

CAVE FAUNA OF THE BUFFALO NATIONAL RIVER

G. O. GRAENING

The Nature Conservancy, 601 North University Avenue, Little Rock, AR 72205, USA, graening@razorbackroad.com

MICHAEL E. SLAY

The Nature Conservancy, 601 North University Avenue, Little Rock, AR 72205, USA, mslay@tnc.org

CHUCK BITTING

Buffalo National River, 402 North Walnut, Suite 136, Harrison, AR 72601, USA, chuck_bitting@nps.gov

The Buffalo National River (within Baxter, Marion, Newton, and Searcy counties, Arkansas) is completely underlain by karstic topography, and contains approximately 10% of the known caves in Arkansas. Biological inventory and assessment of 67 of the park's subterranean habitats was performed from 1999 to 2006. These data were combined and analyzed with previous studies, creating a database of 2,068 total species occurrences, 301 animal taxa, and 143 total sites. Twenty species obligate to caves or ground water were found, including four new to science. The species composition was dominated by arthropods. Statistical analyses revealed that site species richness was directly proportional to cave passage length and correlated to habitat factors such as type of water resource and organics present, but not other factors, such as degree of public use or presence/absence of vandalism. Sites were ranked for overall biological significance using the metrics of passage length, total and obligate species richness. Fitton Cave ranked highest and is the most biologically rich cave in this National Park and second-most in all of Arkansas with 58 total and 11 obligate species. Recommendations include continuation of physical and biological inventories, increased protection of high-ranking sites, and increased public education/outreach.

INTRODUCTION

The Buffalo National River (BNR), located in northwest Arkansas within Marion, Newton, and Searcy counties, is a 387-km² (95,730-acre) park with extensive recreational and natural resources (Fig. 1). The BNR hosts a rich diversity of biota, including the animals endemic to this watershed, including the milliped *Auturus florus* (Causey 1950, Robison and Allen 1995) and the dipluran *Occasjapyx carltoni* (Allen, 1988). Two-thirds of the total BNR watershed (3,471 km² [857,607 acres]) consists of karst terrain (Scott and Hofer, 1995) (Fig. 2). There are approximately 350 caves on the BNR (defined as a naturally occurring void in the rock with a length and/or depth of at least 15 m (50 ft), with the length of passage greater than twice the width of the entrance whether or not the entrance is natural). With approximately 3,900 caves on USDI National Park Service (NPS) lands, the BNR contains 9% of all known caves on NPS lands (Steele, 2002). Yet, this National River lacked a comprehensive inventory of its cave resources, which hinders the protection of these resources from encroaching development, looting, and habitat degradation. The physical and biological inventory of the karst resources began in the 1970s with contracts to the Cave Research Foundation. This study expanded the biological component, and sought to describe the abundance and diversity of animal life in subterranean habitats of the BNR. Furthermore, this study explored the relationship of biodiversity metrics to habitat variables to discern any patterns in subterranean diversity within the BNR.

METHODS

Biological inventories of macrofauna were performed from November 1999 to December 2005. During this five-year study, at least 139 inventory events were performed and at least 67 caves and other karst features were inventoried (Fig. 3). Sites were georeferenced in Universal Transverse Mercator coordinates using the North America Datum 1983 with a global positioning system handheld unit (Garmin III Plus GPS), and the estimated position error was recorded (range of 1 – 20 m). At each site, the specific habitat variables were determined (Table 1).

Macrofauna were counted visually with helmet-mounted lights, using snorkeling gear and dive lights for deep pools. Bio-inventories were discontinued any time endangered bats of any species were encountered. Collections were limited to those fauna that were impossible to identify in the field and performed under the following permits: NPS Collecting permit PSN-101, Federal Fish and Wildlife Permits PRT-834518, TE834518-1, TE834518-2, and TE834518-1; and Arkansas Game and Fish Commission Educational Collecting Permit 1082 and 1476. Voucher specimens were collected primarily by hand, aspirator, and dipnet (and occasionally by bait trap), and preserved in 75–90 % ethanol, and brought back to the University of Arkansas at Fayetteville (UAF) for identification and cataloging. Specimens were identified at UAF by Graening and Slay, by J. Barnes (UAF Dept. of Entomology), or sent to taxonomic specialists, including the following: K. Christiansen (Grinnell College) and J. Battigelli (Earthworks Research Group) for collembolans; H. Hobbs III (Wittenburg University) for decapods; J. Holsinger (Old Dominion University) for amphipods; J. Lewis (Lewis and




Figure 1. Location of Buffalo National River (black polygon) in Arkansas with county boundaries shown in gray.

Associates, LLC.) for isopods; W. Shear for diplopods; J. Battigelli for Acari; W. Muchmore (University of Rochester) for pseudoscorpions; H. Robison (Southern Arkansas University) for fishes; S. Peck (Carleton University) for coleopterans; J. Cokendolpher (Museum of Texas Tech University) and D. Ubick (California Academy of Sciences) for opilionids; L. Ferguson (Longwood College) and M. Muegge (Texas Cooperative Extension) for diplurans; A. Hampton (Castleton College) for planarians; T. Cohn (University of Michigan) for orthopterans; and G. Walsh for gastropods.

The species' occurrence data and habitat characteristics were entered into a relational database (Access 2003, Microsoft, Inc.) and combined with historical data from 1935 to 1999, primarily the Cave Research Foundation project inventory of 98 sites in BNR (Lindsley and Welbourn, 1977; Welbourn and Lindsley 1979). Data were also used from the following previous studies: Black and Dellinger 1938; Baker 1949; Dearolf 1953; Brandon and Black 1970; Youngsteadt and Youngsteadt 1978; Schram 1980; Schram 1982; Brown and Willis 1984; Chaney 1984;



 Buffalo National River

Geologic Unit













-  Atoka Formation
-  Boyd Shale and Prairie Grove Member of Hale Formation
-  Boone Formation
-  Cane Hill Member of Hale Formation
-  Cason Shale, Fernvale Limestone, Kimmswick Limestone, Platin Limestone, Joachim Dolomite
-  Chattanooga Shale, Clifty Limestone, Penters Chert
-  Cotter and Jefferson City Dolomites
-  Lafferty, St. Clair, Brassfield Limestones
-  Pitkin Limestone, Fayetteville Shale (incl Wedington Sand), Batesville Sand (incl Hindsville Limest)
-  Powell Dolomite
-  Ruddell Shale
-  St. Peter Sandstone and Everton Formation

Figure 2. Surficial geology of Buffalo National River (park boundary in black), adapted from a digital map created by the Arkansas Geologic Commission.

Willis and Brown 1985; Graening and Brown 2000; Graening *et al.* 2001; Peck and Thayer 2003; Shear 2003; Barnes 2004; and Graening *et al.* 2005. Unpublished data sources were also used: cave files of the Association for Arkansas Cave Studies (D. Taylor, data manager); Arkansas Natural Heritage Database (Arkansas Natural Heritage Commission, C. Osborne, data manager); cave files of the Buffalo National River (NPS, C. Bitting, data manager); field notes of A. Brown, L. Willis, and S. Todd (all three with the University of Arkansas at Fayetteville); taxonomic database of collembola of K. Christiansen (Grinnell College); annual status reports from 1981 to 2005 of endangered bat surveys of M. Harvey (Tennessee Technological University) and R. Redman (Arkansas Soil and Water Commission); cave database of J. Roth (Oregon Caves National Monument); and unpublished data from the M.S. thesis of Slay (University of Arkansas at Fayetteville).

Statistical analyses (using JMP 5 software, SAS Institute, Inc.) and geographical information system analyses (using ArcView 3.2 software, ESRI, Inc.) were performed to discern any relationships between the richness of cave fauna and habitat factors such as geologic setting and watershed, level of disturbance, *etc.* Statistics used included linear and logistic regression, *t*-test, and the chi-square test. One-way analysis of variance (ANOVA, or *F*-test) was used to determine if there was a statistical difference between the group mean values. To determine differences

between groups, a post-hoc comparison was performed using the Tukey-Kramer Honestly Significant Difference Test.

RESULTS

BIOINVENTORY DATA

The bioinventory data generated during this data was pooled with historical data to produce a data set as follows: 143 sites (31 only partially inventoried); 443 inventory events - 139 in this study, 131 by the Cave Research Foundation, 169 by M. Harvey, and 4 by N. and J. Youngsteadt; 2,068 occurrence records; and 301 taxa. The Appendix summarizes the faunal list. Of 143 cave habitats with at least partial inventory data, the mean species per habitat (alpha diversity) was 11, with a maximum of 58 (Fitton-Fitton Spring Cave complex), a median of five, and a mode of one. The Fitton-Fitton Spring Cave complex was the richest with 58 taxa, and second was Square Cave with 51 taxa. Regional species richness (gamma diversity) was difficult to estimate, but at least 20 species obligate to ground water (stygobites) or caves (troglobites) and at least 280 other, non-cave adapted taxa occurred on the BNR (Appendix). The Fitton Cave-Fitton Spring Cave complex had the most obligates per cave with a count of 11; other notable sites were Coon Cave with eight, Van Dyke Cave with seven, and John Eddings Cave with six. There were numerous anecdotal reports by recreational cavers of cavefish (Amblyopsidae) and cave crayfish (Cambaridae), but these reports could not be confirmed. The pooled faunal occurrences ($n = 2,068$) were examined for most abundantly occurring species, irrespective of habitat. Overall, arthropods dominated the cave habitats, especially crickets, mosquitoes, spiders, and springtails. The most common invertebrate taxon was cave crickets of the genus *Ceuthophilus* with 112 site occurrences, and second was cave orb weaver (*Meta americana*) with 27 occurrences. The most common vertebrates were eastern pipistrelle bat (*Pipistrellus subflavus*) with 60 occurrences and cave salamander (*Eurycea lucifuga*) with 53 occurrences. In aquatic habitats, crustaceans dominated (including 32 occurrences of the isopods of the genus *Caecidotea*).

HABITAT CORRELATES

Surficial geology was determined for 91 solution caves, 16 mines, 13 bluff shelters, 10 pits, 9 sinkholes and 3 springs by site reconnaissance and by applying GIS analyses on the Arkansas Geologic Commission's digital version of the 1976 Geologic

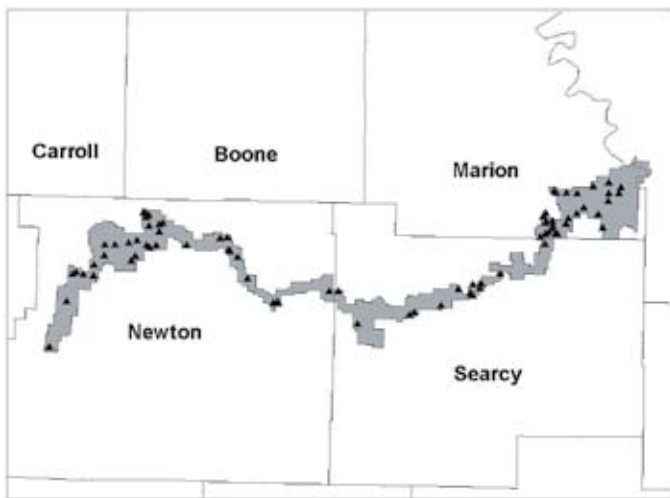


Figure 3. Location of sites (black triangles) in the BNR (gray polygon) bioinventoried in this study.

Table 1. Habitat variables determined for the BNR biological macrofauna inventory.

General Feature	Habitat Variables
Type of Site	Bluff Shelter, Cave, Sinkhole, Well, Quarry, Spring, Mine, Crevice/Talus
Degree of Public Use ^a	None, Light, Moderate, Heavy
Vandalism ^b	Yes / No
Presence of Organics ^c	Yes / No
Presence of Bat Guano	Yes / No
Subterranean Water Resource	Perennial Stream, Intermittent Stream, Drip Pools Only, Dry, Unknown
Gated Site Entrance	Yes / No
Surficial Geologic Unit	...

^a Primarily recreational caving.

^b Defined as evidence of looting, presence of litter, campfire smoke residue, graffiti, animal injury, or damage of geologic resources.

^c Defined as guano or other feces, leaf litter, woody debris, *etc.*

Map of Arkansas, scale 1:500,000 (Fig. 2). Sixty-two caves were formed in Mississippian-aged limestone of the Boone formation (including St. Joe member), four in Mississippian-aged limestone of the Pitkin Formation, eight in Ordovician-aged limestones / dolomites of the Fernvale, Platin, and Joachim formations, 64 in Ordovician-aged limestone (Everton formation), and three in Silurian-aged limestone of the St. Clair Formation. Of the 143 inventoried sites, mean total passage length was 226 m (742 ft); the longest cave in the data set was the Fitton Cave – Fitton Spring Cave complex at over 13,411 m (43,999 ft) of combined, mapped passages, and the shortest were springs and shelters at 3 m (10 ft) (Table 2). Site passage length did not significantly differ by geologic category, according to a one-way ANOVA ($n = 133$, F ratio = 0.441, $p = 0.780$). Furthermore, a one-way ANOVA of surface geology categories with species richness as the response variable revealed no significant differences in species richness between geologic categories ($n = 142$, F ratio = 1.470, $p = 0.215$). However, linear regression revealed that species richness of a site was directly proportional to its passage length (m) (richness = $0.004 \times \text{length} + 9.783$, $n = 133$, $R^2 = 0.164$, $t = 9.77$, $p < 0.001$). According to this linear model, approximately one more taxon is added to the site's richness for every additional 250 m of cave passage (Fig. 4).

Other habitat characteristics were compared to site richness. Most caves did not have appreciable organics (100 of 143) and most did not have bat guano (112 of 143), but species richness was significantly greater when organics were present ($n = 143$, $F = 31.171$, $p < 0.001$) and when bat guano was present ($n = 143$, $F = 22.731$, $p < 0.001$). Species richness was significantly different between habitat types ($n = 143$, $F = 2.847$, $p = 0.018$); Tukey-Kramer HSD determined that caves were significantly more rich than bluff shelters, but comparison of other habitat types were not significantly different. The water resource type was relatively evenly distributed between categories, and species richness differed significantly between water resource types ($n = 138$, $F = 4.395$, $p = 0.006$). Tukey-Kramer HSD determined that sites with perennial streams were significantly richer than dry sites, but comparison of other water resource types were not significantly different. Degree of public use for most sites was light (Table 1) (85 of 143), and site richness was significantly different between degree of use categories ($n = 138$, $F = 5.061$, $p = 0.001$), with sites with moderate use significantly more rich than sites with light use. Given the correlation between richness and passage length, this result was not totally unexpected as disturbed sites (defined as the combined categories of heavy use and moderate use [Table 1]) were significantly

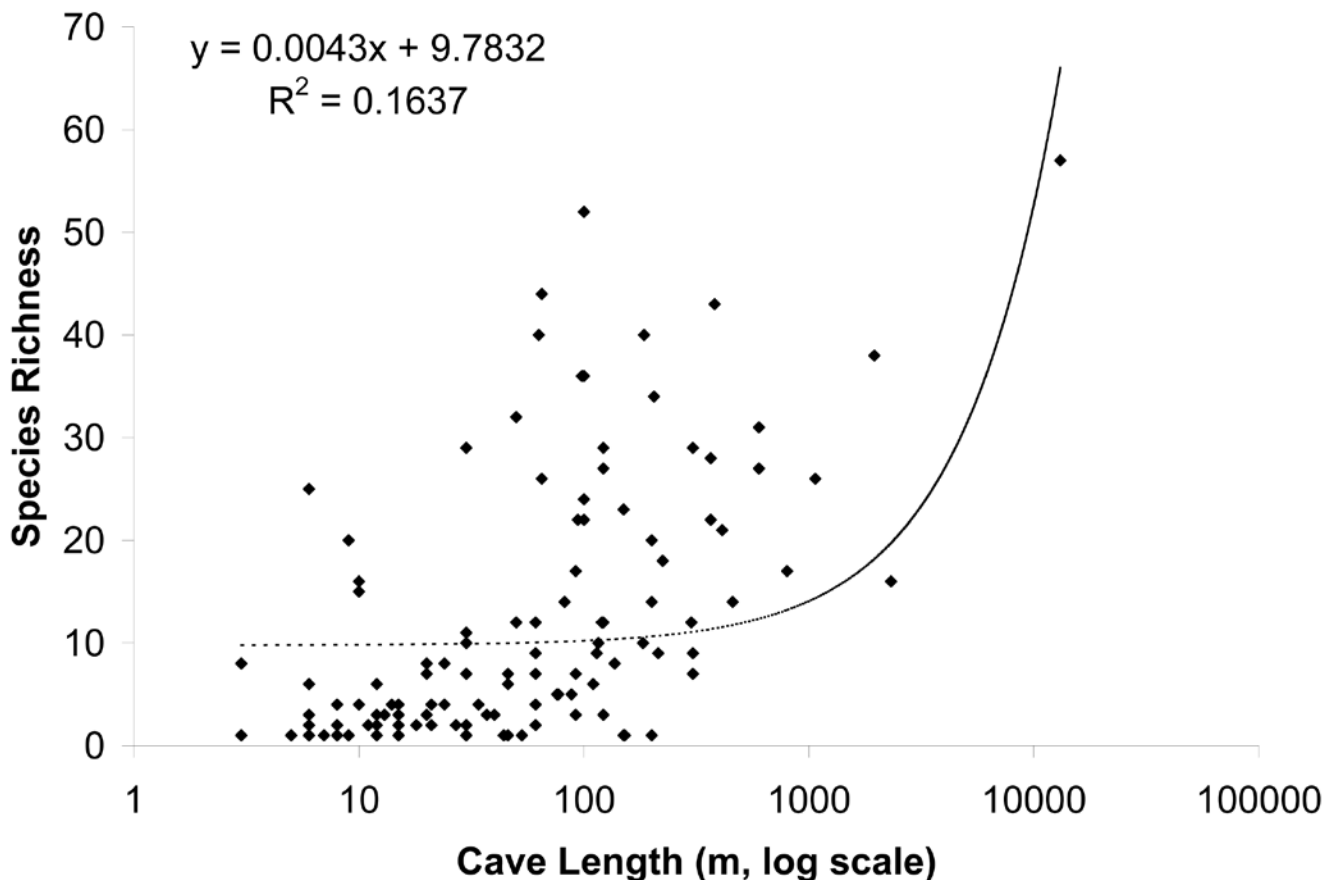


Figure 4. Significant linear relationship between total passage length of a site (shown on log scale) and the species richness of the site.

Table 2. Ranking of the top 20 most biologically significant caves on the BNR, with and without Fitton Cave and Fitton Spring Cave combined.

Site Name	No. of Obligates	No. of Species	Length	Score	Rank
Fitton Cave / Fitton Spring Cave	11	58	13,411	284	1st
Fitton Cave	8	48	13,106	242	1st
John Eddings Cave	6	35	1,952	139	2nd
Coon Cave	8	37	185	131	3rd
Van Dyke Spring Cave	7	37	63	115	4th
Fitton Spring Cave	7	26	305	113	5th
Tom Barnes Cave	4	38	381	98	6th
Earl's Cave	5	35	98	95	7th
In-D-Pendants Cave	4	30	600	94	8th
Tom Watson's Bear Cave	3	15	2,316	93	9th
Forest Trail Ridge Cave	4	42	65	90	10th
Corkscrew Cave	5	19	412	89	11th
Cave Mountain Cave	3	26	1,067	89	12th
Summer Cave	4	29	365	88	13th
Copperhead Cave	4	17	800	85	14th
Stockman Cave	5	20	200	84	15th
Square Cave	2	52	100	82	16th
Pretty Clean Cave	3	27	600	81	17th
Willis Cave	4	22	366	81	18th
Back o' Beyond Cave	4	27	122	78	19th
Len House Cave	3	28	366	77	20th

Sites were scored according to the following formula: (number of obligate species $\times 10$) + (number of total species) + (square root of length in meters).

longer than undisturbed sites (combined categories of light use and no use [Table 1]) ($n = 134$, $t = 2.709$, $p = 0.008$). Species richness was significantly greater when the site was gated ($n = 143$, $F = 151.106$, $p < 0.001$), but this may be another nested effect because all long caves on the BNR are gated, and we demonstrated earlier that longer caves have greater richness. Logistic regression revealed that gated caves were significantly longer than ungated caves ($n = 133$, $X^2 = 12.015$, $p < 0.001$). Most sites were not vandalized (111 of 143); however, those that were vandalized had greater richness ($n = 143$, $F = 11.357$, $p < 0.001$). Again, due to the correlation between richness and length, this result was not totally unexpected. Vandalized caves were significantly longer than caves not vandalized ($n = 136$, $t = -2.700$, $p = 0.008$). Contingency analysis of vandalism by degree of public use revealed a significant relationship ($n = 143$, Pearson $X^2 = 49.570$, $p < 0.001$). Most sites had light or no use with no vandalism, but those sites rated moderate and heavy use were more likely to be vandalized.

DISCUSSION

The BNR is one of the most biologically important karst areas of the Ozark Plateaus ecoregion. Several species with federal status under the Endangered Species Act rely upon subterranean habitats of the BNR: the endangered gray bat (*Myotis grisescens*) and Indiana bat (*M. sodalis*) utilize caves for hiber-

nation and reproduction and the endangered Ozark big-eared bat (*Corynorhinus townsendii ingens*) has occasionally been reported in crevice and solution caves. At least 20 subterranean-obligate species exist on the BNR, including three new species of troglobitic diplurans and one troglobitic springtail that await taxonomic description. However, this bioinventory effort is not complete, and much taxonomic work remains to be done. Continuation of biologic and geologic inventories is highly recommended in order to accurately assess and manage these karst resources.

The 143 sites analyzed in this study were ranked in order of biological importance to facilitate and focus management decisions. The richness of obligate species is often used to rank the importance of the world's caves (e.g. Culver and Sket, 2000; Graening *et al.* 2004), and so this criterion was used. Total cave passage length is one metric of habitat size, and passage length was significantly correlated to richness in this study and in other Arkansas caves (Graening *et al.*, 2004). For this reason, length was used as another criterion for biological significance ranking. The third criterion was total species richness, which is a common measure of biological significance (*i.e.*, alpha diversity). The caves that had been bioinventoried thoroughly (117 out of 143) were ranked according to these three criteria if they had a minimum of at least two obligate species, at least 60 m of cave passage, and at least 15 total taxa (Table 3). The Fitton Cave / Fitton Spring Cave complex ranked highest with 58 species, 11 of which were stygobites or troglobites. This cave complex is the second-most biologically rich cave in Arkansas - Blanchard Springs Caverns is first with 96 documented taxa (Graening *et al.*, 2004).

The Buffalo River watershed is subject to several ecosystem stressors, primarily land conversion and water quality degradation. Conversion of forest to pasture is occurring at an average annual rate of approximately 15 km² per year (3,707 acres per year) (Scott and Hofer, 1995). Since the establishment of BNR in 1972, more watershed has been deforested than is protected within the boundaries of the National River. Scott and Hofer (1995) report that water quality and land use monitoring in the Buffalo River watershed demonstrates a correlation between deforestation and confined animal feeding operations activities and increased turbidity, nutrient and fecal bacterial concentrations in tributary streams. The Arkansas Department of Pollution Control and Ecology designated 11 kilometers of the Buffalo River as impaired by nonpoint source pollution. In response to concerns over degrading water quality, USDA Natural Resources Conservation Service initiated a Watershed Protection Water Quality Enhancement Project and the NPS has developed a Water Resources Management Plan for the Buffalo River watershed. The BNR is afforded some protection through federal Wild and Scenic River designations and State of Arkansas Extraordinary National Resource Waters and Natural and Scenic Waterway designations.

Another potential stressor is recreational use of the subterranean resource occurs from the nearly one million people who visit the BNR each year who take part in hiking, canoeing, caving, and other recreational activities. BNR's longest cave is also

its most popular, with approximately 100 permit trips issued per year. Our study demonstrated that the longest caves are also the most biologically rich, and this constitutes a significant management challenge because the longest caves are also the most attractive for recreational caving. A high degree of recreational use and vandalism was observed in the longest caves, making the potential impact of trespass, archaeological looting, and vandalism in caves of the BNR of special concern. For example, in 2005, a vandal shot approximately 200 hibernating endangered bats (*Myotis grisescens*) in Cave Mountain Cave, ranked 12th in biological significance (27 May 2005 edition of NPS' The Morning Report).

The Arkansas Cave Resources Protection Act of 1989 affords limited protection to caves, and subterranean fauna are protected by Arkansas Game and Fish Commission Regulation No.1817 - Wildlife Pet Restrictions and the federal Endangered Species Act of 1973. The Federal Cave Resources Protection Act protects caves designated as significant on federal lands by allowing federal land managers to keep cave locations and names confidential and assign a penalty of up to \$10,000 for abuses. All caves on NPS lands have been designated significant. Access to certain caves is restricted through a permitting system, while access to other caves is unrestricted. Permits to enter the restricted caves may be acquired from BNR headquarters. Approximately 100 recreational caving permits per year and five scientific study permits per year are issued. Over 1,000 recreational caving trips per year are undertaken in caves that do not require a permit (C. Bitting, NPS, unpublished data).

The NPS has invested approximately \$0.6 million in protection of karst resources on the BNR, including the following

expenditures: endangered bat species monitoring and research at approximately \$20,000 per year for at least four years; 27 cave gates at approximately \$9,000 each; and monitoring, research, and educational products at approximately \$13,000 per year for the last 20 years. The NPS has also developed a park-wide cave resources management plan and a plan specifically for Fitton Cave. We recommend increasing protection of sites that ranked high in this analysis, and the improvement of public outreach regarding wise use of subterranean resources.

ACKNOWLEDGMENTS

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Table 3. Cave-obligate Animals of BNR. At least 20 species are known to be limited to, or adapted to, groundwater habitats (stygobites) or caves (trogllobites) on the BNR.

Taxon	Common Name	Global Rank	State Rank	No. of Sites
<u>Vertebrates</u>				
<i>Eurycea spelaea</i>	grotto salamander	G4	S4	25
<u>Arachnids</u>				
<i>Apoththonius</i> sp.	cave false scorpion	GU	SU	7
<i>Crosbyella distincta</i>	cave harvestman	G1G2	SNR	1
<i>Hesperochernes occidentalis</i>	cave false scorpion	G4G5	SNR	10
<i>Porrhomma cavernicola</i>	Appalachian cave spider	G4G5	SNR	3
<u>Crustaceans</u>				
<i>Brackenridgia</i> sp.	cave pill bug	GU	SU	1
<i>Caecidotea ancyla</i>	cave isopod	G3G4	S1?	2
<i>Caecidotea antricola</i>	cave isopod	G5	SNR	4
<i>Caecidotea dimorpha</i>	cave isopod	G1G3	S1?	2
<i>Caecidotea macropropoda</i>	Bat Cave isopod	G2G3	SNR	1
<i>Caecidotea stiladactyla</i>	cave isopod	G3G4	S1?	6
<i>Stygobromus alabamensis</i>	Alabama cave amphipod	G4G5	SNR	8
<i>Stygobromus ozarkensis</i>	Ozark cave amphipod	G3G4	S1	5
<u>Other Invertebrates</u>				
<i>Causeyella dendropus</i>	cave millipede	GNR	SNR	1
Japygidae	undescribed cave dipluran	GU	SU	3
<i>Litocampa</i> sp. nov. # 1	undescribed cave dipluran	GU	SU	2
<i>Litocampa</i> sp. nov. # 2	undescribed cave dipluran	GU	SU	3
<i>Pseudosinella</i> sp. nov.	undescribed cave springtail	GU	SU	1
<i>Spelobia tenebrarum</i>	cave dung fly	GNR	SNR	3
Tricladida	cave flatworm	GU	SU	3

Note: Also shown are the global and state (or subnational) heritage status ranks assigned by The Nature Conservancy and NatureServe: 1- critically imperiled; 2 – imperiled; 3 – vulnerable; 4 – apparently secure; 5 – demonstrably secure; GU – unranked; and NR – not rankable (NatureServe, 2006).

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APPENDIX 1. TAXONOMIC LIST OF ALL KNOWN FAUNA FROM SUBTERRANEAN HABITATS WITHIN THE BNR.

Site names were assigned the following code numbers, alphabetically: 1 = Attic Cave; 2 = Baby Toad Cave; 3 = Back o' Beyond Cave; 4 = Bat Cave; 5 = Bear Pit; 6 = Bear Wallow Tube Cave; 7 = Beaver Den Shelter; 8 = Beechwood Mine; 9 = Bennett Mines; 10 = Big Bluff; 11 = Blowing Bear Cave; 12 = Blue Bluff Cave; 13 = Boat Creek Mine; 14 = Bolin Cave; 15 = Bonanza Mine; 16 = Broken Ladder Pit; 17 = Broken Stalactite Cave; 18 = Cave Mountain Cave; 19 = Chert Cave; 20 = Chuck's Forest Trail Cave; 21 = Cob Cave; 22 = Cold Spring; 23 = Coon Cave; 24 = Copperhead Cave; 25 = Corkscrew Cave; 26 = Crane Cave; 27 = Debbie's Delight; 28 = Den Cave; 29 = Dirt Cave; 30 = Dixie Girl Mine; 31 = Dogman Cave; 32 = Dome Room Shelter; 33 = Eagle Aerie Cave; 34 = Earl's Cave; 35 = Eden Falls Cave; 36 = Elephant Cave; 37 = Fallout Cave; 38 = Fire Place Cave; 39 = Fitton Cave; 40 = Fitton Spring Cave; 41 = Flat Cave; 42 = Flea Cave; 43 = Flowstone Façade Cave; 44 = Fool's Crawl; 45 = Forest Trail Pit; 46 = Forest Trail Ridge Cave; 47 = Fox Den Mine; 48 = Friday the 13th Cave; 49 = Gaddy Cave; 50 = Greasy Fissure Cave; 51 = Greenbriar Cave; 52 = High Water Shelter; 53 = Huchingson's Waterfall Cave; 54 = Icebox Cave; 55 = Indian Creek Cave; 56 = Indian Rockhouse Cave; 57 = Indian Rockhouse Sink Cave; 58 = In-D-Pendants Cave; 59 = John Eddings Cave; 60 = Keeton Sinkhole; 61 = Keyhole Cave; 62 = Kneebacker Cave; 63 = Ladder Cave # 2; 64 = Leatherwood Sink Cave; 65 = Len House Cave; 66 = Little Den Cave; 67 = Long Ear Mine; 68 = Magic Bean Cave; 69 = Mickey Mouse Pit; 70 = Middle Creek Spring Cave; 71 = Mike's Maze; 72 = Milk Cow Cave; 73 = Morning Star Mine # 05; 74 = Morning Star Mine # 06; 75 = Morning Star Mine # 07; 76 = Morning Star Mine # 15; 77 = Mr. Clean Cave; 78 = Natural Bridge Cave; 79 = Novack Spring Cave; 80 = Novak's Shed Cave; 81 = One Note Pit; 82 = Oven Bird Cave; 83 = Overlook(ed) Cave; 84 = Pa Pa Shelter Cave; 85 = Pack Rat Shelter; 86 = Pam's Blower Cave; 87 = Panther Cave; 88 = Paul's Paradise; 89 = Perry Cave; 90 = Peter Cave; 91 = Plum Field Pit; 92 = Prelunch Pit Stop; 93 = Pretty Clean Cave; 94 = Pretty Junkyard Spring Cave; 95 = Rat's Nest Cave; 96 = Rattlesnake Cave; 97 = Red Roof Shelter; 98 = Reddell Bluff Grotto; 99 = Roadcut Solution Hole; 100 = Rush Landing Spring Cave; 101 = Rush Spring; 102 = Saltpeter Cave; 103 = Sandstone Cave; 104 = Seashell Dome Cave; 105 = Shack Cave; 106 = Silver Hill Cave; 107 = Silver Hill Pit; 108 = Sinkhole Icebox; 109 = Six Shooter Cave; 110 = Sixteen Mine; 111 = Skull Pit; 112 = Small Arch Cave; 113 = Small Cave; 114 = Sneeds Creek Cave; 115 = Spider Cave; 116 = Springhouse at Steel Creek Ranger Cabin; 117 = Square Cave; 118 = Squirrel Pit; 119 = Steel Creek Campground Cave; 120 = Steeve's Mine; 121 = Stockman Cave; 122 = Stovepipe Cave; 123 = Summer Cave; 124 = Switchback Cave; 125 = Sycamore Cave; 126 = Toga Toga Cave; 127 = Tom Barnes Cave; 128 = Tom Watson's Bear Cave; 129 = Toney Bend Mine # 2; 130 = Toney Bend Mine # 3; 131 = Triangle Cave; 132 = Turtle Crack; 133 = Unnamed Mine at T17N = R15W = S12; 134 = Van Dyke Spring Cave; 135 = Villines Spring Cave; 136 = Walnut Cave; 137 = Waterfall Pit # 1; 138 = Waterfall Shelter; 139 = Wild Goose Cave; 140 = Willis Cave; 141 = Winding Staircase # 1; 142 = Winding Staircase # 2; and 143 = Wishbone Spring.

PHYLUM ANNELIDA**CLASS CLITELLATA****ORDER HAPLOTAXIDA****Family Lumbricidae**

Genus undetermined (undet.), earthworm. Marion County (Marion): 83, 87, 102, 113, 129, 130. Newton County (Newton): 66, 77, 118, 119, 127. Searcy County (Searcy): 58, 91, 117.

ORDER Undet.

Hirudinea, leech. Newton: 134.

PHYLUM ARTHROPODA**CLASS ARACHNIDA****ORDER ACARINA****Family Cheyletidae**

Cheyletus tenuipilis, mite. Newton: 55.

Family Ereyneidae

Ereynetes sp., mite. Newton: 59.

Family Histiomidae

Histiostoma sapromyzae, mite. Newton: 5.

Family Ixodidae

Genus undet., tick. Searcy: 117.

Family Laelapidae

Genus undet., mite. Marion: 4, 23. Newton: 40, 65, 134.

Family Nanorchestidae

Nanorchestes sp., mite. Newton: 25.

Family Oribatulidae

Oribatula tibialis, mite. Newton: 118.

Genus undet. Marion: 67. Searcy: 117.

Family Parasitidae

Genus undet., mite. Marion: 23. Newton: 65, 134.

Family Podocinidae

Podocinum sp., mite. Newton: 79.

Family Pygmephoridae

Genus undet., mite. Newton: 42.

Family Rhagidiidae

Rhagidia sp., mite. Marion: 23. Newton: 34, 65, 134, 136. Searcy: 37.

Genus undet. Marion: 46, 73, 83, 102, 129, 130. Newton: 54, 104, 119. Searcy: 58, 117.

Family Trombiculidae

Genus undet., mite. Marion: 23, 46.

ORDER ARANEAE**Family Araneidae**

Meta americana, cave orb weaver. Marion: 31, 56, 70, 87, 92, 102, 123.

Newton: 25, 34, 35, 51, 53, 65, 78, 79, 104, 115, 119, 121, 128, 134, 136, 140, 142, 135. Searcy: 58, 91.

Family Dictynidae (funnel-weaving spider)

Cicurina brevis. Newton: 134.

Cicurina davisii. Newton: 134.

Cicurina sp. Marion: 23.

Family Linyphiidae

Centromerus latidens. Marion: 45.

Meioneta sp. Marion: 23.

Porrhomma cavernicola, Appalachian cave spider, G4G5. Marion: 4.

Newton: 25, 65.

Family Lycosidae

Lycosa sp., wolf spider. Marion: 123. Newton: 7, 49, 104, 115, 121, 127, 128.

Family Nesticidae

Eidmannella pallida, cave spider. Newton: 134.

Family Pisauridae

Dolomedes sp., fishing spider. Marion: 129, 130. Newton: 116, 119. Searcy: 117.

Family Symphytognathidae

Maymena ambita, spider. Marion: 20. Newton: 34.

Family Theridiidae

Genus undet., spider. Searcy: 3.

ORDER OPILIONES**Family Phalangiidae**

Bishopella sp., harvestman. Newton: 18.

Family Phalangodidae

Crosbyella distincta, cave harvestman, G1G2. Newton: 39.

Crosbyella sp., cave harvestman. Marion: 23, 110, 123. Newton: 18, 34, 39, 59, 65, 119, 121, 127, 128, 78, 134, 140. Searcy: 26.

Family Sabaconidae

Sabacon cavicolens, harvestman. Marion: 123. Newton: 77, 93.

Sabacon sp. Marion: 20, 23, 46, 67, 73, 74, 75, 83, 94, 102, 129, 130. Searcy: 117.

Family Sclerosomatidae

Leiobunum flavum, harvestman. Searcy: 3

Leiobunum sp. Marion: 45, 46, 73, 75, 102, 129. Newton: 34, 53, 59. Searcy: 3, 117.

ORDER PSEUDOSCORPIONES**Family Chernetidae**

Hesperochernes occidentalis, cave false scorpion, G4G5. Marion: 23, 45, 123. Newton: 34, 40, 65, 134, 136. Searcy: 26, 37, 58, 117.

Family Chthoniidae

Apochthonius sp., cave false scorpion. Marion: 4, 23. Newton: 18, 34, 40, 134, 136

CLASS CHILOPODA**ORDER LITHOBIOMORPHA****Family Lithobiidae (centipede)**

Genus undet. Marion: 67, 73, 102, 129, 130. Newton: 135. Searcy: 117.

CLASS DIPLOPODA**ORDER CHORDEUMATIDA****Family Paradoxosomatidae**

Oxidus gracilis, hothouse millipede, G5. Newton: 119, 121, 127. Searcy: 122.

Family Trichopetalidae

Causeyella dendropus, cave millipede. Newton: 39.

Causeyella sp. Marion: 20, 23, 46, 83. Newton: 39, 40, 53, 78, 104, 127, 134, 140. Searcy: 37, 58, 117, 122.

Scytonotus granulatus, millipede, G5. Marion: 20.

Trigenotyia parca, Cave Millipede, G1G2. Newton: 18, 65.

ORDER POLYDESMIDA**Family Paradoxosomatidae**

Undet. Millipede. Newton: 127

Family Polydesmidae

Pseudopolydesmus minor, millipede. Newton: 59.

Pseudopolydesmus sp. Marion: 94.

CLASS INSECTA**ORDER ARCHAEOGNATHA****Family Machilidae (jumping bristletail)**

Genus undet. Marion: 67, 130. Searcy: 117.

ORDER COLEOPTERA**Family Cantharidae (soldier beetle)**

Genus undet. Marion: 46. Searcy: 117.

Family Carabidae (ground beetle)

Brachinus americanus. Newton: 118.

Platynus parmarginatus. Newton: 25

Platynus tenuicollis. Marion: 123. Newton: 18, 40, 59, 135.

Platynus sp. Marion: 102, 49, 77, 118, 127, 131, 134. Newton: 93. Searcy: 117.

Family Chrysomelidae (leaf beetle)

Genus undet. Newton: 128

Family Coccinellidae (lady beetle)

Genus undet. Newton: 119

Family Cryptophagidae

Cryptophagus sp., silken fungus beetle. Newton: 18

Family Curculionidae (weevil)

Genus undet. Marion: 130

Family Dytiscidae (predaceous diving beetle)

Agabus sp. Newton: 43, 135

Hydaticus sp. Newton: 43

Family Elateridae (click beetle)

Genus undet. Marion: 46

Family Histeridae (hister beetle)

Genus undet. Searcy: 117.

Family Leiodidae (round fungus beetle)

Ptomaphagus cavernicola. Marion: 23, 45, 123. Newton: 18, 24, 34, 39, 65, 78

Ptomaphagus shapardi. Newton: 39

Ptomaphagus sp. Marion: 45, 46, 67, 73, 75, 83, 130. Newton: 54, 104, 118, 127, 136, 140. Searcy: 58, 117

Family Scarabaeidae (scarab beetle)

Genus undet. Searcy: 117.

Family Staphylinidae (rove beetle)

Atheta troglophilia, Rove Beetle, G1. Newton: 18

Athetini sp. Newton: 59

Bisnius cephalotes group. Marion: 123

Quedius erythrogaster. Newton: 25

Quedius sp. Marion: 45, 46, 67, 83, 102, 129, 130. Newton: 7, 34, 39, 54, 65, 104, 118, 127, 134, 136, 140. Searcy: 58, 117.

ORDER COLLEMBOLA (springtails)

Family Entomobryidae

Pseudosinella aera. Marion: 4.

Pseudosinella argentea. Marion: 4, 23, 45. Newton: 18, 34, 65, 136.

Pseudosinella collina. Marion: 4.

Pseudosinella folsomi. Newton: 18, 59.

Pseudosinella sp. nov., undescribed cave springtail. Newton: 134

Pseudosinella violenta. Marion: 23.

Tomocerus flavescens, golden springtail, G5? Marion: 23, 45, 70. Newton: 25, 34, 59, 65, 134, 136. Searcy: 3

Tomocerus lamelliferus. Marion: 4.

Tomocerus sp. Marion: 46, 67, 73, 74, 75, 83, 102, 129, 130.

Tomocerus sp. Searcy: 58, 117.

Genus undet. Newton: 104, 119, 135.

Family Hypogastruridae

Hypogastrura antra. Newton: 34

Genus undet. Marion: 129, Newton: 118.

Family Isotomidae

Folsomia nivalis. Marion: 23.

Isotoma notabilis, remarkable springtail. Marion: 45.

Proisotoma ballistura antiqua. Marion: 45.

Family Onychiuridae

Onychiurus pseudofmetarius. Newton: 93.

Onychiurus sp. Newton: 18.

Genus undet. Marion: 46.

Family Sminthuridae

Arrhopalites clarus, springtail, G4. Newton: 18, 34, 39, 59, 65, 77, 136.

Arrhopalites pygmaeus, pygmy springtail. Marion: 4, 23. Newton: 18, 24, 34, 134.

Lepidocyrtus sp. Newton: 65.

Ptenothrix ptenothrix marmorata. Newton: 134.

Sminthurides hyogramme. Newton: 5.

Genus undet. Marion: 46, 67, 73, 74, 75, 83, 130. Newton: 5. Searcy: 117.

ORDER DERMAPTERA

Family Labiduridae (earwig)

Genus undet. Newton: 59. Marion: 123.

ORDER DIPLURA

Family Campodeidae

Litocampa sp. nov. # 1, undescribed cave dipluran. Marion: 123. Newton: 39.

Litocampa sp. nov. # 2, undescribed cave dipluran. Newton: 39, 40. Searcy: 3.

Litocampa sp., cave dipluran. Marion: 17, 23, 46, 75, 83, 129, 130. Newton: 34, 54, 59, 104, 121, 127, 134, 136, 140. Searcy: 58, 37, 117, 122.

Family Japygidae

Cenopjyx sp. nov., undescribed cave dipluran. Marion: 31. Newton: 93.

Genus undet. Marion: 129. Newton: 39, 121.

ORDER DIPTERA

Family Calliphoridae

Calliphora sp., blow fly. Newton: 118.

Family Cecidomyiidae

Peromyia sp. Newton: 5.

Genus undet. Marion: 67, 73, 74, 75. Newton: 5.

Family Chironomidae (bloodworm)

Genus undet. Marion: 31, 67, 74. Newton: 49.

Family Culicidae (mosquito)

Anopheles punctipennis. Newton: 128.

Genus undet. Marion: 70. Newton: 34, 39, 65, 119, 121, 127, 134, 140. Searcy: 3, 58.

Family Drosophilidae (pomace fly)

Genus undet. Newton: 59.

Family Empididae (balloon fly)

Tachypeza sp. Newton: 39.

Family Heleomyzidae (fly)

Aecothea specus. Marion: 23, 94.

Amoebalaria defessa. Marion: 83, 94. Newton: 24, 39, 128. Searcy: 3.

Heleomyza brachypterna. Newton: 25.

Genus undet. Marion: 4, 46, 47, 67, 73, 74, 75, 102, 123, 129. Newton: 35, 40, 43, 49, 77, 79, 86, 93, 127, 131, 135, 140. Searcy: 91, 117, 122.

Family Mycetophilidae (fungus gnat)

Exechiopsis sp. Newton: 128.

Macrocera nobilis. Marion: 6, 46, 73, 83, 129. Newton: 39, 77, 127. Searcy: 58, 117.

Genus undet. Marion: 20, 23, 67, 74, 75, 102, 113, 130.

Family Phoridae (humpbacked fly)

Megaselia cavernicola. Marion: 4, 23, 70. Newton: 34, 65, 134.

Genus undet. Marion: 46, 67, 73, 74, 75, 83, 129, 130. Newton: 127. Searcy: 117.

Family Psychodidae (moth fly)

Genus undet.. Marion: 75, 83, 129. Newton: 104. Searcy: 117.

Family Sciaridae (dark-winged fungus gnat)

Corynoptera sp. Newton: 59

Genus undet. Marion: 46, 67, 73, 74, 75, 83, 129, 130. Newton: 39. Searcy: 117.

Family Sphaeroceridae (small dung fly)

Leptocera caenosa. Newton: 59.

Spelobia tenebrarum, cave dung fly. Marion: 94. Newton: 24, 25.

Telomerina flavipes. Newton: 59.

Genus undet. Marion: 46, 67, 73, 74, 83, 102, 129, 130. Newton: 104. Searcy: 58, 117.

Family Tipulidae (crane fly)

Pedicia sp. Newton: 131

Genus undet. Marion: 20, 46, 67, 73, 74, 75, 83, 102, 129, 130. Newton: 49, 119. Searcy: 117.

ORDER EPHEMEROPTERA

Family Leptophlebiidae (mayfly)

Paraleptophlebia sp. Newton: 39, 55.

ORDER HEMIPTERA

Family Reduviidae (tread-legged bug)

Genus undet. Marion: 23, 45.

ORDER HETEROPTERA

Family Gerridae (water strider)

Gerris remigis. Marion: 94. Newton: 40, 59, 135.

ORDER HOMOPTERA

Family Cicadellidae (leafhopper)

Genus undet. Newton: 118.

ORDER HYMENOPTERA

Family Braconidae

Genus undet., parasitic wasp. Marion: 67, 73, 74, 75, 129. Newton: 136

Family Formicidae

Camponotus americanus, carpenter ant. Marion: 130

Tapinoma sessile, ant. Marion: 123

Genus undet. Marion: 46, 67, 83, 130. Newton: 34, 39, 131. Searcy: 117.

Family Sphecidae (mud dauber)

Genus undet. Searcy: 3

Family Vespidae (wasp)

Genus undet. Marion: 73, 97, 129. Searcy: 98.

ORDER LEPIDOPTERA

Family Pyralidae (moth)

Genus undet. Newton: 127.

Family Undet. Marion: 45, 67, 73, 74, 75, 83, 102, 123, 129, 130. Newton: 49, 93, 119. Searcy: 58, 117.

ORDER MEGALOPTERA

Family Corydalidae (hellgrammite)

Genus undet. Newton: 39, 104.

Family Myrmeliontidae (ant lion)

Genus undet. Newton: 14.

ORDER NEUROPTERA

Family Chrysopidae (lacewing)

Genus undet. Newton: 39.

ORDER ORTHOPTERA

Family Acrididae (grasshopper)

Genus undet. Searcy: 117. Newton: 118.

Family Raphidophoridae (cave cricket)

Ceuthophilus gracilipes. Marion: 6, 31, 46, 67, 73, 74, 75, 83, 92, 94, 102, 113, 123, 129, 130. Newton: 24, 35, 39, 40, 43, 49, 59, 77, 79, 99, 104, 116, 118, 119, 128, 135. Searcy: 3, 58, 91, 117, 122.

Ceuthophilus silvestris, woodland camel cricket. Marion: 45. Newton: 25

Ceuthophilus sp. Marion: 13, 15, 17, 23, 38, 46, 47, 50, 56, 70, 87, 102, 109, 112, 130, 132, 133. Newton: 2, 7, 12, 19, 29, 32, 34, 35, 40, 42, 48, 51, 53, 54, 59, 60, 61, 63, 64, 65, 66, 69, 71, 72, 78, 79, 80, 81, 88, 93, 95, 103, 115, 119, 120, 121, 125, 126, 127, 128, 131, 134, 136, 138, 140, 142. Searcy: 3, 11, 26, 36, 37, 89, 90, 96, 106, 107, 139

Family Tettigoniidae

Pterophylla camellifolia, Northern True Katydid. Newton: 68

Genus undet. Searcy: 117.

ORDER PHASMIDA (walking stick)

Family Diapheromeridae

Diapheromera sp. Newton: 111

Family Phasmatidae

Genus undet. Searcy: 117.

ORDER PLECOPTERA

Family Chloroperlidae

Alloperla sp., Green Stonefly. Newton: 39

Family Leuctridae (stonefly)

Zealeuctra sp. Newton: 40

ORDER PSOCOPTERA

Family Psyllipsocidae

Psyllipsocus ramburii, cave barklice. Marion: 45, 46, 67, 74, 75, 83, 102. Newton: 34, 65, 127. Searcy: 58.

ORDER SIPHONAPTERA

Family undet., flea. Newton: 18, 34, 65,

ORDER THYSANURA

Family Lepismatidae (silverfish)

Genus undet. Marion: 45, 83. Newton: 51, 119, 121.

ORDER TRICHOPTERA

Family Hydropsychidae (net-spinning caddisfly)

Homoplectra doringa. Newton: 39.

CLASS MALACOSTRACA

ORDER AMPHIPODA

Family Crangonyctidae

Stygobromus alabamensis sensu latu, Alabama cave amphipod, G4G5.

Marion: 23, 70. Newton: 18, 24, 25, 48, 77, 128.

Stygobromus ozarkensis, Ozark cave amphipod, G3G4S1. Marion: 13.

Newton: 39, 40, 59, 93.

Stygobromus sp. Marion: 75, 100. Newton: 104, 121, 136. Searcy: 3.

Family Gammaridae

Gammarus minus, epigean amphipod. Marion: 22, 101, 143. Newton: 43, 59

ORDER DECAPODA

Family Cambaridae

Orconectes neglectus neglectus, ringed crayfish, G5T4T5. Newton: 59.

Orconectes sp. Newton: 35, 39, 40, 53, 78, 93, 134, 135, 140.

ORDER ISOPODA

Family Armadillidiidae (sowbug)

Armadillidium nasatum. Marion: 73, 74, 130.

Armadillidium vulgare. Marion: 73, 74, 102, 130. Searcy: 117.

Family Asellidae

Caecidotea ancyla, cave isopod, G3G4S1? Newton: 40, 93

Caecidotea antricola, cave isopod, G5SNR. Newton: 34, 59, 65, 135.

Caecidotea dimorpha, Cave Isopod, G1G3S1? Marion: 123. Searcy: 122.

Caecidotea macropropoda, Bat cave isopod, G2G3. Newton: 128.

Caecidotea stiladactyla, cave isopod, G3G4S1? Marion: 70. Newton: 18, 35, 39, 59, 79.

Caecidotea sp. Marion: 23, 31, 33, 56, 100, 143. Newton: 24, 25, 43, 66, 104, 116, 121, 131, 134. Searcy: 3, 58.

Lirceus sp., epigean isopod. Marion: 56, 94. Newton: 24, 39, 40, 55, 119, 134, 135. Searcy: 58, 122.

Family Ligiidae (sowbug)

Ligidium sp. Newton: 104. Searcy: 58, 117.

Family Trichoniscidae

Amerigoniscus sp., cave sowbug. Marion: 20.

CLASS MAXILLOPODA

Order undet., copepod. Marion: 13.

CLASS OSTRACODA

Order undet., ostracod. Newton: 104.

CLASS SYMPHYLA

Order undet., pseudoscorpion. Marion: 130.

PHYLUM CHORDATA

CLASS ACTINOPTERYGII

ORDER CYPRINIFORMES

Family Cyprinidae

Genus undet., minnow. Newton: 39, 59, 127, 135.

ORDER PERCIFORMES

Family Centrarchidae

Lepomis sp., sunfish. Newton: 39, 127, 134.

ORDER SCORPAENIFORMES

Family Cottidae

Cottus carolinae, banded sculpin, G5S4. Newton: 39, 40, 59, 134, 135.

CLASS AMPHIBIA

ORDER ANURA

Family Bufonidae

Bufo americanus, American toad, G5S5. Newton: 2

Family Hylidae

Hyla sp., tree frog. Searcy: 91

Pseudacris crucifer crucifer, Northern spring peeper, G5T5S5. Newton: 118

Pseudacris sp., chorus frog. Searcy: 91.

Family Ranidae

Rana catesbeiana, bullfrog, G5S5. Searcy: 58.

Rana clamitans melanota, green frog, G5T5S4. Marion: 123. Newton: 40.

Rana palustris, pickerel frog, G5S4. Marion: 75, 130. Newton: 39, 40, 43, 59, 93, 104. Searcy: 91.

Rana sphenoccephala, Southern leopard frog, G5S5. Newton: 93

Rana sylvatica, wood frog, G5S4. Marion: 15, 45, 87, 130. Newton: 21.

Searcy: 117.
Rana sp. Newton: 7.

ORDER CAUDATA**Family Ambystomatidae**

Ambystoma tigrinum, tiger salamander, G5S3. Newton: 69.

Family Plethodontidae

Eurycea longicauda melanopleura, dark-sided salamander, G5T4S4. Marion: 30, 67, 123, 130. Newton: 7, 24, 39, 40, 43, 48, 49, 59, 79, 127, 134, 135, 140.

Eurycea lucifuga, cave salamander, G5S4. Marion: 15, 20, 23, 27, 45, 46, 67, 70, 73, 83, 92, 94, 102, 108, 113, 123, 129, 130. Newton: 5, 24, 25, 34, 39, 40, 43, 48, 49, 62, 65, 68, 71, 78, 79, 93, 103, 105, 111, 116, 118, 120, 127, 128, 131, 134, 135, 136, 140. Searcy: 3, 11, 58, 91, 107, 117.

Eurycea multiplicata griseogaster, graybelly salamander, G4T4S4. Marion: 70. Newton: 79.

Eurycea spelaea, grotto salamander, G4S4. Marion: 15, 23, 56, 123, 129. Newton: 5, 24, 25, 39, 40, 48, 53, 54, 59, 66, 77, 93, 116, 119, 127, 134, 140. Searcy: 3, 58, 122.

Plethodon albagula, slimy salamander, G5S5. Marion: 13, 15, 23, 27, 31, 45, 47, 67, 70, 73, 74, 130. Newton: 5, 24, 25, 34, 39, 40, 43, 48, 59, 65, 66, 69, 77, 78, 79, 93, 118, 119, 127, 134, 140, 141. Searcy: 3, 91, 117.

Plethodon angusticlavius, Ozark zigzag salamander, G4S3. Marion: 46, 83, 87, 129, 130. Newton: 34, 40, 65, 79, 93, 116, 118, 127, 134, 142. Searcy: 91.

Family Salamandridae

Notophthalmus viridescens louisianensis, central newt, G5T5S5. Newton: 5, 118. Searcy: 91.

CLASS AVES**ORDER CICONIIFORMES****Family Cathartidae**

Coragyps atratus, black vulture, G5S4. Newton: 10. Searcy: 139.

ORDER PASSERIFORMES**Family Tyrannidae**

Sayornis phoebe, Eastern phoebe, G5S4. Marion: 4, 16, 56, 67, 70, 87, 102, 123, 129, 130. Newton: 1, 12, 14, 82, 118, 119. Searcy: 3, 117.

CLASS MAMMALIA**ORDER ARTIODACTYLA****Family Cervidae**

Odocoileus virginianus, white-tailed deer, G5S4. Marion: 67.

ORDER CARNIVORA**Family Mephitidae**

Mephitis mephitis, striped skunk, G5S4. Marion: 4.

Family Procyonidae

Procyon lotor, Northern raccoon, G5S4. Marion: 23. Newton: 39, 93, 121.

Family Ursidae

Ursus americanus, American black bear, G5S3. Marion: 6. Newton: 126, 128

ORDER CHIROPTERA**Family Vespertilionidae**

Corynorhinus townsendii ingens, Ozark big-eared bat, G4T1S1. Marion: 4, 23, 76. Searcy: 124.

Eptesicus fuscus, big brown bat, G5S4. Marion: 123. Newton: 18, 39, 59. Searcy: 89, 90.

Myotis grisescens, Gray Bat, G3S2. Marion: 123. Newton: 18, 25, 39, 42, 55, 59, 135. Searcy: 3, 26, 37, 90.

Myotis leibii, Eastern small-footed bat, G3S1. Newton: 18.

Myotis lucifugus, Little Brown Bat, G5S3? Newton: 18, 39.

Myotis septentrionalis, Northern long-eared bat, G4S2. Marion: 15, 47, 70. Newton: 18, 25, 39, 140.

Myotis sodalis, Indiana bat, G2S2. Marion: 4. Newton: 18, 25, 39, 42, 55.

Myotis sp. Newton: 55, 93. Searcy: 26

Pipistrellus subflavus, Eastern pipistrelle, G5S4. Marion: 4, 15, 23, 31, 46, 47, 50, 87, 102, 109, 113, 123, 129, 130. Newton: 5, 9, 18, 19, 24, 25, 34, 35, 39, 40, 42, 48, 53, 54, 55, 59, 63, 65, 66, 69, 72, 79, 86, 93, 104, 111, 116, 118, 119, 121, 126, 127, 128, 134, 135, 140, 142. Searcy: 3, 26, 37, 58, 89,

90, 91, 117, 122.

ORDER INSECTIVORA**Family Soricidae (shrew)**

Genus udet. Searcy: 91.

ORDER RODENTIA**Family Castoridae**

Castor canadensis, beaver, G5S4. Marion: 22. Newton: 40, 134, 135.

Family Muridae

Mus musculus, house mouse, G5SE. Newton: 34.

Neotoma floridana, Eastern woodrat, G5S4. Marion: 4, 13, 16, 17, 23, 45, 46, 56, 83, 87, 94, 97, 102, 123, 130. Newton: 12, 14, 34, 35, 40, 48, 61, 64, 65, 69, 77, 84, 85, 93, 95, 119, 120, 121, 134, 135, 136. Searcy: 3, 26, 37, 58, 122, 137.

ORDER XENARTHRA**Family Dasypodidae**

Dasypus novemcinctus, nine-banded armadillo, G5S4. Searcy: 91.

CLASS REPTILIA**ORDER SQUAMATA****Family Colubridae**

Diadophis punctatus, ringneck snake, G5S4? Marion: 130. Searcy: 91, 117.

Thamnophis sp., garter snake. Searcy: 91.

Family Viperidae

Agkistrodon contortrix contortrix, Southern Copperhead, G5T5S5. Searcy: 91.

ORDER TESTUDINES**Family Emydidae**

Terrapene carolina triunguis, three-toed box turtle, G5T5S4. Marion: 132. Searcy: 91, 117. Newton: 5, 126.

PHYLUM MOLLUSCA**CLASS GASTROPODA****ORDER BASOMMATOPHORA****Family Carychiidae**

Carychium exile, ice thorn snail, G5. Newton: 53.

Carychium sp. Newton: 104. Searcy: 58.

ORDER STYLOMMATOPHORA**Family Philomycidae**

Megapallifera ragsdalei, Ozark mantleslug. Newton: 116. Searcy: 58.

Family Physidae

Physella gyrina, tadpole physa, G5SNR. Newton: 59, 135.

Family Polygyridae

Inflectarius inflectus, shagreen, G5S5. Marion: 45.

Patera perigrapta, engraved bladetooth snail. Marion: 20, 67, 73, 130. Newton: 10, 39. Searcy: 3, 117.

Family Zonitidae

Genus udet. Marion: 87. Newton: 34, 65. Searcy: 106

PHYLUM NEMATA

Class undet., roundworm. Newton: 141.

PHYLUM NEMATOMORPHA**CLASS GORDIACEA****ORDER GORDIOIDEA****Family Gordiidae**

Gordius sp., Gordian worm. Newton: 48, 66, 141.

PHYLUM PLATYHELMINTHES**CLASS TURBELLARIA****ORDER TRICLADIDA****Family Dendrocoelidae**

Dendrocoelopsis americana, cave flatworm, G3G4SNR. Newton: 119, 128.

Family undet.

Cave flatworm. Marion: 23, 31. Newton: 141.