

**Summary of Stream Habitat and Fish Inventories on the Big Piney Ranger
District, Ozark National Forest, 2009-2010**



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Introduction

The USDA Forest Service, Southern Research Station, Center for Aquatic Technology Transfer (CATT) has worked with resource managers on the Ozark National Forest (ONF) since 2004 to develop and implement customized stream inventories. The CATT field crews have performed stream habitat and fish inventories on the Big Piney (formerly Bayou and Buffalo), Boston Mountain, Magazine, Pleasant Hill, St. Francis, and Sylamore Ranger Districts (Leonard et. al., 2005; Nuckols and Roghair, 2006; Krause and Roghair, 2006; 2007; 2008). The discovery of the Fayetteville Shale, which produces natural gas, has increased interest for mineral rights on the Big Piney Ranger District of the ONF. In spring 2009 the ONF requested assistance with stream habitat and fish inventories on the Big Piney Ranger District to obtain baseline data for land use management decisions. We deployed a biologist and 4 technicians from May 24 to August 14, 2009 and a biologist and 8 technicians from May 24 to August 20, 2010 to quantify stream habitat conditions and provide associated fish assemblage information.

Oil and gas companies have developed horizontal drilling methods, which allow extraction of natural gas in an area known as the Arkansas Fayetteville Natural Gas Field. This field lies beneath 21 counties in Arkansas and includes parts of the ONF. Southern Electric Equipment Company Inc. (SEECO Inc.) obtained mineral rights on areas of the ONF and began exploration and extraction activities in winter 2010. In order to minimize detrimental effects to aquatic or terrestrial populations the ONF and SEECO Inc. entered into a collection agreement. The agreement outlines stream, cave, botanical, terrestrial, bat mist-net, and bat anabat (detector) inventories to collect data for biological evaluation documentation. These inventories will determine the presence or absence of federally endangered, threatened, or Regional-Forester's sensitive species, and provides baseline aquatic and terrestrial population data for the proposed drilling areas. SEECO Inc. funded inventories will incorporate approximately 732 square kilometers of National Forest lands. The CATT's portion (stream habitat and fish inventories) of the project began October 1, 2008 and completed September 30, 2010.

This report presents aquatic habitat and fish population data collected during the 2009-2010 summer field seasons. All of the collected data, as well as detailed reports summarizing the data, are available in the project's MS Access database ('Arkansas Bvet Efish Pebble Database.mdb'). Major watersheds surveyed included: Anderson Creek, Bear Creek, Brock Creek, Driver Creek, Dry Creek, East Fork Illinois Bayou, Gee Creek, Hill Creek, Hurricane Creek, Illinois Bayou, Indian Creek, Lick Creek, Mill Creek, Moccasin Creek, Murray Creek, Poe Creek, Rock Creek, Spring Creek, Sulphur Creek, and Trace Creek.

Methods

Habitat Inventory

Two-person crews performed customized basinwide visual estimation technique (BVET) (Dolloff et al. 1993) stream habitat inventories. Stream inventories began at USFS boundaries or at the downstream end of reaches as defined in the National Hydrography Dataset (NHD), which were often the confluence with another reach. A map delineating stream reaches with corresponding reach numbers was provided by the Forest prior to the start of the inventory. At the beginning of the inventory the crew determined the starting NHD number from these maps. Crews tracked their location with GPS and topo maps, and recorded changes in NHD numbers as they moved upstream. Surveys were terminated when encountering an upstream USFS boundary or a continuously dry channel for more than 500 m.

We used a two-stage visual estimation technique to quantify stream habitat on the Big Piney Ranger District. During the first stage, habitat was stratified into similar groups based on naturally occurring habitat units including pools (areas in the stream with concave bottom profile, gradient equal to zero, greater than average depth, and smooth water surface), and riffles (areas in the stream with convex bottom profile, greater than average gradient, less than average depth, and turbulent water surface). Glides (areas in the stream similar to pools, but with average depth and flat bottom profile) were identified during the survey but were grouped with pools for data analysis. Runs (areas in the stream similar to riffles but with average depth, less turbulent flow, and flat bottom profile), and cascades (areas of fast water with gradient $\geq 12\%$) were grouped with riffles for data analysis.

A two-person crew classified and inventoried stream habitat; one crew member identified each habitat unit by type (as described above), estimated average wetted width, average and maximum depth, riffle crest depth (RCD), substrate composition, and percent fines. The length of each habitat unit was measured with a hip chain (1 m increments). Average wetted width was visually estimated. Average and maximum depth of each habitat unit were estimated by taking depth measurements at various places across the channel profile with a graduated staff marked in 5 cm increments. The RCD was estimated by measuring water depth at the deepest point in the hydraulic control between fast and slow-water habitat units. Substrates were assigned to one of nine size classes (Appendix A, Table A1). Dominant substrate (covered greatest amount of surface area in habitat unit) and subdominant substrate (covered 2nd greatest amount of surface area in habitat unit) were visually estimated. We estimated percent fines, which are the percent surface area of the streambed consisting of sand, silt, or clay substrate particles (particles < 2 mm diameter). In addition, several stream features and their associated attributes (location, type, size, etc.) were recorded when encountered; including: bridge, culvert, dam, ford, landslide, seep, side channel, tributary, and waterfall.

The second crew member classified and inventoried large wood (LW) within the stream channel and recorded data with an electronic data logger. Pieces of LW were assigned to one of four size classes (Appendix A, Table A2). Wood less than 1.0 m long and less than 10 cm in diameter were omitted from the survey.

The first unit of each habitat type selected for intensive (second stage) sampling (i.e. measured wetted width) was determined randomly. Additional units were selected systematically (every 10th habitat unit type for streams greater than 1,000 m, and every 5th habitat unit type for streams less than 1,000 m). The wetted width of each systematically selected habitat unit was measured with a meter tape across at least three transects and averaged. In each of the systematically selected (second stage) riffles the bankfull stream channel width, riparian width, channel gradient, and water temperature were measured. In addition, a digital photograph looking upstream was taken and GPS coordinates were recorded (UTM NAD83). Bankfull channel width was recorded as the width of the bankfull channel perpendicular to flow. Riparian width was measured from the edge of the bankfull channel to the intersection with the nearest landform at an elevation equal to two-times maximum bankfull depth as described by Rosgen (1996). Gradient of the channel was measured with a clinometer by sighting as great a distance as feasible from downstream to upstream. Water temperature was measured in flowing water out of direct sunlight with a thermometer. The downstream and upstream ends of every second paired sample unit were flagged to mark fish inventory and pebble count locations.

A calibration ratio was developed using the ratio of measured to estimated area, which allowed correction of visual estimates. BVET calculations (Dolloff et al. 1993) and data summaries were computed with a Microsoft Access database.

Fish Inventory

An Appalachian Aquatics backpack electrofishing unit (running direct current) was used to collect fish from every 2nd paired sample-unit flagged during the habitat inventory. In each designated habitat unit a four-person crew performed a single electrofishing pass with 2 dip-nets. We did not set blocknets. The voltage and total shock time (seconds) was recorded from the built-in timer on the backpack electrofishing unit. The total number of young-of-year (age 0+) and/or adult (older than age 0+) of each captured species were recorded and fish were released back into the habitat unit. In cases where species identification was not certain specimens were vouchered. All vouchers were preserved in labeled containers using 10% formalin and were later identified in the lab.

Pebble Count

Electrofishing crews also conducted pebble counts to characterize the substrate composition of sample reaches. Pebble counts were performed in riffles designated for electrofishing by walking transects perpendicular to the flow within the bankfull channel (Harrelson et al. 1994). The person walking the transect began at the edge of the bankfull channel on one side of the stream and walked heel-to-toe across the stream channel to the opposite bank (Wolman, 1954). At each step the individual picked up the pebble at the tip of their toe and measured its intermediate axis with a ruler to the nearest millimeter (Bunte and Abt, 2001). For very large particles, the same particle was counted as many times it was encountered. These procedures were repeated until at least 100 measurements were recorded. Transects were not terminated until the opposite bank was reached even if this resulted in more than 100 measurements. Transects were distributed throughout the riffle. If detritus, LW, or other organic materials were encountered the rock substrate found directly below them was sampled. For data analysis the substrate particle sizes were grouped into size class categories (Appendix, Table A3) and substrate classified as bedrock was placed within the very large boulder category (2048-4096 mm) (G. Kappesser, USDA Forest Service, personal communication).

Results

During the 2009 and 2010 field seasons the CATT and ONF personnel completed 92 inventories on 266 km of streams within 188 National Hydrography Dataset (NHD) stream reaches (Table 1). Field crews recorded a total of 76 km of dry habitat. Due to dry habitat, BVET analyses on 40 of the 92 inventories are incomplete; however the data will be useful in describing overall channel conditions and large wood loading. We collected fish data from 304 pools within 113 NHD reaches and 204 riffles within 97 NHD reaches (Table 2). We collected pebble data from 194 riffles within 94 NHD reaches (Table 2). We captured a total of 30 different fish species in 2009 and 2010 (Table 3). The data collected by the CATT can be used to describe stream condition on the ONF and serve as a baseline for future comparisons and land management decisions. Detailed reports of habitat characteristics, substrate, large wood, and fish abundance are available in the project database reports (Appendix B).

Data Availability

The 2005, 2006, 2007, 2008, 2009, and 2010 stream habitat, fish, and pebble data are stored in a Microsoft Access Database, which is stored at the CATT, and a copy has been provided to Keith Whalen, ONF Fish Biologist. We will support the migration of this data into the USFS database tool, Natural Resource Information System Aquatic Surveys (NRIS AsS) as needed. We have created custom queries and reports within the database that summarize the data as requested by the ONF (Appendix B).

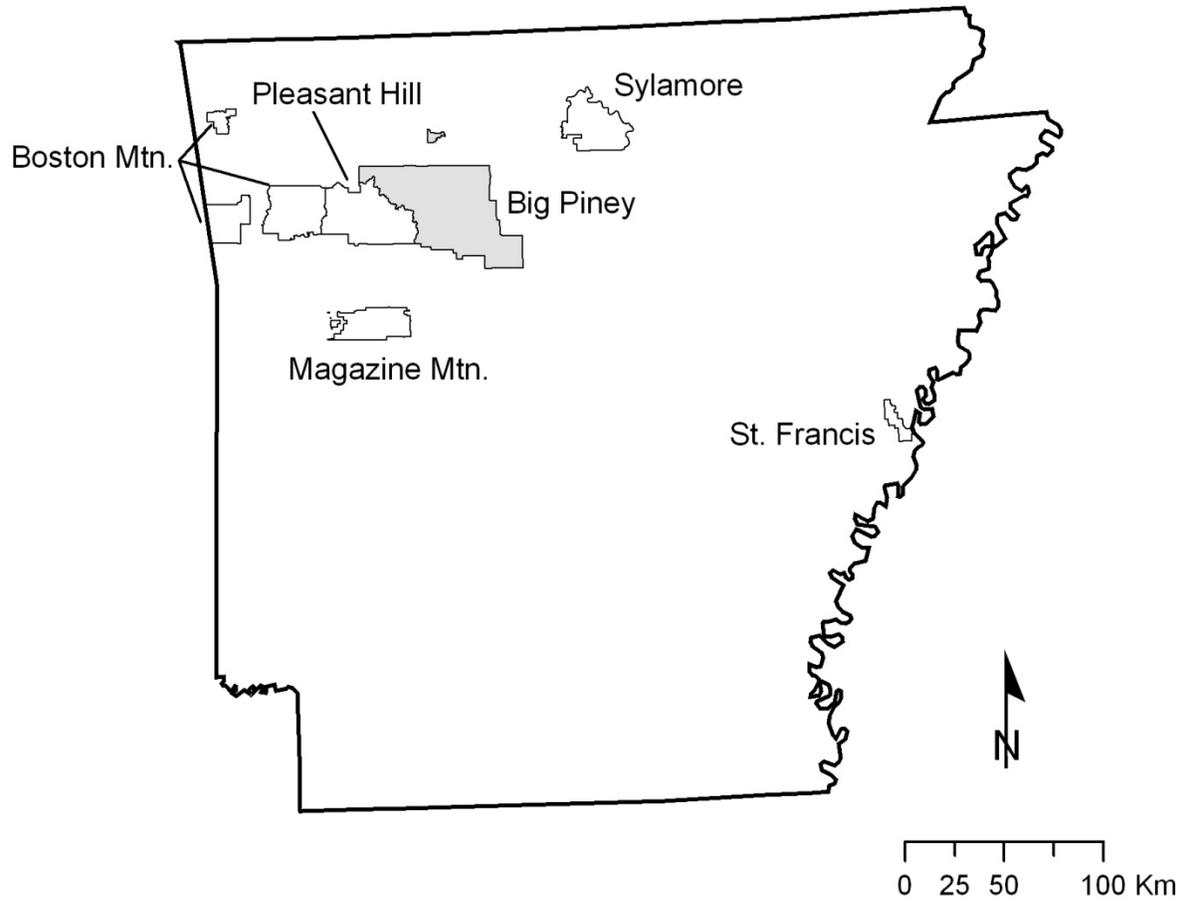


Figure 1. Ranger Districts on National Forest land in Arkansas. The CATT concentrated sampling effort in the southeastern region of the Big Piney Ranger District (shaded in gray) in 2009 and 2010 summer field seasons.

Table 1. Summary of stream habitat inventories by 6th level hydrologic unit code (HUC). Kilometers of habitat inventoried, number of NHD reaches visited, total number of inventories performed, and number of incomplete inventories in 6th level HUCs on the Big Piney and Pleasant Hill Ranger Districts, summer 2009 and 2010. Incomplete inventories are due to dry streambed (see Table 2 comments for details).

District	6th Level HUC	Km Habitat Inventoried	# NHD Reaches Visited	Total # of Inventories	# Incomplete Inventories
Big Piney	111102020606	15.3	9	2	0
	111102020704	3.6	2	1	0
	111102020801	9.8	7	1	0
	111102020802	19.4	14	3	0
	111102020803	11.8	9	3	1
	111102020901	22.7	17	2	0
	111102020903	35.4	18	7	0
	111102020904	24.9	13	7	1
	111102020905	24.3	16	10	6
	111102030101	73.2	58	39	18
	111102030103	10.6	10	10	9
	111102030105	9.0	9	6	5
		<i>Total</i>	<i>260.1</i>	<i>182</i>	<i>91</i>
Pleasant Hill	111102020701	6.2	6	1	0
	<i>Total</i>	<i>6.2</i>	<i>6</i>	<i>1</i>	<i>0</i>
	<i>Grand Total</i>	<i>266.3</i>	<i>188</i>	<i>92</i>	<i>40</i>

Table 2. Summary of stream habitat inventories by NHD reach. Reaches visited, kilometers of habitat inventoried, number of pools and riffles electrofished, and number of pebble inventories completed on the Big Piney and Pleasant Hill Ranger Districts, summer 2009 and 2010.

6th Level HUC	Stream Name	NHD Reach	Km Stream Inventoried	# Pools Efished	# Riffles Efished	# Pebble Inventories	Comments for Incomplete Inventories
111102020606	Bear Creek	11110202000475	2.29	5	3	3	
		11110202000476	0.33	1	1	1	
		11110202000477	0.44	2	1	1	
	Gee Creek	11110202000478	5.41	8	7	7	
		11110202001930	1.21	3	2	2	
		11110202001931	1.60	4	2	2	
		11110202001932	1.09	2	2	2	
		11110202001933	0.19				
11110202001934	2.79	6	2	4			
111102020701	Murray Creek	11110202000616	0.49				
		11110202000617	1.62	2	1	1	
		11110202000618	0.28				
		11110202000619	0.36				
		11110202000620	2.42	3	3	3	
		11110202000621	1.07				
111102020704	Sulphur Creek	11110202000682	0.92	3	1	1	
		11110202000683	2.72	9	7	7	
111102020801	Moccasin Creek	11110202000609	1.64	1	1	1	
		11110202000610	1.17	1	1	1	
		11110202000611	0.67				
		11110202000612	0.76		1	1	
		11110202000613	1.42	2	1	1	
		11110202000614	0.80	1			
		11110202000615	3.36	2	1	1	
111102020802	Lick Creek	11110202001794	0.28				

Table 2. Continued (2 of 8).

6th Level HUC	Stream Name	NHD Reach	Km Stream Inventoried	# Pools Efished	# Riffles Efished	# Pebble Inventories	Comments for Incomplete Inventories	
111102020802	Lick Creek	11110202001796	1.15	2	2	2		
		11110202001797	2.96	7	3	3		
	Gunter Branch	11110202000547	5.31	9	6	7		
		Indian Creek	11110202000153	0.98				
	11110202000154		0.49	1	1	1		
	11110202000155		0.30					
	11110202000156		1.84	1	1	1		
	11110202000157		1.19	1	1	1		
	11110202000158		1.49	1	1	1		
	11110202000159		0.42	1	1	1		
	11110202000160		1.29	1				
	11110202000161	0.09			1	1		
	11110202000162	1.64	2		1	1		
	111102020803	Hole Creek	11110202001948	0.25				Ended inventory due to access issues
Trace Creek			11110202001953	1.24	2	1	1	
		11110202001955	0.98	2	1	2		
		11110202001957	1.40	3	3	3		
		11110202001958	1.33	3	2	2		
		Spring Creek	11110202000677	3.46	6	5	5	
			11110202000678	0.06				
		11110202000679	0.25	1				
		11110202000680	2.84	3	3	3		
111102020901		Hurricane Creek	11110202000566	0.99	1	1	1	
	11110202000567		1.79	2	1	1		
	11110202000568		2.20	6	2	2		

Table 2. Continued (3 of 8).

6th Level HUC	Stream Name	NHD Reach	Km Stream Inventoried	# Pools Efished	# Riffles Efished	# Pebble Inventories	Comments for Incomplete Inventories
111102020901	Hurricane Creek	11110202000569	0.54				
		11110202000570	2.49	2	3	1	
	East Fork Illinois Bayou	11110202000038	1.17	1	1	1	
		11110202000039	4.68	1	1	1	
		11110202000040	0.59	1			
		11110202000046	0.42		1	1	
		11110202000047	0.67				
		11110202000048	0.90	1			
		11110202000049	0.18				
		11110202000050	1.66	1	1	1	
		11110202000052	0.86	1			
		11110202000053	2.85	4	2	2	
		11110202000055	0.19		1	1	
		11110202000056	0.52				
		111102020903	Unnamed	11110202002259	1.32	2	2
11110202002260	2.67			3	2	2	
Payne Creek	11110202002290		0.87	1	1	1	
	11110202002291		6.03	9	8	7	
Unnamed	11110202002261		0.59				
Unnamed	11110202002276		2.74	4	2	1	
Sulphur Creek	11110202002279		0.04				
	11110202002280		3.45	1	1	1	
	11110202002281		0.82	1	1	1	
	11110202002282		1.66	2	2	2	
	11110202002283		2.42	4	2	2	

Table 2. Continued (4 of 8).

6th Level HUC	Stream Name	NHD Reach	Km Stream Inventoried	# Pools Efished	# Riffles Efished	# Pebble Inventories	Comments for Incomplete Inventories
111102020903	Dry Creek	11110202000518	1.16	1	1	1	
		11110202000519	2.54	4	2	2	
		11110202000520	1.30	1	2	2	
	Right Hand Prong	11110202000521	4.37	6	4	4	
		11110202000114	1.13	1	1	1	
		11110202000115	0.36	1			
		11110202000116	1.91	2	2	2	
111102020904	Cowan Creek	11110202002296	2.26	3	2	2	
		11110202002297	2.94	4	3	3	
	Unnamed	11110202002301	0.22				
		11110202002302	3.04	9	5		
	Unnamed	11110202002303	2.10	3	2		
	Unnamed	11110202002299	3.58	4	2	2	
	Unnamed	11110202002250	2.82	5	4	4	
	Campbell Hollow	11110202002304	2.84	2	3	2	
		11110202002305	0.24	1	1	2	
		11110202002306	3.68	7	4	4	
	Bob Bates Fork	11110202002309	0.95				Very little water; low priority stream
		11110202002310	0.16				Very little water; low priority stream
		11110202002311	0.04				Very little water; low priority stream
111102020905	Unnamed	11110202002151	2.71	3	2	1	
	Unnamed	11110202003775	0.50				Dry
	Unnamed	11110202003793	0.35				Dry
	Unnamed	11110202003807	0.50				Dry
	Mill Creek	11110202002235	1.17	1	1	1	

Table 2. Continued (5 of 8).

6th Level HUC	Stream Name	NHD Reach	Km Stream Inventoried	# Pools Efished	# Riffles Efished	# Pebble Inventories	Comments for Incomplete Inventories
111102020905	Mill Creek	11110202002236	0.09				
		11110202002237	3.17	2	2	2	
		11110202002238	0.74	1			
		11110202002239	1.97	2	1	1	
	11110202002240	4.00	6	3	2		
	Unnamed	11110202002247	0.50	1			Dry
	Illinois Bayou	11110202000036	2.47				
		11110202000037	0.47				
	Unnamed	11110202002246	1.35	3			Intermittent
	Unnamed	11110202002242	2.54				Intermittent
Unnamed	11110202002220	1.80					
111102030101	Driver Creek	11110203000207	0.27				
		11110203000208	0.51		1	1	
		11110203000211	1.57	2	1	1	
		11110203000212	0.12				
		11110203000213	0.23				
		11110203000214	0.04				
	Brock Creek	11110203001097	6.81	8	8	8	
		11110203000217	0.56				
		11110203000221	0.73				
		11110203000222	1.06	1	1	1	
		11110203000223	0.36				
		11110203000224	0.68				
		11110203000225	3.67	2	2	2	
		11110203000228	1.26	1	1	1	

Table 2. Continued (6 of 8).

6th Level HUC	Stream Name	NHD Reach	Km Stream Inventoried	# Pools Efished	# Riffles Efished	# Pebble Inventories	Comments for Incomplete Inventories		
111102030101	Brock Creek	11110203000229	0.49	1					
		11110203000230	0.43						
		11110203000231	0.23						
		11110203000232	0.13	1					
		11110203000233	1.69	1					
	Unnamed	11110203000234	2.80	1					
		11110203002390	1.27	3	2	2			
		11110203002436	0.50					Dry	
		11110203002383	0.86	2	2	2			
		11110203002386	0.70						
		11110203001104	2.36						
		11110203001119	0.66	2	2	2			
		11110203002511	1.23	2	2	2			
		11110203001101	1.54						
		11110203002497	0.81					Intermittent	
		11110203001102	1.26					Dry with limited flowing sections	
		Hill Creek	11110203000215	4.05	5	3	3		
		Unnamed	11110203002394	0.74	1				Not suitable fish habitat
		Unnamed	11110203001100	0.78	1	1	1		
		Unnamed	11110203001089	0.94	2	1	1		
		Unnamed	11110203002480	0.51					Dry
		Unnamed	11110203002440	0.37					Dry and encountered private property
		Unnamed	11110203002413	1.32	2	1	1		
Unnamed	11110203001118	1.27	2	2	2				
Unnamed	11110203001116	1.11	1	1	1				

Table 2. Continued (7 of 8).

6th Level HUC	Stream Name	NHD Reach	Km Stream Inventoried	# Pools Efished	# Riffles Efished	# Pebble Inventories	Comments for Incomplete Inventories
111102030101	Unnamed	11110203001117	1.09	1	1	1	
	Unnamed	11110203001091	1.54	3	2	2	
	Unnamed	11110203002453	0.88				Dry and encountered private property
	Unnamed	11110203002432	0.53				Dry
	Unnamed	11110203001090	0.82				Dry
	Unnamed	11110203002384	0.50				Dry
	Unnamed	11110203001095	1.10	2	1		
	Unnamed	11110203001109	4.47	6	5	5	
	Unnamed	11110203002380	0.30				Intermittent, waterfall blocks passage
	Sweden Hollow	11110203001110	5.21	5	3	3	
	Unnamed	11110203002407	0.18				Dry
	Unnamed	11110203001112	0.81				Dry
	Unnamed	11110203001115	0.75				Dry
	Unnamed	11110203001111	3.27	4	2	2	
	Unnamed	11110203002392	0.74				Dry with isolated habitat units
	Unnamed	11110203002382	0.54	1	1	1	Dry with isolated habitat units
	Unnamed	11110203001107	0.88				Dry
	Unnamed	11110203001106	0.50				Dry
	Unnamed	11110203001108	3.22	5	2	2	
	111102030103	Unnamed	11110203001196	1.09			
Unnamed		11110203002572	0.51				Dry
Unnamed		11110203002560	0.48				Dry
Unnamed		11110203002542	0.31				Dry
Unnamed		11110203001201	1.08	2			Dry with isolated habitat units
Poe Creek		11110203001190	3.28	5	4	4	

Table 2. Continued (8 of 8).

6th Level HUC	Stream Name	NHD Reach	Km Stream Inventoried	# Pools Efished	# Riffles Efished	# Pebble Inventories	Comments for Incomplete Inventories
111102030103	Anderson Creek	11110203000371	1.50	1			Dry with isolated habitat units
	Unnamed	11110203001209	0.63				Dry
	Bradley Creek	11110203001206	0.99				Dry
	Unnamed	11110203002472	0.73				Dry
111102030105	Unnamed	11110203001130	1.69	3			Dry with isolated habitat units
	Unnamed	11110203001140	0.74				Dry
	Unnamed	11110203002561	0.30				Dry
	Unnamed	11110203001138	0.40				Dry
	Unnamed	11110203001139	3.19	1			
	Rock Creek	11110203001134	0.89				Dry with isolated habitat units
		11110203001135	0.27	1			Dry with isolated habitat units
		11110203001136	0.48	1			Dry with isolated habitat units
		11110203001137	1.03				Dry with isolated habitat units
		<i>Total</i>	<i>266.3</i>	<i>304</i>	<i>204</i>	<i>194</i>	
		<i>Count of NHD Reaches</i>	<i>188</i>	<i>113</i>	<i>97</i>	<i>94</i>	

Table 3. Fish species captured on the Big Piney and Pleasant Hill Ranger Districts, summer 2009 and 2010.

Family	Scientific Name	Common Name	District	
			Big Piney	Pleasant Hill
Atherinopsidae	<i>Labidesthes sicculus</i>	Brook silverside	✓	
Catostomidae	<i>Erimyzon oblongus</i>	Creek chubsucker	✓	✓
	<i>Hypentelium nigricans</i>	Northern hog sucker	✓	✓
Centrarchidae	<i>Moxostoma duquesnei</i>	Black redbhorse	✓	
	<i>Lepomis cyanellus</i>	Green sunfish	✓	✓
	<i>Lepomis macrochirus</i>	Bluegill	✓	
	<i>Lepomis megalotis</i>	Longear sunfish	✓	✓
Cyprinidae	<i>Micropterus dolomieu</i>	Smallmouth bass	✓	✓
	<i>Campostoma anomalum</i>	Central stoneroller	✓	✓
	<i>Luxilus cardinalis</i>	Cardinal shiner	✓	
	<i>Lythrurus umbratilis</i>	Redfin Shiner	✓	
	<i>Notropis boops</i>	Bigeye Shiner	✓	✓
	<i>Notropis whipplei</i>	Steelcolor Shiner	✓	
	<i>Phoxinus erythrogaster</i>	Southern redbelly dace	✓	
	<i>Pimephales notatus</i>	Bluntnose minnow	✓	✓
Esocidae	<i>Semotilus atromaculatus</i>	Creek chub	✓	✓
	<i>Esox americanus</i>	Grass Pickerel	✓	
Fundulidae	<i>Esox niger</i>	Chain Pickerel	✓	
	<i>Fundulus catenatus</i>	Northern studfish	✓	
	<i>Fundulus olivaceus</i>	Blackspotted topminnow	✓	
Ictaluridae	<i>Ictalurus natalis</i>	Yellow bullhead	✓	
	<i>Noturus exilis</i>	Slender madtom	✓	✓
Percidae	<i>Etheostoma blennoides</i>	Greenside darter	✓	✓
	<i>Etheostoma flabellare</i>	Fantail darter	✓	✓
	<i>Etheostoma punctulatum</i>	Stippled darter	✓	✓
	<i>Etheostoma spectabile</i>	Orangethroat darter	✓	✓
	<i>Etheostoma whipplei</i>	Redfin darter	✓	✓
	<i>Etheostoma zonale</i>	Banded darter	✓	✓
	<i>Percina caprodes</i>	Logperch	✓	
Petromyzontidae	<i>Ichthyomyzon castaneus</i>	Chesnut Lamprey	✓	

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Appendix A: Categories used during BVET Inventories

Table A1. Size classes used to categorize substrate particles. Size was visually estimated on the intermediate axis (b-axis).

Type	Number	Size / Description
Organic matter	1	Leaves, detritus, etc.
Clay	2	Sticky, holds form when rolled into a ball
Silt	3	Slippery, does not hold form when rolled into a ball
Sand	4	Silt – 2 mm, gritty does not hold form when rolled into a ball
Small gravel	5	3 – 16 mm, sand to fingernail
Large gravel	6	17 – 64 mm, fingernail to fist
Cobble	7	65 – 256 mm, fist to head
Boulder	8	> 256 mm, bigger than head
Bedrock	9	

Table A2. Size classes used to categorize large wood during. Wood < 1.0 m in length or < 10 cm in diameter was omitted.

Category	Length (m)	Diameter (cm)
1	1-5	10-55
2	1-5	>55
3	>5	10-55
4	>5	>55
	rootwad	rootwad

Table A3. Substrate size classes used for pebble count data analysis. Bedrock was grouped in the very large boulder size class. Diameter was measured on the intermediate axis.

Size Class	Size Range (mm)
Sand	0 - 2
Very Fine Gravel	2 - 4
Fine Gravel	4 - 8
Medium Gravel	8 - 16
Coarse Gravel	16 - 32
Very Coarse Gravel	32 - 64
Small Cobble	64 - 128
Large Cobble	128 - 256
Small Boulder	256 - 512
Medium Boulder	512-1024
Large Boulder	1024-2048
Very Large Boulder	2048-4096

Appendix B: List of Microsoft Access Database Reports in 'Arkansas Bvet Efish Pebble Database.mdb'

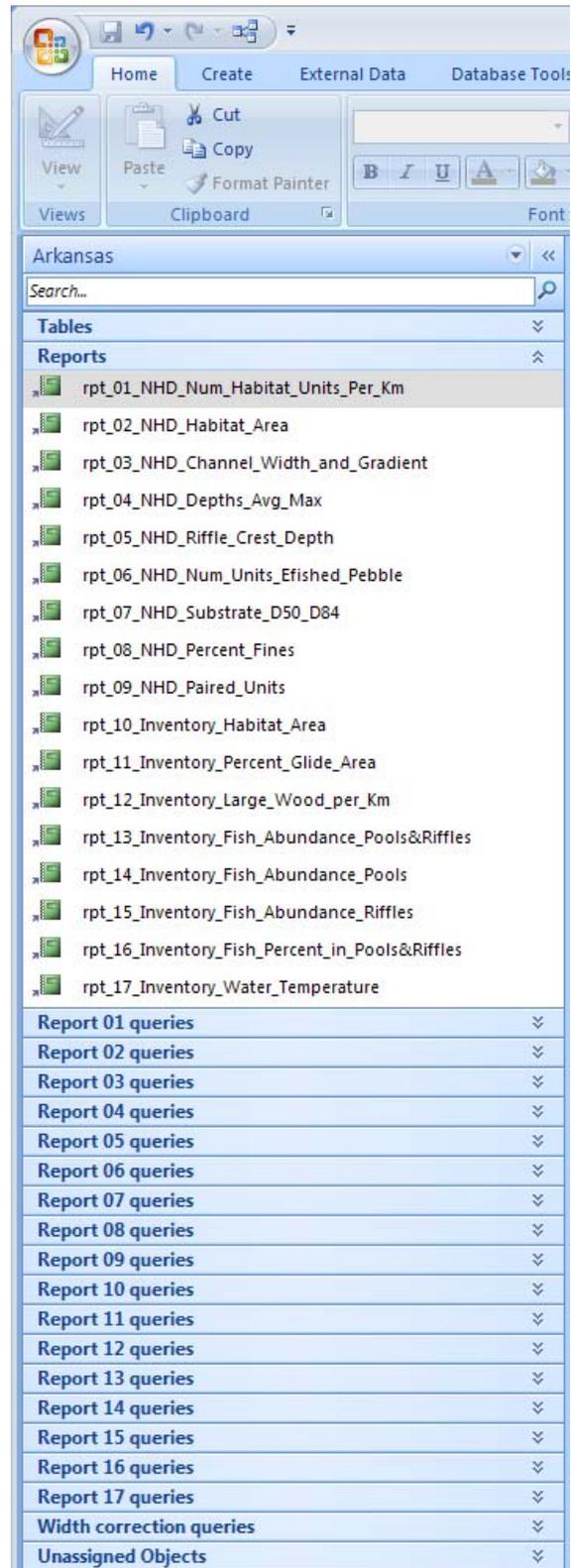
Arkansas Bvet Efish Pebble Database.mdb

'Arkansas' category display selected →

Tables containing data →

Reports summarizing data →

Queries that populate the reports →



List of Database Reports

Reports by NHD

rpt_01_NHD_Num_Habitat_Units_Per_Km

Report 1. Number of habitat units per kilometer by NHD reach and percent of the inventoried NHD reach that was underground (i.e. dry).

rpt_02_NHD_Habitat_Area

Report 2. Wetted stream habitat area (sq. m and %) for slow (pool, glide) and fast-water (riffle, run, cascade) habitat types and percent of the NHD length that was underground (dry) by NHD reach (*insufficient data for calibration of width estimates, thus preventing area calculation).

rpt_03_NHD_Channel_Width_and_Gradient

Report 3. Average bankfull channel width (m) and channel gradient (degrees) by NHD reach.

rpt_04_NHD_Depths_Avg_Max

Report 4. Average of maximum depths (cm) and average depth (cm) by NHD reach ("Dry" = underground).

rpt_05_NHD_Riffle_Crest_Depth

Report 5. Average and number of riffle crest depth (RCD, cm) measurements by NHD reach.

rpt_06_NHD_Num_Units_Efished_Pebble

Report 6. NHD reach distance inventoried (km), number of electrofished slow (pool) and fast-water (riffle) habitat units, and number of pebble inventories performed.

rpt_07_NHD_Substrate_D50_D84

Report 7. D50 and D84 (mm) substrate values from pebble inventories in fast-water (riffle) habitat units.

rpt_08_NHD_Percent_Fines

Report 8. Average of percent fines (sand, silt, clay) in habitat units by NHD reach ("Dry" = underground).

rpt_09_NHD_Paired_Units

Report 9. Number of paired slow (pool, glide) and fast-water (riffle, run, cascade) habitat units by NHD reach.

Reports by Inventory

rpt_10_Inventory_Habitat_Area

Report 10. Total wetted habitat area (sq. m for slow and fast-water habitat), percent slow (pool, glide) and fast-water (riffle, run, cascade) habitat area (sq. m), and percent of the inventory length that was underground (dry) by inventory (*insufficient data for calibration of width estimates, thus preventing area calculation).

rpt_11_Inventory_Percent_Glide_Area

Report 11. Slow-water habitat (glides only and total = pools and glides) area (sq. m and %) by stream inventory.

rpt_12_Inventory_Large_Wood_per_Km

Report 12. Large wood (LW, sizes classes 1-4) and root-wad (RW) counts per kilometer (km) by inventory (* no LW inventory).

rpt_13_Inventory_Fish_Abundance_Pools&Riffles

Report 13. Number and percent of fish by species (adults and YOY combined) captured in slow (pool, glide) and fast-water habitat (riffle, run) by inventory.

rpt_14_Inventory_Fish_Abundance_Pools

Report 14. Number and percent of fish by species (adults and YOY combined) captured in slow-water habitat (pool, glide) by inventory.

rpt_15_Inventory_Fish_Abundance_Riffles

Report 15. Number and percent of fish by species (adults and YOY combined) captured in fast-water habitat (riffle, run) by inventory.

rpt_16_Inventory_Fish_Percent_in_Pools&Riffles

Report 16. Percent of fish (adults and YOY combined) by species captured in slow (pool, glide) and fast-water habitat (riffle, run) by inventory.

rpt_17_Inventory_Water_Temperature

Report 17. Water temperature (minimum, average, and maximum; deg. C) recorded by inventory.