NEW ENGAND RIVERS FISH ASSEMBLAGE ASSESSMENT: REGION I REMAP PROJECT 2008-9

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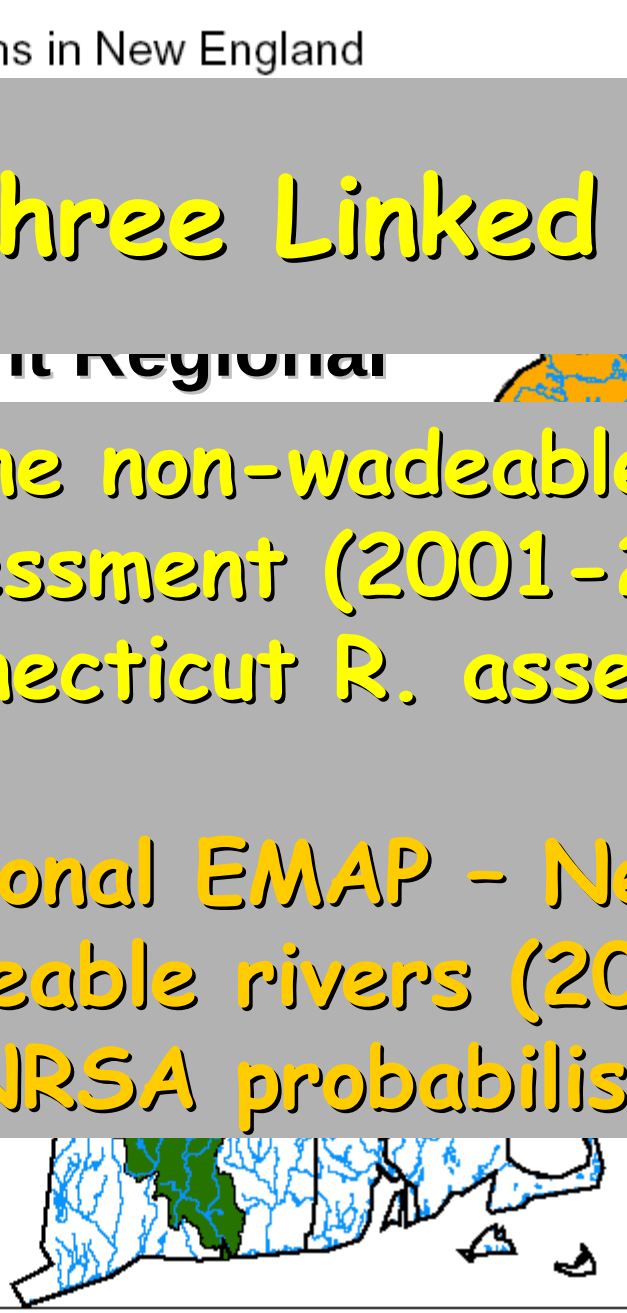
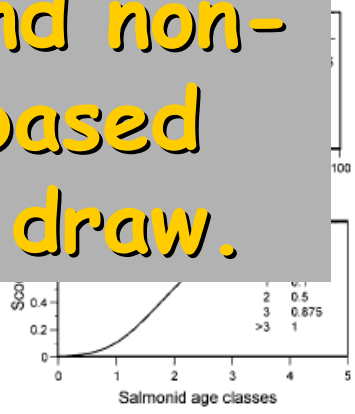
Major River Basins in New England



Three Linked Projects:

1. Maine non-wadeable rivers assessment (2001-2007)
2. Connecticut R. assessment (2008-9).
3. Regional EMAP – New England non-wadeable rivers (2008-9); based on NRSA probabilistic sites draw.



Why Knowledge of the Fish Assemblage is Important

Current Issues:

- **We used to say this just about Maine, but it applies to the rest of New England.**

species and their respective influence.

- **Naturally Depauperate Fauna** – cold water, coastal drainages – "how will these respond?"
- **Assess Potential Conflicts with High Profile Restoration Goals** – do non-native species pose an unintentional deterrent?

REMAP Target Population: Non-Wadeable Rivers, i.e., where a boat or raft platform is needed to effectively sample the fish assemblage

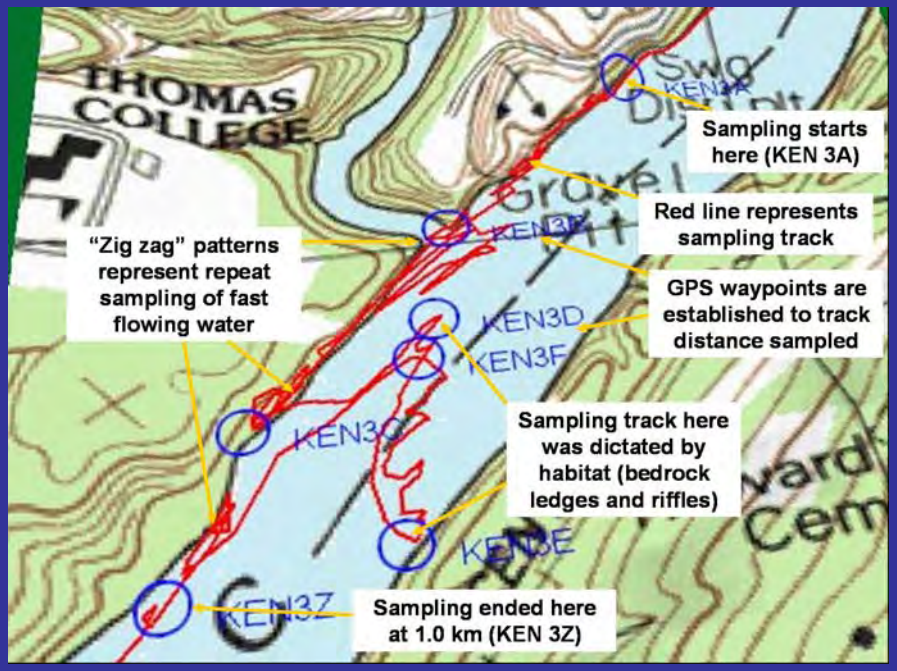
Sampling Methods

Developed and tested in Maine 2002-7

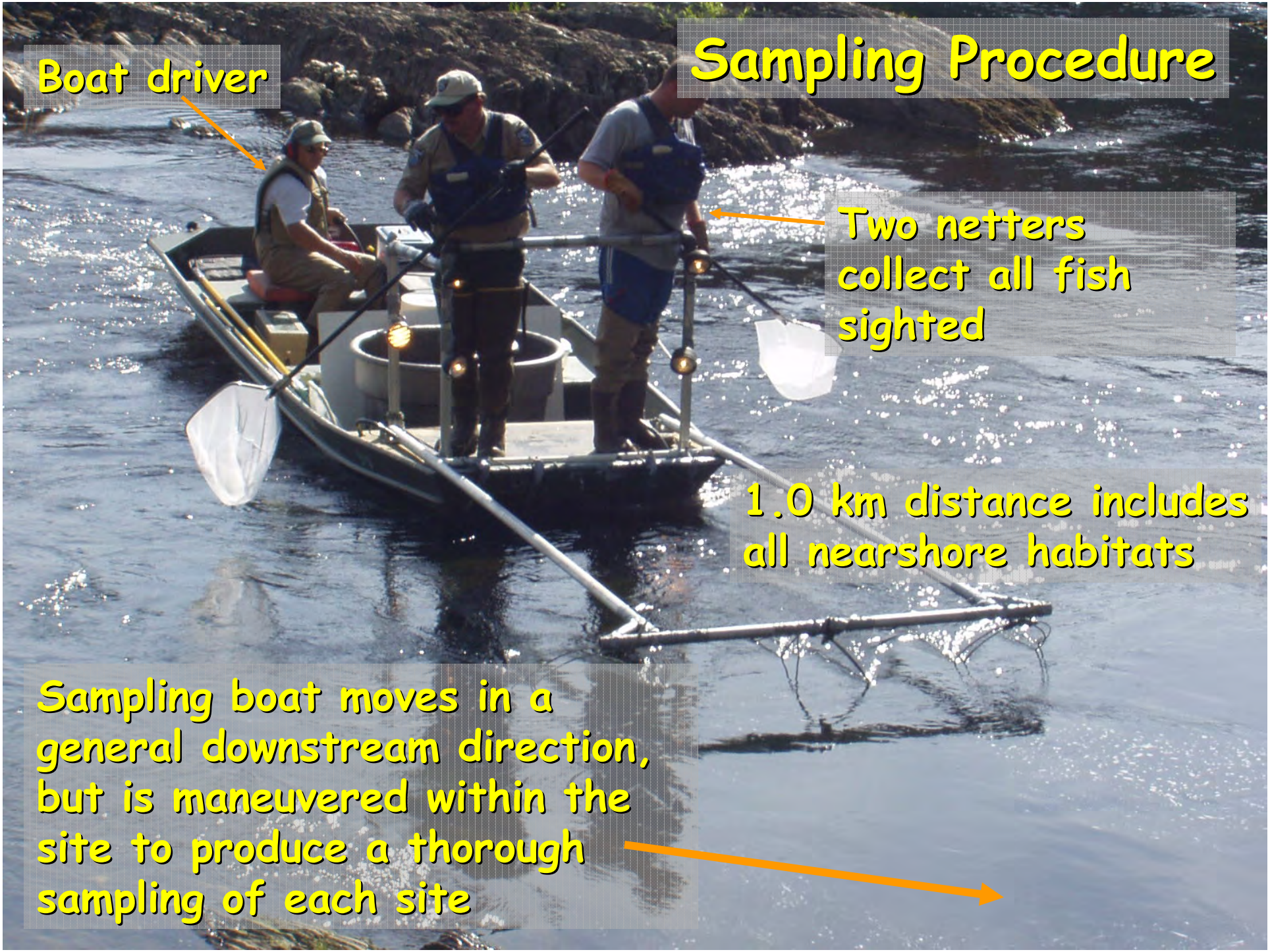
Standardized Approach:

- Pulsed D.C. boat electrofishing – effort indexed to distance
- Electrode array customized for Maine river conditions
- Intensive survey design – mainstem & non-wadeable tribs.
- Field water quality and habitat data
- July 1 – September 30 index period

- Sampling guided by a QAPP
- Standardized sampling to yield comparable data
- All representative habitat types within each site



- Geo-referenced sample site location and sample track
- Fish are identified to species, enumerated, and weighed
- DELT anomalies recorded



Developed in 2005 to Access Medium Sized and Shallower Rivers

Launching & Retrieving

Smith-Root 2.5 GPP Unit

Qualitative Habitat Evaluation Index Field Sheet

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QHEI Score: ____

River Code: ____ *RM:* ____ *Stream:* ____

Site Code: ____ *Project Code:* ____ *Location:* ____

Date: ____ *Scorer:* ____ *Latitude:* ____ *Longitude:* ____

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent

TYPE	POOL	RIFFLE		POOL	RIFFLE
☐☐ -BLDR/SLBS [10]			☐☐ -GRAVEL [7]		
☐☐ -Lg BOULD [10]			☐☐ -SAND [6]		
☐☐ -BOULDER [9]			☐☐ -BEDROCK [5]		
☐☐ -COBBLE [8]			☐☐ -DETRITUS [3]		
☐☐ -HARDPAN [4]			☐☐ -ARTIFICIAL [0]		
☐☐ -MUCK [2]			☐☐ -SILT [2]		

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]

(High Quality Only, Score 5 or >) ☐ -3 or Less [0]

SUBSTRATE ORIGIN — Check ONE (OR 2 & AVERAGE)

☐ -LIMESTONE [1]
☐ -TILLS [1]
☐ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY — Check ONE (OR 2 & AVERAGE)

SILT:
☐ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]

EMBEDDEDNESS:
☐ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

Substrate ____ Max 20

COMMENTS: ____

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure)
____ UNDERCUT BANKS [1]
____ OVERHANGING VEGETATION [1]
____ SHALLOWS (IN SLOW WATER) [1]
____ ROOTMATS [1]

TYPE: Score All That Occur
____ POOLS > 70 cm [2]
____ ROOTWADS [1]
____ BOULDERS [1]

____ OXBOWS, BACKWATERS [1]
____ AQUATIC MACROPHYTES [1]
____ LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☐ -MODERATE 25 - 75% [7]
☐ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover ____ Max 20

COMMENTS: ____

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☐ -MODERATE [3]
☐ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☐ -FAIR [3]
☐ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☐ -RECOVERING [3]
☐ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILTIY
☐ -HIGH [3]
☐ -MODERATE [2]
☐ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☐ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel ____ Max 20

COMMENTS: ____

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH

L	R	(Per Bank)
☐	☐	-VERY WIDE > 100m [5]
☐	☐	-WIDE > 50m [4]
☐	☐	-MODERATE 10 - 50m [3]
☐	☐	-NARROW 5 - 10m [2]
☐	☐	-VERY NARROW < 5m [1]
☐	☐	-NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*)

L	R	(Most Predominant Per Bank)
☐	☐	-FOREST, SWAMP [3]
☐	☐	-SHRUB OR OLD FIELD [2]
☐	☐	-RESIDENTIAL, PARK, NEW FIELD [1]
☐	☐	-FENCED PASTURE [1]

L	R	
☐	☐	-CONSERVATION TILLAGE [1]
☐	☐	-URBAN OR INDUSTRIAL [0]
☐	☐	-OPEN PASTURE, ROWCROP [0]
☐	☐	-MINING / CONSTRUCTION [0]

BANK EROSION

L	R	(Per Bank)
☐	☐	-NONE / LITTLE [3]
☐	☐	-MODERATE [2]
☐	☐	-HEAVY / SEVERE [1]

Riparian ____ Max 10

COMMENTS: ____

Is Sampling Reach Representative of the Stream (Y/N) Y If Not, Explain:

Lat/Long (Beg):	
Lat/Long (Mid):	
Lat/Long (End):	
Lat/Long(X-Loc):	

Major Suspected Sources of Impacts (Check All That Apply):
- None ☐
- Industrial ☐
- WWTP ☐
- Ag ☒
- Livestock ☐
- Silviculture ☒
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other:

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy -% Open
First Sampling Pass	A	1.0	clear	low	100

Subjective Rating (1-10): 7

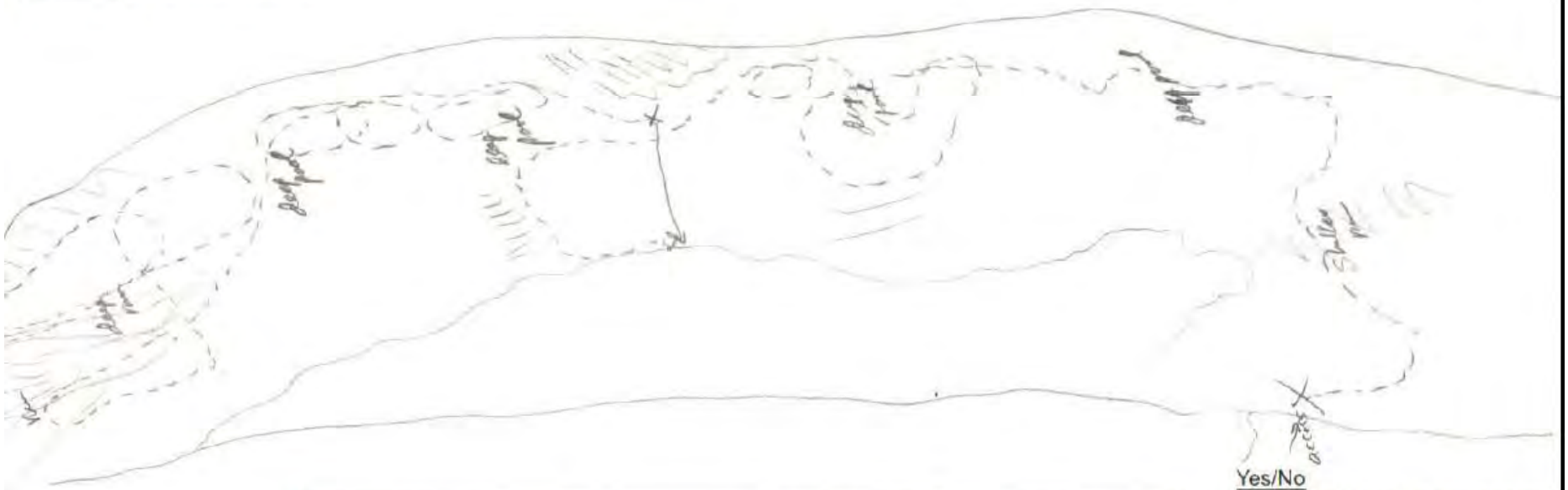
Aesthetic Rating (1-10): 7

Gradient: ☐ - Low, ☒ - Moderate, ☐ -High

Stream Measurements:

Average Width	Average Depth	Maximum Depth	Av. Bankfull Width	Bankfull Mean Depth	W/D Ratio	Bankfull Max Depth	Floodprone Area Width	Entrench. Ratio

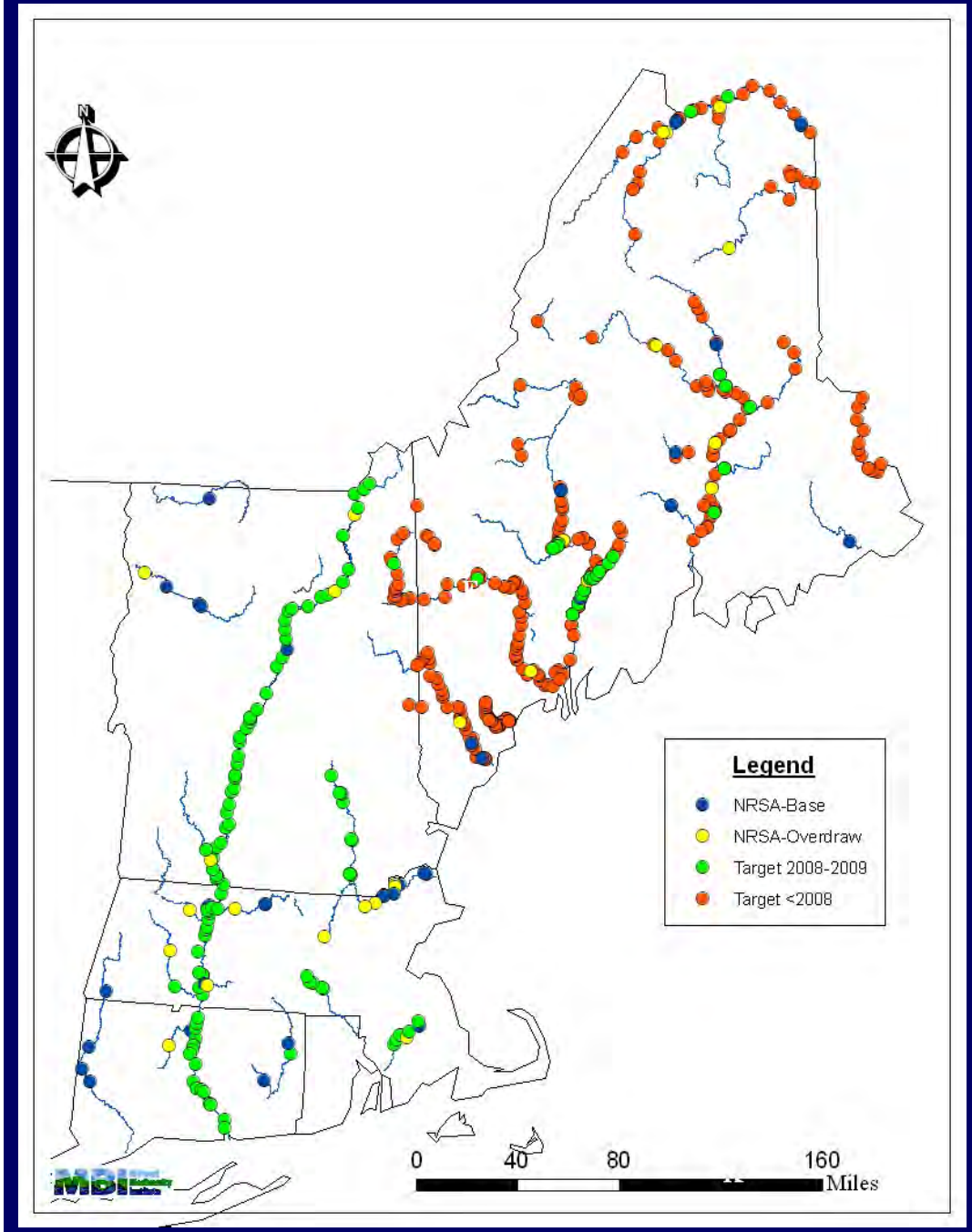
Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

Yes/No	
☐ ☐	Is Stream Ephemeral (no pools totally dry or only damp spots)?
☐ ☐	Is there water upstream? How Far:_____
☐ ☐	Is There Water Close Downstre How Far:_____
☐ ☐	Is Dry Channel Mostly Natural?

Which now brings us to the 2008-9 New England Riverine Fish Assemblage Assessment Project or the "R1REMAP Project"



- NRSA base + equal number of overdraw = REMAP sample
- Summer-fall index period
- Standardized pulsed D.C. electrofishing & qual. habitat (QHEI)
- Targeted pollution survey design for major mainstem rivers
- Geo-referenced sample site location and sample track
- Maine Rivers database 2002-7 supplemental analysis

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R1 REMAP Site Catalogue 2008-9

Probability Sites by State

State (Goal)	NRSA Base*	NRSA Overdraw	Total REMAP**
Vermont (18)	9	9	18
New Hampshire (20)	10	10	20
Maine (20)	10	10	20
Massachusetts (26)	13	13	26
Connecticut (30)	15	12	27
Rhode Island (22)	11	11	22
Sub-total (136)	68	65	133

Targeted Sites by River

River	Targeted sites**	NRSA Overdraw	Total River Sites
Connecticut River***	30	43	73
Blackstone River***	6		12
Merrimack River***	2	19	21
Kennebec River	7		7
Sebasticook River***	5	1	6
Sandy River	4		4
Taunton River***		4	
Androscoggin River***		2	
St. Johns River***		2	
Aroostook River***		1	
Sub-total Targeted & River Sites	54	72	123
Total REMAP Project Sites			216

*All NRSA base sites also served as fish and habitat comparability sites: NRSA vs. REMAP methods.
**In addition 10+% of the probability & targeted sites were resampled.
***Probability sites were also sampled in addition to targeted sites as part of mainstem survey design.

Logistics: Getting the Right Equipment to a Site

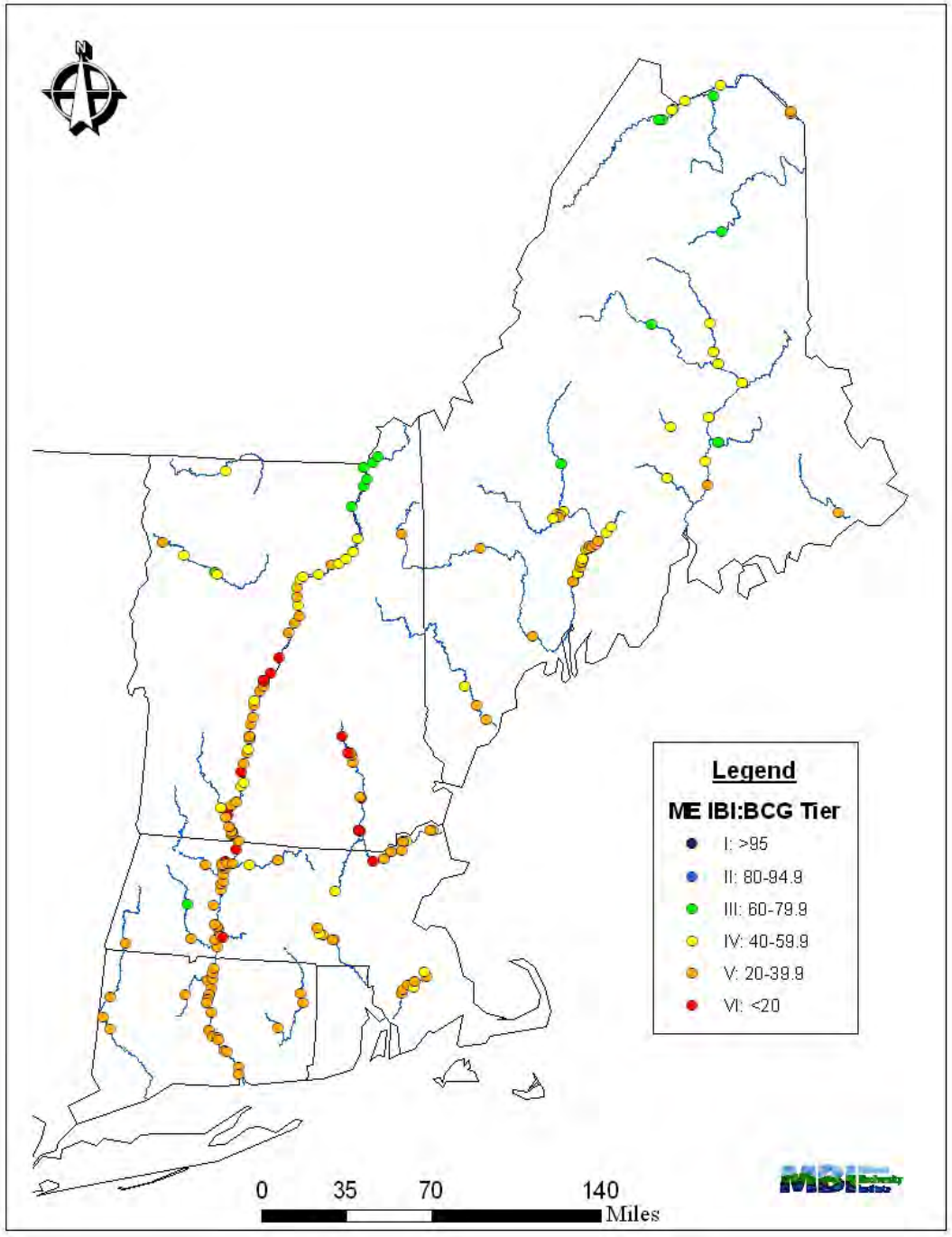
Major Stressors: Hydromodification & Urban

Large Chemical Sources - Reduced & Better Controlled, But Still Present

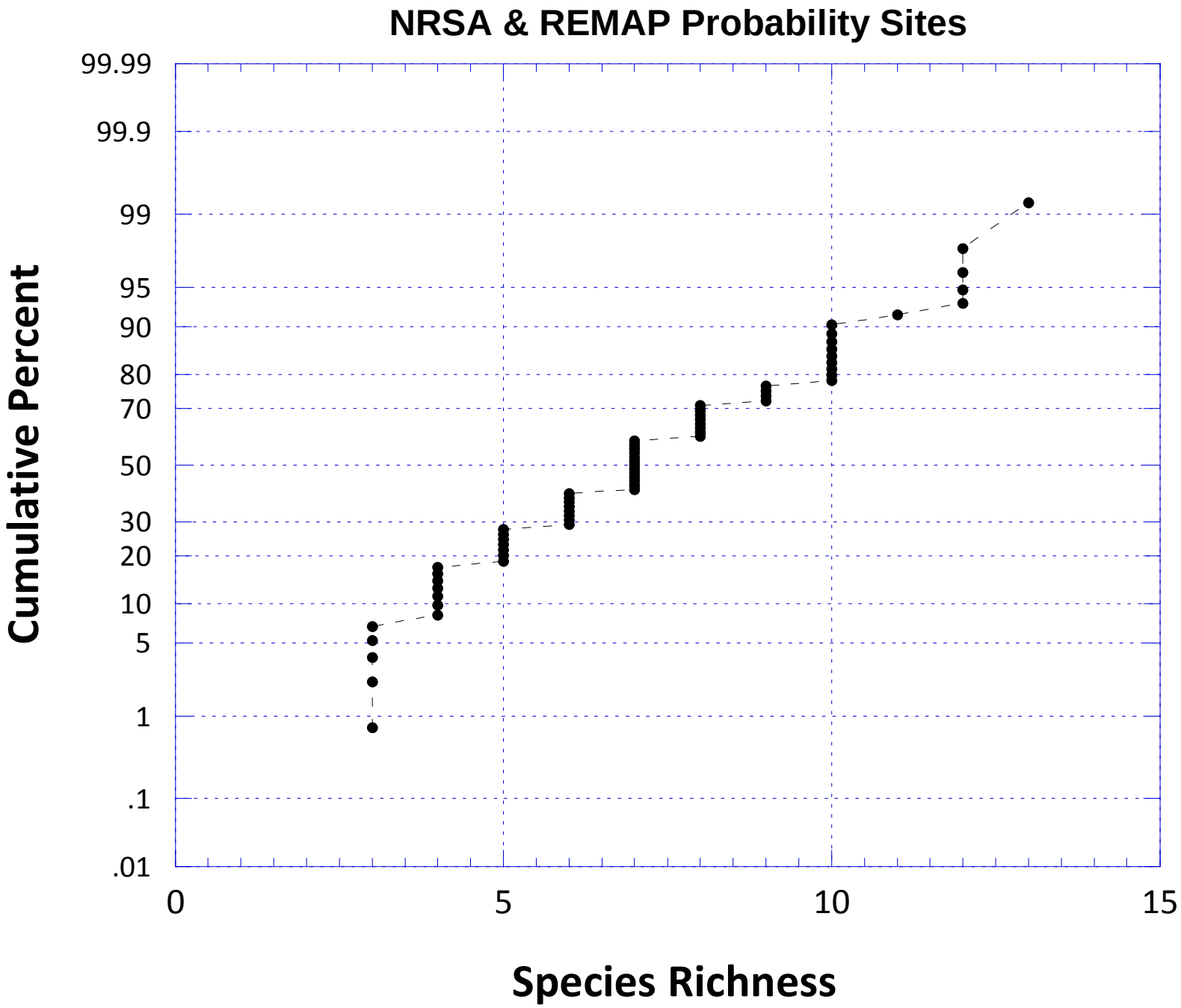
Biological Stressors: Invasive Species

Definitions of Non-indigenous Species Based on Origins (after Halliwell 2005)

- Intercontinental origin – usually referred to as "alien" species
- Intracontinental origin – species can become naturalized (e.g., smallmouth bass, rainbow trout)
- Intraregional origin – usually interstate or nearby New England transplants
- Managed introduced – deliberate stocking for recreational purposes



- Initial data analysis – CFDs & mapped data
- Database in Maine ECOS
- Used ME IBI as initial screen for condition
- Mapped results using color codes for BCG tier
- QHEI & limited chem. parameters
- IBI metrics & other assemblage attributes for exploratory analyses
- Initial focus on REMAP probability dataset
- Compare with targeted database both New England & Maine

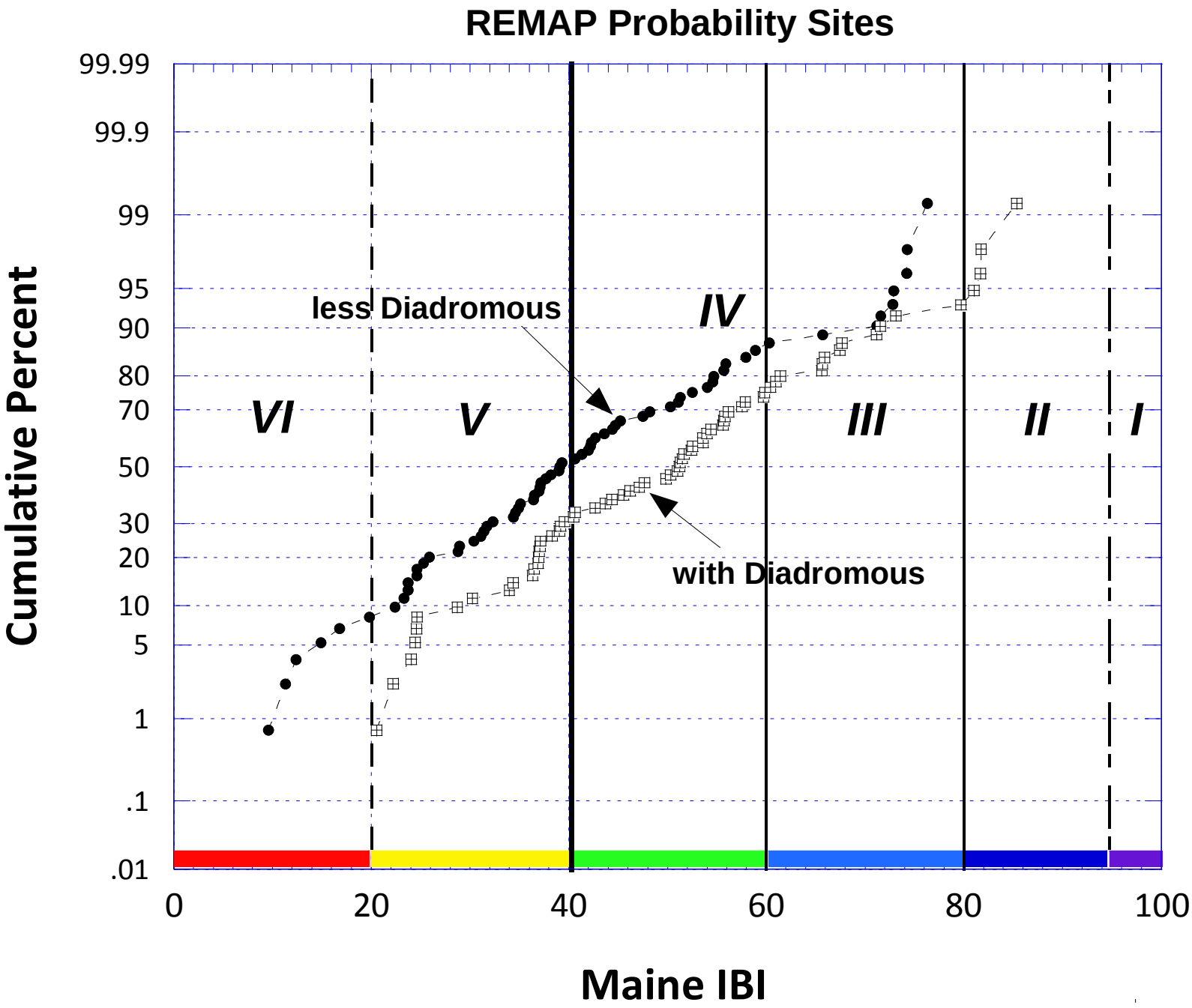


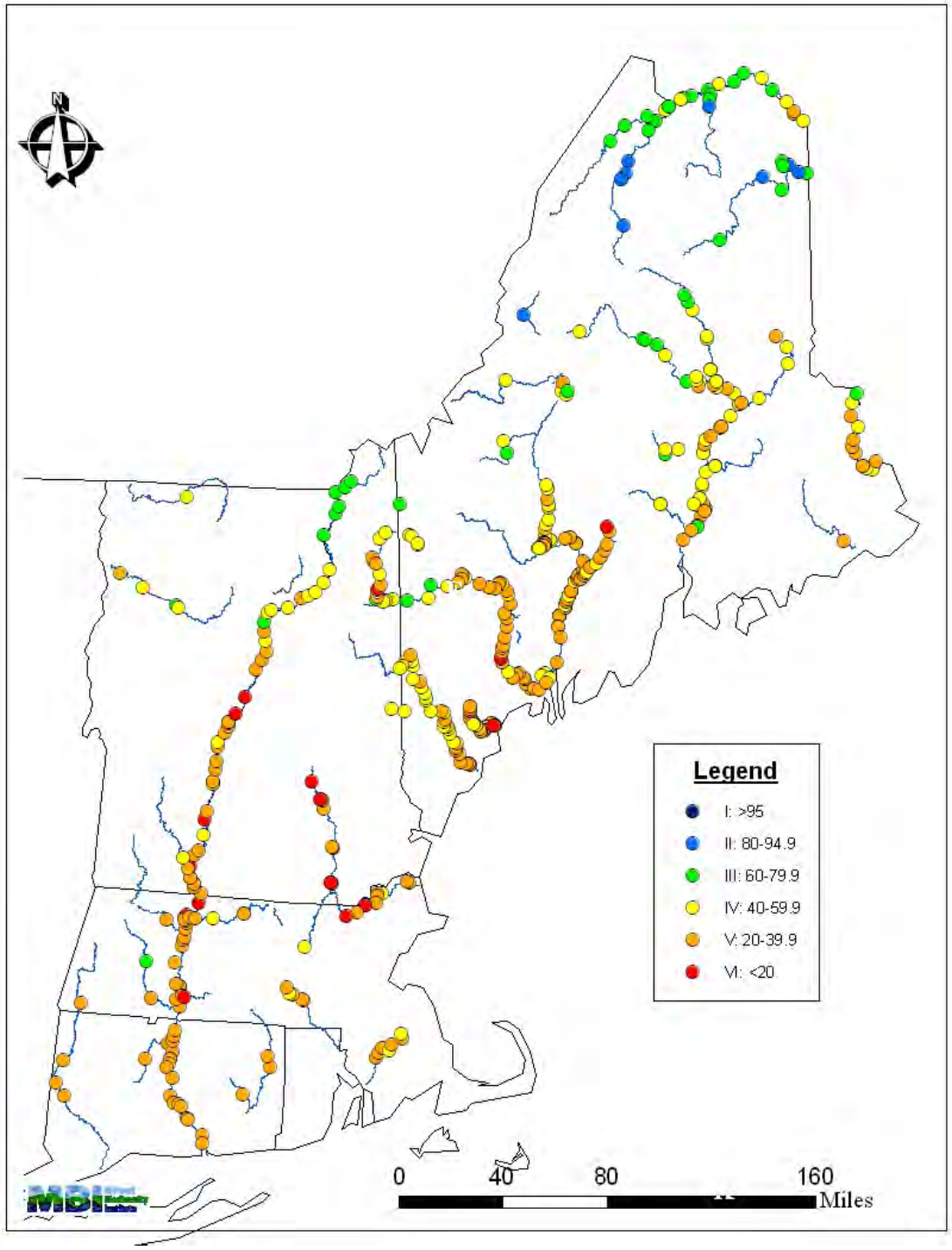
Interim Maine Rivers IBI Metrics & Scoring

Metric	Scoring Equation	Scoring Adjustments	
		Score = 0	Score = 10
Native Species Richness	10 * (-0.2462 + (0.0828*numspec2)))	<3 sp.	≥15 sp.
Native Cyprinid Species (excluding fallfi	(10 * (0.4457 + (0.0109*allcyp_ff) - (0.00005629 *	Eq[1]	Eq
Adu bion			
%Na			
%Benthic Insectivores	10 * (0.010966*benth_pc_n)	0	≥91.2%
%Blackbass	10 - (10 * (-0.09684 + (0.5638*log10(blackbass))))	Eq	0
%Fluvial Specialist/Dependent	(10 * (0.2775 + (0.0073*fluv_pc_n)))	0%	Eq
%Macrohabitat Generalists	10 - (10 * (0.1017 + (0.0096*macro_gen)))	>90%	Eq
Temperate Stenothermic Species	(10 * (0.7154 + (0.4047*(log10(steno)))))	0 sp.	>5 sp.
Non-guarding Lithophilic Species	(10 * (0.2979 + (0.8975*log10(lith_ng))))	<1	>10
Non-indigenous Species	10 - (10 * (0.1063 + (0.3271*Non-indigenous_sp) - (0.029*(Non-indigenous_sp^2))))	≥5	0
%DELT Anomalies	10 - (10 * (0.8965 + (0.1074*log10(delta))))	Eq	0

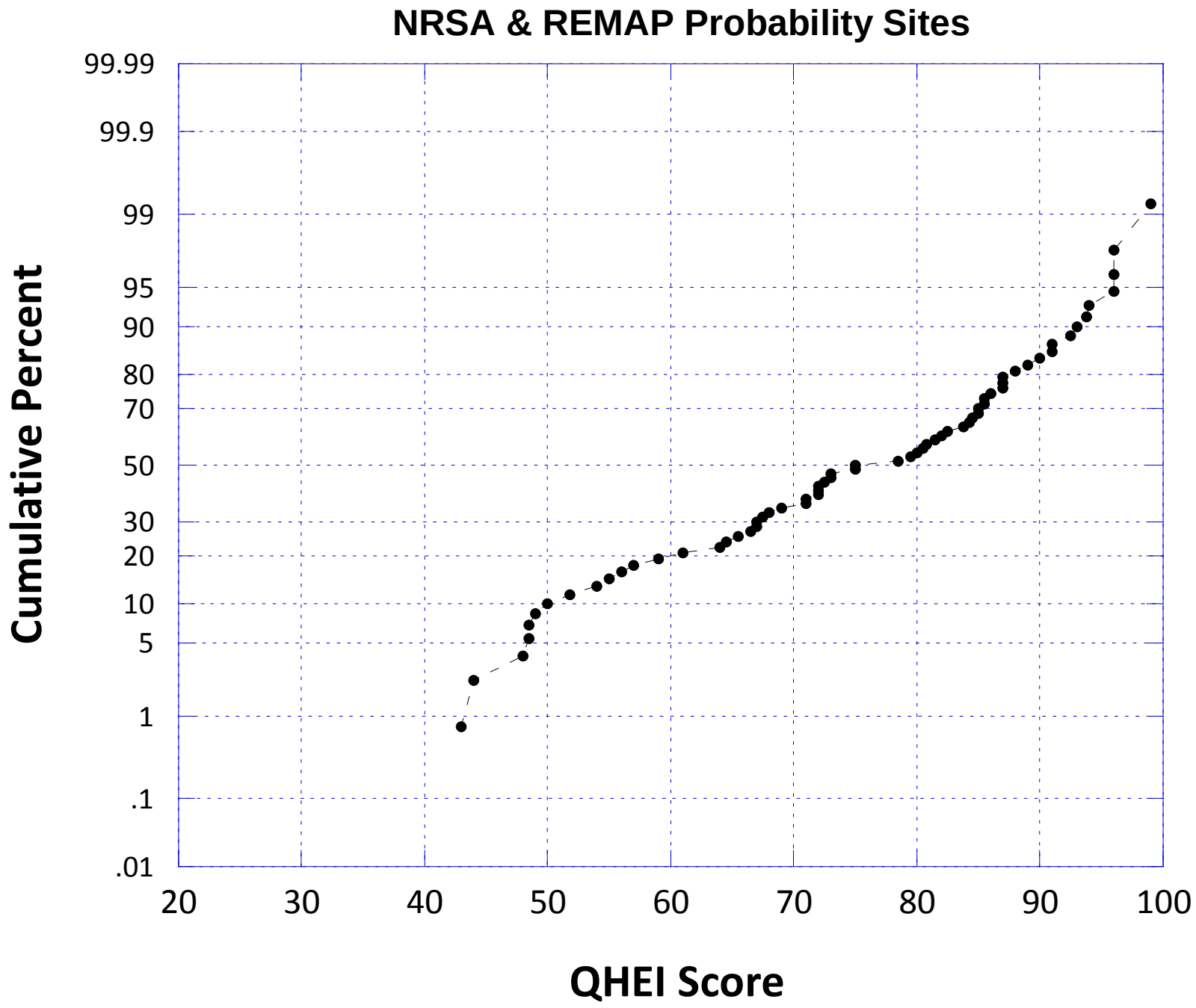
Developmental details will be given in the Maine presentation

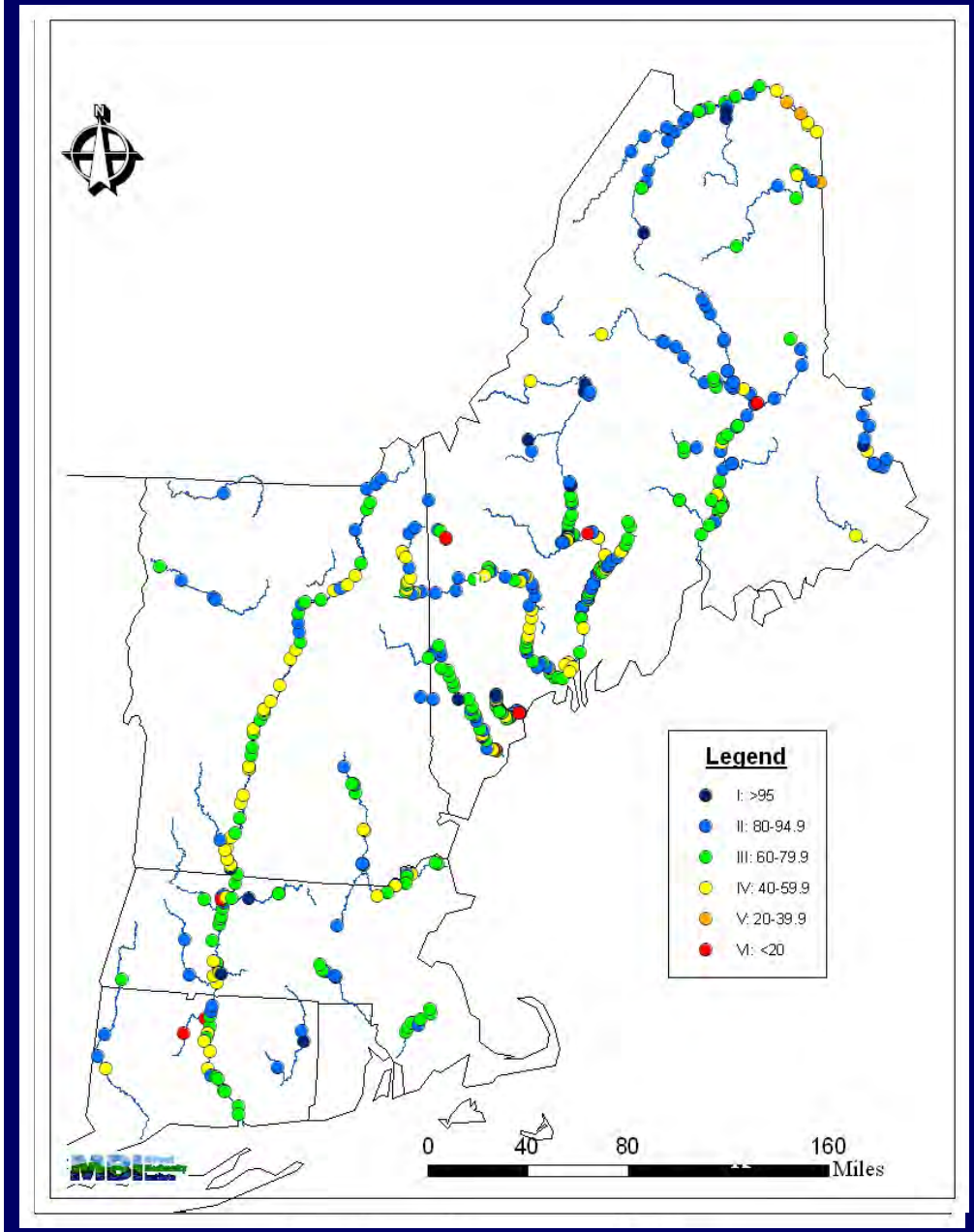
[1] No scoring adjustments are necessary; scoring determined by equation (Eq) across entire metric scoring range of 0-10.





- No tier I or II sites in REMAP results
- North to south "gradient" but not invariable
- Mostly tier IV, V, and VI in southern New England
- Connecticut & other mainstem rivers mostly tier IV, V, & VI
- Maine data 2002-7 needed to see tier II & III; no tier I
- Addition of diadromous modifier may change some sites in coastal rivers

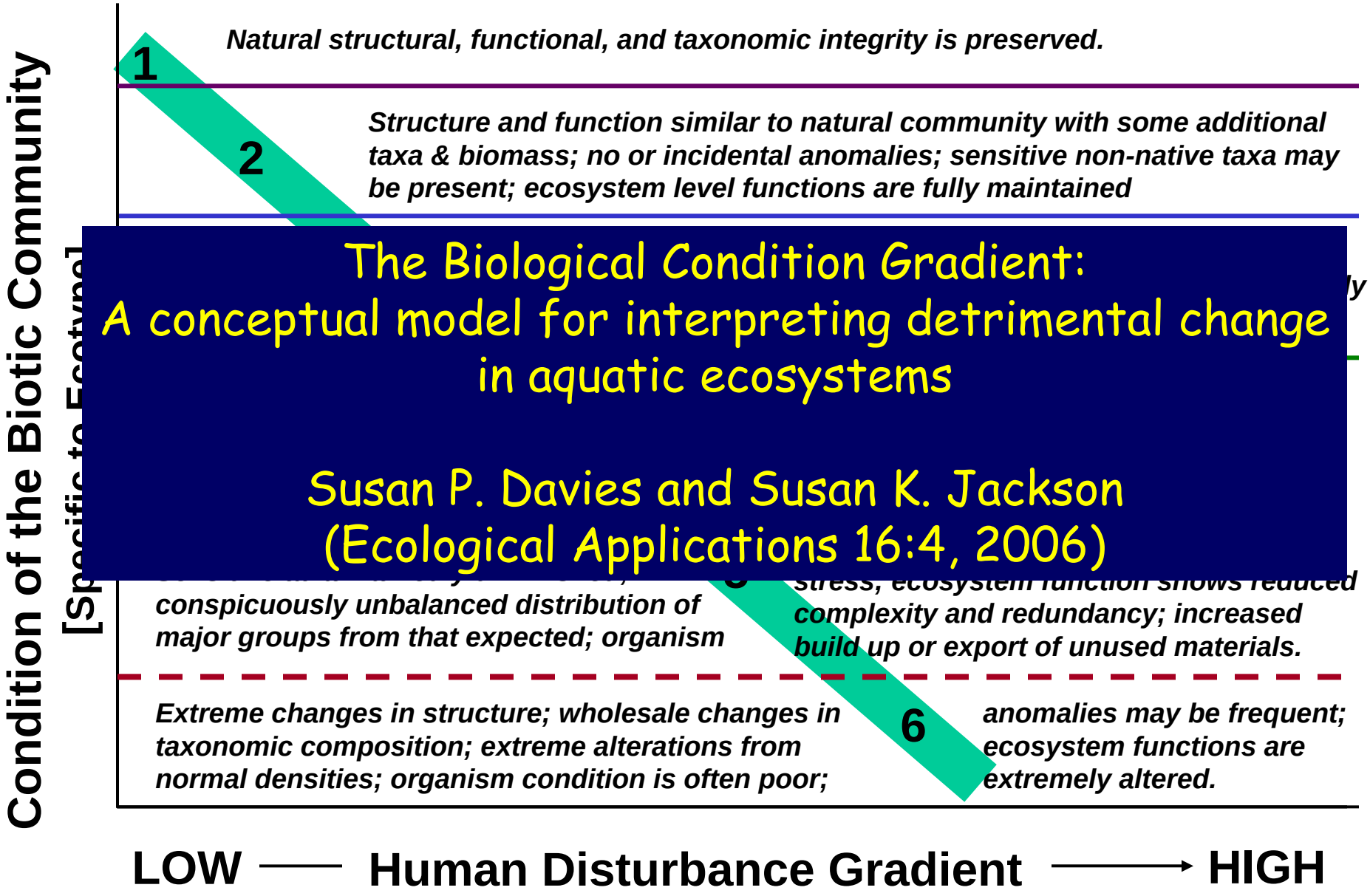




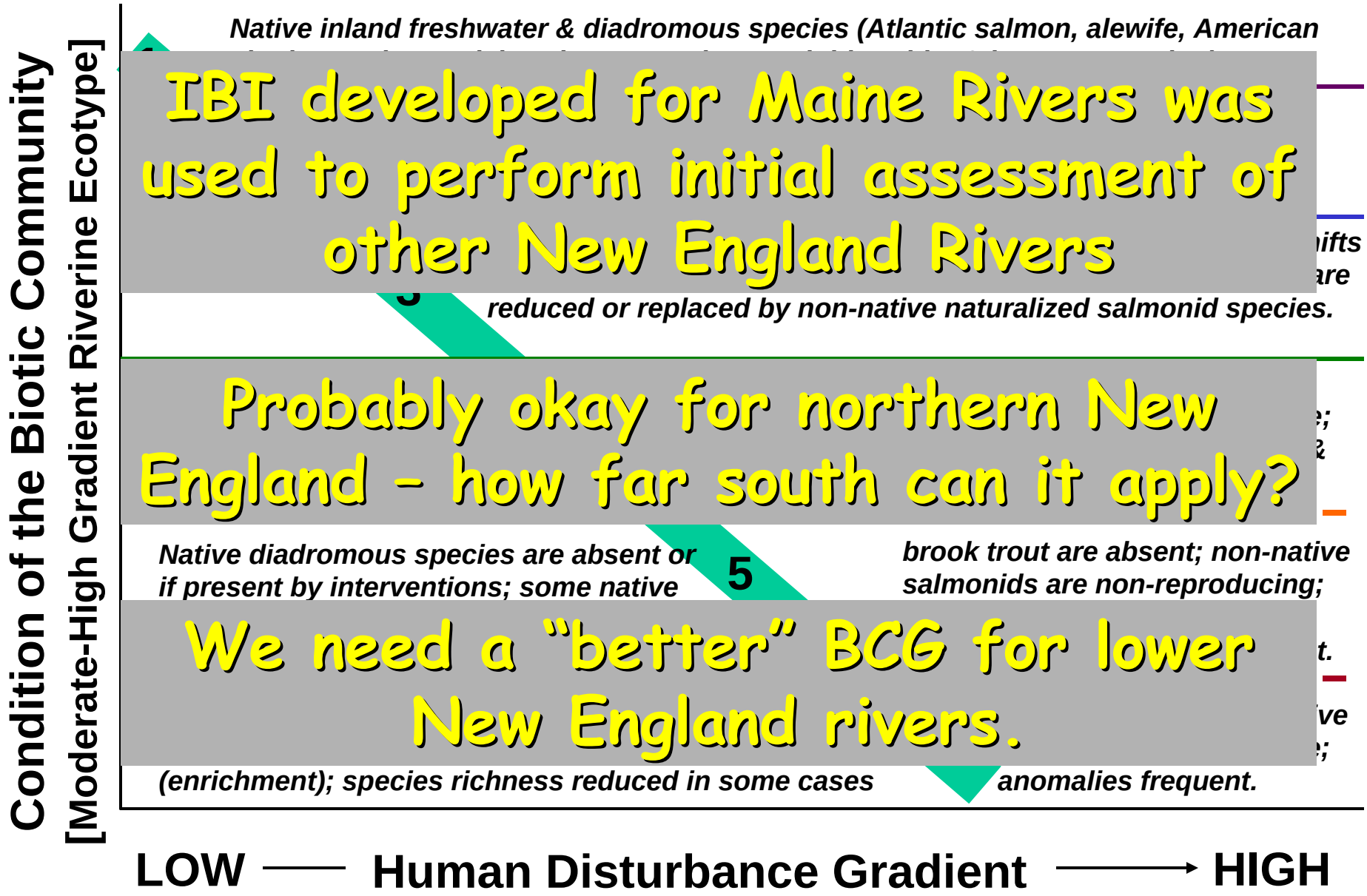
- Habitat quality via QHEI modified for large rivers
- North to south "gradient" also evident, but high quality present at spots in southern New England
- Modification mostly by impoundment
- Again, more dense targeted design reveals more detail
- QHEI attributes relationship with fish assemblage leads to diagnostic tool

Tiered Aquatic Life Use Conceptual Model: Draft Biological Tiers

(10/22 draft)



Tiered Aquatic Life Use Conceptual Model: Maine Rivers



REMAP Project Data Analysis

- More baseline analysis of fish assemblage
- More BCG – ideally a focused workshop*
- Deal w/diadromous sp. – DIBI is promising
- Analysis of spatial data– clarify natural & stressor gradients*
- More detailed analysis of stressor gradients – hydromodification & land use in particular*
- Localized areas of impact – need to perform more complete stressor diagnosis
- Identify potential policy implications

* - we could use some help from EPA!