Crayfish, Herp, and Minnow Sampling
Tallahatchie NWR
FY '12

Tallahatchie National Wildlife Refuge is located in the delta region of Mississippi in Grenada and Tallahatchie Counties, approximately 2 miles east of the town of Philipp, on MS Highway 8. The refuge totals 4,199 acres and the bulk of this acreage was once agricultural lands. The refuge was established in 1991, and since that time approximately 1,700 acres have been reforested. The majority of the surrounding land is still being farmed annually. On the refuge, approximately 600 acres are currently in agriculture, with the remaining acreage (approximately 1,900 acres) in various types of aquatic habitats.

One of the dominant features on the refuge is Tippo Bayou which runs south through the refuge, and ultimately forms the southern boundary of the refuge. Tippo Bayou is one of the last unchannelized water bodies in the Mississippi Delta. However, over time it has been heavily impacted by agriculture, carrying a heavy silt load, as well as various contaminants. Numerous sloughs and oxbows still exist along Tippo Bayou, representing remnants of habitat that was once abundant in the area. Current hydroperiods for these units vary from drying annually to permanently flooded. Several of these areas have retained their connectivity to Tippo Bayou to varying degrees, while others appear completely isolated from any water source.

From October 31, 2011 – August 1, 2012 staff from North Mississippi Refuges Complex (NMRC), Private John Allen National Fish Hatchery (PJANFH), Natchitoches National Fish Hatchery (NNFH), and the Baton Rouge Fisheries Office (BRFO) sampled aquatic habitats on Tallahatchie National Wildlife Refuge for mussels, crayfish, fish, amphibians, and reptiles. Table 1 below summarizes the sampling period, staff involved, methods used, and target fauna.

Table 1: Summary of sampling periods, staff, methods, and target fauna for the mussel, crayfish, fish, amphibian, and reptile inventory conducted on Tallahatchie National Wildlife Refuge, Grenada and Tallahatchie Counties, Mississippi, October 31, 2011 – August 1, 2012.

Sampling period	Staff	Methods	Target fauna
Oct. 31 – Nov. 4, 2011	NMRC	Minnow traps	Crayfish, fish, amphibians, reptiles
Nov. 2 – 3, 2011	PJANFH, NMRC, BRFO	Electrofishing	Fish
Nov. 4 and 10, 2011	NMRC	Area search	Mussels
Nov. 9 and 14, 2011	NMRC	Dip and seine nets	Crayfish, fish
Nov. 16 – 17, 2011	PJANFH, NMRC	Gill nets	Fish
Feb. 13 – 17, 2012	NMRC	Minnow traps, dip nets	Crayfish, fish, amphibians, reptiles
Feb. 22, 2012	PJANFH, BRFO	Electrofishing	Fish
Mar. 12 – 16, 2012	NMRC	Minnow traps, dip nets	Crayfish, fish, amphibians, reptiles
Apr. 30 – May 4, 2012	NMRC	Minnow traps, dip nets	Crayfish, fish, amphibians, reptiles
June 26, 2012	NMRC	Area search	Mussels
June 27, 2012	PJANFH	Electrofishing	Fish
July 31 – Aug. 1, 2012	PJANFH, NNFH	Area search	Mussels

Work done by the PJANFH, NNFH, and BRFO staff focused primarily on Tippo Bayou and Long Branch, the two largest permanent bodies of open water on the refuge. Work done solely by NMRC staff focused on more seasonal water areas.

Prior to the first sampling period, NMRC staff selected five sites that were representative of the forested wetland habitat present on Tallahatchie NWR. These sites were evaluated to determine current water levels, dominant vegetation, connectivity to Tippo Bayou, and microhabitats present. One additional site was sampled in the fall while dry for mussels only, and two additional sites were surveyed during the last sampling period, in order to include some more open aquatic habitat. Table 2 summarizes the results of the initial evaluation of each unit. Unit numbers correspond to official refuge management unit map. Figure 1 shows the location of the various areas sampled, and indicates the taxa sampled at each site.

Table 2: Summary of initial site evaluation of areas surveyed for mussels, crayfish, minnows, amphibians, and reptiles on Tallahatchie National Wildlife Refuge, Grenada and Tallahatchie Counties, Mississippi, October 31, 2011 – August 1, 2012.

Unit/ Name	Size (Acres)	Location	Dominant Species	Microhabitats	Surrounding Land Use	Connectivity/ Water Levels
75 Tupelo Trail	16	Perkins Ridge, north end Tupelo Trail	Tupelo, cypress, buttonbush, duckweed	Cypress knees, buttonbush rootballs, logs, branches, beaver dam/lodge, hardwood litter, cypress litter	Agriculture (soybeans), reforestation area, gravel road	Drainage along east side, possible connectivity to Tippo, though unlikely to back-up from Tippo. Water concentrated in open pool on north end, very soft bottom, but wadable.
76 Beaver Bayou	53	Mabus road, boardwalk	Cypress, buttonbush, bladderwort, coontail, sedges, grasses	Cypress knees, buttonbush rootballs, submerged aquatic veg, emergent herbaceous veg, logs, branches, beaver dam/lodge, hardwood litter, cypress litter	Agriculture (soybeans), fallow field, gravel road	Appears isolated from Tippo Bayou. Stream channel/ditch present on eastern side, but uncertain how often it floods. Water present south of boardwalk for sampling, but too deep to wade.
77 Perkins Ridge	52	Perkins Ridge, at gate, oxbow	Tupelo, cypress, buttonbush, water primrose, *Hydrolea*, sedges, grasses, forbs	Cypress knees, buttonbush rootballs, logs, hardwood litter, cypress litter	Agriculture (soybeans/ milo), reforestation area, gravel road	Only connection to Tippo is through a culvert. Only functional at very high water. Unit completely dry.
80 Dummy Line	63	South of Dummyline Road, east of	Tupelo, cypress, willow, ash,	Cypress knees, submerged aquatic	Gravel road, trail, reforestation	Drainage between moist soil units and Tippo.

		Tippo Trail	parrotfeather, alligatorweed, water primrose	vegetation, branches, beaver dam	area	Acreage includes two oxbows connected to Tippo. Currently water restricted to channel (Only portion below beaver dam wadable.)
82 Horse Barn	47	Between south end of Long Branch and Tippo Bayou	Cypress, water-elm, buttonbush, swamp-privet, bladderwort, alligatorweed, duckweed, mosquito fern, sedges, grasses	Cypress knees, buttonbush rootballs, logs, cypress litter	Mature forest, reforestation area, gravel road	Directly connected to Tippo Bayou. Area dry with exception of small area closest to Tippo—not enough water for traps.
Additional sites added – no initial assessment completed						
25 Grain Bin	41	South of Hwy 8, west of west end of Horse Barn Loop, northwestern moist-soil unit	Primarily coffeeweed stalks with some soft rush in clumps	Soft rush root balls	Other moist soil units, gravel road, paved road	Dried annually then reflooded in fall using rainwater and well water. Strip mowed in 2011. Disked in 2010. Shallowly flooded, barely deep enough to set minnow traps.
13 Slough off Long Branch	4	West of Horsebarn Loop, inside Long Branch	Willow/button bush swamp, duckweed, alligator weed	Buttonbush rootballs, willow rootballs, fallen logs	Reforestation area, permanent water	Directly connected to Long Branch, permanently flooded by Long Branch, probably created when raised levee approximately 5 years ago.
78 Perkins Ridge #2	26	South of Perkins Ridge entrance gate	Cypress, sedges, grasses, parrotfeather	Large cypress bases (hollow), fallen logs	Agricultural fields, Tippo Bayou	Connected to Tippo Bayou during high water, dry during summer.

Methods

Minnow trap sampling

Due to low water levels, only three of the five original sites (75, 76, 77, 80, 82) had sufficient water to trap during the first time period (Oct. 31, Nov. 4), and only one of those was wadable, allowing it to be sampled with dip nets and seines. During the February and March sampling periods, all five sites were sampled using both minnow traps and dip nets. Due to similar species captured during previous sampling periods, only one of the original sites and two new sites (25

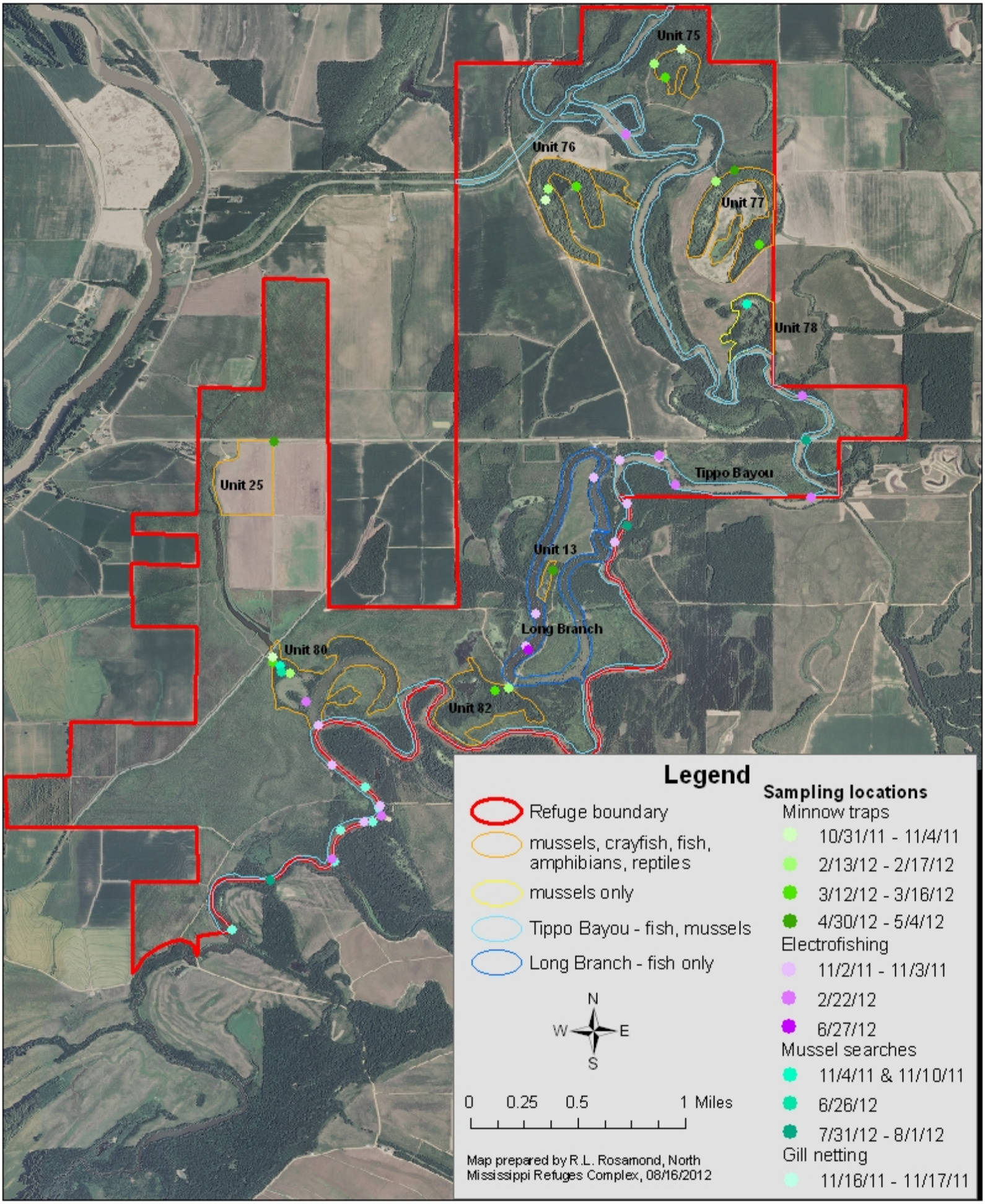

Figure 1: Location of sampling sites and taxa sampled as part of an aquatic species inventory on Tallahatchie National Wildlife Refuge, Grenada and Tallahatchie Counites, Mississippi, conducted October 31, 2011 - August 1, 2012.

different in terms of habitat and were added in an attempt to add additional species to the species list for the refuge.

Minnow trap sampling consisted of setting out 20 aluminum minnow traps (cylindrical, with a funnel at each end) baited with commercial crayfish bait at each site. Traps were checked daily, any animals captured were removed, and the traps replaced at the same location. Captured reptiles and amphibians were identified, photo-vouchered, and released on site. Any individuals found dead were collected, fixed in 10% formalin and preserved in 70% EtOH. Captured fish were sorted and a minimum of 2 specimens per species (when possible) were preserved in a 10% formalin solution. Crayfish were preserved in 70% EtOH. A small number of crayfish were released on site. These were predominantly red swamp crayfish (*Procambarus clarkii*), which are easily identified and a few small individuals that were deemed too small to attempt identification. All crayfish and minnow identifications were confirmed by aquatic ecologists with the U.S. Forest Service Southern Research Station in Oxford, Mississippi.

Dip net sampling

Dip net sampling was done in conjunction with minnow trap sampling. Staff used dip nets to sample the site for a period of 15 – 20 minutes, depending on the number of participants. The goal was a total of about 60 minutes of sampling effort per site. (Three people sampling for 20 minutes equals 60 minutes of sampling effort.) There was some variation in sampling time, however, with total sampling effort per site ranging from 45 – 80 minutes. All crayfish, minnow, amphibians, and reptiles collected were held until the end of the sampling session. At the end of the sampling, animals were identified and released (amphibians and reptiles) or preserved (fish, crayfish) as described above.

During the first sampling periods, seine nets were used either alone or in conjunction with dip nets. This technique was deemed to be ineffective due to the large amount of debris in the water, coupled with the underwater cypress knees and unstable bottoms in the majority of the units.

Area Searches

Area searches were used to find mussels in or near water bodies on the refuge. This technique involved walking through an area, either in the water, near water, or in areas that were seasonally flooded. All dead mussels encountered were collected for identification. Live mussels were identified in situ and released. If a new species was found, it was photographed to confirm identification. Mussel identifications were verified by Wendell Haag, U.S. Forest Service or Tony Brady, U.S. FWS.

Electrofishing

Electrofishing was conducted solely on Tippo Bayou and Long Branch. A Smith Root GPP 9.0 electrofishing unit was set at 680 volts (DC) at 120 pps. An 80% gain delivered an average sustained 6.4 amps to the water. Survey transects consisted of cruising along at trolling speed with for approximately 10 minutes at a time. Fish seen were identified and tallied. The majority were not captured. Transects were run in both open water and along the shoreline, to insure all habitats were sampled.

Gill nets

Only Tippo Bayou was sampled using gill nets. Nets used were experimental gill nets (100' long, 10' deep monofilament with 3 panels of equal length of 3", 4" and 5"), and were deployed in several areas along the south end of Tippo, during a single netting event. A total of 6 areas were sampled with a total netting effort of 20 hours.

Water Quality Monitoring

During each dip net sampling event, water quality parameters were measured and recorded. This included water temperature, pH, conductivity, total dissolved solids, and dissolved oxygen. Table 3 provides a summary of water conditions during each sampling period. These parameters were not measured in Tippo Bayou or Long Branch.

Sampling Results

A total of 9 mussel species, 5 crayfish species, 41 fish species, 12 amphibian species, and 13 reptile species were captured or otherwise recorded. Of these species, 17 species of fish were found only within Tippo Bayou and Long Branch. Table 4 provides a list of species detected and locations where they were found. Species identifications for crayfish and fish were verified by the U.S. Forest Service, Southern Research Station.

Table 3: Water quality parameters measured during dip net sampling at Tallahatchie National Wildlife Refuge, Grenada and Tallahatchie Counties, Mississippi, October 31, 2011 – August 1, 2012.

	Water Temp. (°C)				pH				Conductivity (µS)				Total Dissolved Solids (ppm)				Dissolved Oxygen (ppm)			
Date sampled (week of)	11/9/11	2/13/12	3/12/12	4/30/12	11/9/11	2/13/12	3/12/12	4/30/12	11/9/11	2/13/12	3/12/12	4/30/12	11/9/11	2/13/12	3/12/12	4/30/12	11/9/11	2/13/12	3/12/12	4/30/12
Unit 25, Moist soil unit	---	---	---	25.9	---	---	---	8.24	---	---	---	456	---	---	---	225	---	---	---	6.3
Unit 13, Slough off Long Branch	---	---	---	26.1	---	---	---	7.45	---	---	---	135	---	---	---	50	---	---	---	5.3
Unit 75, Tupelo Trail	20.0	11.4	16.2	---	6.7	6.75	7.13	---	74	68	53	---	37	39	25	---	6.3	6.04	7.26	---
Unit 76, Beaver Bayou	17.6	13.4	21.9	---	7.41	6.98	7.35	---	54	84	65	---	25	49	27	---	4.0	3.31	4.5	---
Unit 77, Perkins Ridge	---	12.0	21.1	23.1	---	6.70	6.77	6.79	---	74	---	103	---	44	---	56	---	4.97	1.75	2.5
Unit 80, Dummyline Road	17.4	11.8	19.7	---	7.86	7.38	7.63	---	646	155	116	---	321	65	58	---	7.45	9.83	4.95	---
Unit 82, Horsebarn	---	11.2	20.7	---	---	6.67	7.41	---	---	88	71	---	---	47	37	---	---	7.36	4.35	---

Table 4: Summary of species collected by site during the inventory effort on Tallahatchie National Wildlife Refuge, Grenada and Tallahatchie Counties, Mississippi, October 31, 2011 – August 1, 2012.

Species		25	13	75	76	77	78	80	82	Tippo/ Long Branch
Mussels										
Unionidae	Flat floater, *Anodonta suborbiculata*						X			
	Yellow sandshell, *Lampsilis teres*			X				X		X
	Fragile papershell, *Leptodea fragilis*									X
	Pondmussel, *Ligumia subrostrata*									X
	Giant floater, *Pyganodon grandis*							X		X
	Mapleleaf, *Quadrula* sp.							X		X
	Texas lilliput, *Toxolasma texasense*						X	X		X
	Paper pondshell, *Utterbackia imbecillus*						X	X		
Sphaeriidae	Fingernail clam			X	X	X		X		
Crayfish										
Cambaridae	Cajun dwarf crayfish, *Cambarellus shufeldtii*		X	X	X	X			X	
	Devil crayfish, *Cambarus diogenes*							X		
	Shrimp crayfish, *Orconectes lancifer*							X		
	White river crayfish, *Procambarus acutus*	X						X		
	Red swamp crayfish, *P. clarkii*	X	X	X	X	X		X	X	
Fish										
Polyodontidae	Paddlefish, *Polyodon spathula*									X
Lepisosteidae	Spotted gar, *Lepisosteus oculatus*									X
	Longnose gar, *L. osseus*									X
	Shortnose gar, *L. platostomus*									X
Amiidae	Bowfin, *Amia calva*			X		X				
Clupeiformes	Gizzard shad, *Dorosoma cepedianum*									X
	Threadfin shad, *D. petenense*									X
Cyprinidae	Common carp, *Cyprinus carpio*									X
	Silver carp, *Hypophthalmichthys molitrix*									X
	Golden shiner, *Notemigonus crysoleucas*							X		
Catostomidae	River carpsucker, *Carpiodes carpio*									X

	Lake chubsucker, *Erimyzon sucetta*			X	X					
	Smallmouth buffalo, *Ictiobus bubalus*									X
	Bigmouth buffalo, *I. cyprinellus*									X
Ictaluridae	Black bullhead, *Ameiurus melas*							X		
	Blue catfish, *Ictalurus furcatus*									X
	Channel catfish, *I. punctatus*									X
	Flathead catfish, *Pylodictis olivaris*									X
Esocidae	Redfin pickerel, *Esox americanus*				X					
Aphredoderidae	Pirate perch, *Aphredoderus sayanus*			X	X	X		X		
Fundulidae	Golden topminnow, *Fundulus chrysotus*		X	X	X			X	X	
	Northern starhead topminnow, *F. d. dispar*		X							
	Black-spotted topminnow, *F. olivaceus*		X					X		
Poeciidae	Western mosquitofish, *Gambusia affinis*		X	X	X			X	X	
Atherinidae	Inland silverside, *Labidesthes beryllina*									X
Elassomatidae	Banded pygmy sunfish, *Elassoma zonatum*		X	X	X	X			X	
Centrarchidae	Flier, *Centrarchus macropterus*			X	X	X		X		
	Green sunfish, *Lepomis cyanellus*			X	X			X		X
	Warmouth, *L. gulosus*		X	X	X			X	X	X
	Orange-spotted sunfish, *L. humilis*							X	X	
	Bluegill, *L. macrochirus*		X					X	X	X
	Dollar sunfish, *L. marginatus*		X					X		
	Longear sunfish, *L. megalotis*		X					X	X	
	Redear sunfish, *L. microlophus*		X			X				X
	Bantam sunfish, *L. symetricus*		X	X	X			X	X	
	Largemouth bass, *Micropterus salmoides*		X	X						X
	White crappie, *Poxomis annularis*									X
	Black crappie, *P. nigromaculatus*								X	X
Percidae	Swamp darter, *Etheostoma fusiforme*			X		X				

	Slough darter, *E. gracile*					X				
Sciaenidae	Freshwater drum, *Aplodinotus grunniens*									X
Amphibians										
Bufonidae	American toad, *Bufo americanus*								X	
	Fowler's toad, *B. fowleri*	X								
Hylidae	Cricketfrog sp., *Acris* sp.	X	X	X	X	X	X	X	X	
	Green treefrog, *Hyla cinerea*							X	X	
	Gray treefrog sp., *H. chrysoscelis/versicolor*			X					X	
Ranidae	Bullfrog, *Lithobates catesbeiana*			X	X	X			X	
	Bronze frog, *L. clamitans*			X		X		X	X	
	Pickerel frog, *L. palustris*			X						
	Southern leopard frog, *L. sphenocephala*	X		X	X	X			X	
Amphiumidae	Three-toed amphiuma, *Amphiuma tridactylum*				X	X				
Sirenidae	Western lesser siren, *Siren intermedia*				X				X	
Salamandridae	Central newt, *Notophthalmus viridescens*				X	X				
Reptiles										
Alligatoridae	American alligator, *Alligator mississipiensis*				X					
Kinosternidae	Common musk turtle, *Sternotherus odoratus*			X				X		
Emydidae	Red-eared slider, *Trachemys scripta*			X						
Scincidae	Ground skink, *Scincella lateralis*					X			X	
	Skink sp., *Eumeces* sp.			X	X	X				
Colubridae	Mississippi green water snake, *Nerodia cyclopion*			X	X	X				
	Diamondback water snake, *N. r. rhombifer*	X								
	Yellowbelly water snake, *N. erythrogaster flavigaster*				X					
	Broad-banded water snake, *N. fasciata confluens*	X			X	X		X	X	
	Graham's crayfish snake, *Regina grahamii*	X								
	Western ribbon snake, *Thmanophis p. proximus*					X				
	Rough green snake, *Opheodrys aestivus*				X					
Viperidae	Cottonmouth, *Agkistrodon piscivorus*	X		X	X					