Results of the Critical Elements Review: California State Water Resource Control Board's Bioassessment Program (2008 State Program Evaluations)

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State/Tribal Program Evaluation: Key Steps

On-site evaluation (2-3 days):
 Bioassessment program,
 Facilities,
 Resource Capacity.

2. Interactive interview and Concensus:
State/Tribal program managers and staff,
Includes <u>Bioassessment</u> and <u>WQS Programs</u> at minimum.

State/Tribal Program Evaluation: Key Steps

3.Systematic compilation and analysis of all technical & programmatic aspects (methods, indicators, WQS (ALUs).

4. Assess capacity to support all water quality management programs.

5. Documents program strengths and fosters a continuous improvement process.

Key Concepts Measured by the CE Review

Accuracy: Biological assessments should produce sufficiently accurate delineations to minimize Type I and II assessment errors.

Comparability: technically different approaches should produce comparable assessments in terms of condition ratings, impairments, & diagnostic properties.

Comprehensiveness: biological response is evaluated in conjunction with other stressor/exposure information to understand the key limiting factors.

Cost-Effectiveness: having reliable biological data to support management decisions outweighs the intrinsic costs of development and implementation (NRC 2001).

EPA Independent Core Team

• U.S. EPA - Susan Jackson, EPA Regional **BC** Coordinators • Tetra Tech – Mike Barbour, Jeroen Gerritsen, Rob Plotnikoff*, Maggie Craig • GLEC - Dennis McIntyre • Midwest Biodiversity Institute – Susan Davies**, Martha Kirkpatrick*, Ed Rankin*, Chris Yoder* *– former State program (Maine, Ohio, Washington) ** – current State program (Maine)

Who are the Primary Users?

 State and Tribal program managers and staff who are responsible for monitoring and assessment and WQS programs.

• U.S. EPA Standards & Criteria and Monitoring & Assessment coordinators who conduct review and oversight of State and Tribal programs.



What Do the Levels Mean?

Level 1 produces general assessments - <u>not</u> amenable to supporting most tasks *i.e.*, status, severity/magnitude, causal associations.

Level 2 includes pass/fail to multiple condition assessments (2-3 categories); capable of general causal determinations.

Level 3 is capable of incremental condition assessment along the BCG and for most causal associations; <u>single</u> <u>assemblage limitations</u>.

Level 4 provides full program support & reasonably robust, accurate, & complete assessments including scientific certainty, accuracy, relevancy of condition, severity & extent, and causal associations.

Level of Rigor in Bioassessment It Matters

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28. N. E. S.		Condition Assessment		Causal Associations		
Low Press	Level	Impairment	Multiple Condition	General	Categorical	Parameter Specific
Sec. 27-12	1	*	—	—	_	—
Constant of	2	**	*	*	_	—
1. A. A. A.	3	**	**	**	**	*
N- 24.00	4	***	***	***	***	**

*** Comprehensively fulfills program support role.

****** General causal associations.

* No causal association capacity.

Programmatic Elements for WQ Management

WQ Programs	
Basic Reporting	StatusTrends
WQS Program	 Tiered Uses UAA

The goal is to produce Bioassessment to Support A// Relevant WQ Management Programs

	· IMDL Dev.
	 Severity/Extent
NPDES/Other	· WQ BELs
Permitting	 Priority Setting
ere e	· CSOs/SSOs
	• Stormwater Ph. I&II
	• WET Limits/Cond.
	 Enforcement
8	• Dredge & Fill

As naturally occurs. Habitat: "natural"

No detrimental change: support all indigenous

An EPA goal: States develop and adopt a TALU based biocriteria process in their M&A and WQS programs.

The purpose for the State Evaluation process: a way to measure incremental progress towards attaining this goal.

Zero discharge; No hydrologic alteration; DO and bacteria as natural

No alternatives: D/C Equal to or better; hydro 75% saturation: bacteria as natural

D/C with ample dilution; DO: 7ppm/75% saturation; 9ppm for salmonid allowed; DO: 7ppm/ spawning; Bacteria: 64/100 mil- in the summer

DO: 5ppm/60% saturation; Water quality sufficient to ensure salmonid spawning/survival; Bacteria:142/100 mil

FIGURE A-3. Relation between Maine TALUs and other water quality standards and criteria.

States Evaluated Since 2002: Region I: CT, ME, RI, NH, MA, VT Region IV: AL Region V: IL, IN, MI, MN, WI, OH Region VI: NM, TX Region VIT: IA, MO Region VIII: CO,MT Region IX: AZ,CA plus Selected Tribes

Reviews are conducted at the request of the State and/or EPA Region

Gretchen Hayslip, USEPA/Region 10

Summary of CE Scores for States



after Yoder and Barbour 2009

Critical (Key) Technical Elements

Building Foundation Elements

Blocks

Dependent on Other Elements



Temporal coverage 2. Spatial coverage 3. **Natural Classification** Criteria for reference sites **5**. **Reference** conditions

6. Sample collection 7. Sample processing 8. Data Management 9

- **Taxonomic Resolution**
- 10. Ecological attributes **Biological endpoints** <u>11</u>.-12. Diagnostic capability 13. Professional review

Table 1. A checklist for evaluating the degree of development for each technical element of a bioassessment program and associated comments on the elements for the Connecticut DEP program. The point scale for each element ranges from lowest to highest

resolution.	(Lowest) 1.5	1.0 2.5 3	.0 3.5 4.	.0 4.5 (Highest)	
Element					Comments
1. Temporal	Collection times are variable	An index period is	A well-documented seasonal	Same as Level 3, but	Adherence to
Coverage	throughout the year, and	conceptually recognized, but	inden period(s) is calibrated	administrative needs and index	standardized
	sampling is performed without	sampling may take place	with data for reference	periods fully reconciled.	index period is
	regard to seasonal influences.	outside of this period for	conditions, but sampling may	Scientific basis of temporal	generally
		convenience or to match	take place outside of this	sampling influences	maintained;
		existing programs; sampling	period for convenience or to	management decision	sampling outside
		outside of the index is not	match emisting programs;	framework.	of index period is
		adjusted for seasonal	sampling outside of the index		infrequently
Points 4.0		influences.	is adjusted for seasonal		conducted to
			influences. Index periods are		satisfy
			selected based on known		information

Checklist is completed with state staff - consensus based process

2. Spatial	An individual site is used for	Multiple sites are used for	Spatial network suitable for	Comprehensive spatial network	Combination of
Coverage	assessment of watershed	watershed assessment; spatial	status assessments; statewide	suitable for reliable watershed	targeted intensive
	condition; simple upstream/	coverage only for questions of	spatial design using rotating	assessments in support of	surveys and a
	downstream and fixed station	general status or locally	basins with single purpose	multiple water quality	statewide
	designs prevail; assessments at	specific problem areas;	design at coarse scale (e.g., 8	management programs at more	probability
	local scale.	synoptic (non-tandom) design	digit HUC); may be	detailed scale (e.g., 11-14 digit	network.
		at coarse scale (e.g., 8-digit	supplemented by occasional	HUC); statewide rotating basin	
		HUC common); spatial	intensive surveys.	approach or similar scheme to	
Points <u>4.0</u>		extrapolation is based on		complete statewide monitoring	
		"rules of thumb"; may be		in a specified period of time;	
		supplemented by simple		multiple spatial designs	
		upstream/downstream		appropriate for multiple issues.	
		assessments.			

Technical Memorandum (draft): California WRCB Bioassessment Program 👘

TECHNICAL MEMORANDUM [Draft]

Evaluation of the California Bioassessment Program

January 23/24, 2008

One product of the review process is a "Technical Memorandum" that communicates program strengths and documents specific areas for improvement.

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April 25, 2008

MBI/Te

SWRCB Program "Design" Scores



1. Temporal coverage (4.5)		4.5	4.0
2. Spatial coverage (4.5)		3.5	4.0
3. Natural Classification (5.0))	3.5	n/a
4. Criteria for reference site	es (5.0)	5.0	n/a
5. Reference conditions (4.0)		3.5	n/a

SWRCB Program "Method" Scores

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<u>N</u>		
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6. Sample collection (5.0)	4.5	4.5
7. Sample processing (5.0)	5.0	5.0
8. Data Management (5.0)	5.0	4.0
9. Taxonomic Resolution (5.0)	4.5	3.0

SWRCB Program "Interpretation" Scores



10.Ecological attributes (4.5)	4.0	n/a
11.Biological endpoints (4.0)	3.5	n/a
12.Diagnostic capability (4.0)	2.5	n/a
13.Professional review (4.5)	4.5	n/a

California SWRCB Program Summary

Statewide Progress

Statewide CE Score = 53/60 Statewide CE % = 88.3% Statewide Level = L3 [85-95%]

Regional Progress Regional = 50.5/60 Regional = 84.2% Regional Level = L2 [70-85%]

Key Findings of the CE Review 1. Sustain support to: Fully develop and use a second assemblage Complete work and development in other bioregions Develop more detailed diagnostic capabilities Improve data management system statewide Develop and improve the capacity of other regional boards

2.Results will be for California's Bioassessment Program to transcend Level 3 to Level 4!!

3.Program only addresses wadeable, perennial streams

Must expand to address additional waterbody types (large rivers, non-perennial streams, lakes, wetlands)

Key Findings of the CE Review

- 4. State Board has invested significant resources in the SWAMP Program
 - Collaboration between CA DFG, SWRCB, and regions has been the reason for the advancement
 - Need investment for in-house Coordinator and Staff
 - Active Management support to achieve Level 4

5. The State and Regional Water Boards will require:

 Biologists and Planning Staff to develop, refine, and implement narrative/numeric biocriteria and TALUs.
 Timeline and Implementation Plan to proceed with next phase

Technical Recommendations 1. SWAMP should support the "technical infrastructure development strategy" in workplans 2.SWAMP program developed a "reference" condition management plan" > Invest in implementation at all levels > Useful to all water management programs 3. SWAMP should develop additional indicators: > Algae indicator (currently under development) > Wetland indicator (CRAM, under development) Fish assemblage indicator 4. A Database Management system (qualityassured): > A framework for statewide integration > A tool for calculating biological expressions > A generator of information for managers/public

Roadmap to Full Implementation

Bioassessment toBiocriteria

SWAMP

Standardized biological protocols

Classify water bodies into similar groups or classes

Identify reference sites in each class

Conduct bioassessments at reference sites in each class

Develop Assessment Tool

STANDARDS

Develop Biocriteria for each Aquatic Life Use

Apply Biocriteria to all Water Bodies

Current Efforts in CA: a benefit to achieving success



Plan for establishing technical components of SWAMP's bioassessment program Plan for biocriteria implementation Build on discussions during this workshop

The Biological Condition Gradient: Biological Response to Increasing Levels of Stress

Levels of Biological Condition

Natural structural, functional, and taxonomic integrity is preserved.

Structure & function similar to natural community with some additional taxa & biomass; ecosystem level functions are fully maintained.

Evident changes in structure due to loss of some rare native taxa; shifts in relative abundance; ecosystem level functions fully maintained.

Moderate changes in structure due to replacement of sensitive ubiquitous taxa by more tolerant taxa; ecosystem functions largely maintained.

Sensitive taxa markedly diminished; conspicuously unbalanced distribution of major taxonomic groups; ecosystem function shows reduced complexity & redundancy.

Extreme changes in structure and ecosystem function; wholesale changes in taxonomic composition; extreme alterations from normal densities.



occurs.

natural conditions.

California Designated Aquatic Life Uses

 <u>Warm Freshwater Habitat (WARM)</u>: Uses of water that support warmwater ecosystems including, but not limited to, preservation and enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

<u>Cold Freshwater Habitat (COLD)</u>: Uses of water that support cold water ecosystems including, but not limited to, preservation and enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

The Biological Condition Gradient

2

Natural structural, functional integrity is preserved.

Minimal changes in structure & function

Evident changes in structure and minimal changes in function

Moderate changes in structure & minimal changes in function

Major changes in structure & moderate changes in function

Severe changes in structure & function —

Increasing Level of Stressors

AS LAN

Natural

Variability

Biological

Condition

Elements of a Narrative Biocriterion

• Waters of the State shall be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.

- "Without detrimental changes in the resident biological communities" means no loss of ecological integrity when compared to natural conditions at an appropriate reference site or region.

"Ecological integrity" means the summation of chemical, physical, and biological integrity capable of supporting and maintaining a balanced, integrated adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of natural habitat in the region.

Management Recommendations

Integrate bioassessment tools into WQ programs:
 Standards, NPDES, and TMDLs
 Requires strong management support

2. SWRCB elevate developing biocriteria as high priority:
 > Develop statewide narrative biocriteria for enforcing biology-based standards

Develop numeric criteria as next step

3. SWRCB support regional efforts to develop TALUs:
 > Improve assessments of ALU attainment
 > Provides a more stable foundation for antidegradation

4. SWRCB should support and maintain a "Statewide Bioassessment Policy Coordinator"

Program Development Chart: Audit Progress of CA Programs



development.

Methods Development

- Review and select candidate methods and protocols
- Consider MQO/DQO needs
- Test methods for applicability
- Analyze test results select methods
- Develop and test reference condition approach
- Select and sample reference sites
- Develop index development and calibration strategy

Assessment Issues

- Use data for "makeable" decisions
- Initiate exploratory analysis of biological responses to stressors

Water Quality Program Support

- Develop capacity to support WQ programs (WQS/UAAs, TMDLs, permits, planning)
- Formalize and increase water quality program support as capacity is developed (biological data should support more decisions)

Water Quality Program Support

- Fully functioning bioassessment program supports WQS (UAAs, ALU, biocriteria) and basic program needs (305b/303d)
- Program dev't should be fully initiated – e.g., integrated chemical, physical, and biological database supports tool, criteria, & policy dev't. (ongoing)

3. Establish Technical Program

4. Develop & Validate Quantitative Thresholds

Continuously evaluate program - develop and implement refinements

Quality Improvement Process

Evaluate effectiveness of initial decisions - make needed adjustments

California's TALU Timeline Progression

INITIAL DEVELOPMENT PHASE 0-18 MONTHS INITIAL IMPLEMENTATION PHASE 12-24 MONTHS INITIAL ASSESSMENT PHASE 1. Establish Science 18 MO - 6 YEARS Policy Conceptual 2. Merge Scientific & FULL ASSESSMENT PHASE **Policy Foundations** Foundation Link conceptual TALU • E 5 - 10+ YEARS tiers to regional BCG 60 Start-Up Tasks: Initial conceptual model D **Technical Development Tasks** Start-Up Tasks: Initiate Evaluate for consistency with d Monitoring Strategy existing WQS framework Acquire Staffing Professional biologists with Program Implementation Draft or refine narrative ALU Initiate Field Sampling • Review spatial designs descriptions taxonomic expertise & training Develop QA/QC and QAPP Database manager Biocriteria Development Select candidate metrics and/or Program Maintenance Develop sampling plans in Interns/technicians (field work, accordance with monitoring assessment tools lab tasks Develop refined uses strategy Biocriteria Development Befine metrics and develop Acquire Facilities & Equipmen narratives. Pilot assessments Test metrics and develop Outfit laboratory and field facility calibrated indices Classification Issues calibrated indices Office accommodations Develop reference benchmarks Consider spatial stratification Evaluate via bioassessmenta. for calibrated indices according Database support infrastructure issues to classification scheme and by Develop and test reference Methods Development 5. Application in WQ Manag major aquatic ecotype condition approach Review and select candidate Link to TALUs via BCG. Select and sample reference Water Quality Program Support methods and protocols site s Develop capacity to support Consider MOO/DOO needs WQ programs (WQS/UAAs, aement Develop index development Test methods for applicability TMDLs, permits, planning) and calibration strategy Analyze test results – select Water Quality Program Support Formalize and increase water Assessment Issues methods Fully functioning bioassessment quality program support as Use data for "makeable" program supports WQS (UAAs, capacity is developed de cisions ALU, biocriteria) and basic (biological data should support Initiate exploratory analysis of more decisions) program nee ds (305b/303d) biological responses to Program dev't should be fully stressors initiate d - e.g., integrate d

initiated – e.g., integrated chemical, physical, and biological database supports tool, criteria, & policy dev't. (ongoing)