Project Completion Report

State Agency: Louisiana Department of Wildlife and Fisheries

Project Title: Aquatic Invertebrate and Habitat Assessment to Define a Reference Condition for Index of Biotic Integrity (IBI) development in the South Central Plains Ecoregion, Louisiana

Project Period:

Start Date – 09/01/2015

End Date – 08/31/2016

Grant Funding: State Wildlife Grants

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Background:

The project surveyed aquatic invertebrate assemblages and their habitats in 4 streams located in the South Central Plains Level III ecoregion of Louisiana, and draining the Ouachita River basin. At least 29 invertebrate species of special concern in Louisiana were targeted, including rare crayfish, mussels, and insects, as well as their instream and riparian habitat. Data from these collections can be used to develop a reference condition (i.e., baseline set of community attributes) that can then be used to generate and validate an index of biotic integrity (IBI) for this ecoregion. Most states have developed region-specific IBIs to assess environmental quality of aquatic ecosystems. However, this work has not been done in Louisiana. One of the first and most important steps towards developing an IBI using natural aquatic community data is to define the reference condition. This study will enable the State of Louisiana to begin this process of biologically-based water quality assessment, one that is much more easily implemented and cost-effective than using traditional numeric concentrations (e.g., TMDLs).

Methods:

During May and August of 2016, surveys of larval life stages of the entire benthic macroinvertebrate community were made at 4 sites including: Schoolhouse Springs (2 reaches), Nealy Branch (part of Schoolhouse Springs system, 1 reach), and Bushley Creek (2 reaches) in the Catahoula National Wildlife Refuge. At all sites, 500 µm-mesh D-frame dip nets were used to sample larval aquatic invertebrates.

Depending on accessibility and weather conditions, multiple reaches (at least 2 per site) were sampled at the sites. Each reach was 150 m long. Structural habitats that are known to be important attachment sites for larval aquatic invertebrates were sampled in each reach (10 habitats per reach) in proportion to their availability. These habitats consisted of woody debris, rootwads, human debris (e.g., tires), leaf litter, and bottom substrata (e.g., silt, clay, gravel, and sand). Pools and riffles were sampled in proportion to their availability in the reach. The 10 habitats will be composited into one sample using a 500 µm-mesh sieve bucket, then preserved in 70% ethanol. Samples were transported back the Fisheries Research Lab at the University of Tennessee-Knoxville for sorting and identification using light microscopy. A target minimum number of invertebrates for each 150-m reach was 250 organisms. This number is typically enough to adequately describe benthic macroinvertebrate communities in Southeastern U.S. coastal plain streams.

Instream physicochemical habitat measurements were made following U.S. EPA Environmental Monitoring and Assessment Protocols (EMAP). Water quality was measured with an YSI 660 multi-meter Sonde (Yellow Springs Inc., Yellow Springs, OH). Water temperature, dissolved oxygen concentration, pH, specific conductivity, and total dissolved solids were measured at the mid-point of each sample reach. For channel measurements, the stream velocity (neutrally buoyant object method), wetted width and depth were measured with a survey tape and ruler, substrate size-distribution were estimated using a modified Wentworth scale (e.g., at least 25 pieces of substrate will be sampled per reach and classified as silt, clay, sand, fine gravel, coarse grave, cobble, boulder, or bedrock), density of woody debris and % areal coverage of cover types will be made. For riparian metrics, legacy trees were identified to species and size estimated (e.g., diameter-at-breast- height, height of tree, distance from channel). Canopy cover (i.e., amount of stream shading) was estimated visually by the observer. Channel and riparian physical habitat metrics were taken at 5 transects along the length of each sample reach. A rapid habitat assessment developed by U.S. EPA EMAP was used to qualitatively score a reach (0-200, where 200 is optimal habitat quality) based on expected least disturbed conditions for wadeable streams.

For the Schoolhouse Springs community (Figure 1), 3 sites (with multiple reaches at each site) were sampled (1 in Nealy Branch and 2 sites in Schoolhouse Branch). This is because there are multiple spring heads in the area that flow independently till their confluence at Mill Creek. At Bushley Creek, 1 site (but multiple reaches) was sampled (Figure 2), because it is a creek with one continuous flow path.

Metrics that are typically used to develop an IBI were created using the aquatic invertebrate data collected. Metrics included: **(1)** %composition of clinger individuals, which are known to be dependent on perennial flow and low sediment yield, **(2)** North Carolina Biotic Index (NCBI), which ranges from 0-10 where 0 represents a community that is intolerant of pollution, and 10 represents a community that is highly tolerant of pollution, and **(3)** % composition of nutrient tolerant individuals, where taxa have been identified by the U.S. EPA as being either tolerant or intolerant of nitrogen and phosphorus pollution.

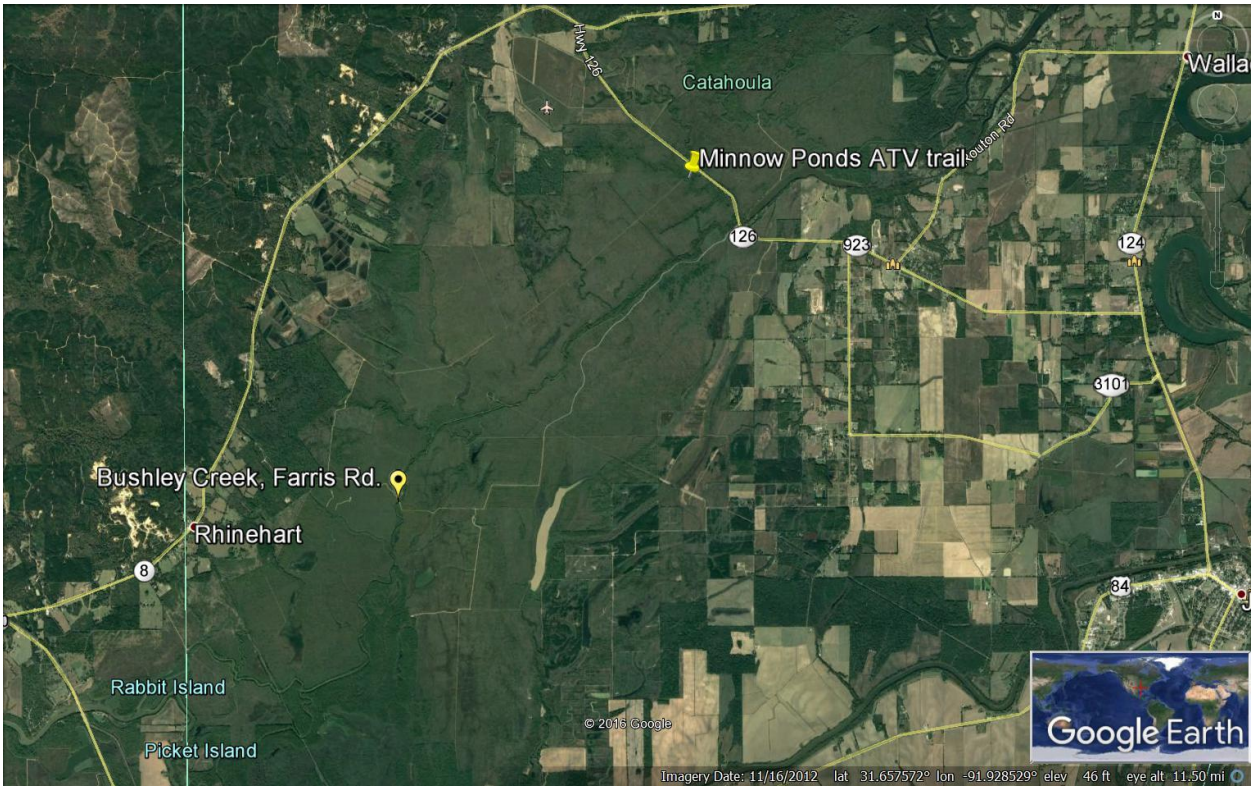

Figure 1. Map of the Schoolhouse Springs reaches in Jackson Parish (above) and the Bushley Creek reaches Minnow Ponds ATV trail off Hwy 126 and Farris Rd. bridge) in the Catahoula National Wildlife Refuge (below).

Results:

The tables below provide a summary of the taxa and IBI metrics calculated for each sample. At the Bushley Creek site, the Little Dubiraphian Beetle (*Dubiraphia parva*), listed as G1G3 and S1, was not collected. Although numerous other riffle beetles (Family Elmidae) were collected, this species, which is known only from Bushley Creek was not sampled. It is unlikely that sample efficiency was the problem. Natural rarity likely lead to a low encounter rate. There is not enough data here to determine if it is extirpated.

In the Schoolhouse Springs system, 4 individuals were identified, and one was the Spring-loving Psiloneurian Caddisfly (*Agarodes libalis*), which is a spring obligate that requires clean sand bottom springs with very good water quality. Samples from these sites will continue to be identified. In addition, samples of adult life forms taken in May 2016 by overnight light traps will be identified.

Bushley Cr. @ Hwy 126, Catahoula NWR, Minnow Ponds ATV Trail, 5/6/16								
Order	**Family**	**Genus**	**Species**	**# Individuals**	**Life Stage**	**Pollution Tolerance Score**	**Nutrient Tolerant**	**Clinger**
Ephemeroptera	Leptophlebiidae	*Leptophlebia*	*cupida*	1	Larval	6.23	Y	N
Ephemeroptera	Leptophlebiidae	*Choroterpes*	*basalis*	1	Larval	6.23	Y	N
Ephemeroptera	Caenidae	*Caenis*	*latipennis*	6	Larval	7.41	Y	N
Ephemeroptera	Heptageniidae	*Maccaffertium*	*smithae*	9	Larval	3.15	Y	Y
Trichoptera	Polycentropodidae	*Cernotina*	*Sp*	2	Larval	4.00	Y	Y
Coleoptera	Gyrinidae	*Dineutus*	*Sp*	1	Larval	5.54	Y	N
Coleoptera	Dytiscidae	*Uvarus*	*Sp*	1	Adult	8.00	Y	N
Coleoptera	Haliplidae	*Peltodytes*	*sexmaculatus*	1	Adult	8.73	Y	N
Diptera	Ceratopogonidae	*Bezzia/Palpomyia*	*Sp*	1	Larval	6.00	Y	N
Heteroptera	Corixidae	*Trichocorixa*	*calva*	1	Adult	6.00	Y	N
Heteroptera	Corixidae	*Trichocorixa*	*kanza*	1	Adult	6.00	Y	N
Diptera	Chironomidae	-	-	240	Larval	N/A	N/A	N/A
Decapoda	Procambaridae	*Procambarus*	*Sp*	5	Adult	9.29	Y	N
Amphipoda		-	-	34	Adult	7.40	Y	N
Megaloptera	Corydalidae	*Chauliodes*	*Sp*	1	Larval	8.98	Y	Y
						NCBI Score	**% Intolerant**	**% Clinger**
						6.78	**0.0**	**18.6**

Bushley Cr. @ Hwy 126, Catahoula NWR, Minnow Ponds ATV Trail, 8/2/16								
Order	**Family**	**Genus**	**Species**	**# Individuals**	**Life Stage**	**Pollution Tolerance Score**	**Nutrient Tolerant**	**Clinger**
Ephemeroptera	Leptophlebiidae	*Paraleptophlebia*	*Sp*	1	Larval	1.20	N	N
Ephemeroptera	Baetidae	*Baetis*	*Sp*	1	Larval	4.51	Y	N
Ephemeroptera	Heptageniidae	*Maccaffertium*	*Sp*	2	Larval	3.15	Y	Y
Ephemeroptera	Heptageniidae	*Maccaffertium*	*terminatum*	4	Larval	3.15	Y	Y
Ephemeroptera	Heptageniidae	*Maccaffertium*	*exiguum*	2	Larval	3.15	Y	Y
Trichoptera	Leptoceridae	*Oecetis*	*cinerescens*	1	Larval	4.47	Y	Y
Trichoptera	Leptoceridae	*Triaenodes*	*perna*	1	Larval	4.70	Y	N
Trichoptera	Leptoceridae	*Nectopsyche*	*pavida*	1	Larval	2.94	N	N
Trichoptera	Hydropsychidae	*Cheumatopsyche*	*Sp*	5	Larval	6.22	Y	Y
Trichoptera	Hydropsychidae	*Hydropsyche*	*alvata*	1	Larval	4.30	Y	Y
Trichoptera	Hydropsychidae	-	-	11	Larval	4.00	Y	Y
Trichoptera	Polycentropodidae	*Cernotina*	*Sp*	1	Larval	4.00	Y	Y
Coleoptera	Elmidae	*Macronychus*	*glabratus*	1	Adult	4.58	Y	Y
Coleoptera	Elmidae	*Stenelmis*	*Sp*	1	Larval	5.10	Y	Y
Coleoptera	Elmidae	*Ancyronyx*	*variegatus*	2	Adult	6.49	Y	Y
Coleoptera	Elmidae	*Ancyronyx*	*variegatus*	1	Larval	6.49	Y	Y
Odonata	Coenagrionidae	*Argia*	*Sp*	1	Larval	8.17	Y	N
Megaloptera	Corydalidae	*Corydalus*	*cornutus*	1	Larval	5.60	Y	Y
Decapoda	Procambaridae	*Procambarus*	*Sp*	1	Adult	9.29	Y	N
Decapoda	Palamaenidae	*Palamontes*	*Sp*	1	Adult	7.40	Y	N
Diptera	Chironomidae	-	-	3	Larval	N/A	N/A	N/A
Veneroidea	Corbilculidae	*Corbicula*	*flaminea*	2	Adult	6.12	Y	N
Diptera	Simuliidae	*Simulium*	*Sp*	2	Larval	4.00	Y	Y
						NCBI Score	**% Intolerant**	**% Clinger**
						4.69	**4.5**	**77.3**

Bushley Cr. @ Farris Rd., Catahoula NWR, 8/2/16								
Order	**Family**	**Genus**	**Species**	**# Individuals**	**Life Stage**	**Pollution Tolerance Score**	**Nutrient Tolerant**	**Clinger**
Ephemeroptera	Isonychiidae	*Isonychia*	*Sp.*	1	Larval	3.80	Y	N
Trichoptera	Philapotamidae	*Chimarra*	*obscura*	1	Larval	2.76	N	N
Trichoptera	Hydropsychidae	*Cheumatopsyche*	*Sp*	1	Larval	6.60	Y	Y
Coleoptera	Elmidae	*Microcylloepus*	*pusillus*	2	Adult	2.11	N	Y
Coleoptera	Elmidae	*Macronychus*	*glabratus*	5	Adult	4.70	Y	Y
Coleoptera	Elmidae	*Stenelmis*	*fuscata*	1	Adult	5.40	Y	Y
Decapoda	Procambaridae	-	-	1	Adult	9.49	Y	N
Diptera	Chironomidae	-	-	3	Larval	N/A	N/A	N/A
Diptera	Simuliidae	*Cnephia*	*Sp*	1	Larval	4.00	Y	Y
Diptera	Simuliidae	*Simulium*	*Sp*	1	Larval	4.40	Y	Y
						NCBI Score	**% Intolerant**	**% Clinger**
						3.09	**21.4**	**78.6**

Nealy Br., @ Hwy 556 near Indian Village, 8/3/16								
Order	**Family**	**Genus**	**Species**	**# Individuals**	**Life Stage**	**Pollution Tolerance Score**	**Nutrient Tolerant**	**Clinger**
Ephemeroptera	Heptageniidae	*Maccaffertium*	*smithae*	1	Larval	3.15	Y	Y
Plecoptera	Leuctridae	*Leuctra*	*Sp*	1	Larval	0.70	N	Y
Plecoptera	Leuctridae	*Leuctra*	*ferruginea/colemanorum*	3	Larval	0.70	N	Y
Trichoptera	Molannidae	*Molanna*	*tryphena*	1	Larval	4.27	Y	N
Trichoptera	Leptoceridae	*Triaenodes*	*ignita*	3	Larval	4.46	Y	N
Trichoptera	Leptoceridae	-	-	1	Larval	4.00	Y	N
Trichoptera	Psychomyiidae	*Lype*	*diversa*	1	Larval	4.05	Y	Y
Trichoptera	Hydropsycidae	*Hydropsyche*	*mississippiensis*	1	Larval	4.30	Y	N
Coleoptera	Dryopidae	*Helichus*	*basalis*	1	Adult	4.63	Y	Y
Coleoptera	Gyrinidae	*Dineutus*	*Sp*	3	Larval	5.54	Y	N
Coleoptera	Elmidae	*Stenelmis*	*Sp*	2	Adult	5.10	Y	Y
Coleoptera	Elmidae	*Stenelmis*	*Sp*	1	Larval	5.10	Y	Y
Coleoptera	Elmidae	*Ancyronyx*	*variegatus*	1	Adult	6.49	Y	Y
Coleoptera	Elmidae	*Ancyronyx*	*variegatus*	1	Larval	6.49	Y	Y
Diptera	Tipulidae	*Hexatoma*	*Sp*	1	Larval	4.31	Y	N
Diptera	Empididae	*Neoplasta*	*Sp*	1	Larval	7.57	Y	N
Diptera	Dixidae	*Dixella*	*Sp*	1	Larval	2.55	N	N
Odonata	Aeshnidae	*Boyeria*	*vinosa*	3	Larval	5.97	Y	N
Odonata	Calopterygidae	*Calopteryx*	*maculata*	6	Larval	7.78	Y	N
Odonata	Gomphidae	*Stylurus*	*plagiatus*	1	Larval	5.80	Y	N
Odonata	Corduliidae	*Neurocordulia*	*alabamensis*	1	Larval	5.03	Y	N
Heteroptera	Veliidae	*Rhagovelia*	*Sp*	1	Larval	6.00	Y	N
Decapoda	Procambaridae	*Procambarus*	*vioscai vioscai*	11	Adult	9.49	Y	N
Diptera	Chironomidae	-	-	1	Larval	N/A	N/A	N/A
Limnophila	Physidae	*Physella*	*Sp*	3	Adult	8.84	Y	N
Amphipoda	-	-	-	2	Adult	7.40	Y	N
Diptera	Culicidae	-	-	2	Larval	8.1	Y	N
						NCBI Score	**% Intolerant**	**% Clinger**
						7.26	**9.3**	**14.8**