Starter text (JS; 7/14/2023)

Opening

Welcome to the Macroinvertebrate Multi-Metric Index (MMI) Calculator for Wadeable Streams in Kansas! This app was developed by Ben Block (Ben.Block@tetratech.com), with underlying R code written by Ben Block, Diane Allen (Diane.Allen@tetratech.com), and Erik W. Leppo (Erik.Leppo@tetratech.com). Please contact Tony Stahl ([Anthony.Stahl@ks.gov](mailto:Anthony.Stahl@ks.gov)) and Elizabeth Smith ([Elizabeth.Smith@ks.gov](mailto:Elizabeth.Smith@ks.gov)) should any issues or questions arise.

Background

This R Shiny application calculates numeric MMI scores based on samples collected from wadeable streams in Kansas (statewide). Five metrics are adjusted by 12-16 different factors (see Metric Adjustment Download Tab) that represent natural stream types. A report detailing the development of the Kansas macroinvertebrate MMI can be found here.

Funding

Development of the KS MMI calculator was funded by the Kansas Department of Health and Environment (KDHE). It utilizes R packages that were developed with funding from the United States Environmental Protection Agency (EPA) Office of Office of Science and Technology (OST) Biocriteria Program and the Office of Research and Development (ORD) Center for Public Health and Environmental Assessment (CPHEA) program.

## Intended application

The KS MMI is intended to be applied to samples that meet the following criteria:

* Geographic area: Kansas
* Stream type: freshwater, wadeable
* Subsample size: 200-count samples are recommended for best performance; once you get below 100, interpret with caution
* Taxonomic resolution: genus or species-level as allowed by available keys, specimen condition, and specimen maturity
* Collection gear: 500-µm mesh D-frame net and fine point forceps
* Collection period: April 15–October 15
* Collection method: KDHE Stream Probabilistic (SP) program or Stream Biological (SB) Monitoring Program protocols. Organisms are composited from multiple habitats. Field staff try to maximize the diversity of organisms being captured, targeting macrohabitats (riffles, leafpacks, undercut banks and rootmats, fine substrate, aquatic vegetation, and large woody debris). One or two-person field crews collect organisms with 500-µm mesh D-frame nets, using sweeps or kicks, or by hand picking organisms off large hard substrates. Organisms are picked in the field and identified in the lab, going to genus or species-level as allowed by available keys, specimen condition, and specimen maturity.

## Input metrics and scoring formulae

Table 1. Metrics and scoring formulae for the KS Macroinvertebrate MMI. DE = discrimination efficiency, Trend = metric response to stress, 5th = 5th percentile of metric values, and 95th = 95th percentile of metric values. All metrics were adjusted by random forest models (RF adj).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Metric Name** | **Metric Abbreviation** | **Metric DE (Trend)** | **Scoring Formula** | **5th** | **95th** | **Metric Category** |
| Number of EPT taxa (RF adj) | nt\_EPT\_Rfadj | 70 (DEC) |  |  |  | Composition |
| Percent sensitive taxa (BCG attribute III+IV better) (RF adj) | pt\_BCG\_att1i234b\_Rfadj | 77 (DEC) |  |  |  | Tolerance |
| Hilsenhoff Biotic Index (HBI) (RF adj) | x\_HBI\_RFadj | 68 (INC) |  |  |  | Tolerance |
| Number of climber + clinger taxa (RF adj) | nt\_habit\_climbcling\_Rfadj | 70 (DEC) |  |  |  | Habit |
| Number of semivoltine taxa (RF adj) | nt\_volt\_semi\_Rfadj | 66 (DEC) |  |  |  | Life cycle |

Who to contact if you have problems, comments or questions

If you encounter problems with the Shiny app and/or have suggestions on ways to further improve it, please contact Ben Block from Tetra Tech via email (Ben.Block@tetratech.com) or via a post on the [BCGcalc GitHub Discussions page](https://github.com/leppott/BCGcalc/discussions" \t "_blank).

For more information on this project, please contact Tony Stahl (Anthony.Stahl@ks.gov).