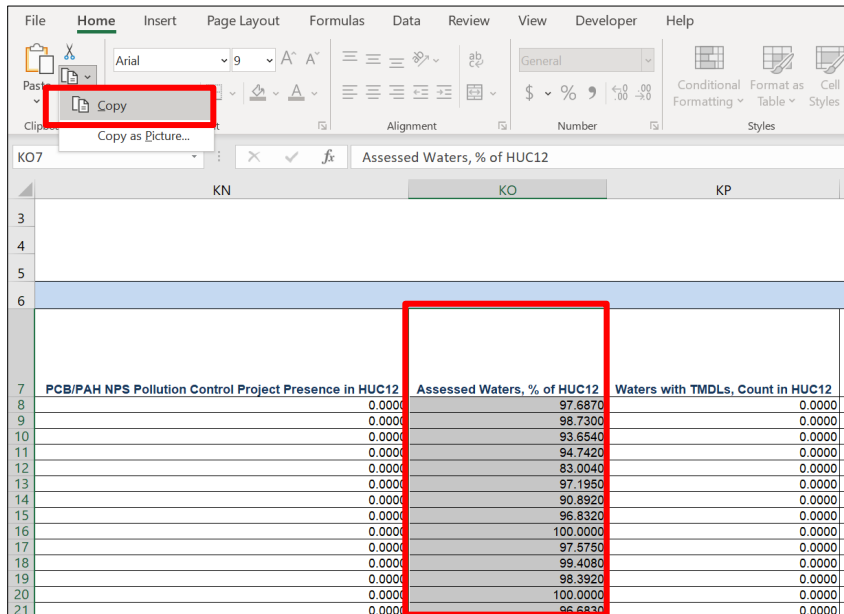
3. Select and copy HUC12 IDs from column A.



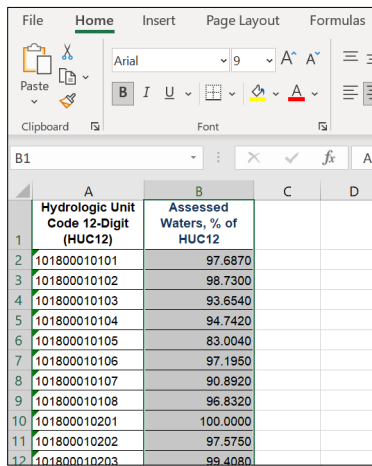
4. Open the new Excel spreadsheet and paste the HUC12 IDs into column A.

File Home Insert Page Layout Formulas				
Clipboard Font				
A1				
A	B	C	D	E
Hydrologic Unit Code 12-Digit (HUC12)				
1				
2	101800010101			
3	101800010102			
4	101800010103			
5	101800010104			
6	101800010105			
7	101800010106			
8	101800010107			
9	101800010108			
10	101800010201			
11	101800010202			
12	101800010203			

- Go to the *HUC12\_Data* sheet and find the column containing the indicator of interest. Select and copy the indicator values.

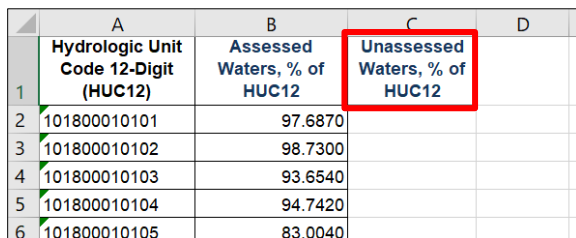


- Open the new Excel spreadsheet and paste the indicator values into column B.



- In the new Excel spreadsheet, enter a name for the inverted indicator into cell C1.

- For example, an inverted version of “Assessed Waters, % of HUC12” could be “Unassessed Waters, % of HUC12” or “Inverted Assessed Waters, % of HUC12”.



8. In the new Excel spreadsheet, calculate the inverted indicator values in column C.
  - Inverted values can be calculated using a variety of different methods.
  - For indicators that are expressed as percentages, inverted values can be calculated as:  $(100 - \text{Indicator Value})$ .
  - For other indicators, inverted values can be calculated as:  $(\text{Maximum} - \text{Indicator Value})$  or  $(1 / \text{Indicator Value})$ .

	A	B	C	D	E	F
	Hydrologic Unit Code 12-Digit (HUC12)	Assessed Waters, % of HUC12	Unassessed Waters, % of HUC12			
1						
2	101800010101	97.6870	=100-B2			
3	101800010102	98.7300	1.2700			
4	101800010103	93.6540	6.3460			
5	101800010104	94.7420	5.2580			
6	101800010105	83.0040	16.9960			
7	101800010106	97.1950	2.8050			
8	101800010107	90.8920	9.1080			
9	101800010108	96.8320	3.1680			
10	101800010201	100.0000	0.0000			
11	101800010202	97.5750	2.4250			

9. Use the *Add\_Indicators* sheet to add the inverted values into the RPS Tool file as a new indicator.
  - Instructions are provided on the *Add\_Indicators* sheet and in the [RPS Tool User Guide](#) and [instructional video](#).

