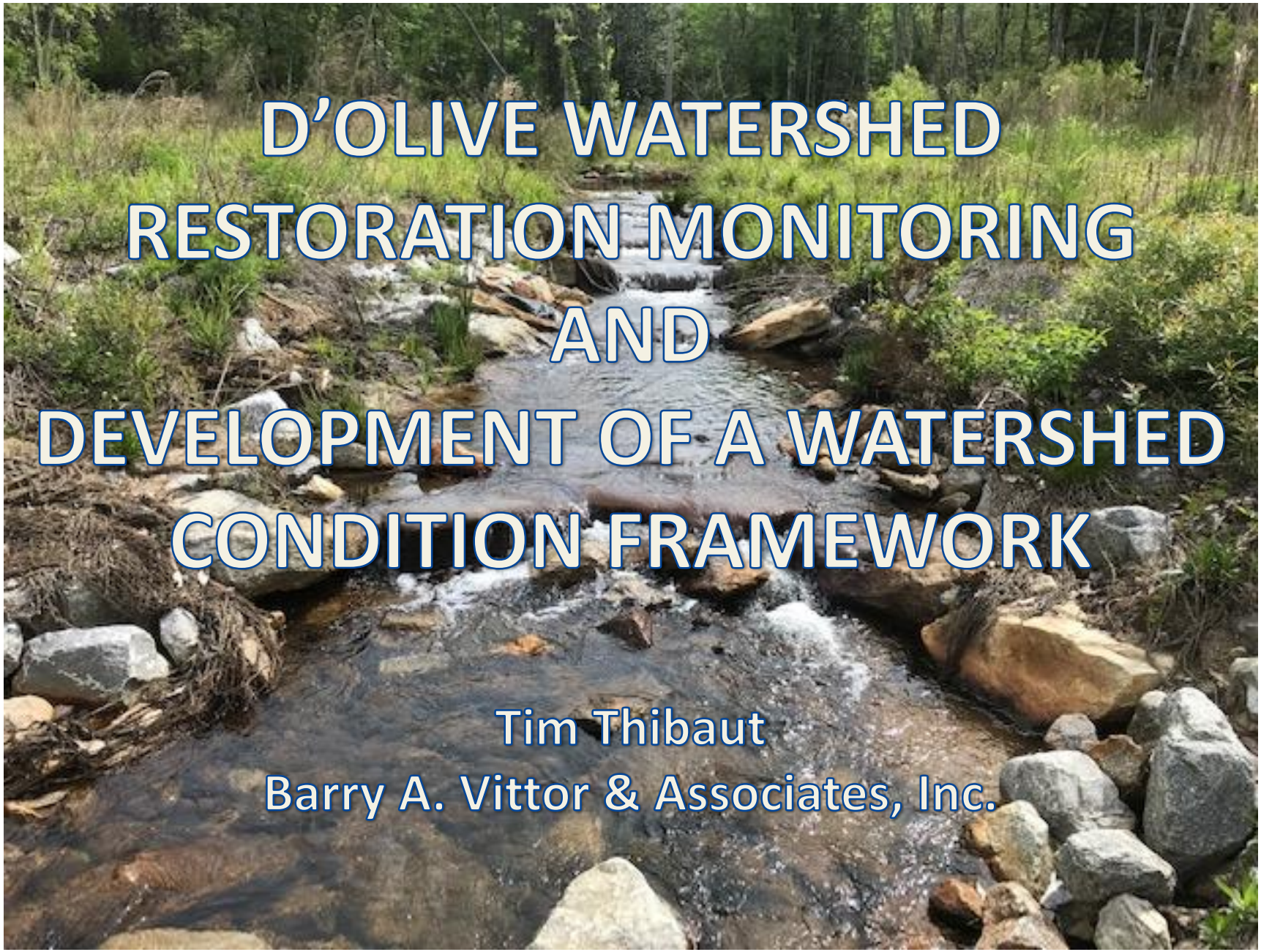


D'OLIVE WATERSHED RESTORATION MONITORING AND DEVELOPMENT OF A WATERSHED CONDITION FRAMEWORK

Tim Thibaut
Barry A. Vittor & Associates, Inc.

Acknowledgements

Vittor & Associates

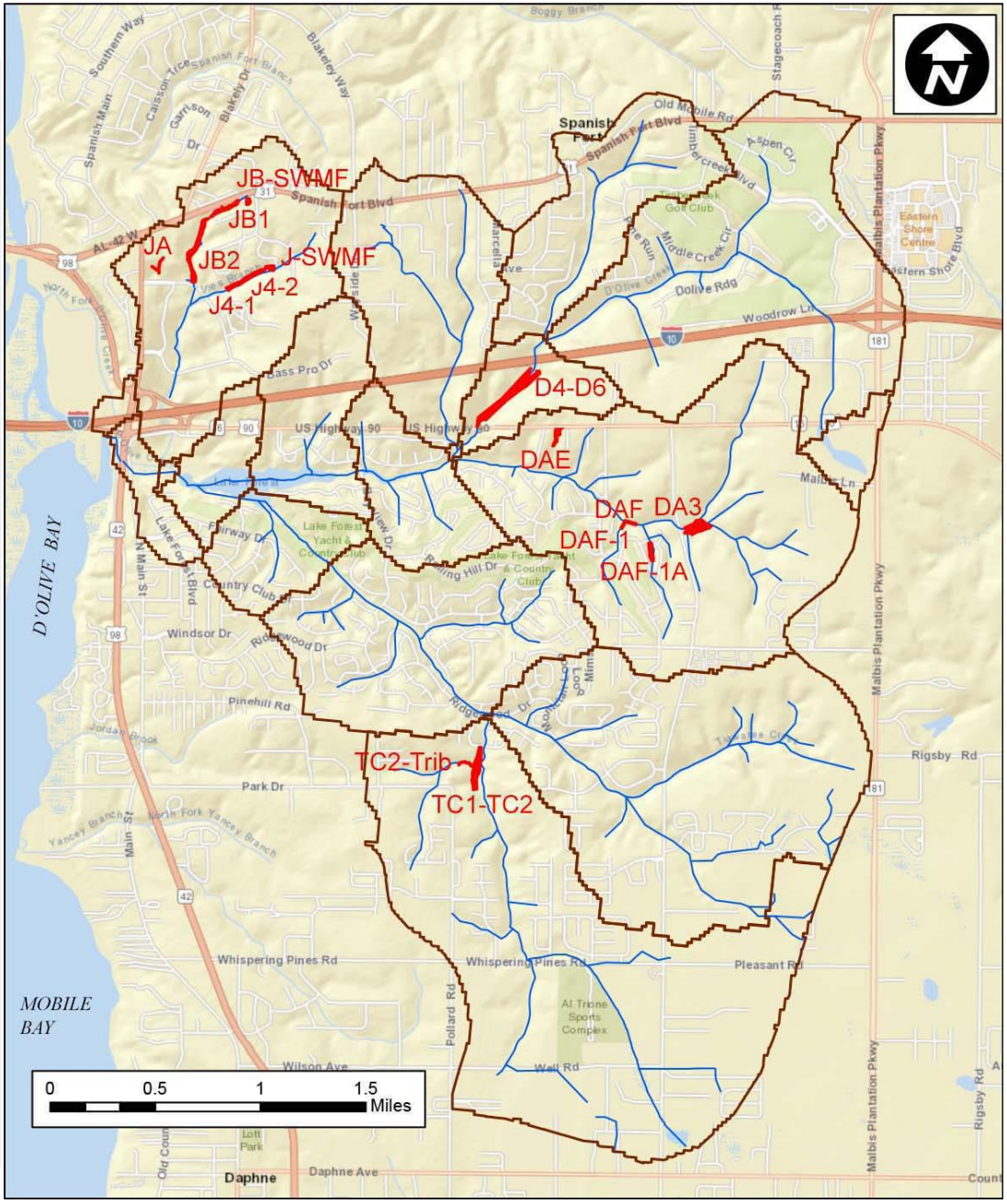
Howard Horne – Wetland assessment, GIS management
David Knowles – Wetland assessment
Jonathan O'Neal – Stream assessment
Tim Thibaut – Project management

Project Funding

MBNEP, through an Alabama Department of Environmental Management (ADEM) EPA Section 319 (non-point source) grant

D'Olive Restoration

Sub-Watershed	Stream Length (ft)	Floodplain Riparian Area (ac)	Wetland Area (ac)
Joe's Branch	4,300	9.2	0.5
D'Olive Creek (D4-D6)	2,714	9.0	
D'Olive Creek (DA)	1,100	2.2	1.6
Tiawasee Creek	1,724	3.9	1.0
Total	11,283	27.6	3.1

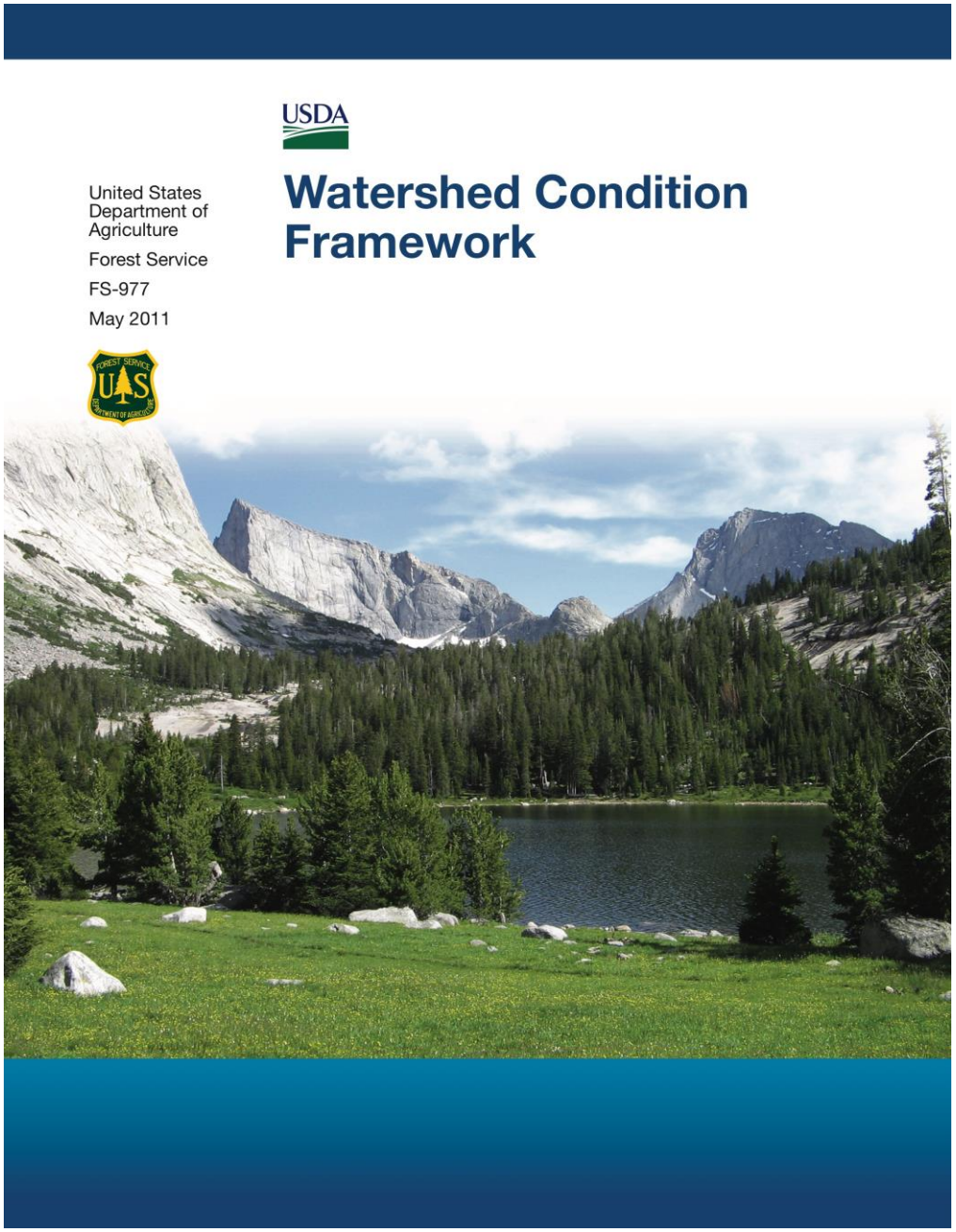


The U.S. Forest Service developed an approach describing three watershed condition classes directly related to the degree or level of watershed functionality, as follows:

Class 1 = Functioning Properly
Class 2 = Functioning at Risk
Class 3 = Impaired Function

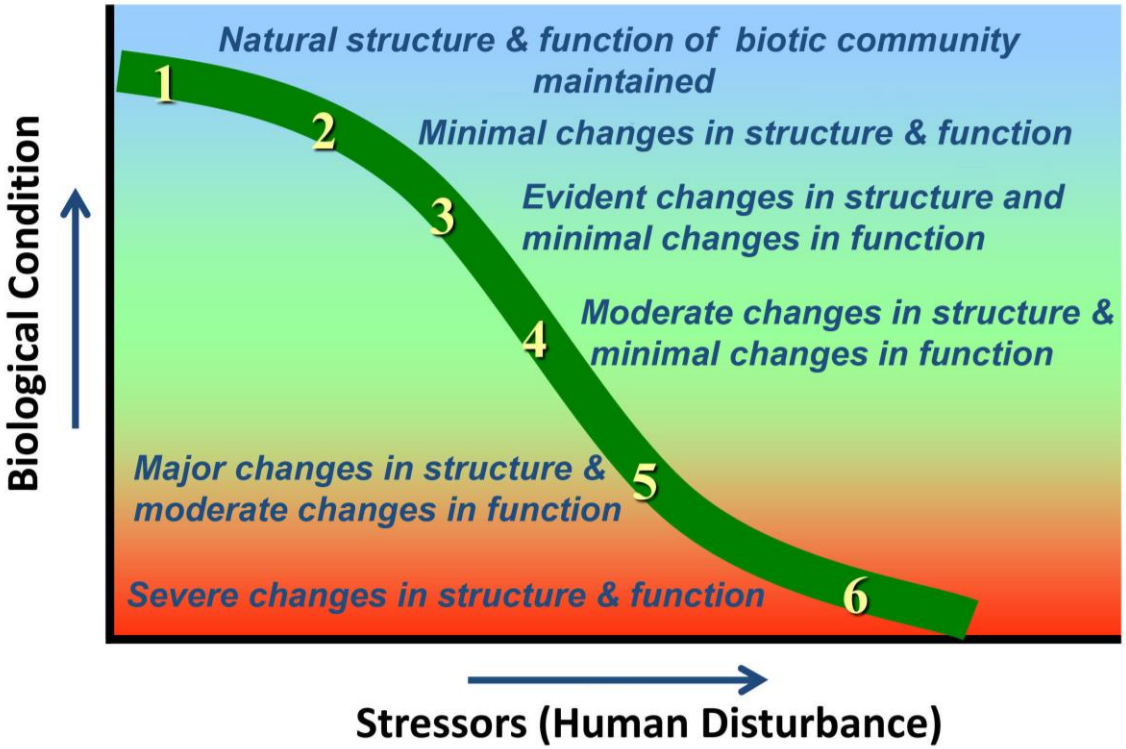
What is it for?

A. Classify watersheds through indicator assessment;
B. Prioritize watersheds for restoration and implement integrated projects;
C. Track restoration accomplishments; and
D. Verify and monitor watershed condition class.



Biological Condition Gradient

The BCG model describes variation in biological condition along a continuum of stress.

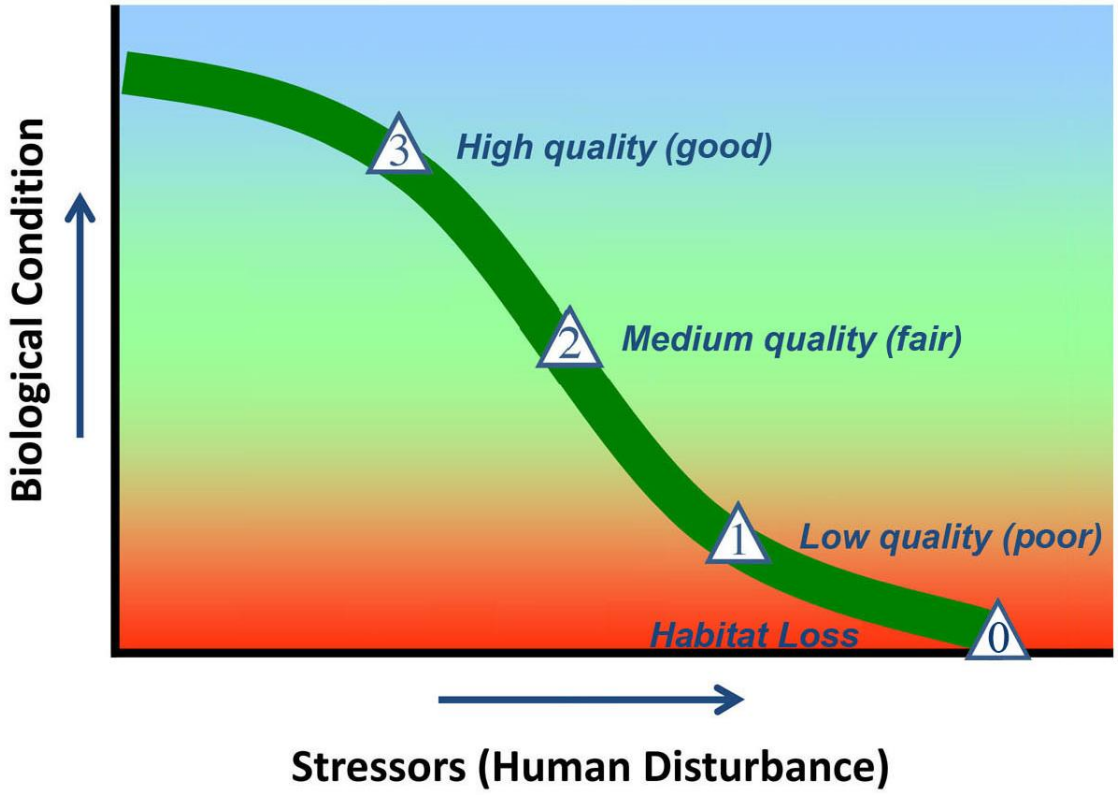


Management efforts can use the BCG to measure and improve the biological condition of MBNEP priority habitats.

Biological Condition Gradient

MBNEP BCG condition tiers:

- Tier 1 - Natural structure and function of the biotic community maintained
- Tier 2 - Moderate impairments in habitat structure and function
- Tier 3 - Major impairments in habitat structure and function



The BCG framework describes habitat quality based on the relative proportion of good, fair, and poor conditions within an assessment area.

Wetland Rapid Assessment Procedure (WRAP)

Six functional values:

- Wetland hydrology
- Water quality input and treatment
- Wetland ground cover
- Wetland canopy
- Habitat support buffer
- Wildlife utilization

WRAP scores reported as total points/maximum possible points:

1.00-0.76 = high quality

0.75-0.51 = medium quality

0.50-0 = low quality

Stream Bioassessment

Macroinvertebrates:

- Good indicators of localized conditions
- Abundant in most streams, including 1st and 2nd order streams
- Assemblages comprise a broad range of trophic levels and pollution tolerances

Concurrent evaluation of habitat quality is an integral part of stream bioassessment:

- Stream width, depth, sinuosity, substrate
- Channel alteration
- Condition of banks and bank vegetation
- Riparian vegetation features

Rapid Stream Assessment

RSA Metric	ADEM HA[1]	RipHLE[2]	WRAP
Sediment Deposition	*		
Habitat Availability	*		
Habitat Smothering	*		
Local Watershed Erosion	*		
Channel Alteration	*		
Channel Sinuosity	*		
Bank Stability	*	*	
Bank Vegetative Protection	*	*	
Riparian Buffer Width	*	*	
Riparian Vegetative Quality		*	*
Canopy Cover	*	*	*
Macroinvertebrates			

[1]ADEM habitat assessment (HA) used for stream bioassessment

[2]Riparian Habitat Health Level Evaluation (RipHLE) (Sapundjieff, 2017)

Rapid Stream Assessment

Metric	Score Criteria		
	Poor +0	Moderate +2	Good +4
Sediment Deposition	>75 affected	25-75% affected	<25% affected
Habitat Availability	<10% stable habitat	10-50% stable habitat	>50% stable habitat
Habitat Smothering	>75% affected	25-75% affected	<25% affected
Local Watershed Erosion	Heavy	Moderate	Light
Channel Alteration	Extensive channelization	Some channelization	No channelization
Channel Sinuosity	Straight channel	Some bends in channel	Extensive bends in channel
Bank Stability	>60% unstable/eroding	30-60% unstable/eroding	<30% unstable/eroding
Bank Vegetative Protection	<50% cover	50-75% cover	>75% cover

Rapid Stream Assessment

Metric	Score Criteria		
	Poor +0	Moderate +2	Good +4
Riparian Zone Width	0-9 m	9-18 m	>18 m
Riparian Vegetative Quality	0-25% Native	25-75% Native	>75% Native
Canopy Cover	<30%, 89-100%	30-50%	51-88%

Rapid Stream Assessment

Metric	Score Criteria		
	Poor	Moderate	Good
Macroinvertebrates Present	No +0	Yes +2	Yes +2
Identified Taxa	Pollution-Tolerant Taxa -2	Moderately Pollution- Sensitive Taxa +2	Pollution-Sensitive Taxa +4
Taxa Examples	Midge Larvae Midge Pupae Black Fly Rat-tailed Maggot	Caddisfly Damselfly Dragonfly Amphipods	Water Penny Stonefly Mayfly Riffle Beetle Dobson Fly

RSA scores reported as total points/maximum possible points:

1.00-0.76 = high quality

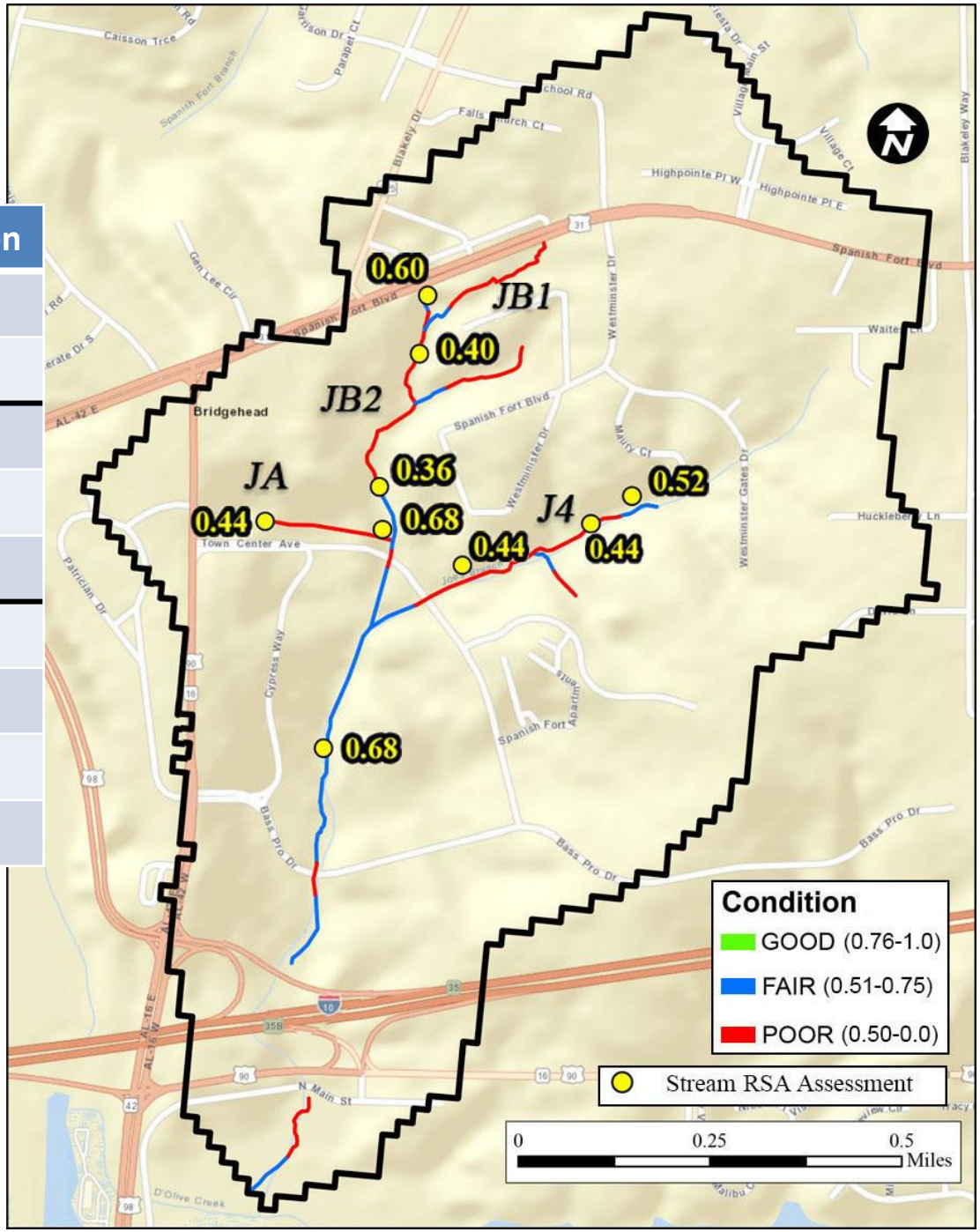
0.75-0.51 = medium quality

0.50-0 = low quality

Joe's Branch Streams

Station	2019 RSA	Condition
JB1 Upstream	0.60	Fair
J4 (1-2) Upstream	0.52	Fair
JB1-Restoration	0.40	Poor
JB2-Restoration	0.36	Poor
J42-Restoration	0.44	Poor
JA-Downstream	0.44	Poor
JB2-Downstream	0.68	Fair
J4 (1-2) Downstream	0.44	Poor
JB-Bass Pro	0.68	Fair

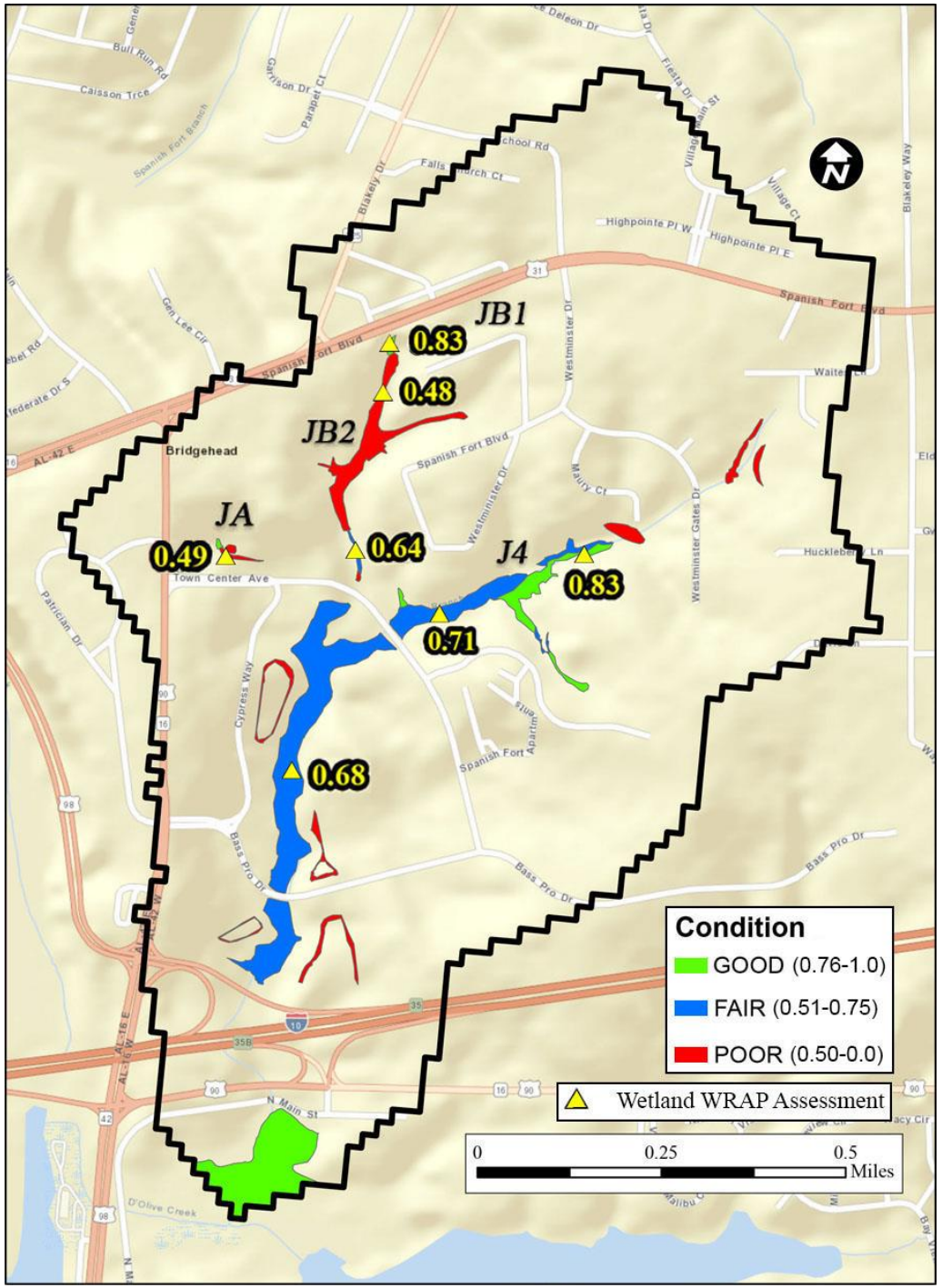
Sub-watershed condition = 0.51



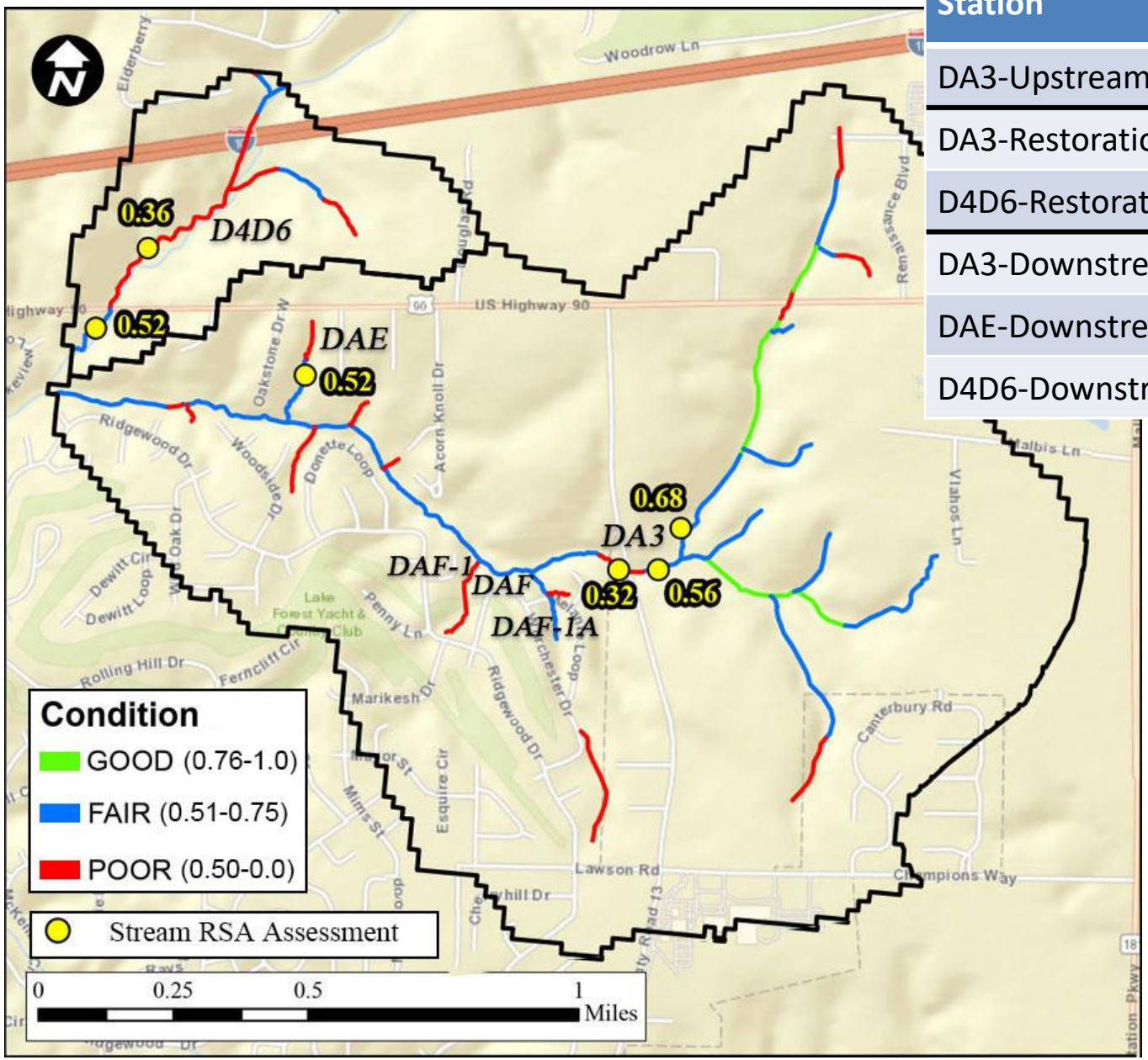
Joe's Branch Wetlands

Station	2019 WRAP	Condition
JB-Upstream	0.83	Good
J4-Upstream	0.83	Good
JA-Restoration	0.49	Poor
JB-Restoration	0.48	Poor
JB-Downstream	0.64	Fair
J4 (1-2) Downstream	0.71	Fair
JB-Bass Pro	0.68	Fair

Sub-watershed condition = 0.70



D'Olive Creek Streams

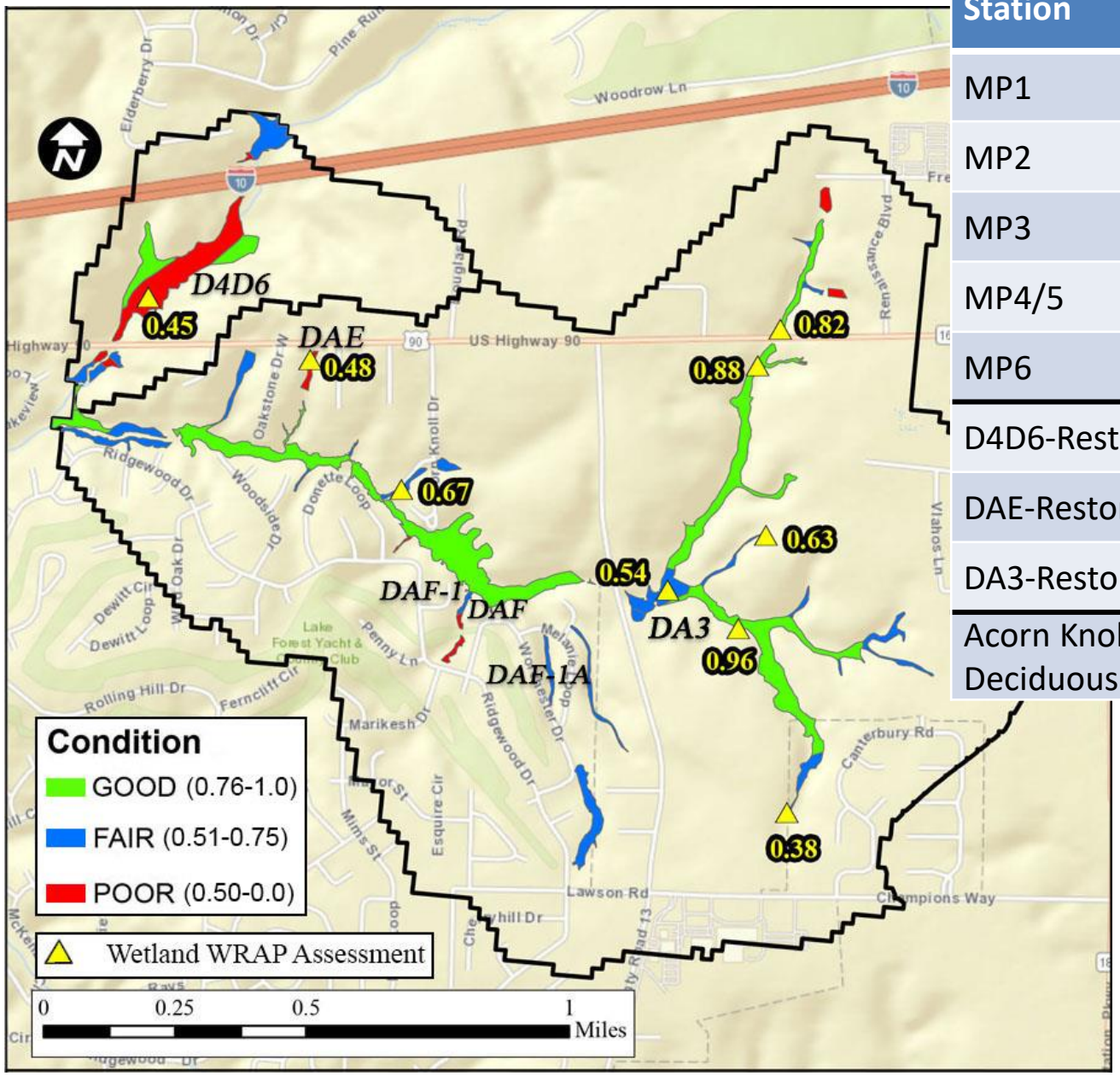


Station	2019 RSA	Condition
DA3-Upstream	0.68	Fair
DA3-Restoration	0.56	Fair
D4D6-Restoration	0.36	Poor
DA3-Downstream	0.32	Poor
DAE-Downstream	0.52	Fair
D4D6-Downstream	0.52	Fair

Sub-watershed D4D6 condition = 0.44

Sub-watershed DA condition = 0.63

D'Olive Creek Wetlands



Station	2019 WRAP	Condition
MP1	0.96	Good
MP2	0.38	Poor
MP3	0.63	Fair
MP4/5	0.82	Good
MP6	0.88	Good
D4D6-Restoration	0.45	Poor
DAE-Restoration	0.48	Poor
DA3-Restoration	0.54	Fair
Acorn Knoll at Deciduous Ct	0.67	Fair

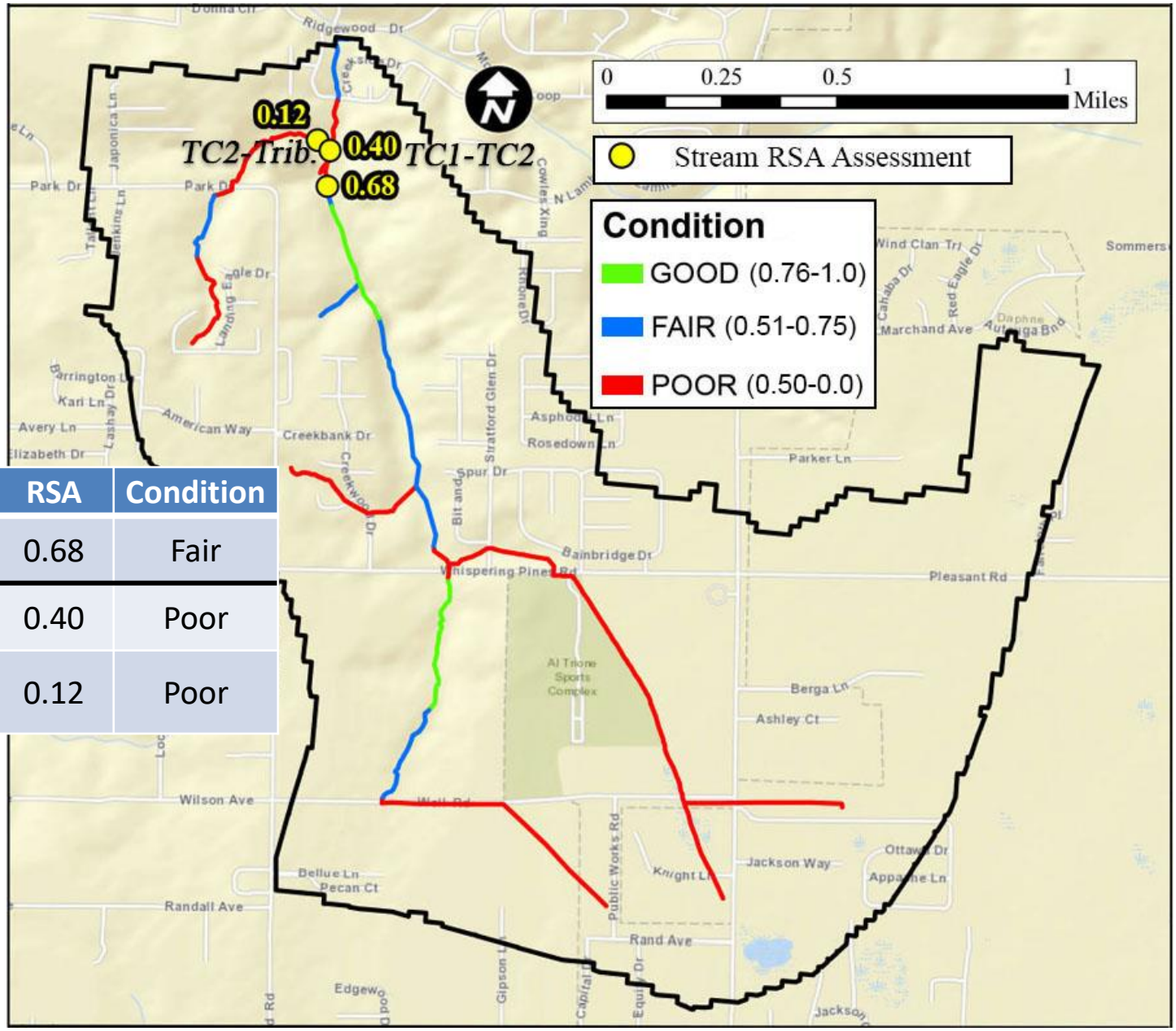
Sub-watershed D4D6 condition = 0.57

Sub-watershed DA condition = 0.88

Tiawasee Creek Streams

Station	RSA	Condition
TC1-TC2 -Upstream	0.68	Fair
TC1-TC2 -Restoration	0.40	Poor
TC2-Tributary Restoration	0.12	Poor

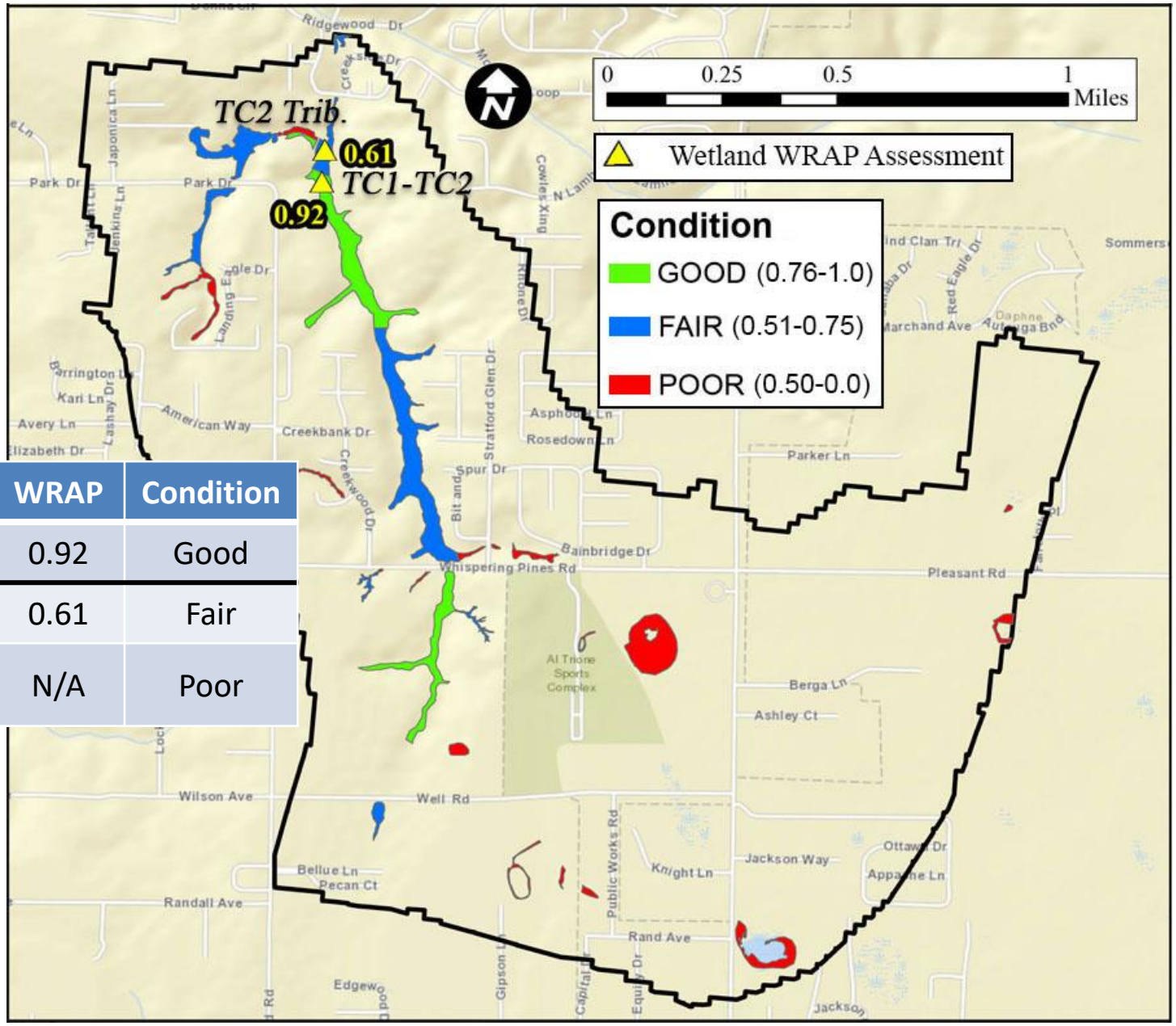
Sub-watershed condition = 0.49



Tiawasee Creek Wetlands

Station	WRAP	Condition
TC1-TC2-Upstream	0.92	Good
TC1-TC2-Restoration	0.61	Fair
TC2 Tributary-Restoration	N/A	Poor

Sub-watershed condition = 0.66



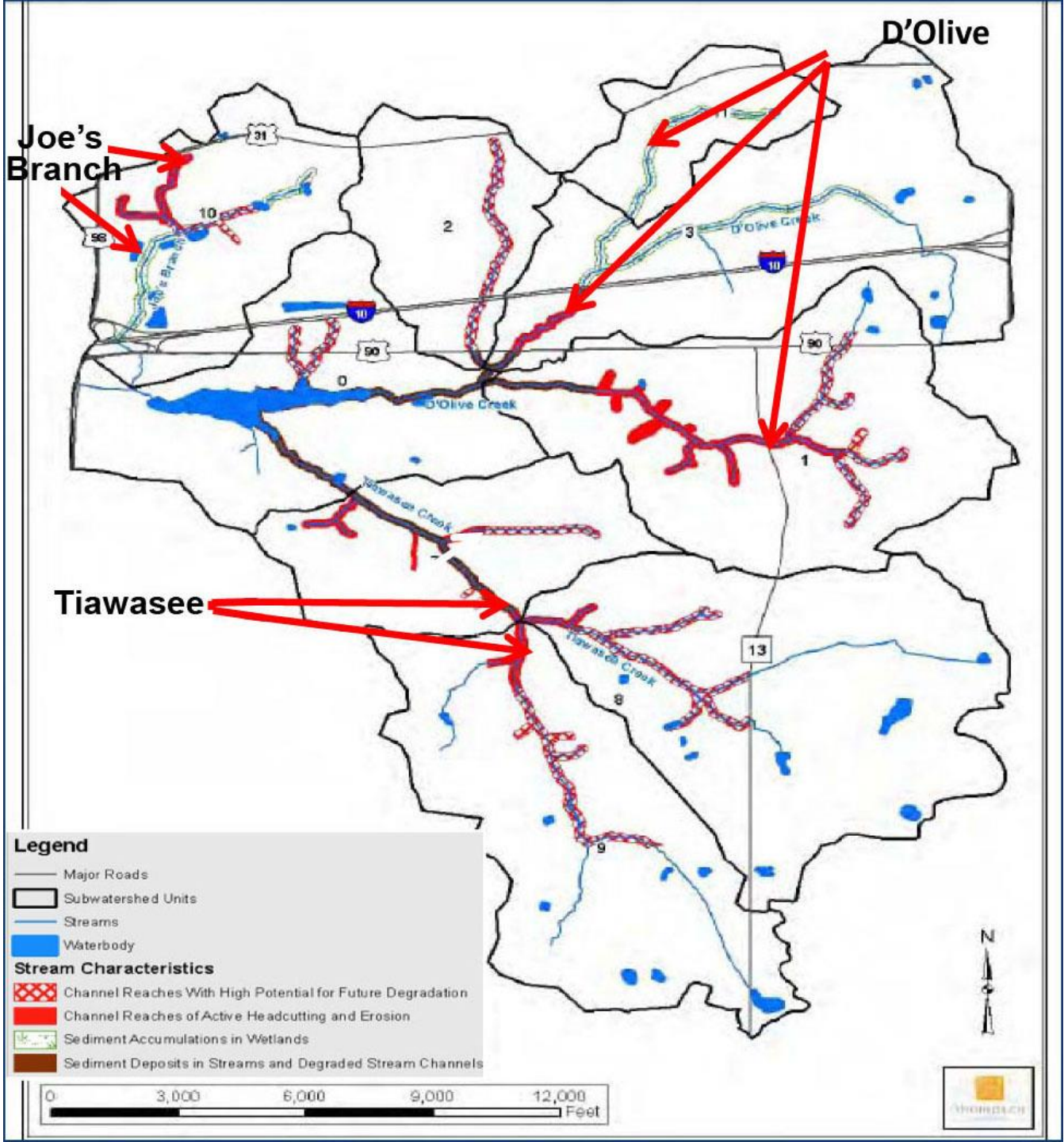
Wetland Trend Assessment

Restoration Site	2016[1] WRAP	2017 WRAP	2019 WRAP	% Change
J4-1-2	0.72	0.72	0.71	-1.4 %
JA	0.44	0.44	0.49	+11.4 %
JB	0.39	0.42	0.48	+23.1 %
DA3	0.66	0.60	0.54	-18.2 %
D4-D6	0.42	0.53	0.45	+7.1 %
TC (1-2)	0.61	0.64	0.61	-

[1]2016 and 2017 WRAPs performed by Wetland Resources Environmental Consulting.

Baseline Assessment 2010 WMP

The Tetra Tech stream analysis mapped locations with head-cutting, channel erosion, and sedimentation.



Baseline Stream Assessment

Baseline conditions at restoration sites were given low (poor) scores for:

- Bank stability
- Bank vegetative protection
- Sediment deposition
- Habitat availability
- Habitat smothering

Figure 4-8. Head-cut on Tributary JA to Joe's Branch

Baseline Stream Assessment

Baseline conditions at <u>downstream</u> locations were given low (poor) scores for:

- Sediment deposition
- Habitat availability
- Habitat smothering
- Riparian buffer zone width
- Riparian vegetative quality
- Canopy cover
- Local watershed erosion

Figure 4-16. Sedimentation in Wetlands of Tributary JB to Joe's Branch Downstream of US Highway 31 Crossing

Figure 4-2. Excessive Sediments in D'Olive Creek Downstream of US 90

Joe's Branch Station	Baseline RSA	2019 RSA	Change
JB1-Restoration	0.16	0.40	+0.24
JB2-Restoration	0.16	0.36	+0.20
J4-2-Restoration	0.20	0.44	+0.24
JA-Downstream	0.24	0.44	+0.20
JB2-Downstream	0.32	0.68	+0.36
J4(1-2)-Downstream	0.20	0.44	+0.24
JB-Bass Pro	0.32	0.68	+0.36

D'Olive Creek Station	Baseline RSA	2019 RSA	Change
DA3-Restoration	0.16	0.56	+0.40
D4D6-Restoration	0.20	0.36	+0.16
DA3-Downstream	0.20	0.32	+0.12
D4D6-Downstream	0.24	0.52	+0.28
DAE-Downstream	0.36	0.52	+0.16

Tiawasee Creek Station	Baseline RSA	2019 RSA	Change
TC(1-2) Restoration	0.16	0.40	+0.24
TC2 Trib. Restoration	0.16	0.12	-0.04

Watershed Stream BCG

Sub-Watershed	Pre-restoration	2019
Joe's Branch	0.38 Poor	0.51 Fair
D'Olive Creek (D4D6)	0.41 Poor	0.44 Poor
D'Olive Creek (DA)	0.59 Fair	0.63 Fair
Tiawasee Creek	0.49 Poor	0.49 Poor

WCF Condition

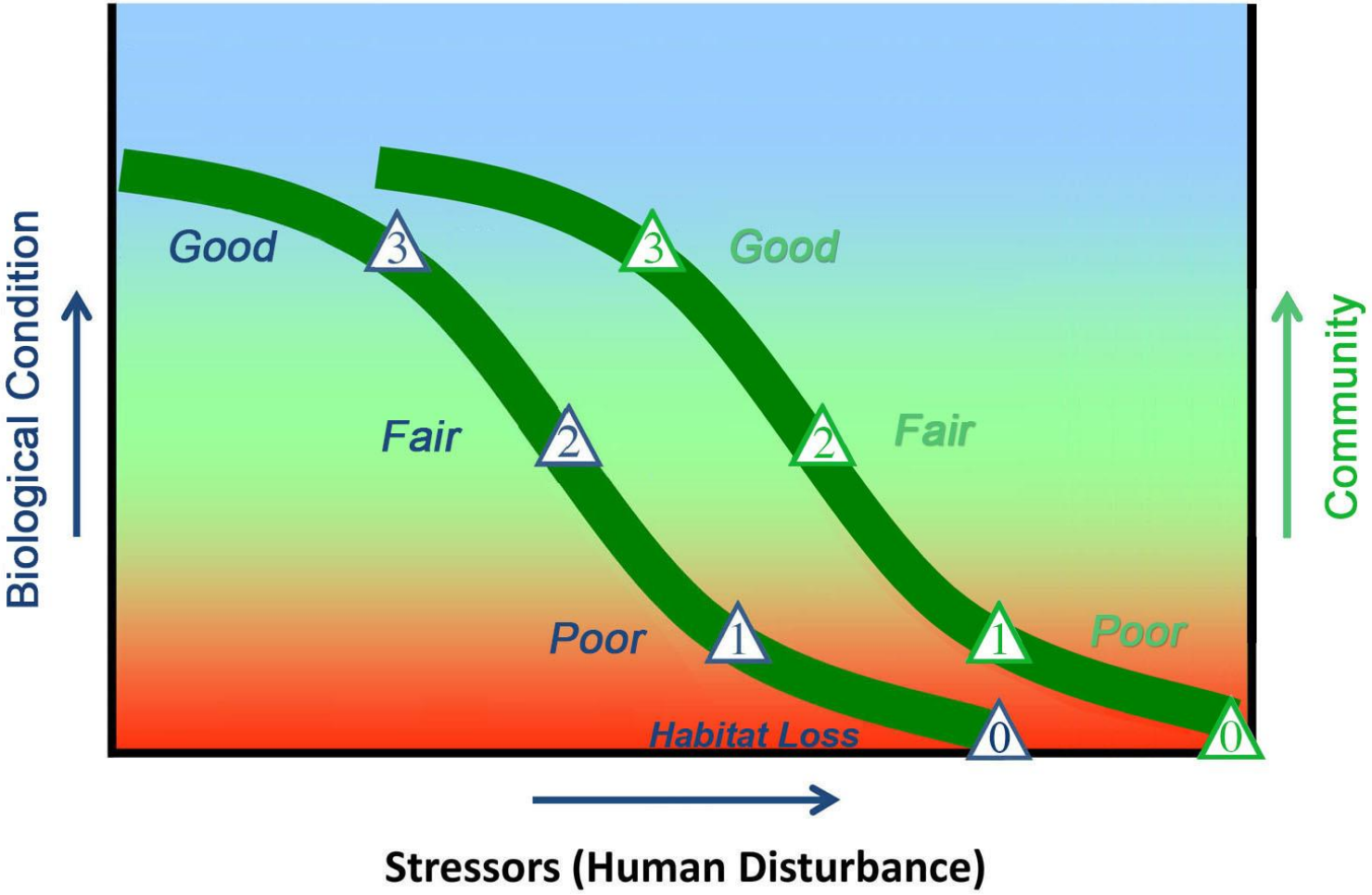
Sub-Watershed	Pre-restoration	Post-restoration
Joe's Branch	Class 3 (Impaired Function)	Class 2 (Functioning at Risk)
D'Olive Creek (D4D6)	Class 3 (Impaired Function)	Class 3 (Impaired Function)
D'Olive Creek (DA)	Class 2 (Functioning at Risk)	Class 2 (Functioning at Risk)
Tiawasee Creek	Class 3 (Impaired Function)	Class 3 (Impaired Function)

Watershed BCG 2019

Sub-Watershed	Stream BCG	Wetland BCG	Average
Joe's Branch	0.51	0.70	0.61 Fair
D'Olive Creek (D4D6)	0.44	0.57	0.51 Fair
D'Olive Creek (DA)	0.63	0.88	0.76 Good
Tiawasee Creek	0.49	0.66	0.58 Fair

WCF Condition

Sub-Watershed	Pre-restoration	Post-restoration
Joe's Branch	Class 3 (Impaired Function)	Class 2 (Functioning at Risk)
D'Olive Creek (D4D6)	Class 2 (Functioning at Risk)	Class 2 (Functioning at Risk)
D'Olive Creek (DA)	Class 2 (Functioning at Risk)	Class 2 (Functioning at Risk)
Tiawasee Creek	Class 2 (Functioning at Risk)	Class 2 (Functioning at Risk)

?

Watershed Condition Framework