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Comparison of three collection techniques for capture of Coleoptera, with an emphasis on saproxylic species, in Great Smoky Mountains National Park, USA

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Abstract. Collection methods and/or habitats sampled influence how many and which species are captured during entomological surveys. Here we compare Coleoptera catches among three survey activities, each using a single collection method, at the same study sites in Great Smoky Mountains National Park, USA. Activities included: short-term flight intercept trapping (FITs); sifting/Berlese funneling of leaf litter and extremely decayed downed coarse woody debris; and using emergence chambers containing coarse woody debris of various decay classes. In total, 2472 adult beetle specimens, representing 217 lowest identifiable taxa within 164 genera and 42 families, were collected during the FIT survey. Each survey activity yielded more than 2000 specimens, and a combined total of 413 species was collected. A combination of all surveys yielded the highest species richness when normalized for number of specimens indicating that variation of habitat and/or collection method significantly increases species richness. Of single surveys the FIT survey had the highest absolute species richness (217) and the highest richness when normalized for number of specimens. Species overlap among survey activities was low (Sorensen's quotient of similarity was 0.20–0.27), which showed that each was about equally dissimilar from all others. Overlap of catch between FITs and emergence chambers was too low to justify substitution of emergence surveys with the FIT survey protocol used when attempting to collect saproxylic Coleoptera.

Introduction

Concerning conservation of biodiversity, Aldo Leopold (1949) once admonished, "To keep every cog and wheel is the first precaution of intelligent tinkering." However, from a practical standpoint, an inventory of the "cogs" and "wheels" (species) at a location, in a community, or within a habitat can be quite daunting, especially for entomologists. The large number and similarity of many species, difficulty of identification of immature forms, relatively short adult life spans, wide variety of micro-niches, and apparent scarcity of some species all contrive to make full inventories difficult.

Habitat and collection method have a major influence over which species and how many specimens are collected. Hammond (1990), in his overview of early results from Project Wallace, where more than 1,000,000 tropical beetle specimens were collected using a wide variety of techniques, reported that 60% of species were collected from only one type of sample. Siitonen (1994) found that window traps collected more saproxylic beetle species associated with a wider variety of habitats than subcortical hand sampling in a northern Finland forest. Hammond (1997) found that window traps and emergence collections showed taxon bias when used to collect arthropods in a Canadian forest. Window traps collected 204 beetle species whereas emergence collected 161 and a 42% overlap of species between the two surveys was documented. Ranius and Jansson (2002) surveyed beetles in hollow oaks using pitfall traps, window traps, and hand searching through wood mold. They found significant differences in catch among the three collection methods despite limiting themselves to a very specific habitat that occupies a relatively small volume. Window traps collected a greater number and wider variety (based on microhabitat group) of species, but under-sampled eight species compared to the other methods. Touroult et al. (2010) compared seven methods used to collect longhorn beetles (Cerambycidae) in French Guiana. They found that time was an important factor in determining the efficiency of methods; emergence and flight intercept trapping (FIT) was most efficient during long studies, whereas direct collection (beating, hand collection) was most efficient during very short studies.

Species inventories and other comparative research are generally conducted by obtaining specimens (physical or observational) through "collecting" or "sampling" and here we differentiate the two activities. Collecting is a broad term for procuring specimens in any fashion or variety of fashions. It may be systematic, standardized, haphazard, eclectic, or serendipitous. Often specimens or groups of specimens obtained through collecting cannot be compared in any statistical sense to other groups, but this does not reduce the value of non-standardized collecting, which is vitally important for inventories, exploration of microhabitats, and obtaining specimens for taxonomic use.

However, often due to the nature of the question being asked, collecting *sensu lato* may not be appropriate and sampling, a type of collecting, must be employed. A sample is the subset representative of a larger set of entities (known as the "target statistical population") (Dauffy-Richard et al. 2009). A sample is more than the specimens obtained; it also contains information important for standardization (e.g., concerning scale, technique, effort, etc.) so that samples can be compared with one another, and meaningful statements, such as extrapolations, can be made about a total. Samples also help to overcome collector bias. Conducting appropriate ecological studies without "sampling" may be impossible, and for the remainder of this study the term "sample" is used in this strict sense.

These designations are meant to emphasize that general collecting and sampling are both important tools but are generally appropriate for answering different questions. Nageleisen and Bouget (2009, and chapters therein) provided an excellent overview of general considerations and techniques used for conducting inventories of insects in forests. They emphasized the need to develop *a priori* a sampling protocol designed to answer the specific question being asked. Additionally they stressed that observations should be, above all, biologically meaningful, and that any sampling design and statistics should be based on the question being asked, not vice versa.

Concurrent research conducted at six sites in Great Smoky Mountains National Park (GSMNP), Tennessee, provided a unique opportunity to compare surveys used to inventory Coleoptera. Ferro et al. (2012a) surveyed Coleoptera in two habitats (or sub/meso-habitats within the greater "forest habitat"), leaf litter and hardwood coarse woody debris decay class V, using a sifting/Berlese funneling (sifting/Berlese) collection method. Three samples of each substrate were taken at each location during fall of 2006 and again spring 2007 (total of 12 samples at each site). They collected a total of 2069 specimens and 128 species from both habitats combined at the two sites (Porters Creek and Greenbrier) surveyed during this study.

Ferro et al. (2012b) used emergence chambers to survey saproxylic Coleoptera emergent from the general woody debris habitat. Three samples of each of the following were taken at each study site during April 2006: fine woody debris decay class I and decay class II; coarse woody debris decay class I; decay class II; and decay classes III and IV combined (total of 15 samples at each site). Each sample consisted of enough substrate to fill a 68-L emergence chamber three-fourths of its capacity. Chambers were sealed and specimens emergent from dead wood were collected over a two year period. They collected a total of 2630 specimens and 190 species at the two sites (Porters Creek and Greenbrier) surveyed during this study.

The purpose of this research was to compare Coleoptera obtained from a survey using short-term FITs with those from sifting/Berlese and emergence surveys. A secondary goal was to determine whether short-term FITs could be substituted for emergence when attempting to collect saproxylic Coleoptera.

Material and Methods

Study Area. Great Smoky Mountains National Park was established in 1934, named as an International Biosphere Reserve in 1976, and a World Heritage Site in 1983. It encompasses 211,000 ha (521,490 acres) in Tennessee and North Carolina, USA. Five major forest communities are recognized in the park, though 80% may be broadly classified as eastern deciduous forest (Houk and Collier 1993). The eastern half of the park contains the largest remaining tract of old growth forest in the eastern U.S. (Davis 1996). See Ferro et al. (2012b) for more details.

Study Sites. Overstory vegetation data were obtained from Madden (Geospatial Dataset-1047498), and understory vegetation data were obtained from Madden (Geospatial Dataset-1047499); see Welch et al. (2002) and Madden et al. (2004) for a description of how data were collected. Geology data were obtained from National Park Service (2006). Vegetation disturbance history data were obtained from National Park Service (2007). Data on forest type in 1938 were obtained from National Park Service (2009). Three locations within each study site were surveyed using a point relascope sampling technique (Brissette et al. 2003; Gove et al. 1999). Findings were averaged to obtain volume of CWD per hectare at each study site.

Collections took place at two locations in GSMNP:

1) Porters Creek (TN: Sevier Co.: N35˚40.790' W83˚23.855'). The site was on Thunderhead Sandstone, has an acid cove forest overstory, and a medium rhododendron understory. Vegetation disturbance was light cut and during a 1938 survey this location was designated as cove hardwood. Coarse woody debris volume was 290 m^3/ha. Because of the history of minimal disturbance this site is referred to as "primary forest."

2) Greenbrier (TN: Sevier Co.: N35˚43.147' W83˚23.349'). The site was on Roaring Fork Sandstone, has a successional hardwood overstory, and an herbaceous/deciduous understory. Vegetation disturbance was settlement class and during a 1938 survey this location was designated as grassland. Coarse woody debris volume was 143 m^3/ha. Because of the history of disturbance (heavily logged) this site is referred to as "secondary forest."

Sampling. Three ground-level FITs (see Schauff 2001 for basic design) were erected at each site on 1 July 2007 and removed on 8 July 2007. Each trap consisted of a vertical mesh pane 1 m high and 3 m long, a plastic horizontal rain fly 1 m wide and 3 m long, and eight collection containers with a combined collection surface of 1830 cm^2. Propylene glycol antifreeze (Prestone® Low Tox™ brand) was used as a killing and preserving agent. Position of traps was based on convenience, not based on proximity to snags or logs. Timing of sampling was based on anecdotal observations that FIT trapping is better in summer than spring or fall.

Adult Coleoptera were pinned or pointed as needed and labeled. Identification to the finest level possible (typically species) was performed with the appropriate taxonomic literature (primarily Arnett

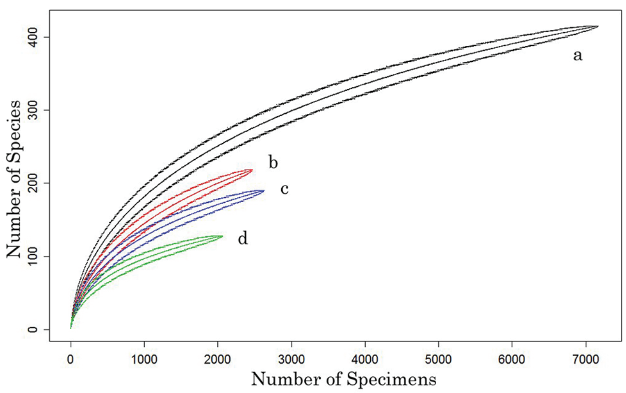

Figure 1. Species accumulation curves for a: all survey activities combined; b: FIT activity; c: emergence activity; d: sift/Berlese activity.

and Thomas (2001) and Arnett et al. (2002) and references therein, plus additional literature as needed), and/or comparison with authoritatively identified reference specimens. Specimens are deposited in the Louisiana State Arthropod Museum (LSAM), LSU AgCenter, Baton Rouge, Louisiana, and Great Smoky Mountains Natural History Museum (GSNP), Gatlinburg, Tennessee.

Data analysis. Individual-based rarefaction curves were used to compare species richness among surveys (Gotelli and Colwell 2001). Curves were constructed using code developed by MLF and KEH and run in the R programming environment (R Development Core Team 2010). For each subset, 1000 rarefaction curves were created, an average curve and its 95% confidence limits were derived from the simulations, and a significant deviation from the simulated average occurred when an observed value fell outside the confidence interval. Each rarefaction curve is shown with a combination of these three lines and an average curve that lies outside the confidence interval of another curve can be considered different at least at the $\alpha = 0.05$ level.

Capture similarity was assessed using Sorensen's quotient of similarity (Southwood 1978).

Results

In total, 2472 adult beetle specimens, representing 217 lowest identifiable taxa within 164 genera and 42 families, were collected during the FIT survey. Of the 217 lowest identifiable taxa, 8 were identifiable only to family or tribe, 48 were identifiable only to genus, and 162 were identified to species (Appendix 1). Groups only identified to family, tribe, or genus may contain multiple species. For the remainder of the results and discussion all lowest identifiable taxa will be referred to as "species" in an attempt to reduce jargon and increase readability.

Staphylinidae were, by a wide margin, the most species rich family collected from the FIT survey with 66 species, followed by Leiodidae (25 spp.), Elateridae (11 spp.), and Curculionidae (10 spp.). Sixteen families were represented by a single species. Five species were represented by more than 100 specimens, and 87 species (40%) were singletons.

At the Porters Creek site 1393 adult beetle specimens, representing 131 species within 107 genera and 34 families, were collected. At the Greenbrier site 1079 adult beetle specimens, representing 160 species within 126 genera and 34 families, were collected.

Species richness based on species accumulation curve comparisons (Fig. 1) was highest for all surveys combined, followed by FIT, emergence, and lastly sifting/Berlese. All were significantly different from one another.

Sorensen's quotient of similarity for collection methods showed least similarity between sifting/Berlese and FIT (0.20), intermediate similarity between sifting/Berlese and emergence (0.22), and highest similarity between emergence and FIT (0.27).

Discussion

All surveys combined yielded 413 beetle species. The FIT survey collected 2472 specimens and 217 beetle species, compared to 2630 specimens and 190 species from the previous emergence survey (Ferro et al. 2012b), and 2069 specimens and 128 species from the previous sifting/Berlese survey (Ferro et al. 2012a) (Appendix 1). Emergence and FIT surveys shared the most species (55, 16%) while sifting and FIT surveys shared the fewest species (34, 11%) (Fig. 2). Only 15 species (4%) were collected in all three surveys. In total 80% of species were collected in only a single survey activity. Hammond (1990) reported 60% of beetle species collected from a single collection type, but collected many more specimens (1,000,000+) and used a wider variety of survey activities.

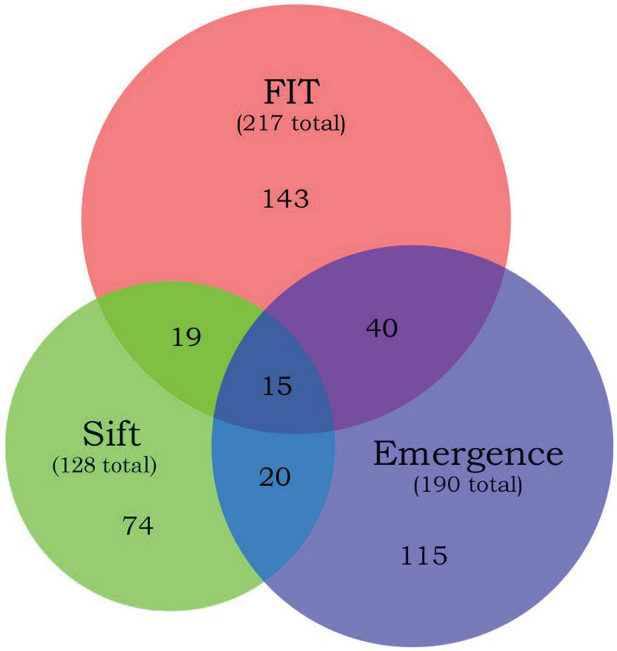

Figure 2. Species overlap among survey activities. Size of circle is proportional to species richness.

The species accumulation curve for all surveys combined was significantly higher than any single survey. The individual influences of either habitat or collection method cannot be assessed based on this study, but it is clear that variation of those factors significantly increases species richness.

Of individual surveys, the FIT survey collected significantly higher species richness than any other survey (Fig. 1). However, surveys had low similarity, ranging from 0.20 to 0.27, which showed that each was about equally dissimilar from all others. Therefore, substitution of one survey for another would be ineffective at recovering similar species.

Application of Survey Comparisons. Use of multiple collection techniques and collection from multiple habitats at a single site offers an opportunity to compare techniques, and provides rudimentary natural history and ecological information about the taxa collected. *Leptoplectus pertenuis* (Casey) (Staphylinidae) is represented by three specimens collected by sifting, 39 emergent from CWD, and two collected in FITs. Multiple collection techniques showed that *L. pertenuis* may be found in a various places, but that it is most abundant in CWD. In contrast *Cercyon occallatus* (Say) (Hydrophilidae) is represented by four specimens collected by sifting, one emergent from CWD, and 385 collected with FITs. The large number of specimens collected with FITs shows that *C. occallatus*, while also collected in a variety of places, is not a general leaf litter dweller or associated with CWD, but must be spending its time elsewhere.

Myrmedonota n. sp. (Staphylinidae) offers an interesting mystery. In total, 282 specimens were collected from both sites with FITs, but no specimens were collected from leaf litter or dead wood. A short adult life span or specificity of microhabitat (e.g. particular fungi, etc.) may explain this interesting observation, but until specimens are collected from a particular substrate, explanations will remain speculative. Without FIT collections this apparently abundant undescribed species would have remained overlooked.

Saproxylic Coleoptera. Other researchers (Siitonen 1994; Hammond 1997) reported a wide overlap of saproxylic beetle species between flight intercept traps and other collection methods. However, their intercept traps were generally much smaller and placed immediately against target habitat such as snags. Additionally they trapped over a much longer period time, up to eight months over a two year period.

Within this research, most families with a high proportion of saproxylic species were poorly represented in the FIT survey compared to the emergence survey. However, Leiodidae, Mordellidae, and Nitidulidae, families with some saproxylic species, were better represented in the FIT survey than either emergence or sifting/Berlese surveys (Appendix 1). Overlap of catch between the FIT and emergence surveys was too low to justify substitution. Therefore, a survey composed of the FIT collection protocol used in this research is not an effective alternative to emergence surveys when attempting to collect saproxylic Coleoptera.

Related Research. This publication represents a portion of a larger body of research, specifically the Coleoptera component of the All Taxa Biodiversity Inventory at GSMNP (Carlton and Bayless 2007). See Ferro et al. (2012b) for a list of publications resultant from this research.

Conclusion

An accurate survey of the Coleoptera in a given area is difficult owing to the wide variety of species and their habits. The three separate surveys using different collection methods and targeting different habitats resulted in the total collection of 7171 specimens and 413 beetle species at two sites in GSMNP. However, there was very little overlap in catch among surveys, indicating that various survey types would increase catch richness, and that substitution of one survey type for another will not yield similar species.

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Appendix 1. List of taxa and number of specimens collected at Greenbrier and Porters Creek sites. Sifting/Berlese data are from Ferro et al. (2012a), and emergence data are from Ferro et al. (2012b). Family names follow Bouchard et al. (2011).

SPECIES	GREENBRIER			PORTERS CREEK		
	SIFT (77)	EMERGENCE (123)	FIT (159)	SIFT (81)	EMERGENCE (130)	FIT (131)
ADERIDAE						
1 *Vanonus huronicus* Casey	—	1	1	—	—	—
AGYRTIDAE						
2 *Necrophilus pettitii* Horn	—	—	—	1	—	—
ANTHICIDAE						
3 *Ischalia costata* (LeConte)	—	—	1	—	—	1
ANTHRIBIDAE						
4 *Eurymycter tricarinatus* Pierce	—	—	1	—	—	—
ARTEMATOPODIDAE						
5 *Eurypogon niger* (Melsheimer)	—	—	—	—	—	1
BUPRESTIDAE						
6 *Dicerca divaricata* (Say)	—	1	1	—	3	—
CANTHARIDAE						
7 Cantharidae gen. sp.	—	—	—	—	—	1

	SPECIES	GREENBRIER			PORTERS CREEK		
		SIFT (77)	EMERGENCE (123)	FIT (159)	SIFT (81)	EMERGENCE (130)	FIT (131)
	CARABIDAE						
8	*Agonum ferreum* Haldeman	—	—	—	—	1	—
9	*Anillinus langdoni* Sokolov and Carlton	88	—	—	107	—	—
10	*Apenes lucidulus* (Dejean)	1	—	—	—	—	—
11	Carabidae gen. sp. (teneral specimen)	—	1	—	—	—	—
12	*Carabus goryi* Dejean	—	—	—	—	—	1
13	*Clinidium baldufi* Bell	—	2	—	—	2	—
14	*Clinidium rosenbergi* Bell	—	—	—	—	1	—
15	*Clinidium valentinei* Bell	3	—	—	—	—	—
16	*Cyclotrachelus freitagi* Bousquet	2	—	—	—	—	—
17	*Dicaelus (Paradicaelus) dilatatus* Say	1	—	—	—	—	—
18	*Gastrellarius blanchardi* (Horn)	—	—	—	1	—	—
19	*Gastrellarius honestus* (Say)	1	3	—	—	6	—
20	*Mioptachys flavicauda* (Say)	—	7	—	—	1	—
21	*Platynus parmarginatus* Hamilton	—	—	—	—	—	3
22	*Polyderis laevis* (Say)	—	1	—	—	—	—
23	*Pterostichus (Steropus) moestus* (Say)	—	—	—	1	—	—
24	*Scaphinotus (Maronetus)* spp.	—	—	—	3	—	—
25	*Serranillus* sp.	1	—	—	—	—	—
26	*Sphaeroderus stenostomus lecontei* Dejean	1	—	—	—	—	—
27	*Trechus (Microtrechus) pisgahensis* Barr	—	—	—	2	—	—
28	*Trichotichnus autumnalis* (Say)	1	—	—	—	—	—

SPECIES	GREENBRIER SIFT (77)	GREENBRIER EMERGENCE (123)	GREENBRIER FIT (159)	PORTERS CREEK SIFT (81)	PORTERS CREEK EMERGENCE (130)	PORTERS CREEK FIT (131)
CERAMBYCIDAE						
29 *Aegomorphus modestus* (Gyllenhal)	—	1	—	—	—	—
30 *Aegomorphus quadrigibbus* (Say)	—	—	—	—	2	—
31 *Analeptura lineola* Say	—	4	—	—	—	—
32 *Astylopsis maculata* (Say)	—	3	—	—	—	—
33 *Clytus ruricola* (Olivier)	—	—	—	—	1	—
34 *Cyrtophorus verrucosus* (Olivier)	—	—	—	—	1	—
35 *Grammoptera exigua* (Newman)	—	1	—	—	—	—
36 *Graphisurus fasciatus* (DeGeer)	—	—	—	—	13	—
37 *Leptorhabdium pictum* (Haldeman)	—	—	—	—	2	—
38 *Leptostylus transversus* (Gyllenhal)	—	1	—	—	—	—
39 *Metacmaeops vittata* (Swederus)	—	—	—	—	—	2
40 *Microgoes oculatus* (LeConte)	—	4	1	—	10	—
41 *Molorchus b. bimaculatus* Say	—	3	—	—	—	—
42 *Neandra brunnea* (Fabricius)	—	1	—	—	1	—
43 *Oplosia nubila* (LeConte)	—	5	—	—	—	—
44 *Saperda vestita* Say	—	1	—	—	—	—
45 *Strangalepta abbreviata* (Germar)	—	1	1	—	—	—
46 *Trachysida mutabilis* (Newman)	—	1	—	—	12	—
47 *Tragosoma depsarium* (Linnaeus)	—	—	—	—	—	1
48 *Urgleptes querci* (Fitch)	—	1	—	—	—	—

		Greenbrier			Porters Creek		
	SPECIES	**SIFT (77)**	**EMERGENCE (123)**	**FIT (159)**	**SIFT (81)**	**EMERGENCE (130)**	**FIT (131)**
CERYLONIDAE							
49	*Cerylon castaneum* Say	—	—	—	—	3	—
50	*Cerylon unicolor* Ziegler	—	1	—	—	—	—
51	*Hypodacne punctata* LeConte	—	1	—	—	—	—
52	*Mychocerus striatus* (Sen Gupta and Crowson)	100	9	—	31	—	—
53	*Philothermus glabriculus* (LeConte)	—	8	—	—	16	—
54	*Philothermus stephani* Gimmel and Slipinski	—	—	—	2	—	—
CHRYSOMELIDAE							
55	*Altica* sp.	—	—	—	—	—	1
56	*Disonycha leptolineata* Blatchley	—	—	—	1	—	—
57	*Disonycha xanthomelas* (Dalman)	—	—	—	1	—	1
58	*Odontota dorsalis* (Thunberg)	—	—	—	2	—	—
59	*Psylliodes appalachianus* Konstantinov and Tishechkin	—	—	—	6	—	21
60	*Rhabdopterus* spp. (female)	—	—	—	—	—	4
61	*Sumitrosis inaequalis* (Weber)	—	—	—	—	—	19
62	*Sumitrosis rosea* (Weber)	—	—	—	—	—	3
63	*Tymnes* sp.	—	—	1	—	—	—
CIIDAE							
64	*Ceracis sallei* (Mellie)	—	3	—	—	—	—
65	*Ceracis singularis* (Dury)	—	—	1	—	1	—
66	*Ceracis* spp.	—	4	1	—	—	—
67	*Ceracis thoracicornis* (Ziegler)	—	3	—	—	—	—

SPECIES	GREENBRIER SIFT (77)	GREENBRIER EMERGENCE (123)	GREENBRIER FIT (159)	PORTERS CREEK SIFT (81)	PORTERS CREEK EMERGENCE (130)	PORTERS CREEK FIT (131)
68 Ciidae gen. spp.	—	—	1	—	2	—
69 *Cis fuscipes* Mellie	—	—	—	—	2	—
70 *Octotemnus laevis* Casey	—	—	—	—	42	—
71 *Rhopalodontus* sp.	—	—	—	—	1	—
CLAMBIDAE						
72 *Clambus* sp.	—	—	—	1	—	—
CORYLOPHIDAE						
73 *Holopsis* spp.	2	—	—	—	—	—
74 *Sericoderus* sp.	—	—	—	—	1	—
CRYPTOPHAGIDAE						
75 *Atomaria* spp.	—	13	—	—	7	—
76 *Cryptophagus* spp.	—	14	—	1	28	—
CUCUJIDAE						
77 *Cucujus clavipes* Fabricius	—	1	—	—	—	—
CUPEDIDAE						
78 *Cupes capitatus* Fabricius	—	1	—	—	1	—

	SPECIES	GREENBRIER			PORTERS CREEK		
		SIFT (77)	EMERGENCE (123)	FIT (159)	SIFT (81)	EMERGENCE (130)	FIT (131)
	CURCULIONIDAE						
79	*Acalles carinatus* LeConte	—	1	—	—	2	—
80	*Acalles* spp.	—	—	—	3	—	—
81	*Caulophilus dubius* (Horn)	6	17	—	21	3	—
82	*Cophes obtentus* (Herbst)	—	—	—	—	1	—
83	*Cossonus impressifrons* Boheman	—	3	—	—	—	—
84	Curculionidae gen. spp.	1	1	3	3	—	—
85	*Cyrtepistomus castaneus* (Roelofs)	1	—	—	—	1	—
86	*Dryophthorus americanus* Bedel	7	57	52	—	134	23
87	*Eurhoptus* n. sp.	25	—	—	—	—	—
88	*Eurhoptus pyriformis* LeConte	1	—	—	5	—	—
89	*Hylesinus pruniosus* Eichhoff	—	—	—	—	3	—
90	*Hylesinus* sp.	—	—	—	—	1	—
91	*Hypothenemus* spp.	—	3	—	—	—	1
92	*Lechriops oculatus* (Say)	—	—	2	—	—	—
93	*Microhyus setiger* LeConte	—	—	—	2	—	1
94	*Micromimus corticalis* Boheman	—	2	—	—	—	—
95	*Myosides seriehispidus* Roelofs	9	2	—	—	—	—
96	*Panscopus impressus* Pierce	—	—	—	1	—	—
97	*Stenoscelis brevis* (Boheman)	—	9	—	—	18	—
98	*Xyleborinus saxeseni* (Ratzeburg)	—	—	1	—	—	—
99	*Xyleborus affinis* Eichhoff	—	—	—	—	1	—
100	*Xyleborus atratus* Eichhoff	—	—	3	—	6	—

		GREENBRIER			PORTERS CREEK		
	SPECIES	SIFT (77)	EMERGENCE (123)	FIT (159)	SIFT (81)	EMERGENCE (130)	FIT (131)
101	*Xyleborus californicus* Wood	—	—	—	—	1	—
102	*Xyleborus ferrugineus* (Fabricius)	—	—	2	—	1	—
103	*Xylosandrus germanus* (Blandford)	—	—	1	—	14	6
104	*Xyloterinus politus* (Say)	—	1	17	—	2	—
DERMESTIDAE							
105	*Anthrenus* spp.	—	—	1	—	—	3
ELATERIDAE							
106	*Ampedus areolatus* (Say)	—	10	—	—	13	—
107	*Ampedus luteolus* (LeConte)	—	5	—	—	1	—
108	*Ampedus rubricus* (Say)	—	—	—	1	—	—
109	*Ampedus semicinctus* (Randall)	—	1	—	—	1	—
110	*Athous acanthus* (Say)	—	—	—	—	—	1
111	*Athous brightwelli* (Kirby)	—	—	2	—	—	1
112	*Athous cucullatus* (Say)	—	2	—	—	—	—
113	*Athous rufifrons* (Randall)	—	—	—	—	1	—
114	*Athous scapularis* (Say)	—	1	—	—	3	—
115	*Cardiophorus* sp.	—	—	1	—	—	—
116	*Ctenicera mimica* Becker	—	—	1	—	—	3
117	*Dalopius* sp.	—	—	—	1	—	—
118	Elateridae gen. spp.	—	—	1	—	—	1
119	*Hemicrepidius memnonius* (Herbst)	—	—	—	—	—	2
120	*Limonius aurifer* LeConte	—	—	1	—	—	—

SPECIES	GREENBRIER SIFT (77)	GREENBRIER EMERGENCE (123)	GREENBRIER FIT (159)	PORTERS CREEK SIFT (81)	PORTERS CREEK EMERGENCE (130)	PORTERS CREEK FIT (131)
121 *Limonius griseus* (Beauvois)	—	—	1	—	—	—
122 *Limonius nimbatus* (Say)	1	—	—	—	—	—
123 *Melanotus decumanus* (Erichson)	—	—	—	—	1	—
124 *Melanotus parallelus* Blatchley	—	—	1	—	—	—
125 *Melanotus sagittarius* (LeConte)	—	—	1	—	—	—
126 *Pityobius anguinus* LeConte	—	—	1	—	—	—
ENDOMYCHIDAE						
127 *Bystus ulkei* (Crotch)	—	3	—	—	8	—
128 *Endomychus biguttatus* Say	—	—	1	—	2	1
129 *Micropsephodes lundgreni* Leschen and Carlton	—	1	—	—	—	—
130 *Mycetina perpulchra* (Newman)	—	—	3	—	—	—
EROTYLIDAE						
131 *Tritoma humeralis* Fabricius	—	—	—	—	—	1
132 *Tritoma mimetica* (Crotch)	—	—	2	—	—	—
133 *Tritoma unicolor* Say	1	—	1	—	—	—
EUCINETIDAE						
134 *Tohlezkus inexpectus* Vit	4	8	—	6	127	—
EUCNEMIDAE						
135 *Dirrhagofarsus lewisi* (Fleutiaux)	—	—	1	—	—	—
136 *Dromaeolus cylindricollis* (Say)	—	—	1	—	1	—
137 *Entomophthalmus rufiolus* (LeConte)	—	3	—	—	—	—

	SPECIES	GREENBRIER			PORTERS CREEK		
		SIFT (77)	EMERGENCE (123)	FIT (159)	SIFT (81)	EMERGENCE (130)	FIT (131)
138	*Isarthrus rufipes* (Melsheimer)	—	—	—	—	5	—
139	*Isorhipis obliqua* (Say)	—	—	1	—	—	—
140	*Melasis pectinicornis* Melsheimer	—	24	—	—	—	—
141	*Microrhagus subsinuatus* LeConte	—	6	1	—	4	7
GEOTRUPIDAE							
142	*Geotrupes balyi* Jekel	—	—	2	—	—	—
143	*Geotrupes splendidus* (Fabricius)	—	—	1	—	—	—
144	*Odonteus liebecki* (Wallis)	—	—	1	—	—	—
HISTERIDAE							
145	*Aeletes floridae* (Marseul)	—	—	3	—	—	—
146	*Bacanius tantillus* LeConte	—	3	—	—	6	—
147	*Geomysaprinus* sp.	—	—	—	—	—	4
148	*Hololepta lucida* LeConte	—	—	2	—	—	—
149	*Margarinotus lecontei* Wenzel	—	—	29	—	—	84
150	*Onthophilus pluricostatus* LeConte	—	—	21	—	—	—
151	*Xestipyge geminatum* (LeConte)	—	—	2	—	—	—
HYDROPHILIDAE							
152	*Cercyon assecla* Smetana	—	1	1	—	—	8
153	*Cercyon occallatus* (Say)	—	—	88	4	1	297
154	*Cercyon pygmaeus* (Illiger)	—	—	2	—	—	1
155	*Cymbiodyta blanchardi* Horn	—	—	1	—	—	—
156	*Pemelus costatus* (LeConte)	—	—	5	—	—	—

	SPECIES	GREENBRIER			PORTERS CREEK		
		SIFT (77)	EMERGENCE (123)	FIT (159)	SIFT (81)	EMERGENCE (130)	FIT (131)
157	*Tectosternum naviculare*(Zimmermann)	—	—	1	—	—	—
	LAMPYRIDAE						
158	Lampyridae gen. spp.	—	—	1	—	—	1
159	*Lucidota* spp.	—	—	—	—	4	—
160	*Photinus* spp.	—	—	—	—	—	11
	LATRIDIIDAE						
161	*Corticarina fuscula* (Gyllenhal)	—	—	—	—	—	1
162	*Melanophthalma americana* (Mannerheim)	—	—	1	—	—	1
	LEIODIDAE						
163	*Agathidium compressidens* Fall	—	—	—	1	—	—
164	*Agathidium kimberlae* Miller and Wheeler	1	—	—	—	—	—
165	*Agathidium* n. sp.	1	—	—	—	—	—
166	*Agathidium oniscoides* Beauvois	—	1	1	2	3	—
167	*Agathidium* spp. (female)	6	6	—	4	11	1
168	*Aglyptinus laevis* (LeConte)	1	—	—	—	—	—
169	*Anisotoma bifoveata* Wheeler	—	—	2	—	—	2
170	*Anisotoma blanchardi* (Horn)	—	—	2	—	—	—
171	*Anisotoma discolor* (Melsheimer)	—	—	1	—	—	—
172	*Anisotoma geminata* (Horn)	—	—	—	—	—	1
173	*Anisotoma* spp. (female)	—	—	3	—	—	2
174	*Anogdus puritanus* (Fall)	—	—	1	—	—	—
175	*Catopocerus appalachianus* Peck	2	—	—	2	—	—

	SPECIES	GREENBRIER			PORTERS CREEK		
		SIFT (77)	EMERGENCE (123)	FIT (159)	SIFT (81)	EMERGENCE (130)	FIT (131)
176	*Catopocerus* n. sp.	1	—	—	2	—	—
177	*Catopocerus* spp. (female)	5	1	—	8	1	—
178	*Catops basilaris* Say	—	—	—	—	—	1
179	*Colenis impunctata* LeConte	7	—	6	—	—	4
180	*Colon dentatum* LeConte	—	—	1	—	—	—
181	*Colon megasetosum* Stephan and Peck	—	—	1	—	—	1
182	*Colon oblongum* Blatchley	—	—	2	—	—	—
183	*Colon* spp. (female)	—	—	7	—	—	—
184	*Dissochaetus oblitus* Peck	—	—	1	—	—	—
185	*Gelae* spp. (female)	—	—	2	—	—	1
186	*Hydnobius substriatus* (LeConte)	1	—	—	—	—	—
187	*Leiodes appalachiana* Baranowski	—	—	1	—	—	—
188	*Leiodes impressa* Baranowski	—	—	1	—	—	1
189	*Liocyrtusa luggeri* (Hatch)	—	—	2	—	—	—
190	*Nemadus* spp. (female)	—	—	2	—	—	—
191	*Nemadus triangulum* Jeannel	—	2	—	—	—	—
192	*Ptomaphagus* (*Adelops*) *brevior* Jeannel	—	—	2	—	—	16
193	*Ptomaphagus* (*Adelops*) *ulkei* Horn	—	—	—	—	—	1
194	*Ptomaphagus* (*Appadelopsis*) *appalachianus* (Peck)	—	—	—	25	—	—
195	*Ptomaphagus* (*Appadelopsis*) *richlandensis* (Peck)	—	—	—	—	—	1
196	*Ptomaphagus* spp.	1	—	1	20	—	—
197	*Sciodrepoides latinotum* Peck and Cook	—	1	—	—	1	—
198	*Sciodrepoides* sp. (female)	—	—	—	—	—	1
199	*Sciodrepoides watsoni* (Spence)	—	—	—	1	—	—

SPECIES	GREENBRIER			PORTERS CREEK		
	SIFT (77)	EMERGENCE (123)	FIT (159)	SIFT (81)	EMERGENCE (130)	FIT (131)
LUCANIDAE						
200 *Ceruchus piceus* (Weber)	—	—	—	—	—	3
201 *Platycerus virescens* (Fabricius)	—	—	—	1	—	—
LYCIDAE						
202 Lycidae gen. spp.	—	—	1	—	—	1
203 *Plateros* spp.	—	1	1	—	—	2
MELANDRYIDAE						
204 *Dircaea liturata* (LeConte)	—	—	1	—	—	—
205 *Emmesa connectens* (Newman)	—	—	—	—	2	—
206 *Hypulus simulator* Newman	—	8	—	—	2	—
207 *Microtonus sericans* LeConte	—	—	—	—	1	—
208 *Phloeotrya vaudoueri* Mulsant	—	—	—	—	2	—
MONOTOMIDAE						
209 *Europs pallipennis* (LeConte)	—	—	1	—	—	—
MORDELLIDAE						
210 *Falsomordellistena bihamata* (Melsheimer)	—	3	6	—	—	4
211 *Falsomordellistena pubescens* (Fabricius)	—	—	1	—	—	—
212 *Glipostenoda ambusta* (LeConte)	—	—	1	—	2	6
213 *Mordellistena frosti* Liljeblad	—	—	1	—	—	1
214 *Mordellistena trifasciata* Ray	—	—	1	—	—	—
215 *Paramordellaria triloba* (Say)	—	—	7	—	—	—

SPECIES	GREENBRIER SIFT (77)	GREENBRIER EMERGENCE (123)	GREENBRIER FIT (159)	PORTERS CREEK SIFT (81)	PORTERS CREEK EMERGENCE (130)	PORTERS CREEK FIT (131)
NITIDULIDAE						
216 *Brassicogethes simplipes* (Easton)	—	—	—	—	—	2
217 *Carpophilus* spp.	—	1	1	—	—	—
218 *Epuraea* spp.	1	1	—	—	—	2
219 *Glischrochilus confluentus* (Say)	—	1	—	—	—	—
220 *Glischrochilus sanguinolentus* (Olivier)	—	—	1	—	—	2
221 *Pallodes pallidus* (Beauvois)	—	—	22	2	—	25
222 *Phenolia grossa* (Fabricius)	—	—	—	—	—	1
223 *Stelidota geminata* (Say)	1	—	45	—	—	9
224 *Stelidota octomaculata* (Say)	19	—	—	4	—	—
OEDEMERIDAE						
225 *Asclera ruficollis* (Say)	—	—	—	—	2	—
PHALACRIDAE						
226 *Acylomus* n. sp.	1	—	—	—	—	—
PTILIIDAE						
227 *Acrotrichis* spp.	—	1	27	461	—	73
228 *Micridium* sp.	—	—	—	—	1	—
229 *Nossidium* spp.	—	—	10	5	—	2
230 *Ptenidium* sp.	—	—	1	—	—	1
231 *Pteryx* spp.	2	84	—	2	56	—
232 Ptiliidae gen. spp.	—	22	42	1	9	39

SPECIES	GREENBRIER			PORTERS CREEK		
	SIFT (77)	EMERGENCE (123)	FIT (159)	SIFT (81)	EMERGENCE (130)	FIT (131)
PTILODACTYLIDAE						
233 *Ptilodactyla angustata* Horn	—	—	5	—	—	1
234 *Ptilodactyla carinata* Johnson and Freytag	—	3	—	—	1	1
235 *Ptilodactyla* spp. (female)	—	—	2	—	2	2
PTINIDAE (formerly ANOBIIDAE)						
236 *Caenocara* spp.	—	—	1	—	—	4
237 *Priobium sericeum* (Say)	—	5	1	—	6	1
238 *Protheca hispida* LeConte	—	—	4	—	—	—
239 *Sculptotheca puberula* (LeConte)	—	1	3	—	—	—
240 *Trichodesma klagesi* Fall	—	—	—	—	3	—
241 *Vrilletta laurentina* Fall	—	1	—	—	—	—
PYROCHROIDAE						
242 *Dendroides canadensis* Latreille	—	7	—	—	22	—
243 *Dendroides concolor* (Newman)	—	—	—	—	5	—
244 *Neopyrochroa flabellata* (Fabricius)	—	—	2	—	5	1
SALPINGIDAE						
245 *Rhinosimus viridiaeneus* (Randall)	—	—	—	—	11	—

SPECIES	GREENBRIER			PORTERS CREEK		
	SIFT (77)	EMERGENCE (123)	FIT (159)	SIFT (81)	EMERGENCE (130)	FIT (131)
SCARABAEIDAE						
246 *Canthon chalcites* (Haldeman)	—	—	1	—	—	1
247 *Canthon viridis* (Beauvois)	—	—	2	—	—	—
248 *Dialytellus tragicus* (Schmidt)	—	—	—	38	—	—
249 *Dialytes ulkei* Horn	—	—	1	—	—	—
250 *Gnorimella maculosa* (Knoch)	—	1	—	—	—	—
251 *Onthophagus hecate* (Panzer)	—	—	1	—	—	—
252 *Onthophagus orpheus* (Fabricius)	—	—	12	—	—	2
253 *Onthophagus striatulus* (Beauvois)	—	—	5	—	—	—
254 *Onthophagus taurus* (Schreber)	—	—	1	—	—	2
255 *Serica* spp. (female)	2	—	4	2	—	2
SCRAPTIIDAE						
256 *Anaspis rufa* Say	—	—	—	—	—	19
SILPHIDAE						
257 *Nicrophorus defodiens* Mannerheim	—	—	—	—	—	3
258 *Nicrophorus orbicollis* Say	—	—	18	—	—	3
SILVANIDAE						
259 *Uleiota dubia* (Fabricius)	—	1	—	—	—	—
SPHINDIDAE						
260 *Eurysphindus comatulus* McHugh	—	—	—	—	—	2

SPECIES	GREENBRIER			PORTERS CREEK		
	SIFT (77)	EMERGENCE (123)	FIT (159)	SIFT (81)	EMERGENCE (130)	FIT (131)
STAPHYLINIDAE						
Aleocharinae						
261 Aleocharinae gen. spp.	—	13	41	3	24	45
262 *Aleodorus bilobatus* (Say)	—	—	—	28	2	3
263 *Atheta* spp.	—	21	57	—	26	27
264 Athetini gen. spp.	4	1	15	5	1	29
265 *Borboropora quadriceps* (LeConte)	—	—	3	—	—	1
266 *Earota* spp.	—	—	—	—	1	—
267 *Euvira* sp.	3	—	—	2	—	—
268 *Gyrophaena* sp.	1	—	—	—	—	—
269 *Hoplandria klimaszewskii* Genier	—	—	7	—	—	16
270 *Leptusa cribratula* (Casey)	—	3	—	—	8	—
271 *Leptusa pseudosmokyiensis* Park and Carlton	—	—	—	1	—	—
272 *Leptusa pusio* (Casey)	—	1	—	13	11	—
273 *Leptusa* spp.	1	4	—	5	5	1
274 *Meronera venustula* (Erichson)	—	—	—	—	—	2
275 *Myllaena* spp.	—	—	—	4	—	—
276 *Myrmecocephalus cingulatus* (LeConte)	—	—	2	—	5	—
277 *Myrmedonota* n. sp.	—	—	5	—	—	277
278 *Oxypoda* sp.	—	—	—	1	—	—
279 *Placusa* spp.	—	—	—	—	—	2
Dasycerinae						
280 *Dasycerus* spp.	20	—	—	—	—	—

SPECIES	GREENBRIER			PORTERS CREEK		
	SIFT (77)	EMERGENCE (123)	FIT (159)	SIFT (81)	EMERGENCE (130)	FIT (131)
Euaesthetinae						
281 *Edaphus americanus* Puthz	4	3	—	1	1	—
Megalopsidiinae						
282 *Megalopinus caelatus* (Gravenhorst)	—	—	1	—	—	—
Omaliinae						
283 *Omalium fractum* Fauvel	—	1	—	—	1	—
Osoriinae						
284 *Thoracophorus costalis* (Erichson)	—	41	1	—	610	3
Oxyporinae						
285 *Oxyporus vittatus* Gravenhorst	—	—	1	—	—	—
Oxytelinae						
286 *Anotylus* spp.	—	—	16	83	1	27
287 *Carpelimus* sp. 1	—	—	—	11	—	—
288 *Oxytelus convergens* LeConte	—	—	—	1	—	2
289 *Oxytelus* spp. (female)	—	—	2	2	—	5
Paederinae						
290 *Achenomorphus corticinus* (Gravenhorst)	1	—	3	—	—	1
291 *Palaminus fraternus* Casey	1	—	—	—	—	—
292 *Palaminus* sp. (female)	1	—	—	—	—	—
293 *Rugilus* spp.	—	—	2	—	—	3
294 *Stilicopsis paradoxa* Sachse	2	—	—	—	—	—
295 *Sunius rufipes* (Casey)	154	—	—	93	—	—
296 *Sunius* spp.	—	—	1	—	1	—
Phloeocharinae						
297 *Charhyphus picipennis* (LeConte)	—	—	—	—	1	—

SPECIES	GREENBRIER			PORTERS CREEK		
	SIFT (77)	EMERGENCE (123)	FIT (159)	SIFT (81)	EMERGENCE (130)	FIT (131)
Piestinae						
298 *Siagonium americanum* (Melsheimer)	—	—	—	—	—	1
Proteininae						
299 *Proteinus* spp.	—	—	5	—	—	1
Pselaphinae						
300 *Actiastes fundatum* Grigarick and Schuster	—	—	—	38	—	3
301 *Actiastes* spp. (female)	—	—	—	76	1	1
302 *Actiastes suteri* (Park)	—	—	—	—	1	—
303 *Adranes lecontei* Brendel	7	11	—	—	—	—
304 *Batrisodes auerbachi* Park	—	—	1	—	—	2
305 *Batrisodes beyeri* Schaeffer	—	—	—	9	1	—
306 *Batrisodes ionae* (LeConte)	—	—	1	—	—	—
307 *Batrisodes lineaticollis* Aube	1	—	1	3	5	—
308 *Batrisodes schaumi* (Aube)	—	—	—	—	1	2
309 *Batrisodes* sp. 2	2	—	—	8	—	1
310 *Batrisodes* spp. (female)	—	1	1	—	6	—
311 *Bibloplectus* sp. (female)	—	1	—	—	—	—
312 *Cedius cruralis* Park	—	1	—	—	—	—
313 *Cedius spinosus* LeConte	—	—	—	—	3	—
314 *Conoplectus canaliculatus* (Brendel)	1	—	3	—	—	—
315 *Ctenisodes* spp.	19	—	—	—	—	—
316 *Custotychus spiculifer* (Casey)	2	—	—	—	—	—
317 *Custotychus* spp.	4	1	—	—	—	—
318 *Dalmosella tenuis* Casey	—	1	—	—	—	—
319 *Decarthron nigrocavum* Park	2	—	—	—	—	—

	SPECIES	GREENBRIER			PORTERS CREEK		
		SIFT (77)	EMERGENCE (123)	FIT (159)	SIFT (81)	EMERGENCE (130)	FIT (131)
320	*Euboarhexius perscitus* (Fletcher)	—	—	—	55	—	—
321	*Euboarhexius trogasteroides* Brendel	1	—	—	3	—	—
322	*Euplectus confluens* LeConte	—	—	—	—	1	—
323	*Euplectus longicollis* Casey	—	1	—	—	—	—
324	*Euplectus* spp. (female)	—	—	3	—	—	2
325	*Eutyphlus dybasi* Park	—	—	—	3	—	—
326	*Eutyphlus similis* LeConte	—	—	—	—	1	—
327	*Eutyphlus* sp. (female)	17	—	—	56	—	—
328	*Leptoplectus pertenuis* (Casey)	3	17	2	—	22	—
329	*Prespelea quirsfeldi* Park	—	—	—	3	—	—
330	*Pseudactium arcuatum* (LeConte)	15	—	—	—	—	—
331	*Pycnoplectus difficilis* (LeConte)	—	—	—	—	—	1
332	*Pycnoplectus infossus* (Raffray)	1	3	—	—	—	—
333	*Pycnoplectus interruptus* (LeConte)	—	—	—	1	—	—
334	*Pycnoplectus* spp. (female)	1	9	—	1	3	—
335	*Rhexius schmitti* Brendel	1	1	—	—	—	—
336	*Rhexius* spp. (female)	1	1	—	—	—	—
337	*Sonoma chouljenkoi* Ferro and Carlton	—	1	—	1	4	—
338	*Sonoma gilae* Ferro and Carlton	—	1	—	—	—	—
339	*Sonoma gimmeli* Ferro and Carlton	3	6	—	—	—	—
340	*Sonoma* spp. (female)	7	14	—	7	6	—
341	*Thesium cavifrons* (LeConte)	—	—	—	—	2	—
342	*Thesium* spp. (female)	—	—	—	—	2	—
343	*Trimiomelba dubia* (LeConte)	—	2	3	—	1	—
344	*Trimioplectus obsoletus* Brendel	—	5	—	—	3	—

SPECIES	GREENBRIER			PORTERS CREEK		
	SIFT (77)	EMERGENCE (123)	FIT (159)	SIFT (81)	EMERGENCE (130)	FIT (131)
Scaphidiinae						
345 *Baeocera pallida* Casey	—	—	—	—	—	1
346 *Baeocera* spp.	—	—	2	—	—	—
347 *Cyparium concolor* (Fabricius)	—	—	5	—	—	2
348 *Scaphisoma carolinae* Casey	—	—	1	—	—	—
349 *Scaphisoma convexum* Say	—	1	2	—	1	—
350 *Scaphisoma suturale* LeConte	2	—	—	—	—	1
351 *Toxidium gammaroides* LeConte	2	—	1	—	—	—
Scydmaeninae						
352 *Brachycepsis* sp.	1	—	—	—	—	—
353 *Euconnus* (*Napochus*) spp.	81	5	11	20	3	3
354 *Euconnus* (*Napoconnus*) spp.	—	—	—	—	2	—
355 *Euconnus* (*Scopophus*) n. sp.	—	3	—	—	4	1
356 *Euconnus* (*Scopophus*) spp.	12	5	3	18	7	8
357 *Euconnus* spp.	6	—	—	1	—	—
358 *Euthiconus* sp.	1	—	1	—	—	—
359 *Microscydmus (Delius)* sp.	—	1	—	—	—	—
360 *Microscydmus (Neladius)* sp.	—	—	1	—	—	—
361 *Parascydmus* spp.	—	2	7	—	1	2
362 *Scydmaenus* spp.	—	—	1	6	1	—
363 *Stenichnus* spp.	—	—	2	—	—	—
Staphylininae						
364 *Atrecus americanus* (Casey)	—	—	—	—	—	1
365 *Belonuchus rufipennis* (Fabricius)	—	1	—	—	2	—
366 *Bisnius blandus* (Gravenhorst)	—	1	50	—	—	39

		GREENBRIER			PORTERS CREEK		
	SPECIES	SIFT (77)	EMERGENCE (123)	FIT (159)	SIFT (81)	EMERGENCE (130)	FIT (131)
367	*Gabrius fallaciosus* (Horn)	—	—	—	—	5	3
368	*Hesperus apicialis* (Say)	—	51	—	—	36	—
369	*Hesperus baltimorensis* (Gravenhorst)	—	1	—	—	1	—
370	*Ontholestes cingulatus* (Gravenhorst)	—	—	30	—	—	25
371	*Philonthus asper* Horn	—	—	—	—	—	5
372	*Philonthus caeruleipennis* Mannerheim	—	—	163	—	—	29
373	*Philonthus* spp.	—	—	4	1	—	2
374	*Platydracus violaceus* (Gravenhorst)	—	—	7	—	—	3
375	*Platydracus viridanus* (Horn)	—	1	—	—	—	—
376	*Tympanophorus puncticollis* Erichson	—	—	1	—	—	—
Steninae							
377	*Stenus* spp.	—	—	—	2	—	—
Tachyporinae							
378	*Bryoporus rufescens* LeConte	5	—	21	—	—	2
379	*Bryoporus testaceus* LeConte	—	—	1	—	—	1
380	*Ischnosoma lecontei* Campbell	5	—	—	3	—	—
381	*Lordithon cinctus* (Gravenhorst)	—	—	1	—	—	—
382	*Lordithon facilis* (Casey)	—	—	—	—	—	1
383	*Lordithon notabilis* Campbell	—	—	2	—	—	5
384	*Mycetoporus americanus* Erichson	—	—	—	1	—	—
385	*Mycetoporus consors* LeConte	—	—	—	—	—	1
386	*Sepedophilus brachypterus* Campbell	—	—	—	2	4	—
387	*Sepedophilus cinctulus* (Erichson)	—	13	7	—	6	—
388	*Sepedophilus crassus* (Gravenhorst)	—	—	2	—	—	3

SPECIES	GREENBRIER			PORTERS CREEK		
	SIFT (77)	EMERGENCE (123)	FIT (159)	SIFT (81)	EMERGENCE (130)	FIT (131)
389 *Sepedophilus occultus* (Casey)	—	10	2	—	1	—
390 *Sepedophilus opicus* (Say)	—	—	1	—	—	—
391 *Sepedophilus* sp.	—	—	—	—	1	—
392 *Tachinus canadensis* Horn	—	—	—	—	—	1
393 *Tachinus fimbriatus* Gravenhorst	—	—	24	—	—	10
394 *Tachinus fumipennis* (Say)	—	—	—	—	—	3
395 *Tachinus luridus* Erichson	—	—	1	—	—	11
STENOTRACHELIDAE						
396 *Cephaloon lepturides* Newman	—	—	—	—	1	—
TENEBRIONIDAE						
397 *Anaedus brunneus* (Ziegler)	1	1	—	—	—	—
398 *Arthromacra aenea lengi* Parsons	—	1	—	—	—	—
399 *Centronopus calcaratus* (Fabricius)	—	—	—	—	8	—
400 *Dioedus punctatus* LeConte	—	—	—	—	—	1
401 *Hymenorus* spp. (female)	—	5	—	—	7	—
402 *Meracantha contracta* (Beauvois)	—	3	—	—	—	—
403 *Paratenetus* sp. 1	4	—	—	1	—	—
404 Tenebrionidae gen. spp.	—	4	—	—	1	—
TETRATOMIDAE						
405 *Eustrophopsis bicolor* (Fabricius)	—	—	1	—	—	—
406 *Holostrophus bifasciatus* (Say)	—	—	—	—	1	—
407 *Synstrophus repandus* (Horn)	—	—	—	—	—	1

SPECIES	GREENBRIER SIFT (77)	GREENBRIER EMERGENCE (123)	GREENBRIER FIT (159)	PORTERS CREEK SIFT (81)	PORTERS CREEK EMERGENCE (130)	PORTERS CREEK FIT (131)
THROSCIDAE						
408 *Aulonothroscus distans* Blanchard	—	248	1	—	158	—
409 *Aulonothroscus* spp.	—	—	—	—	1	—
TROGIDAE						
410 *Trox variolatus* Melsheimer	—	—	—	—	—	2
TROGOSSITIDAE						
411 *Thymalus marginicollis* Chevrolat	—	1	—	—	—	—
ZOPHERIDAE						
412 *Paha laticollis* (LeConte)	—	1	—	—	—	—
413 *Synchita fuliginosa* Melsheimer	—	—	—	—	2	—
Total (specimens/species)	**709/77**	**941/123**	**1079/159**	**1360/81**	**1689/130**	**1393/131**