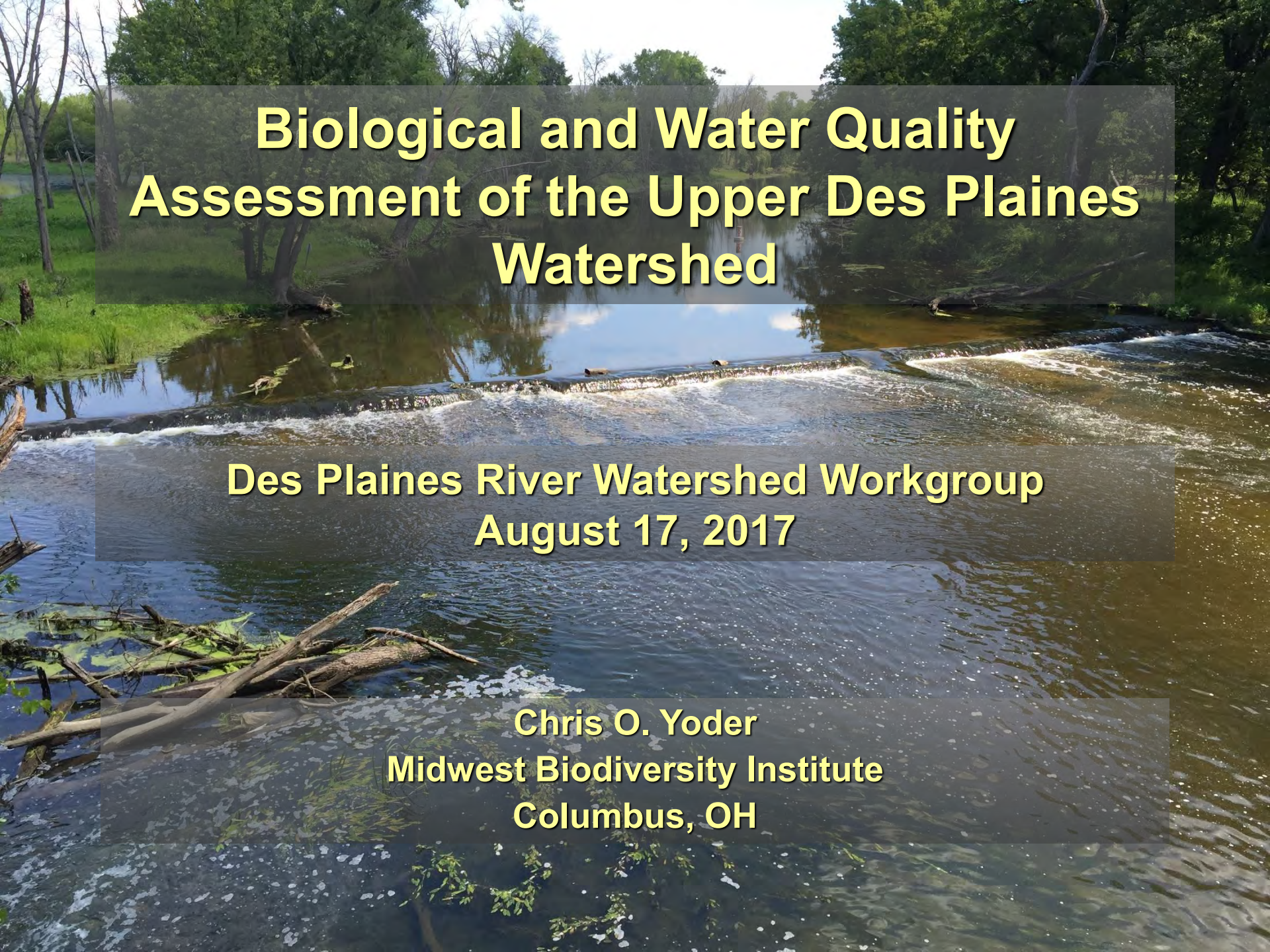

Biological and Water Quality Assessment of the Upper Des Plaines Watershed

Des Plaines River Watershed Workgroup
August 17, 2017

Chris O. Yoder
Midwest Biodiversity Institute
Columbus, OH

MBI is a 501[c][3] Applied Research Organization Specializing in Aquatic Bioassessments, Research, Education, & Training

Major Projects:

1. National Aquatic Resources Assessment
2. Regional Bioassessments – New England, Upper Ohio & Upper Mississippi basins
3. Intensive Watershed Assessments – DRSCWG, MSDGC, DRWW, LDPWG, Black R. AOC

Midwest Biodiversity Institute
Center for Applied Bioassessment & Biocriteria
P.O. Box 21561
Columbus, OH 43221-0561

A Framework and Implementation Plan for Tiered Aquatic Life Uses: Illinois Rivers and Streams

IAWA sponsored an effort to add tiered aquatic life uses and biocriteria to the Illinois WQS (2010-present)

A Final Report to:
Illinois Environmental Protection Agency

Midwest Biodiversity Institute
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The Development of a Biological Assessment Plan for the DuPage and Salt Creek Watersheds

A similar approach was followed for the Upper Desplaines & for the Lower Des Plaines in 2018

Chris O. Yoder
Center for Applied Bioassessment and Biocriteria
Midwest Biodiversity Institute
Columbus, OH

What is a Bioassessment?

- **Bioassessment – a systematic assessment of the aquatic resource using biological indicators AND chemical/physical indicators in order to determine the attainment of a goal expressed in the definition of an aquatic life designated use in the State WQS.**

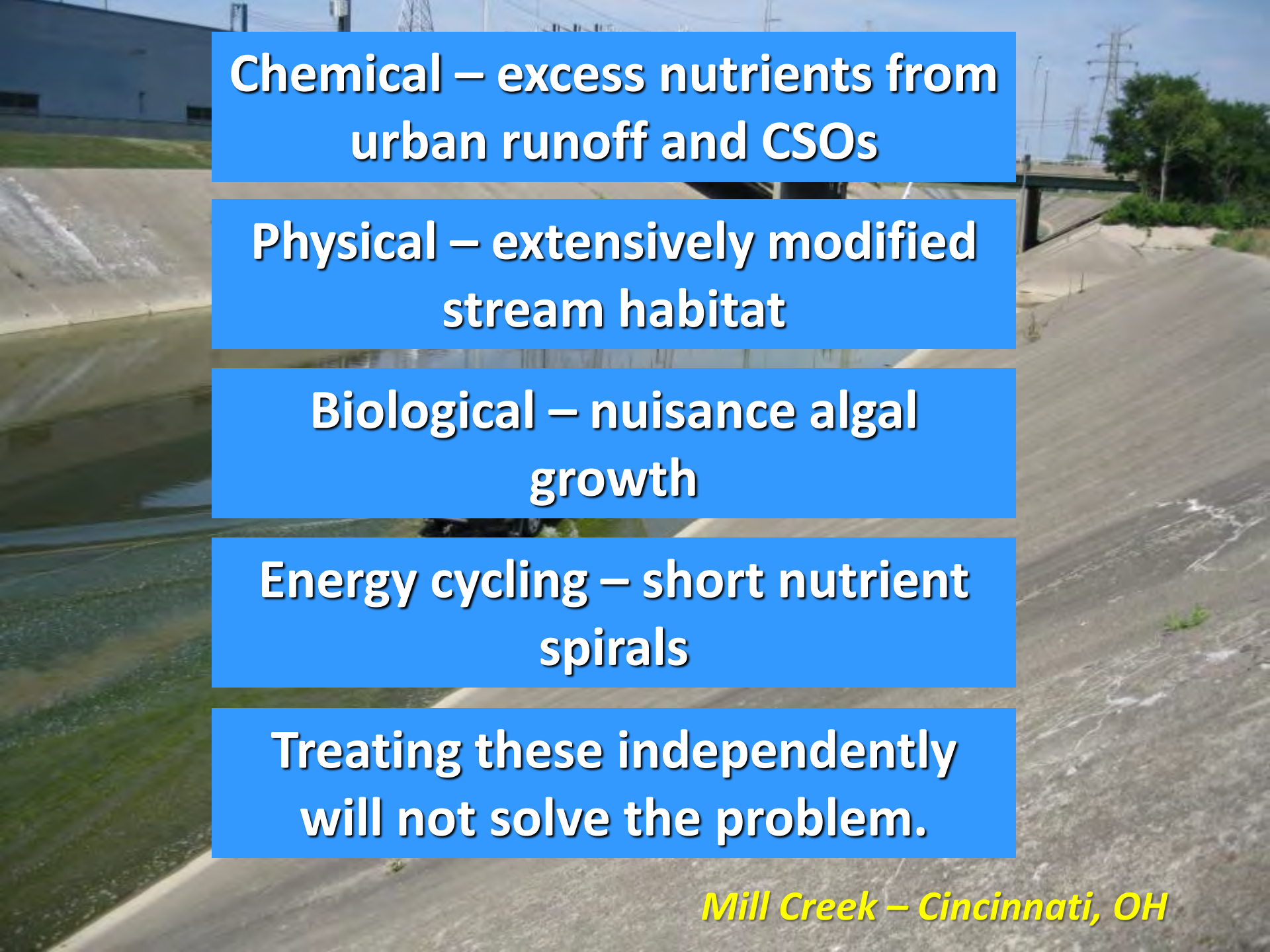
Bioassessment is the essential implementation tool for a TALU based approach

- ***Reasonably available* tools and criteria exist to assess and evaluate this for all waterbody types.**

Aquatic Life Uses

ALUs inherently "drive" the determination of status & management responses, thus they are a critical determinant of overall program effectiveness.

This underscores the critical importance and "reach" of aquatic life uses – they influence every aspect of water quality management.



Chemical – excess nutrients from urban runoff and CSOs

Physical – extensively modified stream habitat

Biological – nuisance algal growth

Energy cycling – short nutrient spirals

Treating these independently will not solve the problem.

Mill Creek – Cincinnati, OH

Core indicators are measured routinely – independent of assessment & management questions

Substrate Quality | Riparian | Conductivity | Dissolved O_2

For Specific Designated Uses Add the Following:

Supplemental indicators are added depending on designated uses, study area setting, and monitoring objectives and questions

AQUATIC LIFE

Base List:

- Ionic s
- Nutrie

Supplem

- Metals
- Organ
- Chlorc

RECREATIONAL

Base List:

WATER SUPPLY

Base List:

- ent)
-)
- Chlorophyll a

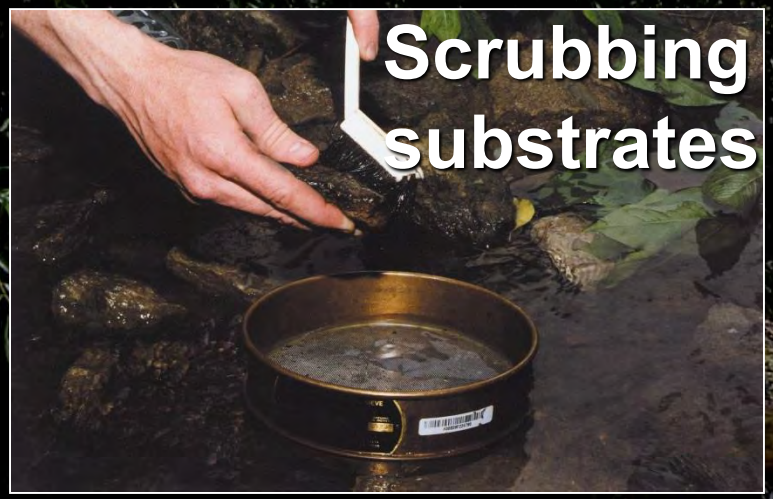
HUMAN/WILDLIFE CONSUMPTION

Base List:

- Metals (in tissues)
- Organics (in tissues)

Benthic Macroinvertebrates

Active Sampling Methods Examples

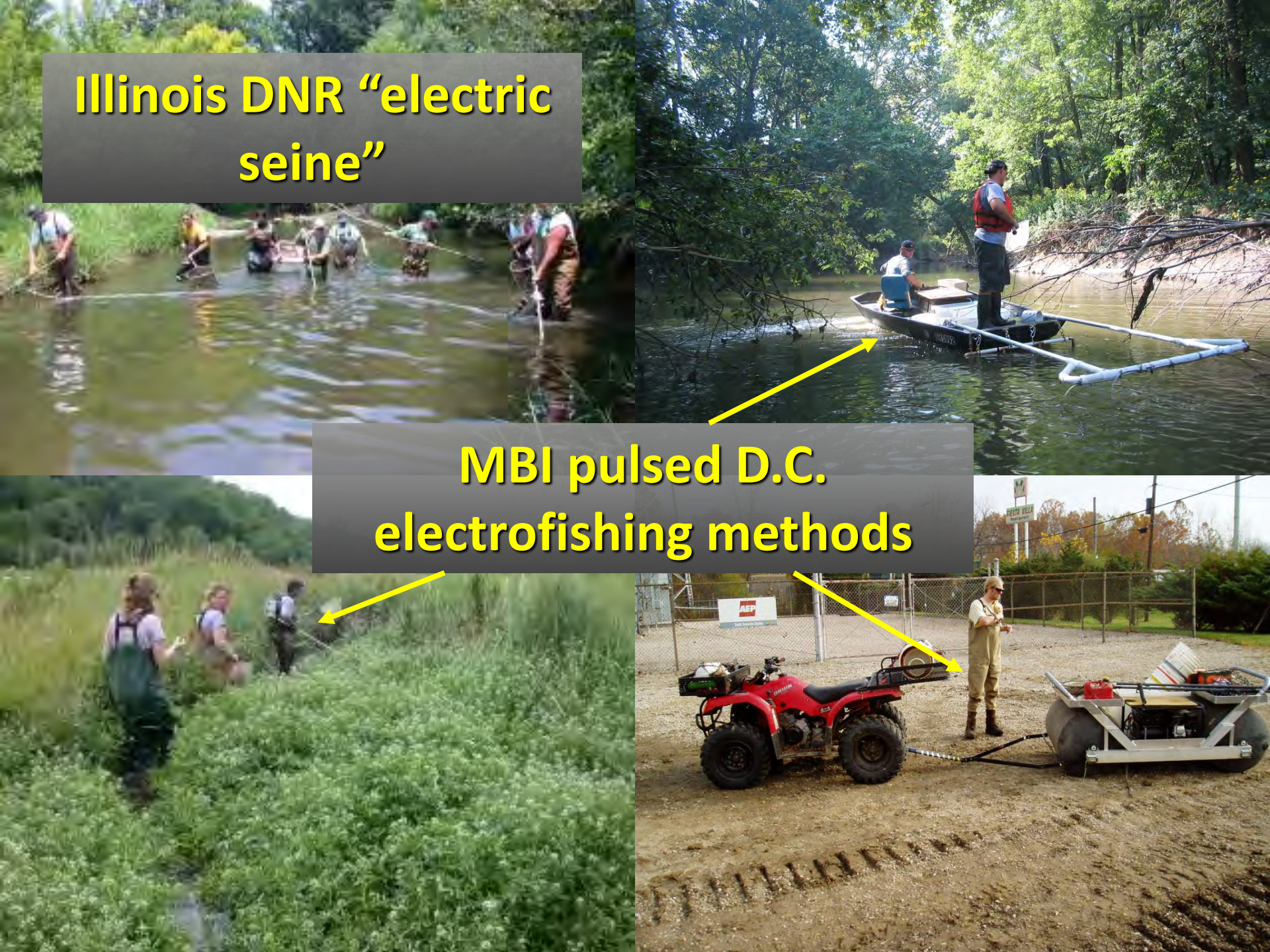


Dome Sampler

Net-based methods (including kicks, dips, jabs, sweeps, & picks)


IEPA methods for field collections & lab processing


Fish are a widely identifiable component of aquatic systems and are valued for their recreational uses. Most species, however, are more obscure, and comprise the second most endangered group.


Illinois DNR “electric seine”
MBI pulsed D.C. electrofishing methods

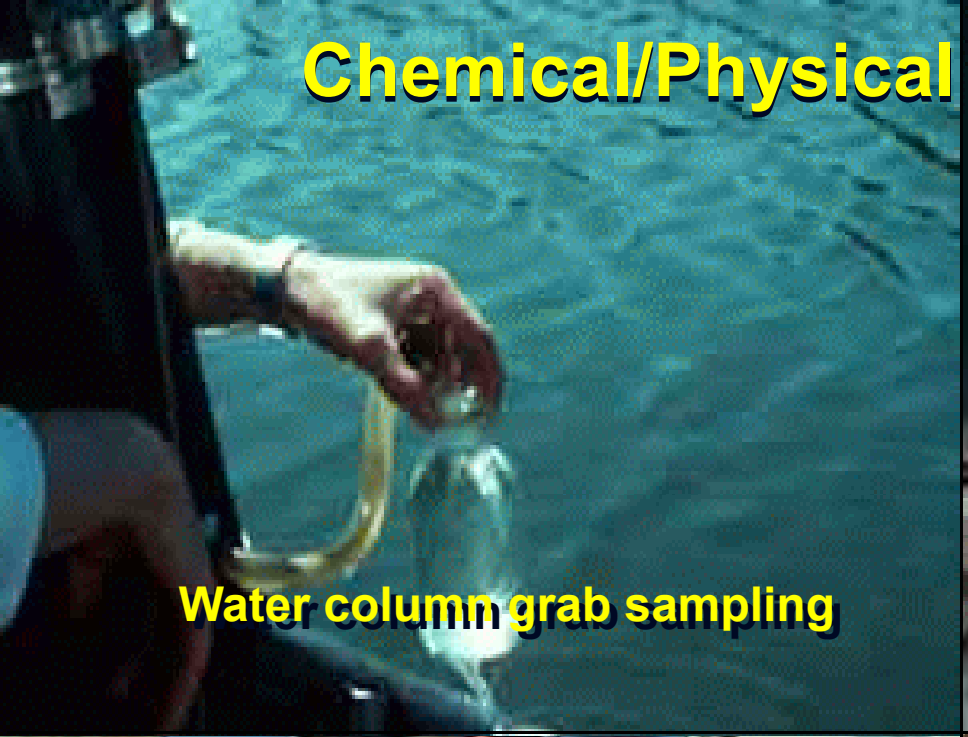
The Qualitative Habitat Evaluation Index (QHEI)

QHEI Includes Six Major Categories of Macrohabitat

- Substrate - types, origin, quality, embeddedness
- Instream Cover – types and quantity
- Channel Quality – sinuosity, development, stability
- Riparian – width, quality, bank stability & quality
- Pool/Run/Riffle – depth, current types, embeddedness, morphology
- Gradient – local gradient (fall per unit distance)

Source: The Qualitative Habitat Evaluation Index (Rankin 1989)

Chemical/Physical Field Procedures



Water column grab sampling

Depth integrated sampler

Automatic composite samplers

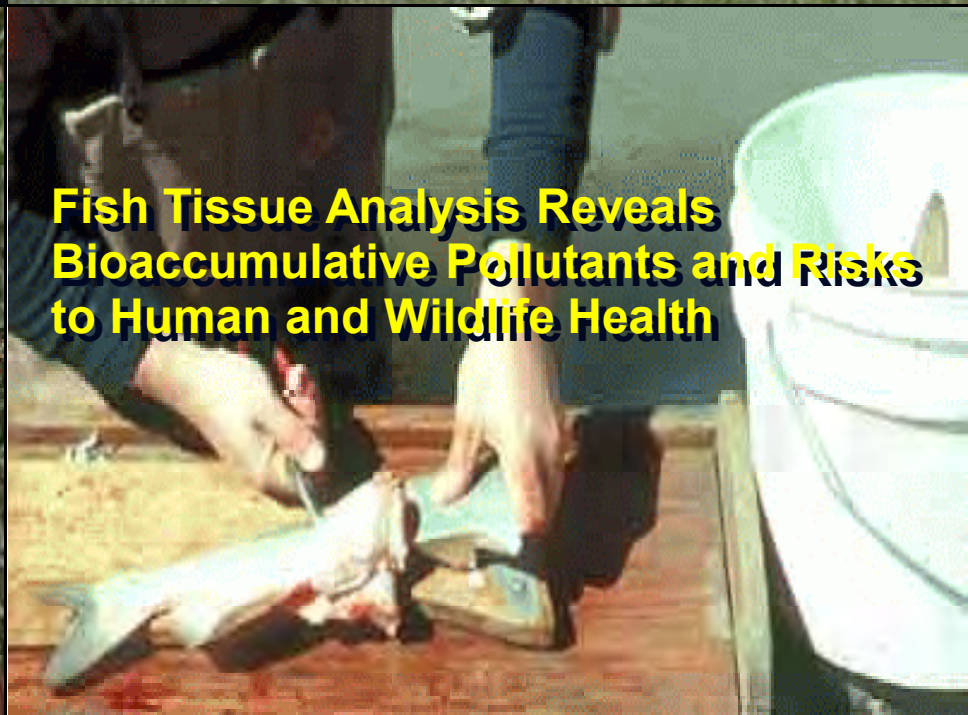
Time-of-travel dye injection

Ohio EPA Chemical Effluent & Exposure Sampling Procedures

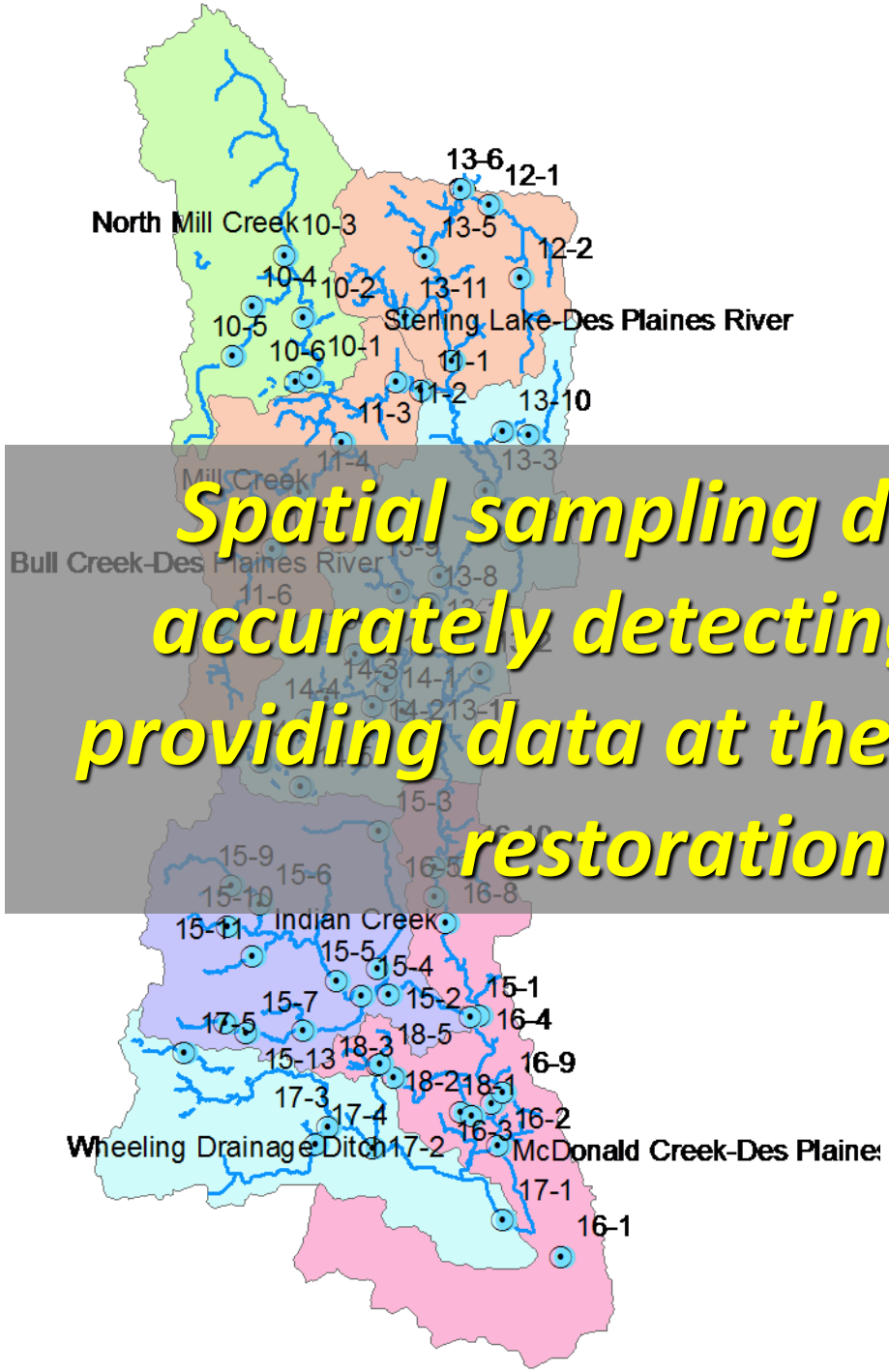
Whole Effluent Toxicity (WET) Testing is Performed Primarily on Effluents

Permitted Discharges are Sampled for a Variety of Chemicals - This Provides Data to Determine Pollutant Loads

Biochemical Markers (Biomarkers) are Useful for Discerning Problem Pollutants



Fish Tissue Analysis Reveals Bioaccumulative Pollutants and Risks to Human and Wildlife Health



Upper Des Plaines Watershed Bioassessment

- Pollution survey design – geometric allocation of sampling sites with additional sites positioned in proximity to suspected sources of stress & contamination.
- Each site assigned a consistent site code (e.g., 13-6).
- 70 sites sampled in mainstem & tributaries, 2 reference sites.
- Each sampled for biological, habitat, & water quality parameters.
- Employed 3 crews over a July-October seasonal index period.
- Followed IEPA methods to ensure data consistency & relevance of results.
- Three year rotation will initiate in 2017.

Spatial sampling design is critical for accurately detecting impairments and providing data at the same scale at which restoration is applied.

Completing the Cycle of WQ Management: Managing for Environmental Results

Indicator Levels

1: Management actions

2: Response to management

} ***Administrative Indicators*** *[permits, plans, grants, enforcement]*

3: Stressor abatement

} ***Stressor Indicators*** *[pollutant loads, land practices]*

4: Ambient conditions

5: Assimilation and uptake

} ***Exposure Indicators*** *[pollutant conc., habitat, ecosystem process, fate & transport]*

6: Biological response

} ***Response Indicators*** *[biological assemblage indices, other attributes]*

"Ecological Health" The Endpoint of Concern

EPA United States Environmental Protection Agency

Discharge Monitoring Report (DMR) Pollutant Loading Tool

Note: The tool uses discharge monitoring report (DMR) data from ICIS-NPDES to calculate pollutant discharge amounts. EPA has verified the accuracy of the tool's calculations. EPA has also performed a limited review of the underlying data that has focused on facilities with the largest amounts of pollutant discharges. Due to the large amount of DMR data, some errors exist in ICIS-NPDES DMR data. Please see the User Guides page for instructions on how to use the tool and how to correct errors in ICIS-NPDES. The tool also uses wastewater pollutant discharge data fr the Toxics Release Inventory (TRI). Contact Us with any comments or questions about the tool, and sign up for our e-mail news bulletin to be notified when new data, enhancements, or training materials become available.

Overview

The Discharge Monitoring Report (DMR) Pollutant Loading Tool is designed to help you determine **who is discharging, what pollutants they are discharging and how much, and where they are discharging**. The tool calculates pollutant loadings from permit and DMR data from EPA's Integrated Compliance Information System for the National Pollutant Discharge Elimination System (ICIS-NPDES). Data are available from the year 2007 to the present. Pollutant loadings are presented as pounds per year and as toxic-weighted pounds per year to account for variations in toxicity among pollutants. The tool ranks dischargers, industries, and watersheds based on pollutant mass and toxicity, and presents "top ten" lists to help you determine which discharges are important, which facilities and industries are producing these discharges, and which watersheds are impacted.

The tool also includes waste[illegible] data fr[illegible] are available for the years 2007 [illegible] the largest pollutant discharges to surface waters or sewage treatment plants (a.k.a. Publicly Owned Treatment Works or "POTWs"). Users can also compare the DMR data search results against TRI data search results and vice versa. The tool clearly labels the source of data when displaying search results but does not mix TRI or DMR data when calculating pollutant discharges.

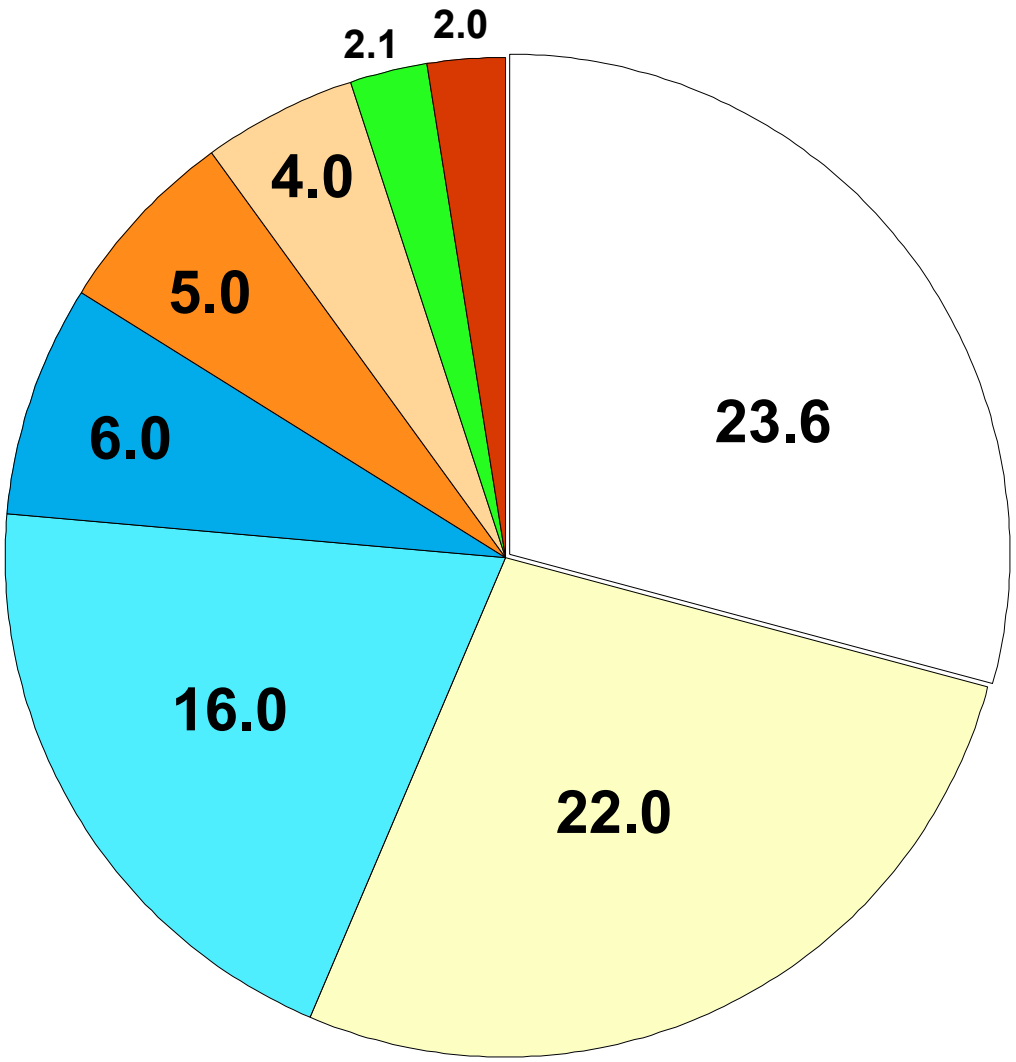
If this is your first time using the tool, you might want to start with the EZ Search (DMR data) or the TRI Search (TRI data). If you need more flexibility with your searches, try the Advanced Search (DMR data). If you have additional questions or would like more information about the tool, you can access more detailed information in the User Guides/Tech Documents tab.

Read on to learn more about:

- How to Navigate the Tool
- Data Sources, Scope, and Limitations
- Frequently Asked Questions and Answers

Facility	Receiving Water Body	River Mile	Latitude	Longitude	Average Flow 2016 (MGD)	Design Average Flow (MGD)	Treatment Type[1]	Nutrient Removal[2]
Lake Co. DPW Mill Creek WWTP	Mill Creek/Des Plaines R.	1.0/102.0	42°25'00"N	87°55'40"W	2.1	7.8	AWT	M
North Shore SD Waukegan WWTP	Des Plaines R.	98.1	42°22'15"N	87°54'53"W	22.0	44.0	AWT	P
North Shore SD Gurnee WWTP	Des Plaines R.	95.5	42°21'25"N	87°55'36"W	23.6	47.2	AWT	N
Libertyville WWTP (IL0029530)	Des Plaines R.	84.8	42°15'15"N	88°56'10"W	4.0	8.0	AWT	M
Mundelein WWTP (IL0022501)	Des Plaines R.	84.6	42°15'11"N	87°50'34"W	5.0	15.0	Secondary	M
Lake Co. DPW New Town Century WWTP (IL0071366)	Des Plaines R.	82.3	42°13'30"N	87°56'15"W	6.0	18.0	AWT	M
Lake Co. DPW Des Plaines WWTP (IL0022055)	Aptaksic Cr./ Des Plaines R.	0.8/76.4	42°09'47"N	87°55'40"W	16.0	51.8	AWT	M
Lindenhurst SD WWTP (IL0020796)	Hastings Cr.	2.8	42°26'01"N	88°01'56"W	2.0	5.7	AWT	M

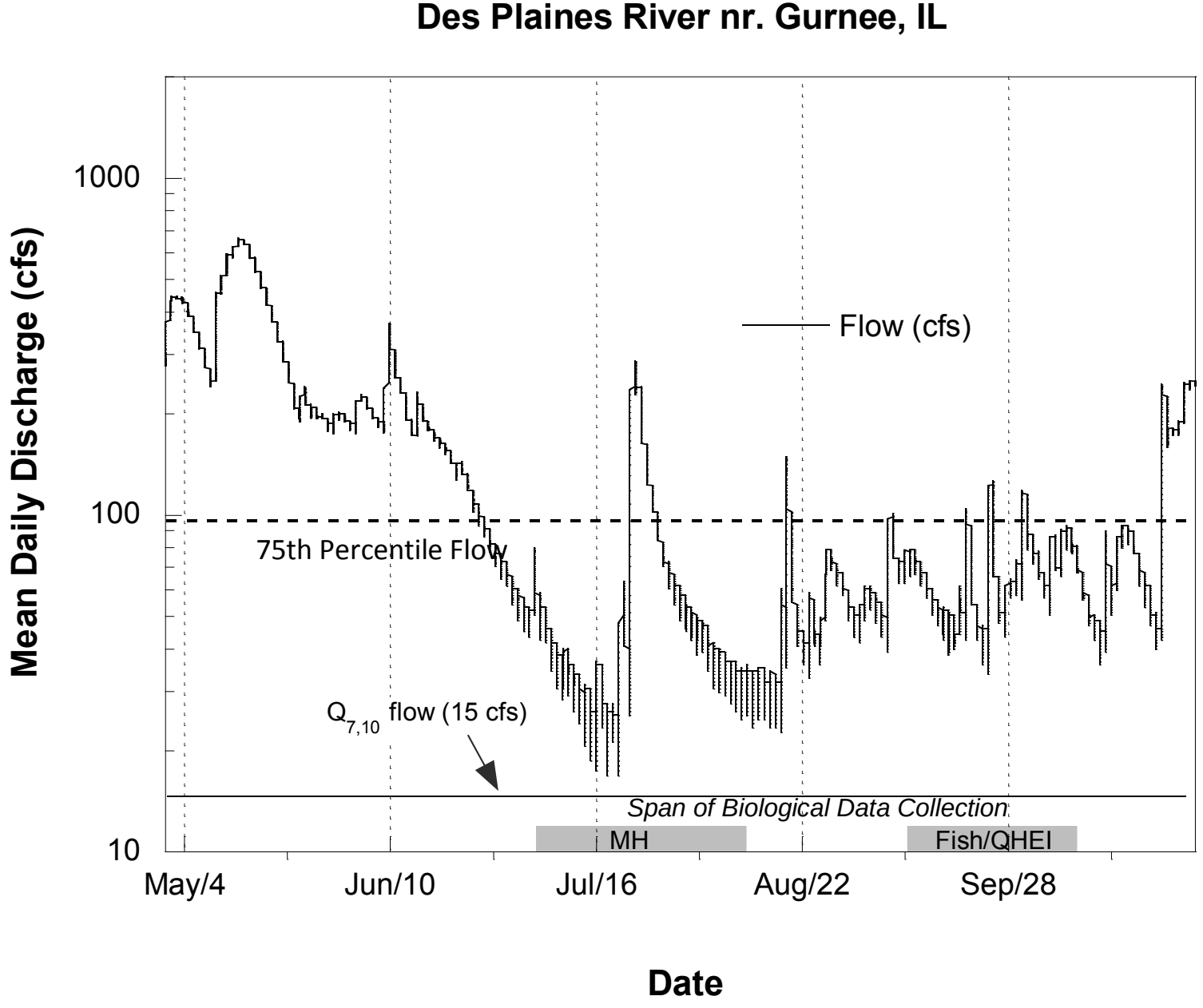
Upper Des Plaines Major WWTP Average Flows 2016 (MGD)



- NSSD Gurnee
- NSSD Waukegan
- Lake Co. Des Plaines
- Lake Co. New Town Century
- Mundelein
- Libertyville
- Lake Co. Mill Creek
- Lindenhurst

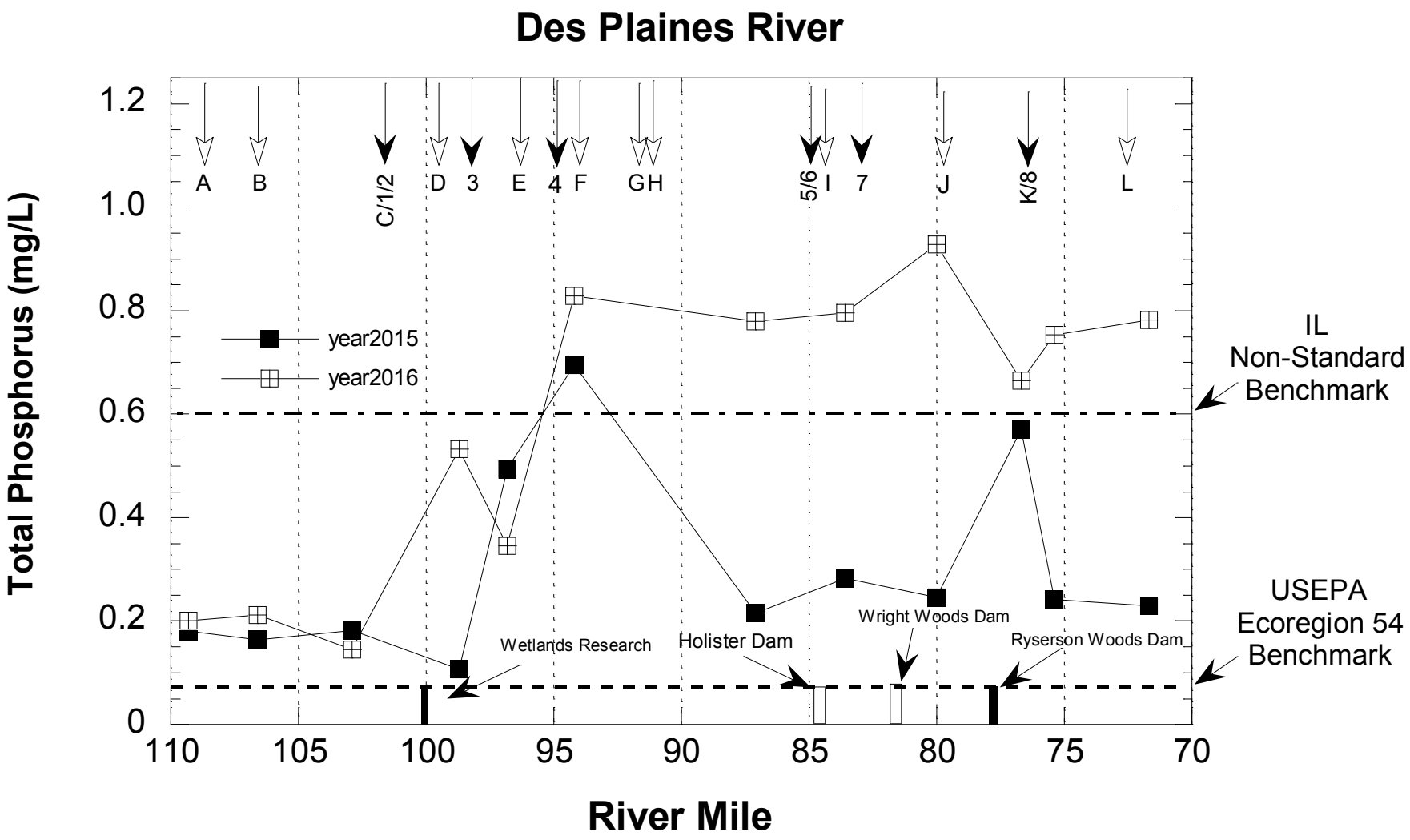
Total (MGD) = 78.7

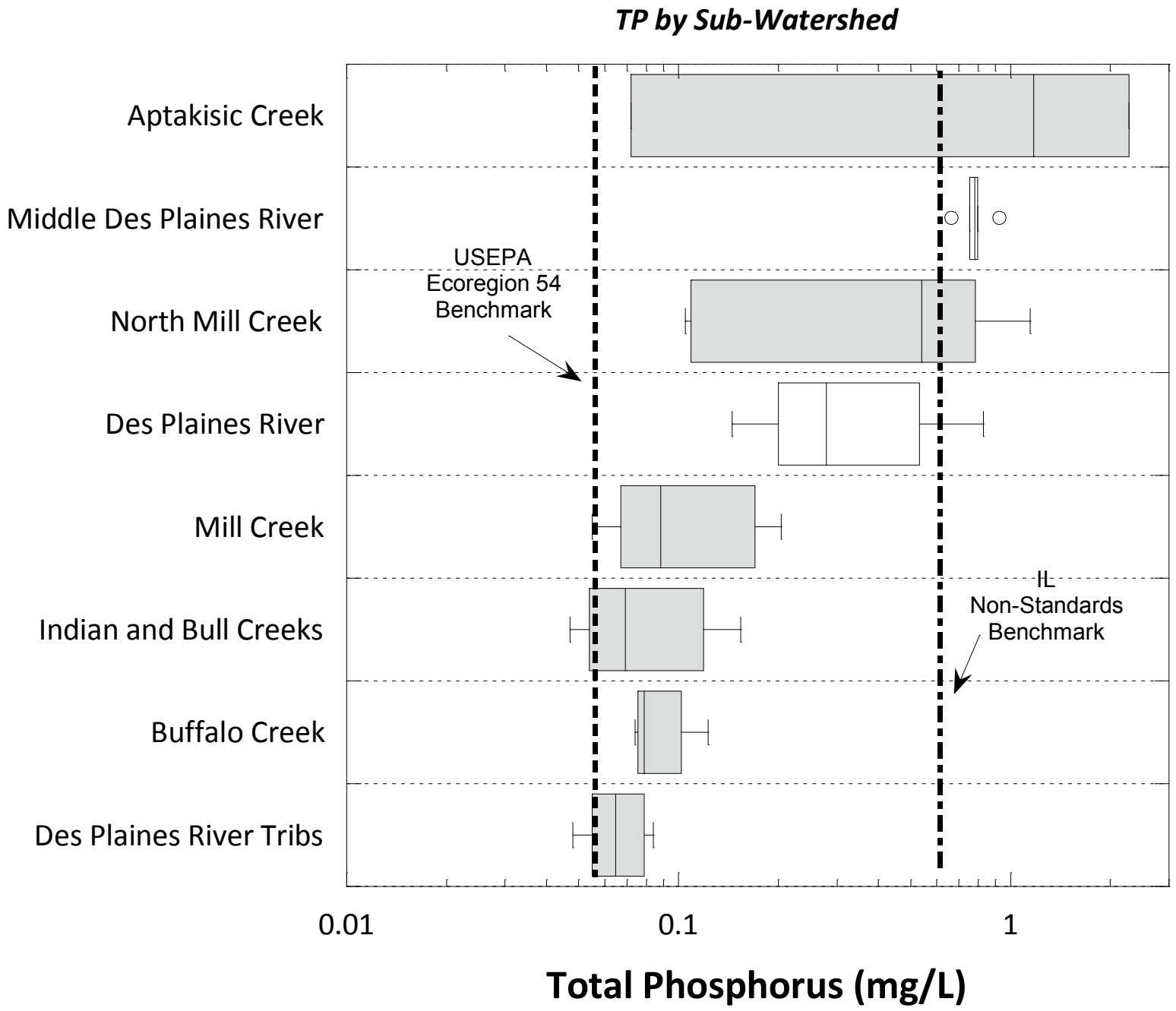
(55% of 75th %ile flow;
89% of $Q_{7,10}$ flow)

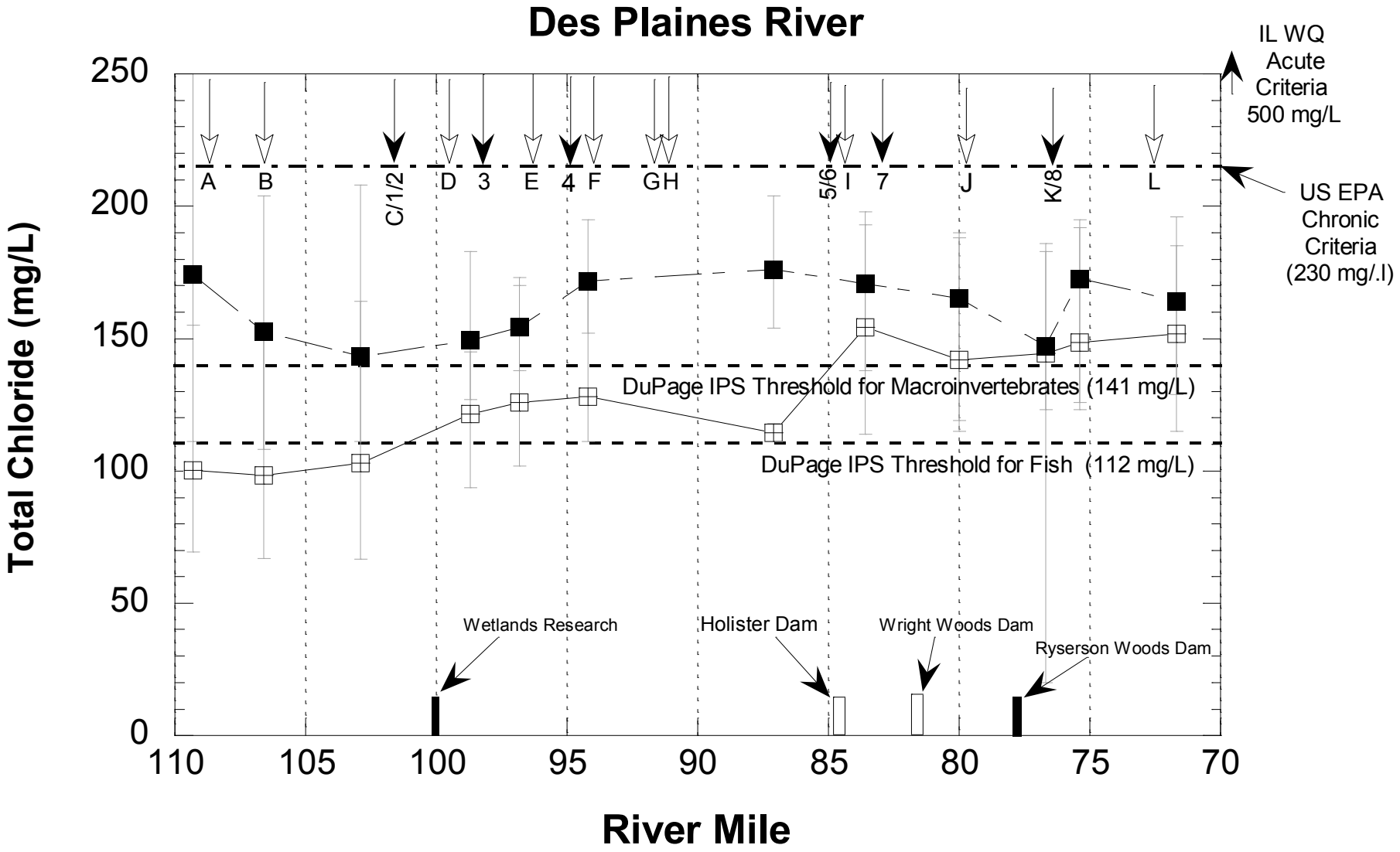

Des Plaines River nr. Gurnee, IL
Mean Daily Discharge (cfs)
1000
100
10
Flow (cfs)
75th Percentile Flow
Q7,10 flow (15 cfs)
Span of Biological Data Collection
MH
Fish/QHEI
May/4
Jun/10
Jul/16
Aug/22
Sep/28
Date

Evaluating Chemical Results: WQC & Threshold Effects

Parameter	Water Quality Criteria		Effect Thresholds				Non-effect Benchmarks	
	IL Chronic	IL Acute	Ohio EPA	SW Ohio	NOAA SQRT	Other	Regional Reference	IL Non-Standard
Demand Group								
BOD_5	NA	NA	--	2.48 mg/L [HW Streams] 2.96 mg/L [WD Streams] 2.60 mg/L [BT Rivers]	--	--	2.00 mg/L [HW Streams]	--
Dissolved Oxygen (D.O.)	5.5./6.0 mg/L [7-day rolling avg.]	3.5/5.0 mg/L [minimum]	7.2 mg/L [HW Streams]	5.32 mg/L [All Streams]	--	--	6.6 mg/L [HW Streams]	--
Suspended Solids (TSS)	NA	NA	16.0 mg/L [HW Streams]	65.7 mg/L [HW Streams] 70.8 mg/L [WD Streams] 74.3 mg/L [BT Rivers]	--	--	28.0 mg/L [HW Streams]	--
Nutrients Group								
Ammonia-N (NH_3-N)	1.24 mg/L [pH 8.0/25°C]	8.40 mg/L [pH 8.0/25°C]	0.05 mg/L [HW Streams]	0.31 mg/L [HW Streams]	--	0.15 mg/L [DRSCW IPS]	0.025 mg/L [HW Streams]	--
Total Kjeldahl Nitrogen (TKN)	NA	NA	0.50 mg/L [HW Streams]	0.51 mg/L [HW Streams] 0.58 mg/L [WD Streams] 1.05 mg/L [BT Rivers]	--	1.00 mg/L [DRSCW IPS[11]]	0.70 mg/L	--


Des Plaines River
Total Phosphorus (mg/L)
River Mile
1.2
1.0
0.8
0.6
0.4
0.2
0
110
105
100
95
90
85
80
75
70
A
B
C/1/2
D
3
E
4
F
GH
5/6
I
7
J
K/8
L
year2015
year2016
IL
Non-Standard
Benchmark
USEPA
Ecoregion 54
Benchmark
Wetlands Research
Holister Dam
Wright Woods Dam
Ryserson Woods Dam


TP by Sub-Watershed
Aptakisic Creek
Middle Des Plaines River
North Mill Creek
Des Plaines River
Mill Creek
Indian and Bull Creeks
Buffalo Creek
Des Plaines River Tribs
USEPA
Ecoregion 54
Benchmark
IL
Non-Standards
Benchmark
0.01
0.1
1
Total Phosphorus (mg/L)


Des Plaines River
Total Chloride (mg/L)
River Mile
250
200
150
100
50
0
110
105
100
95
90
85
80
75
70
A
B
C/1/2
D
3
E
4
F
GH
5/6
I
7
J
K/8
L
IL WQ
Acute
Criteria
500 mg/L
US EPA
Chronic
Criteria
(230 mg/.l)
DuPage IPS Threshold for Macroinvertebrates (141 mg/L)
DuPage IPS Threshold for Fish (112 mg/L)
Wetlands Research
Holister Dam
Wright Woods Dam
Ryserson Woods Dam

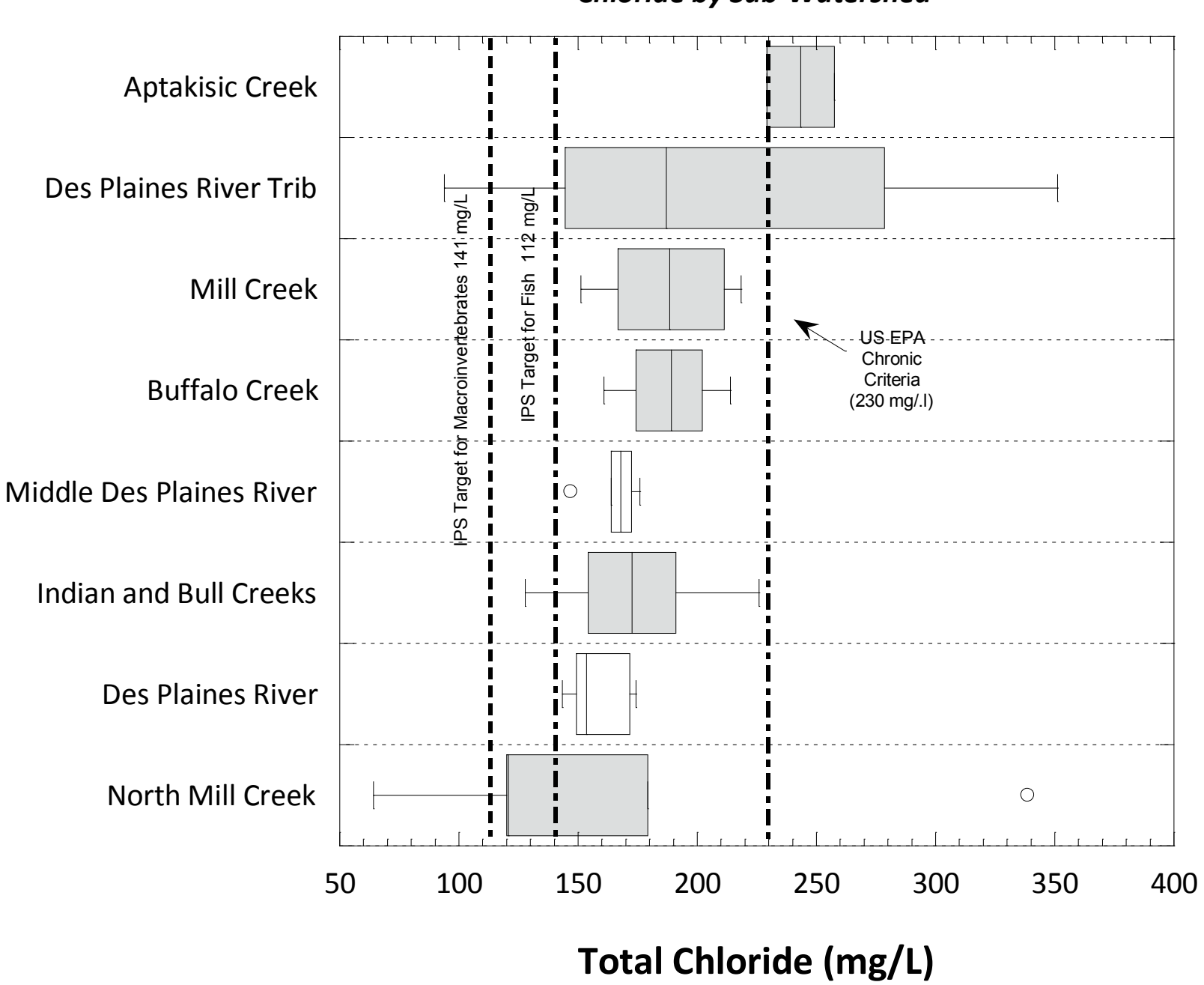
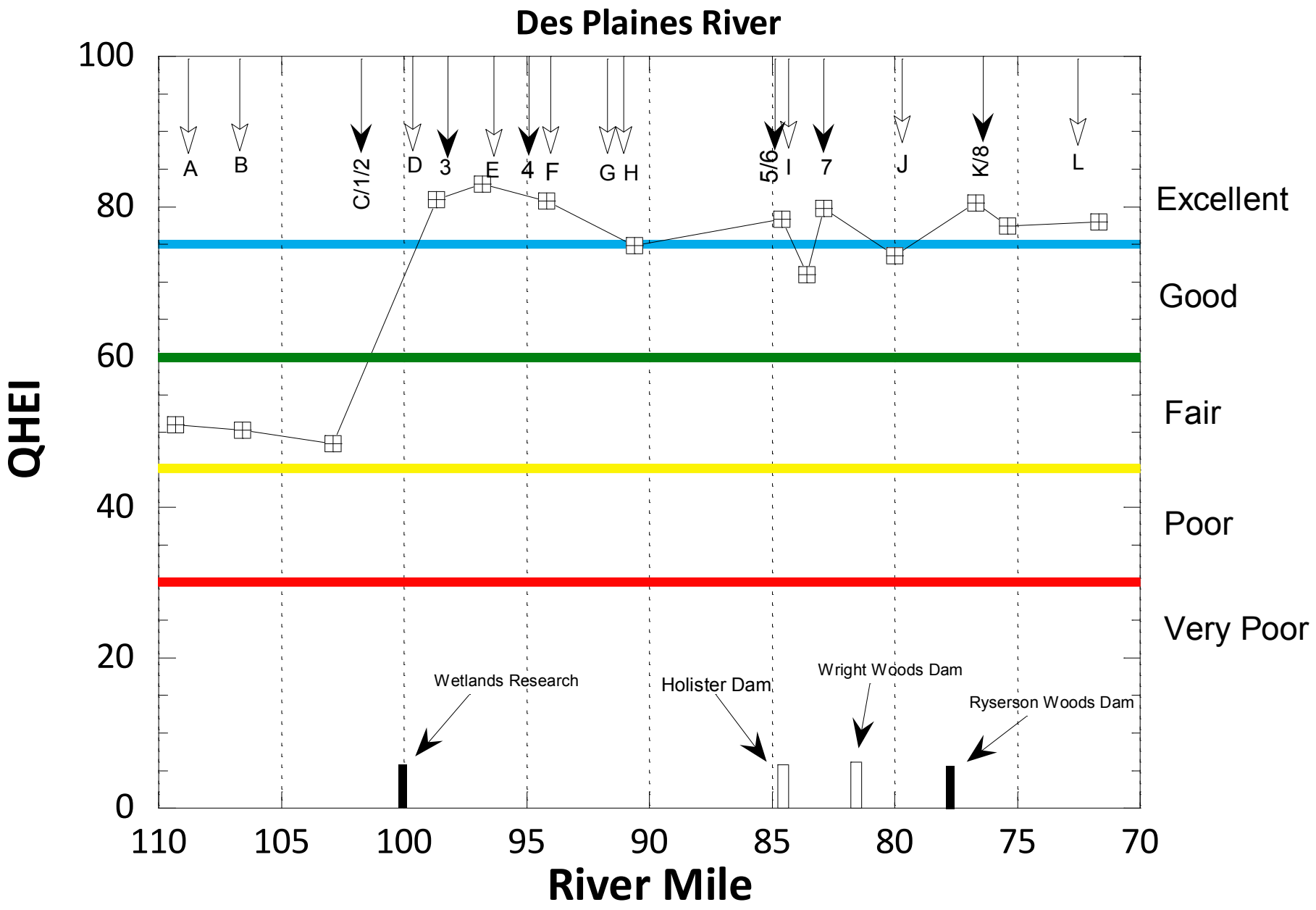

Chloride by Sub-Watershed
Aptakisic Creek
Des Plaines River Trib
Mill Creek
Buffalo Creek
Middle Des Plaines River
Indian and Bull Creeks
Des Plaines River
North Mill Creek
IPS Target for Macroinvertebrates 141 mg/L
IPS Target for Fish 112 mg/L
US EPA Chronic Criteria (230 mg/.l)
50
100
150
200
250
300
350
400
Total Chloride (mg/L)

Table 13. *Concentrations of organic compounds (mg/kg) in sediments at sites in the Des Plaines River study area October 2016. Values above the MacDonald et al. (2000) PEL and TEL thresholds or the elevated and extremely elevated ranges of Short (1998) are shaded in accordance with the color-code key at the end of the table.*

Site ID	Basin code	Stream Code	RM	Acenaphthene (mg/kg)	Acenaphthylene (mg/kg)	Anthracene (mg/kg)	Benzo(a)anthracene (mg/kg)	Benzo(a)pyrene (mg/kg)	Benzo(b)fluoranthene (mg/kg)	Benzo(g,h,i)perylene (mg/kg)	Benzo(k)fluoranthene (mg/kg)	Chrysene (mg/kg)	Dibenzo(a,h)anthracene (mg/kg)	Fluoranthene (mg/kg)	Fluorene (mg/kg)	Indeno(1,2,3-cd)pyrene (mg/kg)	Naphthalene (mg/kg)	Phenanthrene (mg/kg)	Pyrene (mg/kg)
Des Plaines River																			
13-6	95	656	109.30	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118
13-5	95	656	106.60	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
13-4	95	656	102.90	169	169	169	297	292	519	267	210	402	169	869	169	202	169	380	600
13-3	95	656	98.70	79	79	156	891	926	1460	797	480	1090	141	2700	90	617	79	1300	1950
13-2	95	656	96.82	61	61	61	61	61	61	61	61	61	61	65	61	61	61	61	61
13-1	95	656	94.20	86	86	86	88	116	195	112	86	157	86	282	86	89	86	86	221
16-5	95	656	83.60	133	133	199	1730	1970	3430	1720	897	2490	302	5800	133	1360	133	1820	3960
16-4	95	656	80.00	72	72	72	273	317	573	298	194	439	72	849	72	235	72	231	648
16-3	95	656	76.7	80	80	80	142	187	364	177	104	266	80	485	80	136	80	160	367
16-2	95	656	75.40	90	90	90	279	365	692	357	223	510	90	1050	90	274	90	334	723
16-1	95	656	71.7	444	71	729	3590	2790	3960	1760	1080	3080	412	10200	529	1550	71	4880	5750
Newport Drainage Ditch																			
12-2	95	708	3.03	135	135	135	135	135	135	135	135	135	135	135	135	135	135	135	135
12-1	95	708	0.70	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63
Seavey Drainage Ditch																			
15-3	95	390	3.66	52	52	52	221	258	414	244	150	308	52	651	52	183	52	287	478
15-8	95	390	0.45	98	98	208	2250	2710	4640	2360	1110	3320	401	6980	134	1930	98	1940	5210
Aptaksic Creek																			
18-3	95	701	4.30	135	135	178	1570	2010	3650	1720	980	2590	311	6110	135	1390	135	2090	4050
18-2	95	701	0.8	84	84	84	84	84	156	102	84	120	84	178	84	84	84	84	133
18-1	95	701	0.50	88	88	88	567	549	760	373	270	603	88	1480	88	321	88	478	1070
Buffalo Creek																			
17-3	95	703	7.7	63	63	63	63	63	65	63	63	63	63	99	63	63	63	63	84
17-2	95	703	6.10	93	93	93	275	340	577	281	192	446	93	865	93	225	93	344	662
17-1	95	703	0.75	89	89	121	1160	1430	2540	1270	732	1790	214	3680	89	1000	89	1200	2620
Buffalo Creek Tributary																			
17-4	95	713	0.68	76	76	82	421	498	917	517	291	700	86	1560	76	403	76	612	1140


Des Plaines River
QHEI
River Mile
100
80
60
40
20
0
110
105
100
95
90
85
80
75
70
A
B
C/1/2
D
3
E
4
F
G H
5/6
I
7
J
K/8
L
Excellent
Good
Fair
Poor
Very Poor
Wetlands Research
Holister Dam
Wright Woods Dam
Ryserson Woods Dam

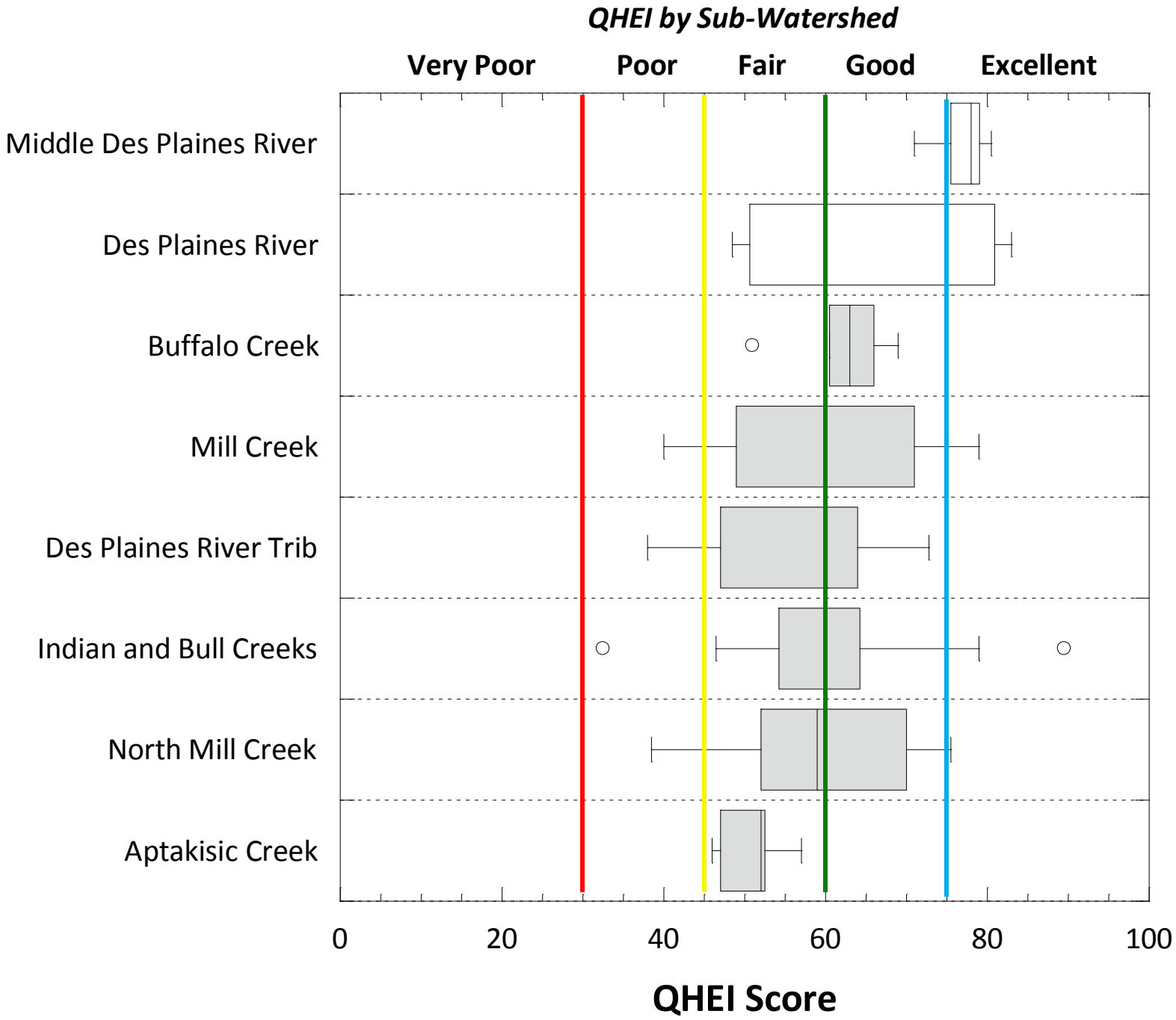

QHEI by Sub-Watershed
Very Poor
Poor
Fair
Good
Excellent
Middle Des Plaines River
Des Plaines River
Buffalo Creek
Mill Creek
Des Plaines River Trib
Indian and Bull Creeks
North Mill Creek
Aptakisic Creek
0
20
40
60
80
100
QHEI Score

Table 11. *Qualitative Habitat Evaluation Index (QHEI) matrix showing good and modified habitat attributes at each site in the Upper Branch Des Plaines River study area in 2016. (■- good habitat attribute; ● - high influence modified attribute; ● - moderate influence modified attribute).*

			Good Habitat Attributes											High Influence Modified Attributes						Moderate Influence Modified Attributes													Ratios	
Site ID	River Mile	QHEI Score	No Channelization	Boulder, Cobble, Gravel	Silt Free	Good-Excellent Development	Moderate-High Sinuosity	Moderate-Extensive Cover	Fast Flow w Eddies	Little to No Embeddedness	Max Depth > 40 cm	No Riffle Embeddedness	"Good" Habitat Attributes	Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse No Cover	Max Depths <40 cm	High Influence Poor Attributes	Recovering from Channelization	Mod-High Silt Cover	Sand Substrates (Boatable sites)	Hardpan Origin	Fair- Poor Development	Low Sinuosity	≤ 2 Cover Types	Intermittent Flow or Pools <20 cm	No Fast Current Types	Mod-Extensive Embeddedness	Mod-Extensive Riffle Embeddedness	No Riffle	Poor Habitat Attributes	Ration of Poor (High) to Good	Ration of Poor (All) to Good
Des Plaines River																																	
13-6	109.3	**51.0**	■				■	■			■		4		●				1		●			●				●	●		●	5	0.83	1.20
13-5	106.6	**50.3**	■				■	■			■		4		●				1		●			●				●	●		●	5	0.83	1.20
13-4	102.9	**48.5**	■					■			■		3		●				1		●			●	●			●	●		●	6	0.57	1.75
13-3	98.7	**81.0**	■			■	■	■	■		■		6						0		●	●						●	●	●		5	1.17	0.86
13-2	96.8	**83.0**	■	■		■	■	■	■		■		7						0		●	●						●	●	●		5	1.33	0.75
13-1	94.2	**80.8**	■	■		■	■	■	■		■		7						0			●						●	●	●		4	1.60	0.63
13-16	90.6	**74.8**	■	■		■	■	■			■		6						0		●	●						●	●	●		5	1.17	0.86
16-7	84.6	**78.3**	■	■		■	■	■	■		■		7						0		●	●						●	●	●		5	1.33	0.75
16-5	83.6	**71.0**	■	■		■	■	■			■		6						0		●	●						●	●	●		5	1.17	0.86
16-8	82.9	**79.8**	■	■		■	■	■	■	■	■		8						0			●						●		●		3	2.25	0.44
16-4	80.0	**73.5**	■	■		■	■	■			■		6						0		●	●						●	●	●		5	1.17	0.86
16-3	76.7	**80.5**	■	■		■	■	■	■	■	■		8						0		●	●						●		●		4	1.80	0.56
16-2	75.4	**77.5**	■	■		■	■	■	■		■		7						0		●	●						●	●	●		5	1.33	0.75
16-1	71.7	**78.0**	■	■		■	■	■	■	■	■		8						0			●						●		●		3	2.25	0.44
Aptaksic Creek																																	
18-4	4.7	**52.5**	■	■			■	■		■			5		●		●	●	3					●				●		●		3	1.50	0.67
18-3	4.3	**57.0**		■				■				■	3					●	1	●	●			●	●			●	●			6	0.57	1.75
18-2	0.8	**46.0**		■				■			■		3				●		1	●	●			●	●			●	●	●		7	0.50	2.00

Illinois EPA Fish Index of Biotic Integrity

Table 3. Ten metrics selected for inclusion in revised Illinois IBIs. Metrics in **bold type** are new to Illinois IBIs; four others are slight variants of previous metrics.

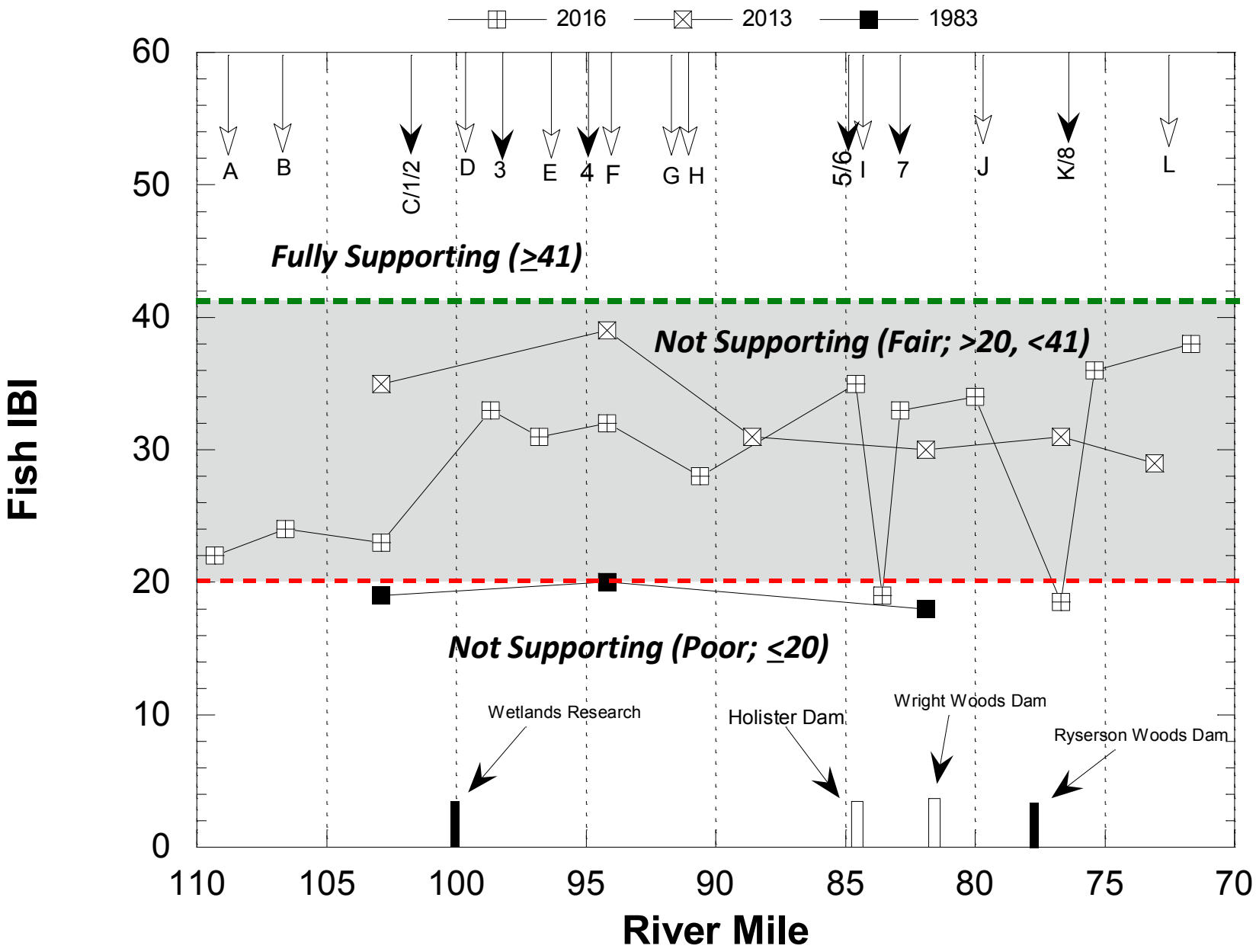
Metric Name	Description
Species-richness metrics	
NFSH	Number of native fish species
NSUC	Number of sucker species (i.e., in family Catostomidae)
NSUN	Number of native sunfish species (i.e., in family Centrarchidae)
INTOL	Number of native intolerant species
NMIN	**Number of native minnow species (i.e., in family Cyprinidae)**
NBINV	**Number of native benthic invertivore species**
Trophic- or reproductive-structure metrics	
SBI	**Proportion of individuals of species that are specialist benthic invertivores**
GEN	**Proportion of individuals of species that are generalist feeders**
LIT0T	**Proportion of individuals of species that are obligate coarse-mineral-substrate spawners and not "tolerant" (i.e., excludes creek chub and white sucker)**
Tolerance metric	
PRTOL	**Proportion of tolerant species**

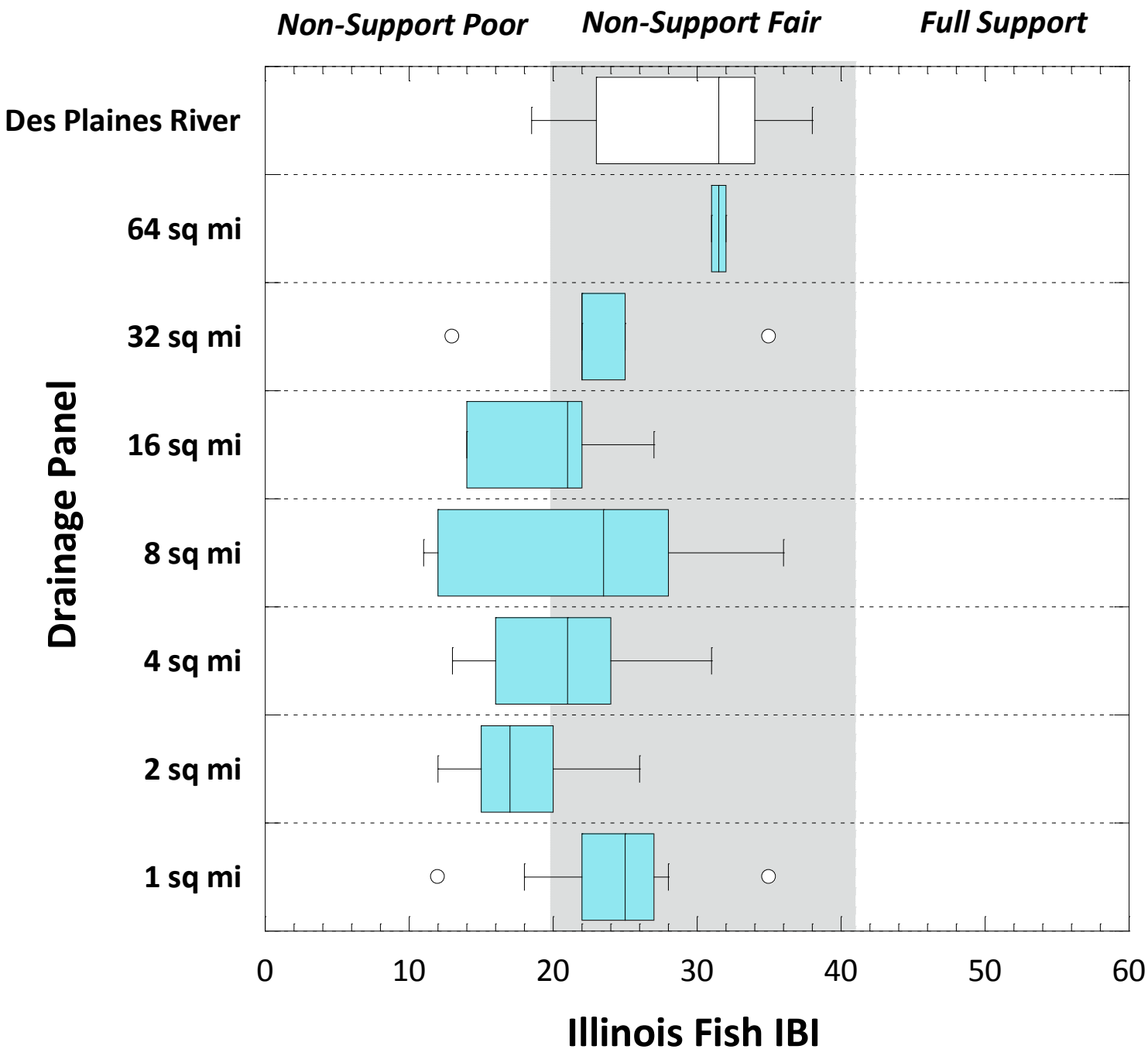
The end goal are biological assemblages that meet the State's aquatic life use "biocriteria"

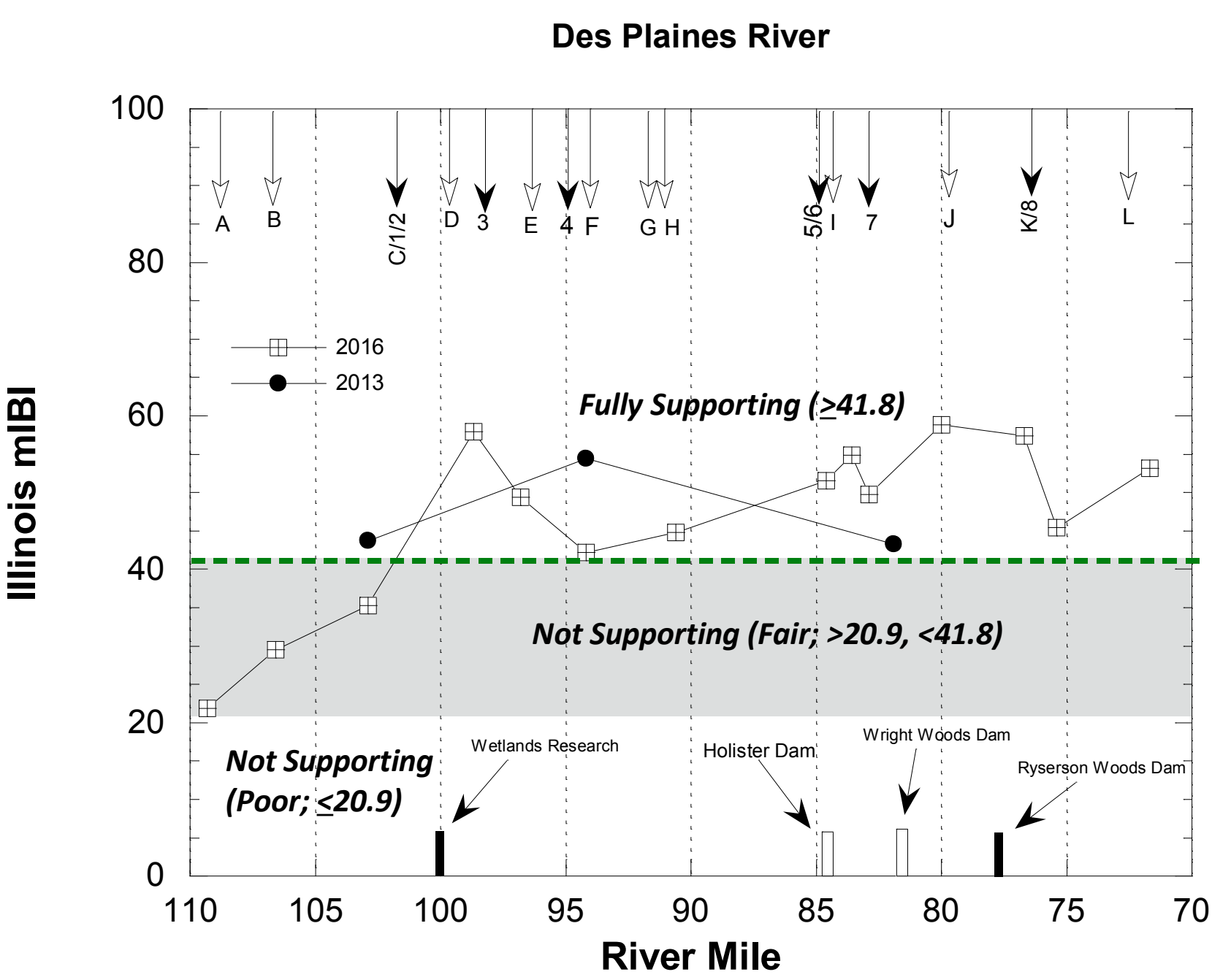
Illinois EPA IBI Narrative Evaluations

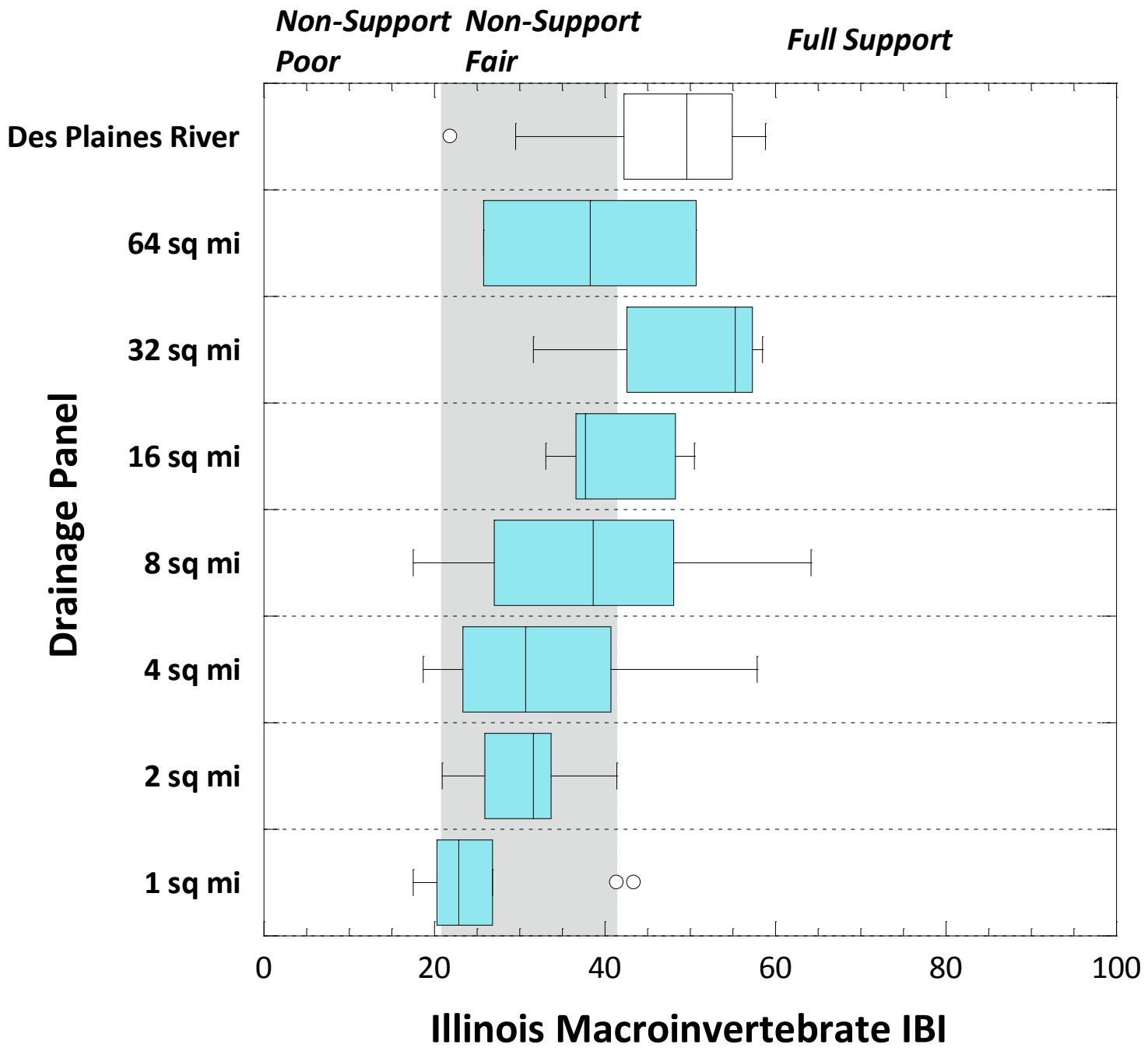
Prior IBI-score Range	Class	Description
51 - 60	A	Unique Aquatic Resource (Exceptional)
41 - 50	B	Highly Valued Aquatic Resource (Good)
31 - 40	C	Moderate Aquatic Resource (Fair)
21 - 30	D	Limited Aquatic Resource (Poor)
< 21	E	Restricted Aquatic Resource (Very Poor)

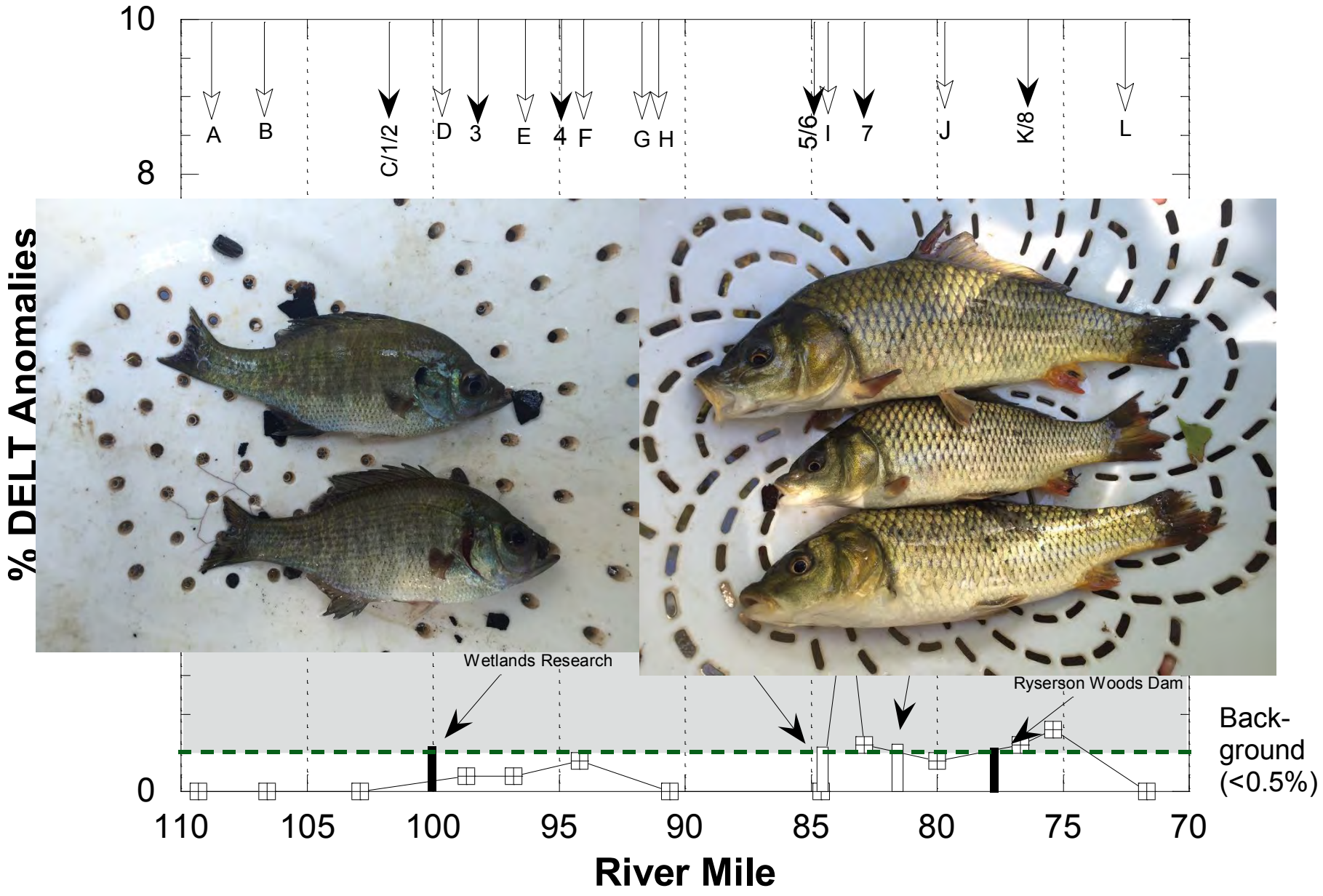
IL General Use Attainment Threshold


2016
2013
1983
A
B
C/1/2
D
3
E
4
F
G H
5/6
I
7
J
K/8
L
Fully Supporting (≥41)
Not Supporting (Fair; >20, <41)
Not Supporting (Poor; ≤20)
Wetlands Research
Holister Dam
Wright Woods Dam
Ryserson Woods Dam
Fish IBI
River Mile
60
50
40
30
20
10
0
110
105
100
95
90
85
80
75
70


Non-Support Poor
Non-Support Fair
Full Support
Des Plaines River
64 sq mi
32 sq mi
16 sq mi
8 sq mi
4 sq mi
2 sq mi
1 sq mi
Drainage Panel
0
10
20
30
40
50
60
Illinois Fish IBI


Des Plaines River
Illinois mIBI
River Mile
100
80
60
40
20
0
110
105
100
95
90
85
80
75
70
A
B
C/1/2
D
3
E
4
F
G
H
5/6
I
7
J
K/8
L
2016
2013
Fully Supporting (≥41.8)
Not Supporting (Fair; >20.9, <41.8)
Not Supporting (Poor; ≤20.9)
Wetlands Research
Holister Dam
Wright Woods Dam
Ryserson Woods Dam


Non-Support
Poor
Non-Support
Fair
Full Support
Des Plaines River
64 sq mi
32 sq mi
16 sq mi
8 sq mi
4 sq mi
2 sq mi
1 sq mi
Drainage Panel
0
20
40
60
80
100
Illinois Macroinvertebrate IBI


10
8
A
B
C/1/2
D
3
E
4
F
G
H
5/6
I
7
J
K/8
L
% DELT Anomalies
Wetlands Research
Ryserson Woods Dam
Back-
ground
(<0.5%)
0
110
105
100
95
90
85
80
75
70
River Mile

Biological Attributes & "Signatures"

DRWW Site ID	River Mile	Drain-age Area (mi².)	Fish Assemblage							Macroinvertebrate Assemblage								
			fIBI	MIwb	Native Sp.	%DELT Anom-alies	Intol. Sp.	%Mineral Spawners	%Toler-ant	mIBI	Total Taxa	Intol. Taxa	%Toler-ants	EPT Taxa	% EPTs	MBI	%Toxic Toler-ant	% Org. Enrich. Taxa
Des Plaines River																		
13-6	109.30	123.67	22	5.86	11	0	1	3.45	36.36	21.92	16	0	0.794	2	3.17	5.3	0	0.6
13-5	106.60	137.29	24	7.65	11	0	1	2.74	18.18	29.53	20	1	1.379	4	11.03	5.3	0.7	16.2
13-4	102.90	145.55	23	7.78	12	0	1	6.67	41.67	35.3	17	1	0.794	3	49.21	5.4	0	2.9
13-3	98.70	220.29	33	9.74	23	0.2	2	9.49	26.09	57.86	34	3	7.958	7	22.82	5.4	3	4.8
13-2	96.82	225.36	31	9.15	19	0.21	2	11.78	26.32	49.39	34	4	6.571	4	4.49	5.7	9	8.3
13-1	94.20	232.03	32	9.41	20	0.37	1	15.38	30	42.19	25	2	5.786	7	8.01	4.7	0.3	11.9
13-16	90.60	253.75	28	6.91	12	0	1	55.88	41.67	44.77	23	5	10.093	5	16.15	5.1	5.9	5.3
16-7	84.60	266.48	35	9.25	24	0	3	9.97	25	51.61	32	5	2.824	8	7.31	4.8	4.7	11
16-5	83.60	268.07	19	7.13	11	2.56	0	15.38	36.36	54.92	31.5	4	4.57	6.5	29.45	4.9	0.8	11.1
16-8	82.90	268.9	33	9.12	22	0.60	2	14.33	27.27	49.75	36	5	9.627	8	8.7	5.7	0.6	19.3
16-4	80.00	273.21	34	8.64	18	0.36	2	15.11	27.78	58.79	28	6	2.027	9	47.3	5.0	0	6.8
16-3	76.70	314.68	18.5	4.87	10	0.58	1	5.06	13.16	57.42	32	5	2.93	11	26.95	3.4	0	4.7
16-2	75.40	323.96	36	8.78	22	0.83	3	19.05	27.27	45.37	21	3	1.104	5	38.17	4.4	0.3	15.1
16-1	71.70	358.68	38	8.53	20	0	3	43.68	30	53.15	28	6	2.694	7	38.05	5.1	0.3	16.2
Bull Creek																		
14-6	5.95	2.42	12	na	1	0	0	0	0	22.09	12	0	19.544	0	0	6.4	0	10.7
14-5	4.70	1.32	25	na	4	0	0	0	50	17.45	24	1	22.484	0	0	7.4	5	60.1
14-2	1.00	8.44	28	na	8	0	0	31.51	37.5	35.31	18	2	6.832	1	0.31	5.9	0.3	14.9
14-1	0.50	11.69	36	na	21	0	2	20.61	28.57	62.89	39	4	9.241	5	5.94	5.8	1	14.2
Seavey Drainage Ditch																		
15-3	3.66	5.05	15	na	5	0	0	0	40	25.99	24	1	16.667	1	0.65	6.5	0.3	40.5
15-8	0.45	9.77	24	na	12	0	1	0.73	50	25.74	23	1	21.838	0.5	0.17	7.3	0	50.5
Aptaksic Creek																		
18-4	4.70	1.09	27	na	5	0	0	0	60	18.46	13	0	12.541	0	0	6.1	0	16.6
18-3	4.30	2.3	17	na	7	1.49	0	0	71.43	25.61	23	1	8.766	0	0	6.0	8.1	19.8
18-2	0.80	4.94	26	na	18	0.49	1	0.74	33.33	30.74	27	2	13.934	3	6.23	6.3	7.9	19.3
18-1	0.50	5.5	24	na	12	1.14	1	1.71	33.33	22.97	22	2	14.047	0	0	6.9	47.8	33.8

***Table 1**. Aquatic life use attainment status in the 2016 Upper Des Plaines River watershed study area with associated causes and sources of impairment listed for partial and non-supporting sites determined by this study and by IEPA (2016) for matching sites (see footnote for fIBI and mIBI use support thresholds). fIBI, MIwb, and mIBI values that do not meet the threshold are asterisked (*) and poor values are underlined. The most limiting assemblage for partial support is indicated by a F (fish) or M (macroinvertebrates).*

DRWW Site ID	River Mile	Drain-age Area (mi.^{2})	fIBI	MIwb[1]	mIBI	QHEI	Attain-ment Status[2]	MBI Causes	MBI Sources	IEPA Causes
Des Plaines River										
13-6	109.30	123.7	22*	5.9*	21.2*	51.0	Non - Fair	Siltation; Org. Enrich.; Nutrients; Chlorides	Urban runoff	D.O., TSS,
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] runoff	[illegible]
13-4	102.90	145.6	23*	7.8ns	[illegible]	[illegible]	Non - Fair	Siltation; [illegible]	Urban runoff	D.O., Siltation, TSS
13-3	98.70	220.3	33*	9.7	57.9	81.0	Partial (F)[3]	Org. Enrich; Siltation; Chlorides, PAHs	WWTP, Urban runoff	NA[4]
13-2	96.82	225.4	31*	9.2	49.4	83.0	Partial (F)	[illegible] Siltation; Chlorides	WWTP, Urban runoff	NA
13-1	94.20	232.0	32*	9.4	42.2	80.8	Partial (F)	[illegible] Nutrient; Siltation; Chlorides	WWTP, Urban runoff	NA
13-16	90.60	253.8	28*	6.9*	44.8	74.8	Partial (F)	Org. Enrich; Nutrients; Siltation; Chlorides	WWTP, Urban runoff	Arsenic, Chloride, TP

Finding Biological impairments is a first step in impaired waters listings.

A "lines-of-evidence" approach is used to assign causes & sources.

***Table 2**. E. coli values (cfu/100 ml) for samples collected in the Upper Des Plaines study area during May-October 2016. Yellow shaded values exceed the recommended U.S. EPA (2012) recreation use criteria.*

DRWW Site ID	Basin Code	Stream Code	River Mile	N	Minimum (cfu/100 mL)	Geometric Mean (cfu/100 mL)	Maximum (cfu/100 mL)
			Des Plaines River				
13-6	95	656	109.3	6	27.2	92.6	387
13-5	95	656	106.6	5	6.3	49.9	131
13-4	95	656	102.9	6	42.2	111.6	548
13-3	95	656	98.7	5	65.7	214.4	1050
13-2	95	656	96.82	6	1	106.1	816
13-1	95	656	94.2	6	88.4	147.1	219
[illegible]	95	[illegible]	[illegible]	6	81.6	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16-4	95	656	80	6	64.4	145.8	228
16-3	95	[illegible]	76.7	6	65.1	138.3	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	308
16-1	95	656	71.7	6	2	49.9	387
			Hastings Creek				
10-5	95	702	3.12	5	3.1	106.2	921
10-4	95	702	1.68	5	179	390.9	980
			North Mill Creek				
10-3	95	996	10.2	5	1	115.3	816
10-2	95	996	8.1	6	98.5	374.2	1050
10-1	95	996	1.1	6	1	150	866
			Mill Creek				
11-6	95	995	17.2	6	435	656.3	921
11-5	95	995	13.8	6	1	50.8	201
11-4	95	995	10.1	6	115	189.7	345
11-3	95	995	7.2	5	1	74.5	488

Is *E. coli* a sufficiently reliable indicator of risks to human health?

Midwest Biodiversity Institute
Center for Applied Bioassessment & Biocriteria
P.O. Box 21561
Columbus, OH 43221-0561

Priority Rankings based on Estimated Restorability for Stream Segments in the DuPage-Salt Creek Watersheds

Midwest Biodiversity Institute
Center for Applied Bioassessment & Biocriteria
P.O. Box 21561
Columbus, OH 43221-0561
mbi@mwbinst.com

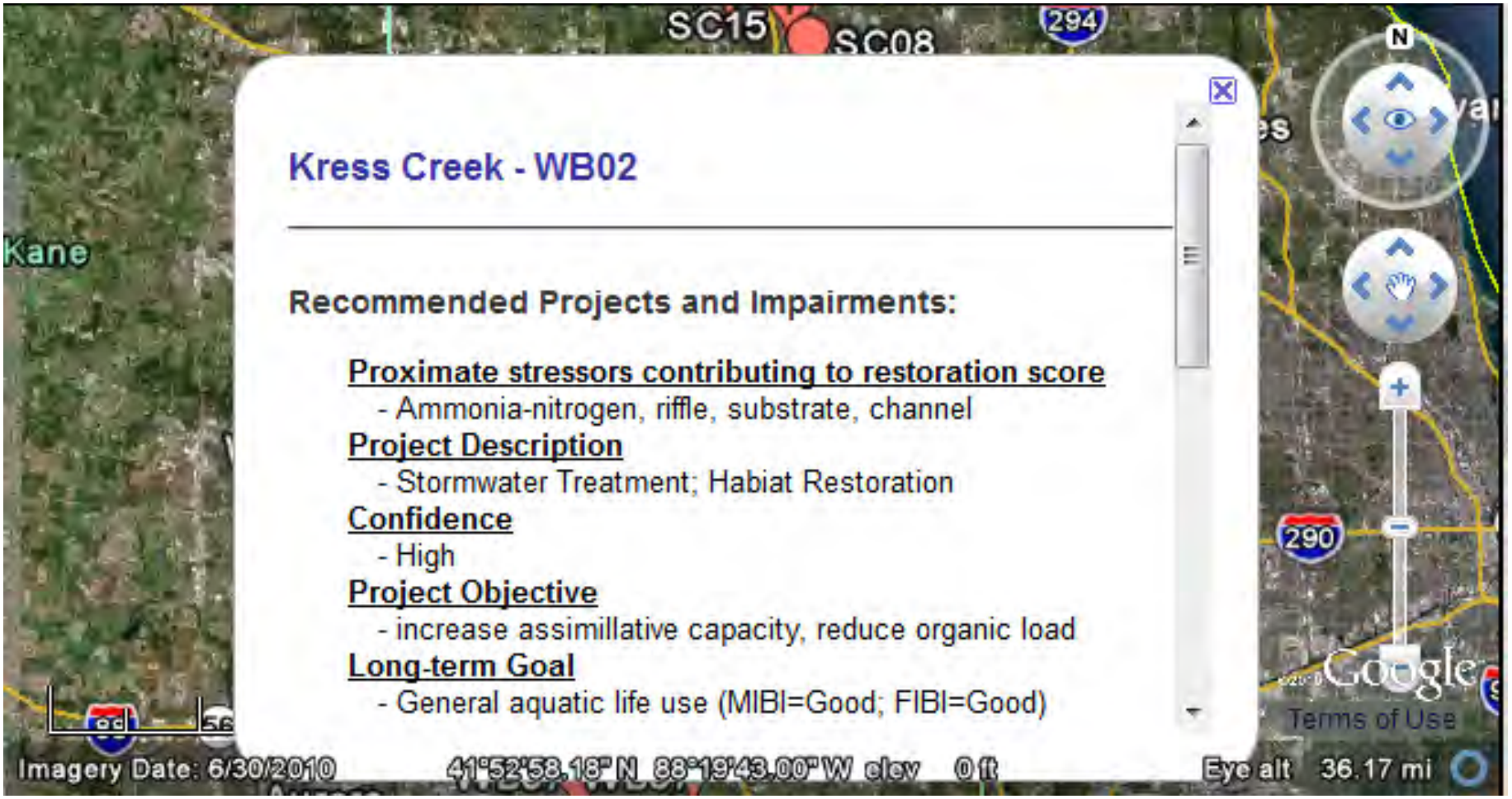
Integrated Analyses

- Analyzed 2006-7 database for stress:response patterns & thresholds.
- Used a series of analytical techniques to extract relationships.
- Nine "categorical" stressors were identified – some are representative of multiple effects.
- Revising in 2017-18 with expanded regional data.
- Incorporation of better visualization tools.

An Integrated Prioritization System (IPS) was developed for DRSCWG in 2009-10.

Statistically Demonstrated Stressor Indicators

Parameter	mIBI	fIBI
– Riparian Score	5	Continuous
– Riffle Score	4	3
– Channel Score	Continuous	10
– Substrate Score	9	Continuous
– Pool Score	7	7
– Chloride	141 mg/l	112 mg/l
– TKN	Continuous	1.0 mg/l
– BOD_5	Continuous	Continuous
– NH3N	Continuous	0.15 mg/l



Kress Creek - WB02

Recommended Projects and Impairments:

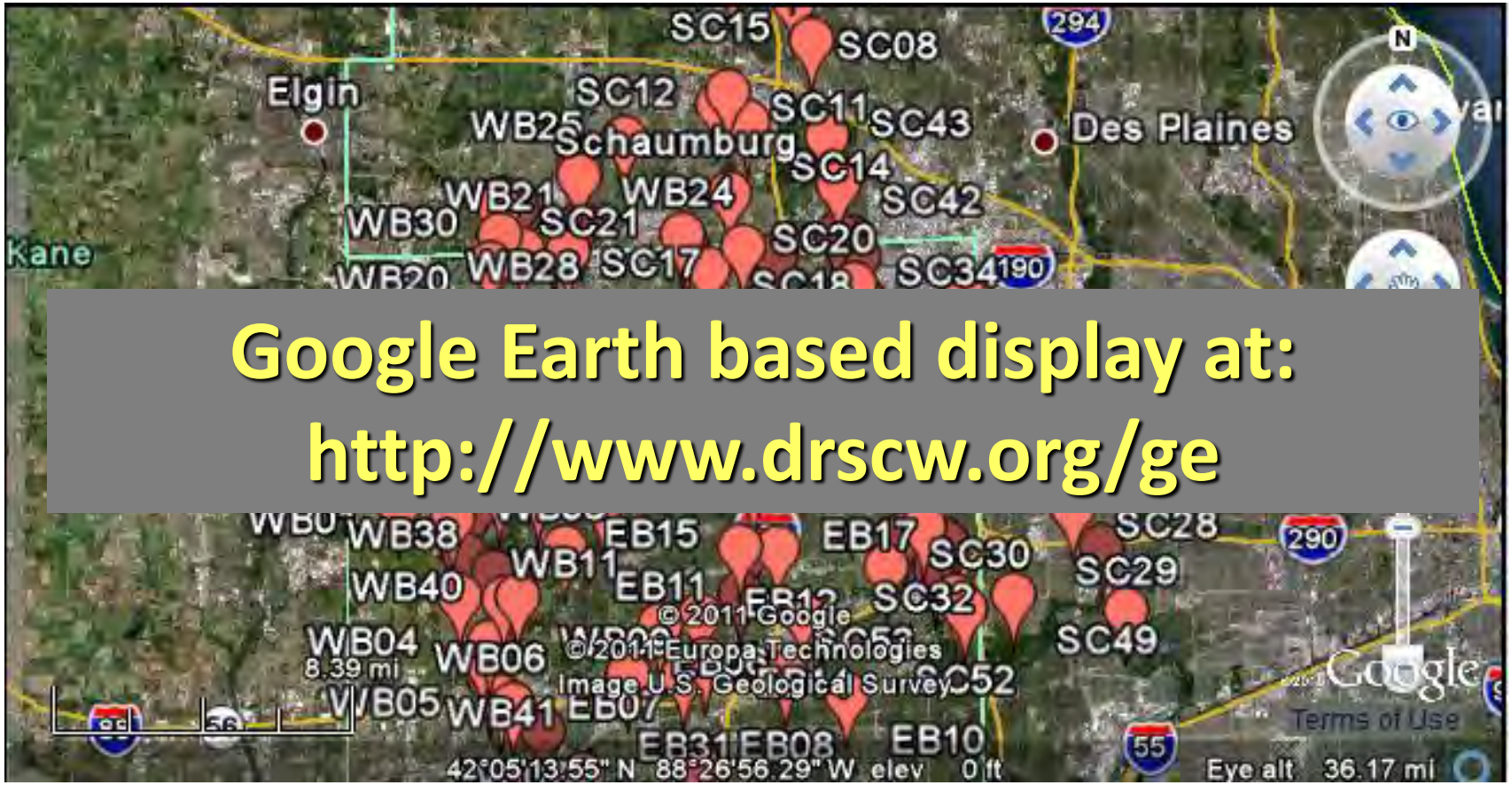
Proximate stressors contributing to restoration score
- Ammonia-nitrogen, riffle, substrate, channel

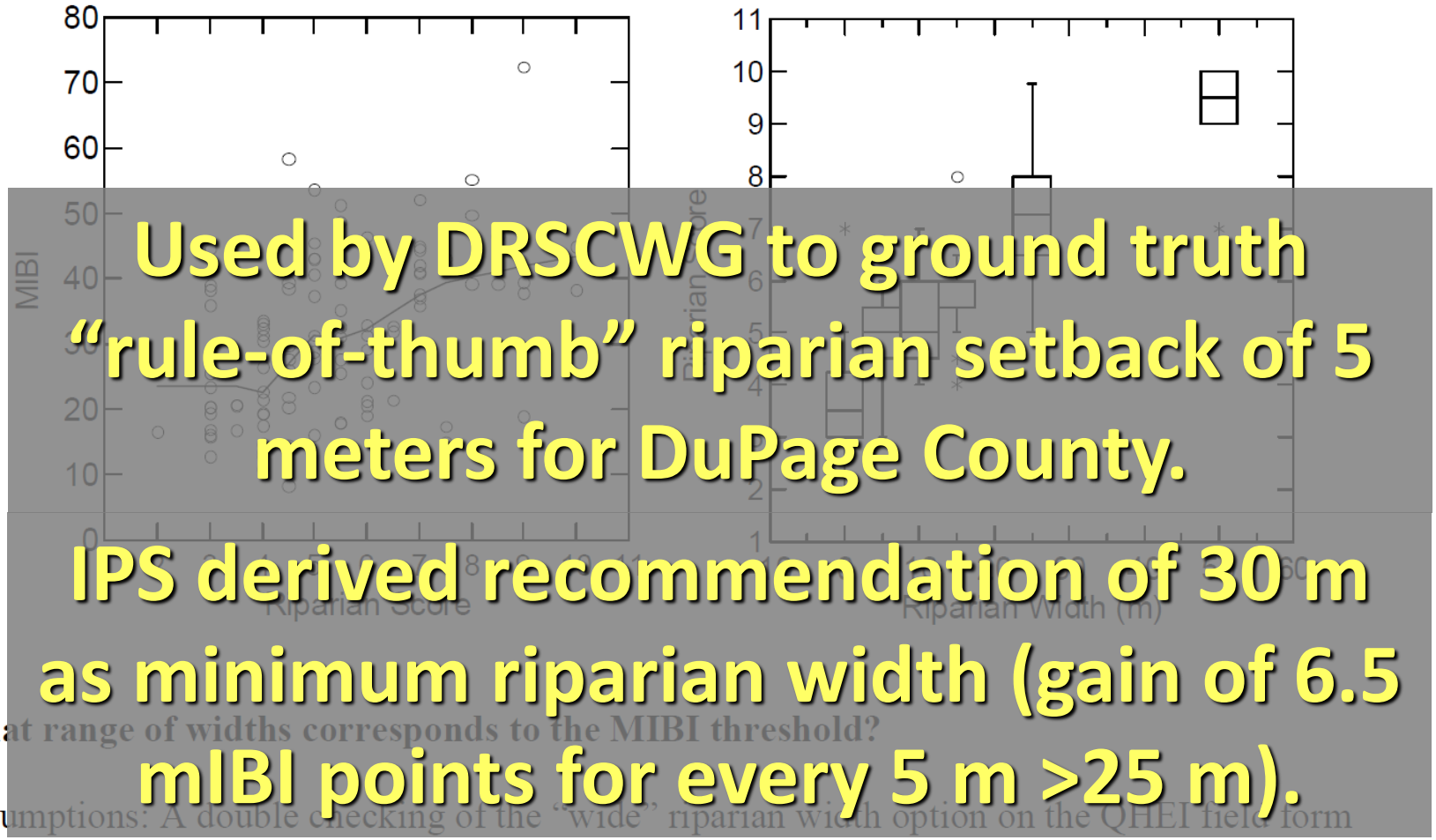
Project Description
- Stormwater Treatment; Habiat Restoration

Confidence
- High

Project Objective
- increase assimillative capacity, reduce organic load

Long-term Goal
- General aquatic life use (MIBI=Good; FIBI=Good)


SC15
SC08
294
Elgin
SC12
SC11
SC43
WB25
Schaumburg
Des Plaines
SC14
WB21
WB24
SC42
WB30
SC21
SC20
Kane
WB28
SC17
SC34
190
Google Earth based display at:
http://www.drscw.org/ge
WB38
EB15
EB17
SC28
290
WB11
SC30
SC29
WB40
EB11
SC32
© 2011 Google
WB04
WB06
© 2011 Europa Technologies
SC49
8.39 mi
Image U.S. Geological Survey
SC52
WB05
WB41
EB07
Google
Terms of Use
EB31
EB08
EB10
55
42°05'13.55" N 88°26'56.29" W elev 0 ft
Eye alt 36.17 mi



Used by DRSCWG to ground truth "rule-of-thumb" riparian setback of 5 meters for DuPage County.

IPS derived recommendation of 30 m as minimum riparian width (gain of 6.5 mIBI points for every 5 m >25 m).

What range of widths corresponds to the MIBI threshold?

Assumptions: A double checking of the "wide" riparian width option on the QHEI field form was assigned a riparian width of 50 meters; a split checking of "wide" and "moderate" was assigned a width of 25 m; moderate and narrow were assigned 15 m, and so on. After widths were assigned based on inspecting which width choices were checked, the riparian scores were plotted (as box plots) by the width category to determine how the two corresponded. The resulting plot suggests that a width of 25 m is needed on both sides (part of the assumption of how I binned the widths) to confidently be on the positive side of the IPS threshold (i.e., a riparian score greater than 5).

What are the advantages of pushing the buffer beyond the threshold?

DRSCW

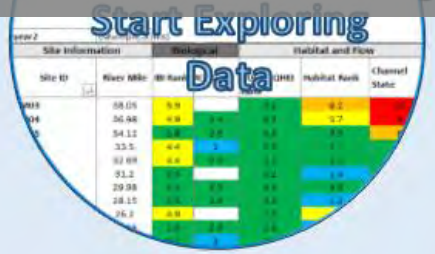
An example of where water quality criteria base don 1970s technology are now outdated.

Can you trust your state chloride water quality standard to protect your local aquatic communities?

Stephen McCracken, DRSCW
Fresh Water Society Road Salt Symposium
2.3. 2012

MSDGC Integrated Prioritization System (IPS)

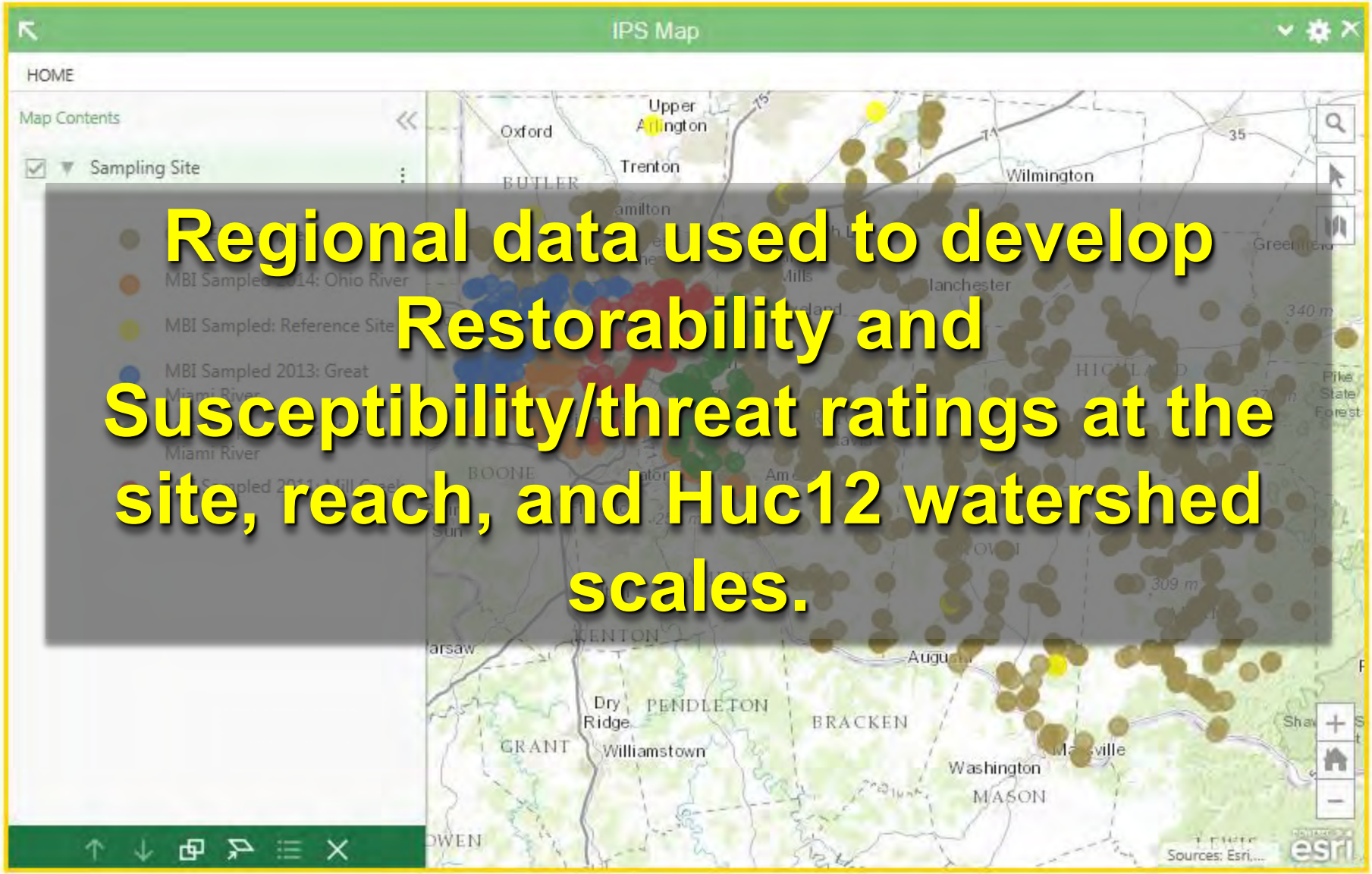
Developed in 2015 and benefiting from the DRSCWG IPS experience.



What is the IPS?

- Allows user to ***visualize and rank*** aquatic life use aspects of CWA water quality issues:
  - Identifies designated aquatic life uses (goals) for streams and rivers.
  - Identifies aquatic life impaired reaches including severity and extent.
  - Identifies probable causes of impairment.
  - *Standardized* approach to viewing data linked to attainment of aquatic life uses.
  - Sites, reaches, and watersheds ranked by ***Restorability*** (for impaired waters) and ***Susceptibility*** & ***Threat*** (for attaining waters).

Data Used in the MSDGC IPS

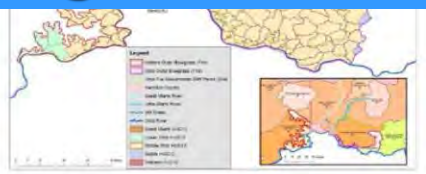


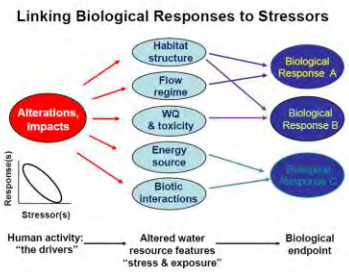
METROPOLITAN SEWER DISTRICT of greater CINCINNATI

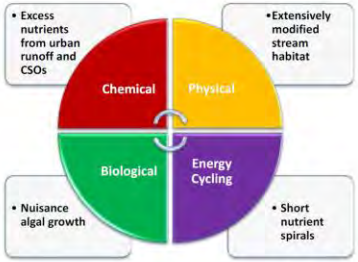
PROJECT GROUNDWORK
your pipeline to clean water

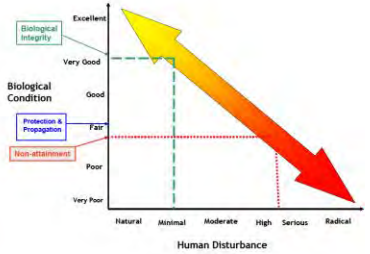
Integrated Prioritization System (IPS) Documentation and Atlas of Biological Stressor Relationships for Southwest Ohio

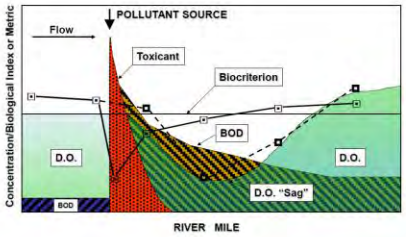
http://www.msdgc.org/initiatives/water_quality/index.html

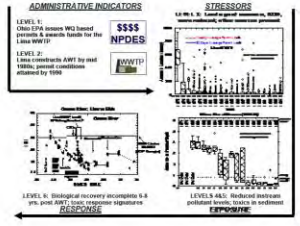










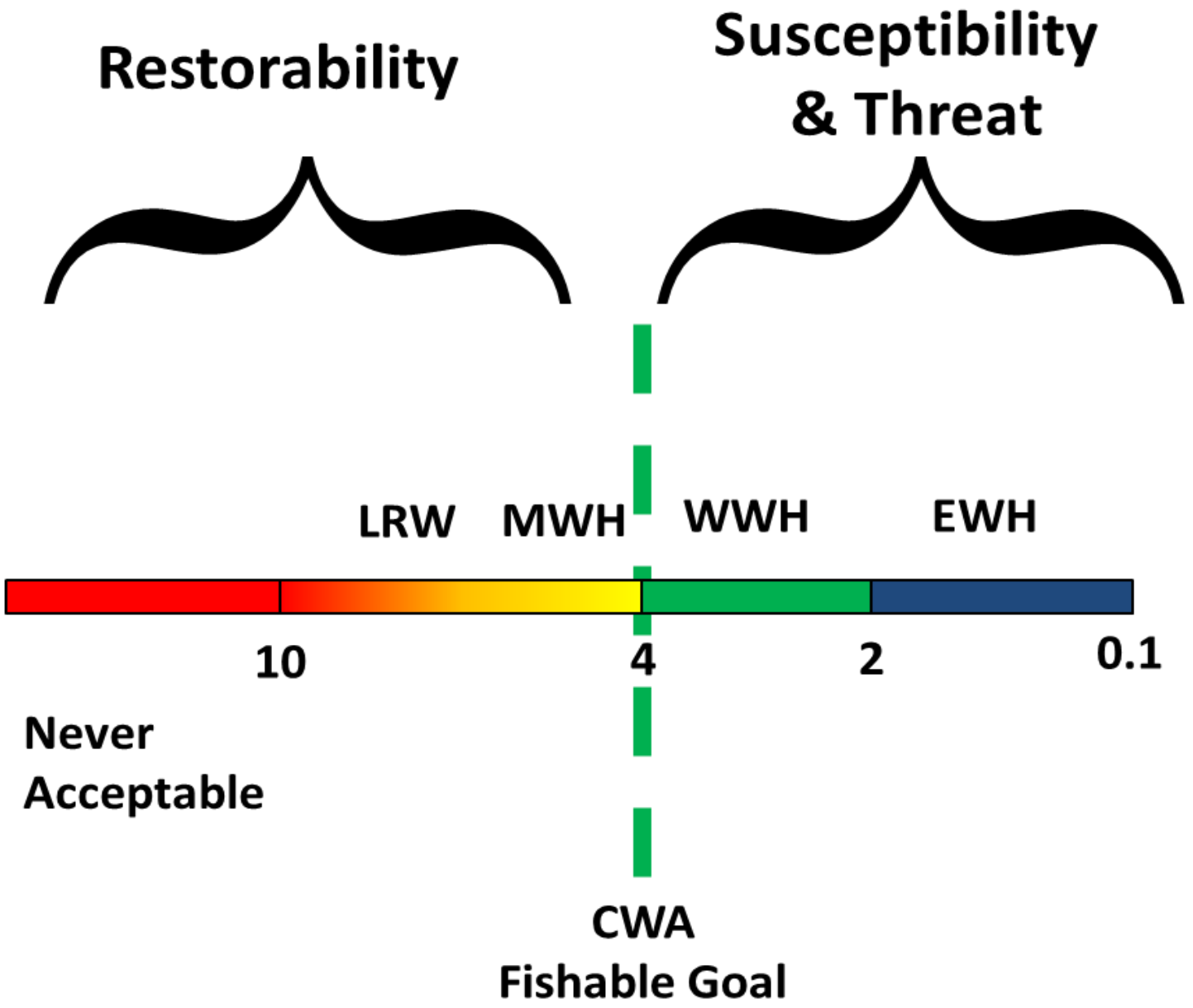


Stressor and Response Variables are Normalized to the Same Scale

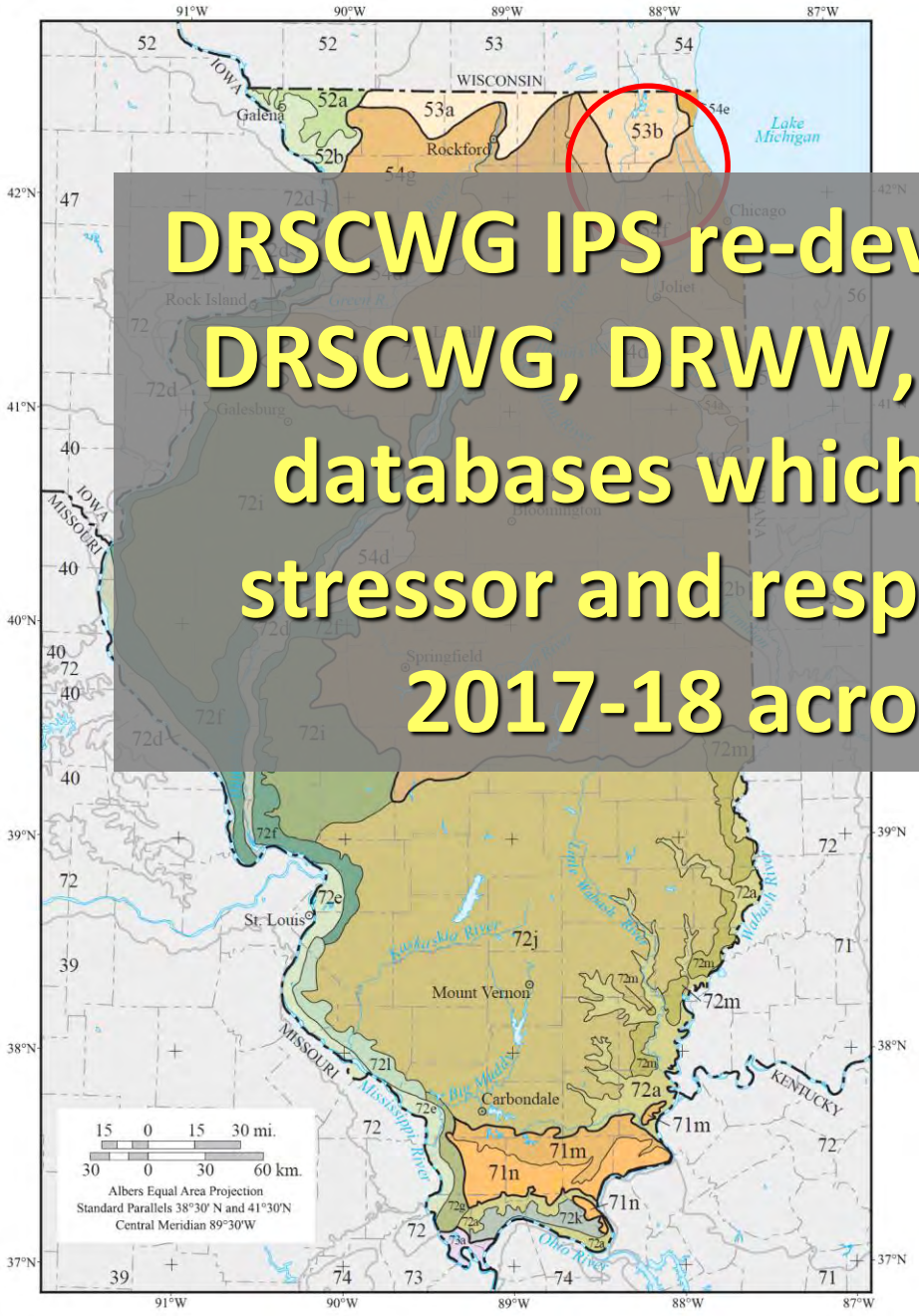
Stressor Rank Guide		
Narrative Description	**Aquatic Life Use Equivalent**	**Numeric Range**
Excellent	Exceptional Warmwater Habitat (EWH)	0-2
Good	Warmwater Habitat (WWH)	2-4
Fair	Modified Warmwater Habitat (MWH)	4-6
Poor	Limited Resource Water (LRW)	6-8
Very Poor	Never Acceptable	8-10

Principal IPS Outputs

Indivi Response		hreat
Narrative Scale/Aq Use		hreat
Excellent		w 0-50
Good		gh 51-100
Fair		*threat*
Poor		*ed to*
Very Poo		*s.*



NE Illinois IPS Data



DRSCWG IPS re-development includes DRSCWG, DRWW, and IEPA regional databases which will expand the stressor and response gradients in 2017-18 across NE Illinois.