



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
MISSISSIPPI VALLEY DIVISION, CORPS OF ENGINEERS
P.O. BOX 80
VICKSBURG, MISSISSIPPI 39181-0080

CEMVD-PD-N

7 February 2014

MEMORANDUM FOR CECW-NAD (Luisa)

SUBJECT: Recommendation for Regional Approval of the High Gradient Macroinvertebrate Index and New Jersey Modified Fish Index of Biological Integrity

1. References:

- a. Engineering Circular 1105-2-412: Assuring Quality of Planning Models, dated 31 March 2010.
- b. US Army Corps of Engineers. Assuring Quality of Planning Models - Model Certification/Approval Process: Standard Operating Procedures. February 2012
- c. Model Documentation Package for the High Gradient Macroinvertebrate Index and New Jersey Modified Fish Index of Biological Integrity (Encl 1)

2. The National Ecosystem Restoration Planning Center of Expertise (ECO-PCX) evaluated the High Gradient Macroinvertebrate Index (HGMI) and New Jersey Modified Fish Index of Biological Integrity (New Jersey FIBI) in accordance with references 1.a. and 1.b. Based on the results of the review, the ECO-PCX recommends approval for regional use of the HGMI and NJ FIBI models for use in New Jersey. Use of the models within watersheds which extend into adjacent states should be coordinated with the ECO-PCX prior to application. These models are proposed for use in the Peckman River Flood Risk Management (FRM) Study, Passaic and Essex Counties, New Jersey. Please log in this recommendation with the Office of Water Project Review for consideration by the Model Certification Team.

3. The New Jersey FIBI and HGMI are currently employed by the New Jersey Department of Environmental Protection (NJDEP) for the purposes of assessing stream health. The FIBI was originally developed by the U.S. Environmental Protection Agency Region 2 in 1994 utilizing fish sampling data from least impaired and most impaired streams across the state. Metric selection, development, scoring, and calibration of the model were conducted following standard IBI methodologies (Karr et al. 1986¹). In 2005 the New Jersey Department of Environmental Protection Bureau of Fish and Biological Monitoring recalibrated the model to refine the metrics and increase sensitivity to anthropogenic stressors.

¹ Karr, J. R., K. D. Fausch, P. L. Angermeier, P. R. Yant, and I. J. Schlosser. 1986. Assessing biological integrity in running waters: a method and its rationale. Illinois Natural History Survey Special Publication 5, Urbana, Illinois. 28 pp.

The metrics included in the FIBI are the total number of fish species, number of benthic insectivore species, number of trout and sunfish species, number of intolerant species, proportion of tolerant individuals, proportion of individuals as generalists, proportion of individuals as insectivorous cyprinids, proportion of individuals as trout or proportion of individuals as piscivores, number of individuals in the sample, and proportion of individuals with disease or anomalies. Collectively, the metrics provide a robust representation of species richness and composition, trophic composition, and fish abundance and condition.

The HGMI has been in use in New Jersey since 1992. The premise of the index development process is that physical and chemical disturbances are reflected by changes in the benthic macroinvertebrate community. Similar to the FIBI, macroinvertebrate data from least disturbed to most disturbed streams from over 882 sites was used to identify a biological condition gradient. Meaningful biological signals of disturbance were then summarized in a multimetric index which is used to evaluate biological integrity in sites of unknown quality. Metrics for the genus level HGMI include total number of genera, percent of genera that are not insects, percent EPT individuals, number of scraper genera, Hilsenhoff Biotic Index, number of attribute 2 genera, number of attribute 3 genera.

4. The ECO-PCX reviewed the FIBI and HGMI models (Encl 1) in accordance with References 1.a. and 1.b. The general review that was conducted is appropriate for models such as this which have withstood historical informal reviews, were developed according to prescribed standards and have been thoroughly tested. The current New Jersey FIBI has been peer-reviewed, vetted, and published as state reports.
5. The FIBI and HGMI have sufficient technical quality. The IBI, whether macroinvertebrate or fish, has proven to be a reliable means of assessing the biotic integrity of streams and watersheds relative to a biological disturbance gradient. Both models operate on the premise of biological integrity, which is the ability to support and maintain a functionally balanced biological system having the full range processes expected in the natural habitat of the area. The FIBI and HGMI models adequately address the fish and benthic macroinvertebrate community components necessary to evaluate aquatic integrity.

The methods used to develop the models follow accepted and vetted protocols for collection of fish data, analysis of the data, and presentation of the final IBI scores. The metrics contained within the HGMI and FIBI models are biological, interpretable at several trophic levels, sensitive to the environmental conditions being monitored, contain acceptable response ranges, reproducible and precise within defined limits over space and time, and are only slightly variable. The reviewers found the metrics adequately addressed the community components necessary to evaluate the aquatic integrity.

Assumptions and limitations of the models are identified in the model documentation. The HGMI is limited in its ability to evaluate streams with limestone geology or drainage less

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than one or greater than 19 square miles due to inadequate testing of the metrics. The FIBI only applies to perennial streams with drainage areas greater than 5 square miles. The Peckman River FRM Study does not meet the limitation criteria.

The models are able to facilitate forecasting of the future with- and without project conditions. However, each application of the models should consider monitoring results from similar past projects, expert assistance from the resource managers, and, to the extent possible, current published scientific literature when forecasting future conditions.

6. Currently, neither model includes software to calculate IBI scores. Project teams using the models in the future should be charged with the creation of software to facilitate the calculation of IBI scores. In the meantime, the ATR team should be charged with checking the inputs and computational correctness of the application of the models.
7. The models have acceptable usability in that the scoring of metrics, development of an overall score, and output interpretation is straightforward. Data required for input is available through fish/macroinvertebrate collection surveys. Sampling methodology and definitions to facilitate application consistency is included in the model documentation. Outputs facilitate the evaluation and comparison of alternatives within the Corps planning process.
8. In summary, the ECO-PCX finds the New Jersey Fish Index of Biotic Integrity and High Gradient Macroinvertebrate Index have sufficient technical quality, meets usability criteria, and complies with USACE policy and guidance. It is the recommendation of the ECO-PCX that the models be approved for regional use in New Jersey. Use of the models in watersheds that extend into adjacent states should be coordinated and reviewed by the ECO-PCX prior to application. Future users should consider the development and review of software to allow for easy data input and calculation of IBI scores. Please notify the ECO-PCX of the findings of the Model Certification Panel.

E-Signed by CRESWELL, JODI, K. 1231223858
VERIFIED BY THE SYSTEM WITH ADEPT
CRESWELL, JODI, K. 1231223858

Encl (1)

Jodi Creswell
Operating Director, Ecosystem Restoration
Planning Center of Expertise

CF (w/ enclosures):
CECW-PC (Coleman, Matusiak, Trulick, Ware, Bee)
CECW-CP (Kitch, Hughes)
CECW-PB (Carlson)

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CECW-NAD (Hannon, Shuman, Gomez)

CENAD-PD (Vietri, Cocchieri, Henn, Weichenberg)

CENAN-PL (Santomauro)

CENAN-PL-EW (Brighton, Rightler)

CENAN-PP (Greco)

CENAN-PP-C (Gould)

CELRH-PM-PD-F (Miller)

CELRN-PM-P (Ferguson)

CESPD-PDS-P (Thaut)

CEMVD-PD-N (Wilbanks, Lachney, Creswell)

CEMVP-PD (Richards)