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Assessing macroinvertebrates and habitat to develop restoration baselines and recommendations

Larissa Herrera
Senior Biologist

Outline

- Purpose and Need
- Site Location
- Macroinvertebrates
- Goals
 - Assess Bowen Park Glen Flora Tributary
 - Assess Dunal Area
- Information Obtained
 - Baseline physical and biological data
 - MIBI and MBI Scores

Purpose

- Macroinvertebrates are used to assess water quality
- WHCAG wanted to have a baseline inventory of macroinvertebrate data
 - Assess Glen Flora tributary and Dune/Swale complex
 - Provide recommendations based on data



Site Location Map – Bowen Park



Stream Sites

- Characteristics
 - Cobble, gravel, sand substrate
 - Riffles



Site Location Map – Dunal Area



Dune Sites

- Characteristics
 - Sandy-silty substrate
 - Slow, stagnant water
 - Mostly common reed



Qualitative Habitat Index (QHEI)

- QHEI scores calculated using the Ohio EPA methodology
- The swale sites are not really poor quality, they are a entirely different system and do not have many stream characteristics
- WB-5 was added in the second year

Narrative Rating	QHEI Range	
	Headwaters	Larger Streams
Excellent	≥70	≥75
Good	55 to 69	60 to 74
Fair	43 to 54	45 to 59
Poor	30 to 42	30 to 44
Very Poor	<30	<30

Site	QHEI Score	Narrative Rating
WB-1	31	Poor
WB-2	34	Poor
WB-3	41	Poor
WB-4	40	Poor
WB-5	42	Poor
WR-1	73.5	Excellent
WR-2	71	Excellent
WR-3	43	Fair

Methodology

- IEPA Methodology
 - Used to assess streams and rivers (riffle/run sequence)
 - We used to assess swales as well
 - No current state specific non-flowing water methodology
- Dnet
 - 20 jabs
 - Take jabs in different habitat types
 - Effort allocated based on percentages of habitat type
- Samples identified in the laboratory

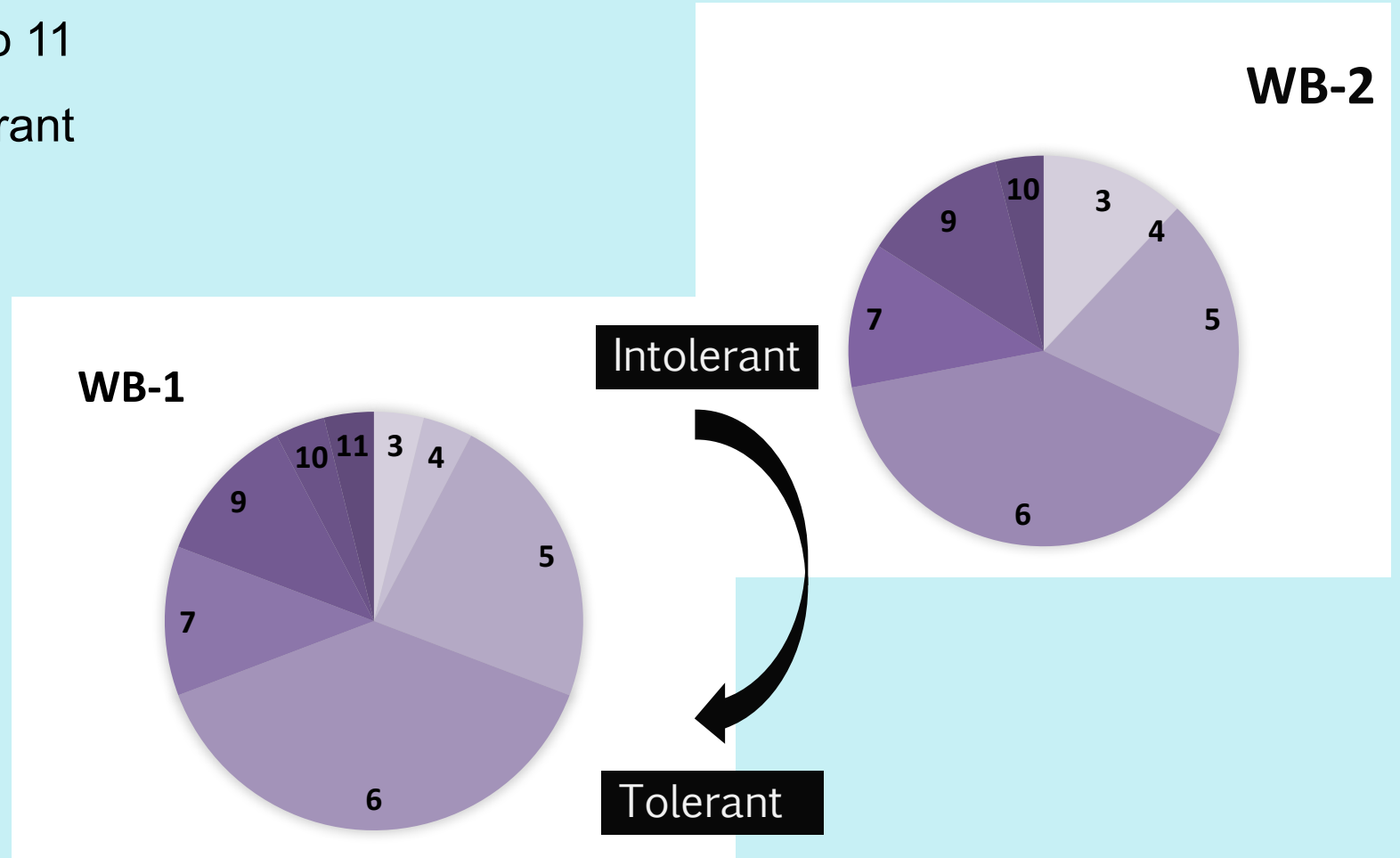
MBI

- Macroinvertebrate Biotic Index
- Calculated using numerical rating of each taxa
- Used throughout U.S. for stream health evaluations
- Illinois EPA assigns values for Illinois
- Each taxa has a value from 0 to 11 with 0 being most sensitive and 11 being least
- A lower MBI score is better

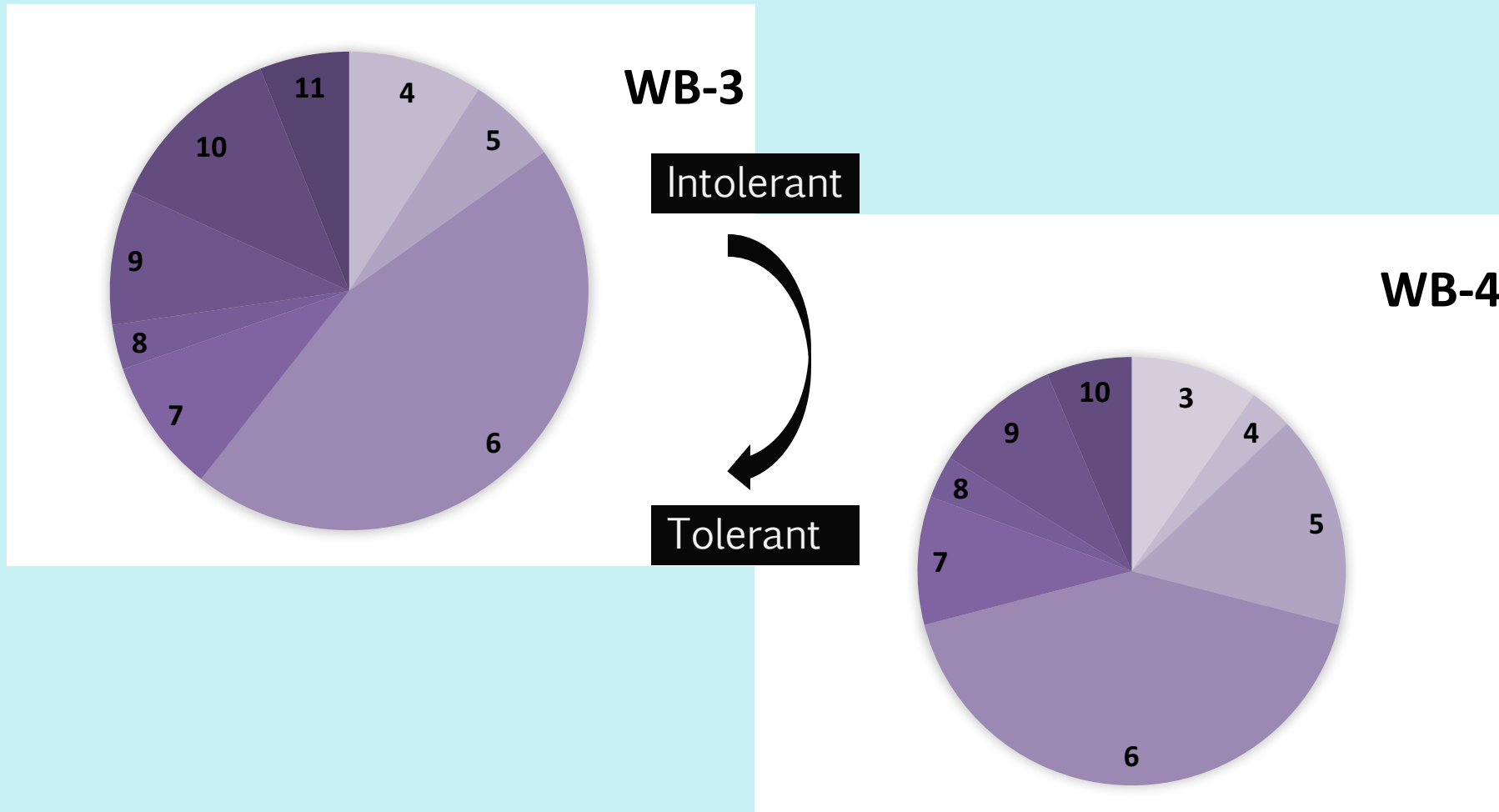


Beach Sites – IEPA Values

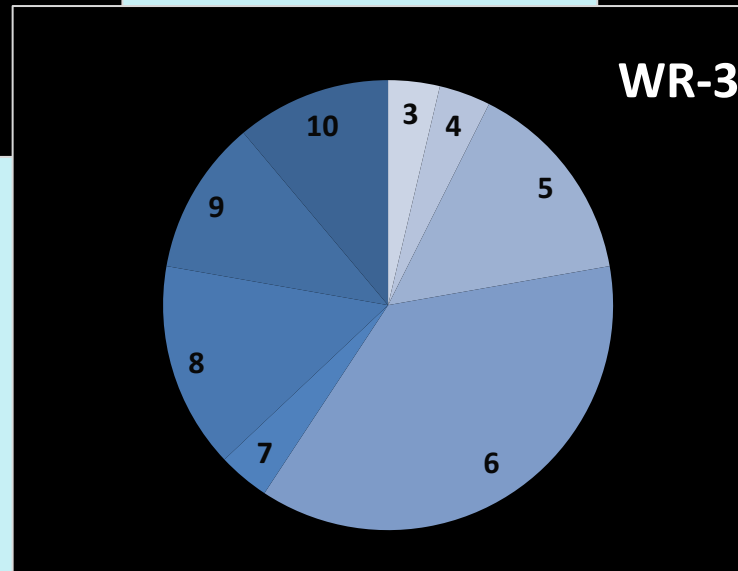
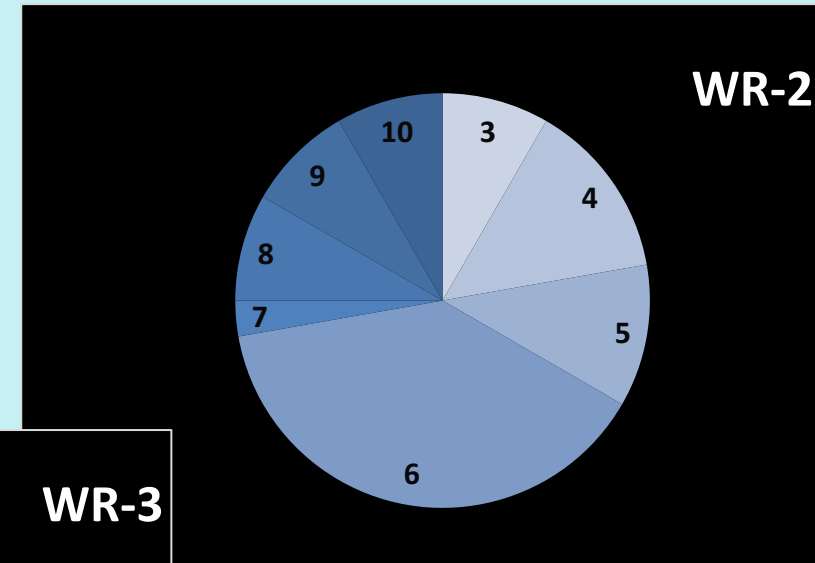
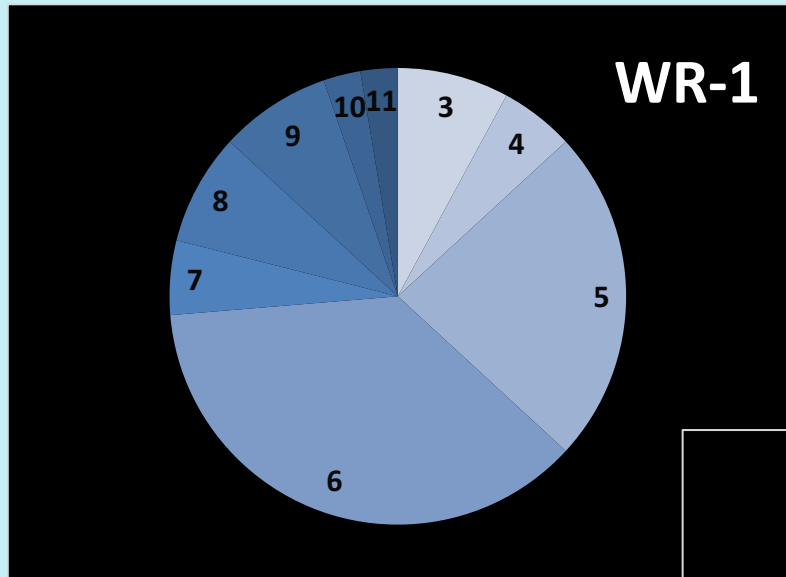
- IEPA Values range from 0 to 11
- 0 to 3 are considered intolerant



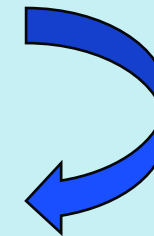
Beach Sites – IEPA Values



Bowen Park Sites – IEPA Values



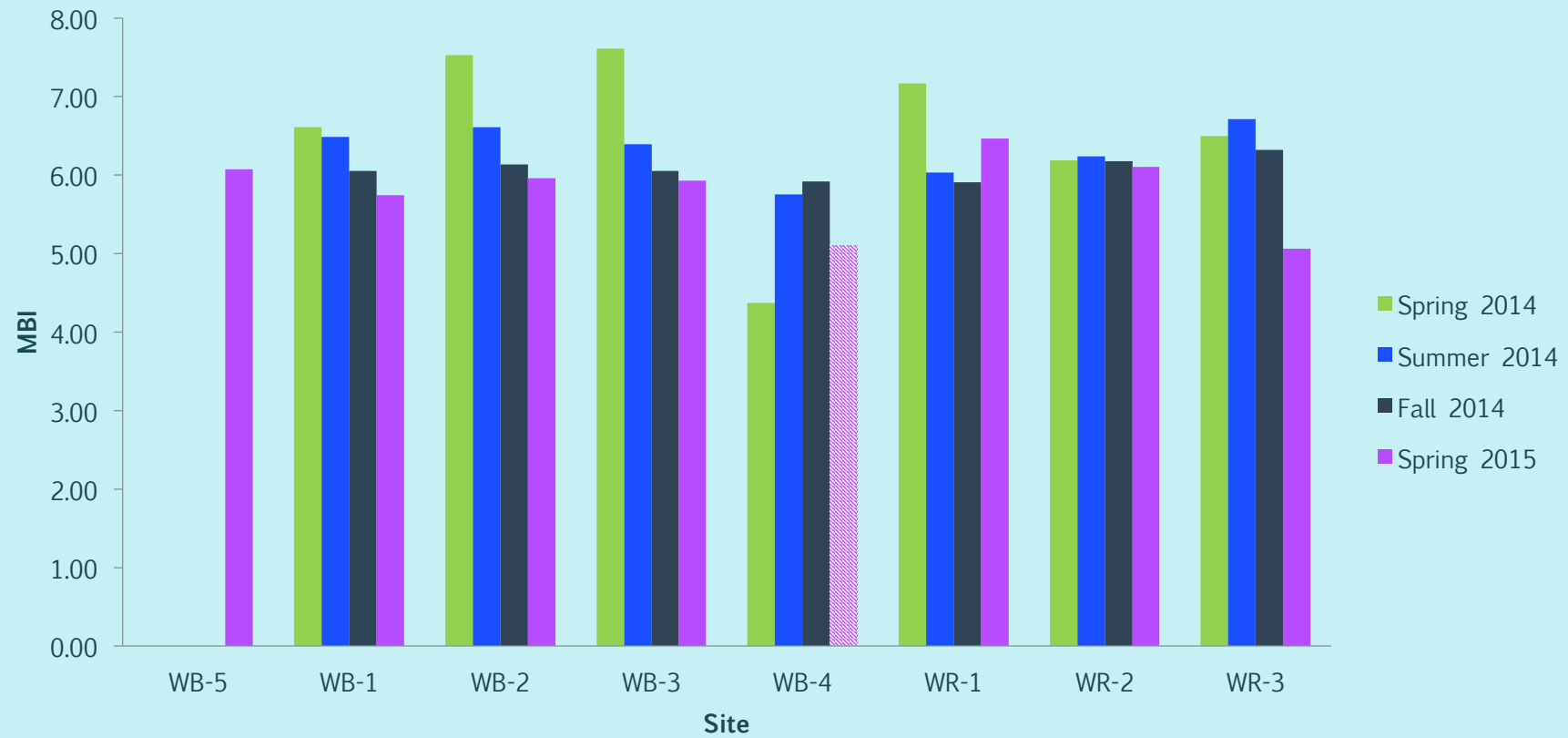
Intolerant



Tolerant

MBI Results

MBI Score by Site and Date



MIBI

- Macroinvertebrate Index of Biotic Integrity
- Illinois Environmental Protection Agency (IEPA)
- Multi-metric evaluation
- Preferred in Illinois due to resolution of detail
- A higher MIBI score is better

Lower Boundary Score	Upper Boundary Score	Comparison to Reference Conditions	Narrative description
73	100	> 75 th Percentile	Exceptional
41.8	72.9	> 10 th Percentile	Good
20.9	41.7	Bisects 10 th percentile (Upper)	Fair
0	20.8	Bisects 10 th Percentile (lower)	Poor

MIBI

- Total Number of Taxa
- Number of Coleoptera (Beetle) Taxa
- Number of Ephemeroptera (Mayfly) Taxa
- Number of Intolerant (as designated from IEPA list) Taxa
- Macroinvertebrate Biotic Index
- Percent individuals as Scrapers (as designated from IEPA list)
- Percent individuals as Ephemeroptera, Plecoptera (stonefly) or Trichoptera (caddisfly)

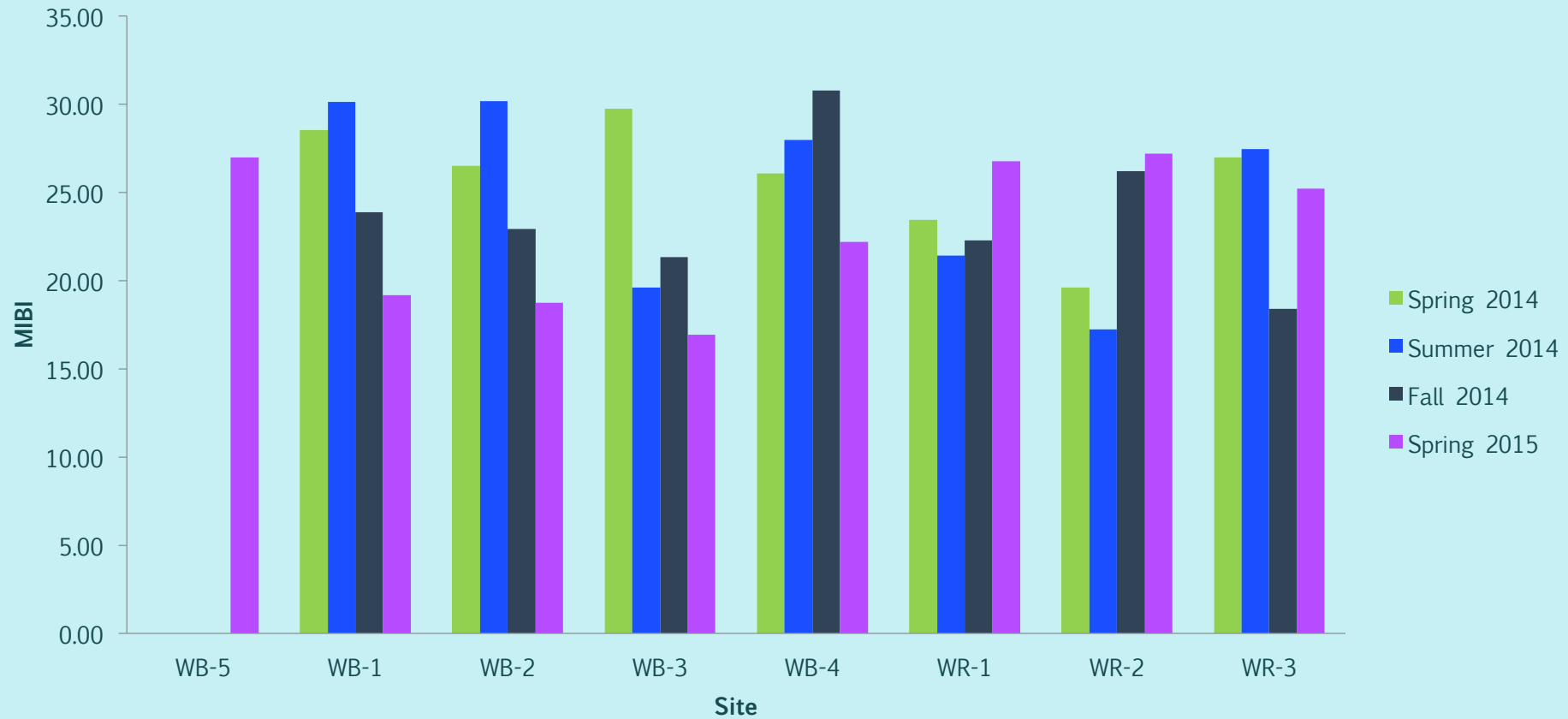
TABLE 2.1

BEST METRIC VALUES FOR MIBI

Metric	Response to Disturbance
Coleoptera Taxa	Decrease
Ephemeroptera Taxa	Decrease
Total taxa	Decrease
Intolerant Taxa	Decrease
MIBI	Increase
Percent Scrapers	Decrease
Percent EPT Taxa	Decrease

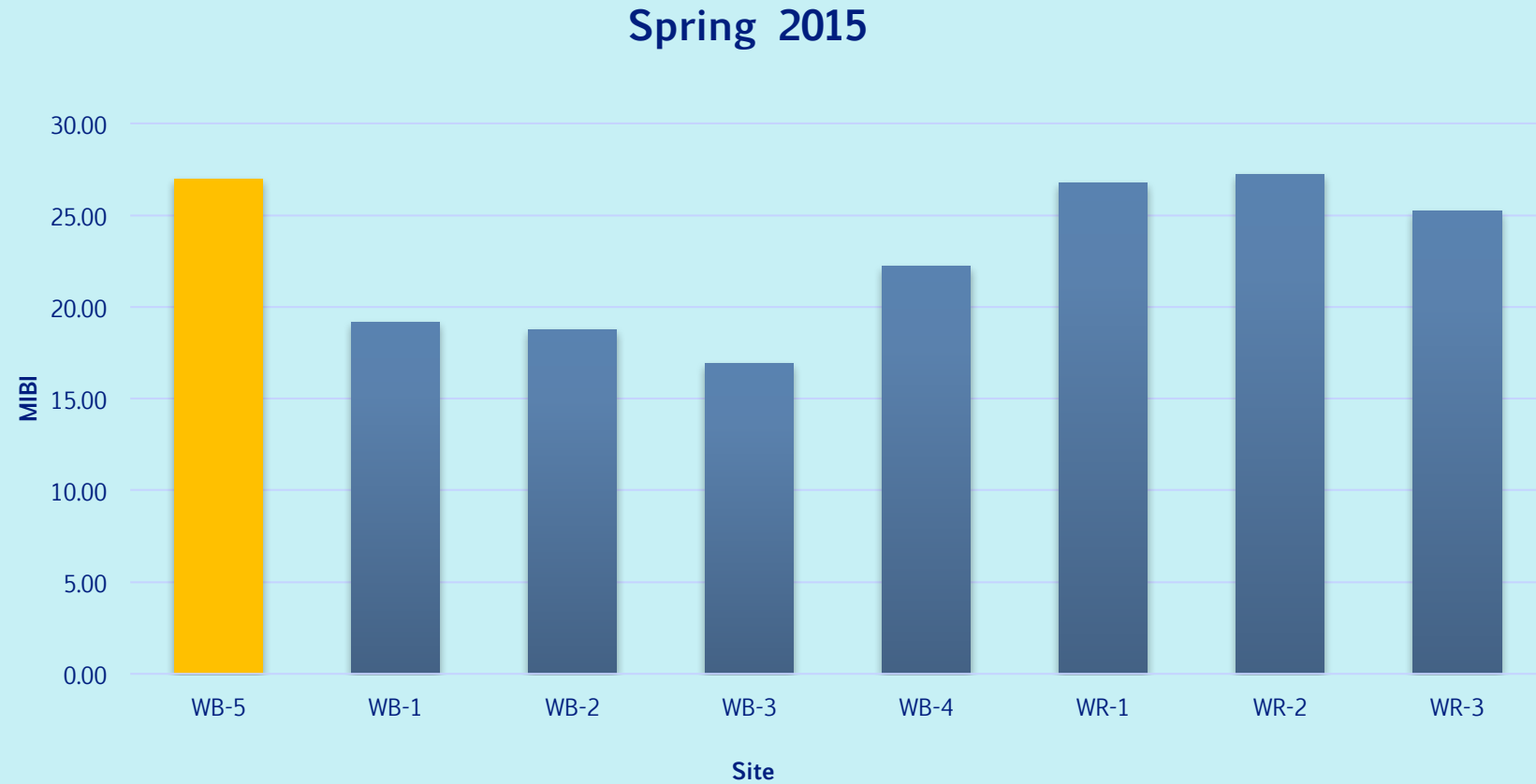
MIBI Results

FIGURE 3.1
MIBI Score by Site and Date



MIBI Results

MIBI Score by Site for Spring 2015



MIBI

Site	Spring 2014	Summer 2014	Fall 2014	Spring 2015	Average	Cumulative	MIBI Narrative Description
WB-1	28.55	30.12	23.89	21.90	26.12	36.52	Fair
WB-2	26.49	30.15	22.93	18.85	24.61	32.77	Fair
WB-3	29.72	19.61	21.35	16.85	21.88	36.52	Fair
WB-4	26.06	27.96	30.76	21.12*	26.48	33.60	Fair
WB-5				26.99	26.99	26.99	Fair
WR-1	23.44	21.42	22.29	26.75	23.48	31.96	Fair
WR-2	19.60	17.23	26.19	27.21	22.56	36.65	Fair
WR-3	26.99	27.45	18.39	25.21	24.51	33.70	Fair

Bottom notes pertain MIBI narrative description

*Indicates WB-4b

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Other Metrics

Site	Number of Unique Taxa	Number of individuals	Number of Coleoptera	Number of Ephemeroptera	Number of intolerant taxa	Percent lentic*	Percent lotic*	Lotic and Lentic*
WB-1	17	336	0	1	2	12.6	0	49.2
WB-2	15	230	0	1	1	5.4	0	65.5
WB-3	23	348	1	2	0	5.5	0	75.1
WB-4	23	364	1	0	1	4.9	0	34.7
WB-5	11	87	0	2	0	7.2	1.0	75.3
WR-1	28	574	2	2	1	2.0	10.5	30.3
WR-2	27	890	2	3	3	0.7	3.8	31.4
WR-3	22	706	0	2	2	0.7	0.7	65.1

*Lentic and lotic percentages do not add up to 100% because all taxa have not been categorized

All sites from 2014 gained unique taxa when sampled in the spring 2015

Conclusions

- Sites had similar MBI and MIBI scores.
- Lentic (still waters) and lotic (flowing waters) taxa indicate flow regime
 - Only one site is likely to be flowing year round (WR-1 was the only site with significant lotic taxa)
 - Rest of sites are mostly taxa without strong flow preferences
- The river sites and WB-4 had the greatest richness (number of unique taxa)
- The river sites had the greatest abundance (number of individuals)
- None of the sites had more than 1-2 intolerant taxa (IEPA value of less than 3)



Conclusions

- **Swales**

- Generally less stable habitats
- The sites all scored lower than expected
- Likely due to using a stream indicator for different system
- However, metric still shows WB-5 as being the best site

- **Vegetation**

- WB-2 lost most of the vegetation from 2014 due to storms
- Very low numbers of organisms present in 2015
- Very little in-stream habitat
- Less cover leads to higher predation
- Less cover means very few food sources

Recommendations

- **Swales**

- High spring MIBI scores
 - Two potential reasons
 - Lake Michigan water
 - Lack of predation
 - Large scud community which are considered intolerant by IEPA
 - WB-4 had 100 scuds in the spring sample
- Low fall scores
- Low overall macroinvertebrate density
 - Almost all predatory insects in summer/fall
 - What are they eating?
 - Need to increase food base to increase overall abundances
- Very dense filamentous algae community

- **Vegetation**

- Native plugs
- Already burning invasive plants
- Need to remove dead Phragmites from swales

- **Nutrients**

- **Habitat**

- Driftwood common in great lakes
- Redistribute or add rootwads (more complex habitat)
- Understand seiches, wave action might move or remove it

Recommendations

- **Glen Flora Tributary**
 - Good riffles and substrate at 2/3 sites
 - Scuds (every sites) and intolerant dragonfly (only 1 at WR-2 fall sample)
 - Water levels decrease drastically in late summer
- **Bank Stabilization**
 - High sediment loads from steep, unvegetated banks
 - Might be natural part of ravine system
- **Flow**
 - Maybe the flow regime is similar to historical flow regime
 - Hydrological study (gauges) would confirm
 - Less flow in late summer/fall, less riffles
- **Deeper Pools**
 - Provide refuge during summer
- **Woody Debris**
 - Some sites with good amounts of woody debris already
 - Don't want dams, strategically place



http://www.marylandinsects.com/images/Platheimis_lydia_nymph_Farm_Pond_West_Friendship_Park_26-Apr-14.jpg



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Questions?

