Preliminary Healthy Watersheds Assessments (PHWA)

helping states better protect high quality waters

Healthy Watersheds Program Team

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What is the PHWA?

- Statewide healthy watersheds assessments for lower 48 states
- Health and vulnerability index scores for all HUC12 watersheds (avg size 36 sq mi)
- Each HUC12 is separately scored \textit{relative} to all HUC12s statewide and ecoregion-wide
Why was the PHWA done?

• The PHWA was designed to:
  – Help states implement Clean Water Act goal of maintaining high quality waters as well as restoring impaired waters
  – Provide a foundation of nationally consistent data that can be built on and enhanced
  – Help states and EPA communicate with partners about opportunities for healthy waters protection
Who are the intended users?

- States, tribes and other government/non-government entities engaged in watershed protection
- Broader audiences may include planners, fish and wildlife managers, large-scale projects seeking to avoid impacting beneficial environments, counties and local communities
Healthy Watersheds Assessment Framework

identify essential ecological attributes that support healthy ecosystems

**Landscape Condition**
Patterns of natural land cover, natural disturbance regimes, lateral and longitudinal connectivity of the aquatic environment, and continuity of landscape processes.

**Geomorphology**
Stream channels with natural geomorphic dynamics.

**Habitat**
Aquatic, wetland, riparian, floodplain, lake, and shoreline habitat. Hydrologic connectivity.

**Water Quality**
Chemical and physical characteristics of water.

**PO₄³⁻**

**Hydrology**
Hydrologic regime: Quantity and timing of flow or water level fluctuation. Highly dependent on the natural flow (disturbance) regime and hydrologic connectivity, including surface-ground water interactions.

**Biological Condition**
Biological community diversity, composition, relative abundance, trophic structure, condition, and sensitive species.

*Figure 1.* Six attributes of watershed health described in *Identifying and Protecting Healthy Watersheds: Concepts, Assessments, and Management Approaches* (USEPA 2012). Measurement of watershed indicators related to each attribute (i.e., “sub-index”) provides the basis for the Watershed Health Index score.
# Watershed Health Index

## Landscape Condition
- % Natural Land Cover (Ws)
- % Natural Land Cover (HAZ)
- Population Density (Ws)
- Population Density (RZ)
- Mining Density (Ws)

## Hydrology
- % Ag. on Hydric Soils (Ws)
- Dam Storage Ratio (Ws)
- % Forest Remaining (Ws)
- % Wetlands Remaining (Ws)
- % Impervious Cover (Ws)
- Road Stream Crossing Density (Ws)

## Geomorphology
- Dam Density (Ws)
- % Ditch Drainage (Ws)
- Road Density (RZ)
- % High-Intensity Land Cover (RZ)

## Habitat
- NFHP Habitat Condition Index Local Watershed

## Biological Condition
- Mean Probability of Good Biological Condition (Ws)
- Biological Condition at Watershed Outlet

## Water Quality
- Difference Between % Assessed HUC12 Streamlength Supporting vs. Impaired
- Difference Between % Assessed HUC12 Waterbody area Supporting vs. Impaired

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**Legend:**
- **Metric score**
- **Sub-Index score** (avg. of normalized metric scores)
- **Index score** (avg. of sub-index scores)

Watershed (Ws)
Riparian Zone (RZ)
Hydrologically Active Zone (HAZ)
Watershed Vulnerability Index

- **Land Use Change**
  - % Human Use Change (Ws) (2001-2011)
  - % Human Use Change (RZ) (2001-2011)
  - Projected Change in Impervious Cover (Ws) (2010-2050)
  - % Protected Lands (Ws)

- **Water Use**
  - Agricultural Water Use (Ws)
  - Domestic Water Use (Ws)
  - Industrial Water Use (Ws)

- **Wildfire**
  - Mean Wildfire Risk (Ws)
  - % High or Very High Wildfire Risk (Ws)

*Legend:
- ▫ = Metric score
- ▪ = Sub-Index score (avg. of normalized metric scores)
- ▼ = Index score (avg. of sub-index scores)

Watershed (Ws)
Riparian Zone (RZ)
Hydrologically Active Zone (HAZ)
Caveats

- Does not specify healthy/unhealthy threshold
- Does not compare HUC12s at national scale
- Scores represent the single HUC not its full watershed (i.e., upstream HUCs)
- All indicators were weighted equally
- Based on datasets nationally available in 2016
- In Vulnerability index, current land and water use serve as surrogates for future use
Statewide vs. Ecoregional Scoring
West Virginia: PHWA Statewide Health Index
darkest blue = highest statewide health scores
West Virginia intersects four Level III ecoregions

Darkest blue = highest ecoregional health scores (multi-state)
STATEWIDE VS. ECOREGIONAL SCORING:
WHY DO BOTH?

- Provides two alternate viewpoints on health
- ST and ER high-scorers sometimes differ a lot
- ST more relevant for supporting state-based actions and decisions
- ER means more ecologically as within-ER HUCs are more similar to begin with
Main Products

1. Geodatabase
2. Overview Document
3. Excel Watershed Data File
Watershed (HUC12) health and vulnerability scores for all watersheds in each lower 48 state and each Level 3 ecoregion.
File Geodatabase

• State-specific ArcGIS file geodatabase enables
  – Easier integration of PHWA results with other state datasets
  – Further modification of state-specific index calculation and data sources

• Each state geodatabase includes
  – State, HUC12, and instate ecoregional boundaries
  – Values from all indicators, sub-indices, and indices
Colorado's Preliminary Healthy Watersheds Assessment (PHWA) evaluated the relative watershed health and vulnerability of Colorado's 2,983 12-digit hydrologic unit code (HUC12) watersheds. Watersheds were assessed at both the statewide and ecoregional scale, resulting in paired Watershed Health and Watershed Vulnerability scores per HUC12 watershed (i.e., one set of statewide scores and one set of ecoregional scores per watershed). Together, these scores provide insight on a watershed's condition relative to others within the state, as well as those watersheds sharing similar ecological characteristics across the ecoregion.

Statewide and ecoregional index scores are presented below as both raw scores (“Score”, between 0 and 1) and percentiles (0 to 100%). The “Top 10%” and “Top 25%” columns denote watersheds scoring in the top percentiles of watershed health, both within the state and their ecoregion.

**Blue-highlighted** watershed names indicate those scoring in the Top 25% of watershed health both within the state and their ecoregion. Among these Top 25% “healthiest” watersheds, **yellow-highlighted** watershed names indicate those that also have an elevated (> 75th percentile) statewide vulnerability score. This information helps distinguish between healthy watersheds and healthy watersheds most at risk to degradation.

Please note that the full PHWA dataset, including indicator and sub-index scores that comprise each overall index, is available in other worksheets of this file.

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### PHWA Watershed Index Summary

<table>
<thead>
<tr>
<th>Watershed Name</th>
<th>HUC12</th>
<th>ECOREGION</th>
<th>STATE</th>
<th>STATEWIDE Score</th>
<th>Statewide Percentile</th>
<th>ECOREGONAL Score</th>
<th>Ecoregional Percentile</th>
<th>Top Scoring Watersheds</th>
<th>Top 10%</th>
<th>Top 25%</th>
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<td>Bronco Canyon-Purgatorie River</td>
<td>1102000101604</td>
<td>26 CO</td>
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<td>No</td>
<td>0.13</td>
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</tbody>
</table>

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**Figure:** Colorado includes parts of six Omeron Level III ecoregions.
Potential Uses

• Support state actions to prioritize, protect and maintain high quality waters
• Raise awareness of where the healthiest watersheds occur
• Raise awareness that healthy watersheds are sometimes highly vulnerable
• Improve communication and coordination by providing nationally-consistent data on watershed health and vulnerability
• Help promote high quality waters protection within other landscape management efforts
• Provide an initial dataset upon which others can build better watershed condition information
Comparing Connecticut’s HUC12s: PHWA Health Index (left) and State 303(d) Vision Priorities (below)

- HUC12 priority for protection
- HUC12 priority for restoration

Darker blue = higher health score
For more information about EPA’s Healthy Watersheds Program, including information about the PHWA and other ongoing projects, please visit: https://www.epa.gov/hwp/

QUESTIONS?
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