

A Survey of the Unionids (Bivalvia: Unionidae) of Buck Creek, Pulaski County, Kentucky

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ABSTRACT

The unionid fauna of Buck Creek, a fifth-order tributary of the upper Cumberland River, was surveyed. Fifty-six collections from 24 sites along the mainstem were examined. The unionid community of Buck Creek consisted of 29 species, of which 10 belonged to the Cumberlandian faunal group. Two species, *Villosa trabalis* and *Pegias fabula*, are listed as endangered on the federal endangered species list. Seven other species have been assigned conservation status in Kentucky and warrant special concern. Buck Creek has the most diverse extant unionid fauna of any of the major tributaries of the upper Cumberland River that have recently been surveyed.

INTRODUCTION

Buck Creek, a fifth-order tributary of the upper Cumberland River, has exceptionally good water quality and aquatic faunal diversity (1), but very little has been published concerning this stream. Two major unionid surveys within the Cumberland River system have been published (2, 3), but neither study included Buck Creek. Ortmann (4, 5, 6) stated that the Cumberlandian unionid fauna was unique and deserved special consideration. However, since Ortmann's time a great many changes have taken place in the upper Cumberland River system. These changes included the construction of Wolf Creek Dam, which led to the establishment of Lake Cumberland, and extensive surface strip mining, which has led to the serious degradation of water quality throughout the upper Cumberland system. For these reasons, most of the unionid species in the mainstem have been extirpated (7). Many of the major tributaries have also been severely impacted due to these activities (8, 9). Of the major tributaries of the upper Cumberland be-

low Cumberland Falls, Buck Creek remains one of the least impacted (1).

A recent study of the fishes of Buck Creek (10) showed that this stream was an important refugium in the Cumberland River system. Buck Creek had never been systematically surveyed for unionids, but with the discovery of the federally endangered *Villosa trabalis*, interest in the stream intensified. In the late 1970s a new bridge at the State Route (SR) 461 crossing was proposed (11), and with the subsequent site surveys for this project, it became clear that virtually nothing was known about the unionids. All of these factors helped precipitate the current study.

STUDY AREA

Buck Creek is a fifth-order stream that lies primarily in Pulaski County, Kentucky with its headwaters arising in Lincoln County and additional tributaries originating in Rockcastle County. Draining 767 sq km and having a length of 107.2 km (10), the stream empties into the Cumberland River (Lake Cumberland) at river km 859. As part of the middle Cumberland River Subsystem (12), Buck Creek lies almost entirely within the Eastern Highland Rim (13). The surface geology is composed primarily of Mississippian Age limestone with limited exposures of shale bedrock in the

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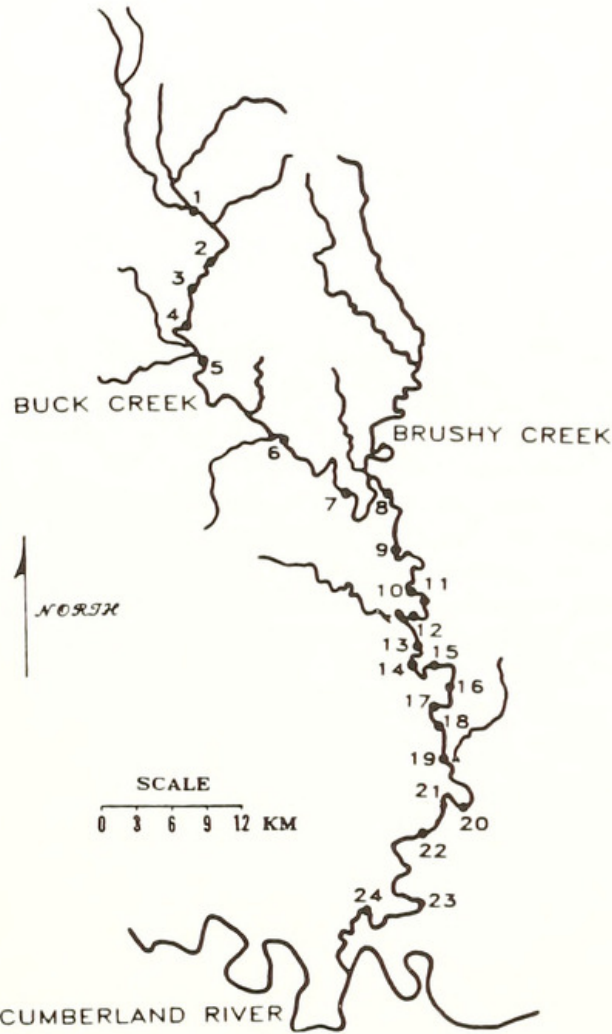


FIG. 1. Map of Buck Creek mainstem, Kentucky, showing collection sites.

northeastern portion of the basin. According to Harker et al. (1, 12), Buck Creek has high water quality and is well oxygenated and well buffered.

In the upper portions of Buck Creek the stream forms numerous braids that, during the dry summer months, may become isolated stagnant pools or dry up altogether. The substrate consists of coarse sand, gravel and small cobbles. Downstream, the substrate gradually changes to coarse limestone rubble and slab boulders with extended areas of cracked bedrock. Because of the coarser substrates, as well as deeper water, the lower portions of the stream are very hard to sample. The last 2 stations (Fig. 1) are inundated by Lake Cumberland for periods of the year and have a substrate of soft mud. Because of the very wide fluctuations of water levels throughout the year, this area is almost devoid of unionids.

The Buck Creek drainage area is primarily agricultural, and the margins of the stream are generally covered with forested areas. Coal stripmines and limestone quarries do occur in the watershed south of SR 80 but comprise less than 1% of the watershed area (10). In addition, some gravel removal has taken place below SR 39 bridge.

METHODS AND MATERIALS

The entire length of the mainstem of Buck Creek was hand sampled for unionids. This involved walking the shoreline and the stream, where possible, searching for both live specimens and empty shells. Plexiglass water scopes and mask and snorkel were used where conditions permitted. The occurrence and number of live specimens, replaced in the stream, were recorded. A comprehensive collection of valves from each locality was made; representative specimens of each species were retained and eventually catalogued into the mussel collections of Eastern Kentucky University (EKU) and Ohio State University Museum of Zoology (OSUM). Other collections are housed at Harvard University Museum of Comparative Zoology (MCZ), Kentucky Department of Fish and Wildlife Resources (KDFWR), the University of Michigan Museum of Zoology (UMMZ), and Tennessee Valley Authority (TVA). A section of Buck Creek between SR 80 and SR 192, which was inaccessible by car, was canoed and thoroughly sampled. In addition, all known collections by other workers were examined and are included in these records. The common names used in the species accounts are taken from Turgeon et al. (14).

The collecting sites are mapped in Figure 1. Given in Table 1 is the exact locality for each site as well as the records of all collections made at that site. The deposition of each collection is given in parentheses after each collection record. All 56 collections were made in the mainstem of Buck Creek flowing through Pulaski County.

RESULTS AND DISCUSSION

A total of 29 species of unionids were collected from Buck Creek (Table 2). Of these species, *Quadrula pustulosa*, *Villosa lienosa* and *Ligumia recta* are known only from weathered dry specimens. All of the remaining species are known from either live or fresh dead specimens. Certain unionids displayed a

TABLE 1. Collecting sites and records for Buck Creek, Kentucky.

Sites	Collection records
1	Confluence of Buck Cr. with Gilmore Cr., at Lincoln and Pulaski co. lines, 21 Sept. 1984, R. S. Butler and G. A. Schuster (EKU).
2	1.0 km downstream from SR 328 crossing, 27 July 1984, R. S. Butler, P. M. Mastrangelo, G. A. Schuster (EKU).
3	At the crossing of Goochtown Rd., 10 May 1985, R. S. Butler, G. A. Schuster (EKU).
4	At Fairview Rd. Ford, W of Clarence, 8 Oct. 1980, W. Davis (KDFWR); 27 July 1984, R. S. Butler, P. M. Mastrangelo, G. A. Schuster (EKU). 5 km downstream from the crossing of SR 70, 30 Oct. 1975, D. H. Stansbery (OSUMZ); 3 Nov. 1983, R. S. Butler, G. A. Schuster (EKU).
5	Downstream from the crossing of SR 70, 30 Oct. 1975, D. H. Stansbery (OSUMZ); 3 Nov. 1983, R. S. Butler, G. A. Schuster (EKU).
6	0.1 km upstream from the crossing of SR 39, July 1968, S. Blankenship (EKU); 31 Oct. 1975, D. H. Stansbery (OSUMZ); 3 Nov. 1983, R. S. Butler, G. A. Schuster (EKU); 13 Sept. 1984, R. S. Butler (EKU).
7	5.0 km upstream from the crossing of SR 461 on Price-Bennett Rd., 10 Oct. 1983, R. S. Butler, G. A. Schuster (EKU).
8	At the crossing of SR 461, 31 Oct. 1975, D. H. Stansbery (OSUMZ); 13 July 1978, J. R. MacGregor et al. (OSUMZ); 30 Aug. 1978, J. R. MacGregor et al. (OSUMZ); 13 May 1979, S. Ahlsted, R. Currie (TVA); 25 May 1981, G. J. Fallo (OSUMZ); 11 Sept. 1982, R. S. Butler, S. L. Steele (EKU); 25 Sept. 1983, R. S. Butler et al. (EKU).
9	At the crossing of SR 1677, 31 Oct. 1975, D. H. Stansbery (OSUMZ); 13 June 1978, S. M. Call et al. (OSUMZ); 9 Sept. 1978, L. Kornman (EKU); 18 Oct. 1978, S. M. Call et al. (OSUMZ); 9–10 June 1980, J. MacGregor et al. (OSUMZ); 12 July 1980, S. M. Call, R. J. DiStefano (OSUMZ); 18 Aug. 1982, R. S. Butler (EKU); 19 Oct. 1982, R. S. Butler, C. A. Roth (EKU); 10 Oct. 1983, R. S. Butler, G. A. Schuster (EKU).
10	2.0 km upstream from the crossing of SR 80 along Leo Gilliland Rd., 13 June 1978, S. M. Call et al. (OSUMZ); 12 July 1978, J. R. MacGregor, E. G. Amburgey (OSUMZ); 30 Sept. 1983, R. S. Butler, M. A. Luthman, G. A. Schuster (EKU).
11	At the crossing of old SR 80 at Stab, July 1968, S. Blankenship (EKU); 23 Sept. 1971, J. J. and C. S. Jenkinson (OSUMZ); 28 July 1973, D. L. Batch (EKU); 15 Aug. 1974, D. H. Stansbery, W. J. Clench, C. Boone (OSUMZ); 22 April 1978, L. T. McGeehan, M. Coburn (OSUMZ); 11 Oct. 1980, G. J. Fallo (OSUMZ); 17 Aug. 1982, R. S. Butler (EKU).
12	1.0 km SW of Stab, 3.5 km ESE Shopville, 13 Aug. 1984, R. S. Butler, G. A. Schuster (EKU).
13	4.5 km SE of Shopville, 1.0 km N of Bent, 13 Aug. 1984, R. S. Butler, G. A. Schuster (EKU).
14	At the confluence of Bridge Hollow, adjacent to SR 1003, 19 June 1982, G. J. Fallo (OSUMZ).

TABLE 1. Continued.

Sites	Collection records
15	1.5 km NNE of Bent, 3.0 km S of Stab, 13 Aug. 1984, R. S. Butler, G. A. Schuster (EKU).
16	1.9 km ENE of Bent, 4.4 km NW of Whetstone, 19 June 1982, G. J. Fallo (OSUMZ).
17	4.0 km NW of Whetstone, 1.8 km ENE of Bent, 13 Aug. 1984, R. S. Butler, G. A. Schuster (EKU).
18	At the crossing of SR 1003, 31 Oct. 1975, D. H. Stansbery (OSUMZ); 17 Aug. 1982, R. S. Butler (EKU); 20 Oct. 1983, R. S. Butler, G. A. Schuster (EKU); 14 Aug. 1984, R. S. Butler, G. A. Schuster (EKU).
19	0.4 km SSW of Ula, 3.2 km N of Dykes, 14 Aug. 1984, R. S. Butler, G. A. Schuster (EKU).
20	1.0 km E of crossing of SR 192, 2.0 km ESE of Dykes, 14 Aug. 1984, R. S. Butler, G. A. Schuster (EKU).
21	At the crossing of SR 192, 17 May 1959, H. D. Athearn (MCZ and UMMZ); 23 July 1972, D. L. Batch (EKU); 19 Aug. 1983, R. S. Butler (EKU).
22	2.4 km downstream of the crossing of SR 192, 3 May 1981, R. S. Butler, R. R. Cicerello (OSUMZ).
23	5.3 km NNE of Hail along SR 1097, 3 June 1968, G. Bastin (EKU).
24	1.0 km W of Hail, 4 June 1968, G. Bastin (EKU).

preference for stream size along the mainstem. For instance, 7 species (*Pegias fabula*, *Quadula pustulosa*, *Cyclonaias tuberculata*, *Ptychobranchius subtentum*, *Ligumia recta*, *Epioblasma triquetra*, and *E. capsaeformis*) were found only in the fifth-order portion of Buck Creek. However, only *Anodonta imbecillis* was wholly restricted to the fourth-order mainstem. Of the 29 species, 10 are members of the Cumberlandian fauna (Table 2), which, according to Ortmann (5), originated and are restricted to the Cumberland and Tennessee river systems. The remaining species are more widely distributed within the Mississippi River basin. Included in these 29 species are *Villosa trabalis* and *Pegias fabula*, which are on the federal endangered species list. These 2, as well as 7 other species, have various types of conservation status in Kentucky (Table 3). In other words, one-third of the species living in Buck Creek are in need of some sort of protection to insure their preservation in Kentucky. Buck Creek is acting as an important refugium for these species. Another way to measure the importance of Buck Creek is to compare its unionid fauna to faunas in adjacent, similar

TABLE 2. Species composition and longitudinal distribution of unionids from Buck Creek mainstem collecting sites.

Species	Localities																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
<i>Anodonta imbecillis</i>	L	X		X	X																			
<i>Strophitus undulatus</i>	X	X	X	F	X																			
<i>Alasmidonta viridis</i>	F	X	X				X		L					F										
<i>Pegias fabula</i> *										X														
<i>Lasmigona costata</i>	L	X	X	X			L	L	L	L	X	X	X	X	X	X	L	L	L	X	X	X		
<i>Tritogonia verrucosa</i>						X	L	L	X		X	X	X	X	X	X	L	L	L	F		X		
<i>Quadrula pustulosa</i>										X														
<i>Cyclonaias tuberculata</i>													X	X		X	X		L	X	X			
<i>Pleurobema oviforme</i> *	X	L			X		X	X	X			X					X	X		X	X			
<i>Elliptio dilatata</i>							X	L	L	L	X	X		F	X					X	X			
<i>Ptychobranchus fasciolaris</i>	X	L	L	L	F	L	L	L	L	L	F	L	F	X	X	F	L	L	L	X	X	F		
<i>P. subtentum</i> *							X	X	X	L	F	F	X	F	X	X	X	X	X	X	L			
<i>Actinonaias pectorosa</i> *					X		X	L	X	L	X	L	L	X	X	F	L	L	L			X		
<i>Obovaria subrotunda</i>	F	F	L	L	L		L	L	L	X	X	F	F	X	X	X	F	X	F	X	X			
<i>Leptodea fragilis</i>	L	X	F	X	L	L	L	L	F	X	X			X								X		
<i>Potamilus alatus</i>	L	L	L	L	L	X	L	L	L	L	X		L	X	X	X	L	L	L	X	X	X	F	F
<i>P. ohioensis</i>																								
<i>Toxolasma lividus</i> *	F	X	L	X	X		X	X	X					X										
<i>Medionidus conradicus</i> *		X	L		X	X	L	L	L	X	X	F	F	X	X	F				X	X			
<i>Ligumia recta</i>							X							X					X					
<i>Villosa trabalis</i> *	L	L	L	F	L	X	L	L	L	L	X	X	F	X	X	X	X	X	X	X	L	X	X	
<i>V. iris</i>	X						L	L	F	X	X	F	X	X	X	X	F	F	X	X	F	X	X	
<i>V. t. punctata</i> *	L	X	L	F	X	X	L	L	L	L	F	L	F	X	X	X	X	L	X	X	F	X	X	
<i>V. lienosa</i>																								
<i>Lampsilis ventricosa</i>	F	L	L	X	L	L	L	L	L	L	X	X	X	F	X	F	L	L	L	X	X	X		
<i>L. fasciola</i>	L	L	L	X	L		L	L	L	X	L	F	X	X	X	X	L	L	L	X	X	X		
<i>Epioblasma triquetra</i>							X	X	X	L	X		F	X	X	F	X	X	L	X	X	X	X	
<i>E. brevidens</i> *								L	L	X	X			X			X	X	F	X	X	X	X	
<i>E. capsaeformis</i> *					X			X	X	X	X	F	X	X		F	X	X	X	X	X	X	X	
Totals	10	16	14	12	15	7	15	21	21	15	19	15	15	22	14	18	15	17	16	18	16	13	2	1

* = Cumberlandian species, F = fresh dead specimens, L = live specimens, X = weathered dry or subfossil specimens.

TABLE 3. Comparative species composition of unionids from major tributaries of the upper Cumberland River below Cumberland Falls.

Species	Streams				
	Buck	Little S. Fork	Horse Lick	Rockcastle	Pitman
<i>Anodonta grandis</i>		X			
<i>A. imbecillis</i>	X	X			
<i>Strophitus undulatus</i>	X	X	X	X	
<i>Alasmidonta viridis</i>	X	X	X	X	
<i>A. marginata</i>		X	X		
<i>Pegias fabula</i> *	X	X	X		X
<i>Lasmigona costata</i>	X	X	X	X	X
<i>Tritogonia verrucosa</i>	X			X	
<i>Quadrula pustulosa</i>	X			X	
<i>Amblema plicata</i>			X	X	
<i>Cyclonaias tuberculata</i>	X	X		X	
<i>Pleurobema oviforme</i> *	X	X	X	X	
<i>P. sintoxia</i>			X	X	
<i>Elliptio dilatatus</i>	X	X	X	X	X
<i>E. crassidens</i>			X	X	
<i>Ptychobranhus fasciolaris</i>	X	X	X	X	X
<i>P. subtentum</i> *	X	X	X	X	
<i>Actinonais l. gibba</i>		X		X	
<i>A. l. carinata</i>			X		
<i>A. pectorosa</i>	X	X	X	X	
<i>Obovaria subrotunda</i>	X	X			
<i>Truncilla truncata</i>				X	
<i>Leptodea fragilis</i>	X	X		X	
<i>Potamilus alatus</i>	X	X		X	
<i>P. ohiensis</i>	X				
<i>Toxolasma lividus</i> *	X	X	X	X	X
<i>Medionidus conradicus</i>	X	X	X	X	X
<i>Ligumia recta</i>	X		X	X	
<i>Villosa trabalis</i> *†	X	X	X	X	
<i>V. iris</i>	X	X	X	X	X
<i>V. taeniata punctata</i>	X	X	X	X	X
<i>V. lienosa</i> *	X				
<i>Lampsilis ventricosa</i>	X		X	X	X
<i>L. ovata</i>		X			
<i>L. fasciola</i>	X	X	X	X	X
<i>Epioblasma triquetra</i> *	X				
<i>E. brevidens</i> *	X				
<i>E. capsaeformis</i> *	X				
Totals	29	24	22	26	10

* = Species assigned conservation status in Kentucky.

† = Species assigned protection status by Federal government.

sized streams within the Cumberland River basin. In recent years intensive surveys have been conducted on the Little South Fork of the Cumberland River (8), Horselick Creek (15) and the Rockcastle River (9). In addition, some work has been done on Pitman Creek (Butler and Schuster, unpubl. data). A comparison of faunas among these streams (Table 3) indicates that Buck Creek has the largest number of species. Buck Creek has 4 species which have not recently been found in the other streams: *Potamilus ohiensis*, *Epioblasma triquetra*, *E. brevidens* and *E. capsaeformis*.

The status of the entire genus *Epioblasma* should be of crucial concern (16, 17). Within Kentucky, the only species that is widespread is *E. triquetra*.

With the virtual eradication of unionids in the main channel of the upper Cumberland River due to the closing of Wolf Creek Dam in 1952 (7), survival of unionids depended on the quality of its tributaries. Buck Creek is one of the few major tributaries that has suffered minimal degradation. The major perturbation in the other tributaries has been surface mining. Relatively undisturbed critical habitat for

such species as *Villosa trabalis* and other uncommon Cumberlandian species remains in Horselick Creek (15) and Buck Creek. *Epioblasma brevidens* and *E. capsaeformis* in Kentucky appear to be restricted to Buck Creek and the upper portions of the Big South Fork of the Cumberland River (the lower portions are severely impacted by mining and impoundment). Initial studies of the Big South Fork of the Cumberland River have indicated that portions of the stream have a relatively rich unionid fauna.

Buck Creek, however, is not without its immediate problems. In the vicinity of SR 39 (site 6), active gravel removal from the stream bed has been observed. A previous study (18) documented decreased macroinvertebrate diversity due to gravel mining activities at this site. At least in part for this reason, only 7 species were collected there (Table 2). The lower portion of the stream is greatly affected by Lake Cumberland making it the least diverse site in the free-flowing mainstem (Table 2). This stretch has no doubt seen a tremendous change since the time of impoundment. Only 2 species were collected in this section of the stream (Table 2). In addition, the effect of agricultural practices may have been profound. It is not uncommon for clearcutting and plowing to be carried out to the edge of the stream thereby increasing siltation within the stream. The use of herbicides and pesticides within the drainage may also be harmful to unionids. Such agricultural pollutants may have already contributed to the demise of several species, particularly in the lower half of the mainstem. Some species (e.g., *Elliptio dilatata*, *Obovaria subrotunda*, *Medionidus conradicus*, *Villosa trabalis*, *V. taeniata punctata*, and *Lampsilis fasciola*) were commonly found alive upstream from site 10, but were rarely if ever found alive in the lower mainstem. Twenty-one species were observed alive upstream of site 10, while only 10 were found alive downstream from site 11.

Harker et al. (1) indicated that the Soil Conservation Service suggested that a series of low-level dams be constructed the length of Buck Creek. It is hoped that this never comes to fruition, since it has been established that, although such dams are advantageous for some species, the majority of unionids do not tolerate such impoundments.

For the present, Buck Creek has high water quality (1), and this is borne out by the diverse resident unionid fauna. In order to protect this fauna it is suggested that the highest possible water quality be maintained. Buck Creek should be periodically monitored to insure this. Otherwise, the continued existence of an important state and national biological resource is at stake.

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