Planning and Assessment Tools for Watershed Studies

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Steve Ashby, PhD (https://swwrp.usace.army.mil)
Watershed Boundaries

CE District Boundaries

USGS Hydrologic Units

EPA Ecoregions

Political Boundaries
Watershed Activities
Watershed Characteristics

Essential Ecological Attributes
*EPA SAB, 2002*

1. Landscape condition
2. Biotic condition
3. Chemical and physical char.

4. Ecological Processes
5. Hydrology and morphology
6. Natural disturbance regimes

Aquatic Ecosystem Drivers
*ESA Report, 2002*

* Biotic assemblage
Sediment and organic inputs
Chemical and nutrient inputs
Biotic assemblage
Flow regime
*
Geospatial Tools

Multi-Scale Assessment of Watershed Integrity (MAWI)

MAWI – POC Dan Smith (Ronald.D.Smith@usace.army.mil)
Indicator Scores and Indices

Indicator metric values were converted to a score based on an ordinal scale relationship between indicators and assessment endpoints established using field observation and judgment.

Selected indicator scores were summed to give hydrologic, water quality and habitat integrity indices.

<table>
<thead>
<tr>
<th>Indicator Metric Value Range</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5% of main stem channel disconnected from the floodplain</td>
<td>5</td>
</tr>
<tr>
<td>&gt;5 and &lt;15% of main stem channel disconnected from the floodplain</td>
<td>4</td>
</tr>
<tr>
<td>&gt;15 and &lt;30% of main stem channel disconnected from the floodplain</td>
<td>3</td>
</tr>
<tr>
<td>&gt;30 and &lt;50% of main stem channel disconnected from the floodplain</td>
<td>2</td>
</tr>
<tr>
<td>&gt;50% of main stem channel disconnected from the floodplain</td>
<td>1</td>
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</tbody>
</table>
Indexed-Based Habitat Tools

Habitat Evaluation and Assessment Tools (HEAT)

HEAT – POC Kelly Burks-Copes (Kelly.A.Burks-Copes@usace.army.mil)
Runoff and Loading
Runoff Modeling – Hydrology, Nutrients, Sediment

Hydrologic Modeling System (HEC-HMS)  Gridded Surface Subsurface Hydrologic Analysis (GSSHA)

HMS – POC Bill Scharffenberg (William.A.Scharffenberg@usace.army.mil)
GSSHA – POC Chuck Downer (Charles.W.Downer@usace.army.mil)
Vegetation and Hydrology Interactions Modeling

Ecologic Dynamics Simulation (EDYS)

Ecologic Dynamics Simulation Lite (EDYS-L)

EDYS - POC David Price (David.L.Price@usace.army.mil)
Loading and Ecological Response Modeling
Reservoir Water Quality Modeling

Trophic Assessment Screening Tool for Reservoirs (TASTR)

Reservoir Simulation with 2D Water Quality Model (ResSim/W2)

Dottie Tillman, ERDC-EL
Chan Modini, HEC
Scott Wells, Portland State University

TASTR – POC Dave Soballe (David.M.Soballe@usace.army.mil)
ResSim/W2 – POC Dottie Tillman (Dorothy.H.Tillman@usace.army.mil)
Coupled Runoff and Reservoir Modeling

GSSHA

CE-QUAL-W2
Assess and compare risks

Identify Mission Impacts

Mitigate Problems

Conduct Trend Analyses

Project Future Changes

LEAM – Land use and Evolution impact Assessment Model
Summary

- Understand/define problems/objectives
- Use appropriate tools for assessments
- Involve stakeholders and decision-makers

- Risk Models
  - TrophicTrace
  - WEAP

- Environmental Models
  - Ecological models
  - Hydrodynamic Models
  - Water Quality Models

- Decision Analysis Tools
  - Criterium DecisionPlus
  - ExpertChoice
  - DecisionLab

Figure adapted from Todd Bridges