Busey Woods Bioblitz
Report of Scientific Findings

Submitted to:
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by
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The results and findings of the Busey Wood Bioblitz were entered into the Illinois Natural History Survey (INHS) Mandela database under the oversight of database creator Gail Kampmeier. After UPD staff and volunteers spent much time verifying the authenticity of identifications and working with Kampmeier to make updates to the taxonomy of the new species identified and added to Mandela database, the final species count for the Bioblitz totaled 1327 species. The attached Mandela generated report shows the breakdown and distribution of species according to Kingdom and Major Groups. Among these, scientists discovered 738 invertebrates (611 insects), 378 higher plants, 62 fungi, 54 birds, 30 fish, 13 mammals, and 4 amphibians. It is notable that invertebrates accounted for over ½ of all species identified with higher plants adding considerably to that total. Such results are in keeping with the pyramidal trophic distribution of species fundamental to the ecological sciences. Kampmeier's attached report draws some additionally interesting comparisons between the findings of the Busey Woods blitz of 2005 and that of the Allerton Bioblitz of 2001, in which although just a fraction of Allerton in size, Busey Woods provided similar results across many of the major groups.

Beyond Kampmeier's comparisons, the results from such a study offer many opportunities for the UPD's environmental education staff to communicate and generate enthusiasm among its residents for the diversity of organisms that are present in a relatively small woodland—right in their own backyards. Furthermore, the Busey Woods Bioblitz provided the opportunity for the scientific community to become similarly excited about diversity of an urban natural area in their own hometown. Several of the scientists present admitted to having had relatively little opportunity to investigate the biodiversity of Champaign County much less a woodland within a few miles of the Illinois Natural History Survey's headquarters, many of these scientists commenting some degree of surprise by their findings. As Illinois Natural History Survey botanist Paul Marcum remarked: "In particular, the wetland near the south boundary shows excellent native character and provides valuable and much needed habitat for many native plants and animals. This area is valuable, not only for the plants and animals, but it is a tremendous resource and refuge for the Champaign-Urbana community."

Although not a complete and comprehensive survey, the results of the Busey Woods Bioblitz have significantly increased the scientific and land management community's understanding of the area's biodiversity. INHS botanists added 101 species of plant to the UPD's list of flora for the woods. Gary Lutterbie of the Illinois Department of Natural Resources (IDNR) added six species of fish to IDNR's list for the Saline Branch of the Salt Fork River: *Ambloplites rupestris, Carassius auratus, Ericymba buccata, Etheostoma blennioides, Ictalurus punctatus, Pomoxis annularis*. And perhaps most notably, Chris Dietrich of the Illinois Natural History Survey identified a state record planthopper as *Pissonotus aphidioides* Van Duzee.

The enthusiasm generated by the Bioblitz has continued on in many ways among the scientific community. Jim Nardi, who helped coordinate the invertebrate teams, provided the attached drawing of a rove beetle larvae and scan of a paurapod found during the blitz. Andrew Suarez provided the attached investigation of the ants of Busey Woods. Most recently, after being pleasantly surprised by the results of the survey of the aquatic macro invertebrates of the Saline Branch during the Bioblitz, Ed Dewalt and Lynn Flemma conducted a follow-up study on the Saline Ephemeroptera, Plecoptera, and Trichoptera diversity as indicators for overall stream health. Their report, although not as encouraging as the initial Bioblitz findings, is attached and has provided the impetus for UPD staff to continue such investigations and evaluate opportunities for increased stream stewardship along sections of the Saline contained within District lands.

Natural Areas Coordinator accounting of hours:

Hours spent in preparation/planning:	48 hours
Hours spent at actual event:	18 hours
Hours spent recording data after:	32 hours
Total:	98 Hours

Taxa Found by Major Group within a Kingdom

Animalia		Total by Kingdom	841
amphibians		Total of Major Group	4
Acris crepitans blanchardi			
Ambystoma texanum	small-mouthed salamander		
Bufo americanus americanus	eastern American toad		
Rana catesbeiana	bullfrog		
amphipods		Total of Major Group	1
Hyalella azteca			
bees, ants, wasps		Total of Major Group	132
Aliolus morphospecies 1 Whitfield			
Ammophilia morphospecies 1 Whitfield			
Andrena morphospecies 1 Cameron			
Apanteles morphospecies 1 Whitfield			
Apanteles morphospecies 2 Whitfield			
Aphaenogaster fulva			
Aphaenogaster tennesseensis			
Apidae morphospecies 1 Whitfield			
Apis mellifera Linnaeus			
Arotes morphospecies 1 Whitfield			
Aspilota morphospecies 1 Whitfield			
Aspilota morphospecies 2 Whitfield			
Atanycolus morphospecies 1 Whitfield			
Atanycolus morphospecies 2 Whitfield			
Augochlorini morphospecies 1 Cameron			
Augochlorini morphospecies 2 Cameron			
Bethylidae morphospecies 1 Whitfield			
Bombus bimaculatus			
Bombus impatiens			
Brachymyrmex depilis			
Bracon morphospecies 1 Whitfield			
Camponotus castaneus			
Camponotus nearcticus			
Camponotus pennsylvanicus (DeGreer)	carpenter ant		
Camponotus subbarbatus			
Ceraphronidae morphospecies 1 Whitfield			

Ceraphronidae morphospecies 2 Whitfield	
Charmon morphospecies 1 Whitfield	
Chelonus morphospecies 1 Whitfield	
Chelonus morphospecies 2 Whitfield	
Chrysididae morphospecies 1 Whitfield	
Chrysididae morphospecies 2 Whitfield	
Chrysididae morphospecies 3 Whitfield	
Cotesia morphospecies 1 Whitfield	
Crematogaster lineolata (Say)	
Cynipidae morphospecies 1 Whitfield	
Diapriidae morphospecies 1 Whitfield	
Diapriidae morphospecies 2 Whitfield	
Diapriidae morphospecies 3 Whitfield	
Diapriidae morphospecies 4 Whitfield	
Diapriidae morphospecies 5 Whitfield	
Diapriidae morphospecies 6 Whitfield	
Dolichovespula maculata	
Dryinidae morphospcies 1 Whitfield	
Dryinidae morphospecies 2 Whitfield	
Dryinidae morphospecies 3 Whitfield	
Enicospilus morphospecies 1 Whitfield	
Eulophidae morphospecies 1 Whitfield	
Eumenes morphospecies 1 Whitfield	
Eurytomidae morphospecies 1 Whitfield	
Evaniidae morphospecies 1 Whitfield	
Evaniidae morphospecies 2 Whitfield	
Formica fusca Linnaeus	
Formica pallidefulva	
Glyptapanteles morphospecies 1 Whitfield	
Halictidae morphospecies 1 Cameron	
Halictidae morphospecies 2 Cameron	
Halictidae morphospecies 3 Cameron	
Halictidae morphospecies 4 Cameron	
Heterospilus morphospecies 1 Whitfield	
Hylaeus morphospecies 1 Whitfield	
Ichneumonidae morphospecies 1 Whitfield	
Ichneumonidae morphospecies 10 Whitfield	

Ichneumonidae morphospecies 11 Whitfield	
Ichneumonidae morphospecies 12 Whitfield	
Ichneumonidae morphospecies 13 Whitfield	
Ichneumonidae morphospecies 14 Whitfield	
Ichneumonidae morphospecies 15 Whitfield	
Ichneumonidae morphospecies 16 Whitfield	
Ichneumonidae morphospecies 17 Whitfield	
Ichneumonidae morphospecies 18 Whitfield	
Ichneumonidae morphospecies 19 Whitfield	
Ichneumonidae morphospecies 2 Whitfield	
Ichneumonidae morphospecies 20 Whitfield	
Ichneumonidae morphospecies 3 Whitfield	
Ichneumonidae morphospecies 4 Whitfield	
Ichneumonidae morphospecies 5 Whitfield	
Ichneumonidae morphospecies 6 Whitfield	
Ichneumonidae morphospecies 7 Whitfield	
Ichneumonidae morphospecies 8 Whitfield	
Ichneumonidae morphospecies 9 Whitfield	
Lasius alienus	
Lasius umbratus	
Leptothorax curvispinosus	
Leptothorax schaumi	
Megachile morphospecies 1 Cameron	
Megachilidae morphospecies 2 Cameron	
Megarhyssa morphospecies 1 Whitfield	
Megaspilidae morphospecies 1 Whitfield	
Megaspilidae morphospecies 2 Whitfield	
Meteorus morphospecies 1 Whitfield	
Microctonus morphospecies 1 Whitfield	
Microplitis morphospecies 1 Whitfield	
Myrmecina americana	
Myrmica spatula Smith	
Netelia morphospecies 1 Whitfield	
Orgilus moprhospecies 1 Whitfield	
Oxybelis morphospecies 1 Hauser	
Paratrechina parvula	
Perilampidae morphospecies 1 Whitfield	

Platygastridae morphospecies 1 Whitfield	
Polistes morphospecies 1 Whitfield	
Pompilidae morphospecies 1 Whitfield	
Pompilidae morphospecies 2 Whitfield	
Pompilidae morphospecies 3 Whitfield	
Pompilidae morphospecies 4 Whitfield	
Ponera pennsylvanica	
Proceratium silaceum	
Pteromalidae morphospecies 1 Whitfield	
Sapygidae morphospecies 1 Whitfield	
Scelionidae morphospecies 1 Whitfield	
Scelionidae morphospecies 2 Whitfield	
Scoliidae morphospecies 1 Whitfield	
Spathius morphospecies 1 Whitfield	
Sphecidae morphospecies 1 Whitfield	
Sphecidae morphospecies 2 Whitfield	
Sphecidae morphospecies 3 Whitfield	
Sphecidae morphospecies 4 Whitfield	
Sphecidae morphospecies 5 Whitfield	
Sphecidae morphospecies 6 Whitfield	
Sphecidae morphospecies 7 Whitfield	
Stenamma impar	
Tapinoma sessile (Say)	
Tenthredinidae morphospecies 1 Whitfield	
Tenthredinidae morphospecies 2 Whitfield	
Tenthredinidae morphospecies 3 Whitfield	
Tenthredinidae morphospecies 4 Whitfield	
Tetramorium caespitum (Linnaeus)	
Tiphiidae morphospecies 1 Whitfield	
Torymidae morphospecies 1 Whitfield	
Vespula morphospecies 1 Whitfield	
Xylocopa virginica	

beetles	Total of Major Group	96

Agrilus	
Berosus	
Bolitotherus cocnutus	
Bostrichidae morphospecies 1 Reagel	

Bruchidae morphospecies 1 Lacey	
Bruchidae morphospecies 1 Reagel	
Buprestidae Acmaeodera	
Cantharidae Cantharis	
Cantharidae morphospecies 1 Reagel	soldier beetle
Cantharidae morphospecies 2 Reagel	
Cantharidae Trypherus Lacey	
Carabidae morphospecies 1 Reagel	ground beetle
Carabidae morphospecies 2 Reagel	
Cerambycidae Urographis	
Chauliognathus pennsylvanicus	soldier beetle
Chrysomelidae morphospecies 1 Lacey	
Chrysomelidae morphospecies 1 Reagel	
Chrysomelidae morphospecies 2 Lacey	
Cicindelidae morphospecies 1 Reagel	tiger beetle
Ciidae	minute tree fungus beetle
Cleridae Chariessa	
Cleridae morphospecies 1 Reagel	
Cleridae morphospecies 2 Reagel	
Coccinelidae	ladybird beetle
Coccinellidae morphospecies 1 Lacey	
Coccinellidae morphospecies 1 Reagel	
Curculionidae morphospecies 1 Lacey	
Curculionidae morphospecies 1 Nardi	weevil
Curculionidae morphospecies 2 Lacey	
Curculionidae morphospecies 2 Nardi	weevil
Curculionidae morphospecies 3 Nardi	weevil
Curculionidae morphospecies 4 Nardi	weevil
Derodontidae	tooth-necked fungus beetle
Dubiraphia Sanderson	
Elateridae morphospecies 1 Lacey	
Elateridae morphospecies 1 Reagel	
Erotylidae Megalodacne	
Erotylidae morphospecies 1 Lacey	
Erotylidae morphospecies 1 Reagel	
Hippopsis lemniscata	long-horned beetle
Hydrophilidae morphospecies 1 Reagel	

Hydrophilidae morphospecies 2 Reagel	
Lampyridae Photuris	
Languria mozardi	clover stem borer
Lathridiidae	miute brown scavenger beetle
Liopinus alpha	
Malthinus	
Melandryidae morphospecies 1 Reagel	
Melanophila	
Metriona bicolor	
Mordellidae morphospecies 1 Reagel	
Mordellidae Tomoxia	tumbling flower beetle
morphospecis 1 Nardi	
Nitidulidae morphospecies 1 Lacey	
Nitidulidae morphospecies 1 Nardi	sap beetle
Nitidulidae morphospecies 2 Lacey	
Nitidulidae morphospecies 2 Nardi	sap beetle
Nitidulidae morphospecies 3 Lacey	
Nitidulidae morphospecies 3 Nardi	sap beetle
Oberea tripunctata	dogwood twig borer
Phyllophaga	
Podabrus	
Podabrus morphospecies 1 Reagel	
Popilia japonica	japanese beetle
Prionus	
Pselaphidae morphospecies 2 Nardi	short-winged mold beetle
Pselaphidae morphospecies1 Nardi	shot-winged mold beetle
Ptiliidae morphospecies 1 Nardi	feathering beetle
Ptiliidae morphospecies 2 Nardi	feathering beetle
Ptiliidae morphospecies 3 Nardi	feathering beetle
Ptilodactylidae	
Scydmaenidae	
Scydmaenidae morphospecies 1 Lacey	
Staphylinidae morphospecies 1 Lacey	
Staphylinidae morphospecies 1 Nardi	rove beetle
Staphylinidae morphospecies 10 Nardi	rove beetle
Staphylinidae morphospecies 11 Nardi	rove beetle
Staphylinidae morphospecies 12 Nardi	rove beetle

Staphylinidae morphospecies 13 Nardi	rove beetle
Staphylinidae morphospecies 2 Lacey	
Staphylinidae morphospecies 2 Nardi	rove beetle
Staphylinidae morphospecies 3 Lacey	
Staphylinidae morphospecies 3 Nardi	rove beetle
Staphylinidae morphospecies 4 Nardi	rove beetle
Staphylinidae morphospecies 5 Nardi	rove beetle
Staphylinidae morphospecies 6 Nardi	rove beetle
Staphylinidae morphospecies 7 Nardi	rove beetle
Staphylinidae morphospecies 8 Nardi	Rove beetle
Staphylinidae morphospecies 9 Nardi	rove beetle
Stenelmis Dufour	
Tenebrionidae morphospecies 1 Lacey	
Tenebrionidae morphospecies 2 Lacey	
Tetraopes tetrophthalmus	
Trichodes morphospecies 1 Hauser	
Trichodes morphospecies 2	
Tylonotus bimaculatus Hald	

birds — Total of Major Group 54

Agelaius phoeniceus	Red-winged Blackbird
Aix sponsa	Wood Duck
Anas platyrhynchos	Mallard
Archilochus colubris	Ruby-throated Hummingbird
Ardea herodias	Great Blue Heron
Bombycilla cedrorum	Cedar Waxwing
Butorides virescens	Green Heron
Cardinalis cardinalis	Northern Cardinal
Carduelis tristis	American Goldfinch
Carpodacus mexicanus	House Finch
Ceryle alcyon	Belted Kingfisher
Chaetura pelagica	Chimney Swift
Charadrius vociferus	Killdeer
Chordeiles minor	Common Nighthawk
Coccyzus americanus	Yellow-billed Cuckoo
Colaptes auratus	Northern Flicker
Columba livia	Rock Dove, Pigeon
Contopus virens	Eastern Wood-pewee

Corvus brachyrhynchos	American Crow
Cyanocita cristata	Blue Jay
Dumetella carolinensis	Gray Catbird
Geothlypis trichas	Common Yellowthroat
Hirundo rustica	Barn Swallow
Hylocichla mustelina	Wood Thrush
Icterus galbula	Baltimore oriole, northern oriole
Melanerpes carolinus	Red-bellied Woodpecker
Melospiza melodia	Song Sparrow
Molothrus ater	Brown-headed Cowbird
Myiarchus crinitus	Great Crested Flycatcher
Otus asio	Eastern Screech-owl
Passer domesticus	House Sparrow
Passerina cyanea	Indigo Bunting
Picoides pubescens	Downy Woodpecker
Picoides villosus	Hairy Woodpecker
Pipilo erythrophthalmus	rufous-sided towhee, eastern
Poecile atricapillus	Black-capped Chickadee
Poecile carolinensis	Carolina Chickadee
Polioptila caerulea	Blue-gray Gnatcatcher
Protonotaria citrea	Prothonotary Warbler
Quiscalus quiscula	Common Grackle
Sayornis phoebe	Eastern Phoebe
Sitta carolinensis	White-breasted Nuthatch
Spizella passerina	Chipping Sparrow
Stelgidopteryx serripennis	Northern Rough-winged Swallow
Strix varia	Barred Owl
Sturnus vulgaris	European Starling
Thryothorus ludovicianus	Carolina Wren
Toxostoma rufum	Brown Thrasher
Troglodytes aedon	House Wren
Turdus migratorius	American Robin
Vireo flavifrons	Yellow-throated Vireo
Vireo gilvus	Warbling Vireo
Vireo olvaaceus	Red-eyed Vireo
Zenaida macroura	Mourning Dove

book lice, bark lice	Total of Major Group	6

Psocoptera morphospecies 1 Nardi	
Psocoptera morphospecies 2 Nardi	
Psocoptera morphospecies 3 Nardi	
Psocoptera morphospecies 4 Nardi	
Psocoptera morphospecies 5 Nardi	
Psocoptera morphospecies 6 Nardi	

butterflies, moths	Total of Major Group	156

Acleris chalybeana	
Acrolophus popeanella	
Acronicta americana	
Aglossa cuprina	
Agonopterix alstromeriana	
Amydria morphospecies 1 Harrison	
Amydria morphospecies 2 Harrison	
Anacamptodes defectaria	
Antispila hydrangiaeella	
Argyresthia morphospecies 1 Harrison	
Argyresthia morphospecies 2 Harrison	
Argyrotaenia velutinana (Walker)	
Aristotellia roseosuffusella (Clemens)	
Artogeia rapae	cabbage white
Asterocampa celtis	Hackberry butterfly
Atteva punctella	Ermine moth
Autographa precationis	
Baileya australis	
Balsa malana	
Batrachedra curvilineella	
Blastobasidae morphospecies 1 Harrison	
Blastobasidae morphospecies 2 Harrison	
Blastobasidae morphospecies 3 Harrison	
Bromolocha abalienalis	
Bucculatrix	
Caenurgina erechtea	
Callima argenticinctella Clemens	
Caloptilia morphospecies 1 Harrison	
Cameraria ulmella	
cartiella	

Celastrina neglecta	summer azure
Ceratomia undulosa	
Chionodes morphospecies 1 Harrison	
Chionodes morphospecies 2 Harrison	
Chionodes negundella	
Chrysoteuchia topiaria	
Coleophora mayri	
Coleophora morphospecies 1 Harrison	
Coleotechnites	
Coptodisca	
Corticivora clarki	
Cosmiotes illectella Clemens	
Cosmopterix clemensella	
Cosmopterix pulcherrima	
Crambidae morphospecies 2 Harrison	
Crambinae morphospecies 1 Harrison	
Crambinae morphospecies 2 Harrison	
Crambus agitatellus	
Crocidophora tuberculalis	
Decantha boreasella	
Dichomeris ventrella (Fitch)	
Diploschizia impigritella	
Ectropis crepuscularia	
Elachista madarella (Clemens)	
Endothenia hebesana (Walker)	
Epermenia pimpinella	
Epiblema morphospecies 1 Harrison	
Epiblema morphospecies 2 Harrison	
Eulithis diversilineada	lesser grapevine looper
Eustixia pupula	
Fomoria pteliaeella	
Galgula partita	
Grapholita prunivora (Walsh)	
Haematopis grataria	
Halysidota tessellaris	
Haploa confusa	
Haploa lecontei (Guerin-Meneville)	Leconte's Haploa

Haploa reversa (Stretch)	reversed Haploa moth
Hedya chionosema	
Helcystogramma chambersella	
Herculia infimbrialis	
Homosetia	
Hyalophora cecropia	
Hybroma servulella Clemens	
Hypeninae	Deltoid Noctuid
Hypoprepia fucosa	Painted Lychen Moth
Ipimorpha pleonectusa	
Isophrictis similiella	
Itame pustularia	
Limenitis arthemis astyanax (Fabricius)	Red spotted purple
Lithacodia carneola	
Lytrosis unitaria	
Mellilla xanthometata (Walker)	
Metanema inatomaria	
Metzneria lappella (Linnaeus)	
Microcrambus biguttellus	
Microcrambus elegans (Clemens)	
Microcrambus kimballi	
Mompha solomoni	
Monopsis crocicapitella	
Nadata gibbosa	
Nematocampa limbata	
Neodactria morphospecies 1 Harrison	
Noctua pronuba	
Nomophila nearctica	
Oligia modica	
Orthonama centrostrigaria	bent-line carpet
Orthonama obstipata	
Parornix	
Perimede	
Periploca	
Philonome clemensella	
Phycitinae morphospecies 1 Harrison	
Phycitinae morphospecies 2 Harrison	

Phycitinae morphospecies 3 Harrison	
Phycitinae morphospecies 4 Harrison	
Phycitinae morphospecies 5 Harrison	
Phycitinae morphospecies 6 Harrison	
Phyllocnistis vitifoliella	
Phyllonorycter crataegella	
Pigritia	
Pleuroprucha insulsaria	
Plutella xylostella (Linnaeus)	
Polia latex	
Polygonia interrogationis (Fabricius)	Question mark
Prochoerodes transversata	large maple spanworm
Proteoteras	
Protolampra brunneicollis	
Pseudaletia unipuncta	Army worm moth
Pseudopostega albogalleriella	
Pterophoridae	
Pyraustinae	
Raphia abrupta	
Raphia frater	
Scoleocampa liburna	
Scoparia basalis Walker	
Sesiidae	
Spargaloma sexpunctata	
Speyeria cybele (Fabricius)	Great spangled fritillary
Stigmella chalybeia	
Stigmella purpuratella	
Stigmella quercipulchella	
Syncopacma palpilineella	
Tanygona lignicolorella	
Tegeticula yuccasella	yucca moth
Tetanolita mynesalis	
Tineidae morphospecies 1 Harrison	
Tortricidae morphospecies 1 Harrison	
Tortricidae morphospecies 2 Harrison	
Tortricidae morphospecies 3 Harrison	
Tortricidae morphospecies 4 Harrison	

Tortricidae morphospecies 5 Harrison	
Tortricidae morphospecies 6 Harrison	
Tortricidae morphospecies 7 Harrison	
Udea rubigalis	
Untomia albistrigella	
Urola nivalis (Drury)	
Vanessa atalanta rubria (Fruhstorfer)	Red admiral
Vanessa cardui	
Vaxi auratella (Clemens)	
Walshia miscecolorella	
Xanthorhoe ferrugata	
Xylesthia pruniramiella Clemens	
Yestia dolosa	Greater black-legged dart
Yponomeuta multipunctella Clemens	
Zale lunifera	
caddisflies	Total of Major Group 14
Ceraclea cancellata	
Ceraclea tarsipunctata Vorhies	
Ceraclea transversa Hagen	
Cheumatopsyche analis	
Cheumatopsyche campyla Ross	
Helicopsyche borealis	
Hydropsyche betteni Ross	
Hydropsyche simulans Ross	
Hydroptila armata	
Hydroptila waubesiana (Betten)	
Oecetis inconspicua Walker	
Oxyethira pallida Banks	
Potamyia flava (Hagen)	
Ptilostomis ocellifera Walker	
centipedes	Total of Major Group 1
Geophilomorpha	soil centipede
cockroaches	Total of Major Group 1
Parcoblatta pennsylvanica (DeGeer)	
crayfish	Total of Major Group 2
Orconectes propinquus	Northern clearwater crayfish
Orconectes virilis	virile crayfish

daddy longlegs	Total of Major Group	2
Phalangodidae morphospecies 1 Nardi		
Phalangodidae morphospecies 2 Nardi		
dragonflies, damselflies	Total of Major Group	15
Argia apicalis Say	blue-fronted dancer	
Dromogomphus		
Enallagma		
Epiaeschna heros		
Erythemis simplicicollis Say		
Hetaerina americana Fabricius		
Ischnura hastata (Say)	citrine forktail	
Ischnura verticalis Say		
Lestes		
Libellula luctuosa Burmeister		
Libellula (Plathemis) lydia (Drury)		
Libellula vibrans		
Macromia		
Pachydiplax longipennis (Burmeister)	blue dasher	
Somatochlora linearis		
earthworms	Total of Major Group	2
Lumbricidae morphospecies 1 Zaborski	earthworm	
Lumbricidae morphospecies 2 Zaborski	earthworm	
earwigs	Total of Major Group	1
Forficula auricularia	European earwig	
fish	Total of Major Group	30
Ambloplites rupestris (Rafinesque)	rock bass	
Ameiurus natalis (Lesueur)	yellow bullhead	
Carassius auratus Linnaeus	goldfish	
Catostomus commersoni (Lacepede)	white sucker	
Cyprinella spiloptera (Cope)	spotfin shiner	
Cyprinella whipplei Girard	steelcolored shiner	
Cyprinus carpio Linnaeus	common carp	
Dorosoma cepedianum (Lesueur)	gizzard shad	
Ericymba buccata Cope	silverjaw minnow	
Esox americanus Gmelin	grass pickerel	
Etheostoma blennioides Rafinesque	greenside darter	
Etheostoma nigrum Rafinesque	johnny darter	

Fundulus notatus (Rafinesque)	blackstripe topminnow
Hypentelium nigricans (Lesueur)	northern hog sucker
Ictalurus punctatus (Rafinesque)	channel catfish
Lepomis cyanellus (Rafinesque)	green sunfish
Lepomis macrochirus Rafinesque	bluegill
Lepomis megalotis (Rafinesque)	longear sunfish
Luxilus chrysocephalus (Rafinesque)	striped shiner
Lythrurus umbratilis (Girard)	redfin shiner
Micropterus dolomieu Lacepede	smallmouth bass
Micropterus punctulatus (Rafinesque)	spotted bass
Micropterus salmoides (Lacepede)	largemouth bass
Minytrema melanops (Rafinesque)	spotted sucker
Nocomis biguttatus (Kirtlandi)	hornyhead chub
Notropis ludibundus (Girard)	sand shiner
Notropis rubellus (Agassiz)	rosyface shiner
Noturus flavus Rafinesque	stonecat
Pimephales notatus (Rafinesque)	bluntnose minnow
Pomoxis annularis Rafinesque	white crappie

flatworms	Total of Major Group	1

Dugesia tigrina	

flies	Total of Major Group	45

Ablabesmyia	
Aedes solicitans	
Aedes triseriatus (Say)	
Aedes trivittatus	
Aedes vexans	
Allognosta	
Allograpta	
Anopheles punctipennis (Say)	
Calliphoridae	
Ceratopogonidae	
Chloropidae	
Choerades	
Coquillettidia peturbans	
Culex pipiens Linnaeus	
Culex restuans	
Dolichopodidae morphospecies 1 Hauser	

Dolichopodidae morphospecies 2	
Efferia	
Mallota	
Micropezidae	
Muscidae	
Nilotanypus	
Nilotanypus fimbriatus	
Ocyptamus	
Paragus	
Paratendipes	
Physocephala	
Pipunculidae	
Platypezidae	
Procladius	
Psychodidae	
Ptecticus tivittatus	
Rhagionidae	
Sarcophagidae	
Scatophagidae	dung flies
Solva	
Spilomyia	
Syrphus	
Tabanus	
Tabanus trimaculatus	
Tipulidae	
Toxomerus	
Tribelos fuscicorne	
Xanthogramma	
Xylota	

grasshoppers, crickets, katydids	Total of Major Group	5

Ceuthophilus divergens	divergent camel cricket
Dissostiera carolina	Carolina grasshopper
Gryllus veletis	spring field cricket
Melanoplus sanguinipes	migratory grasshopper
Nemobiinae	

lacewings, antlions, alderflies	Total of Major Group	1

Chrysopidae	

mammals		Total of Major Group	13
	Didelphis virginiana Kerr	Virginia opossum	
	Eptesicus fuscus (Beauvois)	Big brown bat	
	Homo sapiens	Human being	
	Marmota monax (Linnaeus)	Woodchuck	
	Microtus ochrogaster (Wagner)	Prairie vole	
	Mustela vison Schreber	Mink	
	Odocoileus virginianus (Zimmermann)	White-tailed Deer	
	Peromyscus leucopus	White-footed mouse	
	Procyon lotor (Linnaeus)	Raccoon	
	Sciurus carolinensis Gmelin	Gray squirrel	
	Sciurus niger Linnaeus	Fox squirrel	
	Sylvilagus floridanus (Allen)	Eastern cottontail	
	Vulpes vulpes (Linnaeus)	red fox	
mantids		Total of Major Group	1
	Mantodea	mantids	
mayflies		Total of Major Group	13
	Acerpenna pygmaea (Hagen)		
	Baetis flavistriga		
	Baetis intercalaris McDunnough		
	Caenis latipennis Banks		
	Centroptilum		
	Fallceon quilleri		
	Hexagenia limbata (Serville)		
	Leucrocuta hebe (McDunnough)		
	Nixe inconspicua		
	Pseudocloeon propinquum (Walsh)		
	Stenacron interpunctatum (Say)		
	Stenonema terminatum terminatum (Walsh)		
	Tricorythodes Ulmer		
millipedes		Total of Major Group	3
	Julida	millipede	
	Parasitidae morphospecies 3 Ugarte		
	Polydesmida		
mites, ticks		Total of Major Group	47
	Alicorhagia		
	Ascidae Asca	bee mite	

Ascidae morphospecies 1 Ugarte	
Ascidae morphospecies 2 Ugarte	
Astigmata	
Bdellidae	
Brachychthoniidae	
Cunaxidae	
Epilohmanniidae morphospecies 1 Zaborski	
Epilohmanniidae morphospecies 2 Zaborski	
Eupodidae morphospecies 1 Zaborski	
Eupodidae morphospecies 2 Zaborski	
Linopodes	
Mesostigmata morphospecies 1 Ugarte	
Nanorchestidae	
Ologamasidae	
Oppiella nova	
Oribatida morphospeceis 8 Zaborski	
Oribatida morphospecies 1 Zaborski	
Oribatida morphospecies 10 Zaborski	
Oribatida morphospecies 11 Zaborski	
Oribatida morphospecies 2 Zaborski	
Oribatida morphospecies 3 Zaborski	
Oribatida morphospecies 4 Zaborski	
Oribatida morphospecies 5 Zaborski	
Oribatida morphospecies 6 Zaborski	
Oribatida morphospecies 7 Zaborski	
Oribatida morphospecies 9 Zaborski	
Parasitengona sp. 1	
Parasitengona sp. 2	
Parasitidae morphospecies 1 Ugarte	
Parasitidae morphospecies 2 Ugarte	
Phthiracaridae	
Phytoseiidae	
Podocinidae Podocinum	
Polyaspididae	
Prostigmata morphospecies 1 Zaborski	
Prostigmata morphospecies 2 Zaborski	
Prostigmata morphospecies 3	

Rhagidiidae	
Rhodacaridae	
Scutacaridae	
Tarsonemidae	
Tectocepheus minor	
Tectocepheus velatus	
Uropodidae	
Veigaiidae	
mollusks	**Total of Major Group 10**
Anodontoides ferussacianus	cylindrical papershell
Corbicula fluminea (Müller)	Asian clam
Ferissia rivulans	Limpit
Helisoma anceps (Menke)	Two-ridge Rams-horn4405
Physella	
Physella gyrina (Say)	Tadpole Physa
Planorbis	
Sphaerium	fingernail clam
Sphaerium morphospecies 1 Cummings	fingernail clam
Uniomerus tetralasmus (Say)	Pondhorn
nematodes	**Total of Major Group 18**
Aphelenchus avenae	
Aporcelaimus	
Croconemella macrodora	ring nematode
Diplogaster	
Helicotylenchus morphospecies 1 Noel	
Helicotylenchus morphospecies 2 Noel	
Helicotylenchus morphospecies 3	
Heterodera	
Longidorus crassus	
Meloidogyne hapla	
Mononchus	
Mononchus papillatus	
Neotylenchus	
Rhabditis	
Tripylidae	
Tylenchorhynchus nudus	stunt nematode
Xiphinema americanum	dagger nematode

Xiphinema chambersi	dagger nematode
ostracods	Total of Major Group 1
Cypridopsis	
pauropods	Total of Major Group 1
Pauropoda	pauropods
pillbugs	Total of Major Group 5
Armadillidium	
Caecidotea	
Cylisticus convexus	sowbug
Lirceus	
Trachelipus rathkei	
plant bugs	Total of Major Group 36
Acutalis tartarea	
Agallia constricta	
Anoscopus serratulae	
Aphis spiraecola	
Balclutha abdominalis	
Balclutha neglecta	
Balclutha punctata	
Campylenchia latipes	
Capitophorus eleaegni	
Catamergus kickapoo	
Chaetosiphon	
Chlorotettix attenuatus	
Chlorotettix galbanatus	
Delphacodes laminalis	
Dikraneura angustata Ball & DeLong	
Dikrella cuneata	
Drepanaphis	
Empoasca fabae	potato leafhopper
Entylia carinata	
Forcipata loca DeLong & Caldwell	
Graminella fitchii (Van)	
Graphocephala coccinea (Forster)	
Jikradia olitoria	
Latulus sayi (Fitch)	
Lepyronia quadrangularis Say	

Micrutalis calva	
Myndus fulvus Osborn	
Nesosteles neglecta	
Oncometopia orbona	
Pemphigus	
Planicephalus flavicostus	
Polyamia caperata	
Polyamia weedi	
Ponana	
Prociphilus fraxinifolii	
Prosapia bicincta	
Scaphytopius acutus	
Subsaltusaphis wanica	
Thripsaphis	
Tylozygus bifidus	
Uroleucon (Lambersius)	
Uroleucon (Uroleucon)	
proturans	Total of Major Group 1
Protura	proturans
pseudoscorpions	Total of Major Group 2
Pseudoscorpionida morphospecies 1 Nardi	
Pseudoscorpionida morphospecies 2 Nardi	
reptiles	Total of Major Group 1
Terrapene carolina carolina (Linnaeus)	Eastern Box Turtle
snails	Total of Major Group 1
Ferrissia	
spiders	Total of Major Group 7
Araneidae	
Clubionidae	
Lycosidae	
Phalangodidae morphospecies 3 Nardi	
Salticidae	
Tetragnathidae	
Thomisidae	
springtails	Total of Major Group 19
Entomobryidae morphospecies 1 Nardi	
Entomobryidae morphospecies 10 Nardi	

Entomobryidae morphospecies 2 Nardi	
Entomobryidae morphospecies 3 Nardi	
Entomobryidae morphospecies 4 Nardi	
Entomobryidae morphospecies 5 Nardi	
Entomobryidae morphospecies 6 Nardi	
Entomobryidae morphospecies 7 Nardi	
Entomobryidae morphospecies 8 Nardi	
Entomobryidae morphospecies 9 Nardi	
Hypogastruridae	
Isotomidae morphospecies 1 Nardi	
Isotomidae morphospecies 2 Nardi	
Isotomidae morphospecies 3 Nardi	
Isotomidae morphospecies 4 Nardi	
Neelidae	
Sminthuridae morphospecies 1 Nardi	
Sminthuridae morphospecies 2 Nardi	
Sminthuridae morphospecies 3 Nardi	
stoneflies	Total of Major Group 2
Perlesta decipiens Walsh	
Perlesta lagoi Stark	
symphylans	Total of Major Group 1
Symphyla	symphylans
thrips	Total of Major Group 1
Thysanoptera	thrips
true bugs	Total of Major Group 87
Acanalonia	
Acanalonia bivittata	
Aceratagallia agricola	
Acutalis tartarea	
Agallia quadripunctata	
Agalliopsis peneoculata	
Amblysellus curtisii (Fitch)	
Aphrodes albifrons (Linnaeus)	
Aphrodes bicincta	
Aulacizes irrorata	
Balclutha abdominalis	
Balclutha impicta	

Bruchomorpha oculata Newman	
Campodeidae	
Carynota mera	
Chlorotettix attenuatus	
Clastoptera obtusa	Alder Spittle Bug
Coreidae morphospecies 1 Dietrich	
Corimelaenidae	negro bugs
Dikraneura mali	
Dikraneura mali (Provancher)	
Draeculacephala antica (Walker)	
Draeculacephala constricta Davidson & DeLong	
Draeculacephala mollipes (Say)	
Elymana acuma DeLong	
Empoasca bifurcata	
Empoasca recurvata	
Enchenopa binotata	
Entylia bactriana Germar	
Entylia carinata	
Erythroneura aclys	
Eupteryx	
Forcipata loca DeLong & Caldwell	
Graminella fitchii (Van)	
Graphocephala versuta (Say)	
Gyponana	
Gyponana brevita DeLong	
Gyponana panda DeLong	
Latulus sayi (Fitch)	
Liburniella ornata	
Limotettix uhleri	
Lygaeidae morphospecies 1 Dietrich	
Lygaeidae morphospecies 2 Dietrich	
Lygaeidae morphospecies 3 Dietrich	
Lygaeidae morphospecies 4 Dietrich	
Membracidae Crytolobus Dietrich	
Microcentrus caryae	
Micrutalis calva	
Miridae morphospecies 1 Dietrich	

Miridae morphospecies 10 Dietrich	
Miridae morphospecies 11 Dietrich	
Miridae morphospecies 12 Dietrich	
Miridae morphospecies 13 Dietrich	
Miridae morphospecies 14 Dietrich	
Miridae morphospecies 15 Dietrich	
Miridae morphospecies 2 Dietrich	
Miridae morphospecies 3 Dietrich	
Miridae morphospecies 4 Dietrich	
Miridae morphospecies 5 Dietrich	
Miridae morphospecies 6 Dietrich	
Miridae morphospecies 7 Dietrich	
Miridae morphospecies 8 Dietrich	
Miridae morphospecies 9 Dietrich	
Myndus fulvus Osborn	
Nabidae morphospecies 1 Dietrich	
Nabidae morphospecies 2 Dietrich	
Oncometopia orbona	
Osbornellus	
Paraphlepsius	
Pediopsoides	
Penestragania robusta	
Pentatomidae morphospecies 1 Dietrich	
Pentatomidae morphospecies 2 Dietrich	
Philaenus spumarius Linnaeus	meadow spittlebug, meadow
Phymatidae	
Pissonotus aphidioides	
Ponana quadralaba	
Reduviidae morphospecies 1 Dietrich	
Scaphoideus cinerosus Osborn	
Scaphoideus morphospecies 1 Dietrich	
Scaphoideus morphospecies 2 Dietrich	
Scaphoideus titanus	
Scaphoideus torqus	
Scolops sulcipes (Say)	
Stenocranus morphospecies 1 Dietrich	
Stenocranus morphospecies 2 Dietrich	

	Stictocephala		
	Stictocephala brevitylus		
	Stictocephala diceros		
	Stictocephala taurina		
	Trichocorixa		
	Tylozygus bifidus		
water fleas		Total of Major Group	2
	Ceriodaphnia		
	Daphnia		
Bacteria		Total by Kingdom	5
bacteria		Total of Major Group	4
	Frankia		
	Rhizobium	rhizobial bacteria	
	Serratia	canker bacteria	
	Thiobacillus		
blue-green algae		Total of Major Group	1
	Oscillatoria		
Fungi		Total by Kingdom	62
club, gill, pore, shelf fungi, rust		Total of Major Group	7
	Ganoderma applanatum	artist's conk	
	Laetiporus sulphureus	sulpher shelf, chicken of the	
	Phellinus gilvus		
	Pluteus cervinus		
	Stereum hirsutum		
	Trametes versicolor	Turkey Tail	
	Trichaptum biformis		
	Xylobolus frustulatus	ceramic fungus	
fungi		Total of Major Group	28
	Auricularia aricula-judae		
	Bertia moriformis		
	Coprinus atramentarius		
	Daldinia concentrica	carbon balls	
	Diatrypaceae		
	Galerina		
	Hemitrichia calyculata		
	Hydnochaete olivaceum		
	Hysteriales		

Inocybe	
Irpex	
Irpex lacteus	
Laccaria	
Lentinus tigrinus	
Mycena corticola	
Mycena galericulata	
Peniophora	
Phaeolus schweinitzii	
Piziza	
Pluteus cervinus	
Polyporus alveolaris	
Poria spissa	
Psathyrella	
Russula	
Sarcoscypha occidentalis	stalked scarlet cup
Schizophyllum commune	split gill polypore, common split
Stemonitis axifera	horse hair fungus
Stereum ostrea	
plasmodial slime molds	**Total of Major Group 1**
Fuligo septica	dog vomit slime mold
sac fungi, lichens	**Total of Major Group 26**
Amandinea punctata	lichen
Anisomeridium polypori	lichen
Arthonia caesia	lichen
Caloplaca feracissima	Lichen
Candelaria concolor	Lichen
Candelariella aurella	lichen
Candelariella vitellina	lichen
Cladonia macelenta var. bacillaris	lichen
Endocarpon pusillum	Lichen
Flavoparmelia caperata	common greenshield lichen
Lecanora dispersa	Lichen
Lecanora strobilina	Lichen
Opegrapha atra	lichen
Parmelia sulcata	lichen
Parmotrema hypotropum	lichen

Phaeophyscia cernohorskyi	lichen
Phaeophyscia rubropulchra	Lichen
Physcia millegrana	lichen
Physcia stellaris	lichen
Physciella chloantha	lichen
Physconia detersa	lichen
Punctelia missourensis	lichen
Rinodina	lichen
Scutellinia scutellata	Eyelash Cup
Trapeliopsis flexuosa	board lichen
Xanthoria fulva	lichen

Plantae	Total by Kingdom	415
bryophytes	Total of Major Group	24

Amblystegium	amblystegium moss
Anomodon	anomodon moss
Anomodon attenuatus (Hedw.)	anomodon moss
Anomodon minor	anomodon moss
Atrichum angustatum	atrichum moss
Atrichum oerstedianum	Oersted's atrichum moss
Brachythecium	brachythecium moss
Brachythecium acuminatum	acuminate brachythecium moss
Bryhnia	bryhnia moss
Bryum argenteum	silvergreen bryum moss
Ceratodon purpurea	fire moss
Ditrichum pallidum	pale ditrichum moss
Entodon seductrix	seductive entodon moss
Fissidens	fissidens moss
Grimmia	grimmia dry rock moss
Grimmia apocarpa	moss
Leptodictyum riparium	leskea moss
Leskea morphospecies 1 Sargent & Miller	leskea moss
Leskea morphospecies 2 Sargent & Miller	leskea moss
Mnium cuspidatum	toothed plagiomnium moss
Orthotrichum	Orthotrichum moss
Orthotrichum pusillum	Orthotrichum moss
Platygyrium repens	platygyrium moss
Pohlia nutans	pohlia moss

conifers	Total of Major Group	1
Juniperus virginiana	Eastern Red Cedar	
diatoms	Total of Major Group	4
Diatoma		
Gomphonema		
Melosira		
Navicula		
dicots	Total of Major Group	299
Abutilion theophrastii	Buttonweed	
Acer negundo	Ash-leaved maple, boxelder	
Acer rubrum	Red maple	
Acer saccharinium	Silver maple	
Acer saccharum var. saccharum	Sugar maple	
Achillea millefolium	Common millfoil	
Agastache nepetoides	Yellow giant hyssop	
Agrimonia parviflora	Swamp agrimony	
Agrimonia pubescens	Soft agrimony	
Ailanthus altissima	Tree-of-heaven	
Alcalypha rhomboidea		
Alliaria petiolata	Garlic mustard	
Allium canadense	Wild garlic	
Amaranthus tuberculatus	roughfruit amaranth	
Ambrosia artemisiifolia	Bitterweed	
Amelanchier arborea	Juneberry	
Anethum graveolens	dill	
Apocynum cannabinum	Dogbane	
Arctium minus	Common burdock	
Arenaria serpyllifolia	Thyme-leaved sandwort	
Aristolochia serpentaria	Birthwort	
Asarum canadense	Canada wild ginger	
Asclepias incarnata	Swamp milkweed	
Asclepias syriaca	Common milkweed	
Asclepias tuberosa	Butterfly Weed, Chigger Weed	
Asclepias verticillata	Horsetail milkweed	
Asimina triloba	Pawpaw	
Aster drummondii	Drummond's aster	
Aster lateriflorus	Side-flowered aster	

Aster novae-angliae	New England aster
Aster ontarionis	Ontario aster
Aster pilosus	Hairy aster
Aster shortii	Short's aster
Aster simplex	Panicled aster
Baptisia lactea	
Barbarea vulgaris	Winter cress
Berberis thunbergii	Japanese barberry
Bidens aristosa	Swamp marigold
Bidens frondosa	Common beggar-ticks
Bidens vulgata	Sticktight
Blephilia ciliata	Ohio Horse Mint
Blephilia hirsuta	Pagoda plant
Boehmeria cylindrica	False nettle
Calystegia sepium	American Bindweed
Campanula americana	American bellflower
Campsis radicans	Trumpet creeper
Capsella bursa-pastoris	Shepherd's purse
Carya cordiformis	Bitternut hickory
Carya laciniosa	Shellbark hickory
Carya ovalis	False shagbark hickory
Carya ovata	scaly-bark hickory, shag-bark
Carya tomentosa	Mockernut hickory
Catalpa	
Catalpa bignonioides	Common catalpa
Catalpa speciosa	Western catalpa
Celastrus scandens	Bittersweet
Celtis occidentalis	Hackberry
Cephalanthus occidentalis	Buttonbush
Cerastium vulgatum	Common mouse-ear chickweed
Cercis canadensis	Eastern redbud
Chamaesyce supina	Milk spurge
Chenopodium album	Lamb's quarters
Cichorium intybus	Chicory
Circaea lutetiana	
Cirsium arvense	Canada thistle
Cirsium discolor	Field thistle

Cirsium vulgare	Bull thistle
Clematis pitcheri	Leatherflower
Commelina communis	Common day flower
Conium maculatum	Poison hemlock
Convolvus arvensis	Field bindweed
Conyza canadensis	
Coreopsis tripteris	Tall coreopsis
Cornus drummondi	Rough-leaved dogwood
Cornus florida	Flowering dogwood
Cornus racemosa	Gray dogwood
Corylus americana	Hazelnut, American filbert
Cotinus coggygria	European smoketree
Crataegus crusgalli	Cock-spur thorn
Crataegus mollis	Red haw
Crataegus pruinosa	Frosted hawthorn
Cryptotaenia canadensis	Honewort
Cynanchum laeve	honeyvine, climbing milkweed
Dasistoma macrophylla	Mullein foxglove
Daucus carota	Queen Anne's lace
Dentari laciniata	Pepper-root
Dianthus armeria	Sweet william
Dipsacus laciniatus	Cut-leaf Teasel
Dipsacus sylvestris	Common Teasel
Elaeagnus umbellata	Autumn olive
Erechtites hieracifolia	Fire weed
Erigeron annuus	Annual fleabane
Erigeron strigosus	Daisy fleabane
Erodium cicutarium	
Eryngium yuccifolium	Rattlesnake Master
Erysimun repandum	spreading wallflower
Euonymus alatus	Burning bush
Euonymus atropurpureus	Burning bush
Euonymus fortunei	Climbing euonymus,
Eupatorium altissimum	Tall boneset
Eupatorium perfoliatum	Common boneset
Eupatorium purpureum	Green-stemmed joe-pye weed
Eupatorium rugosum	White snakeroot

Eupatorium serotinum	Late boneset
Fraxinus americana	White ash
Fraxinus pennsylvanica	Green ash
Fraxinus quadrangulata	Blue ash
Galinsoga ciliata	
Galinsoga parviflora	gallant soldier
Galium aparine	Annual bedstraw
Galium concinnum	Shining bedstraw
Galium obtusum	Wild madder
Galium tinctorium	
Galium triflorum	Sweet-scented bedstraw
Gaura biennis	Butterfly-weed
Gentiana alba	pale gentian
Geranium carolinianum	Wild cranesbill
Geranium maculatum	Wild geranium
Geum canadense	
Glecoma hederacea	Ground ivy
Gleditsia triacanthos	Honey locust
Glyceria striata	Fowl manna grass
Gymnocladus dioica	Kentucky coffee tree
Hackelia virginiana	Stickseed
Helenium autumnale	Autumn sneezeweed
Helianthus annus	Common sunflower
Heliopsis helianthoides	False sunflower
Hydrophyllum virginianum	Virginia waterleaf, Shawnee salad
Hypericum perforatum	Commons St. John's Wort,
Hypericum punctatum	spotted St. Johns wort
Impatiens biflora	jewelweed
Impatiens capensis	
Impatiens pallida	Pale touch-me-not
Iodanthus pinnatifidus	Purple rocket
Juglans nigra	Black walnut
Lactuca canadensis	Canada lettuce
Lactuca floridana	Blue lettuce
Lamium amplexicaule	Henbit
Lamium purpureum	purple deadnettle
Laportea canadensis	Canada wood nettle

Lepidium virginicum	Common peppergrass, Virginia
Liatris pycnostachya	Prairie blazing star
Ligustrum vulgare	Common Privet
Lindera benzoin	Feverbush
Lonicera japonica	Japanese honeysuckle
Lonicera maackii	Amur honeysuckle
Lonicera prolifera	Grape honeysuckle
Lonicera tatarica	Tartarian honeysuckle
Lysimachia ciliata	Fringed loosestrife
Lysimachia nummularia	Moneywort
Maclura pomifera	Hedge apple, Osage orange
Malus coronaria var. coronaria	Sweet crab apple
Malus pumila	Apple
Malus sieboldii	Toringa crab
Matricaria matricarioides	Pineapple weed
Medicago lupulina	Black medic
Melilotus alba	White sweet clover
Melilotus officianalis	Yellow sweet clover
Menispermum canadense	Moonseed
Monarda bradburiana	Eastern beebalm
Morus alba	White mulberry
Oenothera biennis	Common Evening Primrose
Ophioglossum vulgatum	Adder's tongue
Osmorhiza longistylis	Anise-root
Ostrya virginiana	Hop hornbeam
Oxalis dillenii	Yellow wood sorrel
Oxalis stricta	Yellow wood sorrel
Parietaria pennsylvanica	Pennsylvania Pellitory
Parthenocissus quinquefolia	virginia creeper
Pastinaca sativa	Parsnip
Penstemon digitalis	
Penstemon pallidus	Pale beard-tongue
Perideridia	
Perideridia americana	Thicket Parsley
Phlox divaricata	Blue phlox
Physalis heterphylla	Ground cherry
Physalis subglabrata	Smooth ground cherry

Phytolacca americana	Pokeweed
Pilea pumila	Canada clearweed
Plantago lanceolata	Buckhorn
Plantago rugelii	Red-stalked plantain
Plantago virginica	Dwarf plantain
Platanus occidentalis	American sycamore
Podophyllum peltatum	Mayapple
Polygonatum commutatum	Great Solomon seal
Polygonum caespitosum var. longisetum	oriental ladysthumb
Polygonum convolvulus	
Polygonum hydropiper	Mild water pepper
Polygonum lapathifolium	Curttop lady's thumb
Polygonum pennsylvanicum	Giant smartweed
Polygonum persicaria	Knotweed
Polygonum punctatum	Dotted smartweed
Polygonum scandens	Climbing buckwheat
Polygonum virginianum	Virginia knotweed
Populus deltoides	Eastern cottonwood
Populus heterophylla	Swamp cottonwood
Portulaca oleracea	Purslane
Potentilla recta	Sulfur cinquefoil
Prunella vulgaris	Self-heal
Prunus serotina	Wild black cherry
Pycnanthemum pilosum	Hairy mountain mint
Quercus alba	White oak
Quercus bicolor	Swamp white oak
Quercus imbricaria	Jack oak, shingle oak
Quercus macrocarpa	Burr oak
Quercus palustris	
Quercus rubra	Northern red oak
Ranunculus abortivus	Little-leaf buttercup
Ranunculus septentrionalis	Swamp buttercup
Ratibida pinnata	Drooping coneflower
Rhamnus cathartica	Common buckthorn
Rhus aromatica var. aromatica	Fragrant sumac
Rhus glabra	Smooth sumac
Rhus typhina	Staghorn sumac

Ribes americanum	Wild black currant
Ribes missouriense	Missouri gooseberry
Rosa multiflora	Multiflora rose
Rosa setigera	Prairie rose
Rubus allegheniensis	Common blackberry
Rubus occidentalis	Black raspberry
Rubus pensylvanicus	Blackberry
Rudbeckia hirta	Black-eyed Susan
Rudbeckia triloba	Brown-eyed Susan
Ruellia strepens	Smooth ruellia
Rumex altissimus	Pale dock
Rumex crispus	Curly dock
Saguinaria canadensis	Bloodroot
Salix nigra	Black willow
Sambucus canadensis	Common elder
Samolus parviflorus	
Samolus valerandi	brookweed
Sanicula gregaria	Common snakeroot
Sanicula odorata	clustered black snakeroot
Saponiaria officianalis	Bouncing bet
Saururus cernuus	Lizard's tail
Scrophularia marilandica	Late figwort
Scutellaria lateriflora	Mad-dog skullcap
Senecio glabellus	Butterweed
Sicyos angulatus	Bur cucumber
Silene antirrhina	Sleepy catchfly
Silene stellata	Starry campion
Silphium integrifolium	
Silphium laciniatum	Compass-plant
Silphium perfoliatum	Cup plant
Silphium terebinthinaceum	Dock rosin-weed, prairie dock
Solanum carolinense	Horse-nettle
Solanum dulcamara	bitter nightshade
Solidago altissima	Canada golden rod
Solidago canadensis	Canada Goldenrod
Solidago gigantea	Late goldenrod
Solidago speciosa	Showy goldenrod

Solidago ulmifolia	Elm-leaved goldenrod
Sonchus	
Sonchus oleraceus	Common sowthistle
Specularia	
Stellaria media	Common chickweed
Symphoricarpos orbiculatus	coralberry, Buckbrush
Taraxacum officinale	Common dandelion
Teucrium canadense	
Thalictrum thalictroides	
Thalicturm dioicum	Early meadow rue
Thlaspi arvense	field pennycress, Frenchweed
Tilia americana	American basswood
Torilis japonica	Hedge parsley
Toxicodendron radicans radicans	Poison Ivy
Tragopogon pratensis	Common goat's beard
Trifolium hybridium	Alsike clover
Trifolium pratense	Red clover
Trifolium repens	White clover
Ulmus americana	American elm
Ulmus pumila	
Ulmus rubra	Slippery Elm
Verbascum blattaria	Moth mullein
Verbascum thapsus	Woolly mullein
Verbascum thlaspi	
Verbena stricta	Hoary vervain
Verbena urticifolia	White vervain
Verbesina alternifolia	Wing stem
Vernonia missurica	Missouri ironweed
Veronica arvensis	Corn speedwell
Veronica peregrina	Purslane speedwell
Viburnum lantana	Wayfaring tree
Viburnum lentago	Nannyberry
Viburnum opulus	European high-bush, European
Viburnum prunifolium	Black haw
Viburnum recognitum	Smooth arrowwood
Viola pratincola	Common Blue Violet
Viola pubescens	

Viola sororia	Woolly blue violet
Viola striata	Common white violet
Vitis aestivalis	Summer grape
Vitis cinerea	Winter grape
Vitis riparia	Riverbank grape
Vitis vulpina	Frost grape
Xanthium strumarium	Cocklebur
Zanthoxylum americanum	Prickly ash
Zizia aurea	Golden Alexanders
ferns	**Total of Major Group 1**
Cystopteris protrusa	Fragile Fern
green algae	**Total of Major Group 5**
Botryococcus	
Dictyosphaerium	
Microspora	
Mougeotia	
Zygnema	
liverworts	**Total of Major Group 2**
Cololejeunea biddlecommiae	
Frullania eboracensis	
monocots	**Total of Major Group 79**
Agropyron repens	
Agrostis alba	Red top
Allium canadense	Wild garlic
Allium tricoccum	Ramp
Allium vineale	Field garlic
Arisaema dracontium	Green dragon
Arisaema triphyllum	Indian turnip, Indian jack in the
Asparagus officinalis	Garden asparagus
Avena sativa	Cultivated oats
Bromus inermis	awnless brome grass, smooth
Bromus japonicus	Japanese brome
Bromus tectorum	Cheat grass brome
Carex blanda	Woodland sedge
Carex conjuncta	soft fox sedge
Carex davisii	Davis sedge
Carex frankii	Sedge

Carex granularis	Meadow sedge
Carex grayi	Bur sedge
Carex grisea	Sedge
Carex hirtifolia	Hairy sedge
Carex jamesii	James' sedge
Carex molesta	Field Oval Sedge
Carex muhlenbergii	
Carex normalis	Spreading Oval Sedge
Carex radiata	
Carex rosea	
Carex shortiana	Sedge
Carex sparganioides	Sedge
Carex stipata	owlfruit sedge, stalk-grain sedge
Carex vulpinoidea	Brown Fox sedge
Cinna arundinacea	Stoutwood reed
Convallaria majalis	Lily of the valley
Cyperus esculentus	yellow nut sedge
Dactylis glomerata	Orchard grass
Dichanthelium acuminatum var. fasciculatum	western panicgrass; tapered
Digitaria ischaemum	Smooth crab grass
Digitaria sanguinalis	Hairy crab grass
Eleusine indica	Goose grass
Elymus hystrix	eastern bottle-brush grass
Elymus villosus	Hairy wild rye
Elymus virginicus	Virginia Wild Rye
Festuca arundinacea	
Festuca obtusa	Nodding fescue
Festuca pratensis	
Glyceria striata	Fowl manna grass
Hemerocallis fulva	Day lily
Juncus interior	Inland Rush
Juncus tenuis	Path rush
Leersia oryzoides	rice cut grass
Leersia virginicus	
Lemna minor	Common duckweed
Lolium perenne	Crested rye grass
Muhlenbergia schreberi	Nimble will

Panicum acuminatum	
Phalaris arundinacea	Reed canary grass
Phleum pratense	Timothy
Poa annua	Annual bluegrass
Poa compressa	Canada Bluegrass
Poa pratensis	Kentucky Bluegrass
Poa sylvestris	Woodland bluegrass
Scirpus	
Scirpus atrovirens	Dark green rush
Scirpus lineatus	
Scirpus pendulus	Red bulrush, hanging bulrush,
Setaria faberi	Giant foxtail
Setaria glauca	Yellow Foxtail
Setaria viridis	Common foxtail
Sisyrinchium angustifolium	Common blue-eyed grass
Smilacina racemosa	False Solomon seal
Smilax ecirrata	upright carrion-flower
Smilax hispida	Bristly greenbrier
Smilax lasioneuron	
Sorghastrum nutans	Indian Grass
Sphenopholis obtusus	prairie wedgescale
Sporobolus heterolepis	Prairie Dropseed
Sporobolus vaginiflorus	poverty dropseed
Tradescantia ohiensis	Ohio spiderwort
Triticum aestivum	Bearded wheat
Yucca flaccida	Yucca
Zea mays	Corn

Protista	Total by Kingdom	4
euglenoids	Total of Major Group	2
Euglena		
Phacus pleuronectes		
protozoa	Total of Major Group	2
Colpoda	ciliate	
Uroleptus		
	Grand Total Unique Taxa	1327

ILLINOIS NATURAL HISTORY SURVEY

Reports

Winter 2006
No. 386

INSIDE

24 Hours: The 2005 Busey Woods BioBlitz

What brings more than 50 scientists together with interested amateurs and the general public for a 24-hour extravaganza to see how many species could be identified from a 59-acre urban natural area? The 2005 Busey Woods BioBlitz, which ran from noon on June 24 to noon the following day, was sponsored by the Urbana (Illinois) Park District and supported by a grant from the Illinois Department of Natural Resources. It featured many biologists on busman's holiday from their work at the Illinois Natural History Survey (INHS), and from various parts of the state. Armed with nets, binoculars, and other assorted gear, these scientists wrote down their observations, checked species off lists, examined samples of water and soil under a microscope, and generally looked everywhere they could think of in the quest for additions to the growing list of species identified during the blitz. Specialists spoke with the public, who were invited to learn about the biodiversity of this much loved park. The data collected were entered into a database called Mandala, which was originally created for a National Science Foundation PEET (Partnerships for Enhancing Expertise in Taxonomy) project dealing with specimen-based systematics research of a poorly known family of flies (Therevidae) that are not only present in Illinois, but found worldwide. The database was first used at the Allerton BioBlitz in 2001 where 1,949 species were identified from nearly 3,000 observations recorded during a 24-hour period in this 1,500-acre park near Monticello, Illinois.

INHS researcher Tim Smith, with net, searches for fishes during the 2005 Busey Woods BioBlitz in Urbana. Volunteer Jim Hoyt follows with a collecting bucket. Photo by Julie Miller, Urbana Park District

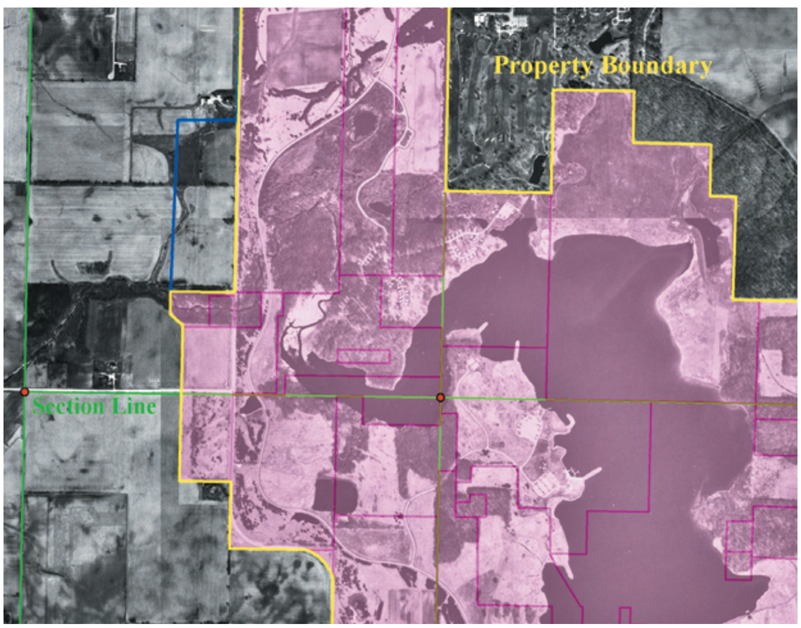
So why, in an area less than 4% of the size of Allerton Park, did scientists manage to find 1,327 species (in ~1,700 recorded observations), including a new state record for a planthopper, or nearly 68% of the total number of species identified at Allerton? Part of the answer goes to the root of why biodiversity studies are important and why so many specialists are needed to do this work. Biologists working during the blitz were under no illusion that they would identify all of the species to be found in those 59 acres, and in fact, no one knew how many species might be there, because no one had ever really looked in such detail. This was both an opportunity to share with the public the kind of work and tools that it takes to conduct a bioinventory of a site, and to take a snapshot of its biodiversity. To do a thorough bioinventory of an area, the work that many of these biologists are engaged in throughout the state of Illinois, takes more than the quick snapshot in time allocated for this bioblitz. Changes through the season, caused by differences in temperature and moisture will also account for variation through time. Bringing home the message about the importance of establishing baseline data for an area, being able to monitor changes in the biodiversity through time, and

Continued on back page

Mapping Owned, Managed, or Leased Properties of the Illinois Department of Natural Resources

Development and enhancement of key data sets are vital to efficiently direct efforts to protect, conserve, and manage natural resources and to effectively evaluate the success of those efforts. In Illinois, over 90% of the land is privately owned. Illinois Department of Natural Resources (IDNR) lands provide a critical opportunity to directly protect, manage, sustain, and enhance the state's remaining natural lands and waters and the plants and animals they support. Comprehensive, reliable, and accessible information regarding the land holdings of IDNR (which total approximately 417,000 acres) is vital for planning, implementation, and assessment of the long-term conservation strategy for the state as outlined by the Illinois Wildlife Action Plan (formerly known as the Comprehensive Wildlife Conservation Plan).

The GIS staff at the Illinois Natural History Survey is developing a spatial database of locational data and descriptive information (e.g., ownership, funding source, management goals and activities, and restrictions) for conservation-related properties owned, managed, or leased (OMLP) by IDNR. Utilization of the OMLP database in a GIS environment allows access to descriptive tabular information in a single database, visual display of information on maps, and the capability to conduct spatial analyses with a variety of other databases (e.g., wildlife species distributions, areas of high biodiversity, land cover, surrounding land use, surrounding land ownership) and at a variety of scales, providing scientific and technological information to meet ecosystem-based management and protection goals.



Completed OMLP property showing Shabbona Lake located in DeKalb County.

The OMLP project was initiated in the fall of 2003. The OMLP geodatabase consists of property boundaries at the parcel level, with legal boundary descriptions obtained mainly from paper records from the Office of Realty and Environmental Planning at the IDNR office in Springfield. Each property requires a thorough research of files with extensive amounts of paper records for relevant information concerning parcel boundaries and conservation practices. Most properties consist of multiple parcels; some of the more complex properties have hundreds of parcels. A procedure for accurately and consistently digitizing each property has been developed using ESRI ArcGIS software. Metadata are being created for the GIS data layers using Federal Geographic Data Committee compliance standards as a guide. A quality assurance/ quality control (QA/QC) methodology has been put into place to ensure that the data created meet the accuracy standards defined in the OMLP project data input methodology. To maximize its usefulness as an information and planning tool, the OMLP database has been designed for integration with other agency databases. This will facilitate coordinated conservation management activity efforts within IDNR.

The OMLP project is an on-going effort. The initial phase of the project focused on mapping properties purchased with federal or special funds (Habitat, Pheasant, Migratory Waterfowl Stamp, and Furbearer funds); subsequent phases will include additional IDNR properties such as state parks, state conservation areas, and state forests.

Tari Tweddale, Center for Wildlife and Plant Ecology

New INHS Space Facilities

After 17 years of preliminary planning (primarily led by recently retired William Ruesink), and two major shifts in direction due to funding constraints, the Illinois Natural History Survey (INHS) is continuing its move out of the Natural Resources Building (NRB) at 607 Peabody Drive, to new facilities on the south campus adjacent to the recently developed University of Illinois Research Park. Since 2002 the east half of what is referred to as the I-Building (we're looking for a new name) at 1816 South Oak Street was leased and shared by INHS and the Illinois State Geological Survey. A total of $26.7 million was raised for the INHS move project. Project funds, now in one university account, came from a long-standing state appropriation, the University of Illinois, money allocated by the Illinois Department of Natural Resources from the sale of the old Burnham Hospital complex, and state initiative funds provided by the late Senator Stanley Weaver. About $20 million was made available for new INHS facilities, and about $6.7 million for renovation of vacated NRB space for use by the university. In 2004, project funds were used to purchase the entire I-Building. During 2005 the west side of the building was renovated (~ 20,000 nsf) and a move from NRB was completed in late November 2005. This new space accommodates most of the Office of the Chief, library, and most of the Center for Wildlife and Plant Ecology.

The I-Building is the new headquarters of the Illinois Natural History Survey.

The second phase of our move involves construction of a new building (~ 30,000 nsf). This is to be adjacent to the Natural Resources Studies Annex (1910 South Griffith Drive) which houses most of the survey's Champaign-based Center for Aquatic Ecology and Conservation. Both buildings will be very near the I-Building, thus providing better consolidation of our programs. The new building will be used to house the survey's biological collections and associated staff, as well as the UIUC biological collections. In addition, the new building will include wet laboratories for use by staff in the Center for Biodiversity and the Center for Wildlife and Plant Ecology. Design work for this project began in September 2005 and we anticipate that we might be able to move to this new facility in early 2008. Until then, the Center for Biodiversity and the biological collections will remain in NRB.

Looking to the future, we are hoping that someday Capital Development funds will become available for a much needed phase 3 building. This facility, adjacent to the above mentioned new building, would allow us to relocate our Insect Pathology Program, which remains isolated on north campus in the National Soybean Research Center. We would also relocate sections of programs currently housed in pole barns and other substandard facilities adjacent to the Annex and the I-Building. We would also like to provide staff much needed environmentally secure BL-3 laboratories for our research in medical entomology, insect pathology, wildlife disease, and other research areas where we are currently constrained. We can only remain hopeful that the state economy will improve to the point that our dreams can be realized.

Ronald McGinley, Assistant Chief

Energy Impact of Compact Development vs. Sprawl (Urban Ecology III)

There are many valid social and economic reasons to favor compact development over "sprawl." Additionally, it is often claimed that living in compact neighborhoods requires significantly less energy than suburban or rural living. The usual image is that sprawl means more and longer auto commuting and more spacious housing, both major energy users. But because energy is required to produce and provide all consumer goods and services, one might be suspicious that this picture is too simple: what about those vacation trips to California or Italy?

Previously (Urban Ecology, Part II. *INHS Reports* No. 373:4. Autumn, 2002) we outlined the method of converting detailed household expenditure data (from the U.S. Bureau of Labor Statistics (BLS)) to energy requirements. We reported that in spite of the concern about other expenditures, four items related to sprawl comprise a major fraction of nationally averaged household energy impact. Updating the approach has reinforced this conclusion: for the year 2003 auto fuel (23%), residential fuel and electricity (39%), and purchase/maintenance of auto (6%) and housing (13%) add up to 81% of the total. This seems to argue for a large energy-saving potential for sprawl management.

But in spite of this result, we are finding that on average in America today, the rural energy intensity (energy divided by dollars) is only about 16% higher than urban. Figure 1 illustrates how this is determined. Points above the average graph of energy versus expenditures are more energy intensive (i.e., require more energy per dollar spent) than average, while points below are less energy intensive. The figure shows a trend towards lower intensity as the population of the living area increases from "outside urban area" to a city of more than 5 million inhabitants. This difference is significant, but not as large as compact ("smart") growth proponents have claimed. If it is correct, it is an example of the limits of efficiency as a solution to the energy requirements of growth. That efficiency improvements often are followed by an increase in consumption is known as Jevons' Paradox, and is exemplified by the equation I=PAT (Ecological Numeracy. *INHS Reports* No. 352:4. July-August, 1998).

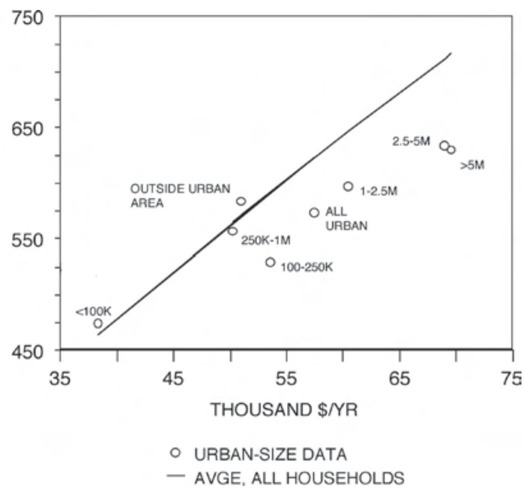


Figure 1. Average U.S. total household energy impact vs. expenditures, 2003. Only aggregated data sorted by population of urban area are available, resulting in the eight points shown. Points above the average line are more energy intensive than average; points below are less energy intensive.

How accurate is this result? There are many issues of method, data, and even of interpretation, which we are investigating, including a statistical analysis of the full BLS household consumption survey But we think the 15–20% size of "the effect" is reasonable for the following reasons:

1. Studies in Norway, Denmark, and Australia have found differences in the 12–14% range. They are highly developed countries and comparable to the U.S. Results for Brazil and India show smaller differences, though their data are less reliable.

2. In the U.S. auto (car, pickup truck, van, SUV, etc.) ownership (0.71 per capita) is already saturated. All of the eight household classes in Figure 1 have 1.7–1.9 autos per household except "outside urban area" (2.3) and ">5 million" (1.5). Except for exceptionally dense living, as in Manhattan, even urban life involves auto ownership only marginally different from suburban life.

3. We have accounted for all expenditures and hence covered the effect of "respending" money saved through less vehicle and residential use. In some cases the respending is as energy intensive as the original spending. For example, while public ground transport uses several times less energy per passenger mile than auto, it is comparable in energy per dollar spent. See the comparison below.

Option	Energy intensity (1,000 Btu/$)
Auto, 25 mpg, total cost $045/mile.	17
Suburban bus, Portland, OR, 4 mpg, 10 passengers, 15 miles for $1.70	40
Urban bus, Champaign, IL, 3 mpg, 10 passengers, 2 miles for $1.00	12

Consumer goods and services from a highly connected economy tend to be "blended" by integrated manufacture, transportation, and marketing...not to mention globalization. It is possible to design a lifestyle that reduces energy requirements, but if overall consumption measured in dollars/year is maintained or increased, we still find that one must be studiously careful about how that money is spent to avoid largely erasing the gains.

Robert Herendeen, Center for Aquatic Ecology and Conservation; Md. Rumi Shammin and Michelle Hanson, UIUC

Insect Biodiversity Informatics

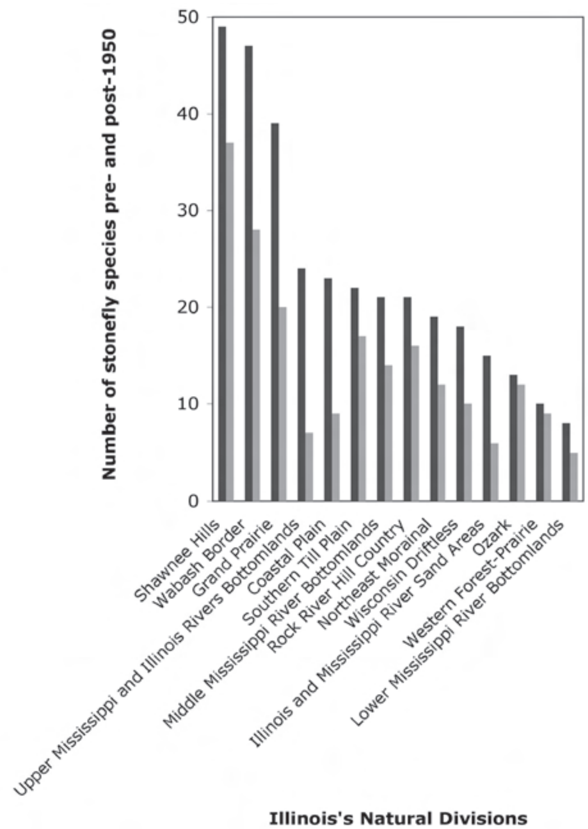
The Illinois Natural History Survey (INHS) Insect Collection houses approximately 6.5 million specimens collected over the course of 145 years. What these specimens represent is the biological history of the state of Illinois, with every specimen being a record of a particular species located at a particular place and at a particular time. Any single specimen can therefore be said to have three principal dimensions of data: the species name (taxonomy), where it was collected (place), and when it was collected (time). There are other dimensions, of course, such as the coloration or anatomical characteristics of the specimen, the identity of its host (if it is a parasite), what its behavior was at the time of capture, et cetera.

The most frequent users of the insect collection are systematists who study the diversity of insect forms within and between species to better understand and describe the biological diversity of our planet. Because the primary use of the collection is for taxonomic purposes, and because ascertaining the taxonomic dimension of a specimen is considerably more work than ascertaining its collection locality and date, the arrangement of the specimens is taxonomic. That is, the collection is arranged according to the insects' taxonomic hierarchy. For instance, all the beetles are together in the collection, and the families of beetles are themselves arranged alphabetically within that larger group.

It is relatively easy to create a list of all the places a particular insect species was collected: just go to that part of the collection and look through the specimens. Creating a list of all the species collected at a particular place is much more problematic, however, as one would have to look through the entire collection; likewise if one wanted to create a list of the insects collected in Illinois in the 1940s.

In order to exploit all three key specimen dimensions, we need a method of easy data retrieval, that is, a computerized specimen database. Digitizing the three dimensions is relatively straightforward, if labor-intensive. Each individual specimen is removed from the collection, the data on the specimen's label are manually entered into the database, a unique number is assigned to the computer record, a corresponding label is put on the specimen, and the specimen is then returned to the collection.

Once the data are entered, any number of analyses can take place. Data from the INHS Insect Collection database have been used for stoneflies to uncover new Illinois records, to document range expansions and contractions, fundamental shifts in insect species assemblages, and to evaluate the relative biodiversity over time of various parts of Illinois. See the chart for an example of recent work by INHS entomologist R. Edward DeWalt.



The number of species of stoneflies in the INHS Insect Collection collected before 1950 (black bars) and after 1950 (grey bars), in Illinois's 14 natural biological divisions. Note that every natural division has lost some of its stonefly fauna.

With three major orders of aquatic insects fully databased, we are now digitizing the data associated with the Hymenoptera: ants, bees, and wasps that constitute approximately 300,000 specimens. Along with the actual specimen data, we will also research and assign latitude and longitude coordinates for all the collection localities in the United States. These geoposition data will allow for easy mapping of species distributions in time and space.

The insect order Hymenoptera includes many groups of economic importance: many parasitic wasps are control agents for insect pests of agriculture, bees are critical plant pollinators, and ants disperse plant seeds. Over 100 species of ants in the United States are non-native, and two of them, the Argentine and red imported fire ants, alone cost billions annually in damage and control efforts. Other Hymenoptera have similar economic significance.

The data gathered by this three-year project will provide valuable tools for documenting species declines or local extinctions, the historical presence of particular species, changes in species distribution, range expansion of invasive species, ecological restoration, assessments of biodiversity, and conservation. The INHS bumblebee collection is particularly strong in its historical documentation and may, with new collecting statewide, provide interesting insights into the changes that have occurred in that fauna over time.

Colin Favret, Center for Biodiversity

Species Spotlight

Hellbender

Susan Post

The hellbender, *Cryptobranchus alleganiensis*. Photo from INHS Manual 8: Field Guide to Amphibians and Reptiles of Illinois

In a few Illinois streams a large, cryptically colored salamander can be found—the hellbender, *Cryptobranchus alleganiensis*. Hellbenders are the largest salamanders in North America and the third largest in the world. Adults range in length from 11 to 29 inches and may weigh four to five pounds. They are fully aquatic and cannot live out of water.

Hellbenders have wide, flat heads with tiny lidless eyes and paddlelike tails. These salamanders have no external gills, instead they have folds of skin which help them take in oxygen from the water. These folds cover their bodies and their short, thick legs. While their bellies are usually only one color—yellowish-brown—the rest of their bodies are a combination of browns or grayish browns with dark blotches. During the breeding season hellbenders may have an overall reddish brown color.

Illinois Natural History Survey herpetologist Phil Smith described hellbenders as, "ugly in appearance and unpleasant to handle because of their extreme sliminess." This slime makes them very hard to catch and handle. Scientists think that the skin secretions keep the hellbenders free from infections, protect against predators, and decrease the friction of fast flowing water.

Hellbenders are found in the Appalachian and Ozark Mountain regions, from southern New York state to northern Georgia and west to Missouri. They have been found in southern and southeastern Illinois. They live in cool, clear streams with moderate to fast currents. The water is usually one to three feet deep and is a mix of faster flowing rapids and slower runs and pools. The rocky riffles help oxygenate the water. Large, flat rocks or bedrock with openings in shallow water are also important, as the hellbenders use these for shelter. Keeping their habitat protected from pollution, excessive siltation, and other degradations is key for hellbender survival.

Hellbenders are nocturnal, secretive, and seldom observed. They will walk along stream bottoms but most of their time is spent hiding under large, flat rocks. As water flows over their bodies, oxygen is taken up by tiny blood vessels in their skin and carbon dioxide is released. Hellbenders have lungs and are capable of gulping air from the surface; however, their lungs are mainly used for buoyancy.

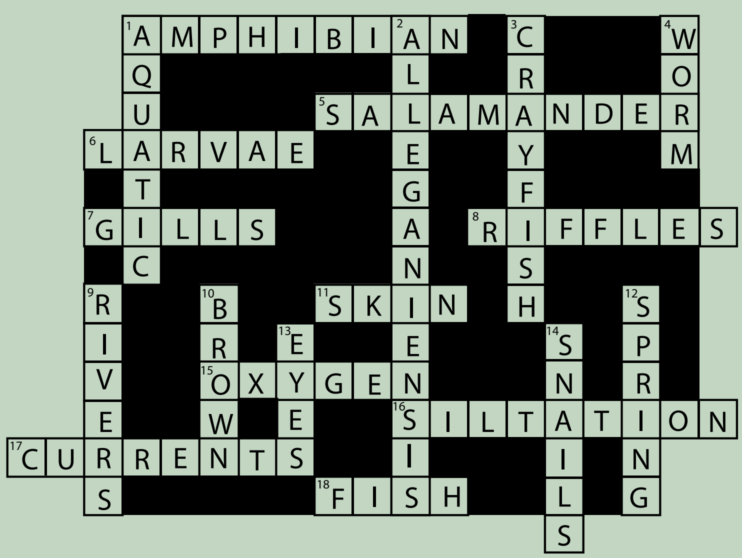
They will eat a variety of aquatic prey, such as small fish and insects; yet, 90% of their diet consists of crayfish.

Courtship and breeding take place during late summer or early autumn. During this time hellbenders increase their activity and may actually be seen walking around on the bottoms of streams. Females will reach breeding age at seven or eight years of age and may breed only every second or third year. Males breed at a younger age. In the fall the males will excavate cavities (nest sites) under large rocks. The female will lay her eggs in a long strand (similar to a strand of beads) in a cluster in the nest site. The male will then come and fertilize the eggs externally, much like a fish. Once the female has laid her eggs, the male forces her out of the nest and he stays and guards the eggs, protecting them from other hellbenders that would eat them. The eggs will swell to ping-pong ball size and hatch in four to six weeks. The newly hatched larvae are less than one inch in length. The larvae have streamlined bodies, short gills, and low tail fins. Once they begin to eat small aquatic invertebrates, the larvae will turn dark brown or black. By their second year the larvae are four to five inches in length and have lost their gills. The larvae spend most of their time hiding in stream gravel niches. Hellbenders can live for 30 to 35 years.

Hellbenders have a variety of nicknames based on appearance and/or location. These include mud cat, walking catfish, Allegany alligator, snot-otter, mud devil, and mountain alligator. The common name of hellbender is thought to have originated with early settlers who upon seeing the organism's odd look, thought it was a creature from hell and bent on returning.

The Naturalist's Apprentice Teachers' Page

Answers for Crossword Puzzle on next page



Hellbender Crossword Puzzle

Carolyn Nixon

Across

1. Hellbenders are a type of this animal group. It also includes frogs and toads. The word means an animal that can live both in water and on land.

5. Hellbenders are members of #1 across that are long and slender, and have tails and legs as adults.

6. Young hellbenders are called __________.

7. Young hellbenders breathe with these organs, but lose them before they become adults.

8. Areas of streams where water churns and splashes as it flows over rocks are called ____________. Hellbenders often live in streams that have this type of habitat.

11. Adult hellbenders breathe through this soft, slimy, wrinkled body covering.

15. Hellbenders only live in streams that have a lot of this important air component dissolved in them.

16. Fine sediment that is deposited on the bottom of a stream and often covering up the rocks is called ___________. Streams that have a lot of it no longer have hellbenders.

17. The flowing movements of water in a stream are ___________. Hellbenders need streams with fast ones.

18. Hellbenders sometimes eat the small examples of these swimming animals that have scales and spines.

Down

1. _________ animals live in water. Hellbenders are this for their entire lives.

2. Cryptobranchus __________________.

3. These lobsterlike animals are the main food of hellbenders.

4. A hellbender will often eat one of these long, slender, soft animals. Some anglers will put one on a hook and use them as bait to catch #18 across.

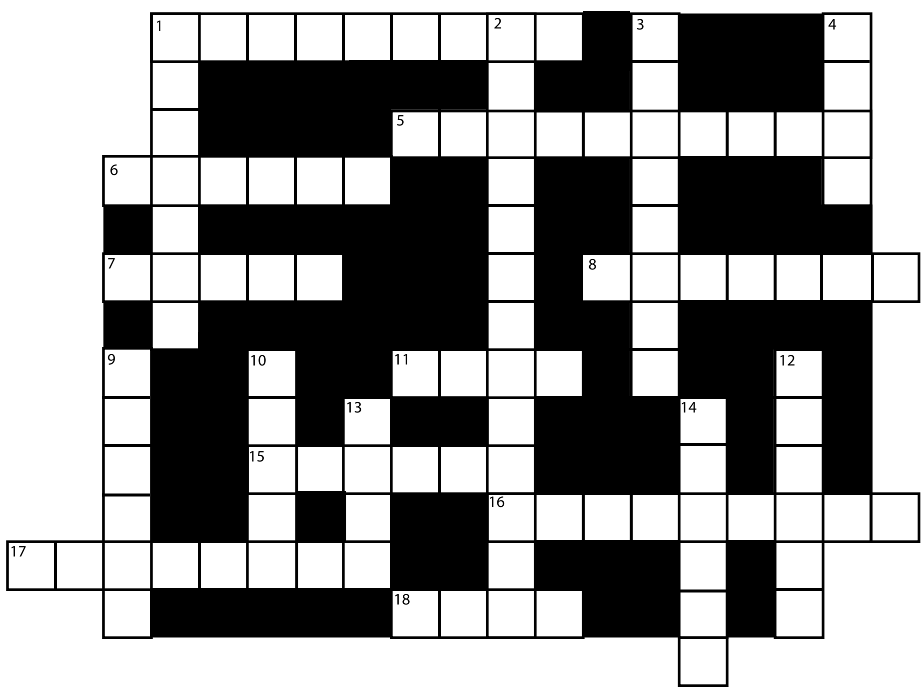
9. Large streams, where hellbenders often live, are called ______________.

10. The main color of a hellbender is ____________.

12. The preferred habitat of the hellbender is ________________-fed streams.

13. These organs, used for sight, are very small on hellbenders.

14. Hellbenders sometimes eat these mollusks that have coiled shells.



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BioBlitz

continued from front page

having specialists able to reliably track these changes, are important to enabling public understanding of the work being done by INHS scientists around the state.

While the numbers of scientists working during the Allerton and Busey Woods BioBlitzes were somewhat comparable, the mix of specialists was different. It is likely that the comparatively large difference between the numbers of beetles identified at Allerton (275) vs. Busey Woods (96), was due at least in part to a missing specialist. However, the difference in the number of conifers (Allerton, 10; Busey Woods, 1) was more likely due to decreased diversity reflective of the smaller area covered by the 2005 blitz than a lack of qualified botanists. Interestingly, the numbers of higher plants identified, although fewer at Busey Woods (78 monocots; 300 dicots) than at Allerton (122 monocots; 392 dicots) were more indicative of the difference in the percentage of the total number of species identified, so less likely to have been influenced by changes in botanical expertise or interests of the scientists participating in the blitzes. However, such gross groupings presented here say little about the true diversity in these groups.

Add up all of the species of mammals (12), birds (54), fish (30), mollusks (11), reptiles (1), and amphibians (4), identified during the Busey Woods BioBlitz and the total (112) does not exceed the number of species of bees, ants, and wasps (132), butterflies and moths (156), or plant and true bugs (123) identified from the megadiverse insect groups. However with the insect groups, as well as many of the fungi, bacteria, and lower plants, identifications to species are difficult even for specialists, who in the limited time of a bioblitz must often content themselves to distinguishing morphospecies, or groups of organisms with enough characters in common to be thought of as separate species, but for whom no name may be definitively put.

This 24-hour demonstration in a confined area gives a hint of the challenge facing us if we ever hope to document and begin to understand the impacts of the changes we make to our landscape, not just in 59 acres, but around the planet.

Gail E. Kampmeier, Center for Ecological Entomology

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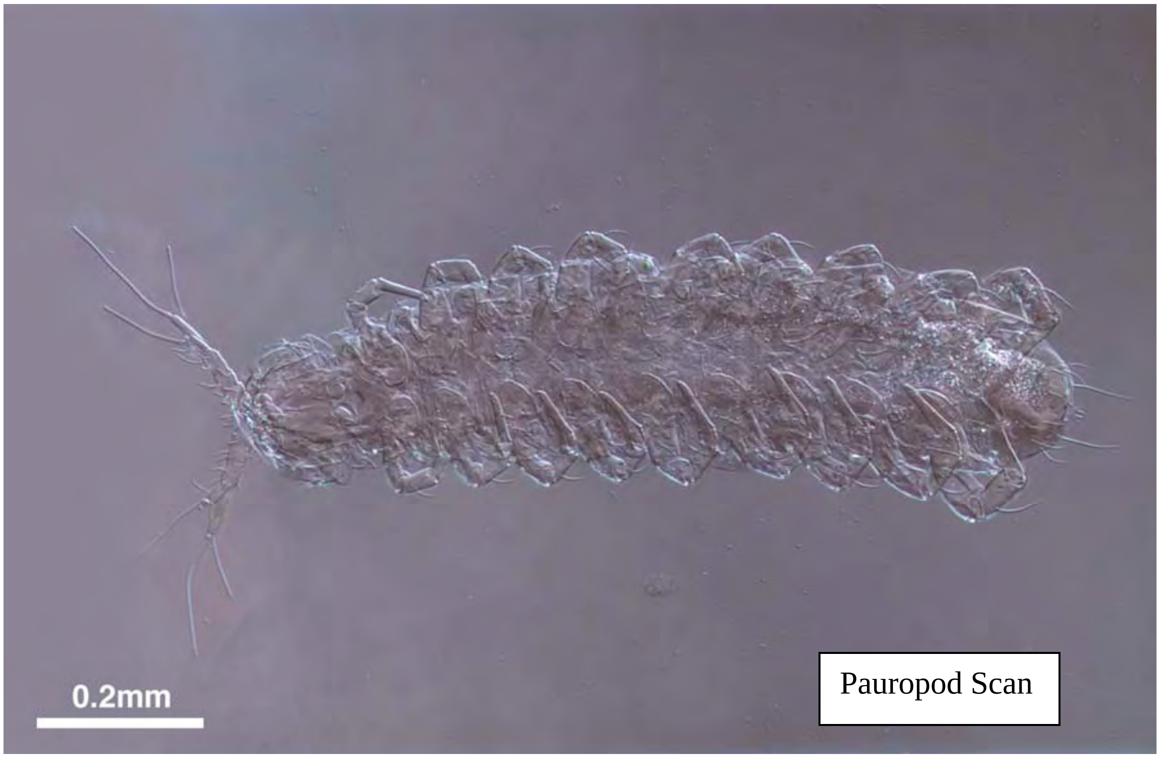
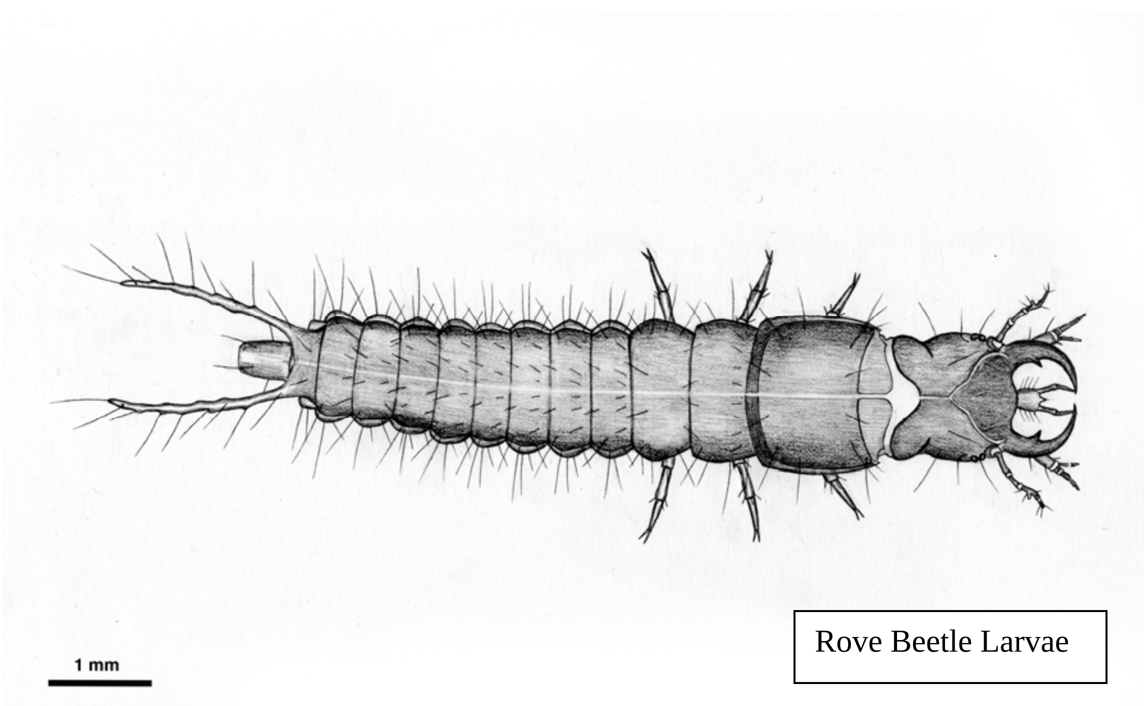
Busey Woods BioBlitz
Jim Nardi, Planning Committee

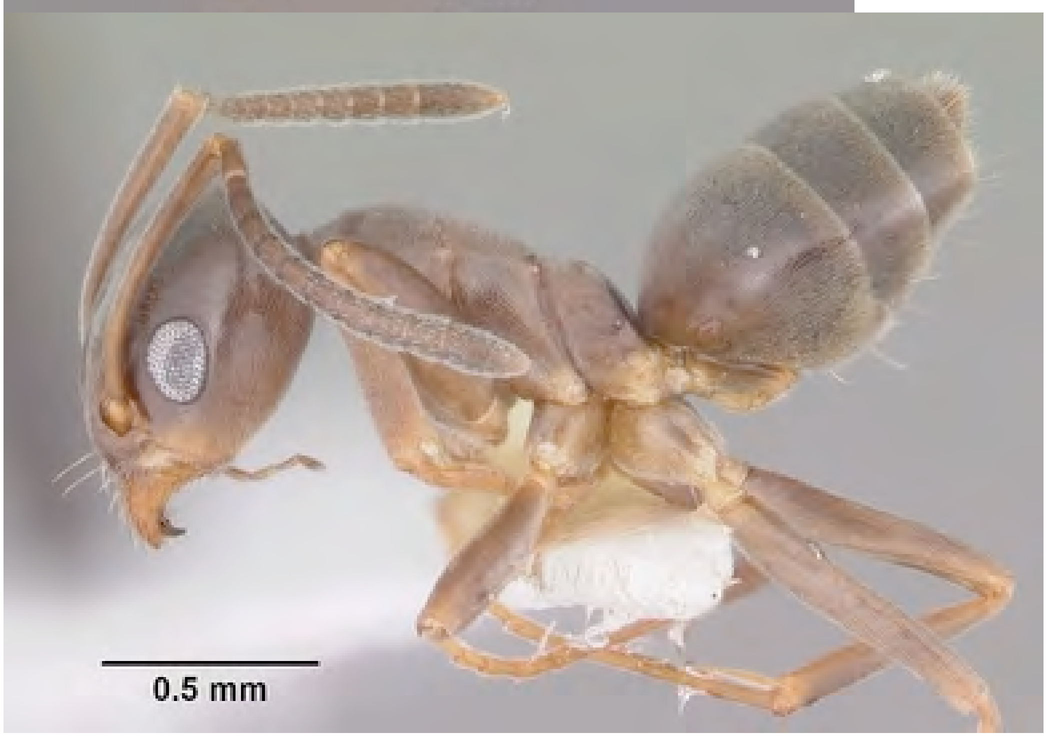




Ants of Busey Woods, Bioblitz June 24-25, 2005
(compiled by Andrew Suarez, avsuarez@life.uiuc.edu).

Subfamily	Genus	Species
Dolichoderinae	*Tapinoma*	*sessile*
Formicinae	*Acanthomyops*	*parvula*
	Brachymyrmex	*depilis*
	Camponotus	*castaneus*
	Camponotus	*nearcticus*
	Camponotus	*pennsylvanicus*
	Camponotus	*subbarbatus*
	Formica	*pallidefulva* subsp. *nitidiventris*
	Formica	*fusca*
	Lasius	*alienus*
	Lasius	*umbratus*
Myrmicinae	*Aphaenogaster*	*fulva*
	Aphaenogaster	*tennesseensis*
	Crematogaster	*lineolata*
	Myrmecina	*americana*
	Myrmica	*spatulata*
	Stenamma	*impar*
	Temnothorax	*curvispinosus*
	Temnothorax	*schaumii*
	Tetramorium	*caespitum* (introduced species)
Ponerinae	*Ponera*	*pennsylvanica*
Proceratiinae	*Proceratium*	*silaceum*

Tapinoma sessile



Brachymyrmex depilis

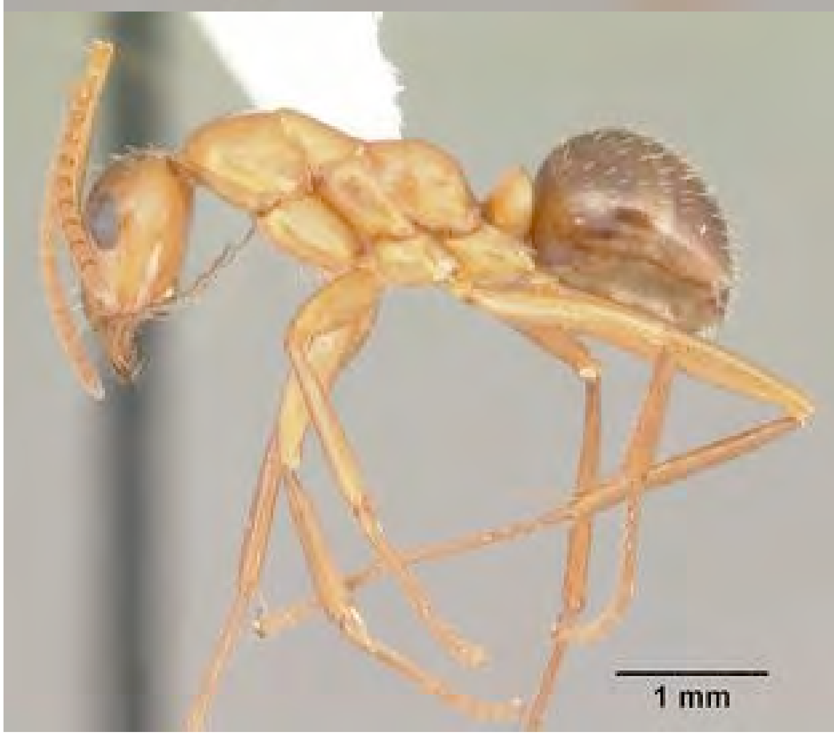
Camponotus castaneus

Camponotus nearcticus

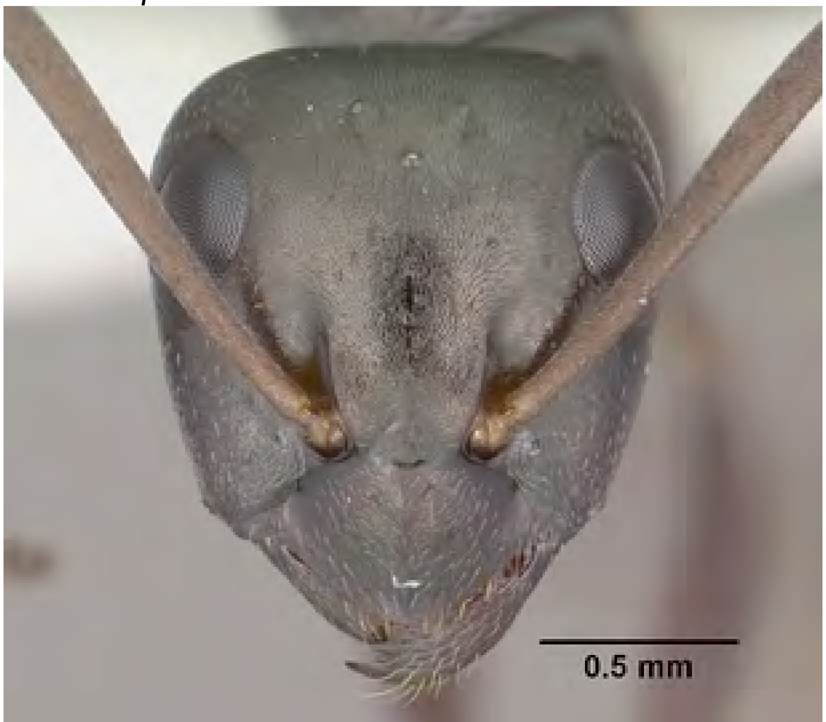
Camponotus pennsylvanicus

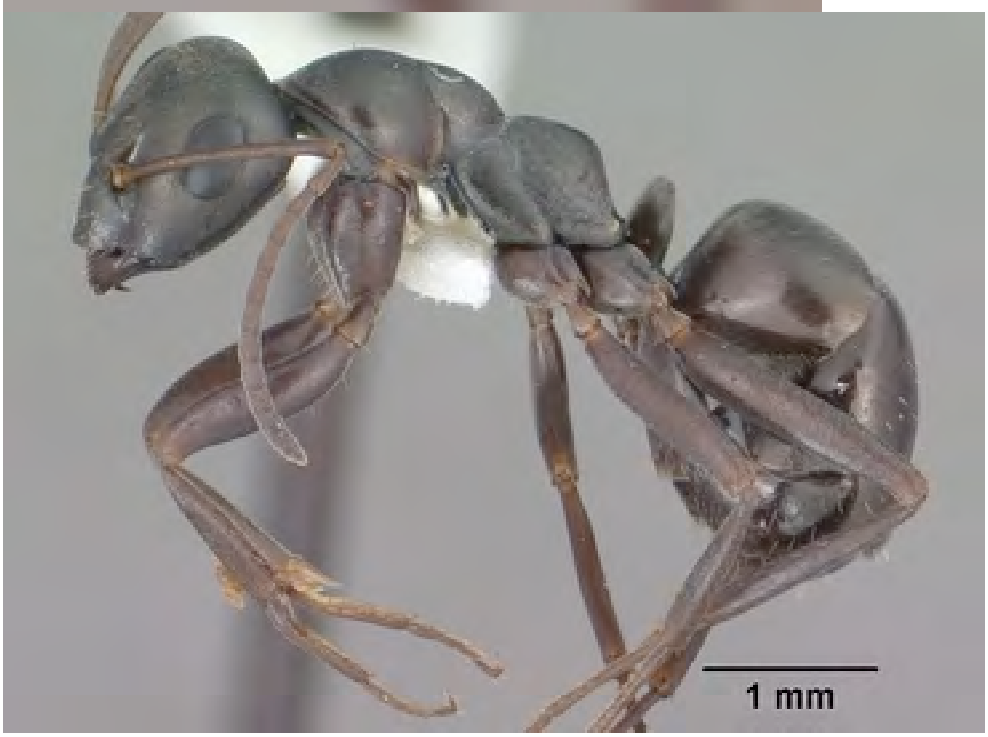
Camponotus subbarbatus

Formica pallidefulva subsp. *nitidiventris*

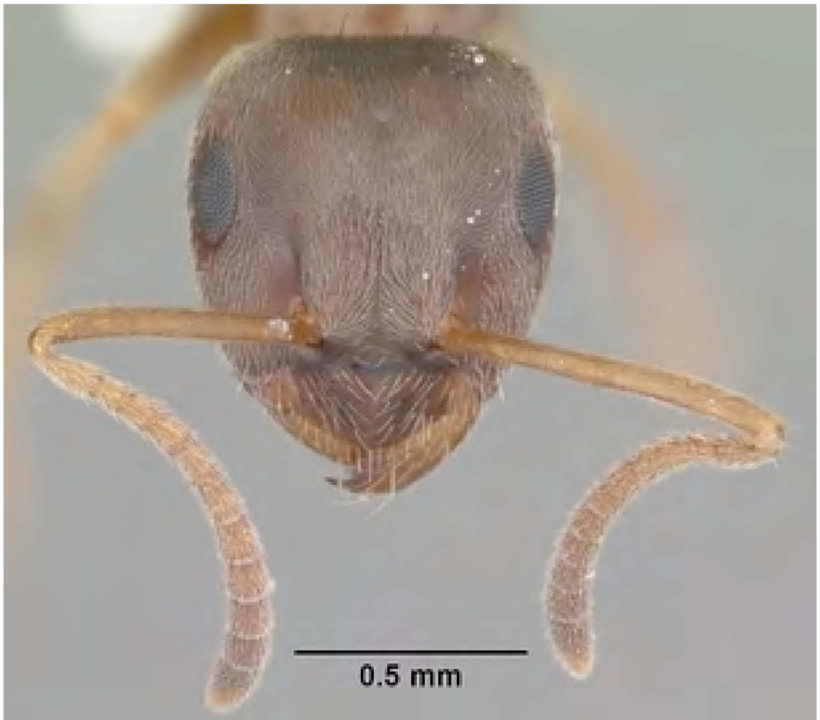


Formica fusca

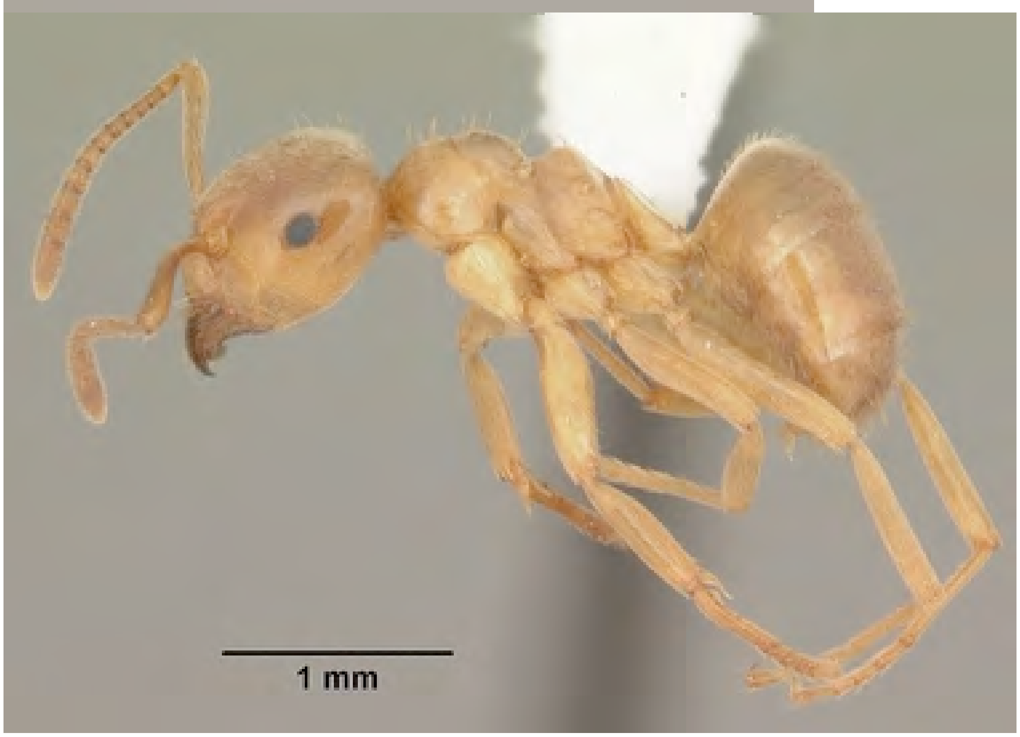




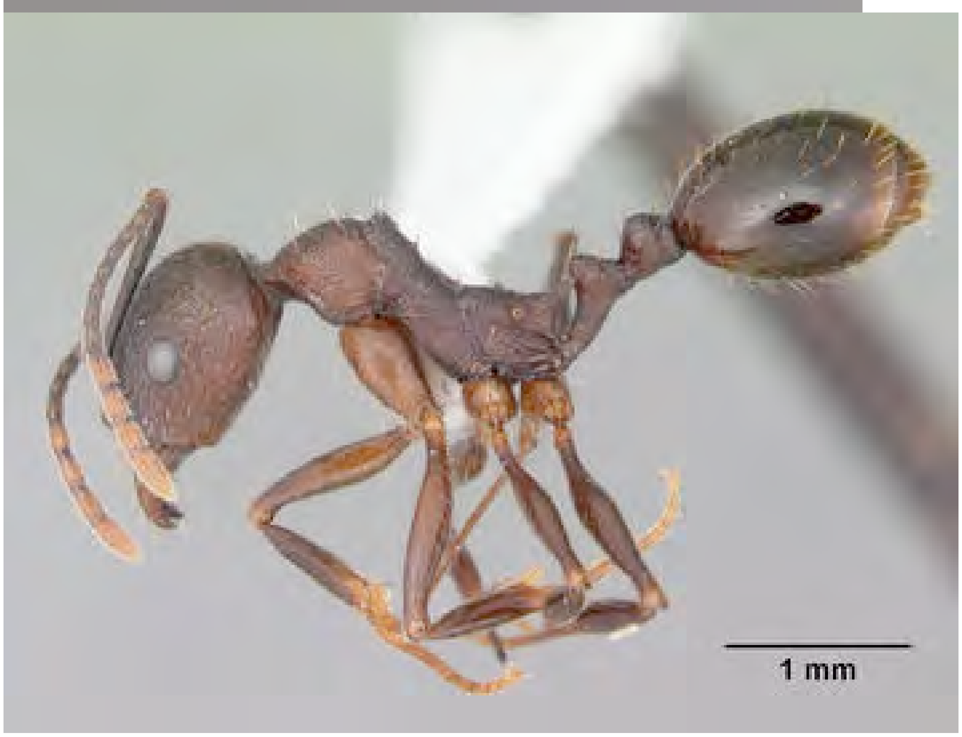
Lasius alienus



Lasius umbratus



Aphaenogaster fulva

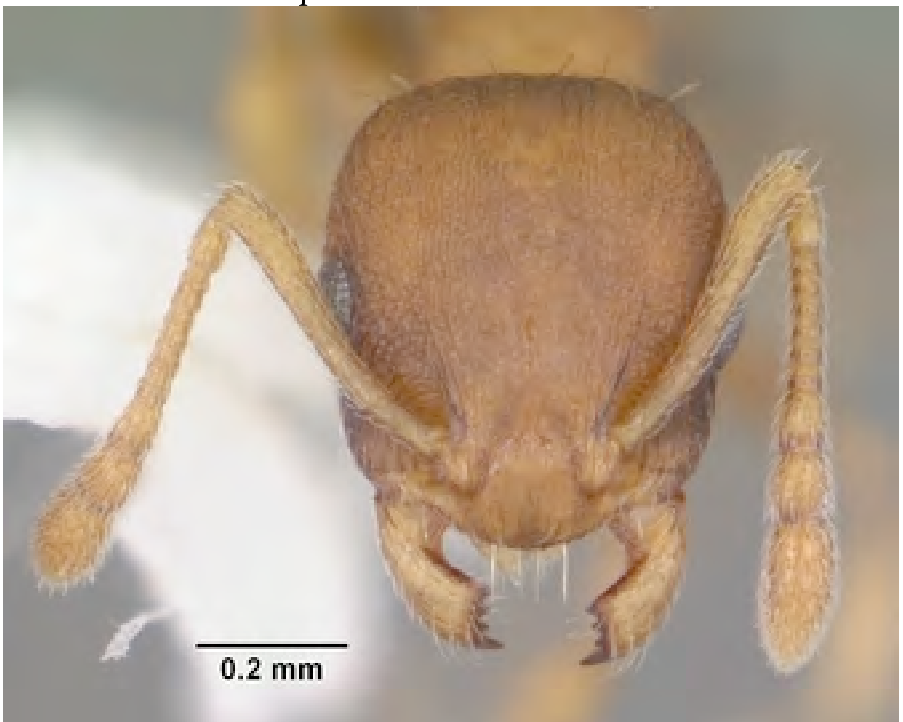


Aphaenogaster tennesseensis

Crematogaster lineolata

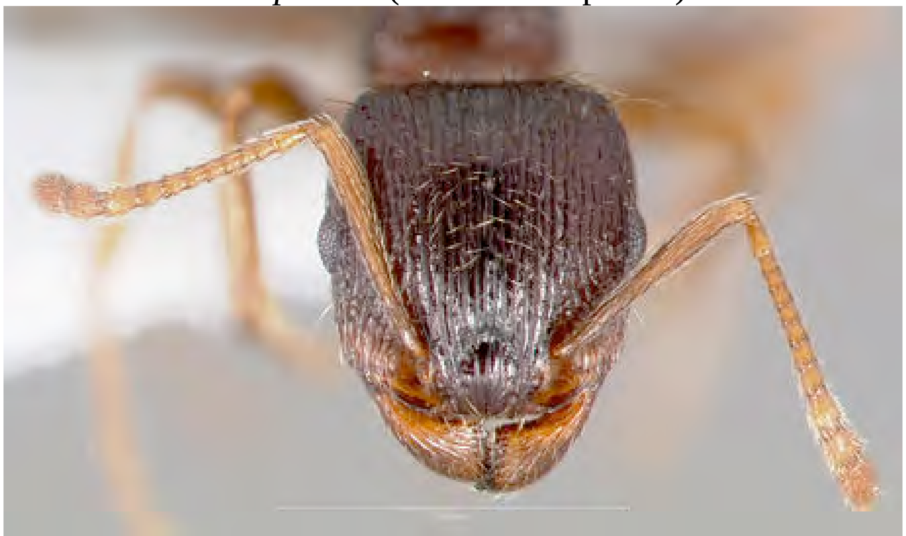
Myrmecina americana

Temnothorax curvispinosus



Temnothorax schaumii

Tetramorium caespitum (introduced species)



Ponera pennsylvanica

Proceratium silaceum

STREAM CONDITION IN THE SALINE BRANCH DRAINAGE OF CHAMPAIGN AND URBANA, ILLINOIS.

By

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&
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10/11/2006

To

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Illinois Natural History Survey
Center for Biodiversity
Technical Report 2006(9)

ABSTRACT

In-situ water chemistry, Ephemeroptera, Plecoptera, and Trichoptera (EPT) abundance and taxa richness, the Hilsenhoff Biotic Index (HBI) of organic enrichment, and a Habitat Quality Index (HQI) were used to assess stream condition for seven stream sites along an agricultural to urban drainage gradient in Urbana and Champaign, Illinois. These data were compared to numerical criteria developed from high quality stream locations in the Grand Prairie Natural Division. Dissolved oxygen saturation average 82.3% with values ranging from 20 to 113%. EPT richness was low across the entire drainage, averaging 3.7 taxa and ranging from 0 to 7. HBI scores indicated a moderate to high organic enrichment in the drainage, with an average score of 6.4 and a range of from 5.6 to 6.9. Habitat quality averaged 86.4 points and ranged from 56 to 112. Compared to reference stream data most Saline Branch drainage sites were of Poor overall quality, with the exception of the downstream most site, which was given a Fair overall rating.

INTRODUCTION

The Saline Branch Drainage Ditch (hereafter Saline Branch) drains 60 mi^2 of cropland before it enters the urban area of Champaign and Urbana. Here it drains another 9 mi^2. Boneyard Creek, a tributary of the Saline Branch, drains urban landscape in Champaign and Urbana, flowing from the west (Fig. 1).

The Saline Branch has been subjected to severe degradation in the past century. Channelization has decreased the diversity of stream habitat by creating a straight, uniform channel with limited variation in water depth. This causes extreme fluctuations in water level, chemistry, and temperature. In addition, field tiling causes great water fluctuations and allows pesticides, fertilizers, and other runoff to bypass grass and wooded riparian zones to directly enter into streams. This instability in water level puts a great stress on the organisms in the streams by repeatedly and unpredictably stranding aquatic invertebrates clinging to bank habitat. The urban areas of the two streams are also exposed to residential and commercial runoff, including lawn chemicals, trash, oils, and road salts. In some areas the stream banks are covered by slabs of concrete; while this helps prevent the erosion of the bank, it eliminates a bank habitat for aquatic species that use it.

The Anita Purves Nature Center and Crystal Lake Park areas contain enough space that stream restoration projects are a possibility. Our results can be used to compare these areas before and after these projects to determine the effectiveness of restoration efforts on aquatic invertebrate habitat. Additionally, the Critical Trends Assessment Program (CTAP), of the Illinois Natural History Survey (INHS), characterized the best remaining stream sites in the Grand Prairie Natural Division, an area of agriculture that surrounds Champaign and Urbana (Sangunett 2005). By comparing Saline Branch drainage efforts to CTAP reference site data, one can determine the level of degradation to which the Saline Branch drainage has been subjected.

Having our current data and the CTAP reference data for these areas in the past would have been extremely valuable. An ammonia spill occured in 2004 in the lower Saline Branch, but because there were no macroinvertebrate data for the area at the time, assessing the damage that occurred there was difficult. The effects of a future spill or disturbance can be more accurately determined because of the availability of our and other CTAP data.

The objectives of our study are to characterize the current stream condition using CTAP protocols. These results will be compared to streams sites with the highest biotic potential using the CTAP reference stream data. Our results provide a list of the taxa found, specimen abundance at each site, a habitat quality score, and several water chemistry measurements.

METHODS

Streams were sampled using CTAP protocols (DeWalt 2002) from May 15-31, 2006. Parameters measured included the taxonomic richness of aquatic insects in the orders Emphemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies), or EPTs, the Hilsenhoff Biotic Index (HBI), and a habitat quality index (HQI). EPT taxa are excellent indicators of watershed disturbance and require no expensive equipment for collection (Barbour et al. 1999). The HBI is measure of the pollution tolerance of aquatic insects; most EPT taxa have their own numerical organic pollution tolerance rankings (Hilsenhoff 1987) and the HBI for a site is simply the weighted average of these rankings. Values range from 0-10, with higher values indicating a community of greater pollution tolerance. The HQI, an index of 12 parameters, measures a stream's ability to provide habitat for aquatic organisms. The HQI we have used is similar to that used in Barbour et al. (1999). Some measures include the width of the riparian zone (its natural vegetation zone), the composition of the stream sediments, and the sinuosity (how much it meanders) of the channel. More habitat for aquatic insects translates to a higher score; for example, aquatic insects depend on wood debris in the stream for shelter. A stream with logs and rocks in it will receive a higher score than that of a barren stream.

CTAP also uses *in-situ* chemical traits of the water, including temperature, dissolved oxygen, pH, and conductivity. These are useful for discovering potential problems that are not readily visible, such as a drop in dissolved oxygen or rise in temperature that effects stream organisms. Measurements were taken with a Hydrolab Quanta™ that was calibrated daily.

EPT samples were collected using a rectangular dipnet from fast current riffles of rock, as well as in slow current banks. The variety in the chosen habitats increases the number of taxa collected in the area. The specimens were identified to species where possible and put in the INHS Insect Collection as a voucher. The CTAP metrics were compared against the reference stream conditions in the Grand Prairie (Sangunett 2005). Using this comparison, the sites received a rating based on their measurements.

Seven sites were sampled (Fig. 1, Table 1), two in the Boneyard Creek drainage and five in the Saline Branch drainage. While the Boneyard drained only urban areas, sites for the Saline Branch were chosen to demonstrate the difference between streams that are either dominated by agricultural drainage or by urbanization.

RESULTS

Water Chemistry and Temperature.-Water temperatures averaged 16°C and ranged from 11.1 to 23.0°C across the seven stream sites. The highest water temperature was recorded at the Saline Branch east of Augerville, which is below the Urbana Wastwater Treatment Plant (WTP) outfall.

All streams were slightly basic with an average pH of 7.80 and a range of 7.34 to 7.98 (Fig. 2). The lowest pH, 7.34, occurred in the Boneyard Creek at the Sycamore Rd. site. Conductivity averaged 633 µS/sec and ranged from 412 (Scott Park) to 714 µS/sec (Chief Shumager Park) (Fig. 3). Percentage saturation of dissolved oxygen averaged 81%, meaning that only 81% of the water's oxygen holding capacity was met (Fig. 4). The lowest percentage saturation of dissolved oxygen occurred at the Sycamore Rd., Boneyard Creek site. Here, only 23.7% of oxygen capacity was reached, possibly indicating a high organic enrichment load. The Chief Shumager Park site was supersaturated with oxygen at 113%. This was probably due to the streams overall faster flow and to high photosynthetic rates of algae on this sunlit afternoon.

EPT Abundance.-This was generally low, averaging 82.1 individuals (Fig. 5). The Boneyard Creek at Scott Park (completely urban) supported no EPT specimens, while the Saline Branch at Oak and CR 1300E (totally agricultural) produced 364 specimens.

EPT Taxonomic Richness.-This was also low in both drainage basins, averaging 3.7 taxa (Fig. 6. Table 2). Of course, Boneyard Creek at Scott Park yielded no EPT taxa, while the Saline Branch at Crystal Lake Park produced 7 taxa. The Boneyard Creek at Sycamore Rd. produced a single taxon, three specimens of the moderately tolerant net-spinning caddisfly, *Hydropsyche betteni* Ross.

Hilsenhoff Biotic Index.-HBI averaged 6.4 units across the basin (Fig. 7). The Saline Branch at Oak and CR 1300E scored highest (worst) at 6.9 units, while the Chief Shumager Park site scored lowest (best) at 5.60 units. Boneyard Creek at Sycamore Rd. had an HBI score derived from only three specimens, so the number itself is not informative. No HBI was calculated for the Boneyard Creek at Scott Park, since no EPTs were collected there.

Habitat Quality Index.-HQI values averaged 86.4 points (Fig. 8). The highest score, 112, occurred at the Boneyard Creek at Sycamore Rd., while the lowest score, 56, occurred at the Scott Park.

DISCUSSION

CTAP has sampled 63 randomly chosen stream sites in the Grand Prairie Natural Division of Illinois, most of them being predominantly agricultural in nature. It has also sampled 17 high quality reference streams in the division, allowing for the establishment of numerical rating criteria for streams sampled with the CTAP procedure (Sangunett 2005, see Table 3 for EPT, HBI, HQI statistics and numerical and qualitative ratings for Grand Prairie streams). To date, CTAP has gathered little information to determine the condition of urban streams in the region. This study allows CTAP to depict the condition of seven stream segments, six of which are dominated by urban drainage.

All seven sites sampled during this study scored Poor to Fair when compared to Grand Prairie reference stream data (Table 4). Boneyard Creek sites demonstrated a singular inability to support EPT or nearly any other fauna (Table 2). Habitat in Boneyard Creek at Scott Park was limited to fine sediments or a few silt and algae covered bricks, remnants of fill materials. The site yielded a few non-target taxa, including aquatic worms, leeches, and pond (sewage) snails, taxa that are highly tolerant of organic enrichment and low dissolved oxygen. The Boneyard

Creek at Sycamore Rd. was little better, with the exception that habitat had improved dramatically. However, low oxygen saturation, possibly due to organic enrichment, supported a limited fauna.

Efforts on the Saline Branch began in agricultural lands north of Urbana area. Here, the stream was channelized and leveed with small, adjacent wooded areas. Much of the bottom was shifty sand and fine silt, although the water was clear and the bottom supported multiple species of aquatic plants. It produced the greatest abundance of EPT specimens, but the richness of species was low, in the Poor category for EPT in the region. Sampling at Anita Purves produced many fewer individuals, but a similar EPT taxa richness. This low abundance and EPT richness carried throughout the remaining Saline Branch sites (Table 2).

The taxa list contains only moderately tolerant species (Table 2). The Boneyard Creek community is suggestive of chronic hypoxia (low dissolved oxygen), which may mean that one or more sanitary sewer lines are damaged somewhere in the drainage, although other factors may be responsible. The Saline system is in better condition as evidenced by its ability to support several EPT species. Here, it appears that acute exposures to lawn chemicals, light industrial runoff, or some other chemical source eliminates many of the insects from Anita Purves and downstream. It is likely that such an event took place sometime in the second half of 2005 or first half of 2006. The 2005 Bioblitz in the Saline Branch at Anita Purves Nature Center (site 4 in Table 1) yielded some 20 EPT taxa. Although the methods are not strictly comparable to the current procedures, the EPT community found in 2005 provides strong evidence that the Anita Purves site was not habitat or water quality limited and that some recent event has eliminated many taxa. Having EPT data collected with a standard procedure will aid in determining the negative impacts of spill events in the future.

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Table 1. Locations sampled on Boneyard Creek and Saline Branch in agricultural and urban areas of Urbana and Champaign, Illinois, May 2006.

Stream	Short Names for Figures	Locality	Date	Classification	Latitude	Longitude
1. Boneyard Creek	Boneyard Scott Pk	Champaign, Scott Park	5/15/2006	Urban	40.1120	88.2366
2. Boneyard Creek	Boneyard Sycamore Rd.	Urbana, Sycamore Rd.	5/31/2006	Urban	40.1168	88.2009
3. Saline Branch	Saline Oak & 1300E	4 km WNW Augerville, Oak & CR1300E	5/16/2006	Agricultural	40.1507	88.2151
4. Saline Branch	Saline Anita Purves	Urbana, adj. Anita Purves Nature Center	5/22/2006	Urban	40.1275	88.1230
5. Saline Branch	Saline Crystal L	Urbana, Crystal Lake Park	5/15/2006	Urban	40.1197	88.2091
6. Saline Branch	Saline Shumager	Urbana, Chief Shumager Park	5/22/2006	Urban	40.1194	88.2010
7. Saline Branch	Saline E Augerville	1.8 km E Augerville, south of CR 1800N	5/31/2006	Urban	40.1372	88.1522

Table 2: Taxa collected from 7 sites in the Boneyard Creek and Saline Branch drainages of Champaign and Urbana during May, 2006. Site numbers refer to locations in Table 1.

	Sites							
Taxon	**1**	**2**	**7**	**3**	**4**	**5**	**6**	**Total**
Ephemeroptera								
Baetidae								
Acentrella turbida (McDunnough)					2		8	10
Baetis flavistriga McDunnough						1		1
Baetis intercalaris McDunnough							10	10
Plauditus sp.				2				2
Caenidae								
Caenis latipennis Banks			14	331	36	28		409
Emphemeridae								
Hexagenia limbata (Serville)				10	1			
Hexagenia sp.			2	20				22
Heptageniidae								
Stenacron interpunctatum (Say)			5		1	5		11
Trichoptera								
Oecetis sp.				1				1
Heliopsychidae								
Heliopsyche borealis Hagen			1		2			3
Hydropsychidae								
Cheumatopsyche analis (Banks)					1	1		2
Cheumatopsyche sp.			1		2	5	20	28
Hydropsyche betteni		3			5	6	51	65
Abundance	0	3	23	364	48	45	81	564
Ephemeroptera	0	0	3	3	4	3	2	
Trichoptera	0	1	2	1	3	2	2	
Plecoptera	0	0	0	0	0	0	0	
EPT Richness	0	1	5	4	7	5	4	

Table 3. Critical Trends Assessment Program numerical criteria and suggested quality ratings for streams in the Grand Prairie Natural Division of Illinois (Sangunett 2005).

Statistics and Quality Ratings	**EPT**	**HBI**	**HQI**
Mean	18.5	4.841	132.22
Standard Dev	2.662	0.622	13.567
Excellent	>18.5	<4.84	>132.22
Good	15.84-18.4	4.85-5.46	118.66-132.21
Fair	13.18-15.83	5.47-6.09	105.07-118.65
Poor	<13.2	>6.08	<105.09

Table 4. Qualitative ratings for Boneyard Creek and Saline Branch sites sampled in May 2006. Quantitative EPT, HBI, and HQI values were were compared to numerical criteria established for Grand Prairie Natural Division streams (Sangunett 2005), the division to which Boneyard Creek and Saline Branch belong. Overall ratings are generally the most frequent rating for individual parameters.

Sites	EPT	HBI	HQI	Overall
Boneyard Scott Pk	Poor	Poor	Poor	Poor
Boneyard Sycamore Rd.	Poor	Fair*	Fair	Poor
Saline Oak & 1300E	Poor	Poor	Poor	Poor
Saline Anita Purves	Poor	Poor	Poor	Poor
Saline Crystal L	Poor	Poor	Poor	Poor
Saline Shumager	Poor	Poor	Poor	Poor
Saline E Augerville	Poor	Fair	Fair	Fair

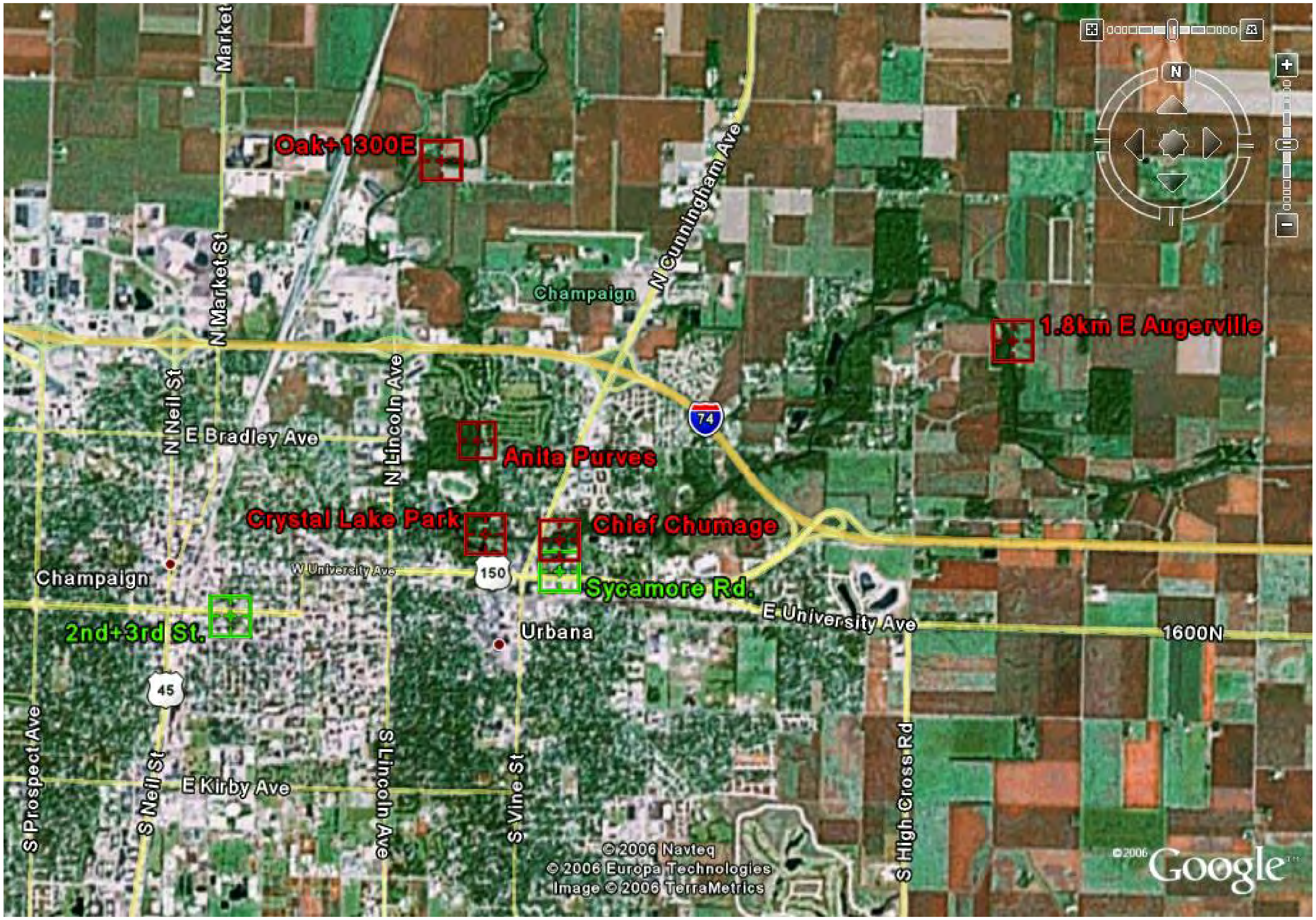

Figure 1. Saline Branch drainage sites sampled during May, 2006 using Critical Trends Assessment Procedures. Red indicates Saline Branch sites, while green indicates Boneyard Creek sites.

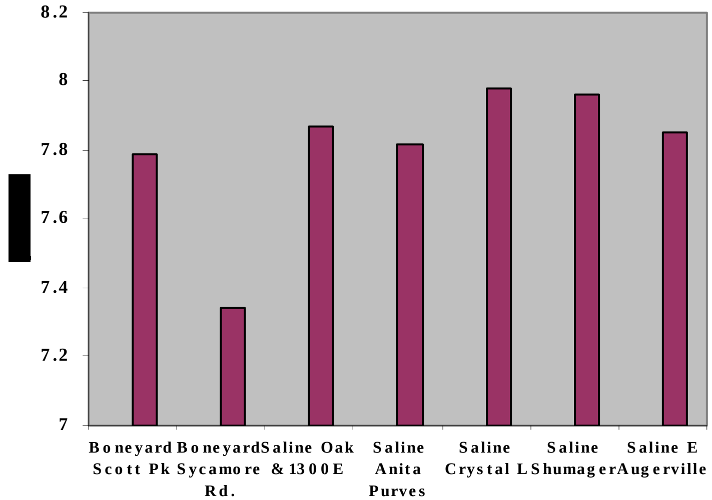

Fig. 2. pH units for seven stream sites in the Saline Branch drainage.

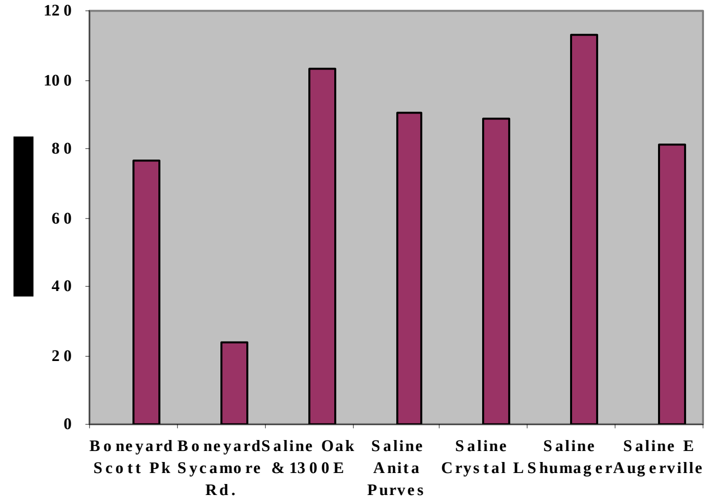

Fig. 3. Conductivity (µS/cm) for seven stream sites in the Saline Branch drainage.

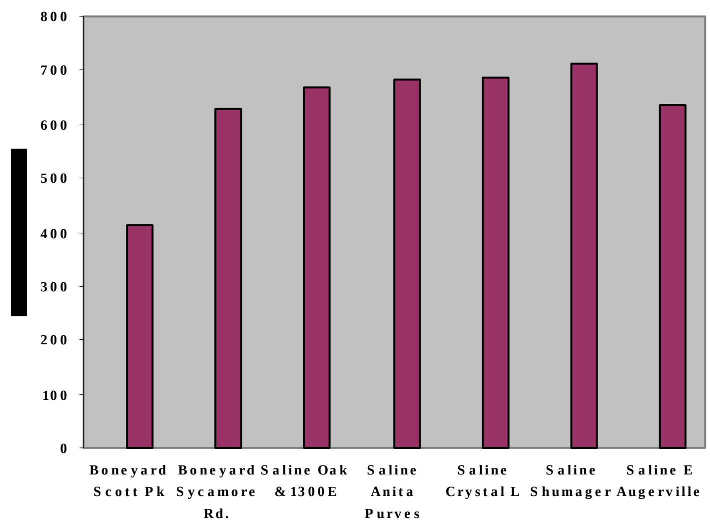

Fig. 4. Percentage saturation dissolved oxygen for seven stream sites in the Saline Branch drainage.

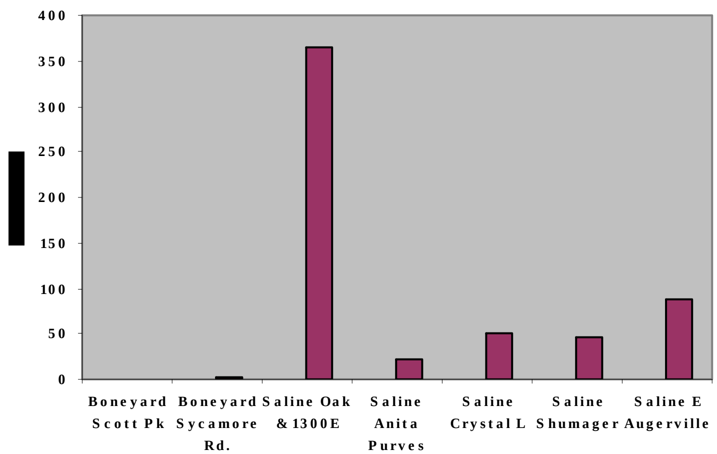

Fig. 5. EPT abundance from seven stream sites in the Saline Branch drainage.

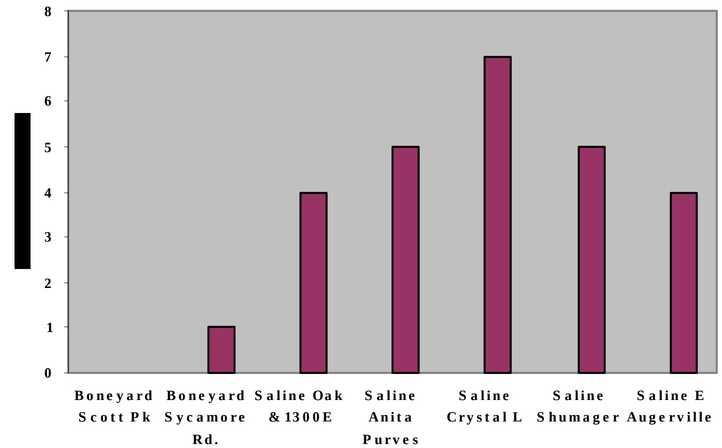

Fig. 6. EPT taxa richness from seven stream sites in the Saline Branch drainage.

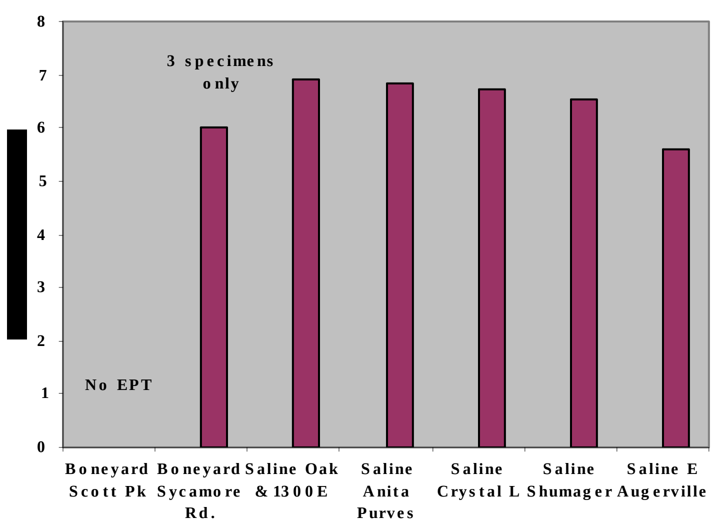

Fig. 7. Hilsenhoff Biotic Index scores from seven stream sites in the Saline Branch drainage.

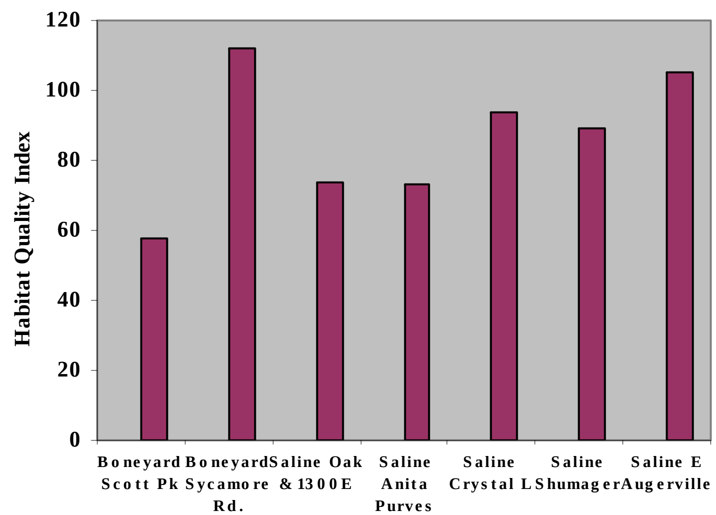

Fig. 8. Habitat Quality Index scores from seven stream sites in the Saline Branch drainage.