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Distribution, Life History Aspects, and Conservation Status of the Spothanded Crayfish, *Orconectes* (*Procericambarus*) *punctimanus* (Creaser) (Decapoda: Cambaridae), in Arkansas

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Abstract

The spothanded crayfish, *Orconectes* (*Procericambarus*) *punctimanus* (Creaser), is an endemic crayfish of the Interior Highlands (Ozark Plateau) of Arkansas and Missouri. Fieldwork within the Arkansas portion of its overall distribution from 1999–2012 and a search of museum and literature records revealed a state distribution of 11 counties in northern Arkansas. Eighty-two collections of this crayfish were made from the White River system in 9 counties, including Baxter, Fulton, Independence, Izard, Lawrence, Marion, Randolph, Sharp, and Stone. Two additional counties, Clay and Searcy, are also added to the distribution of *O. punctimanus* from museum and literature records. This crayfish inhabits areas under rocks and rubble in clear streams and is found primarily in pool regions. Form I males were found mainly in September and October. We document additional new localities for *O. punctimanus* as well as provide a summation of all known localities for the species in Arkansas. In addition, various aspects of the biology of *O. punctimanus* are discussed. Based on our recent collections, we recommend a conservation status of "Currently Stable" (CS) for *O. punctimanus* in Arkansas.

Introduction

Freshwater crayfishes of the family Cambaridae reach their greatest diversity in North America north of Mexico totaling 374 species with new species described each year (Taylor et al. 2007, Crandall and Buhay 2008, Jones and Eversole 2011). Crayfishes are the largest Arkansas invertebrates and are important components of the aquatic ecosystem (Huryn and Wallace 1987, Momot 1995, Usio and Townsend 2004). Despite their abundance, diversity, and importance to stream function, little is known of crayfish ecology and natural history (Schuster 1997, Hobbs 2001). The spothanded crayfish, *Orconectes* (*Procericambarus*) *punctimanus* (Creaser, 1933) is an Interior Highlands endemic inhabiting the Ozark Mountain Physiographic province of southern Missouri and northern Arkansas. It was originally described as *Faxonius punctimanus* by Creaser (1933) from Rubidoux Creek, Pulaski County, Missouri. He examined one series from the Spring River, 1.6 km S of Mammoth Springs, Fulton County, Arkansas. Williams (1954) later reported *O. punctimanus* from Fulton, Izard, Lawrence, and Sharp counties, Arkansas. In an unpublished thesis, Reimer (1963) reported a few specimens from Arkansas. More recently, Wagner et al. (2010) reported it from the White River basin of the state. Little is known about the precise distributional limits of this species in Arkansas and even less about its natural history, including ecology, reproductive biology, habitat characteristics, and general biology. This study was initiated to learn more about *O. punctimanus* and to assess its conservation status in Arkansas.

Specific objectives of our study were to: (1) determine the relative abundance and precise distributional limits of the range of *O. punctimanus* within Arkansas; (2) gather data on life history aspects of this species including information on habitat, reproductive period, and any other biological data available; (3) document data on ecological and habitat characteristics of this species; and (4) assess its current conservation status based on the collected distributional data in the state.

Materials and Methods

Field work was conducted between 1999 and 2012. A total of 107 collections was made in a 10 county area of northern Arkansas, including Clay, Baxter, Fulton, Independence, Izard, Lawrence, Marion, Randolph, Sharp, and Stone in an effort to locate *O. punctimanus* in the state. Much of the fieldwork occurred during the

fall, spring, and summer. A variety of collecting methods was used in this study, including the use of aquatic dipnets, seines, and both baited and unbaited crayfish traps. Most individuals were released unharmed at the collecting site following measurement of body length (distance from tip of rostrum to end of telson [Pflieger 1996]); representative specimens were preserved in 60% isopropyl alcohol or ethanol for later study at Southern Arkansas University (SAU). The number of specimens (Appendix) is the number of specimens preserved (historical data) or the total number found at a site. Voucher specimens were deposited in the SAU Invertebrate Collection, the Illinois Natural History Survey (INHS) crayfish collection, the Smithsonian National Museum of Natural History (USNM) Invertebrate Zoology Collection, Washington, D.C., or the Brigham Young University (BYU) crayfish collection.

Physicochemical conditions were measured at Mill Creek in Stone County where *O. punctimanus* is common; this site served as a typical habitat. Physiochemical parameters measured were: pH, water temperature, dissolved oxygen, chloride, alkalinity, dissolved solids, specific conductance, total dissolved solids, discharge, and turbidity (Standard Methods 2005).

In addition to collections made during this survey, an on-line search of museum specimens housed at the USNM (USNM 2012) and INHS (INHS 2012) were used to document the distribution of *O. punctimanus*. Previous literature dealing with this species was also consulted.

Results and Discussion

Our survey reports 854 specimens of *O. punctimanus* in 82 of 107 (77%) localities (see Appendix). This crayfish was found under rocks and rubble usually in shallow pools or pool margins of clear streams (stream order 3–5) where rocks and rubble were frequent.

Recognition Characters of O. punctimanus.–*Orconectes punctimanus* is a relatively large crayfish that lives in streams and rivers. Its rostrum is wide with a distinct trough–like central depression and small marginal spines. Branchiostegal spines are distinct. The acumen is of moderate length and strongly curved dorsad. The areola is open and the antennal scale is widest at the mid–length. The first pleopod (gonopod) terminates in two elongate, slender processes both of which are curved gently caudad. The central projection is longer and bent slightly caudad at the distal end. The mesial process is slightly shorter than the central projection. They are both curved in the same direction and separated from by a space. The tip of the mesial process tapers to a point with a shoulder usually present on the mesial surface of the gonopod near the base of the central projection (Pflieger 1996). Hooks are present on the third pair of pereiopods. The cephalothorax is ovate and the antennae are shorter than the body. The chelae have setiferous punctations on all surfaces and the fingers are ridged with a double row of tubercles on the mesial surface of the palm and proximal half of the dactyl (Williams 1954). Creaser (1933) provided a line drawing of the gonopod of Form I and II males. In addition, Williams (1954) and Hobbs (1989) figured the gonopod, carapace, antennal scale (Williams 1954 only), chela and carpus, and annulus ventralis. Pflieger (1996, his plate 26) provided line drawings of the gonopod and other structures.

Coloration is olive–green on the carapace with a dark, crescent–shaped saddle mark across the carapace at its junction with the abdomen (Pflieger 1996). The chelae are olive–green and have a conspicuous and diagnostic black spot at the base of the dactyl (moveable finger). Yellowish knobs or tubercles occur along the margins of the chelae. A black band runs along the ventrolateral edge of the carapace. The coloration of the abdomen is light green with brick red coloration outlining each individual segment of the abdomen, including the telson and uropods.

Taxonomic Remarks.–Pflieger (1996) stated that this crayfish was one of the most variable Ozark crayfishes, perhaps consisting of several subspecies or even 2 or more recognizable species in Missouri. In Arkansas, it appears this species lacks much of the variability of its Missouri relatives and probably consists of a single taxon in the state, although we did encounter variation in certain measurements such as the width of the rostrum which is highly variable. In addition, Crandall and Fitzpatrick (1996) showed a very close relationship between the northern crayfish, *Orconectes virilis* (Hagen, 1870) and *O. punctimanus*.

Relative Abundance.–It appears that *O. punctimanus* is a relatively abundant crayfish within its distributional limits in Arkansas. A total of 854 specimens was found during this study and almost all were released at their collection site. A few were kept as voucher specimens and some sent to BYU for eventual DNA analyses. Collections at individual sites ranged from 1 to 38 individuals.

Habitat.–Williams (1954) reported *O. punctimanus* apparently preferred the muddier portions of streams,

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being found most abundantly in quiet backwater pools, where they hid in vegetation along the roots of trees in undercut banks, or under rocks in deep clay or mud bottomed pools. Reimer (1963) reported the species from small, clear running streams with rock bottoms, and along the shoals of large, fast moving rivers. Most of his specimens were taken from under rocks or overhanging vegetation along the banks. Pflieger (1996) reported this crayfish was abundant in protected areas along the shore where there was cover in the form of vegetation, detritus, or large rocks. In the current study, it was always found in clear pool areas and only occasionally in swift riffles. It was most often found hiding beside rocks and debris or under rocks in the pool regions of the stream, but patrolled pool bottoms regularly. We did not encounter clay or mud bottomed streams in the study area. All of the sites we sampled were typical, clear, gravel–bottomed Ozarkian streams with American water willow (*Justicia americana*) abundant at the stream and pool margins. Sand was occasionally intermixed with gravel and rarely cobble was abundant in the pool regions sampled. No burrowing activity of *O. punctimanus* was noted during this 14–yr study.

***Physicochemical Conditions*.–**Mill Creek is a direct tributary of the White River where *O. punctimanus* is common. This stream was characterized by water temperatures ranging from near 2°C in winter to 24°C in summer, dissolved oxygen values of 7.1 to 10.3 mg/l, pH of 7.1 to 8.3, chloride of 0.5 to 2.6 mg/l, alkalinity of 84 to 167 mg/l, dissolved solids of 22 to 94 mg/l, specific conductance of 70 to 158 µS/cm, total dissolved solids of 54 to 97 mg/l, and discharge generally less than 15.3 m^3/sec. Turbidity was generally low (Jackson Turbidity Units [JTU], range 25–130) although during periods following flooding in the fall and spring, values were as high as 130 JTU. Normally, there were no prolonged periods of turbid conditions.

Distribution.–The spothanded crayfish has a distributional range that includes most of the eastern one-half of the Ozark region in Missouri and extends southward into adjacent counties of northern Arkansas (Pflieger 1996). Within the state, it was originally known from east of the mainstem White River in Fulton, Izard, Lawrence, and Sharp counties in streams that were part of the White River system (Williams 1954). Reimer (1963) first recorded it from west of the mainstem White River in Independence and Stone counties, although he did not provide collecting sites in the latter. Robison (2000) inventoried the Sylamore Ranger District in Stone County for the USDA Forest Service and found additional localities west of the mainstem White River. More recently, Wagner et al. (2010), in a study of the gaped ringed crayfish, *Orconectes neglectus chaenodactylus* Williams, 1952, noted 34 sites for 254 (123 males, 131 females) *O. punctimanus* in the North Fork White River and Middle White River basins. During the present study, 107 collections of crayfishes were made in the 10 county study area of Clay, Baxter, Fulton, Independence, Izard, Lawrence, Marion, Randolph, Sharp, and Stone counties in northern Arkansas. Of the 107 total crayfish collections, *O. punctimanus* was found at 82 localities (77% of sampling sites) in 10 of the 11 counties surveyed (Fig. 1). It was found in 18 sites in Baxter, 7 sites in Fulton, 5 sites in Independence, 8 sites in Izard, 6 sites in Lawrence, 1 site in Marion (new county record), 7 sites in Randolph, 6 sites in Sharp, and 24 sites in Stone counties.

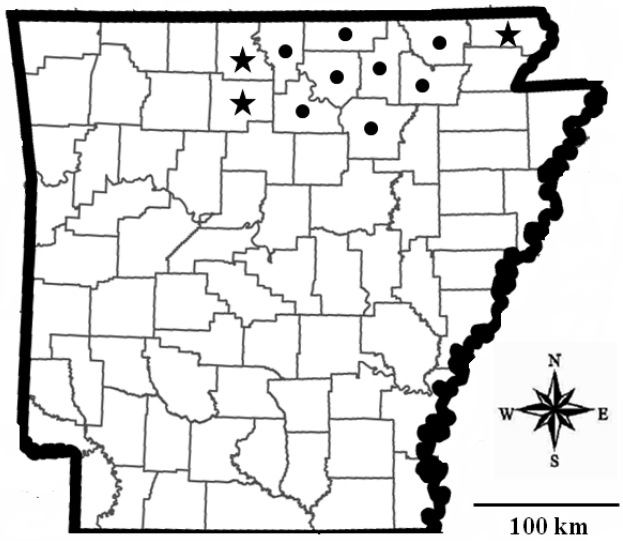

Figure 1. County distribution of *O. punctimanus* in Arkansas. Dots = previous records; stars = new county records.

This Ozark Highland endemic was found in all major tributaries of the Black River system including the Current, Eleven Point, Spring, and Strawberry rivers and the major tributaries of the middle White River system.

In addition to our 82 collections, we used 18 collections of this species housed in the USNM and 35 collections housed in the INHS, plus 7 collections reported by Reimer (1963) to further document the distribution of this crayfish in the state (Appendix). Reimer (1963) reported a collection from Clay County,

Arkansas from the Current River, 1.6 km SE of the Missouri state line (see Appendix). We attempted on 2 occasions to collect *O. punctimanus* from the Current River, but both times were unsuccessful. Interestingly, by the time the Current River reaches Arkansas, it is a large, deep, swift stream, a habitat in which you rarely find *O. punctimanus*. Nevertheless, it is a new county record.

Another spurious record is that of a single collection of 6 specimens (USNM 149014) of *O. punctimanus* taken from Searcy County from Big Creek at St. Hwy 14, 5.0 km E of junction with St. Hwy 27 taken by B. H. Bauer (BHB 79–12) on 20 May 1979 (Appendix). These specimens were identified by Dr. H. H. Hobbs, Jr., the preeminent world authority on crayfishes (now deceased), thus we have no reason to doubt it. This is the westernmost collection of *O. punctimanus* (and a new county record) in Arkansas. HWR has sampled this stream several times for fishes, but has never collected *O. punctimanus*.

Life History Aspects.–In most Ozark crayfishes there is a definite alternation between Form I and Form II males with Form I males predominantly occurring from September or October until March and Form II males predominating the rest of the year (Pflieger 1996). In this study, Form I males were found primarily in September and October. This corresponds to a fall breeding season that Pflieger (1996) noted for most Ozark crayfishes. In our study, small numbers of Form I males were collected in September, October, November, December, and February. Form II males were generally found in April through August. A total of 7 ovigerous females was collected in March (4 specimens) and April (3 specimens) and one adult female with young was collected on April 24. Reimer (1963) reported immature forms were taken in May, June and July, and form I and form II males collected in July. Pflieger (1996) reported females with eggs taken in Missouri in March and May with a female with young observed in May.

Pflieger (1996) noted that adults apparently undergo a general molt as water temperatures rise in early spring and the molt is delayed in females that produce young. In addition, we noted that most males in our study remained in Form II condition through the summer months with many males molting back into Form I condition in the fall of the year.

Although we did not keep length-frequency data, Pflieger (1996) reported young of *O. punctimanus* reach body lengths of about 27.9–53.3 mm by late October, and some of these mature during their first yr of life. Life span is about 2 yrs, although some individuals live 3 or more yrs (Pflieger 1996).

On two occasions this crayfish was observed feeding at night on algae growing on rocks in a pool area 0.4 m deep and a third observation found 2 adults feeding on a dead stoneroller, *Campostoma* spp., in a 0.5 m pool.

Size.–Adults in our study ranged from 35.6–106.7 mm in body length. The largest specimen collected was a female. In addition, Wagner et al. (2010) reported a mean carapace length of 20.7 mm.

Sex Ratio.–Our collections yielded 854 specimens of which 458 were males (103 Form I, 280 Form II, and 75 juveniles) versus 396 females (356 adults and 40 juveniles). This provides a sex ratio of 1.16:1 (male to female). Crayfish populations usually have even sex ratios, and departures from balanced sex ratios favor males because of sexual differences in seasonal activity and catchability during the breeding season (Reynolds 2002).

Decapod Stream Associates.–Other crayfishes most commonly associated with *O. punctimanus* were *O. n. chaenodactylus*; Mammoth Spring crayfish, *Orconectes marchandi* Hobbs, 1948; and Ozark crayfish, *Orconectes ozarkae* Williams, 1952. Occasionally, Hubb's crayfish, *Cambarus hubbsi* Creaser, 1931; long pinchered crayfish, *Orconectes longidigitus* (Faxon, 1898); and coldwater crayfish, *Orconectes eupunctus* Williams, 1952, were found in association with *O. punctimanus*. Wagner et al. (2010) reported that *O. n. chaenodactylus* co–occurred most often with *O. punctimanus*.

Conservation Status.–In a recent study, Taylor et al. (2007) found an estimated 48% of the North American crayfish fauna required some sort of conservation status and protection. However, they designated *O. punctimanus* as a CS "Currently Stable" species, which was defined as a species or subspecies whose distribution is widespread and stable and not in need of immediate conservation management actions. The Heritage status of *O. punctimanus* is S3 (vulnerable) in Arkansas (NatureServe 2011). However, our study strongly suggests this stream crayfish is relatively abundant in the state. We therefore concur with Taylor et al. (2007) with the CS designation of *O. punctimanus* in Arkansas.

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Appendix. Collection sites of *Orconectes punctimanus* from 11 counties in Arkansas.

County	Specific Locality	Date(s)	No. collected	Museum	Collector
Baxter	Big Creek off St. Hwy 201	21 Apr. 1979	16	USNM 177197	R. Bouchard, W. Starnes
	Moccasin Creek at St. Hwy 5	21 Apr. 1979	6	USNM 177201	R. Bouchard, W. Starnes
		27 Apr. 2012	5	SAU	HWR, C. McAllister
	White River at Shipps Ferry (Sec. 9, T17N, R13W)	4 Apr. 1999	1	SAU	HWR
	White River at St. Hwy 341 (Sec. 1, T18N, R12W)	4 Apr. 1999	15	SAU	HWR
	Unnamed tributary at FSR (Sec. 24, T18N, R12W)	4 Apr. 1999	15	SAU	HWR
	Bethel Springs, Sugar Loaf Road (Sec. 14, T17N, R12W)	16 Aug.1999	5	SAU	HWR, K. Tinkle
	Sneeds Creek, Sugar Loaf Road (Sec. 4, T17N, R12W).	16 Aug. 1999	12	SAU	HWR, K. Tinkle
	Coldwater Creek, Sugar Loaf Road (Sec. 4, T17N, R12W)	16 Aug. 1999	5	SAU	HWR, K. Tinkle
	Ferriss Springs, Sugar Loaf Road (Sec. 2, T17N, R13W)	16 Aug. 1999	1	SAU	HWR, K. Tinkle
	Twin Creek at St. Hwy 14 (Sec. 2, T17N, R13W)	16 Aug. 1999	8	SAU	HWR, K. Tinkle
	Perry Creek, Cartney Road (Sec. 20, T18N, R13W)	16 Aug. 1999	11	SAU	HWR, K. Tinkle
	Perry Creek at Range Allotment (Sec. 32, T18N, R13W)	16 Aug. 1999	9	SAU	HWR, K. Tinkle
	Cochran Creek, Cartney Road (Sec. 20, T18N, R13W)	16 Aug. 1999	6	SAU	HWR, K. Tinkle
	Roasting Ear Creek at Stephens Road (Sec. 7, T16N, R12W)	16 Aug. 1999	13	SAU	HWR, K. Tinkle
	Clark Spring at Stephens Road (Sec. 7, T16N, R12W)	16 Aug. 1999	4	SAU	HWR, K. Tinkle
	Trib. to Bennetts Bayou	2006	1	INHS 10731	Unknown
	Pigeon Creek	2006	1	INHS 10734	Unknown
	Cataract Creek	2006	1	INHS 10738	Unknown
	Trib. to Fall Creek	2006	1	INHS 10748	Unknown
	Mill Creek at co. rd. 73 (Culp Road), Bethel Springs	16 Aug. 1999	12	SAU	HWR, K. Tinkle
		16 Apr. 2011	17	SAU	HWR, C. T. McAllister
		28 Jul. 2011	10	SAU	HWR, C. T. McAllister
Clay[1]	Current River, 1.6 km SE of MO state line	1962	1	None	R. Reimer[2]
Fulton	Worthington Creek, 5.0 km WSW Stuart	10 Sept. 1948	1	USNM 133235	A. B. Leonard, Williams
	0.6 km S of Vidette	1962	1	None	R. Reimer[2]
	0.8 km S of Vidette	1962	1	None	R. Reimer[2]
	Town Creek	1990	1	INHS 4446	Unknown
		1994	1	INHS 4850	Unknown
	Big Creek	1990	1	INHS 4914	Unknown
		1994	1	INHS 4849	Unknown
		2006	1	INHS 10756	Unknown
	Strawberry River, 11.3 km W Salem (Sec. l0, T19N, R9W)	11 Sept. 1995	8	SAU	HWR
	Strawberry River at St. Hwy 9 (Sec. 26, R9W, T19N)	2007	13	SAU	HWR
	Myatt Creek	2006	1	INHS 10729	Unknown
	Myatt Creek (36.406°N, 91.583°W)	2008	2	BYU	HWR, K. Crandall
	Norfork Lake	2006	1	INHS 10753	Unknown
	4.3 km S of US 62 on dirt rd. to Elizabeth	1962	1	None	R. Reimer[2]
	Spring River, 1.6 km S Mammoth Springs	1962	1	None	R. Reimer[2]
	Spring River	2006	1	INHS 10703	Unknown
	Spring River at Mammoth Springs (Sec. 8, R5W, T21N)	2007	36	SAU	HWR
	Brushy Creek	2006	1	INHS 10754	Unknown
	Trib. to Bennetts River	2006	1	INHS 10768, 86	Unknown
	Little Creek	2006	1	INHS 10778, 80	Unknown
	Shipman Creek	2006	1	INHS 10823	Unknown
	South Fork of Spring River at Saddle (Sec. 33, R6W, T20N)	2007	27	SAU	HWR
		27 Apr. 2012	5	SAU	HWR, C. T. McAllister
	English Creek at St. Hwy 289 (36.444°N, 91.567°W)	2008	5	BYU	HWR, K. Crandall
	Wild Horse Creek at St. Hwy 289 (36.323°N, 91.225°W)	2008	10	BYU	HWR, K. Crandall
Indepen-dence	Refuge at Jamestown	1962	1	None	R. Reimer[2]
	Stream, jct. St. Hwy 15/ 25 in Locust Grove	15 Apr. 1973	27	USNM 144591	H. H. Hobbs
	Data Creek	1994	1	INHS 4869	Unknown
	Pfeiffer Creek	1996	1	INHS 5539	Unknown
	Polk Bayou at St. Hwy 69, N of Batesville (Sec. 4, R6W, T13N)	26 Jul. 2006	12	SAU	HWR
	Rocky Creek at Locust Bayou (Sec. 32, R7W, T13N)	26 Jul. 2006	19	SAU	HWR
	Jamestown Creek at Jamestown (Sec. 2, R7W, T12N)	27 Jul. 2006	4	SAU	HWR
	Salado Creek at US 167 S of Huff (Sec. 2, R6W, T11N)	27 Jul. 2006	8	SAU	HWR
	E Lafferty Creek, W of Cushman (Sec. 14, R8W, T14N)	27 Jul. 2006	6	SAU	HWR
Izard	Small creek, 2.1 km NW Melbourne	10 Sept. 1948	9	USNM 133234	A. B. Leonard, Williams
	Unnamed trib. of Big Strawberry River	1 Feb. 1975	1	USNM 146563	HWR
	Strawberry River, 4.0 km W Myron	1962	1	None	Reimer[2]
	Strawberry River, 8.0 km W Horseshoe Bend (Sec 7, T18N, R8W)	16 Jun. 1993	17	SAU	HWR

	Strawberry River, 8.0 km NW Franklin (Sec 30, T18N, R8W)	9 Sept. 1995	6	SAU	HWR
	Strawberry River, S Franklin (Sec. 2, R7W, T17N)	21 Jun. 2002	12	SAU	HWR
	McJunkins Branch, 3.5 km SE Franklin (Sec 4, T17N, R7W)	10 Sept. 1995	7	SAU	HWR
	Piney Creek at St. Hwy 56 (Sec. 8, R10W, T17N)	19 Jun. 2002	33	SAU	HWR
	Knob Creek, 7.2 km NW Melbourne (Sec. 31, R9W, T17N)	20 Jun. 2002	16	SAU	HWR
	Indian Creek at Wideman (Sec. 29, R10W, T18N)	20 Jun. 2002	16	SAU	HWR
	Piney Fork Creek, N of Zion (Sec. 19, R7W, T17N)	21 Jun. 2002	11	SAU	HWR
	Calico Creek	2006	1	INHS 10745	Unknown
	Bailey Creek	2006	1	INHS 10762	Unknown
	E Twin Creek	2006	1	INHS 10794	Unknown
Lawrence	Spring River, 0.5 km SSE Ravenden,	9 Sept. 1948	1	USNM 133236	A. B. Leonard/Williams
	Spring River, 0.8 km SE Ravenden	18 Sept. 2000	25	SAU	HWR
	Small creek, 7.1 km SE Imboden	9 Sept. 1948	8	USNM 133237	A. B. Leonard /Williams
	Trib. of Spring River, 5.5 km NNW Powhatan	9 Sept. 1948	9	USNM 133239	A. B. Leonard/Williams
	Cooper Creek at St. Hwy 115 bridge, Machine Creek	29 Mar. 1973	22	USNM 218549	HWR
	Strawberry River, 1.6 km N Poughkeepsie(Sec 26, T17N, R5W)	5 Jul. 1992	5	SAU	HWR
	Strawberry River at St. Hwy. 115	26 Sept. 1993	14	SAU	HWR
	Strawberry River , 3.2 km SW Lynn (Sec 34, T16N, R3W)	19 Oct. 1997	7	SAU	HWR
	Cooper Creek, 1.6 km W Smithville (Sec. 30, T17N, R3W)	6 Oct. 1997	2	SAU	HWR
	Wayland Springs Church Camp (36.169°N, 91.219°W)	2008	2	BYU	HWR, K. Crandall
Marion[1]	Panther Creek at Mull	7 Apr. 2012	7	SAU	M.B. Connior
Randolph	Fourche River	1979	1	INHS 43	Unknown
	Janes Creek	2001	1	INHS 8472	Unknown
		2006	1	INHS 10700	Unknown
	Janes Creek at St. Hwy 90 bridge	15 Jun. 1991	12	SAU	HWR
	Eleven Point River	2001	1	INHS 10503, 07, 10667	Unknown
		2001	1	INHS 8472	Unknown
	Eleven Point River at Dalton (Sec. 36, R2W, T21N).	15 Jun. 1991	8	SAU	HWR
		11 Aug. 2009	37	SAU	HWR
	Eleven Point River at US 62 (Sec. 33, R1W, T19N)	11 Aug. 2009	27	SAU	HWR
	Trib. to River Creek	2006	1	INHS 10737	Unknown
	Rickman Creek	2006	1	INHS 10800	Unknown
	Cedar Creek	2006	1	INHS 10811	Unknown
	Trib. to Dry Creek	2006	1	INHS 10816	Unknown
	Trib. to Thompson Creek	2006	1	INHS 10819	Unknown
	Hall Creek at Ravenden Springs (36.317°N, 91.225°W)	2008	8	BYU	HWR, K. Crandall
	Mill Creek (36.001°N, 91.257°W)	2008	2	BYU	HWR, K. Crandall
	Fourche Creek at St. Hwy 115 (Sec. 35, R1E, T20N)	12 Aug. 2009	2	SAU	HWR
Searcy[1]	Big Creek at St. Hwy 14, 5.0 km E junction St. Hwy 27	20 May 1979	6	USNM 149014	B. H. Bauer
Sharp	Martin Creek, 4.3 km NE Williford	9 Sept. 1948	7	USNM 133238	A. B. Leonard /Williams
	Spring River at Hardy	10 Sept. 1948	3	USNM 133240	A. B. Leonard/Williams
	Sugar Creek, 10.4 km NW Williford	10 Sept. 1948	7	USNM 133241	A. B. Leonard /Williams
	Hackney Creek, 7.4 km WSW Stuart	10 Sept. 1948	9	USNM 133242	A. B. Leonard/Williams
	Trib. to Williams Creek	1962	1	None	R. Reimer[2]
	Trib. to Strawberry River at Calamine on St. Hwy 115	1962	1	None	R. Reimer[2]
	Mill Creek, St. Hwy 115 at Calamine	20 Jul. 1984	1	USNM 219073	HWR
	Mill Creek	1993	1	INHS 4655	Unknown
	Mill Creek, St. Hwy 56, Evening Shade (Sec. 3, T16N, R6W)	18 Oct. 1997	9	SAU	HWR
	Strawberry River at St. Hwy 58, SE Poughkeepsie	20 Jul. 1984	1	USNM 146751	HWR
	Strawberry River, 3.2 km N Evening Shade (Sec. 27, T17N, R6W)	18 Oct. 1997	15	SAU	HWR
	N Big Creek, 1km SE Center (Sec. l0,T17N, R5W)	5 Jul. 1992	14	SAU	HWR
	S Big Creek, 2.4 km NE Calamine (Sec. 23, T16N, R4W)	16 Jun. 1993	7	SAU	HWR
	Piney Fork	1993	1	INHS 4627	Unknown
	Hars Creek, 1.1 km S St. Hwy1 (Sec. 30, T18N, R6W)	18 Oct. 1997	13	SAU	HWR
	Sullivan Creek	2006	1	INHS 10797	Unknown
	Rock Creek at Rock Creek Rd.	18 Nov. 2011	1	SAU	HWR, C. T. McAllister
Stone	Sylamore Creek, S branch	26 Sept. 1967	5	USNM 131641	Marsh and T. Barr
	N Sylamore Creek, Blanchard Caverns RA (Sec. 4, T15N, R11W)	13 Mar. 1999	26	SAU	HWR
	N Sylamore Creek at Gunner Pool (Sec. 25, T16N, R12W)	29 Jun. 1999	26	SAU	HWR, K. Tinkle
	N Sylamore Creek at Pogue Springs (Sec.4, T15N, R11W)	29 Jun. 1999	14	SAU	HWR, K. Tinkle
	N Sylamore at Trail Head (Sec. 11, T15N, R11W)	29 Jun. 1999	18	SAU	HWR, K. Tinkle
	Roasting Ear Creek, FSR 1106 (Sec. 2 & 33,T15-16N, R13W)	13 Mar. 1999	38	SAU	HWR
	Spring Creek at FSR 1111 (Sec. 2, T17N, R14W)	13 Mar. 1999	13	SAU	HWR
	West Dry Creek at FSR (Sec. 30, T16N, R12W)	13 Mar. 1999	3	SAU	HWR
	N Fork trib., Sylamore Creek at FSR (Sec. 28, T16N, R12W)	13 Mar. 1999	5	SAU	HWR
	Bee Branch at St. Hwy 14 (Sec. 2 & 11, T15N, R12W)	13 Mar. 1999	2	SAU	HWR
	White River at Mt. Olive (Sec. 32, T16N, R10W)	14 Mar. 1999	2	SAU	HWR

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White River across from Boswell (Sec. 8, T16N, R10W)	14 Mar. 1999	1	SAU	HWR
White River across from Calico Rock (Sec. 16, T17N, R11W)	14 Mar. 1999	4	SAU	HWR
White River at Sylamore Landing (Sec. 12, T15N, R11W)	4 Apr. 1999	1	SAU	HWR
Sugarloaf Creek at St. Hwy. 5 (Sec. 33, T17N, R11W)	14 Mar. 1999	17	SAU	HWR
Unnamed trib. at St. Hwy 5 (Sec. 28, T17N, R11W)	14 Mar. 1999	11	SAU	HWR
Jack's Creek at FSR 1105 (Sec. 19, T17N, R11W)	14 Mar. 1999	4	SAU	HWR
Jack's Creek at FSR (Sec. 30, T17N, R11W)	14 Mar. 1999	13	SAU	HWR
Trib to Spring Branch Creek at FSR (Sec. 34- 35, T17N, R12W)	4 Apr. 1999	4	SAU	HWR
Barkshed Branch at FSR 1125 (Sec. 7, T16N, R12W)	4 Apr. 1999	2	SAU	HWR
Bear Pen Creek at FSR 1101 (Sec. 12, T16N, R12W)	4 Apr. 1999	1	SAU	HWR
Livingston Creek at FSR (Sec. 21, T16N, R11W)	4 Apr. 1999	16	SAU	HWR
Livingston Creek above Partee Springs (Sec. 26, T16N, R11W)	29 Jun. 1999	13	SAU	HWR, K. Tinkle
E Livingston Creek at Landers (Sec. 31, T16N, R10W	29 Jun. 1999	3	SAU	HWR, K. Tinkle
Cataract Creek at Sugar Loaf Road (Sec. 13, T17N, R12W)	16 Aug.1999	6	SAU	HWR, K. Tinkle
Wolf Bayou	2006	1	INHS 10691	Unknown

[1]**New county record.**
[2]**Reimer (1963).**
Abbreviation: HWR = H. W. Robison.

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