

Tiered Aquatic Life Uses (TALU): A Conceptual and Practical Basis for Determining Water Quality Management Goals and Outcomes

State of the Hudson River Watershed
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National Academy of Sciences Committee to Assess Science in TMDLs¹

Two Major WQ Program Areas Identified as Needing Improvement

Water Quality Standards

- Refined designated uses
- UAA process
- Biological criteria

Monitoring & Assessment

- "Adequacy" in terms of concepts and elements
- Appropriate roles of ambient indicators

Dealing more effectively with a complex mosaic of watershed level impacts is enhanced within a TALU & bio-criteria framework.

¹NRC (2001). *Assessing the TMDL Approach to Water Quality Management*

United States Environmental Protection Agency

Use of Biological Information to Tier Designated Aquatic Life Uses in State and Tribal Water Quality Standards

The Ohio and Maine programs are highlighted as state case examples of long term TALU implementation - the "roots" of each were visible in the 1970s



TALU Facts I

What TALUs Are:

- A reflection of the whole ecosystem - based on **representative ecological attributes**.
- Assigned to water bodies based on the protection and restoration of **ecological potential**.

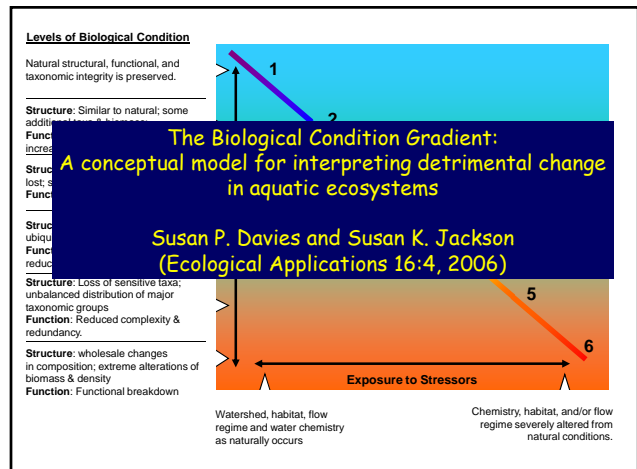
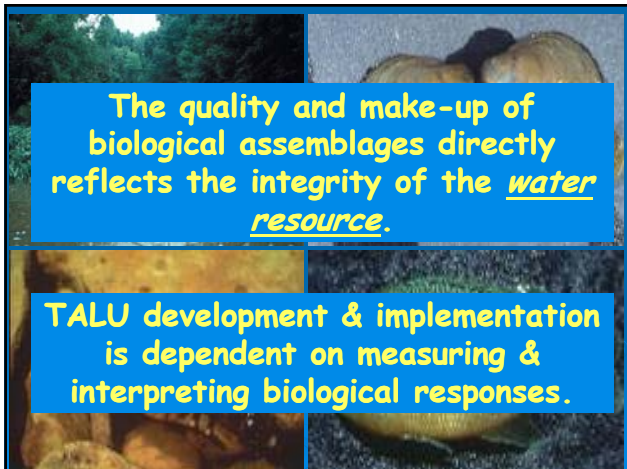
What They Are Not:

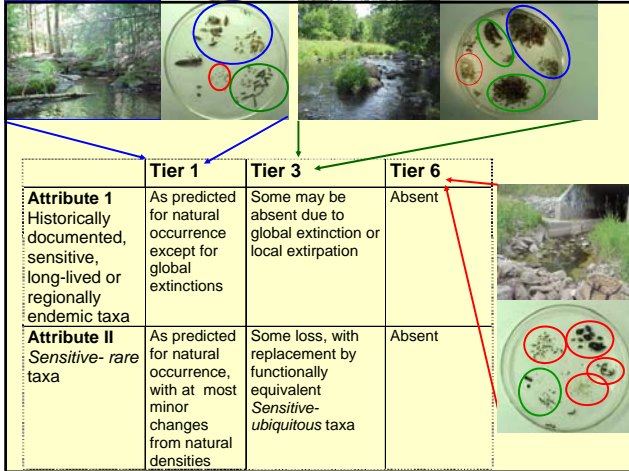
- Based on **"user preferences"** (i.e., effluent conveyance, land use issues).
- A rationale for **lessening** pollution controls.
- An "easy exit" from an **impaired waters** listing.

TALU Facts II

A strategic integration of M&A and WQS:

- Systematic M&A at the same scale at which management is being applied.
- TALU merges M&A and WQS via bioassessments and biocriteria.
- TALU includes *stratification of natural factors* in addition to a general classification scheme.
- Applies M&A data beyond general status - is now used as a "day-to-day" tool set for WQ management.

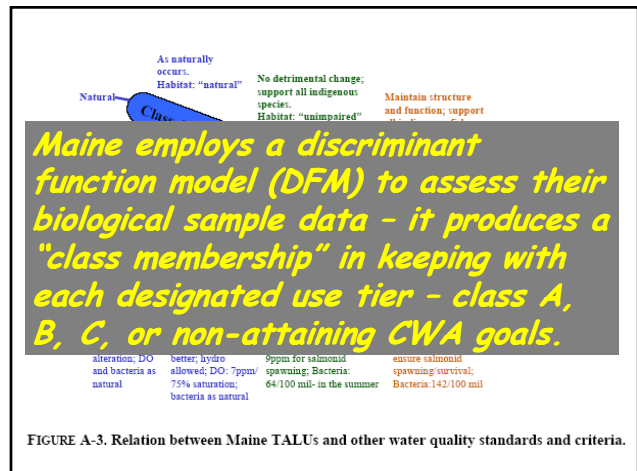
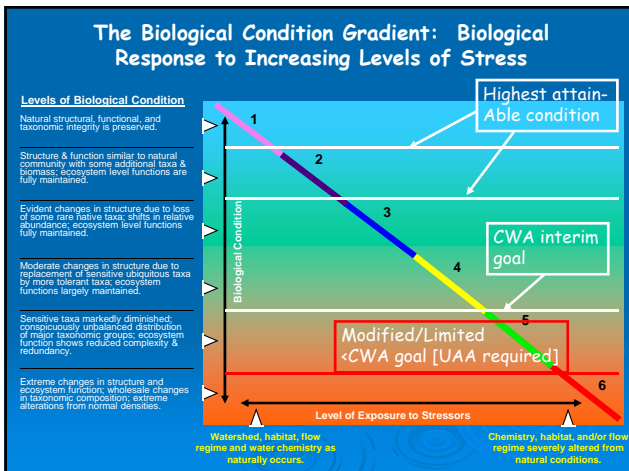




	Tier 1	Tier 3	Tier 6
Attribute I Historically documented, sensitive, long-lived or regionally endemic taxa	As predicted for natural occurrence except for global extinctions	Some may be absent due to global extinction or local extirpation	Absent
Attribute II Sensitive-rare taxa	As predicted for natural occurrence, with at most minor changes from natural densities	Some loss, with replacement by functionally equivalent Sensitive-ubiquitous taxa	Absent

Biological Criteria

- Numeric and narrative rating of a biological sample collected at a single site that supports assessment at multiple scales.
- Biocriteria are indexed to a reference assemblage within a geographical region and with respect to strata such as watershed size, temperature, ecotype, etc.
- Biocriteria represent a calibrated assessment tool that can foster an organized approach to goal setting in an effort to ***reconcile human impacts and guide restoration efforts.***



What Else Can a TALU Process Help Deliver to WQ Management?

- Refined physical and chemical management endpoints (e.g., habitat, nutrients, non-traditional parameters)
- A mechanism for validating new and/or revised water quality criteria (e.g., D.O., NH3-N, dissolved metals)
- Stratification of policy applications (minor POTW, 401 reviews)

Barberry Creek Total Maximum Daily Load (TMDL)

Judge TALU programs by their "products".

An example of an "innovative" approach compared to the convention of TMDLs focused on individual pollutants.

Souman Model
Partnership for Environmental Technology Education (PETE)
584 Main Street, South Portland, ME 04106

and

Maine Department of Environmental Protection
Bureau of Land & Water Quality
Division of Environmental Assessment
State House Station #17, Augusta, ME 04333

July 2006
Report # DEPLW0172

American Fisheries Society Symposium 45:000-000, 2005
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Judge TALU programs by their "products".

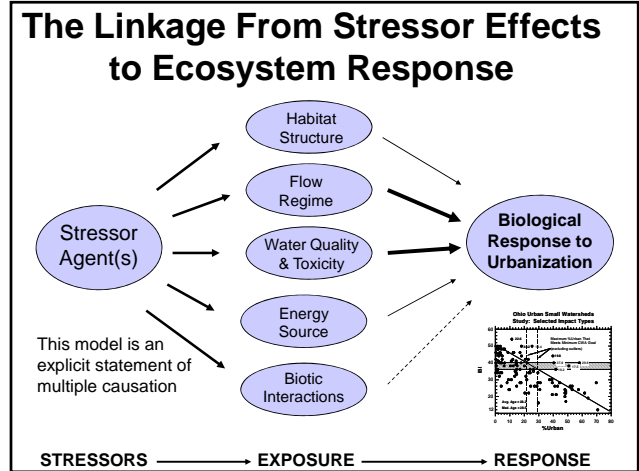
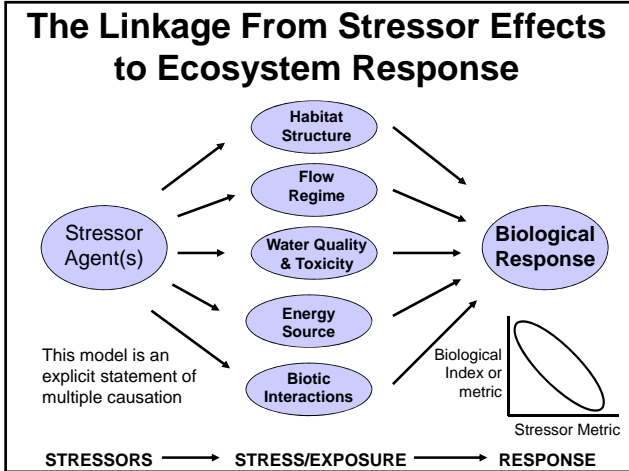
CHRIS O. YODER¹ AND EDWARD T. RANKIN

An example of the long term value of a sustained and systematic M&A effort. This helped validate two decades of NPDES permitting at POTWs & confirmed those policies.

applied in Ohio's rivers since 1979. A primary objective is the assessment of changes in response to water pollution abatement and other water quality management programs. All major, nonwadeable rivers were intensively sampled using standardized electrofishing methods and a summer-early fall index period. Most rivers were sampled two or three times, before and after implementation of pollution controls at major point source discharges and best management practices for nonpoint sources. A modified and calibrated

Major Parts of a TALU Based Program

- The TALU based approach includes tiered aquatic life uses (TALU) based on *numeric biological criteria in WQS*. **These comprise the TALU Process**
- Implementation is via an adequate ambient monitoring and assessment program that includes biological, chemical, and physical measures, parameters, indicators *and a process for stressor & source identification.*
- Bioassessment produces the justification for *WQS revisions before management actions are taken.*



States Evaluated Since 2002-4:

Region I: CT, ME, RI, MA, NH, VT ←

Region IV: AL, FL

Region V: IL, IN, MI, MN, WI, OH ←

Region VI: NM, TX, OK*

Region VII: MO, IA

Region VIII: CO, MT

Region IX: AZ, CA
plus selected Tribes
*- scheduled in 2009-10

Review Committee:

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

- ### State/Tribal Program Evaluation: 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 all technical & programmatic aspects (methods, indicators, WQS (ALUs)).
 - Assess capacity to support all water quality management programs.
 - Documents program strengths and fosters a continuous improvement process.

Key Concepts

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).

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. Taxonomic Resolution	✓		
	7. Sample collection	✓		
	8. Sample processing	✓		
	9. Data Management	✓		
Interpretation	10. Ecological attributes	✓		
	11. Biological endpoints			✓
	12. Diagnostic capability			✓
	13. Professional review		✓	

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 general condition assessments (i.e. 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.

1481 Technical Memorandum Connecticut DEP Bioassessment Program October 31 - November 2, 2006

TECHNICAL MEMORANDUM

Critical Technical Elements Evaluation of the Connecticut DEP Bioassessment Program

Connecticut DEP
Hartford, CT

October 31 - November 2, 2006

A principal product of the review process is a technical memorandum (15-25 pp.) that communicates program strengths and documents specific areas for continuing improvement.

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State TALU Status

CE Level	TALU ¹	In Development	None
Level 4 [2]	2	-	-
Level 3+ [3]	-	3	-
Level 3 [5]	-	3	2
Level 2 [11]	-	-	11
Level 1 [1]	-	-	1
Totals [22]	2	6	14

1 - Biologically based TALUs only. 9/29/2009

How Are TALU-Based CWA Programs Different?

<p>Non-TALU CWA Program Characteristics:</p> <ol style="list-style-type: none"> 1. Manages to minimum CWA 2. 3. 4. 5. priorities 6. Point source policy emphasis 7. Can lead to inconsistencies between states 	<p>Full TALU Program Characteristics:</p> <ol style="list-style-type: none"> 1. Manages to highest attainable 2. 3. 4. 5. priorities 6. Policies responsive to all sources 7. Consistency governed by BCG baseline
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TALU makes WQ management outcomes more accurate, equitable, and visible.

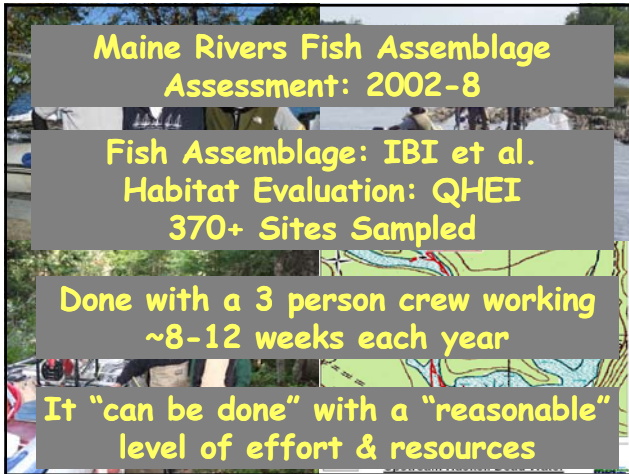
Administrative Output vs. Resource Outcomes Based Management

	ADMINISTRATIVE OUTPUTS BASED	RESOURCE END OUTCOMES BASED
Goal:	Program Performance (Program execution)	Environmental Performance (Attain designated uses)
Measures:	Administrative Actions (Lists, Permits, Funding, Rules)	Indicator End-points (Biological, Chemical, Physical)
Results:	Improve Programs (Reduce backlogs, improve timeliness)	Programs are Tools to Improve the Environment (Admin. outputs evaluated by environmental end outcomes)

TALU Fosters Effectiveness Based Programs

Is This "Stuff" Doable?

- Many believe the level of effort required is either not available nor sustainable.
- The two states that have adopted a TALU approach also do "everything else" that EPA requires - proof that it can be done.
- Many examples of how to get it done exist - just need to know where to look.



**Maine Rivers Fish Assemblage
Assessment: 2002-8**

**Fish Assemblage: IBI et al.
Habitat Evaluation: QHEI
370+ Sites Sampled**

**Done with a 3 person crew working
~8-12 weeks each year**

**It "can be done" with a "reasonable"
level of effort & resources**