Relocation of Brent Run Creek
Re-establising Nearly a Mile of Aquatic Habitat/Biota
(featuring natural recruitment of state-listed Slippershell [*Alasmidonta viridis*])

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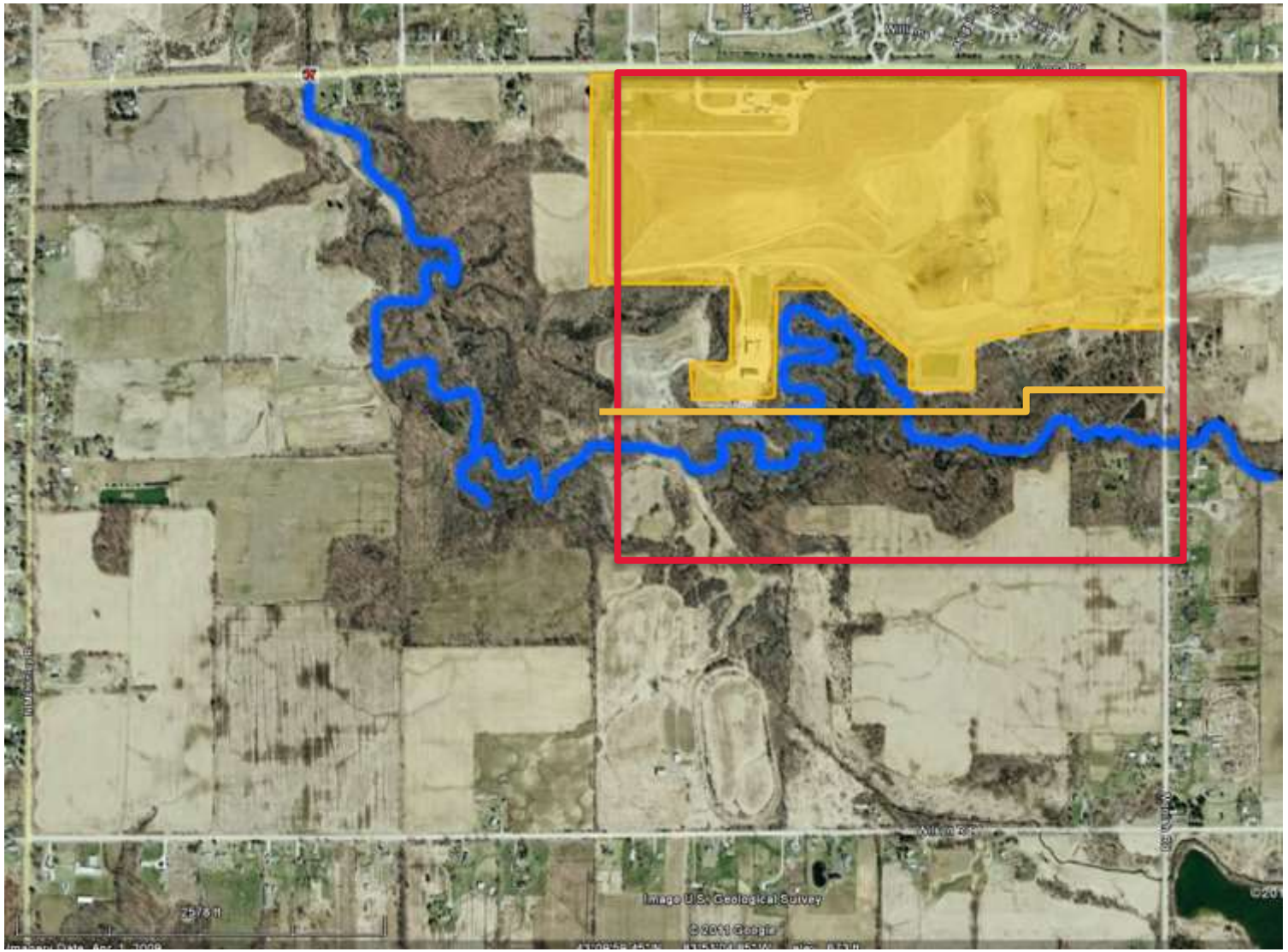
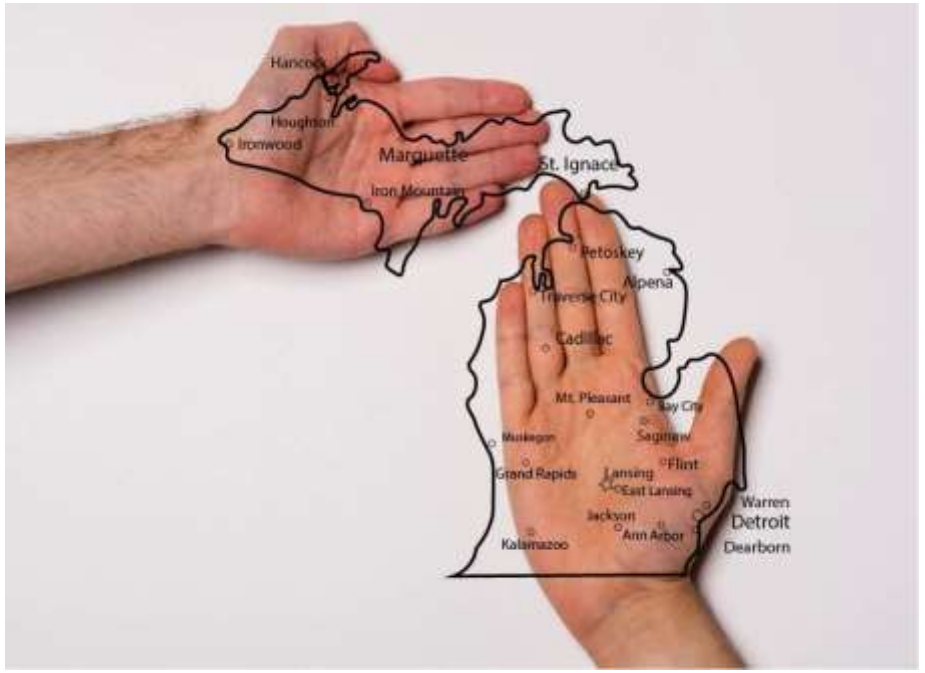
Presentation Outline

- History of Brent Run Landfill
- Project / Ecological Goals
- Design Implementation/Key Features
- Results
- Comparison of Pre- and Post-construction Data
- Lessons Learned

History of Brent Run Landfill





Project and Ecological Goals

Project Goals

- Get a permit within three (3) years to expand landfill
- Provide sufficient time to construct new creek, wetlands, relocate biota, and construct additional “air space” to prevent landfill from closing

Ecological Goals/Permit Requirements

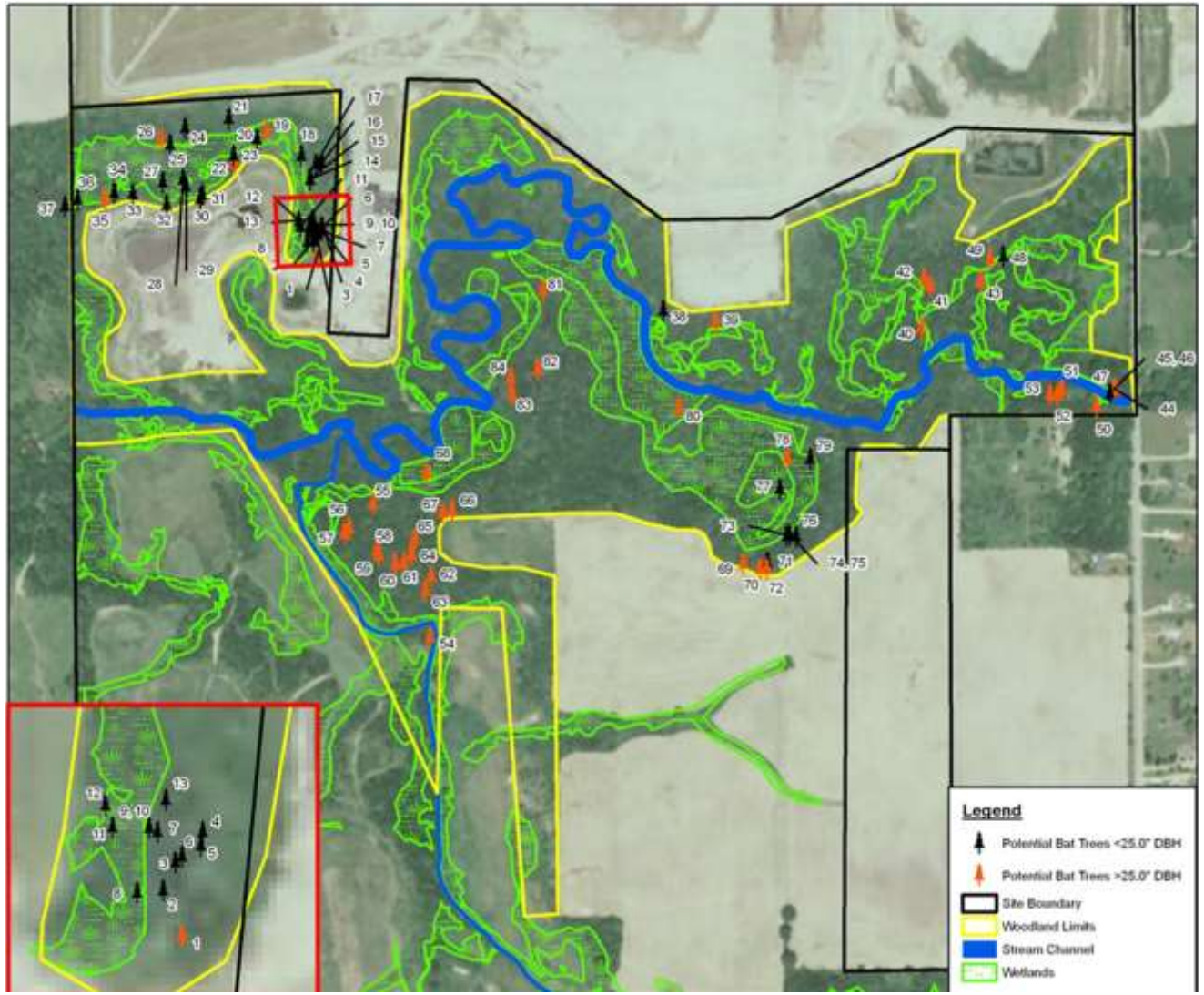
- Impact and mitigate for over 10 acres of wetland impact – approximately 23 acres of mitigation wetland
- Fill/relocate/reconstruct 4,006 linear feet of new creek channel
- Fill/compensate cut for over 50 acre-feet of floodplain impact
- Relocate and show successful re-introduction / natural reproduction of aquatic biota (macroinverts, fish, and freshwater mussels)

Strategic Plan for Getting Permit

- Address Wetland Dependency, Feasible & Prudent Alternatives
- Provide Baseline Information (hide nothing)
- Design Around Resources
- Mimic and Improve Upon Existing Resources
- Net Ecological Gain
  - Increase wetland and floodplain acreage and functions, values, benefits, and uses
  - Restore and improve aquatic habitats
- Get All Approvals/Permits within 3 years

Agency Coordination

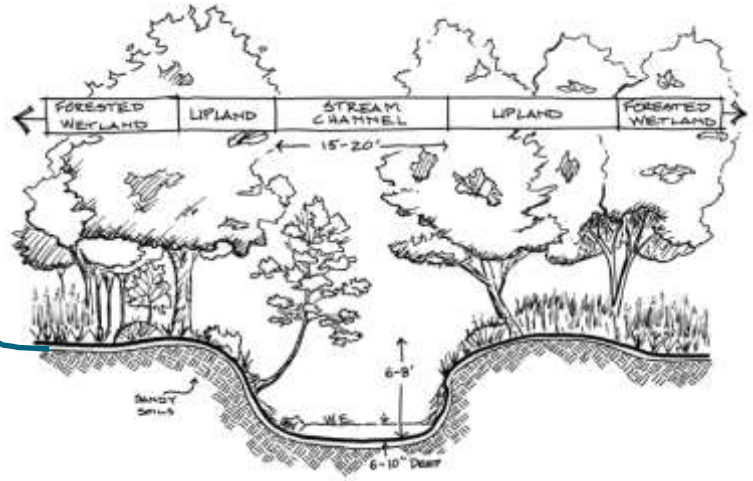
- Consultation/Coordination
- Identification and Delineation
- Functional and Quality Assessments
- Indiana Bat Habitat Assessments
- Freshwater Mussel Surveys
- Regulatory/Permitting
- Mitigation
- Mitigation, Management, and Preservation
- Implementation

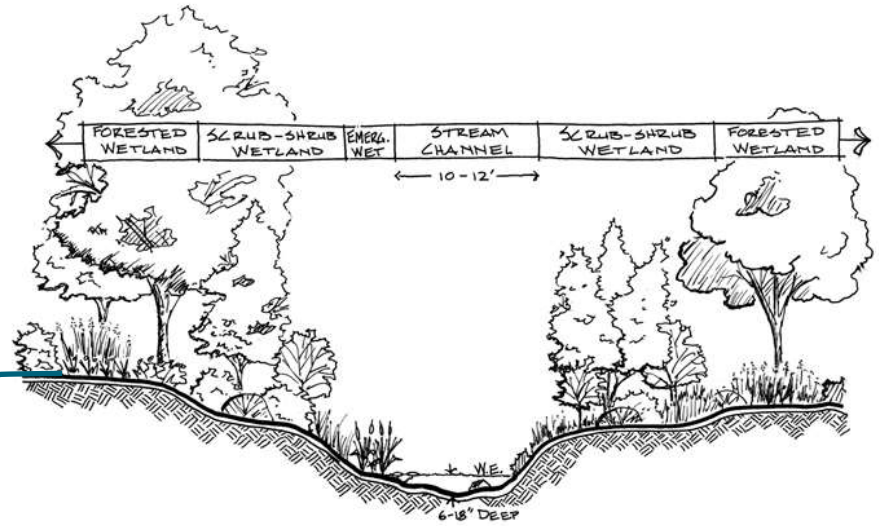


Design Considerations

- Stable but dynamic stream channel
- Restore wetland – floodplain connectivity
- Mimic natural sediment transport patterns
- Create more riffles and stony habitats – host fish and Slippershell habitat
- Meet permit requirements

~30’





Pre-Disturbance Brent Run Creek

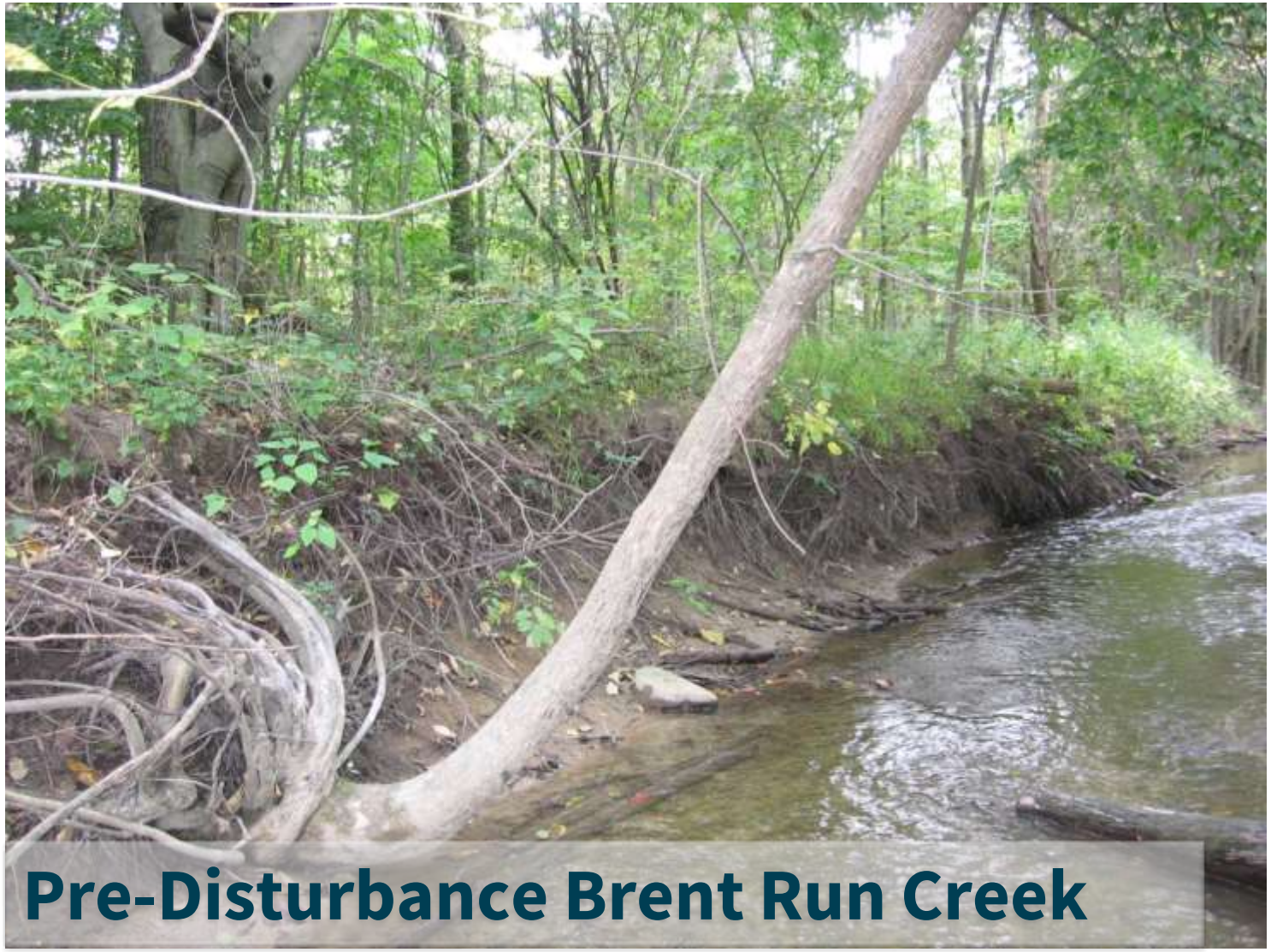
Existing Stream Conditions:

- 15-20 feet wide stream channel
- 6-10” deep stream
- 6-8’ difference between channel bed and top of banks

Pre-Disturbance Brent Run Creek

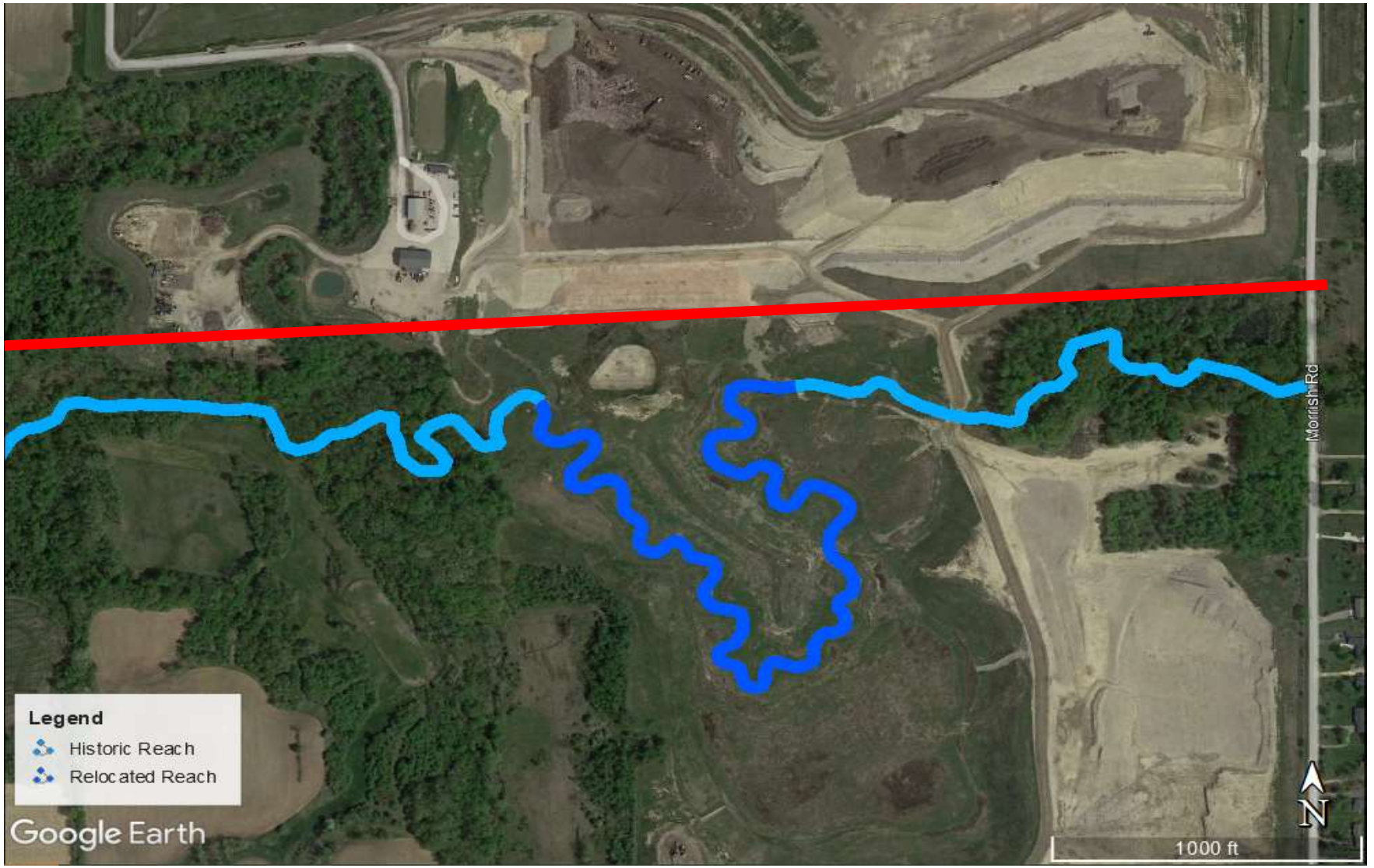
Existing Stream Conditions:

- Steep Banks
- Bank Erosion
  - Pistol-grip Trees
  - Sedimentation



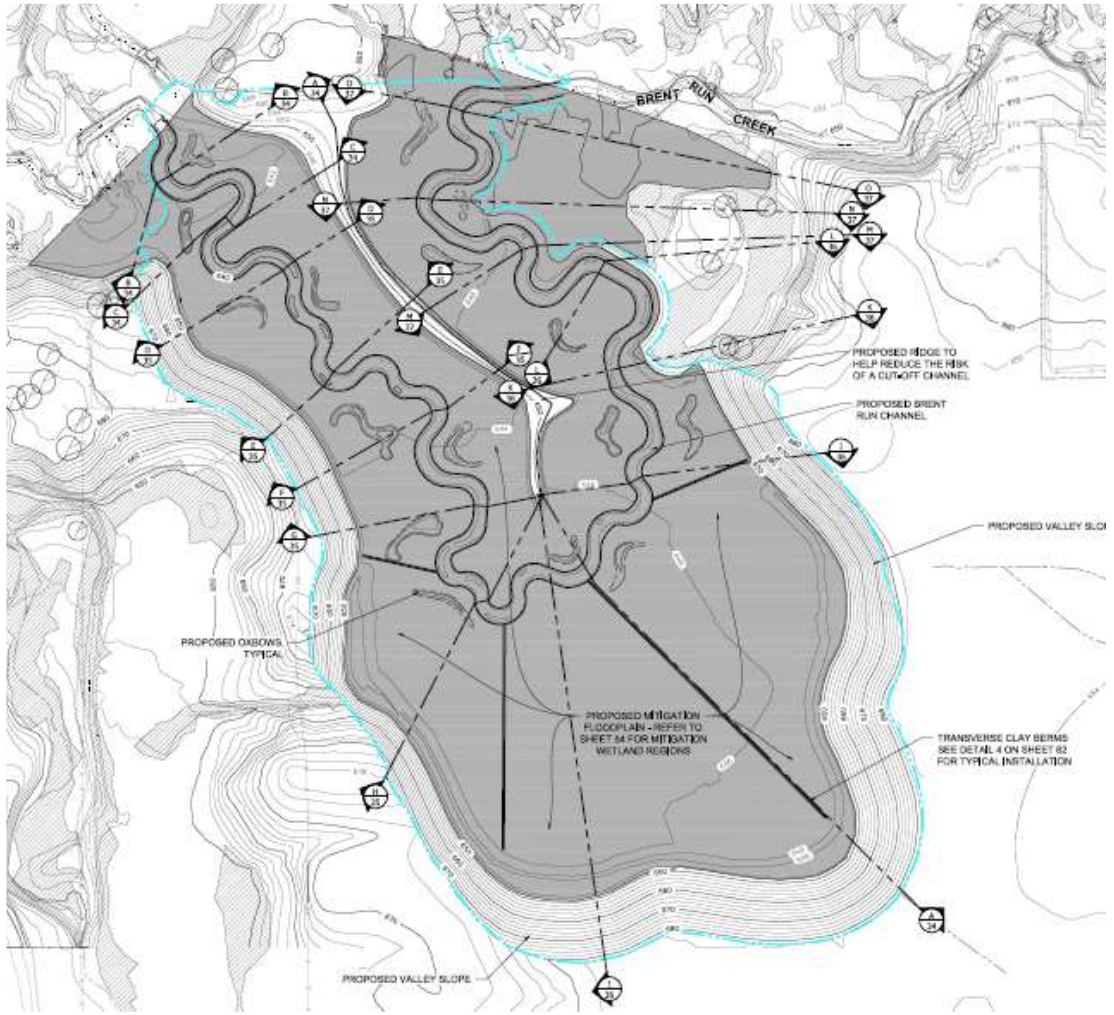
Pre-construction Conditions

Post-construction Conditions



Master Site Plan

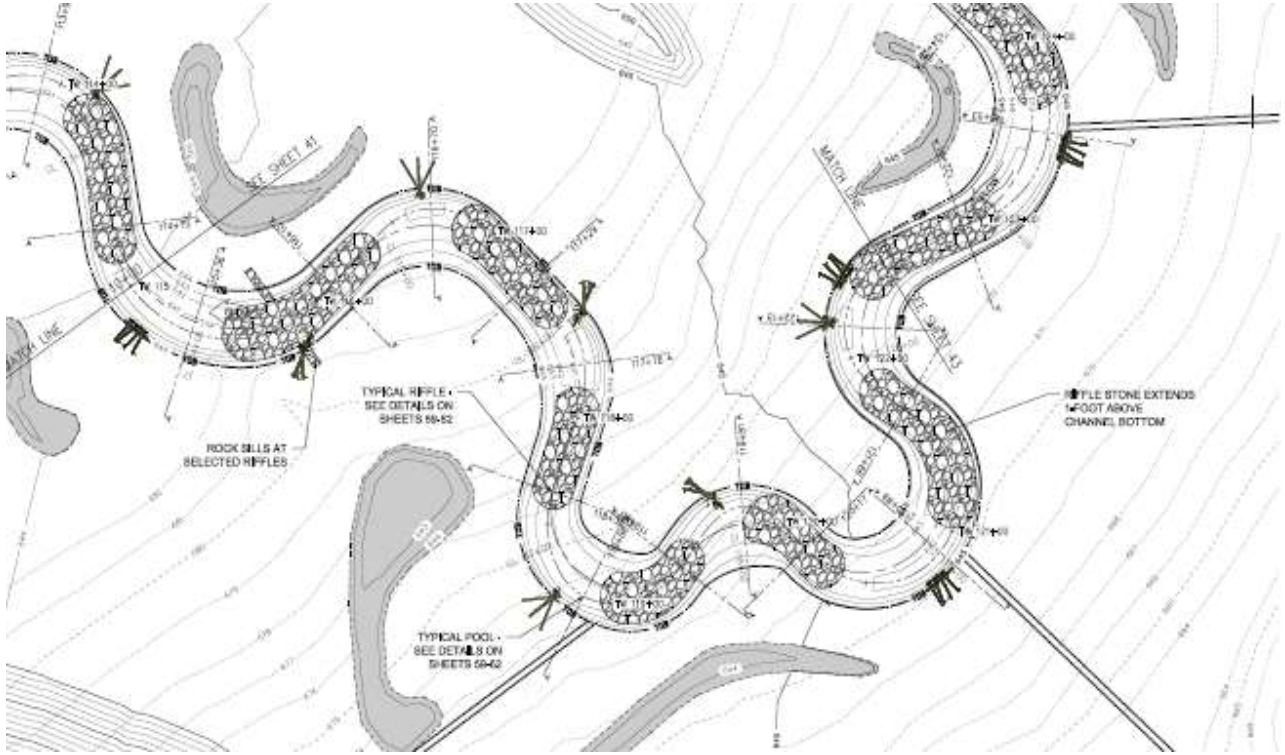
- Relocate ~4000’ of Brent Run Creek
- Create minimum of 22.58 acres (created >25)
- Create over 50 acre-feet of floodplain storage
- Create berm in center of floodplain to eliminate stream cutoff
- Mimic natural system – oxbows - wetland pockets

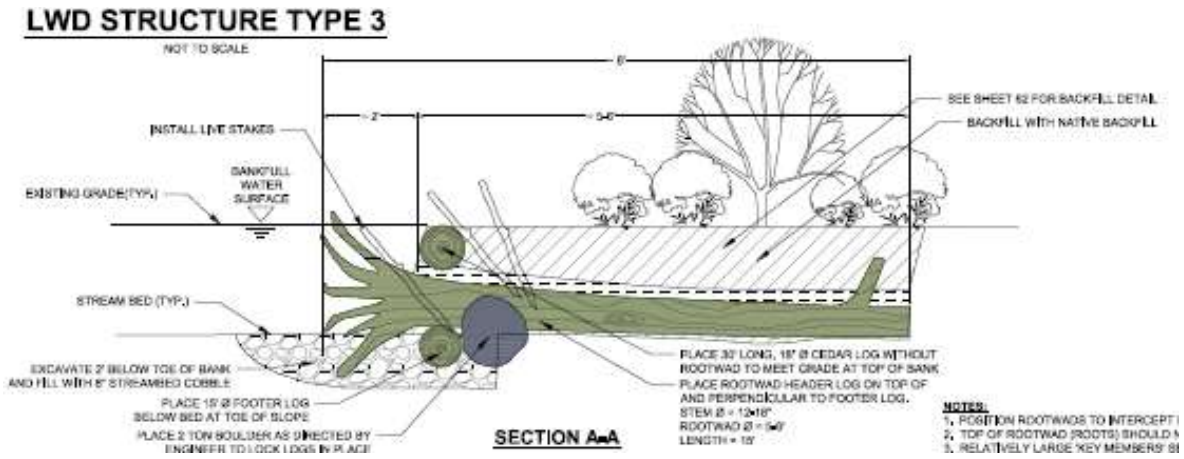


Habitat Structure Installation

Riffles, wood, and oxbows

- 174 log and tree structures
- 39 Riffle structures
- Riffles and sand for mussel habitat and grade control
- Emergent wetland pockets to mimic natural oxbows





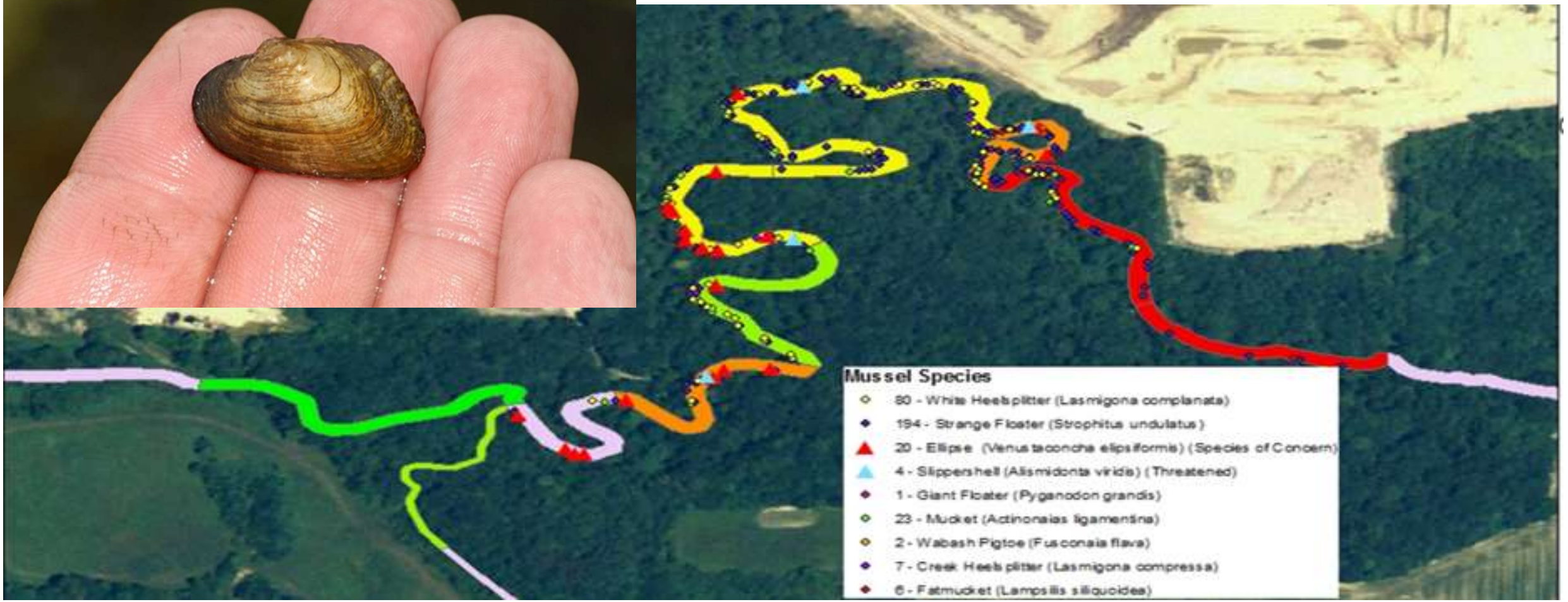
Construction of Riffles – Host fish and Slippershell Habitat


August 4, 2015


August 2, 2016

Freshwater Mussels

- Slippershell (*Alasmidonta viridis*) *State Threatened*
- *Ellipse (Venustaconcha elipsiformis) State Species of Concern*



Biological Survey Timeline

- 2011 - Baseline biota data collected
  - Fish, Benthic inverts, Mussels
- 2015 – Mussel relocation survey of historic reach
- 2016 – P51 surveys @ 5 sites: US, DS, within relocation reach
- 2019 - P51 surveys @ 5 sites: US, DS, within relocation reach
- 2020 – Mussel surveys within relocated reach

Ecological Monitoring & Management

GLEAS Procedure #51 Survey Protocols for Wadable Rivers[1], AKA “P51”

- Standardized methods for evaluating watercourse condition
- Three-part assessment: habitat, macroinvertebrate and fish communities
- Biological integrity - multi-metric scoring system for both fish and macroinvertebrate communities
- Index of bio integrity scoring:

Fish

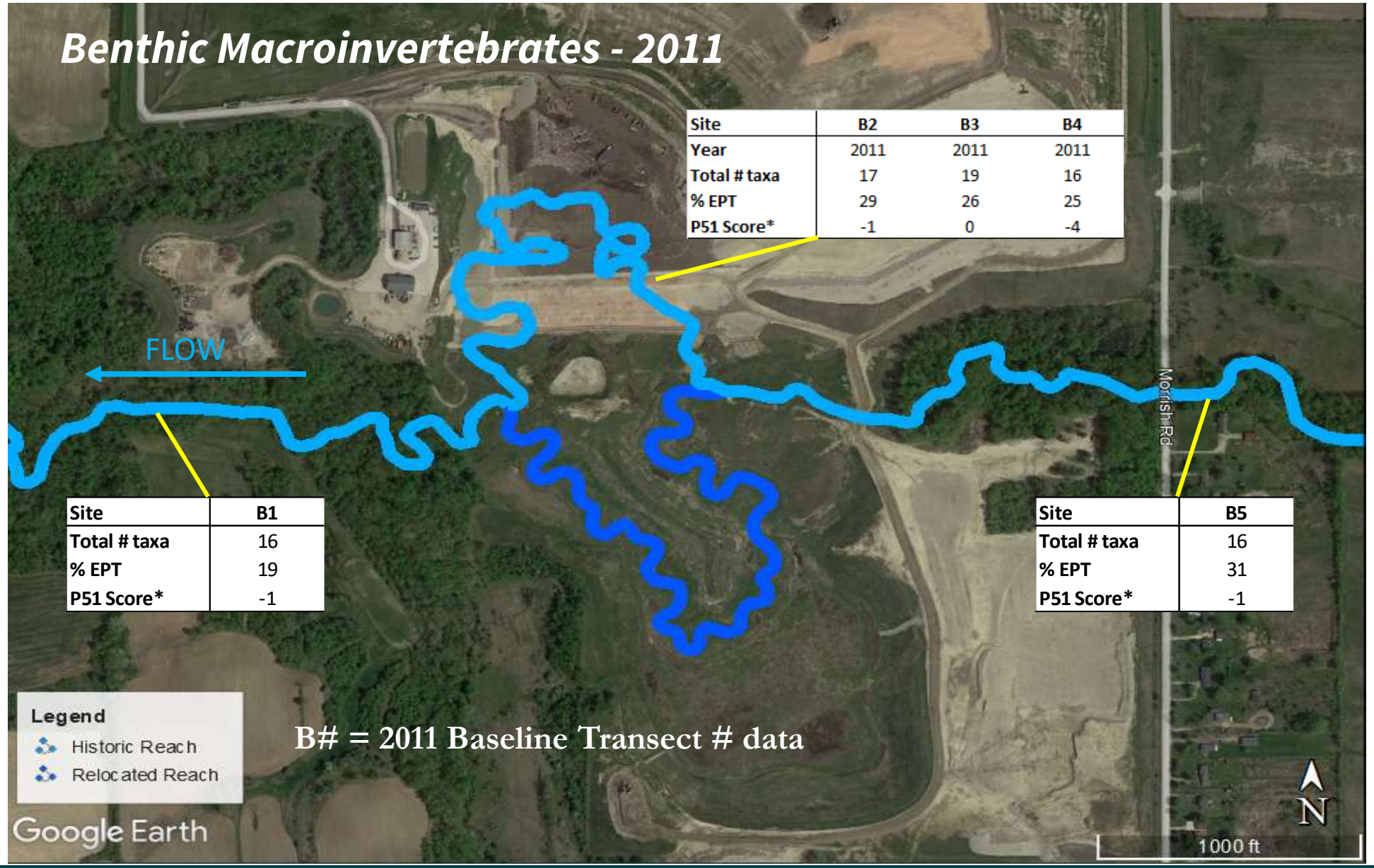
Excellent: 10 to 5
Acceptable: 4 to -4
Poor: -5 to -10

Macroinvertebrates

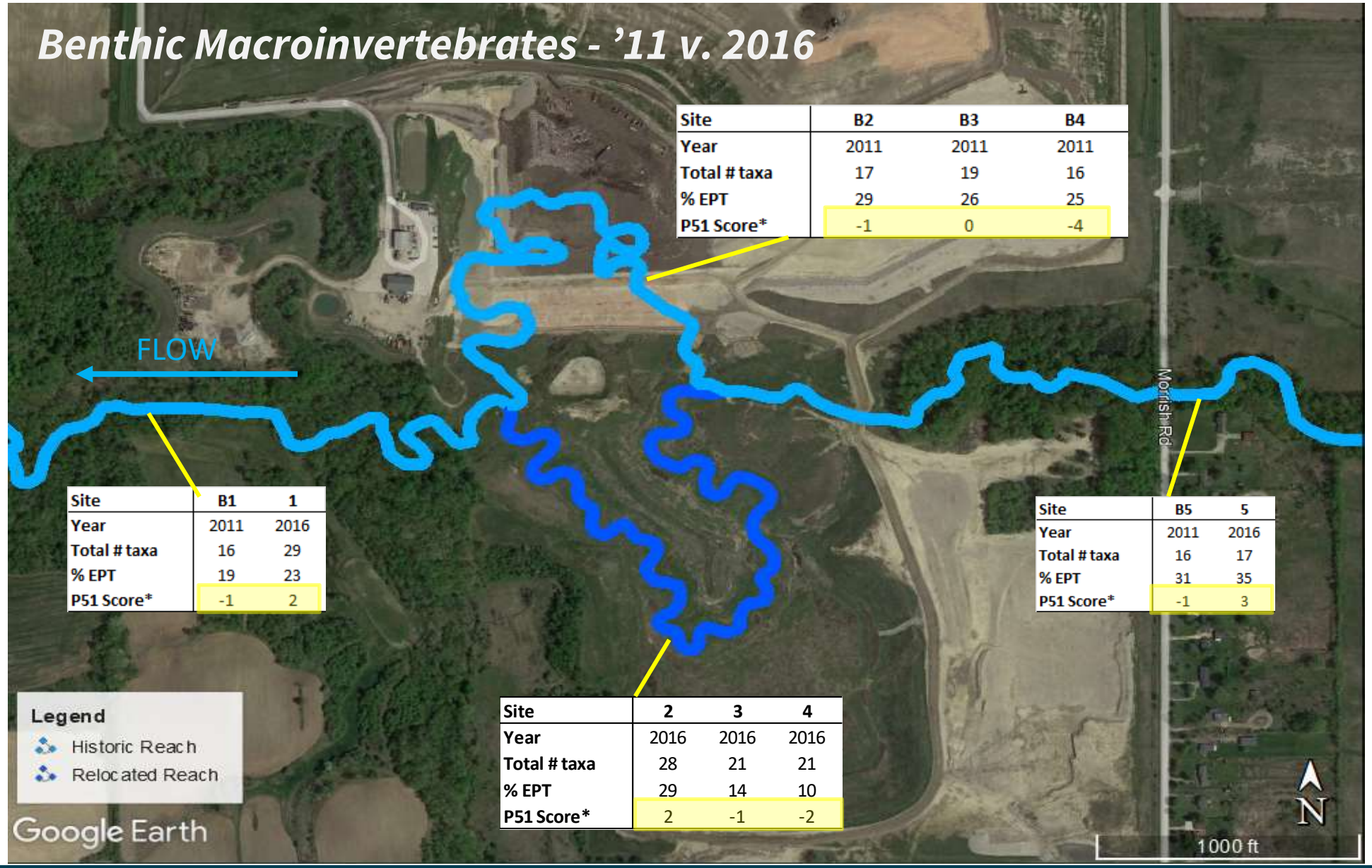
Excellent: 9 to 5
Acceptable: 4 to -4
Poor: -5 to -9

[1]Michigan Department of Environmental Quality, Surface Water Quality Division. 1997. GLEAS Procedure #51 Survey Protocols for Wadable Rivers. Chapter 25A in Schneider, James C. (ed.) 2000. Manual of fisheries survey methods II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 25, Ann Arbor

Ecological Monitoring & Management



Ecological Monitoring & Management



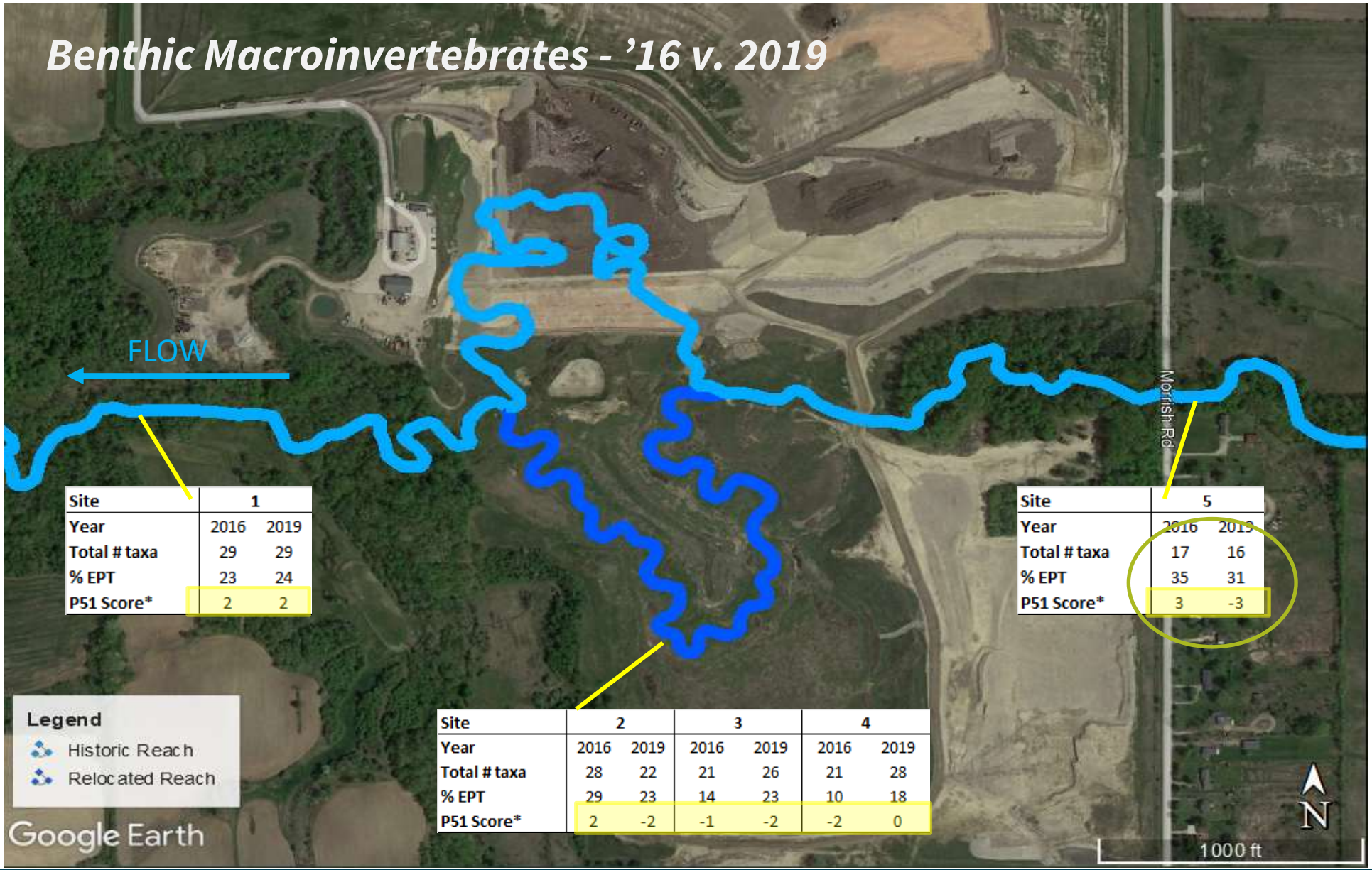
Site	B2	B3	B4
Year	2011	2011	2011
Total # taxa	17	19	16
% EPT	29	26	25
P51 Score*	-1	0	-4

Site	B1	1
Year	2011	2016
Total # taxa	16	29
% EPT	19	23
P51 Score*	-1	2

Site	B5	5
Year	2011	2016
Total # taxa	16	17
% EPT	31	35
P51 Score*	-1	3

Site	2	3	4
Year	2016	2016	2016
Total # taxa	28	21	21
% EPT	29	14	10
P51 Score*	2	-1	-2

Ecological Monitoring & Management



Site	1	
Year	2016	2019
Total # taxa	29	29
% EPT	23	24
P51 Score*	2	2

Site	5	
Year	2016	2019
Total # taxa	17	16
% EPT	35	31
P51 Score*	3	-3

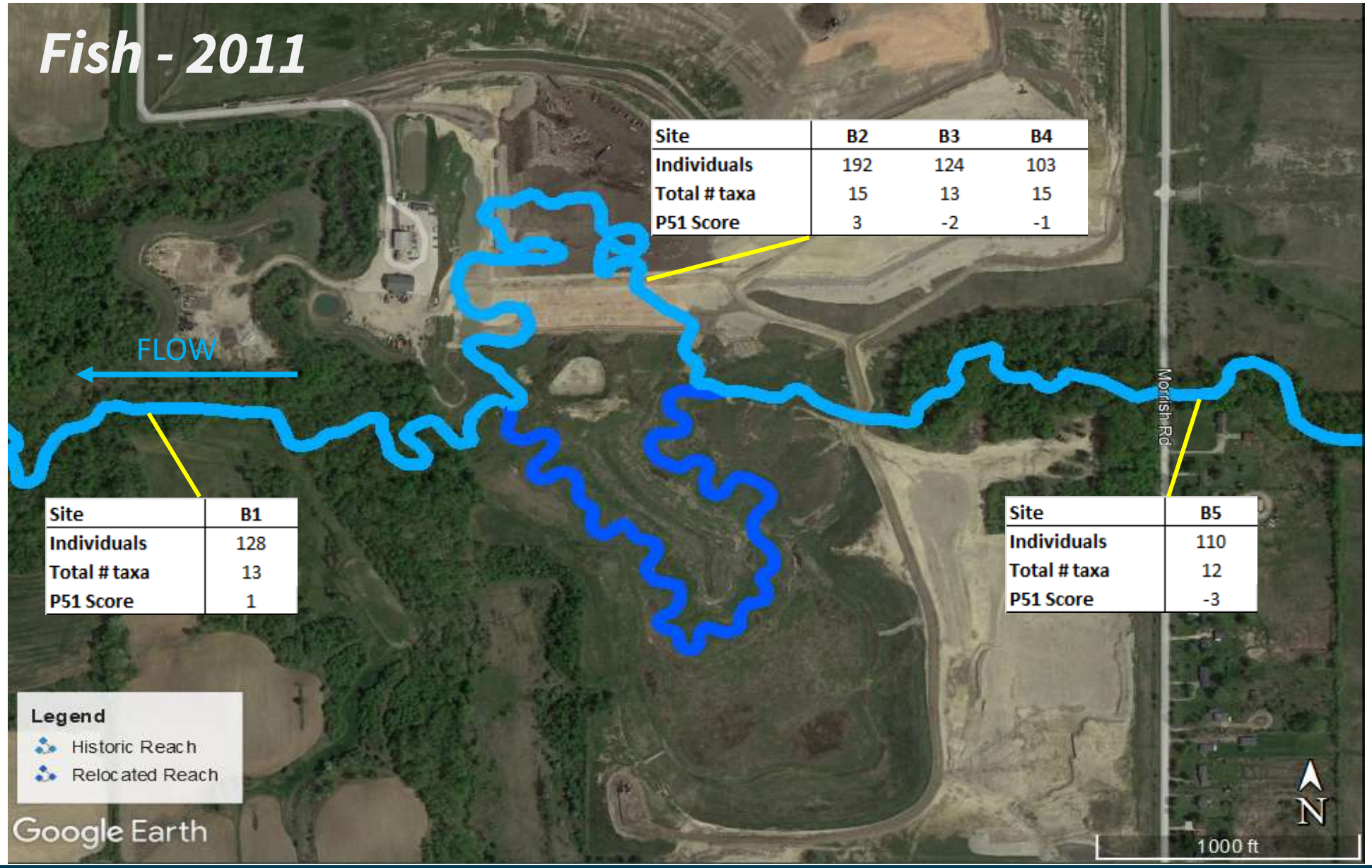
Site	2		3		4	
Year	2016	2019	2016	2019	2016	2019
Total # taxa	28	22	21	26	21	28
% EPT	29	23	14	23	10	18
P51 Score*	2	-2	-1	-2	-2	0

Fish

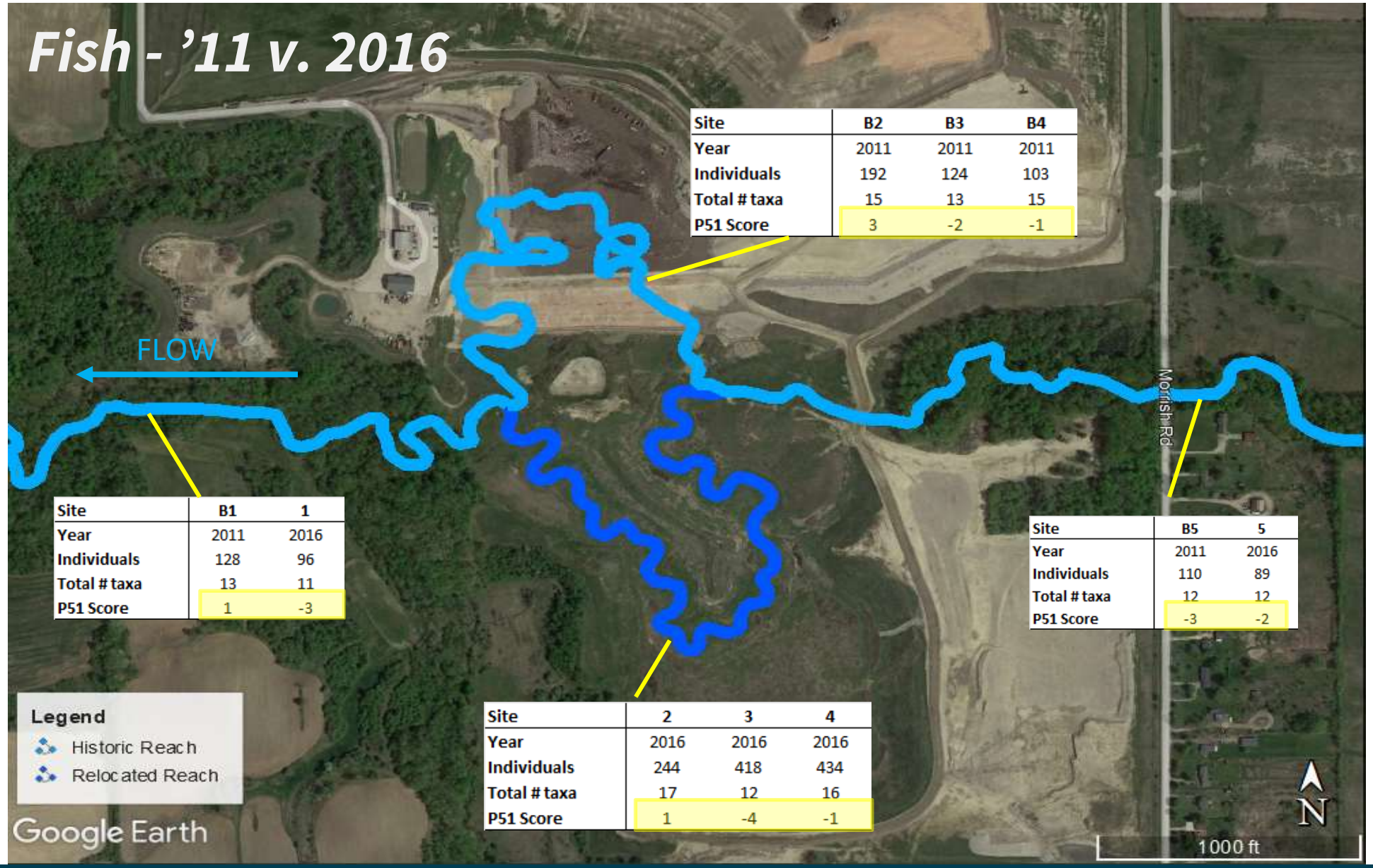
White sucker (*Catostomus commersonii*)

Rainbow and Johnny Darter
(*Etheostoma caeruleum*; *Etheostoma nigrum*)

Ecological Monitoring & Management



Ecological Monitoring & Management



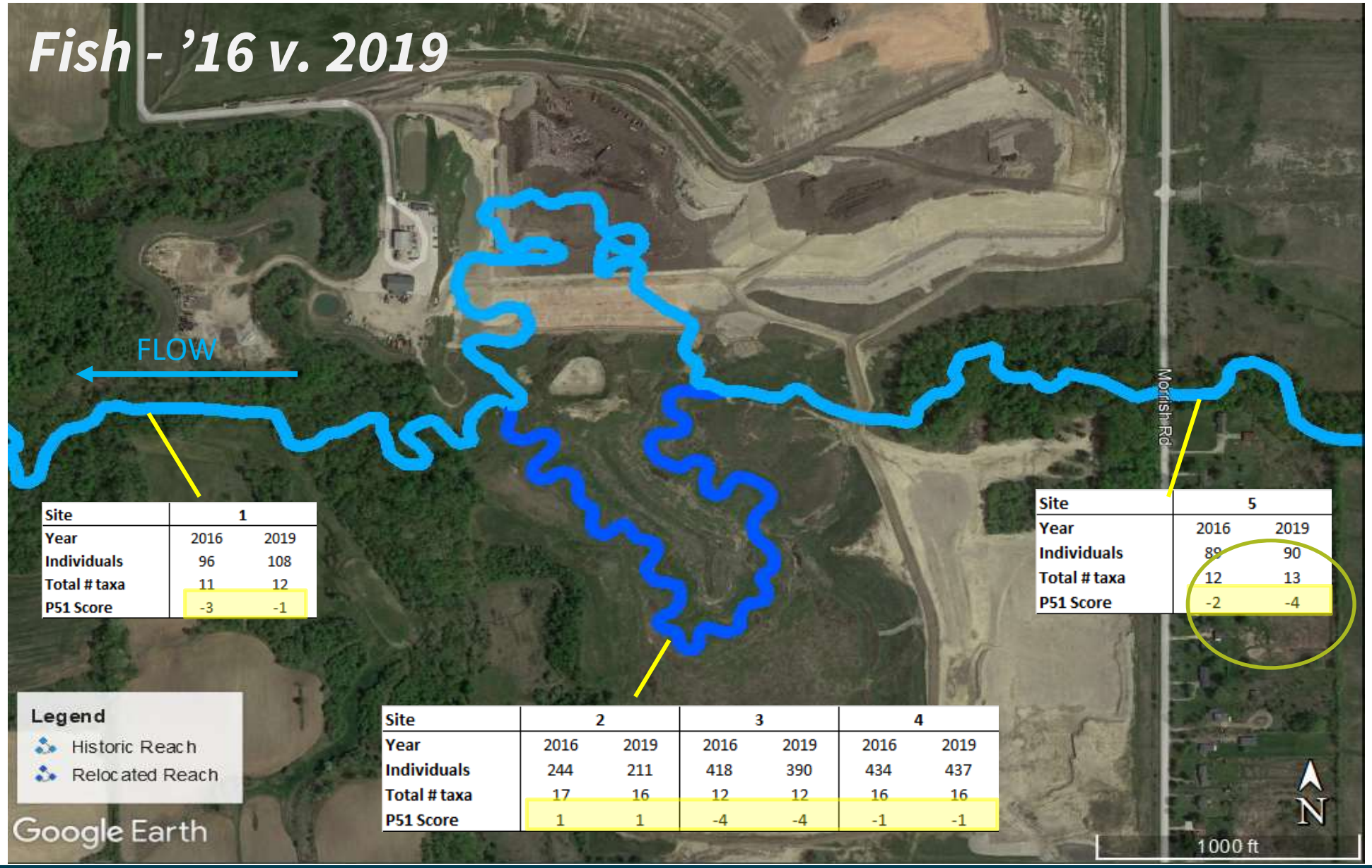
Site	B2	B3	B4
Year	2011	2011	2011
Individuals	192	124	103
Total # taxa	15	13	15
P51 Score	3	-2	-1

Site	B1	1
Year	2011	2016
Individuals	128	96
Total # taxa	13	11
P51 Score	1	-3

Site	B5	5
Year	2011	2016
Individuals	110	89
Total # taxa	12	12
P51 Score	-3	-2

Site	2	3	4
Year	2016	2016	2016
Individuals	244	418	434
Total # taxa	17	12	16
P51 Score	1	-4	-1

Ecological Monitoring & Management

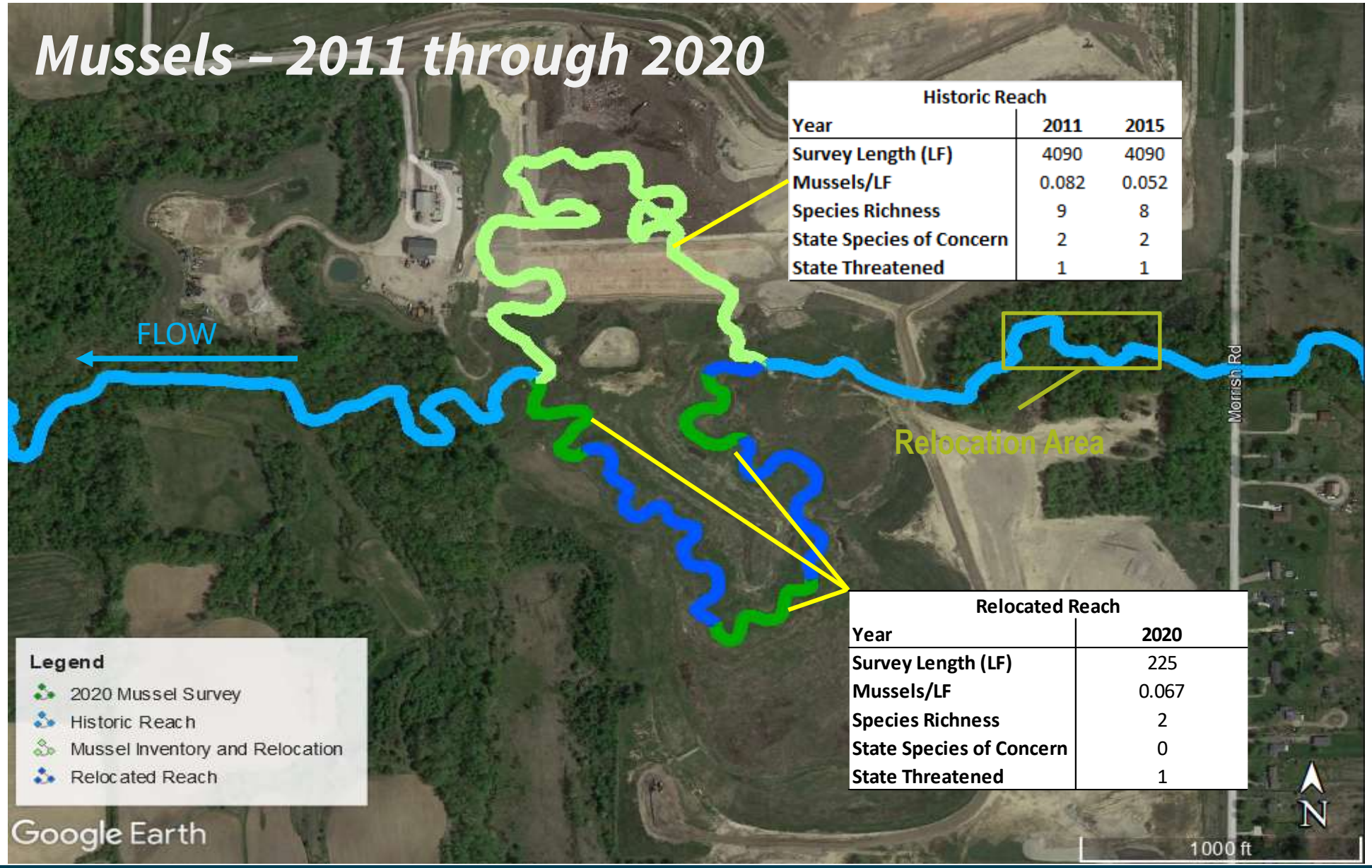


Site	1	
Year	2016	2019
Individuals	96	108
Total # taxa	11	12
P51 Score	-3	-1

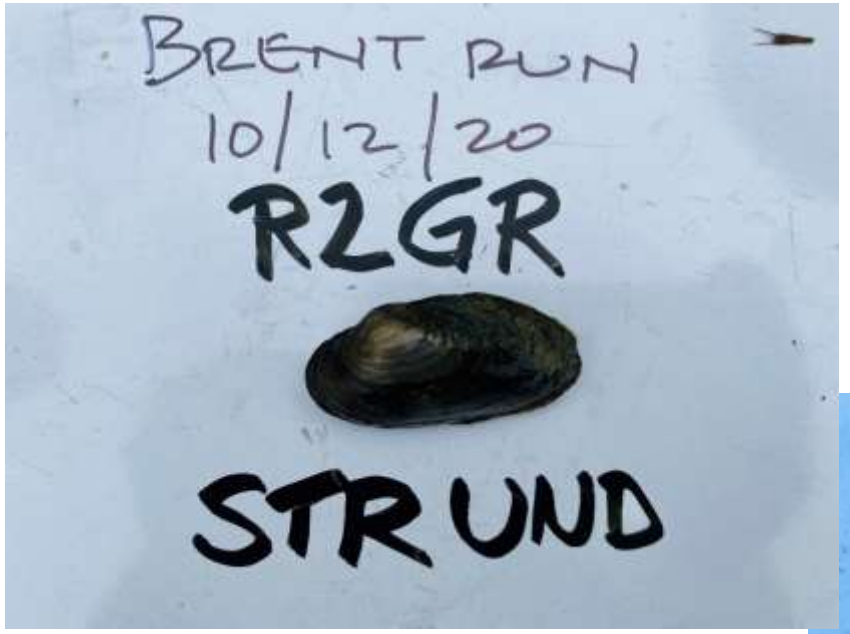
Site	5	
Year	2016	2019
Individuals	89	90
Total # taxa	12	13
P51 Score	-2	-4

Site	2		3		4	
Year	2016	2019	2016	2019	2016	2019
Individuals	244	211	418	390	434	437
Total # taxa	17	16	12	12	16	16
P51 Score	1	1	-4	-4	-1	-1

Ecological Monitoring & Management



2020 Freshwater Mussels in New Channel



Strange floater (*Strophitus undulatus*)

Slippershell (*Alismidonta viridis*)

Ellipse (*Venustaconcha elipsiformis*)

Discussion of Results

- Invertebrate and fish communities in the downstream historic and relocated reaches remained fairly consistent
- The upstream historic/baseline (Site 5) showed degrading communities since 2016 likely due to agricultural inputs
- Site 1 (most downstream) shows improving communities since 2016 attributed to habitat improvement/sediment trapping
- Greater number of fish taxa in new creek channel compared to old channel
- Natural fish and mussel recruitment within the new creek channel
- Anticipate continued natural recruitment and development of mussel beds

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Or see us at our booth