

KEY ISSUES AND UNDERLYING CONCEPTS IN USE ATTAINABILITY ANALYSES FOR AQUATIC LIFE DESIGNATED USES

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Aquatic Life Use

Definition:

A designation (classification) assigned to a waterbody based on the ***potential*** aquatic assemblage that can realistically be sustained given the regional reference condition and the level of protection afforded by the applicable criteria.

Tiered Aquatic Life Uses

Ohio WQS:

- Uses defined as narratives.
- Chemical & biological criteria assigned to each in accordance with the attributes described in the use narrative.

Uses Are Assigned Based on (in order of importance):

- Attainment of the biocriteria.
- Habitat assessment demonstrates potential for a particular TALU.

Use Attainability Analysis

U.S. EPA Regulations Allow Lower than CWA Goal Use Where Precluded by:

- Naturally occurring pollutant levels.
- Natural flow conditions.*
- ***Human induced conditions that cannot be remediated.***
- ***Hydrologic modifications (channel modifications) which cannot be made in a manner consistent with a CWA goal use.***
- Natural physical features (substrate, depth, etc.).
- Adverse, widespread socioeconomic impacts.

**Criteria for 99.99%
of UAAs in Ohio**



Ohio's Public Policy Debate over Drainage Ditches

Dan Dudley

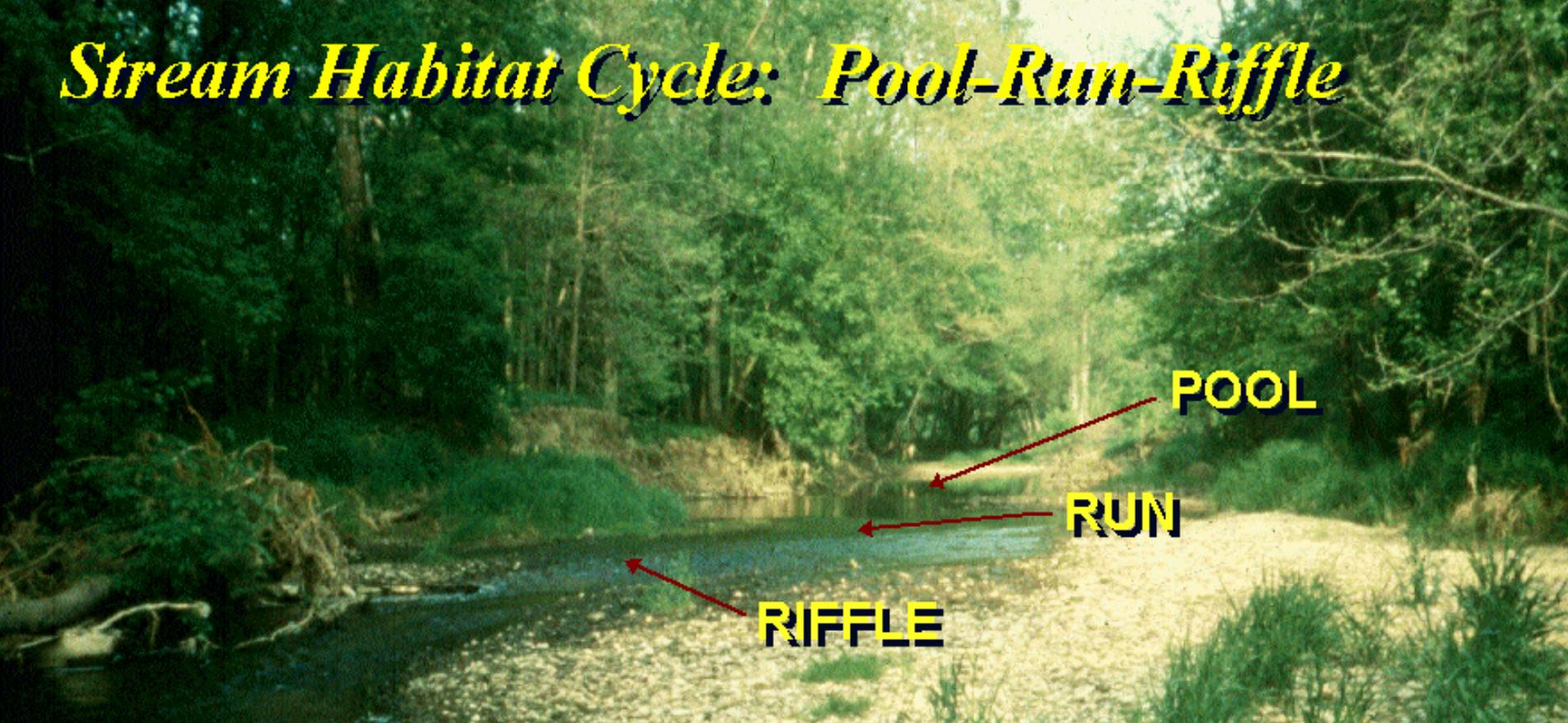
Manager, Water Quality Standards

Ohio EPA, Division of Surface Water

Direct and indirect manipulation of the stream channel and/or riparian zone occurs for a wide variety of purposes. Most have serious and sometimes irretrievable effects on aquatic ecosystems. *Compared to point sources, these are not well managed and regulated and represent a major challenge to efforts to reach 21st century environmental goals and conserve existing ecological resources.*



Stream Habitat Cycle: Pool-Run-Riffle



POOL

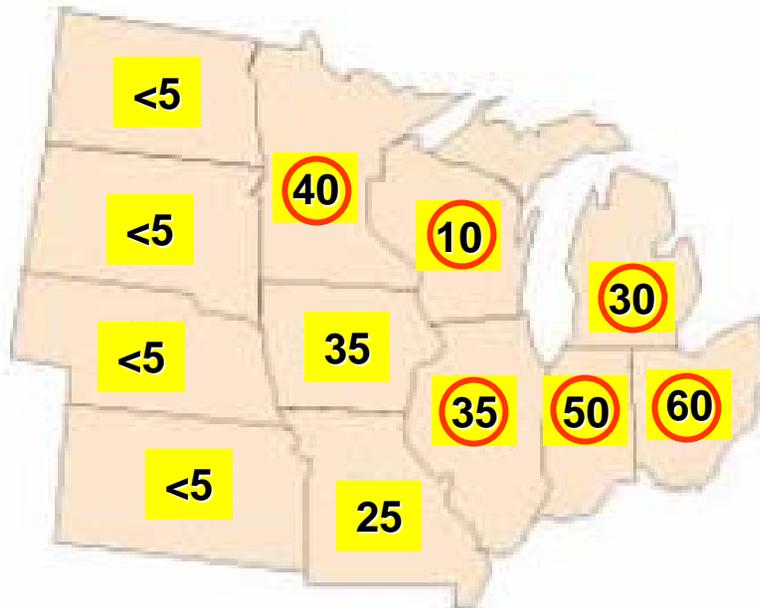
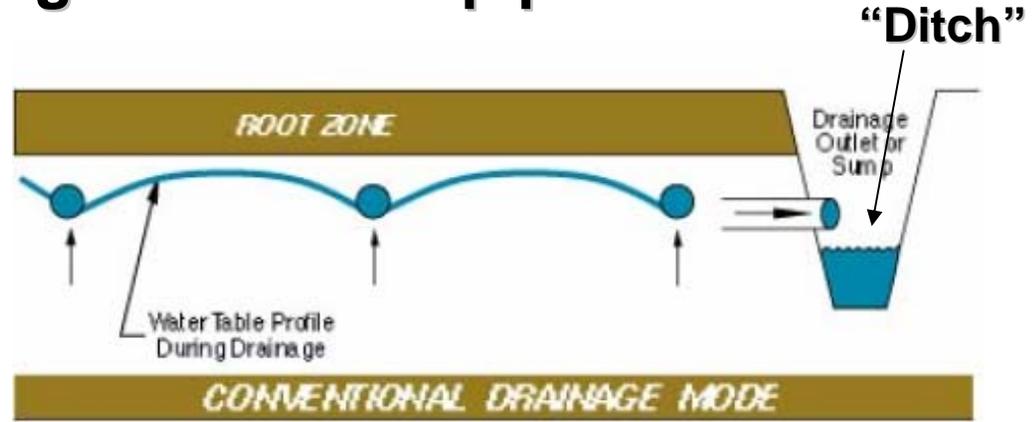
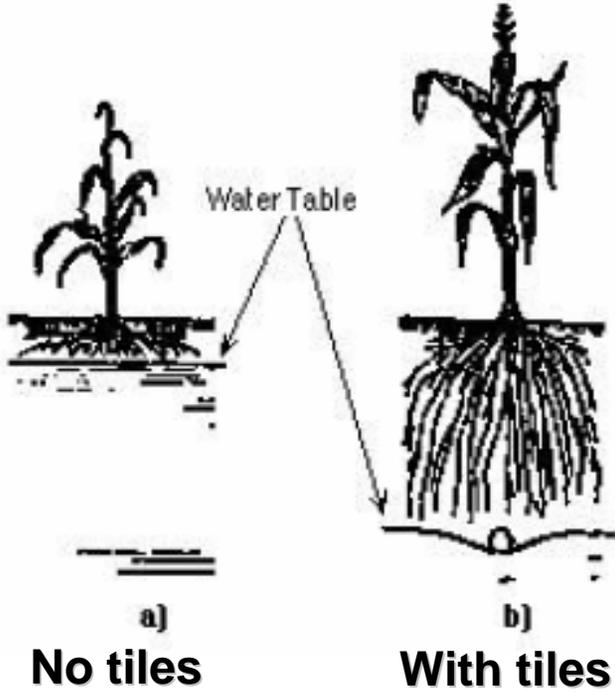
RUN

RIFFLE

**Documenting the ecological consequences of
habitat alterations:**

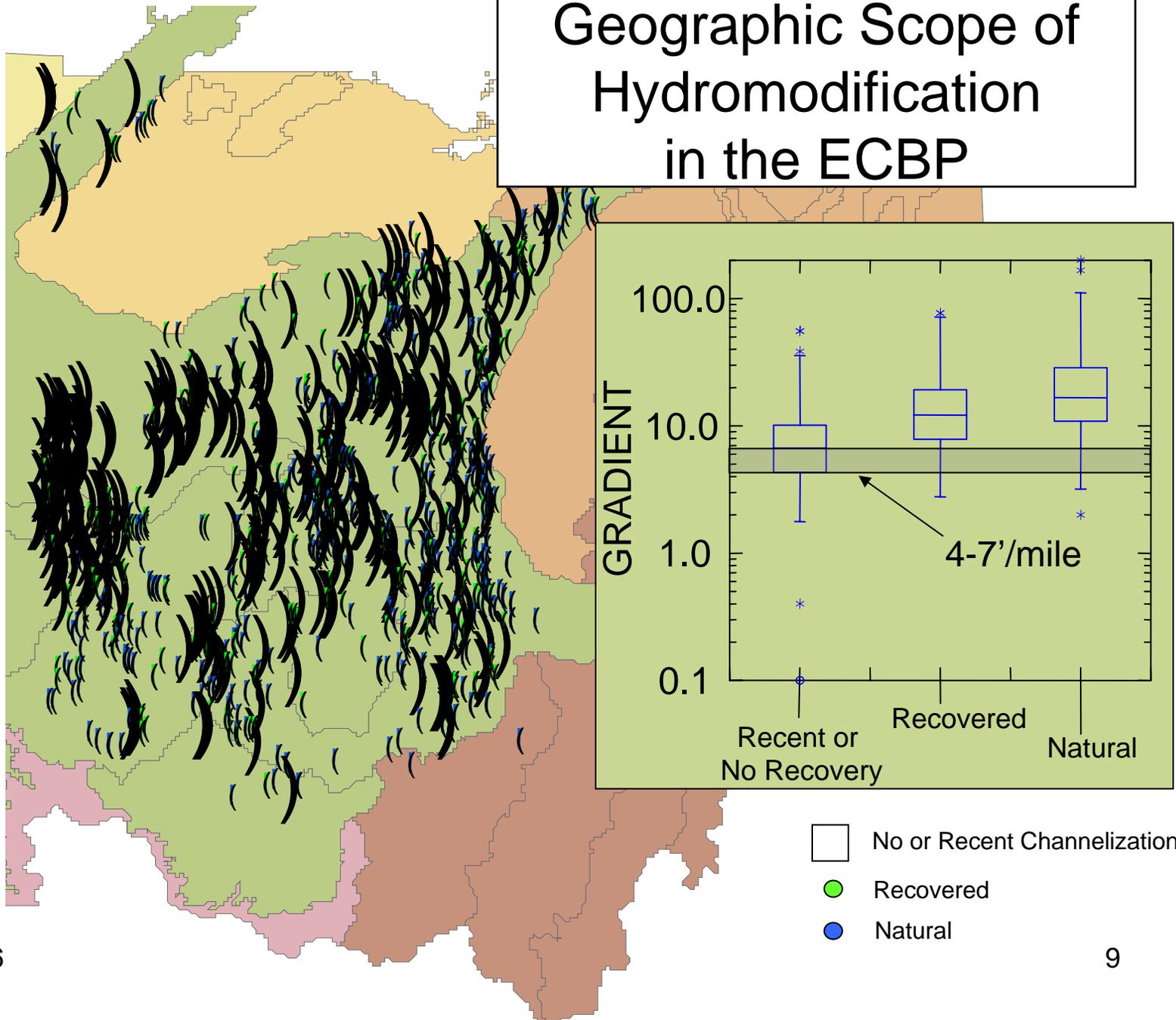
**Unpublished results of the bioassessment of
agricultural associated hydromodifications in
Ohio: 1980-1995**

Streams are channelized to improve subsurface drainage for the benefit of agricultural crop production

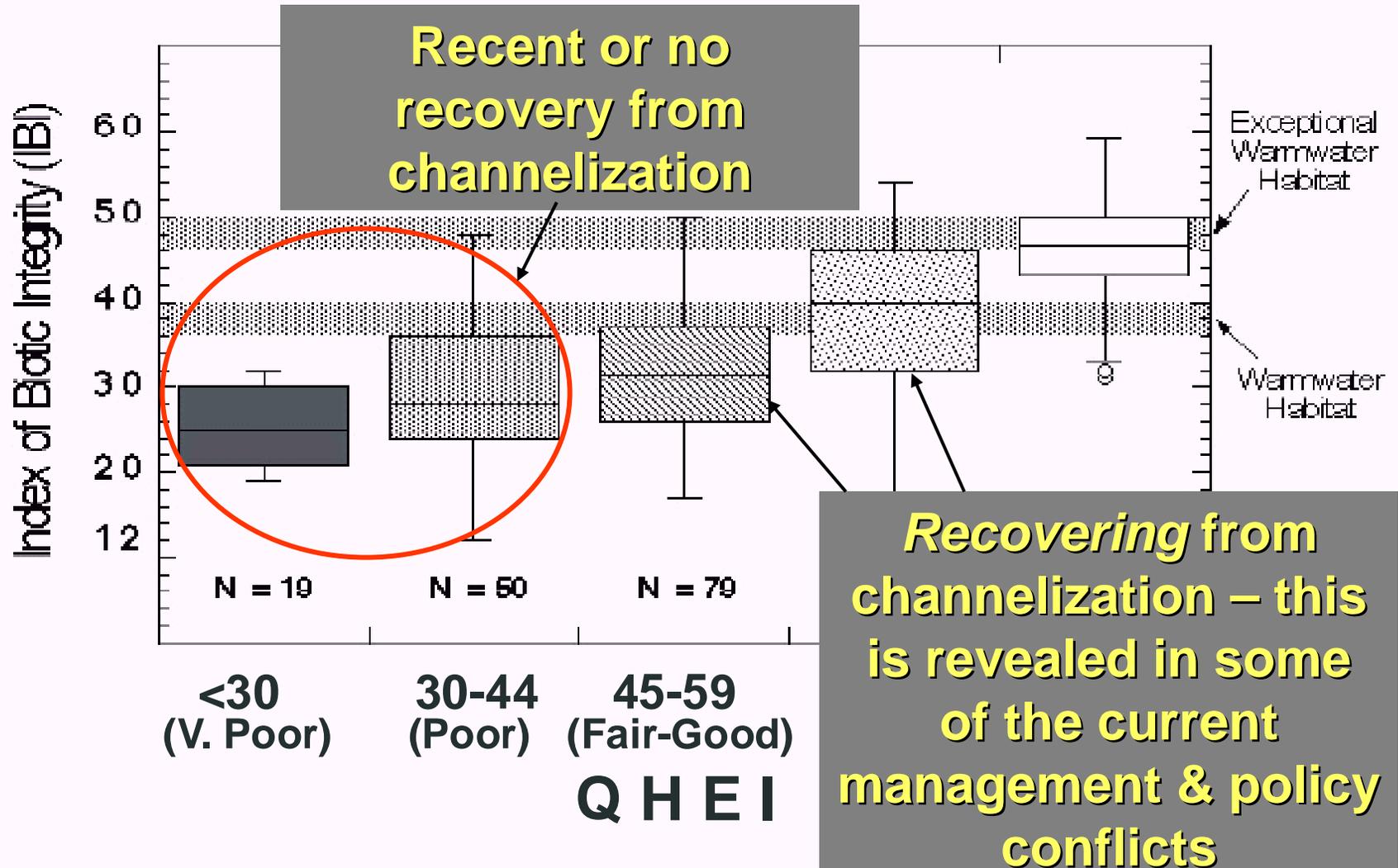


Percentages of agricultural lands that have subsurface drainage in the Corn Belt region of the U.S.

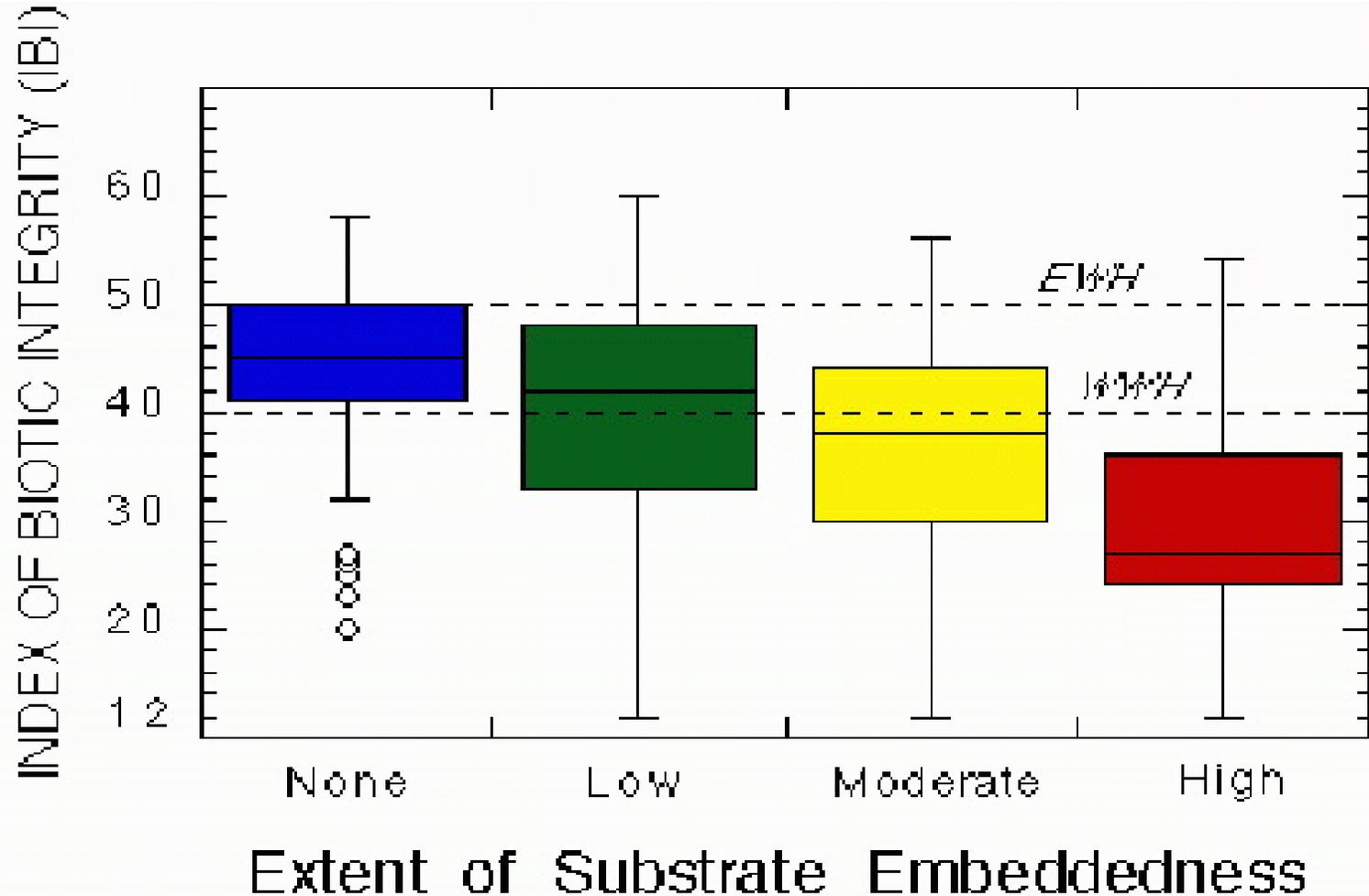
Geographic Scope of Hydromodification in the ECBP

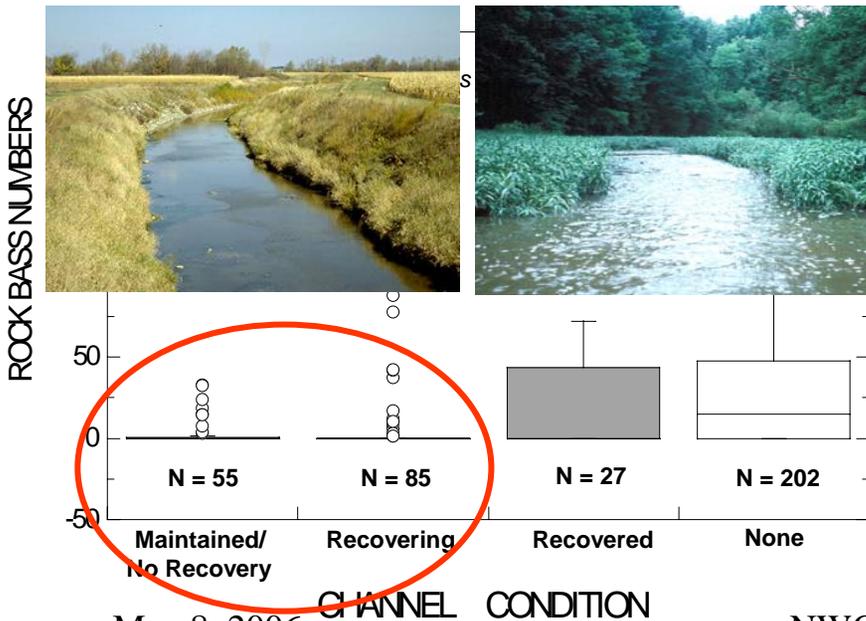
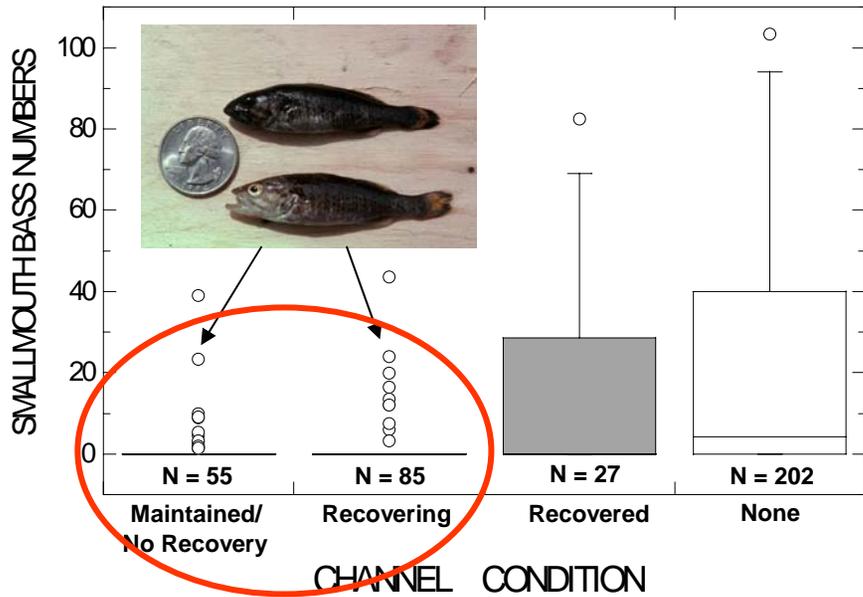


BIOLOGICAL CONDITION IS CORRELATED WITH HABITAT QUALITY: IBI



Substrate Condition Affects the Ability to Meet Designated Uses





May 8, 2006

NWQMC

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

We cannot deal effectively with issues like channelization unless a framework is established via TALU and biocriteria

Monitoring and Assessment

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

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

**Ohio's and Maine's programs are
highlighted as case examples**

Available August 2005

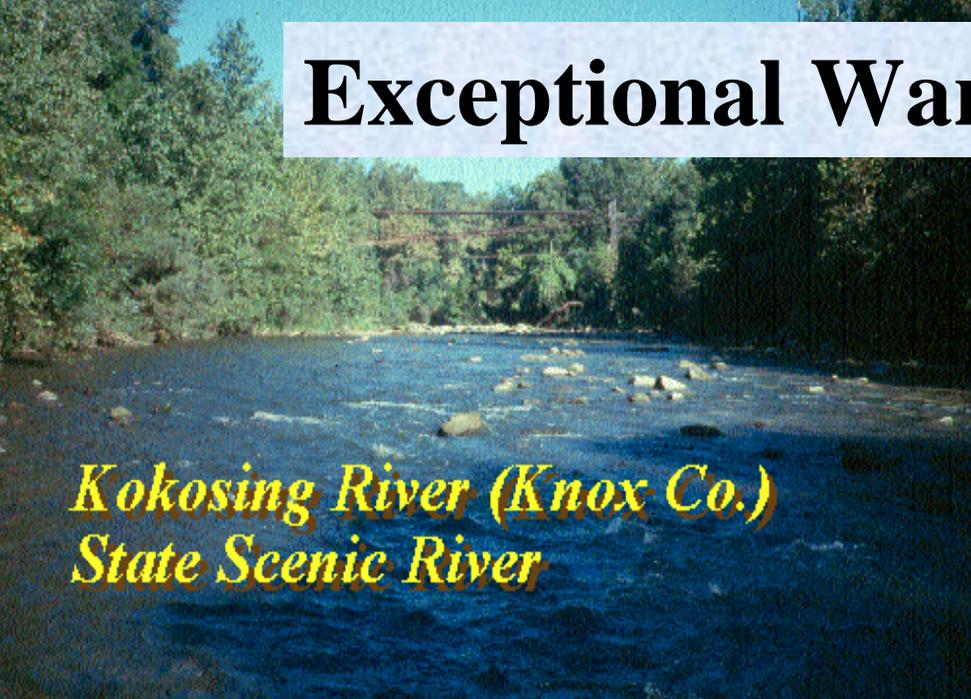
**REVIEW
DRAFT**

Ohio TALUs

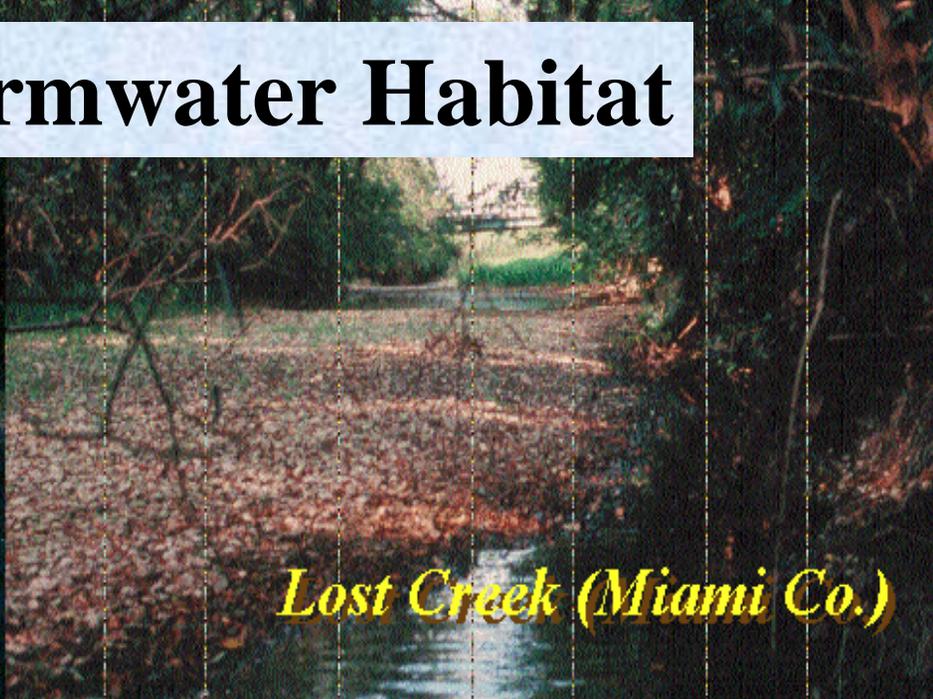
Based on biological assemblage attributes:

- ***Exceptional Warmwater Habitat - preserve & maintain existing high quality.***
- ***Warmwater Habitat – the baseline restoration goal for most streams and rivers.***
- ***Modified Warmwater Habitat - best attainable condition for streams under drainage maintenance or other irreversible hydromodification.***
- ***Limited Resource Waters – irretrievable human induced conditions (e.g., virtual elimination of habitat).***

Exceptional Warmwater Habitat



*Kokosing River (Knox Co.)
State Scenic River*



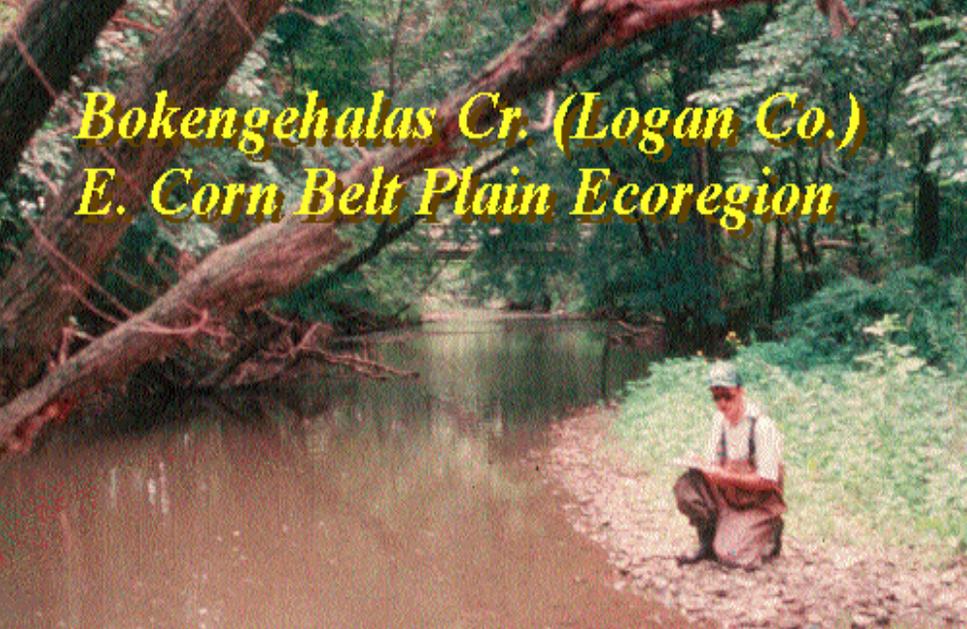
Lost Creek (Miami Co.)



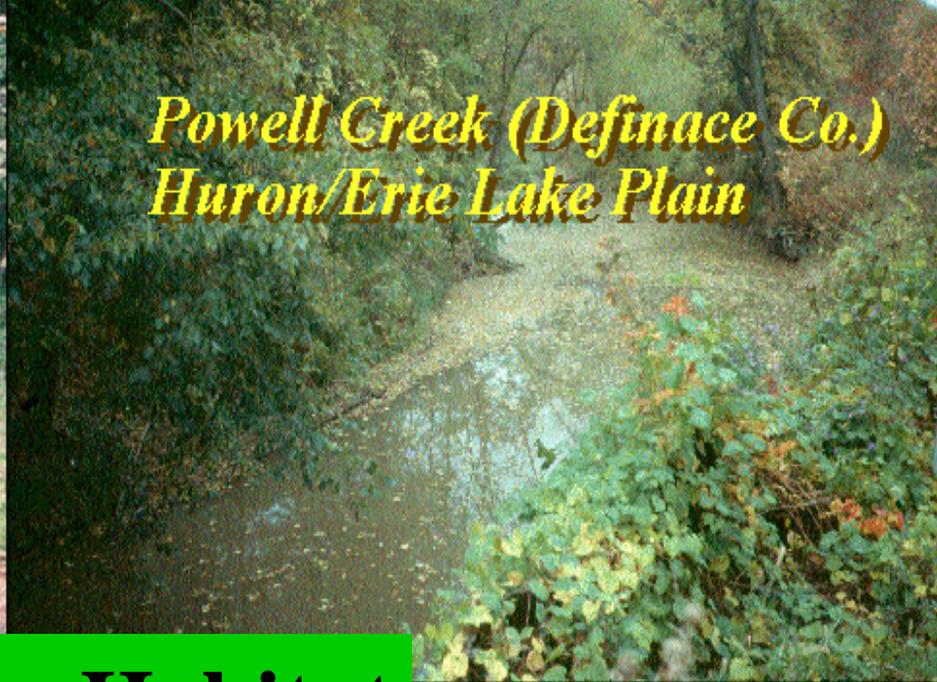
*Big Darby Creek (Madison Co.)
State and National Scenic River*



*Bluebreast darter
(*Etheostoma camurum*)
Ohio Threatened Species*



*Bokengehalas Cr. (Logan Co.)
E. Corn Belt Plain Ecoregion*



*Powell Creek (Defiance Co.)
Huron/Erie Lake Plain*

Warmwater Habitat



*Wolf Creek (Summit Co.)
Erie/Ontario Lake Plain Ecoregion*



*Duck Cr. Subbasin (Wash. Co.)
W. Allegheny Plateau Ecoregion*

*Drainage Maintenance is Common in Western and Northwest Ohio:
MWH - Channelization*



*Low-head Dam on the Scioto R.
(Franklin Co.): MWH - Impounded*

Modified Warmwater Habitat

*Non-Acidic Runoff From
Abandoned Mine Lands Results in
Severe Sedimentation: MWH -
Mine Drainage*



*Creek Chub With Blackspot:
MWH Streams are Predominated
by Tolerant Species*



*E. Fk. Duck Cr. - Hamilton
Co.; LRW - Small
Drainageway Maintenance*

*Hurford Run - Stark Co.;
LRW - Small Drainageway
Maintenance*

Limited Resource Waters

*Moxahalla Cr. - Perry Co.;
LRW - Acid Mine Drainage*

*Cuyahoga River Navigation
Channel; Cuyahoga Co.
LRW - Other*

TABLE B-4. Key features associated with tiered aquatic life uses in the Ohio WQS (OAC 3745-1-07).

Aquatic Life Use	Key Attributes	Why a Waterbody Would Be Designated	Practical Impacts (compared to a baseline of WWH)
Warmwater Habitat (WWH)	Balanced assemblages of fish/invertebrates comparable to least impacted regional condition	Either supports biota consistent with WWH biocriteria; or support recovery of the aquatic fauna	Baseline regulatory requirements consistent with the CWA "fishable" and "protection & propagation" goals; criteria consistent with EPA guidance with State/regional modifications as appropriate
Exceptional Warmwater Habitat (EWH)	Unique and/or diverse assemblages; comparable to upper quartile of statewide reference condition	Attainment of the EWH biocriteria demonstrated by both organism groups	More stringent criteria for D.O., temperature, ammonia, and nutrient targets; more stringent restrictions on dissolved metals translators; restrictions on nationwide dredge & fill permits; may result in more stringent wastewater treatment requirements
Coldwater Habitat (CWH)	Sustained presence of Salmonid or non-salmonid coldwater aquatic organisms; bonafide trout fishery	Bioassessment reveals coldwater species as defined by Ohio EPA (1987); put-and-take trout fishery managed by Ohio DNR	Same as above except that common metals criteria are more stringent; may result in more stringent wastewater treatment requirements
Modified Warmwater Habitat (MWH) ↑	Warmwater assemblage dominated by species tolerant of low D.O., excessive nutrients, siltation, and/or habitat modifications ↑	Impairment of the WWH biocriteria; existence and/or maintenance of hydrological modifications that cannot be reversed or abated to attain the WWH biocriteria; a use attainability analysis is required	Less stringent criteria for D.O., ammonia, and nutrient targets; less restrictive applications of dissolved metals translators; Nationwide permits apply without restrictions or exception; may result in less restrictive wastewater treatment requirements
Limited Resource Waters (LRW)	Highly degraded assemblages dominated exclusively by tolerant species; should not reflect acutely toxic conditions	Extensive physical and hydrological modifications that cannot be reversed and which preclude attainment of higher uses; a use attainability analysis is required	Chemical criteria are based on the prevention of acutely lethal conditions; may result in less restrictive wastewater treatment requirements

Baseline CWA Expectation

Principal Objectives of Systematic Bioassessment Under TALU

- **Determine if use designations are appropriate and attainable**
- **Determine condition and status of the resource (including causal associations)**
- **Are changes taking place over time?**

TABLE B-6. Summary of recommendations for use designations in the Big Darby Creek watershed based on a biological and water quality assessment completed in 2000. Symbols are listed for the existing designation/recommended designation (_ - undesignated; + - verified by biosurvey; * - unverified default designation from 1978 or 1985 WQS).

Water Body Segment	Use Designations												
	S R W	Aquatic Life Habitat						Water Supply			Recreation		
		W W H	E W H	M W H	SS H	C W H	L R W	P W S	A W S	I W S	B W	P C R	S C R
Big Darby Creek (02-200) ^a		*	+				+		**	**		**	
Flat Branch (02-223) (RM 1.5 to mouth)			* +										
Tributary to Flat Branch (02-365) (RM 1.5)													
Little Darby Creek (02-251) (RM 78.34) RM 3.5 to mouth			+				+						
U.T. to B. Darby Cr. (02-361) (RM 74.91) RM 0.75 to mouth			-	+									
Spain Creek (02-222) (RM 74.3) - Headwaters to RM 5.0		+	*				+						
RM 5.0 to mouth			**				+						
Pleasant Run (02-221) (RM 72.01)			**										

Default assigned in 1978 by tributary membership

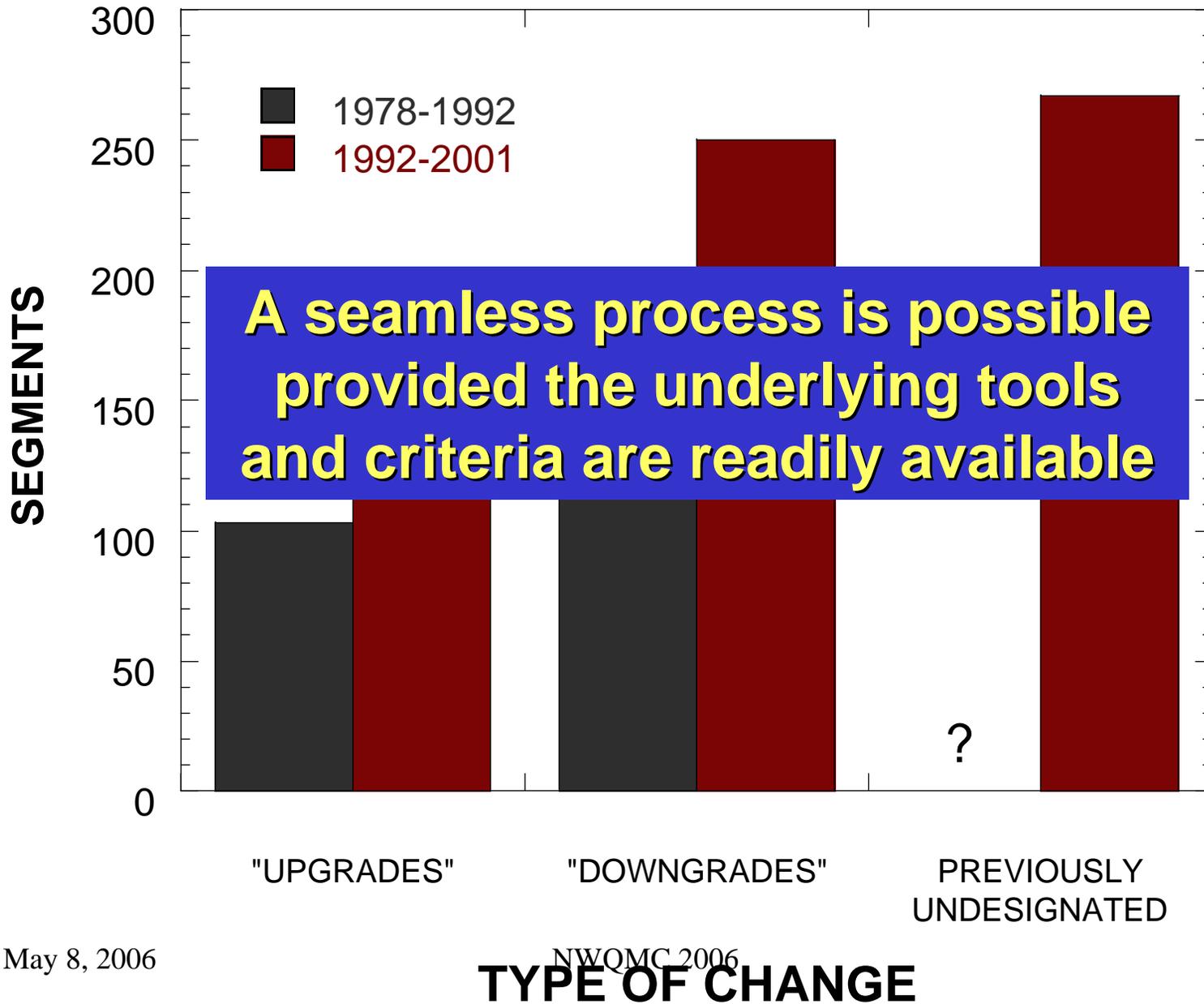
Use assigned by M&A and UAA

Darby contrasts

Down river



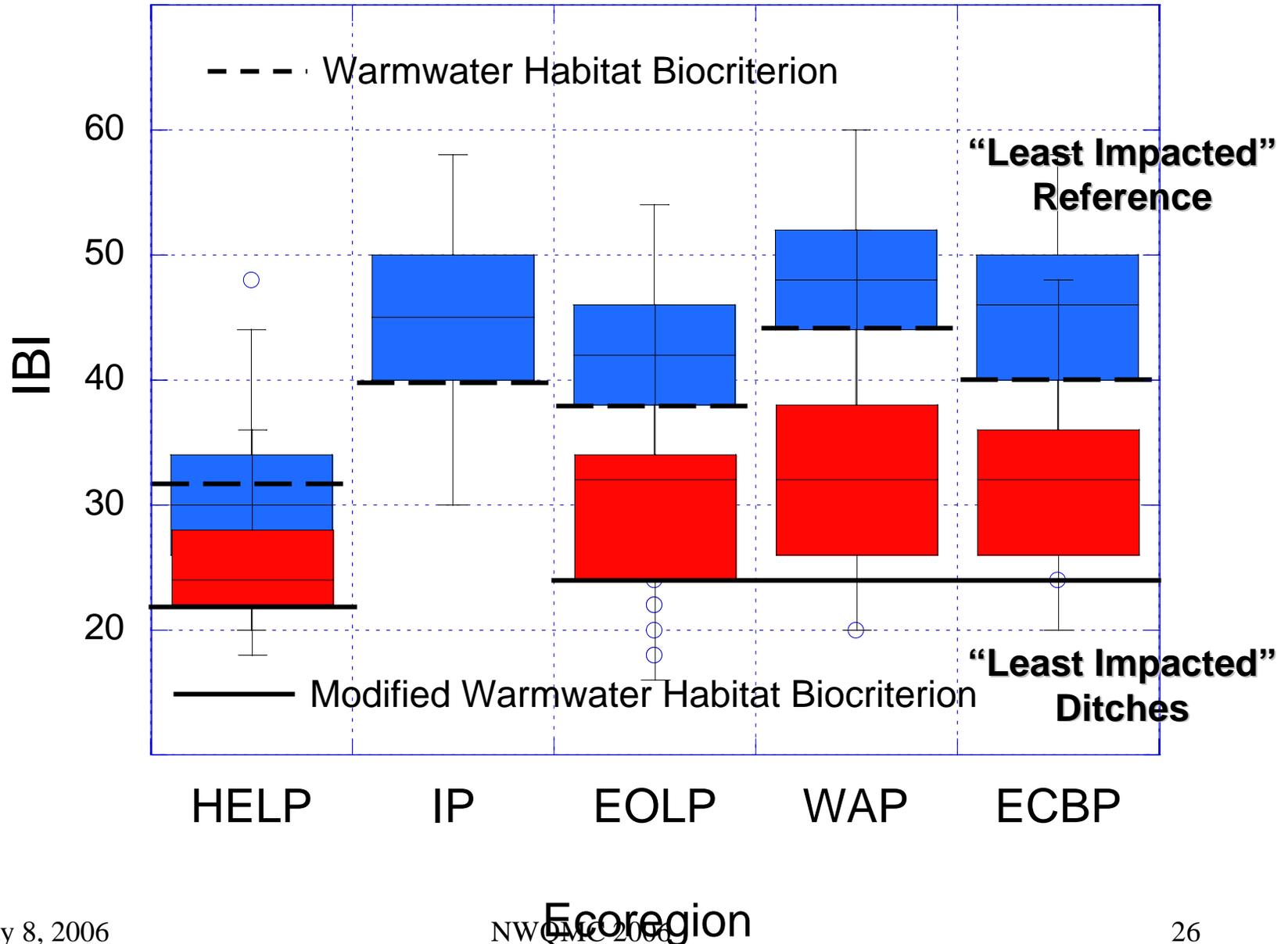
AQUATIC LIFE USE CHANGES: OHIO WQS (1978 - 2001)



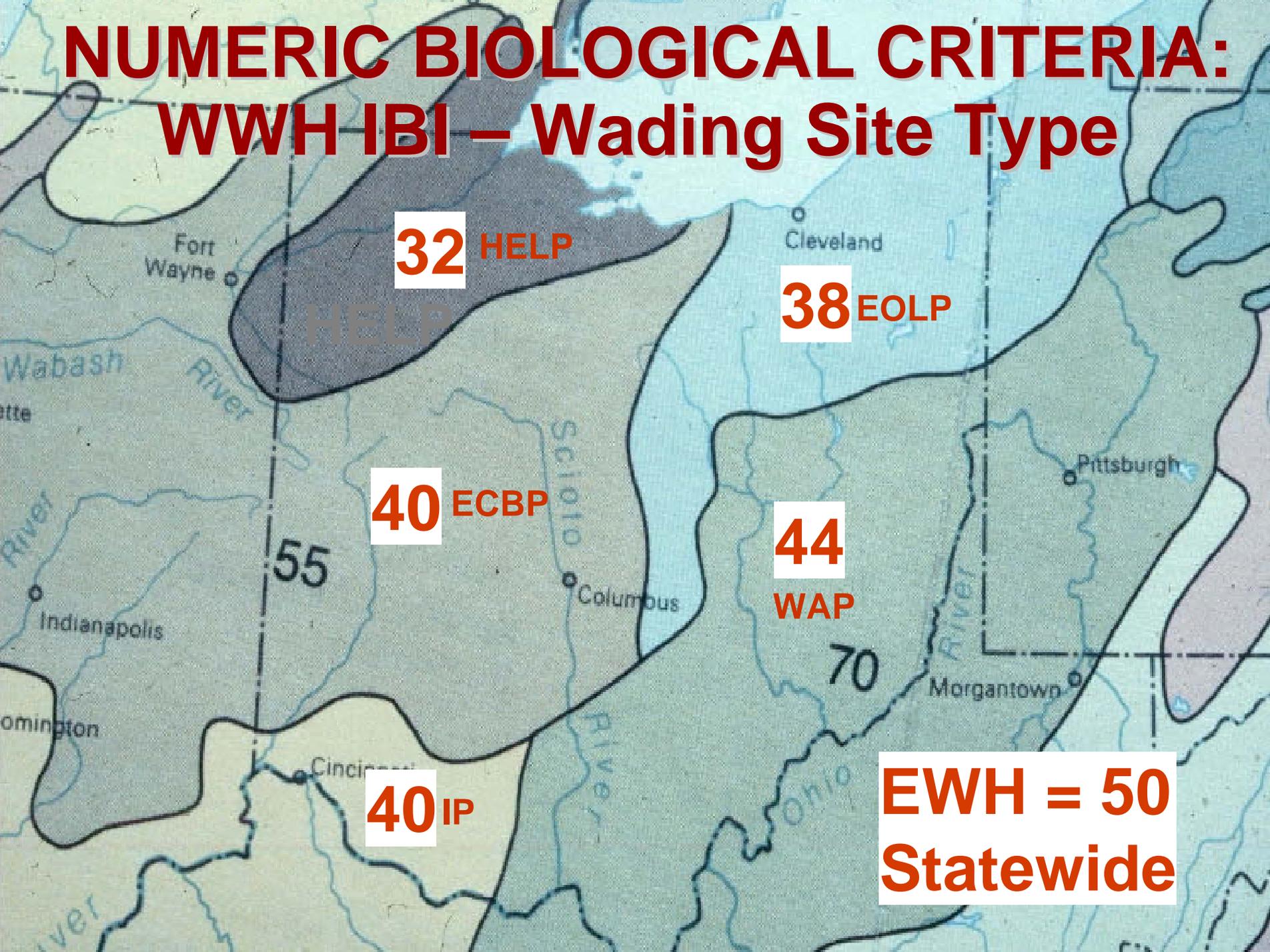
Biological Criteria

- **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.**

Derivation of IBI Biocriteria for WWH and MWH



NUMERIC BIOLOGICAL CRITERIA: WWH IBI – Wading Site Type



32 HELP

38 EOLP

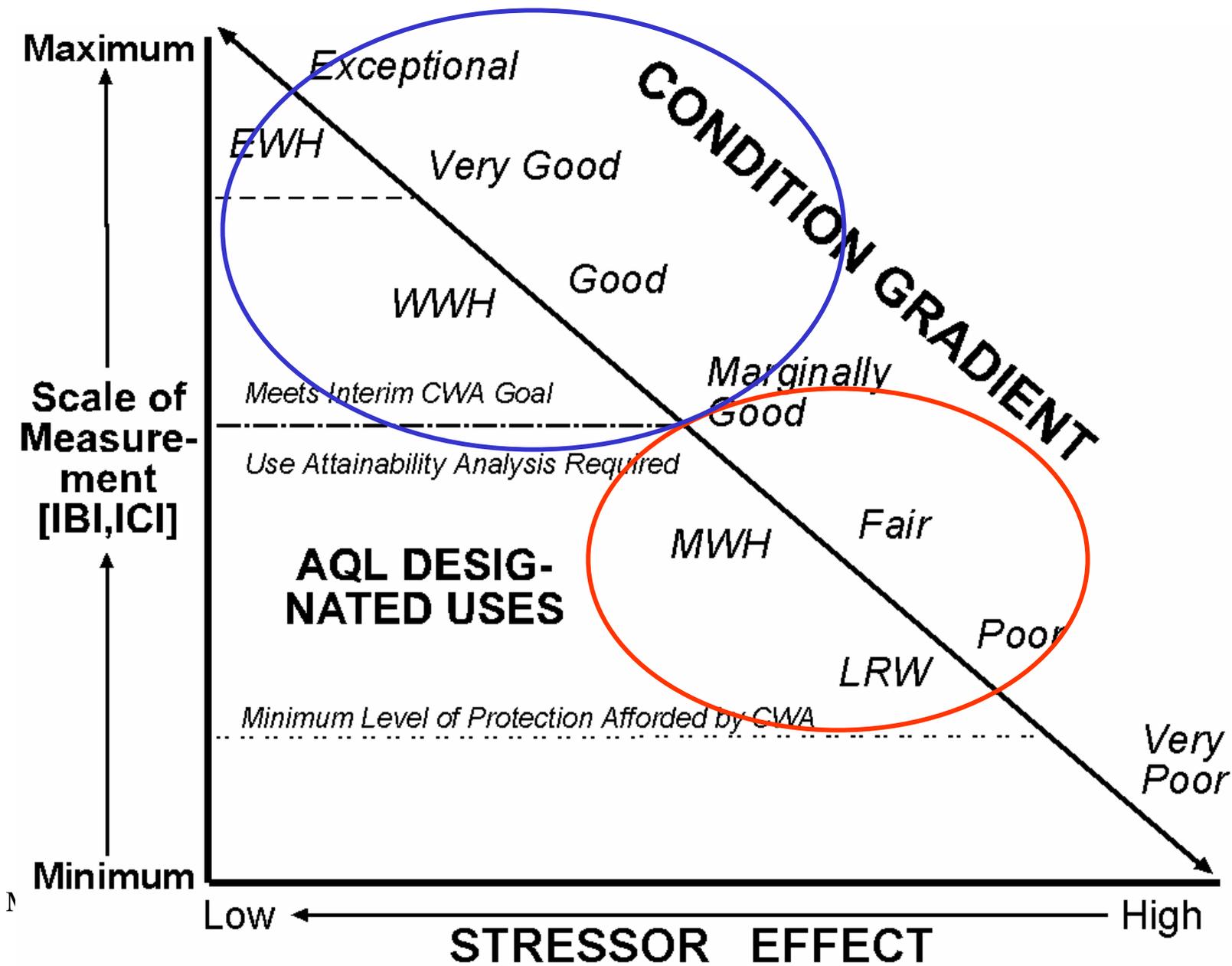
40 ECBP

44
WAP

40 IP

EWH = 50
Statewide

DESIGNATED USE OPTIONS ALONG THE BIOAXIS AND BIOLOGICAL CONDITION GRADIENT

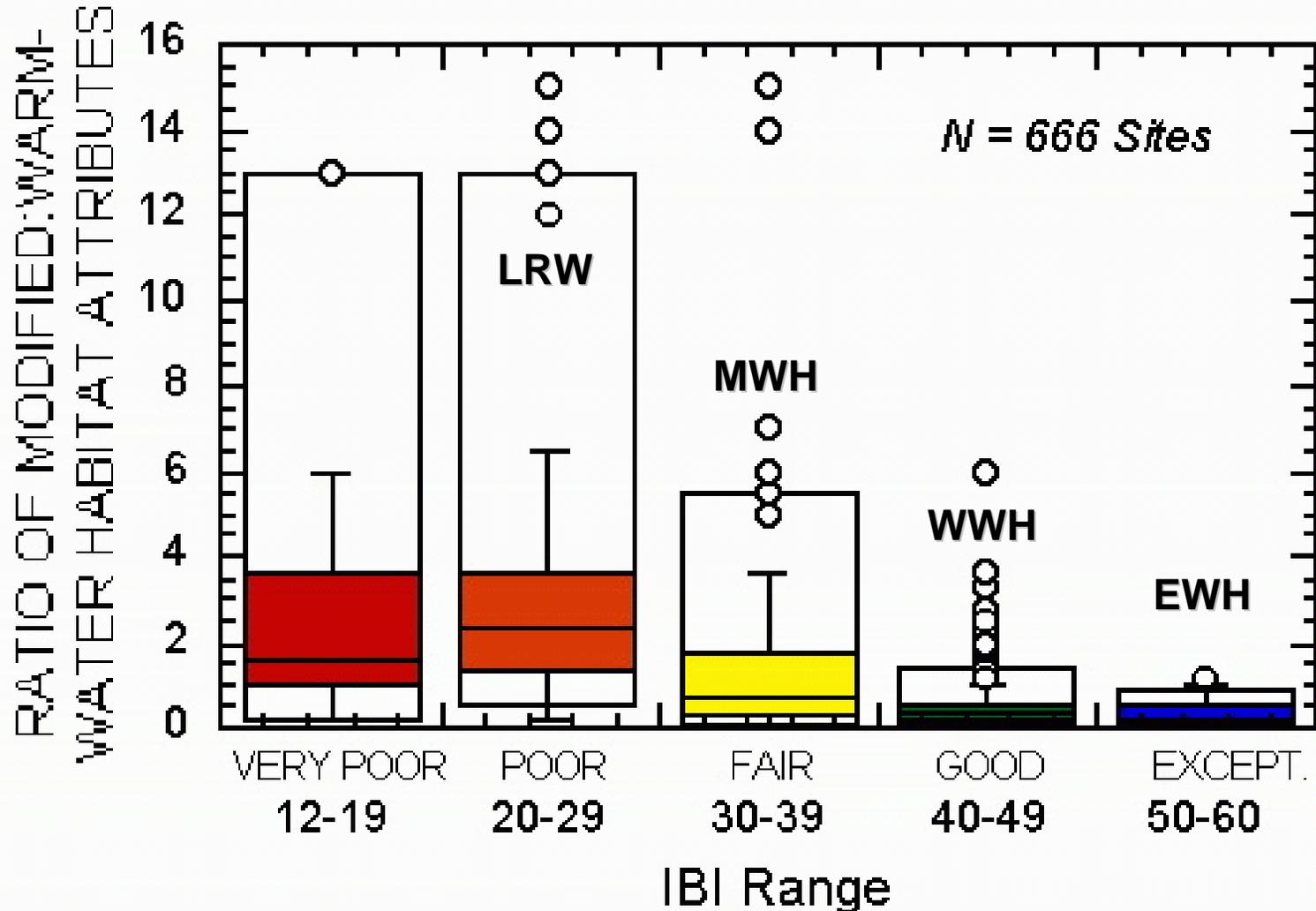


Use Attainability Analyses: Process & Information Requirements

UAAs require the following:

- *Existing status of waterbody based on a bioassessment.*
- *Habitat assessment to demonstrate potential.*
- *Reasonable relationship between the impaired state and the precluding activity based on assessment of multiple indicators used in their most appropriate roles.*
- Recommendation is subject to rulemaking process.
- Reviewable on a periodic basis – not irreversible.

Influence of Modified Habitat Attributes on the IBI and Biological Integrity



Adequate Monitoring & Assessment and Sufficiently Detailed WQS Are Essential to Sound UAA Practice

- UAAs are a routine outcome of adequate M&A.
- Data & assessments to support UAA are produced in a consistent and timely manner.
- Tiered uses and calibrated biocriteria anchor determinations of existing status & potential.
- Focus is on outcome of assessment – terms “upgrade” and “downgrade” are not particularly relevant.