Recommendations for Applying the Critical Elements Methodology

State Tribal Program Evaluations: Key Steps

- On-site evaluation of state and tribal bioassessment program, facilities, and capacities (2-3 days each).
- Interactive interview with state/tribal program managers and staff – includes bioassessment and WQS programs at minimum.
- Systematic compilation and analysis of technical aspects including methods, indicators, bioassessment process, WQS (ALUs), and capacity to support all water quality management programs.
- Documents strengths and fosters a continuous improvement process.

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Region V State Bioassessment and Ambient Monitoring Programs: Initial Evaluation and Review

February 28, 2003
(Revised January 30, 2004)

Final Report

http://www.epa.gov/region5/water/wqb/wqb_r5mon.htm

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Region V States Program Evaluation (2002-5)

Key Premise

". . . ambient monitoring and assessment should function to support all relevant water quality management programs in addition to its more commonplace role of supporting status assessments."

Key Finding

"M&A program design in some states has been driven predominantly by status."

Goals and Desired Outcomes

- Achieve better integration between monitoring & assessment and WQS – ***will foster more consistent use of M&A in water programs***
- Better M&A support for ***all*** water programs
- Improved delineation along a Biocondition Gradient (BCG)
- Refined designated uses (TALU) – benefits to programs
- Improved determination of status and trends

Table 2A. Attributes and characteristics of Region V State biological monitoring and assessment programs: Macroinvertebrate field protocols and applications.

State	Sample Collection Methods[1]						Field Process			Capa-city	Aquatic Ecotypes							
Agency	Quant. Sample	Effort Index	Qual. Sample	Effort Index	Stan-dard-ization	Index Period	Habitat Protocol	Sort	I.D.	#Sites/ Year	Primary HW	Head-water	Wade-able	Large River	Great River	Wet-lands	Lakes/ Res.[2]	Great Lakes
IL EPA	Multiple Habitat Dipnet	Sampling Surface Area	Dip Net/Hand Pick	Time (>60 min.)	NO	June 1-Oct. 15	Quanti-tative Transect	NO	Qual only[3]	80-120	–	–	◐	◐	–	–	–	–
IN DEM	Mod. Hester-Dendy[4]	Sampling Surface Area	Kick Net (1 m²)	Surface Area	YES	July-Sept.	RBP-type Assess-ment	NO	NO	100	–	◐	◐	◐	–	○	○	–
MI DEQ	Mod. Hester-Dendy[5]	Sampling Surface Area	Dip Net/Hand Pick	Time (>30 min.)	YES	June 1 Sept.30	RBP-type Assess-ment	YES	Family level	700	–	–	◐	–	NA	–	–	–
MN PCA	NONE	NA	D-Net/ Hand Pick	20 sweeps	YES	Septem -ber	RBP-type Assess-ment	NO	NO	90-100	–	◐	◐	◐	–	◐	○	–
OH EPA	Mod. Hester-Dendy	Sampling Surface Area	Dip Net/Hand Pick	Time (>30 min.)	YES	July 1-sept.30	Site description (No Index)	NO	Qual only[3]	450-500	◐	●	●	●	◐	◐	–	◐
WI DNR	NO	NA	D-Net/ Hand Pick	Visual Based (2-3 min.)	YES	Spring/ Fall	Wisconsin Protocol	NO	NO	400	–	○	◐	–	–	◐	○	–

● - Method and assessment are fully developed and used and numeric biocriteria are adopted in WQS.
◐ - Method and assessment are fully developed and used, but not adopted in WQS (may include general narrative biocriteria).
○ - Method and assessment are in development and in initial phases of usage.
– - Method and assessment are not developed.

[1] Principal methods are in shaded boxes.
[2] Includes biological assemblage assessments; does not include trophic state and other lake assessments or fishery management surveys.
[3] Gross field identification to determine if new taxa are being included.
[4] Used in lieu of kick net.
[5] Used historically – no longer a principal method – replaced by qualitative method.

Table 6. Relative degree to which major water quality management program areas are supported by monitoring and assessment in each of the Region V states.

State	Basic Reporting		WQS Program					Watersheds/ NPS		TMDL/303d		NPDES/Other Permitting							
Agency	Status[21]	Trend[22]	Tiered Uses[23]	UAA[24]	Refined WQC[25]	Anti-deg.	Site-Specific Crit.Mod.[26]	NPS/BMP Effective-ness	Hab-itat[27]	List/ Delist	TMDL Dev.[28]	WQ BELs[29]	Priority Setting[30]	CSOs/ SSOs	Storm-water Ph. I&II	WET Limits/ Cond.[31]	Sever-ity/ Extent[32]	Enforce ment[33]	404/401 Dredge & Fill[34]
IL EPA	●	○	–	○	–	–	○	○	◐	◐	○	◐	○	○	–	–	○	◐	–
IN DEM	●	○	–	○	–	–	–	○	○	○	○	○	–	–	–	–	–	○	–
MI DEQ	●	○	–	–	–	–	○	◐	◐	●	◐	●	○	○	–	○	–	◐	–
MN PCA	●	○	–	◐	○	–	–	◐	◐	○	○	◐	○	–	–	○	○	○	–
OH EPA	●	●	●	●	●	●	◉	●	●	●	●	◉	◉	◉	◉	◉	●	●	◉
WI DNR	●	○	○	◐	–	○	–	◐	●	○	○	◐	–	–	◐	–	◐	◐	–

● - Well developed and routine process for using monitoring & assessment for at least 5-10 years; based on an integrated indicators framework process and comprehensive watershed design.
◉ - Process and tools are available, but usage is no longer routine and occurs only on a project or issue specific basis.
◐ - Project or site-specific use of monitoring & assessment consisting of upstream/downstream studies, paired stream studies (no comprehensive watershed design).
○ - Occasional or infrequent usage or under development.
– No support from ambient monitoring & assessment.

[21] Basic attainment/non-attainment assessment for aquatic life use status including delineation of causes and sources of threat and impairment.
[22] Sufficient information to report aggregate status of ecotypes over at least a 10 year period; does not refer to analysis of fixed station chemical trends.
[23] Tiered uses that are developed based on assemblage assessments and which correspond to EPA's biological condition axis; does not include fishery based or general uses.
[24] Includes any use of ambient monitoring data to change designated uses, both "upgrades" and "downgrades".
[25] Ambient data is used to develop water quality criteria and/or influence the application or implementation of WQC (exclusive of pH, hardness, and other single modifiers).
[26] Ambient survey data is used to ground truth EPA's site specific criteria process (water effects ratio).
[27] Habitat assessment is linked to biological assessment and listed as a cause of impairment.
[28] Includes using ambient data to support TMDL development and determine success of TMDL implementation beyond basic calibration data.
[29] Water quality based effluent limits – ambient data is used to develop an assessment of the overall effect of the subject discharge on the receiving waters.
[30] Ambient data is used to influence priority setting for NPDES permitting and/or SRF funding priorities.
[31] Ambient survey data is used to develop WET testing requirements and/or effluent limits in NPDES permits.
[32] Assessment framework allows for determination of incremental departures and changes beyond pass/fail and communicates severity of problem over space & time.
[33] Direct use of ambient survey data to support enforcement in terms of demonstrating that action is both legal and reasonable.
[34] Direct support of general policy and site-specific decisions for the 401 certification of 404 dredge and fill permits.

Presented by Roy Smogor (IEPA) at the December 2005 Region V TALU Implementation Workshop

Biological Assessment & Water Quality Standards in Illinois

Technical Element	Description	Level
Temporal coverage	Bug & fish collected in "summer" period (June 01-October 15)	≥ 3
Spatial coverage	Semi-fixed sites, statewide distribution, site info extrapolated to reach (1 to 50 miles, depending on stream size & various factors based on BPJ)	≤ 2
Natural classification	Fish IBI accounts for variation among regions within Illinois; within each region, among stream sizes (width) & slopes. Bug IBI does not address inter- or intraregional variation.	≤ 3
Reference conditions	Bug & fish IBIs based on regional reference conditions defined largely independently of biological attributes (metrics). Facility surveys (using bugs) based on comparison to upstream rather than regional reference.	4 ?
Reference-condition criteria		
Indicator assemblages	Bugs w/resolution typically to genus (otherwise lowest possible) & fish to species; no formal certification program for taxonomic identification	≥ 3
Sample collection	Bug & fish methods defined in SOPs; no formal training certification; bugs collected only by experienced biologists; fish collected under supervision of at least one experienced biologist	≥ 3
Sample processing	Bugs: formal QA/QC'd subsampling procedure & ID checks; ID workshops. Fish: IDs verified by expert; less-formal QA/QC.	3
Ecological attributes	Bug & fish IBIs include attributes based on taxa-specific general tolerance, taxon richness, trophic & reproductive structure (richness & proportional abundance of ecological guilds); no measures of condition of individuals	≤ 3
Biological endpoints & thresholds	For IBIs, formal link to absolute scale of biological integrity and CWA aquatic-life goal; 5 integrity classes; no explicit link to specifics of BCG, but conceptually consistent w/BCG	≤ 4
Diagnostic capability	Limited formal development of biological attributes to diagnose causes; mostly BPJ when diagnosing causes based on biological info	≤ 2
Professional review & documentation	Stakeholder involvement & review from start; limited peer review outside IEPA & stakeholders; formal documentation lacking for fish IBI	≤ 3

Bioassessment and Biocriteria Program Development Timeline

INITIAL DEVEOPMENT PHASE
0-18 MONTHS

INITIAL IMPLEMENTATION PHASE
12-24 MONTHS

INITIAL ASSESSMENT PHASE
18 MO – 6 YEARS

FULL ASSESSMENT PHASE
5 – 10 YEARS

Illinois EPA needs work:

Start-Up Tasks: Logistics

Acquire Staffing:
- Professional biologists with expertise & training

Database manager

- Interns/technicians (field work, lab tasks

Acquire Facilities & Equipment:
- Outfit laboratory and field facility
- Office accommodations

Database support infrastructure

Methods Development:
- Review and select candidate methods and protocols

Consider MQO/DQO needs

- Test methods for applicability
- Analyze test results – select methods

Start-Up Tasks: Implementation

Initiate Field Sampling:

Review spatial designs

- Develop QA/QC and QAPP
- Develop sampling plans in accordance with monitoring strategy
- Pilot assessments

Classification Issues:

-Consider spatial stratification issues
-Select and sample reference sites

- Develop index development and calibration strategy

Program Implementation

Biocriteria Development:
- Select candidate metrics and/or assessment tools

Develop refined uses-narratives

- Test metrics and develop calibrated indices
- Evaluate via bioassessments

Water quality Program Support:

Develop capacity to support WQ programs (WQS/UAAs, TMDLs, permits, planning)

Formalize water quality program support as capacity is developed

Program Maintenance

Biocriteria Development:
- Refine metrics and develop calibrated indices

Develop reference benchmarks for calibrated indices according to classification scheme and by major aquatic ecotype

Water quality Program Support:

Fully functioning bioassessment program supports WQS (UAAs, aquatic life use support) and basic program needs (305b/303d)

Program development should be fully initiated – e.g., integrated chemical, physical, and biological database supports criteria & policy development

Continuously evaluate program

Quality Improvement Process

Evaluate effectiveness of initial decisions – make needed adjustments

Summary of Recommendations: I

- Requires an on-site, interactive interview of state/tribal managers and staff.
- Review and evaluation of key technical details including methods, processes, and facilities
- Technical expertise in bioassessment methods and design is needed to facilitate and conduct the interview process and produce a program evaluation.
- Should be an ongoing and iterative process.

Summary of Recommendations: II

- Establish regional bioassessment working groups comprised of state/tribal biologists and EPA regional staff.
- State/regional training workshops on the critical elements process.
- Complementary to ongoing activities with TALU and related issues (BCG, biocriteria, integrated reporting, etc.).