

# Environmental Protection Agency (EPA) Chesapeake Bay Program (CBP) Goal Implementation Team (GIT) Funding Program



The Chesapeake Bay Trust has been designated to receive federal funds from the U.S. EPA as part of the CBP GIT Funding Program. The work funded by this initiative advances outcomes identified in the 2014 Chesapeake Bay Watershed Agreement. Each year, certain outcomes are chosen by the CBP as top priorities to address, and these stretch across all GITs and workgroups.

**Project Title:**  
GIT #12 Stream Health Indicators  
Project: Recommendations for  
Developing Hydromorphology  
Indicators with GIS Data

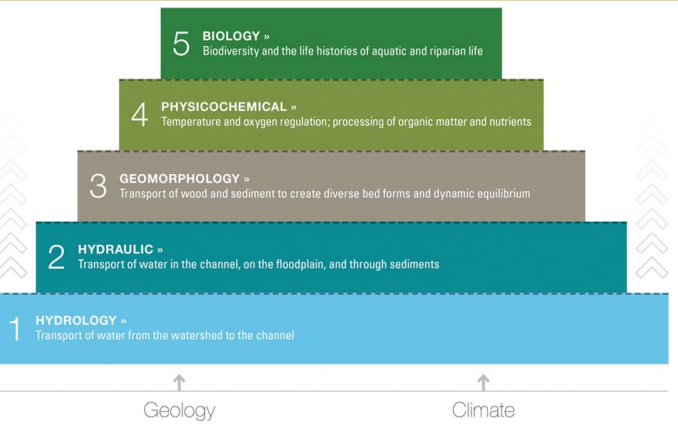
**Organizations:**  
Tetra Tech  
Ecosystem Planning & Restoration

**GIT Supported:**  
Stream Health Work Group  
(SHWG)

**Project Summary/ Context:** This project is a continuation of work developed by the CBP SHWG and USGS to better understand the drivers and stressors affecting stream health throughout the Chesapeake Bay watershed. Our recommendation is to develop a Desktop Hydromorphology Assessment Tool with GIS data using a holistic and multi-scale approach to produce indicator(s) of hydromorphology (hydraulics and geomorphology) associated with stream health. We recommend that a desktop hydromorphology assessment tool be developed following a multi-metric stream health indicator framework that includes metrics within each of six spatial scales embodied in the European REFORM approach and the three lower functional levels within the Stream Functions Pyramid.

**Method:**  
This project conducted interviews with experts, reviewed data, created a framework, provided a data inventory matrix, and made recommendations to help develop multi-metric stream health indicators for hydraulics and geomorphology.

**Results:**  
The table on the following page summarizes the indicators, metrics, and data sources identified to support the desktop hydromorphology assessment tool.



Spatial Dimension	Metric	Measurement Method	Data Source
Large Catchment and Landscape Unit (Pyramid Level 1)	Impervious Cover (IC)	Percent IC	Existing GIS IC data layer
	Runoff	Flashiness	Existing GIS land use / land cover (LULC) and IC data layers; Flow Alteration Metrics (Maloney et al. 2021)
	Sediment Production	Sediment Load	Existing GIS LULC, IC, soils, and riparian vegetation data layers and flow regime analysis results; Gridded Soil Survey Geographic Database (gSSURGO) and Parameter-elevation Regressions on Independent Slopes Model (USGS under development)
River Segment (Pyramid Level 2)	Valley Type/ Confinement*	Anthropogenic Confinement	Floodplain and Channel Evaluation Tool (FACET) and valley type based on landscape position; Hyper-Resolution Terrain-based Hydrography Mapping (CIC and UMBC under development)
	Sediment Transport	Degrading or Aggrading	FACET and floodplain connectivity and channel dimension analysis results; Multi-jurisdictional Rapid Habitat Assessment Database (USGS under development); Gridded Soil Survey Geographic Database (gSSURGO) and Parameter-elevation Regressions on Independent Slopes Model (USGS under development)
Reach (Pyramid Levels 2 & 3)	Floodplain Connectivity*	Bank Height Ratio (BHR)	FACET and bankfull channel dimensions regional curves
		Entrenchment Ration (ER)	Hyper-Resolution Terrain-based Hydrography Mapping (CIC and UMBC under development); Stream and Floodplain Geometry Mapping (USGS in revision)
	Stream Energy	Stream Power	FACET and stream power equation; Stream and Floodplain Geometry Mapping (USGS in revision)
	Channel Dimension	Width/Depth (W/D) Ratio	FACET and bankfull channel dimensions regional curves
	Riparian Vegetation*	Width and Type	Existing GIS data layer(s)
	Planform	Sinuosity/Meander Pattern based on Valley Type	FACET and potential stream planform based on valley type; Multi-jurisdictional Rapid Habitat Assessment Database (USGS under development); Hyper-Resolution Terrain-based Hydrography Mapping (UMBC under development); Stream and Floodplain Geometry Mapping (USGS in revision)
Meander Width Ratio (C and E Stream Types)		FACET and potential stream planform based on valley type; Hyper-Resolution Terrain-based Hydrography Mapping (CIC and UMBC under development)	
Geomorphic and Hydraulic Unit (Pyramid Levels 2 & 3)	Bedform Stability*	Channel Slope	Existing GIS data layer(s)
		Erodible Soils	Existing GIS data layer(s)
		Percent IC	Existing GIS data layer(s)
	Lateral Stability*	Bank Erosion Rate	Multi-jurisdictional Rapid Habitat Assessment Database (USGS under development); Gridded Soil Survey Geographic Database (gSSURGO) and Parameter-elevation Regressions on Independent Slopes Model (USGS under development); Stream and Floodplain Geometry Mapping (USGS in revision)
		Riparian Width	Existing GIS data layer(s)
	Bedform and Habitat Features*	Bed Habitat (embeddedness, riffle frequency velocity/depth combination)	USGS identified 12 rapid habitat metrics and 2 PCA-derived summary metrics (representing bed and bank/riparian elements) with potential for describing habitat quality. Because these rapid habitat data are field assessments at specific sites, Bay-wide coverage would require modeling unsampled streams, as is done for the Chessie BIBI.
Bank/Riparian Habitat (riparian condition score, bank stability, bank vegetation, sediment deposition)		USGS identified 12 rapid habitat metrics and 2 PCA-derived summary metrics (representing bed and bank/riparian elements) with potential for describing habitat quality. Because these rapid habitat data are field assessments at specific sites, Bay-wide coverage would require modeling unsampled streams, as is done for the Chessie BIBI. Field measurements of vegetation strata, percent cover, native species, and microtopography would also be valuable if available.	

\* Indicates priority metrics