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

(2008 State Program Evaluations)

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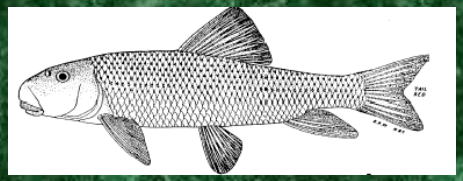

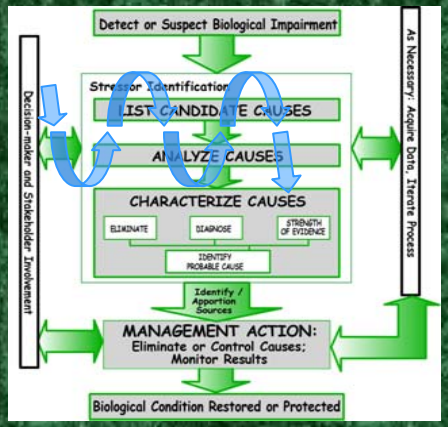

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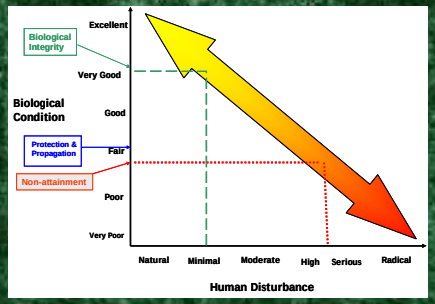

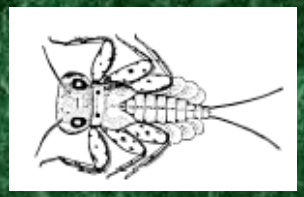

(presented by)
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State/Tribal Program Evaluation: Key Steps

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

2. Interactive interview and Concensus:
   - State/Tribal program managers and staff,
   - Includes Bioassessment and WQS Programs 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

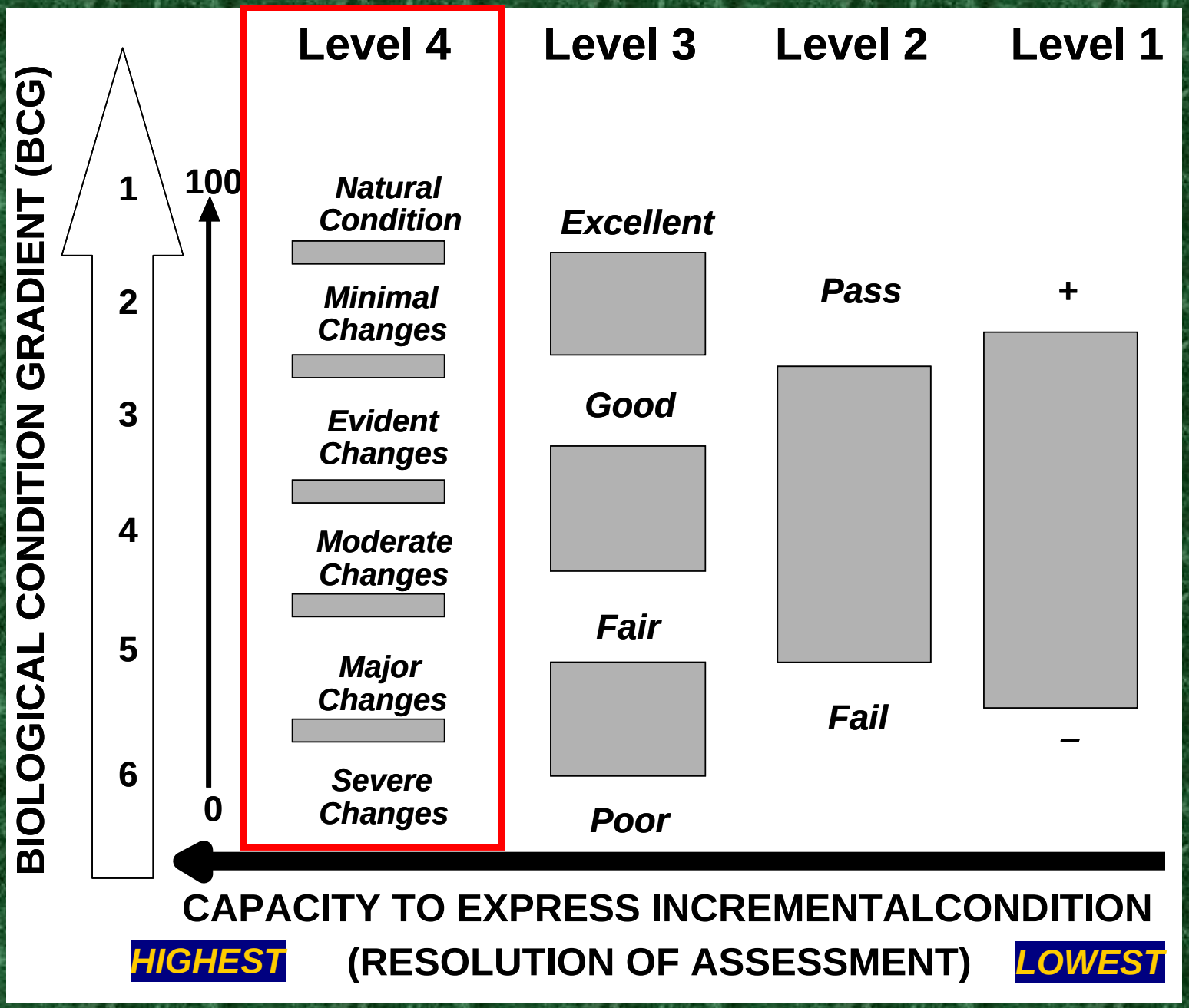
- *U.S. EPA* – Susan Jackson, EPA Regional BC Coordinators
- *Tetra Tech* – Mike Barbour, Jeroen Gerritsen, Rob Plotnikoff*, Maggie Craig
- *GLEC* – Dennis McIntyre
- *Midwest Biodiversity Institute* – Susan Davies**, Martha Kirkpatrick*, Ed Rankin*, Chris Yoder*

*- 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.


Level 4
Level 3
Level 2
Level 1
BIOLOGICAL CONDITION GRADIENT (BCG)
1
2
3
4
5
6
100
0
Natural Condition
Minimal Changes
Evident Changes
Moderate Changes
Major Changes
Severe Changes
Excellent
Good
Fair
Poor
Pass
Fail
+
–
CAPACITY TO EXPRESS INCREMENTALCONDITION
(RESOLUTION OF ASSESSMENT)
HIGHEST
LOWEST

What Do the Levels Mean?

Level 1 produces general assessments - not 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; single assemblage limitations.

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

	Condition Assessment		Causal Associations		
Level	Impairment	Multiple Condition	General	Categorical	Parameter Specific
1	*	–	–	–	–
2	**	*	*	–	–
3	**	**	**	**	*
4	***	***	***	***	**

*** Comprehensively fulfills program support role.

** General causal associations.

* No causal association capacity.

Programmatic Elements for WQ Management

WQ Programs	
Basic Reporting	• Status • Trends
WQS Program	• Tiered Uses • UAA
	• TMDL Dev. • Severity/Extent
NPDES/Other Permitting	• WQ BELs • Priority Setting • CSOs/SSOs • Stormwater Ph. I&II • WET Limits/Cond. • Enforcement • Dredge & Fill

The goal is to produce Bioassessment to Support *All* Relevant WQ Management Programs

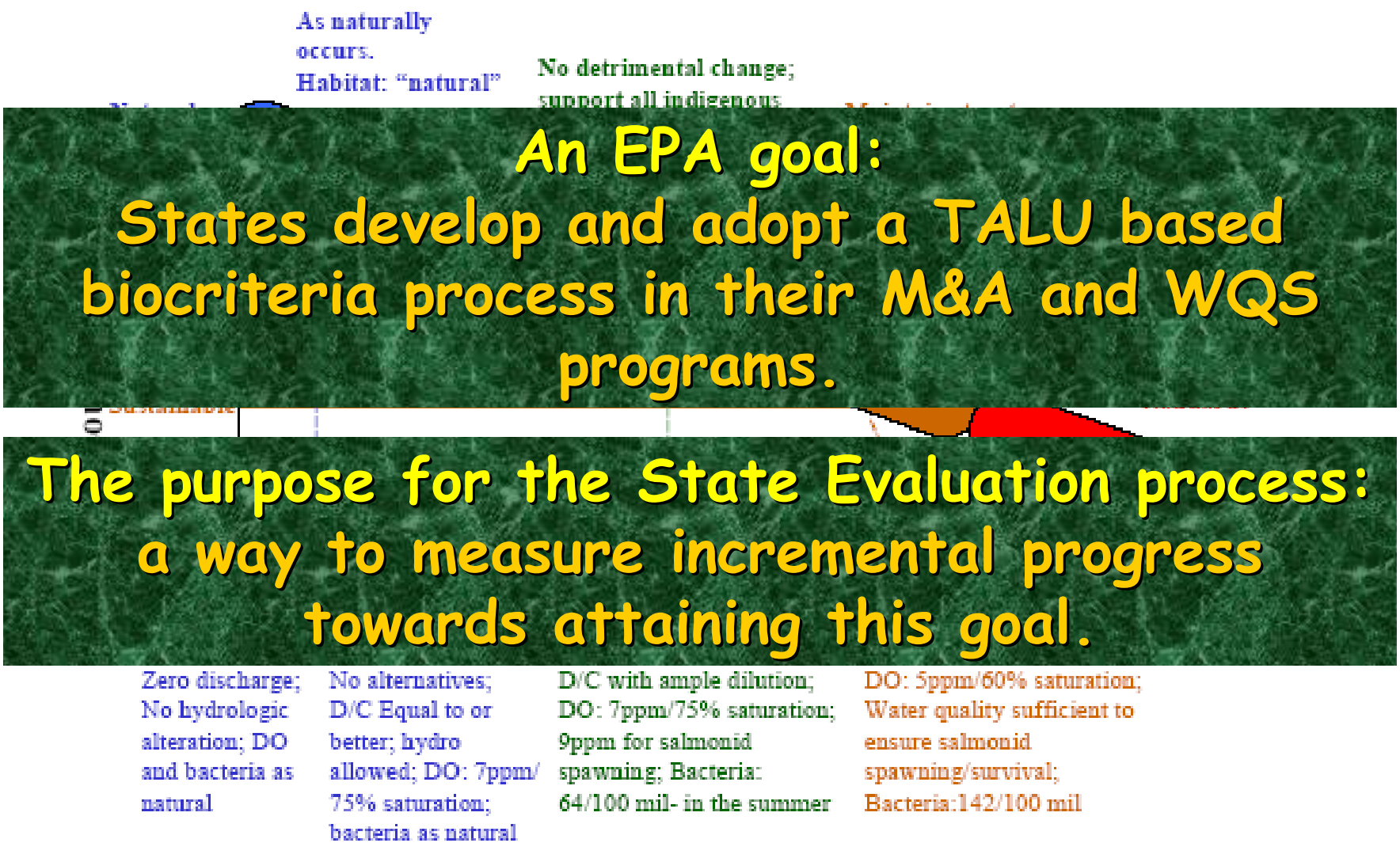


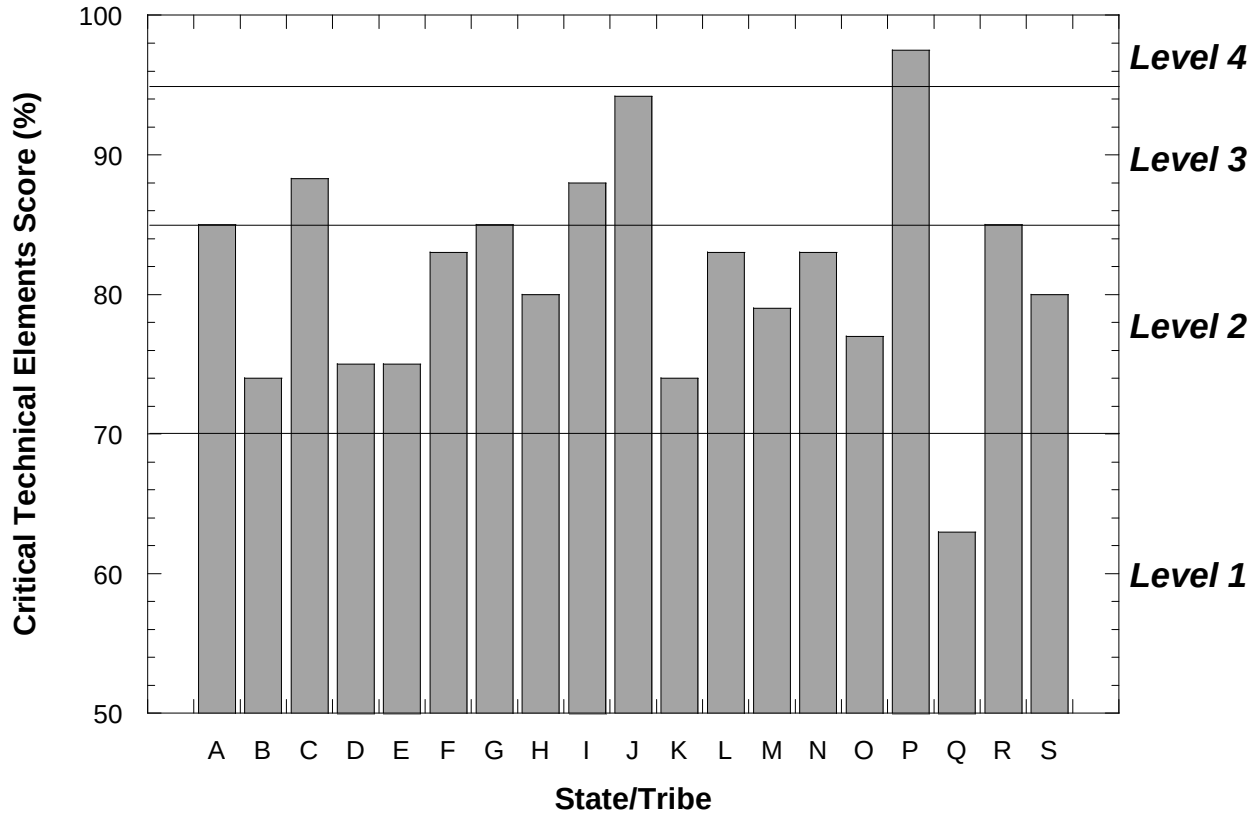
FIGURE A-3. Relation between Maine TALUs and other water quality standards and criteria.

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 VII: 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

Summary of CE Scores for States



after Yoder and Barbour 2009

Critical (Key) Technical Elements

		Foundation Elements	Building Blocks	Dependent on Other Elements
Design	1. Temporal coverage		✓	
	2. Spatial coverage		✓	
	3. Natural Classification	✓		
	4. Criteria for reference sites	✓		
	5. Reference conditions			✓
Methods	6. Sample collection	✓		
	7. Sample processing	✓		
	8. Data Management	✓		
	9. Taxonomic Resolution	✓		
Interpretation	10. Ecological attributes	✓		
	11. Biological endpoints			✓
	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.

Element	(Lowest) 1.5	2.0	2.5	3.0	3.5	4.0	4.5 (Highest)	Comments
1. Temporal Coverage Points 4.0	Collection times are variable throughout the year, and sampling is performed without regard to seasonal influences.	An index period is conceptually recognized, but sampling may take place outside of this period for convenience or to match existing programs; sampling outside of the index is not adjusted for seasonal influences.	A well-documented seasonal index period(s) is calibrated with data for reference conditions, but sampling may take place outside of this period for convenience or to match existing programs; sampling outside of the index is adjusted for seasonal influences. Index periods are selected based on known	Same as Level 3, but administrative needs and index periods fully reconciled. Scientific basis of temporal sampling influences management decision framework.				Adherence to standardized index period is generally maintained; sampling outside of index period is infrequently conducted to satisfy information
2. Spatial Coverage Points 4.0	An individual site is used for assessment of watershed condition; simple upstream/ downstream and fixed station designs prevail; assessments at local scale.	Multiple sites are used for watershed assessment; spatial coverage only for questions of general status or locally specific problem areas; synoptic (non-random) design at coarse scale (e.g., 8-digit HUC common); spatial extrapolation is based on "rules of thumb"; may be supplemented by simple upstream/downstream assessments.	Spatial network suitable for status assessments; statewide spatial design using rotating basins with single purpose design at coarse scale (e.g., 8 digit HUC); may be supplemented by occasional intensive surveys.	Comprehensive spatial network suitable for reliable watershed assessments in support of multiple water quality management programs at more detailed scale (e.g., 11-14 digit HUC); statewide rotating basin approach or similar scheme to complete statewide monitoring in a specified period of time; multiple spatial designs appropriate for multiple issues.				Combination of targeted intensive surveys and a statewide probability network.

Checklist is completed with state staff – consensus based process

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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SWRCB Program "Design" Scores

	Statewide	Regional
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 sites (5.0)	5.0	n/a
5. Reference conditions (4.0)	3.5	n/a

SWRCB Program "Method" Scores

	Statewide	Regional
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

	Statewide	Regional
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 infra-structure 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 (quality-assured):
   - 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

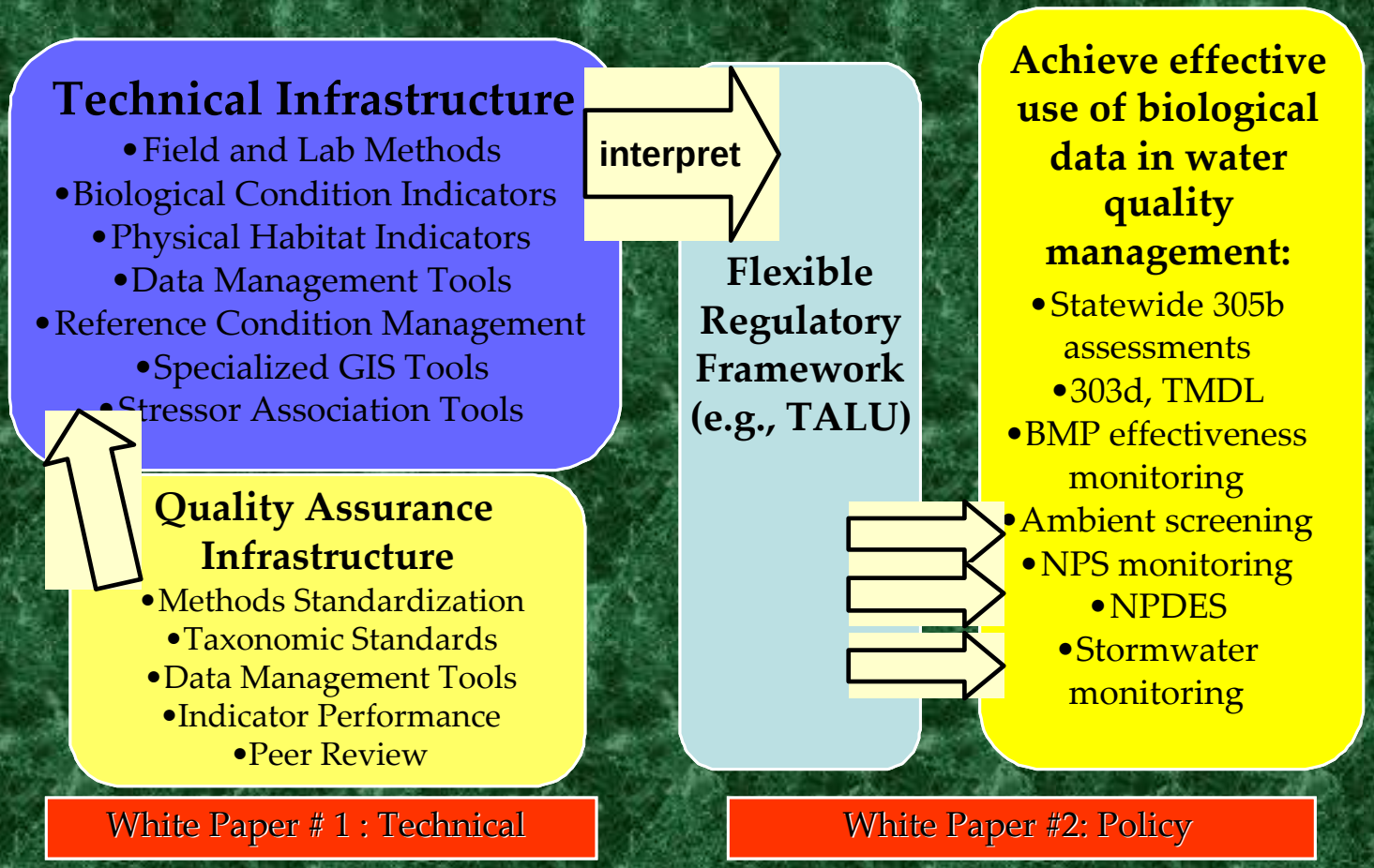
↓

Develop Biocriteria for each Aquatic Life Use

↓

Apply Biocriteria to all Water Bodies

Current Efforts in CA: a benefit to achieving success



White Paper # 1 : Technical

Plan for establishing technical components of SWAMP's bioassessment program

White Paper #2: Policy

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.

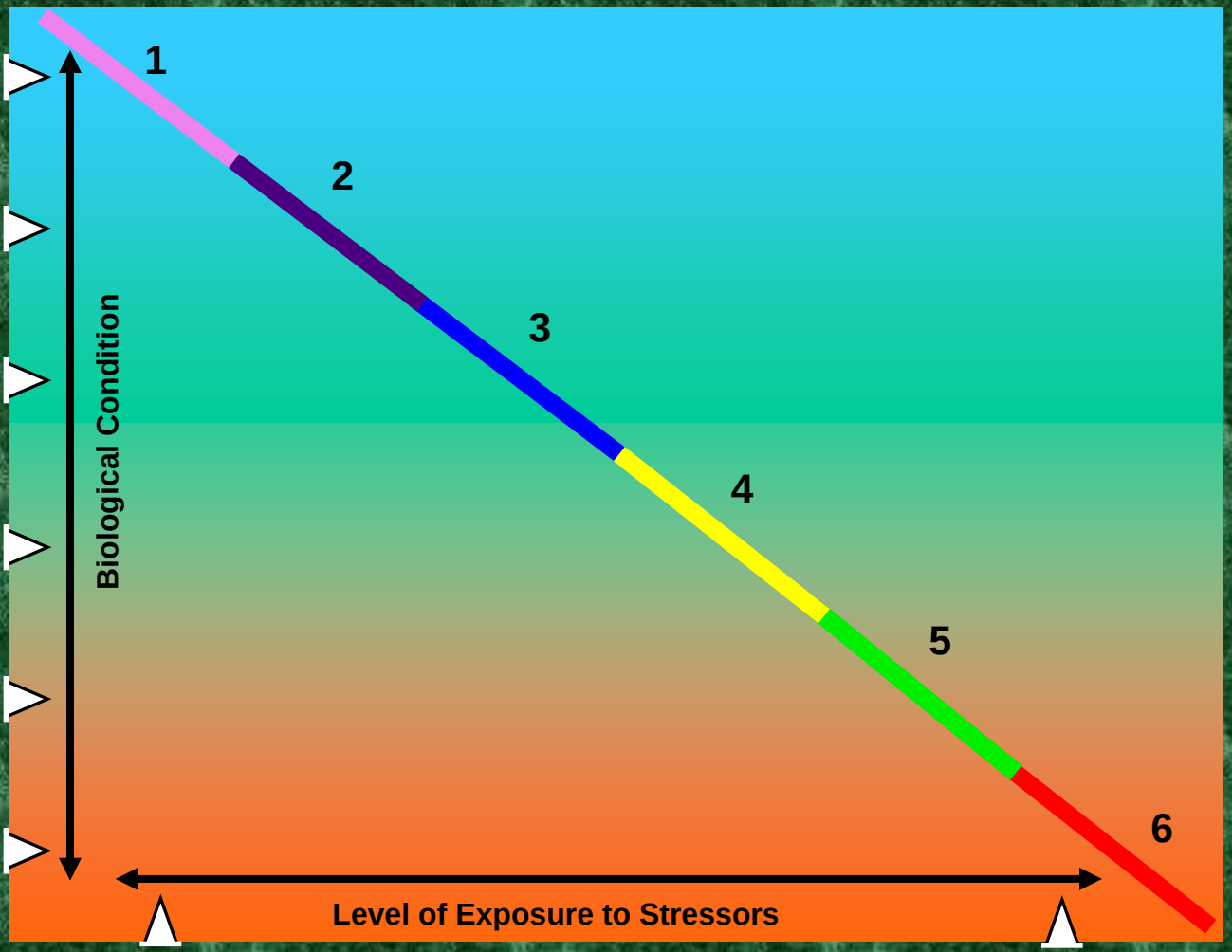
Structure & function similar to natural community with some additional taxa & biomass; ecosystem level functions are fully maintained.

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.



Watershed, habitat, flow regime and water chemistry as naturally occurs.

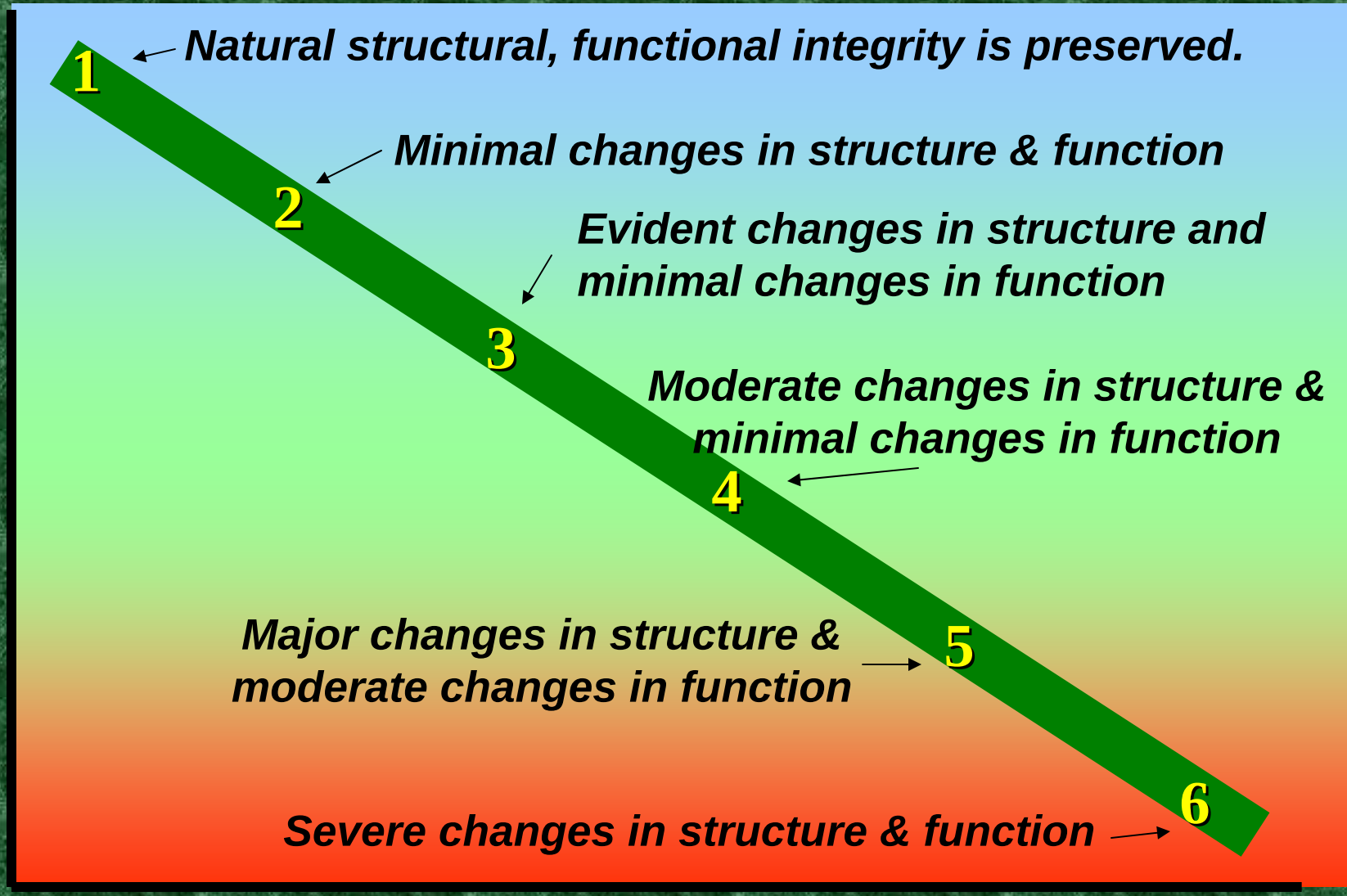
Chemistry, habitat, and/or flow regime severely altered from natural conditions.

California Designated Aquatic Life Uses

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

- *Cold Freshwater Habitat (COLD)*: 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



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

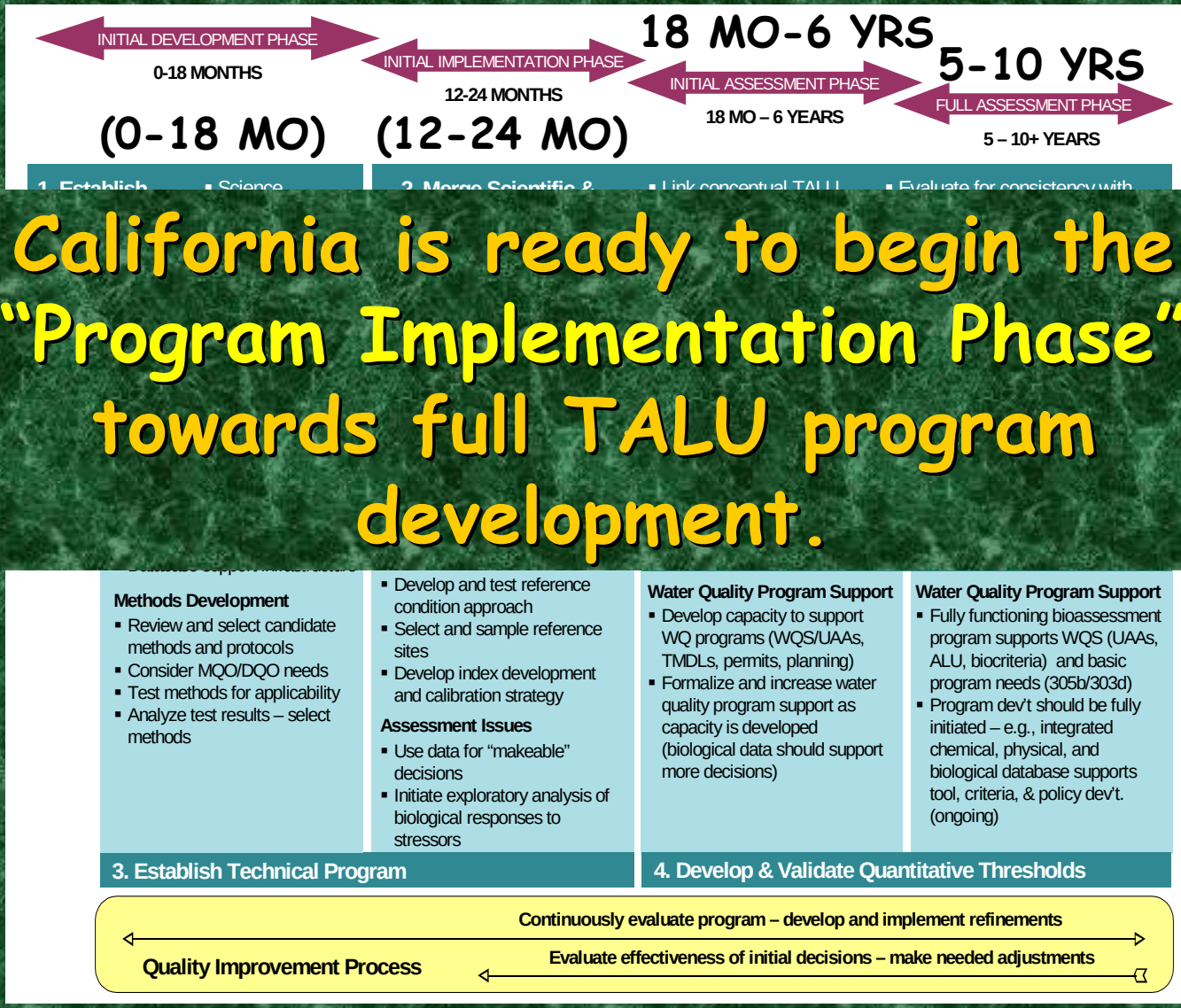
1. Integrate bioassessment tools into WQ programs:
   - Standards, NPDES, and TMDLs
   - Requires strong management support

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



California is ready to begin the "Program Implementation Phase" towards full TALU program development.

California's TALU Timeline Progression