

National Biological Assessment
and Criteria Workshop

Advancing State and Tribal Programs



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TALU 101

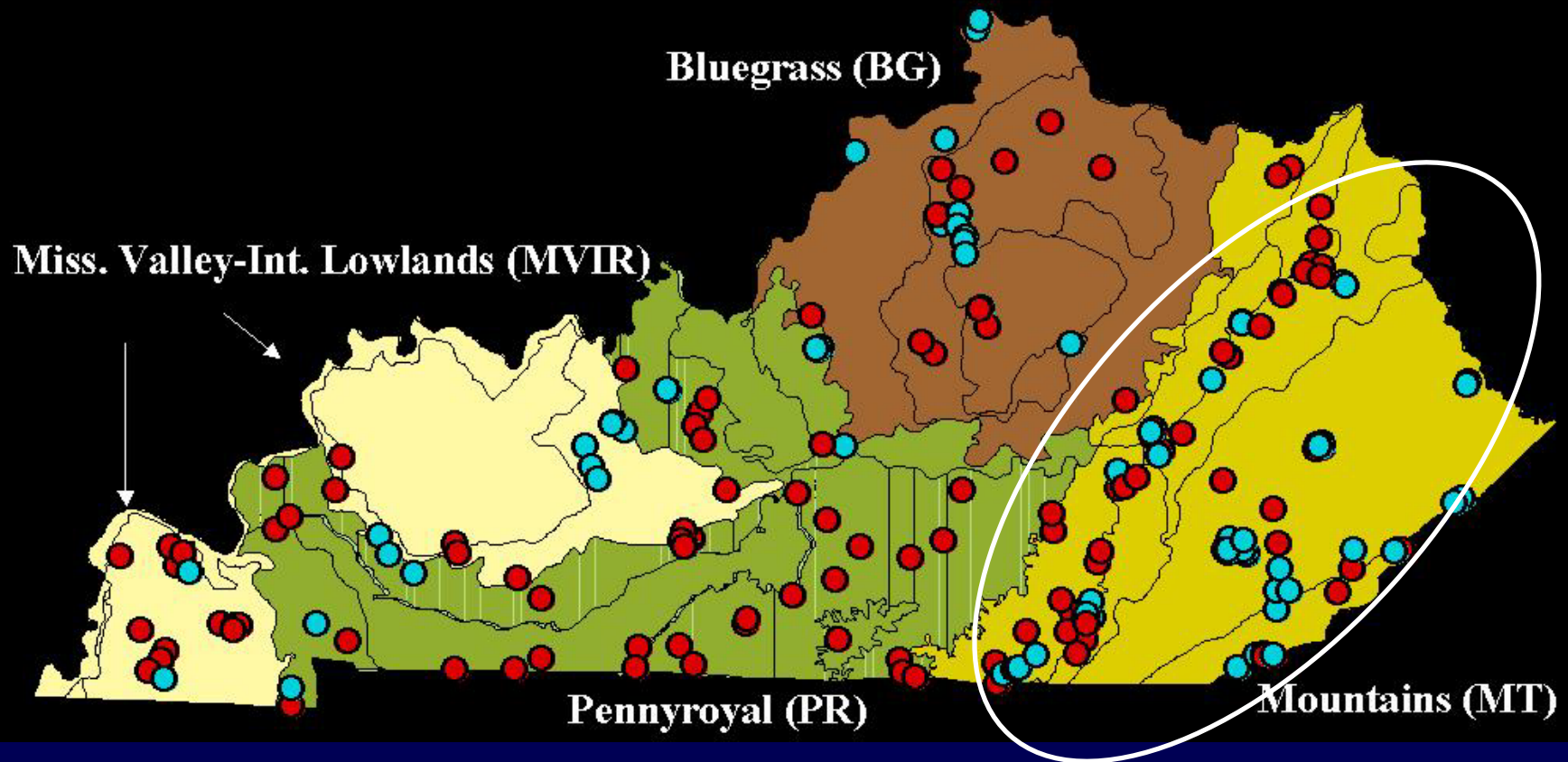
Application of the Biological Condition Gradient in Kentucky

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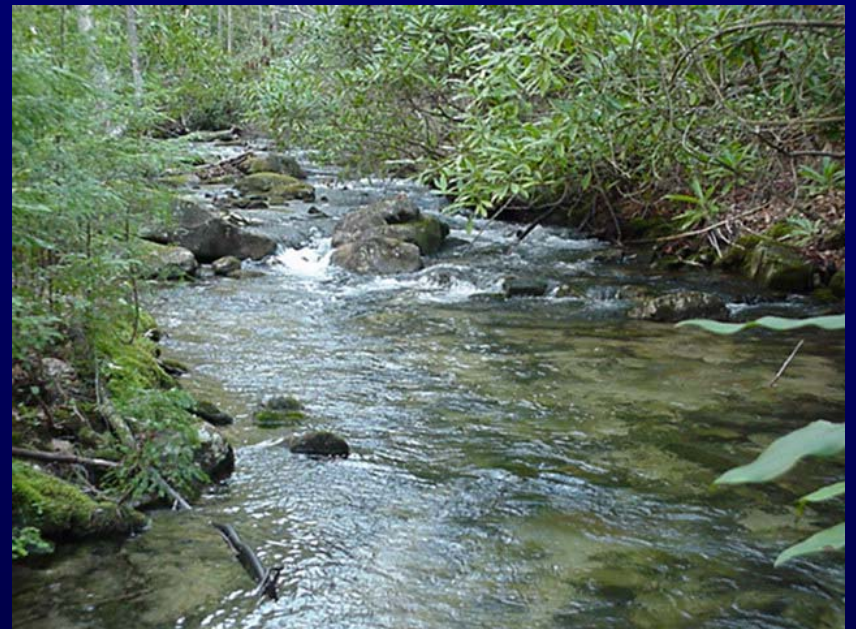
Excerpt from the KY Biological Condition Gradient Model (Modified from Maine's Example)

Resource Condition "Tiers"	Biological Condition Characteristics (Effects)
1	<p>I Historically <i>documented, sensitive, long-lived, or regionally endemic taxa</i> These taxa may be naturally absent or occur sporadically; → Fishes (may be basin and stream-size specific): regionally endemic Arrow Darter; Blackside Dace; Cumberland Johnny Darter; Barcheek Darter; → Crayfishes: sensitive, long lived <i>Cambarus parvoculus</i>; <i>C. distans</i>; in low densities.</p> <p>II Sensitive- <i>rare taxa</i> → The proportion of total richness represented by rare, specialist and vulnerable taxa is high, for example, without limitation, the following taxa are representative: Ephemeroptera: <i>Habrophlebia</i>; <i>Attenella</i>; <i>Ephemera guttulata</i>; <i>Litobranchia</i>; <i>Leucrocuta</i>; <i>Stenonema meririvulatum</i>, <i>Stenacron gildersleevi</i> and <i>carolina</i>; Odonata: <i>Lanthus</i>; Plecoptera: <i>Paracapnia</i>; <i>Paraleuctra</i>; <i>Paraneumoura</i>; <i>Ostrocerca</i>; <i>Talloperla</i>; <i>Malirekus</i>; <i>Remenus</i>; <i>Paragnetina</i>; <i>Yugus</i>; <i>Pteronarcys</i>; Trichoptera: <i>Glossosomatidae</i>; <i>Psilotreta</i>; <i>Homoplectra</i>; <i>Parapsyche</i>; <i>Goerita</i>; <i>Goera</i>; <i>Theliopsyche</i>; <i>Molanna</i>; Coleoptera: <i>Oulimnius</i>; <i>Promoresia</i>; <i>Anchytarsus</i>; Diptera: <i>Stempellina</i>; <i>Parachaetocladus</i>; <i>Heleniella</i>; Fishes: (may be basin and stream-size specific) <i>Clinostoma</i> spp; Arrow Darter; Cumberland Johnny Darter; Northern Brook Lamprey; Trout Perch.</p> <p>III Sensitive- <i>ubiquitous taxa</i> → Densities and richness of Sensitive-ubiquitous taxa are as naturally occur; usually common or abundant. → Diatoms such as <i>Cymbella delicatula</i>; <i>Cymbella silesiaca</i>; <i>Achnanthes</i> group are abundant. Overall diatom richness is relatively low. → For macroinvertebrates, the following taxa are representative of this group for eastern Kentucky: Plecoptera: <i>Acroneuria</i>; <i>Leuctra</i>; <i>Diploperla</i>; <i>Isoperla</i>; <i>Peltoperla</i>; Chloroperlidae; Ephemeroptera: <i>Cinygmula</i>; <i>Epeorus</i>; <i>Paraleptophlebia</i>; <i>Acentrella</i>; <i>Ephemerella</i>, <i>Ameletus</i>; <i>Drunella</i>; Trichoptera: <i>Dolophilodes</i>; <i>Wormaldia</i>; <i>Lepidostoma</i>; <i>Ceratopsyche slossonae</i> or <i>ventura</i>; <i>Diplectrona</i>; <i>Neophylax</i>; <i>Rhyacophila</i>; Diptera: <i>Dicranota</i>; <i>Micropsectra</i>; Fishes: Least Brook Lamprey; Emerald Darter; S. Redbelly Dace; Striped Darter; Sculpins</p>
Natural or native condition	
<i>Native structural, functional and taxonomic integrity is preserved; ecosystem function is preserved within the range of natural variability</i>	

Macroinvertebrate Reference Sites for Headwater ● and Wadeable ● Streams by Bioregion



Typical Reference Sites in the Eastern KY Coal Field Region



Example “Impaired” Sites in the Eastern KY Coal Field Region



Kentucky's Macroinvertebrate Bioassessment Index (MBI)

Taxa Richness- total # of genera

EPT Richness- total # of mayfly, stonefly, and caddisfly genera

mHBI- weighted index combines taxa abundance and tolerance

m% EPT abundance- abundance of EPT (minus Cheumatopsyche)

%Ephem- abundance of mayflies

%Chir+Olig- abundance of midges and worms

%Clingers- abundance of taxa adapted to “cling” to stable substrates

(Metrics standardized to the 95th %ile and scored on a 100-point scale)

Potential Uses for BCG in Kentucky

- Supplement bioassessment index scores (solidify assessment calls)
 - When index scores fall close to designated thresholds
 - When metrics behave erratically due to biological phenomena, (e.g., life history phenologies of particular taxa)
- In-house screening of outside agency, historical, or consultant data
 - When data collected by other methodology cannot be measured with index. BCG allows for assessment with various methods.

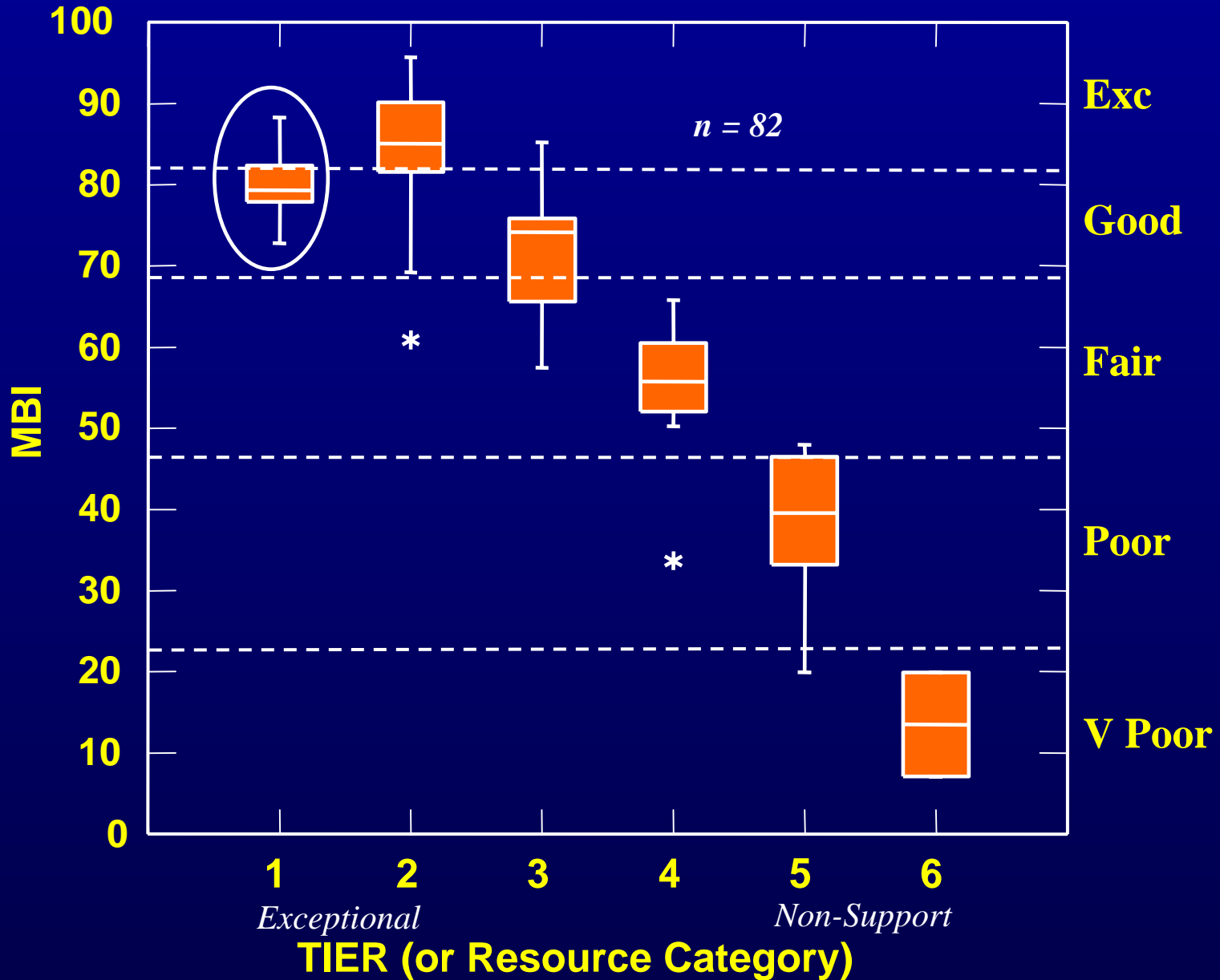
BCG uses (con't)

- Assist in determining cause-source codes
 - Taxonomic signatures give evidence of stressors (e.g., mayflies decline with elevated TDS from mining; specimens infested with filamentous bacteria (*Sphaerotilus*) indicate organic pollution, silt-tolerant taxa respond to sedimentation, etc.)
- Educate managers on biological response to pollutants
 - BCG offers narrative to convey and understand biological responses
- Prepare for expert testimony on enforcement cases
 - Narrative in BCG used as a study guide for biologists to field questions in hearings

BCG uses (con't)

- Identify “Exceptional Waters” that do not score “excellent” on Macroinvertebrate Bioassessment Index
 - 401 KAR 5:030 Section 1 requires that streams must score “Excellent” on MBI to be considered
 - Cold, oligotrophic streams with hemlock/rhododendron canopies often do not score “excellent” on the index
 - While richness metrics are often the reason for reduced index scores, the taxa found in Tier 1-2 streams are predominately *Sensitive-Rare* or *Sensitive-Ubiquitous*.
 - The BCG can identify those streams that have conditions typical of Tiers 1 and 2, but may not score “excellent” due to calibration factors

Eastern Kentucky Headwater Stream Example



Application of BCG w/ Consultant Data

- NPDES General Coal Permit
 - Requires all applicants to do baseline bioassessment to determine current conditions for antidegradation policy
 - Identify “Exceptional Waters” candidates prior to permit issuance
 - 401 KAR 5:030 Section 1 requires that streams need to score “Excellent” on MBI to be considered as an “Exceptional Water”
 - If scores provided by consultants fall short of “Excellent” rating, the BCG could be used to verify appropriate classification.
 - Taxonomy and narrative in BCG could drive the assessment if index scores are suspect. May “flag” pristine-like streams and require follow-up assessment by KDOW.