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**RESURVEY OF THE PENTATOMOIDEA (HETEROPTERA) OF
THE LA RUE-PINE HILLS RESEARCH NATURAL AREA
IN UNION COUNTY, ILLINOIS**

D. L. Tecic¹ and J. E. McPherson²

ABSTRACT

A resurvey of the Pentatomoidea of the La Rue-Pine Hills Research Natural Area was conducted from September 1992 to June 1995 and the results compared with those of an earlier survey by McPherson and Mohlenbrock (1976). Sampling during the resurvey was limited to the 17 collecting sites of the earlier survey, thus permitting comparisons of the flora and fauna in the two studies. Notes were taken on the times of occurrence of adult and immature stages and on the food plants.

Of the 49 pentatomoid species and subspecies included in the original survey, 36 were collected during the resurvey. Of the 13 not collected, 12 were rare and one, *Holcostethus limbolarius* (Stål), was relatively common during the original survey. Two additional species, *Galgupha ovalis* Hussey and *Corimelaena obscura* McPherson and Sailer, were added to the list, the latter because it was described as new subsequent to the original survey. The most noticeable change in the vegetation that accounted for differences in pentatomoid diversity and abundance was the marked reduction in abundance of common mullein, *Verbascum thapsus* L.

The resurvey showed that 11 of the 17 sites had changed in character and plant composition, seven because of woody invasion and four because of the influence of exotic and invasive species; the remaining six had changed little. Exotic plant species have become an increasingly prominent component of the vegetative communities.

McPherson and Mohlenbrock surveyed the Pentatomoidea of the La Rue-Pine Hills Ecological Area (now La Rue-Pine Hills Research Natural Area; hereafter referred to as Pine Hills) from May 1972 to September 1974, the results of which were published in 1976; this superfamily was represented by the Cydnidae (burrowing bugs), Pentatomidae (stink bugs), Scutelleridae (shieldbacked bugs), and Thyreocoridae (= Corimelaenidae) (negro bugs). The survey was based on collections at 17 sites (Fig. 1), which primarily included roadside habitats within open areas and those within bottomland, mesic, and dry forests. This was the first survey of the invertebrates of Pine Hills and supported earlier surveys of vertebrates and plants that had shown this small area, ≈ 7.7 km², to be remarkably diverse. This high diversity resulted from the proximity of several habitat types and included vertebrate and plant species that are rare in Illinois and others that are unique to Pine Hills (e.g., Forbes and Richardson 1920; Gunning and Lewis 1955, 1956; Hoffmeister and Mohr 1957; Rossman 1960; Smith 1961; Mohlenbrock and Voigt 1965; Klimstra 1969). The pentatomoid survey included 49 species, five of which were state records. The remaining 44 represented over 57% of the taxa listed for the state at that time.

Since that survey, there have been changes in the management policy by the USDA Forest Service (USFS) in the maintenance of Pine Hills (see recent history below). These changes have had marked effects on the roadside vegetation, but the resulting effects on the pentatomoid fauna were unknown. Therefore, a resurvey

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was undertaken and compared with the original survey by McPherson and Mohlenbrock (1976) to document changes in the flora and pentatomoid fauna.

The objectives of the resurvey were to: (1) identify the major representatives of the plant communities at the original 17 sites, (2) collect and identify the immature and adult pentatomoids at each site, (3) compare these findings with those of McPherson and Mohlenbrock (1976), (4) attempt to explain changes in the flora and pentatomoid fauna, and (5) provide additional information on the biology of the Pentatomoidea through field observations.

General Description of Area. Pine Hills is located in northwestern Union County, about 29 km northeast of Cape Girardeau, MO (Fig. 1). It extends north and south for 5.6 km, averages 1.6 km in width, and includes upland and lowland areas. These areas fall within two natural divisions: the uplands are part of the southern section of the Ozark division; and the lowlands, including La Rue Swamp and the adjacent floodplain forest, are part of the southern section of the lower Mississippi River bottomlands division (Schwegman 1973). The most prominent feature is the wall of west-facing limestone bluffs that runs most of the length of the area and rises to 107 m above the flood plain. The bluffs provide a variety of habitats ranging from steep talus slopes to moist, undercut, seepage areas and support dense forestland along their ridges and hillsides and a loess hill prairie. The bluffs are covered, in part, with a layer of cherty gravel that provides habitat for some uncommon plant species including the shortleaf pine, *Pinus echinata* Miller, for which Pine Hills was named (Mohlenbrock and Voigt 1965). La Rue Swamp lies at the base of the bluffs (Fig. 2) and receives inflow from seeps and springs along the bluffs; it drains into Running Lake Ditch through three man-made outlets. Water levels in the swamp also are influenced by beaver dams, which have caused flooding and subsequent tree mortality (Hutchison et al. 1986). Areas adjacent to the swamp are predominantly rich, moist bottomland woods. The proximity of the swamp to the bluffs provides prime habitat for the cottonmouth, *Agkistrodon piscivorus* (Lacepede), and the state-threatened Mississippi green water snake, *Nerodia cyclopion* Dumeril, Bibron, and Dumeril (Ballard 1994). This diverse array of habitat types within Pine Hills, including Mississippi bottomland forest; shallow swamp; mesic, dry, and xeric upland forest; cherty slopes; limestone bluffs; and the remnants of a loess hill prairie, supports a wide variety of plant and animal species.

Site Descriptions (Original Survey). The location of each of the 17 collection sites is shown in Figure 2. The sites can be divided roughly into three groups: (1) Levee Road (7, 8, 9), (2) Lowland (1, 2, 3, 4, 5, 6, 10, 11, 12), and (3) Upland (13, 14, 15, 16, 17). Most of the sites comprised roadside vegetation that, during the original survey, and in cooperation with the USFS, were not mowed during the growing season (unpublished information). The plants were identified during two visits in 1974 (i.e., spring/summer, summer/fall) to characterize each site (unpublished data) and were not intended to be a complete list of the species present. Representative plants are given below; these and others are listed in Table 1 for each site with exotics (non-natives) indicated.

Levee Road Sites (7, 8, 9). The Levee Road sites are located just west of Pine Hills proper and are open, disturbed roadsides. During the original survey, common plants at these sites included *Apocynum cannabinum* L., *Campsis radicans* (L.), *Daucus carota* L., *Desmanthus illinoensis* (Michaux), *Oenothera biennis* L., *Rudbeckia hirta* L., *Solidago canadensis* L., and *Vernonia missurica* Rafinesque. Common grasses included *Bromus tectorum* L., *Sorghum halepense* (L.), and *Tridens flavus* (L.). Some areas had woody encroachment, including *Fraxinus americana* L. and *Gleditsia triacanthos* L.

Lowland Sites (1, 2, 3, 4, 5, 6, 10, 11, 12). The lowland sites are located along the base of the bluffs and consist of rich lowland woods that join La Rue Swamp farther west. However, these sites are not homogeneous because slight variations in elevation result in distinct compositional differences. The natural

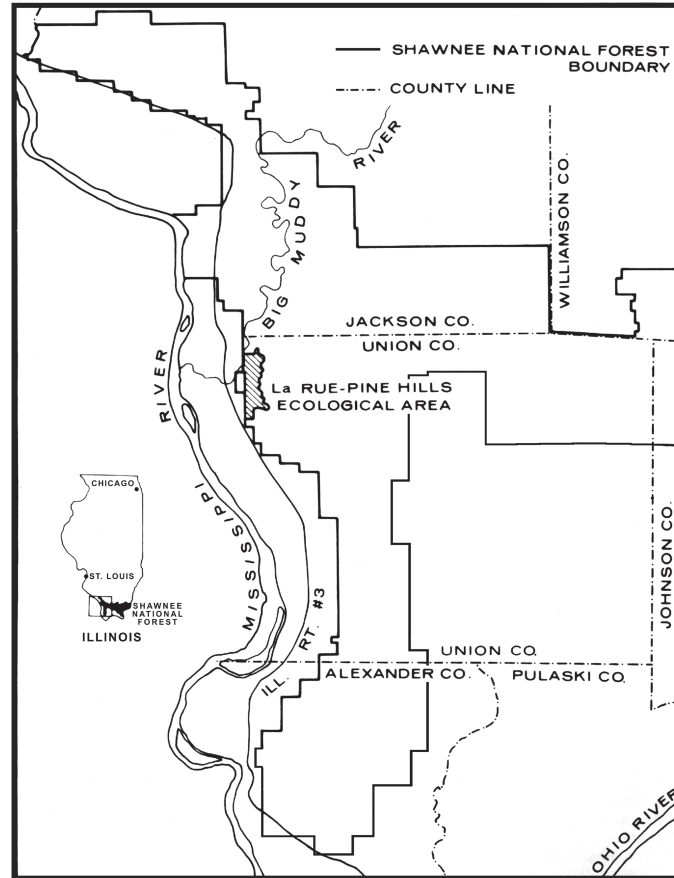


Fig. 1. Location of Shawnee National Forest in Illinois (insert) and of La Rue-Pine Hills Research Natural Area (from McPherson and Mohlenbrock [1976]).

communities range from wet floodplain forest to mesic floodplain forest (Illinois Natural Areas Inventory, unpublished data) but include some more characteristically upland plant species scattered in well-drained, open areas. During the original survey, common trees included *Asimina triloba* (L.), *Celtis occidentalis* L., *Cercis canadensis* L., *Liquidambar styraciflua* L., *Quercus prinoides* Willdenow (= *Q. muhlenbergii* Engelman), *Ulmus americana* L., and *Ulmus rubra* Muhlenberg. Others were *Acer saccharum* Marshall, *Carya ovalis* (Wangenheim), *Carya ovata* (Miller), *Celtis laevigata* Willdenow, *Cornus drummondii* C. A. Meyer, *Gymnocladus dioica* (L.), *Juglans nigra* L., *Morus rubra* L., *Populus deltoides* Marshall, *Quercus imbricaria* Michaux, *Rhus glabra* L., and *Rubus occidentalis* L. Common herbaceous plants included *Dichanthelium commutatum* (Schultes) (= *Panicum commutatum* Schultes), *Echinochloa muricata* (Beauvois) [= *E. pungens* (Poiret)], *Impatiens capensis* Meerbaugh, *Impatiens pallida* Nuttall, *Perilla frutescens* (L.), *Phlox divaricata* L., *Solidago canadensis*, *Symphotrichum pilosum* (Willdenow) (= *Aster pilosus* Willdenow), *Teucrium canadense* L., *Verbena urticifolia* L., and *Verbesina alternifolia* (L.).

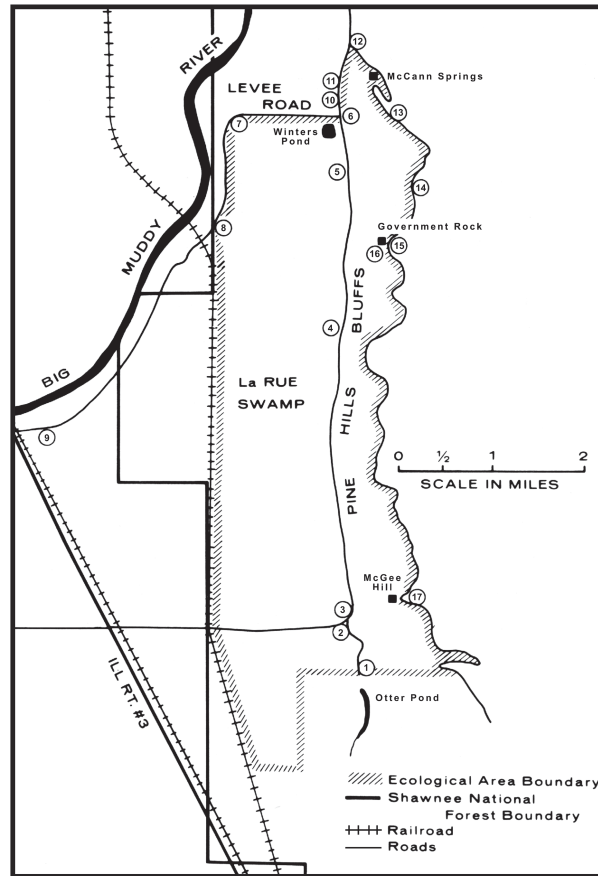


Fig. 2. Map of La Rue-Pine Hills Research Natural Area showing locations of collecting sites (from McPherson and Mohlenbrock [1976]).

Upland Sites (13, 14, 15, 16, 17). The upland sites are located along the road that begins at the floodplain, ascends the bluffs, and continues along the ridge top. In some places, this road is relatively close to the bluff edge, and the natural communities are influenced by the exposure, proximity to bedrock, and thorough drainage. During the original survey, some of these sites supported a variety of prairie plants including *Andropogon gerardii* Vitman, *Ceanothus americanus* L., *Dalea candida* Michaux [= *Petalostemum candidum* (Willdenow)], *D. purpurea* Ventenat [= *Petalostemum purpureum* (Ventenat)], *Schizachyrium scoparium* (Michaux) (= *A. scoparius* Michaux), and *Sorghastrum nutans* (L.). Some common nonprairie plants included *Perilla frutescens*, *Rhus glabra*, *Tridens flavus*, and *Verbascum thapsus* L., which was the most common species at site 13.

Recent History. Until 1982, the USFS maintained the roads within Pine Hills, including a 5-10 m strip parallel to the road. The vegetation of the strip was cut periodically, permitting sunlight to dry the roads more effectively. This “daylighting” helped maintain the roads and decreased road repair (Ray Smith,

personal communication). However, “daylighting” also had a marked impact on roadside vegetation, which was kept in early successional stages, characterized by open areas dominated by grasses and forbs.

Since 1982, the USFS has used a private contractor for road and roadside maintenance. In the late 1980s, several environmental organizations, including the Sierra Club, Association of Concerned Environmentalists (ACE), Regional Association of Concerned Environmentalists (RACE), and Illinois Department of Conservation appealed portions of the First Shawnee USFS Management Plan (Anonymous 1986), including the current road maintenance regime, saying that the roadside vegetation should not be mowed. In 1988, the USFS and environmental groups agreed to certain changes in the management plan under the USFS Settlement Agreement, signed 15 August 1988. This agreement stated, in part, that management of forests should aim to reduce roadside brush cutting and strive for a closed canopy with little fragmentation to increase the habitat for Neotropical migratory birds and reduce habitat for parasitic cowbirds. The terms of this agreement have been met or surpassed and were included in the 1992 Shawnee USFS Management Plan (Anonymous 1992), which superseded the 1986 plan. Currently, the hired maintenance contractors cut only the ditch-to-ditch area along the roads. Consequently, many of the roadside sites included in McPherson and Mohlenbrock’s (1976) original study have been invaded by shrubby or woody vegetation, thus reducing or obliterating the grasses and open canopy forbs. However, the USFS maintenance crews still trim roadside vegetation, especially near signs and at intersections (Ray Smith, personal communication).

MATERIALS AND METHODS

Collecting trips were taken weekly from September to November 1992, March to December 1993 and 1994, and May to June 1995. The early spring and late fall trips occurred before the bugs had emerged from and after they had entered overwintering sites, respectively. The disappearance of the insects in the fall generally corresponded to the senescence of host plants. A total of 84 collecting trips was taken, 81 of which yielded at least one pentatomoid specimen.

The methods used for the resurvey were similar to those of McPherson and Mohlenbrock (1976). Sixteen of the original 17 sites were used for the entire resurvey (Fig. 2). Collecting at site 1 (Otter Pond) was discontinued during summer 1993 because of deterioration of the site and access road (see later discussion of site).

Pentatomoids were collected by handpicking and sweeping. The visual search associated with handpicking also allowed observations of the bugs’ activities on plants. Specimens of common or easily identifiable species were recorded and released. Adults of less common species or those that could not easily be identified were preserved in 70% EtOH and returned to the laboratory for more careful examination. Nymphs that could not be identified were kept alive, brought to the laboratory, and reared to adults to facilitate identification (See below, Identification of Nymphs).

Occasional collecting trips were taken from November to January, 1993 and 1994, to examine leaf litter for overwintering pentatomoids. During each trip, 5-10 random samples of litter were collected and sieved through a stack of three graded screens onto a white sheet; mesh size from top to bottom was 1.3, 0.64, and 0.32 cm. Each screen was held in place by a 65.4 × 65.4 × 9.0 cm wooden frame. This collecting technique also was used sporadically during the active field season to check leaf litter and soil for ground-inhabiting species.

In 1993 and 1994, night collecting was conducted on nine occasions with a blacklight. Also, in 1994, an overnight fluorescent light trap was constructed and used on four occasions. The trap consisted of a tin U-shaped trough 60.3 cm long that tapered from 27.0 to 7.7 cm in width and 20.0 to 8.5 cm in depth. It was

closed at the top (wide end) by a U-shaped piece of tin and enclosed the top of a pint-sized Mason jar at the bottom (narrow end). A portable light with a fluorescent Hitachi F4T5/D bulb was suspended in the trough from a cord inserted through a hole in the back of the trap, 2.6 cm from the top, and knotted. The entire trap was hung from trees at both upland and lowland sites.

Specimens collected from leaf litter and light trapping were preserved in 70% EtOH and returned to the laboratory for further examination.

Identification of Nymphs. Because no adequate species keys for nymphal pentatomoids were available, field-collected immatures (as noted above) that could not be identified were brought to the laboratory and reared to adults to facilitate identification. The rearing technique followed that of McPherson (1971). Nymphs that died during collecting or rearing were compared to those in a synoptic collection, which was obtained by allowing field-collected adults to reproduce and preserving their nymphs in various instars. For field-collected nymphs not represented in the synoptic collection, identifications were made through comparisons with descriptions in the literature.

Techniques for maintaining adults and rearing nymphs varied depending on food preferences. For adults of phytophagous species that were generalists, the techniques followed that of McPherson (1971) (see below). Field-collected adults were placed in 1-quart Mason jars. Green beans (*Phaseolus vulgaris* L.) served as food and were placed on a disk of filter paper on the bottom of the jar. Two strips of paper toweling were added for absorption of excrement and to increase walking surface. Finally, a strip of cheesecloth was added, with one end over the lip of the jar, to serve as an oviposition site. The jar was closed with wire screening and a disc of paper toweling secured with the band of the 2-piece Mason jar lid.

Cheesecloth with attached egg clusters was removed daily and placed on moist discs of filter paper in petri dishes (\approx 9 cm diameter, 1.5 cm deep). The nonfeeding first instars, which usually remained on the empty egg clusters, were kept in the petri dishes; enough distilled water was added daily to keep the filter paper moist. The second and third instars were kept in the same petri dishes and fed green beans; fourth and fifth instars were transferred to Mason jars prepared similarly to those used for field-collected adults but without cheesecloth.

Field-collected nymphs of phytophagous species known or presumed to be generalists (because no specific host plants were known) were reared on green beans in the Mason jars described above except when the nymphs were young (1st-3rd), were thyreocorids or other pentatomoids of small body size, or were older instars (4th-5th) collected in limited numbers (1-3 specimens). These individuals were reared in the petri dishes described above rather than Mason jars. This modification prevented the death of instars that could have wandered beneath the dry filter paper of the jars or escaped.

For adults of phytophagous species with known specific host plants, cut stems of their plants with attached leaves and inflorescences were placed in 3- or 5-dram vials of water stoppered with cotton to prevent the bugs from drowning and placed in Mason jars. The vials of water were not needed if the inflorescence was partially dried or had been producing seeds when collected.

Methods for handling eggs and nymphs of specialists were similar to those mentioned above for field-collected generalists, except for differences associated with the use of host plants rather than green beans.

Predaceous nymphs were reared, and adults maintained, in the petri dishes described above and provided with mealworms (*Tenebrio molitor* L.), rather than green beans, and a moist cotton plug for additional moisture.

Rearing containers were kept in incubators maintained at $\approx 24 \pm 1.0^\circ\text{C}$ and an 18L: 6D photoperiod (130 ft-c). Food and paper were changed when necessary, usually every 4-5 days.

Vegetation. The more common herbaceous and woody plants at each site were identified and/or collected during the weekly trips to Pine Hills. They were identified primarily with keys by Mohlenbrock (1986) but also with those by Britton and Brown (1913), Mohlenbrock and Voigt (1959), Jones (1963), and Gleason and Cronquist (1991). The SIUC herbarium served as reference for key characters and confirmation of species identification. As the original survey was meant only to characterize the sites, the resurvey was a more thorough investigation.

Pentatomoid Species and Subspecies Accounts. The pentatomoid classification follows that of Froeschner (1988). The presentation of data for each species follows the format of McPherson and Mohlenbrock (1976). Relative abundance of each species, based on the total number of adults collected, is indicated by one of four categories: (1) 0-20 [rare], (2) 21-50 [uncommon], (3) 51-100 [common], and (4) 101 or more adults [abundant]; these are the same categories used by McPherson and Mohlenbrock (1976). Dates are earliest and latest collection of adults. Letter designations following host plants are as follows: A, adults; F, feeding; C, copulation; E, eggs; and N, nymphs. Note that if only adults were collected from a particular plant species, the record could represent just a "sitting" record.

RESULTS AND DISCUSSION

Site Descriptions (Resurvey). Comparison of the plant species composition between the two surveys could not be made on a species-by-species basis because the resurvey was more thorough than the original survey. Plants present only in the resurvey could have been missed in the original survey because they actually were not present, were not selected for site characterization, or were overlooked because of the limited number of trips taken (2) for plant identification. Still, the characteristic plants listed for the sites during the original survey are indicative of the plant communities at that time and are useful in discerning changes in species composition between the two surveys. Representative plants are given below. These and others are listed in Table 1 for each site with exotics (non-natives) indicated. Table 1 should be used in conjunction with later comparative statements below concerning changes in the vegetation between the two surveys.

One note of caution is necessary when using Table 1. As noted above, some plant species may have been present during both surveys but found only during the resurvey. Therefore, certain sites, based on Table 1, appear to have undergone marked changes in vegetation composition between the two surveys (e.g., sites 4-7). Yet, the text might indicate these same sites experienced little change. These apparent discrepancies are based on the fact that particular plants occur together in broadly based communities. Therefore, if certain plant species were found during both surveys, but other plants associated with them were found only during the resurvey, we assumed they also were present during the original survey. These sites, then, would be described as having undergone little change in vegetation between the two surveys.

Levee Road Sites (7, 8, 9). The vegetation along the roadside was mowed several times per year as a part of levee maintenance. As a result, these sites remained as fairly typical open, disturbed roadsides including a variety of native and non-native grasses and weedy forb species. However, repeated mowing during the resurvey reduced the number of plants that reached the reproductive phase, which generally is most attractive to pentatomoids. *Sorghum halepense* was a prominent invasive exotic warm-season grass at these sites. Some woody plant species were scattered along the levee, but woody encroachment was controlled by mowing. Species frequently found along these sites included *Apocynum cannabinum*, *Campsis radicans*, *Chamaesyce maculata* (L.), *Daucus carota*, *Desmanthus illinoensis*, *Desmodium illinoense* Gray, *Festuca*

Table 1. Plant species^{1,2,3} recorded from each site during the 1972-1974 survey (A), the 1992-1994 resurvey (B), and both surveys (C) of the flora in the La Rue-Pine Hills Research Natural Area.

Scientific Name	Common Name	Sites																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Acalypha ostryaefolia</i> Riddell	three seeded mercury								B									B
<i>Acalypha virginica</i> L.	three seeded mercury	B	B															
<i>Acer negundo</i> L. ¹	box elder	B	B		B					B	B							
<i>Acer rubrum</i> L.	red maple	B	B	B														
<i>Acer saccharinum</i> L. ¹	silver maple									B								
<i>Acer saccharum</i> Marshall	sugar maple	A																
<i>Achillea millefolium</i> L. ²	common yarrow									B								
<i>Agastache nepetoides</i> (L.) ¹	yellow giant hyssop										B							
<i>Agrimonia pubescens</i> Wallroth	soft agrimony											B						
<i>Allium canadense</i> L. ^{1,3}	wild onion																	
<i>Amaranthus hybridus</i> L.	green amaranth								B									
<i>Amaranthus retroflexus</i> L.	rough pigweed									B								
<i>Amaranthus spinosus</i> L. ²	spiny pigweed																	
<i>Amaranthus</i> sp.	pigweed																	
<i>Ambrosia artemisiifolia</i> L.	common ragweed	B										B			B		B	
<i>Ambrosia trifida</i> L. ¹	giant ragweed	B								A	B	B			B		B	
<i>Ampelopsis arborea</i> (L.)	pepper vine								C									
<i>Ampelopsis cordata</i> Michaux	raccoon grape																	
<i>Andropogon gerardii</i> Vitman	big bluestem										B							
<i>Antennaria plantaginifolia</i> (L.) ^{1,3}	pussytoes																	
<i>Apocynum cannabinum</i> L. ¹	Indian hemp																	B
<i>Arundinaria gigantea</i> (Walter)	giant cane									C								C
<i>Asarum canadense</i> L.	wild ginger																	
<i>Asclepias incarnata</i> L. ¹	swamp milkweed																A	
<i>Asclepias tuberosa</i> L.	butterfly weed																	A

Table 1. Continued.

Scientific Name	Common Name	Sites																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Asclepias viridiflora</i> Rafinesque	green milkweed																	
<i>Asimina triloba</i> (L.)	paw paw	C																
<i>Asplenium platyneuron</i> (L.)	ebony spleenwort										B	B						
<i>Aureolaria flava</i> (L.)	smooth false foxglove												B					
<i>Bidens aristosa</i> (Michaux)	swamp marigold										A							
<i>Bidens bipinnata</i> L.	Spanish needles										A							
<i>Bidens</i> sp.	beggar-ticks										B							
<i>Blephilia ciliata</i> (L.)	pagoda plant	B									B	B						
<i>Boehmeria cylindrica</i> (L.) ¹	false nettle		B	C														
<i>Boltonia asteroides</i> (L.)	false aster											B						
<i>Bouteloua curtipendula</i> (Michaux)	side-oats grama																A	
<i>Bromus inermis</i> Leysser ^{1,2}	awnless brome grass																	
<i>Bromus secalinus</i> L. ^{1,2,3}	Chess (Cheat)																	
<i>Bromus tectorum</i> L. ^{1,2}	downy chess										A							
<i>Bromus</i> sp. ^{1,3}	brome grass																	
<i>Cacalia atriplicifolia</i> L.	pale Indian plantain																	
<i>Campanula americana</i> L.	American bellflower			C	B							B		B	B			
<i>Campsis radicans</i> (L.) ¹	trumpet creeper				B	B	C	B	A	A	B	B						B
<i>Carex amphibola</i> Steudel ^{1,3}	sedge	A																
<i>Carex blanda</i> Dewey ^{1,3}	sedge	A																
<i>Carex normalis</i> MacKenzie ^{1,3}	sedge	A																
<i>Carex shortiana</i> Dewey ³	short sedge	A																
<i>Carya glabra</i> (Miller)	pignut hickory																	
<i>Carya ovalis</i> (Wangenheim)	sweet pignut hickory	C												B				
<i>Carya ovata</i> (Miller)	shagbark hickory																	
<i>Cassia fasciculata</i> Michaux ¹	partridge pea																C	B
<i>Cassia marilandica</i> L.	Maryland senna																B	

Table 1. Continued.

Scientific Name	Common Name	Sites																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Ceanothus americanus</i> L. ¹	New Jersey tea													A	A	A		
<i>Celtis laevigata</i> Willdenow ¹	sugarberry									C								
<i>Celtis occidentalis</i> L. ¹	hackberry	C	A	B	A		B				B	B		B				B
<i>Cercis canadensis</i> L. ¹	redbud	B	B	B	C	A	B				B	B	B	B	B			C
<i>Chaerophyllum procumbens</i> (L.) ^{1,2}	wild chervil						B		B		B							B
<i>Chaerophyllum tainturieri</i> Hooker ^{1,2}	wild chervil						B		B		B							B
<i>Chamaesyce maculata</i> (L.)	nodding spurge						B	B										B
<i>Chasmanthium latifolium</i> (Michaux)	sea oats	B														B		
<i>Chenopodium album</i> L. ^{1,2}	lamb's quarters																	
<i>Cirsium altissimum</i> (L.) ¹	tall thistle															B	B	
<i>Cirsium arvense</i> (L.) ^{1,2,3}	Canada thistle																	
<i>Cirsium discolor</i> (Muhlenberg)	field thistle								A									
<i>Claytonia virginica</i> L.	spring beauty																	
<i>Clematis virginiana</i> L.	virgin's bower						B											
<i>Commelina communis</i> L. ^{1,2}	common dayflower										B					B	B	B
<i>Conium maculatum</i> L. ²	poison hemlock																	
<i>Conyza canadensis</i> (L.)	horseweed												B					
<i>Cornus drummondii</i> C. A. Meyer ¹	rough-leaved dogwood	B	B	B	C		B				B	B					C	
<i>Cornus florida</i> L.	flowering dogwood	B																
<i>Croton monanthogynus</i> Michaux	croton																	B
<i>Cryptotaenia canadensis</i> (L.) ¹	honeysuckle	B	B				B											
<i>Cyperus esculentus</i> L.	nut sedge															A		
<i>Cyperus strigosus</i> L.	sedge																	
<i>Cystopteris protrusa</i> (Weatherby)	fragile fern																	
<i>Dactylis glomerata</i> L. ^{1,2}	orchard grass																A	
<i>Dalea candida</i> (Michaux)	white prairie clover																	A

Table 1. Continued.

Scientific Name	Common Name	Sites																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Dalea purpurea</i> Ventenat	purple prairie clover																	
<i>Daucus carota</i> L. ¹²	wild carrot				B	C	C	C				B	B	B			A	
<i>Delphinium tricornis</i> Michaux	larkspur	A																
<i>Dentaria laciniata</i> Muhlenberg	toothwort				B													
<i>Desmanthus illinoensis</i> (Michaux) ¹	Illinois mimosa					C		C						B				
<i>Desmodium canescens</i> (L.)	hoary tick trefoil	B																
<i>Desmodium illinoense</i> Gray	Illinois tick trefoil					B		B	A	B								
<i>Desmodium paniculatum</i> (L.)	panicked tick trefoil						A	B										
<i>Desmodium</i> sp.	tick trefoil													B				
<i>Dichanthelium boscii</i> (Poir.) ^{1,3}	large-fruited panic grass	A																
<i>Dichanthelium clandestinum</i> (L.) ³	broad-leaved panic grass																	
<i>Dichanthelium commutatum</i> (Schultes) ¹	panic grass		A	C														
<i>Dichanthelium</i> sp. ¹	panic grass	B			B					B	B							B
<i>Dioscorea quaternata</i> (Walter) ¹	wild yam	B																B
<i>Dioscorea villosa</i> L. ¹	wild yam																	A
<i>Diospyros virginiana</i> L. ¹	common persimmon	B											A	B				A
<i>Echinochloa muricata</i> (Beauvois)	barnyard grass					A												
<i>Echinochloa</i> sp.	barnyard grass				B													
<i>Elephantopus carolinianus</i> Rausch	elephant's foot	B	B	B	B													
<i>Eleusine indica</i> (L.) ²	goose grass				B	B												
<i>Elymus canadensis</i> L. ¹	nodding wild rye									B			B	B		B	B	B
<i>Elymus hirtix</i> L. ¹	bottlebrush grass	A											B	B				B
<i>Elymus virginicus</i> L. ¹	Virginia wild rye	B	B	B	B					B								
<i>Eragrostis ciliaris</i> (Allioni) ²	stinking love grass							B										
<i>Erigeron annuus</i> (L.) ¹	annual fleabane			B			C			B	B							

Table 1. Continued.

Scientific Name	Common Name	Sites																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Erigeron philadelphicus</i> L. ¹	marsh fleabane						B											
<i>Erigeron strigosus</i> Muhlenberg ¹	rough fleabane							B										
<i>Eupatorium coelestinum</i> L.	mist flower									A								
<i>Eupatorium purpureum</i> L.	purple Joe-Pye-weed																	B
<i>Eupatorium rugosum</i> Houttuyn ¹	white snakeroot	B	B	B	B	B				B								B
<i>Eupatorium serotinum</i> Michaux	late boneset												B					
<i>Euphorbia corollata</i> L.	flowering spurge											B						
<i>Festuca pratensis</i> Hudson ²	meadow fescue								A									
<i>Festuca</i> sp.	fescue													B				
<i>Fraxinus americana</i> L. ¹	white ash					B	C						B					
<i>Galium aparine</i> L. ¹	goosegrass						B											
<i>Galium</i> sp.	bedstraw				B													
<i>Geranium carolinianum</i> L. ¹	wild cranesbill	A						B	B									
<i>Geranium maculatum</i> L.	wild geranium				A													
<i>Geum canadense</i> Jacquin	white avens	A																B
<i>Gleditsia triacanthos</i> L.	honey locust									C								
<i>Glycine max</i> L. ^{1,2}	soybean											B						
<i>Gymnocladus dioica</i> (L.)	Kentucky coffee tree											A						
<i>Helianthus decapetalus</i> L. ¹	thin-leaved sunflower													A				
<i>Helianthus divaricatus</i> L.	woodland sunflower													B	B	B		
<i>Hibiscus lasiocarpus</i> Cavanilles	hairy rose mallow																	
<i>Hordeum pusillum</i> Nuttall ^{1,3}	little barley																	
<i>Hybanthus concolor</i> (Forster) ¹	green violet																	B
<i>Hydrangea arborescens</i> L. ^{1,3}	wild hydrangea																	
<i>Hydrophyllum appendiculatum</i> Michaux	waterleaf	C																

Table 1. Continued.

Scientific Name	Common Name	Sites																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Hypericum sphaerocarpon</i> Michaux	round-fruited St. Johnswort																	
<i>Impatiens capensis</i> Meerburch ¹	spotted touch-me-not	A			C	C						B						A
<i>Impatiens pallida</i> Nuttall ¹	pale touch-me-not					C					C							C
<i>Ipomoea lacunosa</i> L.	small white morning glory									B								
<i>Ipomoea pandurata</i> (L.)	wild sweet potato vine								B									
<i>Juglans nigra</i> L. ¹	black walnut	C										B	B		B		B	B
<i>Juniperus virginiana</i> L.	red cedar												A					
<i>Lactuca floridana</i> (L.)	woodland lettuce	B									B	A						
<i>Lactuca scariola</i> L. ^{1,2,3}	lettuce																	
<i>Laportea canadensis</i> (L.) ¹	wood nettle				B						B	B						
<i>Leersia virginica</i> Willdenow	white grass										A							
<i>Lindera benzoin</i> (L.)	spicebush	B		B	B	B												
<i>Liquidambar styraciflua</i> L.	sweet gum	C	B		C	B												
<i>Liriodendron tulipifera</i> L.	tulip tree			B	B	B						B						
<i>Lysimachia ciliata</i> L.	fringed loosestrife				C													
<i>Lysimachia nummularia</i> L. ²	moneywort											B						
<i>Malus ioensis</i> (Wood)	Iowa crab apple																	A
<i>Melilotus alba</i> Medikus ^{1,2}	white sweet clover							A	B	A			B	C	B			
<i>Melilotus officinalis</i> (L.) ^{1,2}	yellow sweet clover							C	B	A			B	B				
<i>Menispermum canadense</i> L.	moonseed										B							
<i>Mentha X piperita</i> L. ²	peppermint											B						
<i>Mertensia virginica</i> (L.)	bluebells			B														
<i>Monarda fistulosa</i> L.	wild bergamot												A	B				
<i>Morus rubra</i> L. ¹	red mulberry	B	C												B		B	B
<i>Muhlenbergia schreberi</i> J. F. Gmelin ¹	nimble will	A																

Table 1. Continued.

Scientific Name	Common Name	Sites																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Muhlenbergia sobolifera</i>	Muhly		A															
<i>Oenothera biennis</i> L.	evening primrose							A	A					A				B
<i>Ostrya virginiana</i> (Miller)	hop hornbeam											B						
<i>Oxalis stricta</i> L.	yellow wood sorrel	B									B							
<i>Panicum anceps</i> Michaux	panic grass								A									
<i>Parthenocissus quinquefolia</i> (L.) ¹	Virginia creeper												B	B	B	B	B	B
<i>Paspalum ciliatifolium</i> Michaux ¹	bead grass					C												
<i>Paspalum pubiflorum</i> Ruprecht ¹	bead grass						B											
<i>Paspalum</i> sp.	bead grass																	
<i>Passiflora lutea</i> L. ¹	small passion flower									B								B
<i>Perilla frutescens</i> (L.) ^{1,2}	beefsteak plant	A	B	B	B	B				B	C	C			A			C
<i>Phacelia purshii</i> Buckley	miami mist			B	A													
<i>Phaseolus polystachyus</i> (L.)	wild kidney bean												B					
<i>Phleum pratense</i> L. ^{1,2}	timothy																	
<i>Phlox divaricata</i> L.	blue phlox								A									
<i>Phlox pilosa</i> L. ¹	downy phlox					A												
<i>Phryma leptostachya</i> L. ¹	lopseed				B													
<i>Physalis heterophylla</i> Nees	ground cherry							B	B				B		B			
<i>Phytolacca americana</i> L.	pokeweed	A								B	B				B			
<i>Pilea pumila</i> (L.)	clearweed				B	C												
<i>Pinus echinata</i> Miller	Short leaved pine																	C
<i>Plantago aristata</i> Michaux	bracted plantain														A			
<i>Plantago lanceolata</i> L. ^{1,2,3}	buckhorn																	
<i>Plantago rugelii</i> Decaisne	Rugel's plantain					B	B				B							
<i>Platanus occidentalis</i> L.	sycamore					B												

Table 1. Continued.

Scientific Name	Common Name	Sites																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Poa pratensis</i> L. ²	Kentucky bluegrass	A																
<i>Poinsettia denolata</i> (Michaux)	poinsettia										B	B						
<i>Polygonum cespitosum</i> Blum ²	creeping smartweed	B	B	B	B													
<i>Polygonum pennsylvanicum</i> L.	common smartweed							B										
<i>Polygonum scandens</i> L. ¹	false buckwheat										B				B	B		
<i>Polygonum virginianum</i> L. ¹	Virginia knotweed				B	B												
<i>Polymnia canadensis</i> L. ¹	leafcup				B													
<i>Polymnia uvedalia</i> (L.)	bear's-foot				B	C					B							
<i>Polystichum acrostichoides</i> (Michaux)	Christmas fern												B					B
<i>Populus deltoides</i> Marshall	cottonwood	A					B											
<i>Prunella vulgaris</i> L. ²	self-heal		B								B							
<i>Ptilimnium nuttallii</i> (deCandolle)	mock bishops weed										B							
<i>Quercus alba</i> L.	white oak																B	C
<i>Quercus imbricaria</i> Michaux	shingle oak																	
<i>Quercus prinoides</i> Willdenow	yellow chestnut oak	A	A	B	C	B												
<i>Quercus rubra</i> L.	red oak											B	B				B	
<i>Quercus stellata</i> Wangenheim	post oak																	
<i>Quercus velutina</i> Lamarck	black oak												B					C
<i>Rhus aromatica</i> Aiton ¹	fragrant sumac																	C
<i>Rhus copallina</i> L. ¹	dwarf sumac												C	B				
<i>Rhus glabra</i> L. ¹	smooth sumac	A									B					C	A	
<i>Robinia pseudoacacia</i> L.	black locust																C	C
<i>Rosa multiflora</i> Thunberg ²	multiflora rose											B						
<i>Rubus allegheniensis</i> Porter ¹	common blackberry												B					
<i>Rubus occidentalis</i> L. ¹	black raspberry	A														C	B	

Table 1. Continued.

Scientific Name	Common Name	Sites																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Rubus</i> sp.	blackberry																	
<i>Rubus trivialis</i> Michaux	southern dewberry							B	B					B				
<i>Rudbeckia hirta</i> L.	black-eyed susan							C	A	C				B				
<i>Ruellia humilis</i> Nuttall	wild petunia										A							
<i>Ruellia strepens</i> L.	smooth rueellia	B	B			B						B						
<i>Rumex crispus</i> L. ^{1,2}	curly dock							B	B	B								
<i>Salix nigra</i> L. ¹	black willow	B																
<i>Sambucus canadensis</i> L. ¹	elderberry											A						B
<i>Sanicula canadensis</i> L. ¹	Canadian black snakeroot	B				B	B								B		B	B
<i>Sassafras albidum</i> (Nuttall)	sassafras	B	B											B	B			B
<i>Schizachyrium scoparium</i> (Michaux)	little bluestem												B	B		A		
<i>Scrophularia marilandica</i> L. ¹	late figwort	A													B	B		
<i>Setaria faberi</i> Herrmann ²	giant foxtail									B		B						
<i>Setaria glauca</i> (L.)	yellow foxtail									B		B	B				B	
<i>Setaria viridis</i> (L.) ^{1,2}	green foxtail									C		A					B	
<i>Sida spinosa</i> L. ²	prickly sida												C					
<i>Silene stellata</i> (L.)	starry campion						A							B				
<i>Silphium integrifolium</i> Michaux	rosinweed															A		
<i>Sisyrinchium albidum</i> Rafinesque	blue eyed grass	B																
<i>Smilax bona-nox</i> L.	catbrier															C		
<i>Smilax pulverulenta</i> Michaux	carriion flower	B																
<i>Smilax rotundifolia</i> L.	catbrier		B														B	
<i>Solanum carolinense</i> L. ¹	horsenettle									B			B					
<i>Solidago canadensis</i> L.	tall goldenrod			A						A	C		B	C		C		B
<i>Solidago juncea</i> Aiton	early goldenrod													B				

Table 1. Continued.

Scientific Name	Common Name	Sites																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Solidago</i> sp. ^{1,3}	goldenrod																	
<i>Sonchus asper</i> (L.) ²	spiny sow thistle				B			B										
<i>Sorghastrum nutans</i> (L.)	Indian grass													A				
<i>Sorghum halepense</i> (L.) ^{1,2}	Johnson grass				C	B	C	C		B								C
<i>Spermacoce glabra</i> Michaux	smooth buttonweed							B										
<i>Stachys tenuifolia</i> Willdenow	smooth hedge nettle								B									
<i>Symphytotrichum cordifolium</i> (L.)	arrow-leaved aster										B							
<i>Symphytotrichum novae-angliae</i> (L.)	New England aster										A							
<i>Symphytotrichum pilosum</i> (Willdenow)	hairy aster			A		A				C	B							
<i>Symphytotrichum shortii</i> (Lindley)	Short's aster			B														
<i>Teucrium canadense</i> L. ¹	American germander					A				C		A			B			B
<i>Torilis japonica</i> (Houttuyn) ^{1,2}	hedge parsley					B		B		B	B							
<i>Toxicodendron radicans</i> (L.) ¹	poison ivy	B	C	B	B	B	C	B	B	B	B	B	B	B	B	B	B	B
<i>Tradescantia subaspera</i>																		
Ker Gawler ¹	spiderwort	A			C	B												
<i>Tragopogon pratensis</i> L. ²	common goat's-beard								B									
<i>Tridens flavus</i> (L.)	purple top	A						C	C					C	A			
<i>Trifolium campestre</i> Schreber ²	low hop clover							B										
<i>Trifolium pratense</i> L. ²	red clover								B									
<i>Trifolium repens</i> L. ^{1,2}	white clover										B							
<i>Trillium recurvatum</i> Beck	red trillium																	
<i>Triodanis perfoliata</i> (L.)	Venus' looking-glass												B					
<i>Ulmus americana</i> L. ¹	American elm	C		B		C					B							
<i>Ulmus rubra</i> Muhlenberg ¹	slippery elm			C	C	C		B			B	B	A		B			B
<i>Verbascum thapsus</i> L. ^{1,2}	common mullein								B				C					B

Table 1. Continued.

Scientific Name	Common Name	Sites																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Verbena urticifolia</i> L.	white vervain	A	B				B					C		B	B		B	
<i>Verbesina alternifolia</i> (L.) ¹	yellow ironweed	B	A	C		B	B					B	C					
<i>Verbesina helianthoides</i> Michaux ¹	yellow crownbeard		B	B	B													B
<i>Vernonia missurica</i> Rafinesque ¹	Missouri ironweed		B					C	A									
<i>Veronica arvensis</i> L. ^{1,2,3}	corn speedwell																	
<i>Veronica</i> sp.	speedwell							B										
<i>Veronicastrum virginicum</i> (L.)	culver's root															B		
<i>Vicia cracca</i> L. ²	cow vetch						B											
<i>Vicia villosa</i> Roth ^{1,2}	winter vetch							B	B			B						
<i>Viola</i> spp.	violet	B																
<i>Vitis aestivalis</i> Michaux ¹	summer grape											B						B
<i>Vitis cinerea</i> Engelmann	winter grape						B	B		A								
<i>Vitis vulpina</i> L.	frost grape							C		B		B						
<i>Vitis</i> sp. ^{1,3}	grape																	
<i>Xanthium strumarium</i> L. ²	common cocklebur							B				B						

¹Plant species associated with pentatomoids.

²Non-native (exotic) species.

³Species listed as host plants of pentatomoids during the 1972-74 study but no sites given.

pratensis Hudson (= *F. elatior* L.), *Galium aparine* L., *Geranium carolinianum* L., *Melilotus alba* Medikus, *Melilotus officinalis* (L.), *Paspalum pubiflorum* Ruprecht, *Physalis heterophylla* Nees, *Rubus trivialis* Michaux, *Rudbeckia hirta*, *Rumex crispus* L., *Solanum carolinense* L., *Sorghum halepense*, *Toxicodendron radicans* (L.), *Tridens flavus*, *Vicia cracca* L., and *Vicia villosa* Roth.

Site 7 showed little change in composition between the two surveys. However, sites 8 and 9 showed changes in the dominant exotic species: site 8 was dominated by *Sorghum halepense* during the original survey and *Melilotus alba* and *M. officinalis* during the resurvey; site 9 was dominated by *Melilotus alba* and *M. officinalis* during the original survey and *Vicia villosa* during the resurvey.

Lowland Sites (1, 2, 3, 4, 5, 6, 10 11, 12). The majority of these sites still had a dense closed canopy. Common overstory trees included *Acer negundo* L., *Asimina triloba*, *Celtis occidentalis*, *Cercis canadensis*, *Cornus drummondii*, *Lindera benzoin* (L.), *Liquidambar styraciflua*, *Liriodendron tulipifera* L., *Ulmus americana*, and *Ulmus rubra*.

The relatively dense overstory resulted in an understory of predominantly shade-tolerant low-woodland species with some ubiquitous native and non-native weeds including *Ambrosia trifida* L., *Blephilia ciliata* (L.), *Campsis radicans*, *Cryptotaenia canadensis* (L.), *Elephantopus carolinianus* Raeusch, *Elymus virginicus* L., *Eupatorium rugosum* Houttuyn, *Perilla frutescens*, *Polygonum cespitosum* Blum, *Ruellia strepens* L., *Setaria glauca* (L.), *Toxicodendron radicans*, *Verbesina alternifolia*, and *Verbesina helianthoides* Michaux.

As noted earlier, collecting of pentatomoids at site 1 was discontinued during summer 1993 because of deterioration of the site and access road. This site was the location of the SIUC-Pine Hills Field Station. At that time, the grounds immediately surrounding the station were mowed periodically and its trees trimmed. Use of the field station was discontinued before the present survey; the facilities were allowed to deteriorate and the surrounding area was no longer maintained. As a result, there was a marked change in the flora. The site previously had supported open-canopy, disturbed-area plant species, but lack of maintenance has resulted in closed canopy woods with an understory of shade-tolerant, disturbed-area plants.

Sites 2 and 3 also showed changes in composition due to woody encroachment. Plants adapted to higher light conditions during the original survey were replaced by more shade-tolerant species. Sites 10 and 11 changed in herbaceous composition but not primarily because of woody encroachment. Rather, differences generally involved an increased dominance of several native and exotic invasive species. At site 10, *Teucrium canadense*, which was the predominant herb in the original survey (McPherson and Mohlenbrock 1976), now was dominated by *Campsis radicans*, *Perilla frutescens*, and *Toxicodendron radicans*. Sites 4, 5, 6, and 12 showed little change in composition.

Upland Sites (13, 14, 15, 16, 17). Although most of these sites are still somewhat open, they were dominated during the resurvey by weedy native and exotic plants such as *Ambrosia artemisiifolia* L., *Ambrosia trifida*, *Cirsium altissimum* (L.), *Commelina communis* L., *Daucus carota*, *Melilotus alba*, *M. officinalis*, *Parthenocissus quinquefolia* (L.), *Toxicodendron radicans*, and *Verbena urticifolia*. Prairie species such as *Andropogon gerardii*, *Elymus canadensis* L., *Schizachyrium scoparium*, and *Veronicastrum virginicum* (L.) also were present but scattered at these sites. Woody encroachment by species such as *Cornus drummondii*, *Rhus copallina* L., *R. glabra*, and *Robinia pseudoacacia* L. has reduced the size and diversity of these prairie remnants.

Sites 13, 14, 15, and 16 changed in composition because of woody encroachment. Most notable was the dramatic decrease in the abundance of *Verbascum thapsus* at site 13. It was the most common species at that site during the original survey (McPherson and Mohlenbrock 1976), but only a few scattered plants were found during the resurvey. Site 17 showed little change in composition.

Summary. Changes in character and plant composition have occurred at most sites since the original survey, several of which have been substantial. These changes apparently have resulted from differences in roadside management by the USFS. They can be grouped into the following: (1) woody plant encroachment that, in turn, has affected the herbaceous vegetation, and (2) shift in herbaceous plant composition including invasion of additional exotic species. Other sites have shown little change.

Sites 1, 2, 3, 13, 14, 15, and 16 showed obvious effects of woody plant encroachment. Plants adapted to higher light conditions that were found during the original survey were replaced by more shade-tolerant species found during the resurvey at these sites. This and the lack of regular disturbance (i.e., mowing) explain the significant difference in abundance of *V. thapsus* at site 13 from "common" during the original survey to one or two plants during the resurvey.

Four sites (8, 9, 10, 11) exhibited herbaceous compositional changes because of some form of succession other than woody encroachment. Sites 8 and 9 showed primary changes in the dominant exotic species: site 8 shifted from *Sorghum halepense* to *Melilotus alba* and *M. officinalis*, and site 9 shifted from *Melilotus alba* and *M. officinalis* to *Vicia villosa*. Compositional shifts at sites 10 and 11 were more difficult to categorize. However, differences primarily involved the appearance or an increased dominance of several native and exotic invasive species (e.g., *Ambrosia artemisiifolia*, *Campsis radicans*, *Setaria* spp., and *Perilla frutescens*).

Sites 4, 5, 6, 7, 12, and 17 showed little change in general composition and character of the vegetation.

Pentatomoid Diversity. Of the 49 pentatomoid species and subspecies listed during the original survey, 36 were collected during the resurvey (Table 2). Of the 13 not collected, 10 were rare during the original survey; two, *Aelia americana* Dallas and *Neottiglossa sulcifrons* Stål, were not found during the original survey, but specimens had been collected even earlier at Pine Hills and were deposited in the Southern Illinois University Entomology Collection (SIUEC); and one, *Holcostethus limbolarius* (Stål), had been relatively common (Table 2). Two additional species, *Galgupha ovalis* Hussey and *Corimelaena obscura* McPherson and Sailer were added to the list, the former, which was listed in the original survey as likely to occur in Pine Hills, and the latter, which was described in 1978 subsequent to the earlier survey. The most noticeable change in the vegetation that apparently has accounted for the differences in pentatomoid diversity has been the marked reduction in abundance of *Verbascum thapsus*. This plant was listed as the most common host plant in the original survey, with 14 species of pentatomoids collected from it (see Table 5, McPherson and Mohlenbrock 1976).

A list of the pentatomoid species, number of specimens collected at each site, and total number of specimens per species are given in Table 3.

Superfamily Pentatomoidea

Family Scutelleridae

Subfamily Tetyrinae

Genus *Stethaulax* Bergroth

S. marmorata (Say). (16 April - 9 October) (1).

This species was rare during the original survey. Most specimens were collected at site 1 from *Morus rubra* (A) and *Verbesina alternifolia* (N) and by sweeping (N).

During the resurvey, 19 specimens (11 adults, 8 nymphs) were collected at sites 13 and 17. Of these, 18 were collected from site 13 by handpicking from *Rhus copallina* (A, F, N) and *Rhus glabra* (A, F, N), and one (an adult) was collected from site 17 by sweeping in and around *Rhus aromatica* Aiton.

Table 2. Relative abundance¹ of pentatomoid taxa collected during the 1972-74 survey and 1992-95 resurvey in the La Rue-Pine Hills Research Natural Area.

Taxon	Relative Abundance 1972-1974	Relative Abundance 1992-1995
Family Scutelleridae		
<i>Homaemus parvulus</i> (Germar)	1	-
<i>Stethaulax marmorata</i> (Say)	1	1
Family Thyreocoridae		
<i>Corimelaena agrilla</i> McAtee	4	2
<i>Corimelaena harti</i> Malloch	1	1
<i>Corimelaena lateralis lateralis</i> (F.)	4	4
<i>Corimelaena obscura</i> McPherson and Sailer	-	4
<i>Corimelaena pulicaria</i> (Germar)	4	3
<i>Galgupha aterrima</i> Malloch	3	1
<i>Galgupha atra</i> Amyot and Serville	3	1
<i>Galgupha carinata</i> McAtee and Malloch	1	-
<i>Galgupha denudata</i> Uhler	2	1
<i>Galgupha ovalis</i> Hussey	-	1
Family Cydnidae		
<i>Amnestus pallidus</i> Zimmer	1	1
<i>Amnestus pusillus</i> Uhler	1	-
<i>Amnestus spinifrons</i> (Say)	1	-
<i>Melanaethus pennsylvanicus</i> (Signoret)	1	1
<i>Melanaethus robustus</i> Uhler	1	1
<i>Pangaesus bilineatus</i> (Say)	1	1
<i>Sehirus cinctus cinctus</i> (Palisot de Beauvois)	4	3
Family Pentatomidae		
<i>Acrosternum hilare</i> (Say)	3	3
<i>Aelia americana</i> Dallas ²	- (1)	-
<i>Amaurochrous cinctipes</i> (Say)	1	1
<i>Apoecilus cynicus</i> (Say)	1	1
<i>Banasa calva</i> (Say)	1	-
<i>Banasa dimiata</i> (Say)	1	1
<i>Brochymena quadripustulata</i> (F.)	1	1
<i>Coenus delius</i> (Say)	2	2
<i>Cosmopepla bimaculata</i> (Thomas)	4	3
<i>Dendrocoris humeralis</i> (Uhler)	1	-
<i>Euschistus ictericus</i> (L.)	1	1
<i>Euschistus politus</i> Uhler	3	2
<i>Euschistus servus</i> (Say)	4	4
<i>Euschistus tristigmus tristigmus</i> (Say)	4	4
<i>Euschistus variolarius</i> (Palisot de Beauvois)	3	3
<i>Holcostethus limbolarius</i> (Stål)	2	-
<i>Hymenarcys aequalis</i> (Say)	1	-
<i>Hymenarcys nervosa</i> (Say)	3	1
<i>Meneclis insertus</i> (Say)	1	1
<i>Mormidea lugens</i> (F.)	4	4

Table 2. Continued.

Taxon	Relative Abundance 1972-1974	Relative Abundance 1992-1995
<i>Neottiglossa cavifrons</i> Stål	1	-
<i>Neottiglossa sulcifrons</i> Stål ²	- (1)	-
<i>Nezara viridula</i> (L.)	1	-
<i>Oebalus pugnax pugnax</i> (F.)	4	4
<i>Parabrochymena arborea</i> (Say)	1	1
<i>Podisus maculiventris</i> (Say)	3	1
<i>Podisus placidus</i> Uhler	1	-
<i>Proxys punctulatus</i> (Palisot de Beauvois)	3	3
<i>Stiretrus anchorago</i> (Say)	1	1
<i>Thyanta calceata</i> (Say)	3	1
<i>Thyanta custator accerra</i> McAtee	1	1
<i>Trichopepla semivittata</i> (Say)	1	1

¹Based on adults: 1=0-20 (rare), 2=21-50 (uncommon), 3=51-100 (common), 4=101 or more (abundant).

²Not found during either survey but collected prior to original survey and deposited in SIUEC.

Table 3. Number of pentatomoid specimens of each taxon collected per site during the 1992-1995 resurvey in the La Rue-Pine Hills Research Natural Area.

Taxon	Sites																	Total		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17			
Family Scutelleridae																				
<i>Stethaulax marmorata</i> (Say)													18					1	19	
Family Thyreocoridae																				
<i>Corimelaena ogrella</i> McAtee			2	1	7	3		2		3	1	6			1				14	40
<i>Corimelaena harti</i> Malloch											1									1
<i>Corimelaena lateralis lateralis</i> (F.)			11		4	6	52	40	19	41	8	32	3	2	7				25	250
<i>Corimelaena obscura</i> McPherson and Sailer	14	5	11	11	21	9		3	2	4	2	22	1	2	8	2			20	137
<i>Corimelaena pulicaria</i> (Germar)			1				13	21	43	2	1	2	2			3			3	91
<i>Galgupha aterrima</i> Malloch							1		1		1									4
<i>Galgupha atra</i> Amyot and Serville	1				1	1			2	1		1		1	2				1	11
<i>Galgupha denudata</i> Uhler					2	1	1								5				4	13
<i>Galgupha ovalis</i> Hussey					1			2											1	4
Family Cydnidae																				
<i>Annestus pallidus</i> Zimmer			1		1						1				1	3				7
<i>Melanæthus pennsylvanicus</i> (Signoret)																			1	1
<i>Melanæthus robustus</i> Uhler			3							3				1	1				1	8
<i>Pangaëus bilineatus</i> (Say)					1					4						1				6
<i>Sehirus cinctus cinctus</i> (Palisot de Beauvois)			2	1	1	1	3	24	22	1	1	10			2				2	70
Family Pentatomidae																				
<i>Acrosternum hilare</i> (Say)		2	6	3	10	18	22	21	34	3	66	12	34	23	37	15	40			346
<i>Anaurochrous cinctipes</i> (Say)							1			3										4
<i>Apoecilus cynicus</i> (Say)													1	1						2
<i>Banasa dimidiata</i> (Say)					3	2														5
<i>Brochymena quadripustulata</i> (F.)									1		2									3

Table 3. Continued.

Taxon	Sites																	Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
<i>Coenus delius</i> (Say)						1	22	59	13	1								96
<i>Cosmopepla bimaculata</i> (Thomas)			3			1	4	50	3	1	4	1			125	21	2	215
<i>Euschistus ictericus</i> (L.)		7	1		2	1				1								12
<i>Euschistus politus</i> Uhler		5	1										32	5	2	1	2	48
<i>Euschistus servus</i> (Say)		5	13	2	2	27	35	48	41	4	36	22	44	28	51	38	58	454
<i>Euschistus tristigmus tristigmus</i> (Say)	47	103	91	21	98	94	21	14	10	29	80	70	40	10	47	14	50	839
<i>Euschistus variolarius</i> (Palisot de Beauvois)	2	5	5		1	8	8	13	13	3	8	7	20	3	6	5	16	123
<i>Hymenarcys nervosa</i> (Say)							15	13	2				3				2	35
<i>Meneles insertus</i> (Say)														2				2
<i>Mormidea lugens</i> (F.)	14	4	6		21	14	6	7	5	1	7	9	3	4	41	12	89	243
<i>Oebalus pugnax pugnax</i> (F.)					1		20	28	87							5		141
<i>Parabrochymena arborea</i> (Say)			1			1						1					1	4
<i>Podisus maculiventris</i> (Say)	5	3	11	2	15	5	5		11	6	4	1	5		2	10	11	96
<i>Proxys punctulatus</i> (Palisot de Beauvois)	1	3	97	17	1					1					41	5	11	177
<i>Stiretrus anchorago</i> (Say)	1	1					1	1				1	3	1	11	2	1	23
<i>Thyanta calceata</i> (Say)											3							3
<i>Thyanta custator accerra</i> McAtee									2		3	1						6
<i>Trichopepla semivittata</i> (Say)							1	29										30
TOTAL	83	141	173	138	209	194	231	375	311	112	228	200	209	82	390	137	356	3569

Family Thyreocoridae

Genus *Galgupha* Amyot and Serville*G. aterrima* Malloch. (16 May - 23 July) (1).

This species was common during the original survey. Most specimens were collected at sites 1, 9, and 13 by sweeping low-lying vegetation. Host plants included *Carex retroflexa* Muhlenberg (A) and *Veronica arvensis* L. (A, F).

During the resurvey, four adults were collected: two by sweeping vegetation at sites 9 and 12 on 16 May and 23 July 1993, respectively; and two by handpicking from *Acer negundo* at site 11 on 15 June 1994 and *Erigeron annuus* (L.) at site 7 on 23 June 1993.

G. atra Amyot and Serville. (12 June - 20 October) (1).

This species was common during the original survey and collected at the same sites as *G. aterrima*. Host plants included *Helianthus decapetalus* L. (A, F), *Rubus allegheniensis* Porter (A, N), and *Verbascum thapsus* (A).

During the resurvey, 11 adults were collected by sweeping vegetation at sites 1, 5, 6, 9, 10, 12, 14, 15, and 17. This distribution indicates broad habitat usage including grassy exposed roadside, moist lowland roadside, and drier upland vegetation. No host plants were recorded.

G. denudata Uhler. (3 May - 28 October) (1).

This species was uncommon during the original survey. It was collected only as adults and appeared to prefer low-lying areas. Almost all specimens were collected by sweeping roadside vegetation at sites 1-4.

During the resurvey, 13 adults were collected by sweeping vegetation at sites 5, 6, 7, 15, and 17, with most (69.2%) taken at sites 15 (n = 5) and 17 (n = 4). No host plants were recorded. Collection of this species during the original survey was a state record (McPherson 1974a)

G. ovalis Hussey. (19 May - 20 July) (1).

This species was not found during the original survey, but its occurrence at Pine Hills was predicted by McPherson and Mohlenbrock (1976).

Biehler and McPherson (1982) studied the life history of this species in southern Illinois and described the immature stages. They found this bug is univoltine, overwinters as adults, emerges in the spring, and feeds and reproduces on *Plantago aristata* Michaux. They also reared it in the laboratory from egg to adult on *P. aristata* under controlled conditions. Finally, they reported that *G. ovalis* is parasitized by the tachinid fly *Epigrimyia polita* Townsend.

During the resurvey, four adults were collected by sweeping vegetation at sites 5, 8 (2 specimens), and 17 on 30 June 1993, 19 May and 20 July 1994, and 2 June 1994, respectively. No host plants were recorded.

Genus *Corimelaena* White*C. agrella* McAtee. (3 May - 5 November) (2).

This species was abundant during the original survey. It was collected only as adults, primarily by sweeping roadside vegetation at sites 1-5. Host plants included *Phlox pilosa* L. (A, F) at site 5 and *Chaerophyllum procumbens* (L.) (A) at site 12.

During the resurvey, 40 adults were collected by sweeping vegetation at sites 3, 4, 5, 6, 8, 10, 11, 12, 15, and 17, with most (67.5%) collected at sites 5 (n = 7), 12 (n = 6), and 17 (n = 14). Host plants included *Chaerophyllum procumbens* (A, F), *Chaerophyllum tainturieri* Hooker (A, F), and *Sanicula canadensis* L. (A, F).

C. harti Malloch. (1).

An adult specimen was collected during the original survey. It was swept from roadside vegetation near site 13 on 10 August 1972.

During the resurvey, only one adult specimen was collected, this by sweeping vegetation at site 12 on 12 June 1993.

C. lateralis lateralis (Fabricius). (16 April - 5 November) (4).

This subspecies was widespread and abundant during the original survey and collected most often on exposed roadside vegetation. Host plants included *Chaerophyllum procumbens* (A, F), *Daucus carota* (A, F, C, E, N), *Elymus hystrix* L. (A), *Erigeron philadelphicus* L. (A, C), and *Geranium carolinianum* (A, C).

During the resurvey, this species was the most common of the thyreocorids. A total of 250 specimens (246 adults, 4 nymphs) was collected at all sites except 2, 4, and 16 by handpicking and sweeping vegetation, with most (53.2%) taken at sites 7 (n = 52), 8 (n = 40), and 10 (n = 41). Host plants included *Bromus tectorum* (A), *Chaerophyllum tainturieri* (A, F), *Daucus carota* (A, C, N, F), *Galium aparine* (A), *Geranium carolinianum* (A), *Parthenocissus quinquefolia* (A), and *Torilis japonica* (Houttuyn) (A, F).

C. obscura McPherson and Sailer. (13 May - 25 September) (4).

This species was not described until 1978 and, therefore, was not included in the original survey. Up to that time, it had been confused with *Corimelaena lateralis lateralis*.

Bundy and McPherson (1997) studied the life history of this species in southern Illinois and described the immature stages. They found this bug is univoltine, overwinters as adults, emerges in the spring, and feeds and reproduces on flowering *Cryptotaenia canadensis* and *Sanicula canadensis*; it also feeds on flowering *Chaerophyllum tainturieri* and on *Apocynum cannabinum* and *Torilis japonica* but was not observed reproducing. They also reared it in the laboratory from egg to adult on *S. canadensis* under controlled conditions.

During the resurvey, 137 specimens (131 adults, 6 nymphs) were collected from all sites except site 7 by handpicking and sweeping vegetation, with most (46.0%) taken at sites 5 (n = 21), 12 (n = 22), and 17 (n = 20). Host plants (see above) included *C. canadensis* (A, E, F, N), *C. tainturieri* (A, F), *Elymus virginicus* (A), *S. canadensis* (A, F, C, N), *T. japonica* (A), and *Verbascum thapsus* (A).

C. pulicaria (Germar). (14 April - 20 October) (3).

This species was the most abundant and widespread of the thyreocorids during the original survey, but only two immatures (fifth instars) were found. It was collected from several plant species, three of which involved feeding records: *Antennaria plantaginifolia* (L.) (A, F), *Apocynum cannabinum* (A, F), and *Daucus carota* (A, F).

During the resurvey, 91 adults were collected by sweeping vegetation at sites 3, 7, 8, 9, 10, 11, 12, 13, 16 and 17, with most (84.6%) taken at sites 7 (n = 13), 8 (n = 21), and 9 (n = 43). Host plants included *Apocynum cannabinum* (A, F), *Daucus carota* (A), *Erigeron strigosus* Muhlenberg (A), *Sorghum halepense* (A), and *Torilis japonica* (A).

Family Cydnidae

Subfamily Cydninae

Genus *Pangaeus* Stål

P. bilineatus (Say). (16 April - 2 June) (1).

This species was rare during the original survey. It was collected only as adults and only by sweeping moist and shady areas at sites 1, 4, and 5.

During the resurvey, six adults were collected, four from the surface of floodwater near the road at site 10 on 16 April 1993 and two by sweeping vegetation at sites 5 and 16 on 27 May 1993 and 2 June 1994, respectively. No host plants were recorded.

Genus *Melanaethus* Uhler

M. pennsylvanicus (Signoret). (1).

This species was rare during the original survey. Only three specimens were collected, all adults, by sweeping low-lying vegetation at site 1 on 5 May 1972, 1 June 1973, and 16 August 1974.

During the resurvey, an adult specimen was collected by sweeping vegetation at site 17 on 8 June 1994. No host plant was recorded.

M. robustus Uhler. (16 April - 6 November) (1).

This species was rare during the original survey. Only eight specimens were collected, all adults. Two were swept from roadside vegetation at site 3 on 8 June 1973, and six were extracted from leaf litter with a Berlese funnel at sites 1-5 on 3 and 17 November 1972.

During the resurvey, eight adults were collected: three from the surface of floodwater at site 10 on 16 April 1993, four by sweeping vegetation at site 3 on 17 June 1993 and 2 September 1994, and sites 15 and 17 on 24 May 1994; and one from leaf litter and soil with the graded screens at site 3 on 6 November 1992. No host plants were recorded.

Subfamily Amnestinae

Genus *Amnestus* Dallas

A. pallidus Zimmer. (13 May - 16 October) (1).

This species was rare during the original survey. Only a single adult was collected by sweeping low-lying vegetation at site 1 on 1 June 1973.

During the resurvey, seven adults were collected in 1994 by sweeping vegetation at sites 3, 5, 11, 15, and 16. Of these, two were collected by sweeping an area dominated by *Cirsium altissimum* at site 16 on 13 May 1994, although no individuals were observed on this plant. No host plants were recorded.

Subfamily Sehirinae

Genus *Sehirus* Amyot and Serville

S. cinctus cinctus (Palisot de Beauvois). (14 April - 25 September) (3).

This subspecies was abundant and widespread during the original survey but collected only as adults. It was recorded from several plant species, two of which involved feeding records: *Apocynum cannabinum* (A, F), and *Teucrium canadense* (A, F).

Since that time, Sites and McPherson (1982) have studied the life history of this subspecies in southern Illinois and described the immature stages. They found this bug is univoltine, overwinters as adults, emerges in the spring, and feeds on the mint, *Lamium purpureum* L.; females exhibit egg-guarding behavior. They also reared it in the laboratory from egg to adult on *L. purpureum* under controlled conditions.

During the resurvey, 70 specimens (69 adults, 1 nymph) were collected sweeping vegetation at sites 3-12, 15 and 17, with most (65.7%) taken at sites 8 (n = 24) and 9 (n = 22). The nymph, a fifth instar, was collected from site 8 on 22 June 1994. Host plants included *Bromus tectorum* (A), *Melilotus alba* (A), *Rubus occidentalis* (A), *Sorghum halepense* (A), and *Verbascum thapsus* (A).

Family Pentatomidae

Subfamily Podopinae

Genus *Amaurochrous* Stål

A. cinctipes (Say). (16 April - 20 October) (1).

This species was rare during the original survey; all specimens (adults) were swept from low-lying vegetation at sites 1 and 6.

Since that time, McPherson and Paskewitz (1984a) have reared this species from egg to adult on *Sagittaria latifolia* Willdenow under controlled conditions and described the immature stages. Adults used to establish the laboratory culture were collected from *S. latifolia* growing in water near the shore of La Rue Swamp. The location was near site 2 (unpublished data).

During the resurvey, four adults were collected, two from the surface of floodwater on 16 April 1993 near the road and one by sweeping low-lying vegetation on 27 May 1993, all three from site 10; and one by sweeping roadside vegetation at site 7 on 20 October 1994. No host plants were recorded.

Subfamily Pentatominae

Genus *Parabrochymena* Larivière

P. arborea (Say). (2 June - 7 October) (1).

This species was listed in the original survey as *Brochymena arborea* (Say). However, the genus was revised by Larivière (1992, 1994); a new genus, *Parabrochymena*, described; and *Brochymena* redefined. *B. arborea* then was transferred to *Parabrochymena*.

This species was rare during the original survey; all specimens (adults) were collected from *Juglans nigra* at site 1.

Since that time, Cuda and McPherson (1976) have reared this bug in the laboratory from egg through fourth instar on fresh cuttings of *J. nigra* under controlled conditions.

During the resurvey, two adults and one fifth instar were collected by sweeping vegetation (including shrubs and trees) at sites 3 (N), 6 (A), and 12 (A) on 8 September, 7 October, and 2 June 1994, respectively. An additional adult was found on *Impatiens pallida* at site 17 on 12 September 1993. As the specific epithet suggests, this species is associated with trees. Because the collecting methods did not adequately sample this habitat, it is possible that *P. arborea* and other arboreal species are more common at Pine Hills than reported here.

Genus *Brochymena* Amyot and Serville

B. quadripustulata (Fabricius). (27 May - 2 September) (1).

This species was rare during the original survey and showed no site preference. It was collected from several host plants, including *Juglans nigra*, but was noted feeding only on *Fraxinus americana*. It appeared to be univoltine.

Since that time, Cuda and McPherson (1976) have studied the life history of this species in southern Illinois and described the immature stages. They found this bug is univoltine, overwinters as adults, and feeds and reproduces on immature *J. nigra*. They also reared it in the laboratory from egg to adult on fresh cuttings of *J. nigra* under controlled conditions.

During the resurvey, two adults and one fifth instar were collected by handpicking from *Elymus virginicus* (A) at site 9 on 27 May 1993, and from *Agastache nepetoides* (L.) (N) and *Ulmus americana* (A) at site 11 on 26 August and 2 September 1994, respectively.

Genus *Trichopepla* Stål

T. semivittata (Say). (22 June - 15 August) (1).

This species was rare during the original survey. It was collected as adults and fifth instars on *Daucus carota* (A, F, N) or by sweeping vegetation near this host plant, primarily at sites 8 and 13. The fifth instars were collected on 10 and 31 July 1972.

During the resurvey, this species was found only in 1994. Thirty specimens (10 adults, 20 nymphs) were collected at sites 7 and 8 but almost exclusively at site 8 (n = 29). As in the original survey, the only host plant recorded

was *D. carota* (A, C, F, N). Third-fifth instars and adults were found in the curled, drying inflorescences of this plant from mid- to late July.

Genus *Mormidea* Amyot and Serville

M. lugens (Fabricius). (21 April - 23 October) (4).

This species was abundant during the original survey and bivoltine. Most specimens were collected by sweeping shaded low-lying vegetation in or near site 1. Host plants included *Carex amphibola* Steudel (A, F), *Carex blanda* (A), *Carex normalis* Mackenzie (A, F), *Carex shortiana* Dewey (A, F), *Panicum boscii* Poirlet (A, F), *Panicum clandestinum* L. (A, F, N), *Phleum pratense* L. (A, F), and *Tradescantia subaspera* Ker (N).

During the resurvey, 243 specimens (179 adults, 64 nymphs) were collected by sweeping vegetation at all sites except site 4, with most (53.5%) taken at sites 15 (n = 41), and 17 (n = 89). Third and fourth instars (n = 16) were collected from mid- to the third week of June (n = 6) and from mid- to late September (n = 10). Fifth instars (n = 48) were collected from mid-June through mid-October, with peaks of abundance from mid- to late June (n = 10) and from late August to late September (n = 25). Adults occurred from the third week of April to the third week of October with a peak of abundance in mid-September (n = 29). The data for the nymphs support earlier reports (McPherson 1974b, McPherson and Mohlenbrock 1976) that this species is bivoltine in Pine Hills. Host plants included *Ambrosia trifida* (A), *Dichanthelium* spp. (A, N), and *Passiflora lutea* L. (A).

Genus *Oebalus* Stål

O. pugnax pugnax (Fabricius). (16 May - 18 November) (4).

This subspecies was abundant during the original survey and apparently bivoltine. Most specimens were collected on *Sorghum halepense* (A, F, C, E, N) at site 8, although it was swept from several other plant species including *Solidago* sp. (A, N).

During the resurvey, 141 specimens (104 adults, 37 nymphs) were collected by sweeping vegetation at sites 5, 7, 8, 9, and 16, with most (61.7%) taken at site 9 (n = 87). Young instars (2nds-3rds) (n = 5) were found from late August to late September and older instars (4ths-5ths) from mid-June to early August (n = 9) and from early September to mid-October (n = 23). Adults occurred from mid-May to mid-November with a peak of abundance from early to mid-September (n = 52). Although early instars were not collected during the spring, these data support McPherson and Mohlenbrock's suggestion that this bug is bivoltine in Pine Hills. Host plants included *Melilotus officinalis* (A), *Paspalum pubiflorum* (A, C, F, N) and *Setaria viridis* (L.) (A, F). Surprisingly, this bug was not observed on *S. halpense* during the resurvey.

Genus *Euschistus* Dallas

E. ictericus (L.). (16 April - 6 November) (1).

This species was rare during the original survey, with only 10 adults collected. Nine were found at site 1 (near water); the other was collected from *Verbascum thapsus* at site 13 on 6 June 1973.

Since that time, McPherson and Paskewitz (1984b) have presented further information on the life history of this bug in Pine Hills and described the immature stages. Although they could not determine the number of generations per year, they did note that adults overwintered, emerged in early May, and fed on the heads and copulated on the heads, leaves, and stems of *Carex comosa* Boott growing near the shore of La Rue Swamp. The location was near site 2 (unpublished data). They found six egg clusters, five on *C. comosa* (3 on heads, 2 on bracts) and one on *Sagittaria latifolia* (on a leaf) growing in a stand adjacent to *C. comosa*. Although no first or second instars were collected, they found

thirds-fifths during June-August. Finally, they reared *E. ictericus* in the laboratory from egg to adult on *Phaseolus vulgaris* under controlled conditions.

During the resurvey, 12 specimens (8 adults, 4 nymphs) were collected at sites 2, 3, 5, 6, and 10. These sites are all moist, low-lying areas, thus supporting the findings of McPherson and Mohlenbrock (1976) and McPherson and Paskewitz (1984b) concerning habitat preference of this bug. Of the 12 individuals, three adults and the four nymphs (58.3%) were collected at site 2, and four adults at sites 3, 5, 6, and 10, all by sweeping vegetation. The last adult was handpicked from *Perilla frutescens* at site 5. Of the four nymphs, one third and one fourth instar were collected on 22 June 1994 and two fifth instars on 11 September 1993.

E. politus Uhler. (13 May - 16 October) (2).

This species was common during the original survey and possibly bivoltine, but little evidence of reproduction was noted. All specimens were collected on *Verbascum thapsus* (A, F, C, N), or by sweeping (A, N), at or near site 13.

During the resurvey, 48 specimens (40 adults, 8 nymphs) were collected at sites 3, 13, 14, 15, 16, and 17, with most (66.7%) collected by sweeping vegetation and handpicking from *Verbascum thapsus* at site 13 (n = 32). Of the eight nymphs, three fifth instars were collected between early and the third week of July and three fourth and two fifth instars from mid- to late August. Host plants included *Rubus allegheniensis* (A) and *Verbascum thapsus* (A, C, F).

This species decreased in abundance (3 to 2) between the two surveys, probably because of the marked decrease of *V. thapsus* at site 13 (see earlier discussion of upland sites resurvey). All specimens during the original survey were collected in or near site 13 on this host plant, upon which they were noted feeding, or by sweeping vegetation.

E. servus (Say). (21 April - 11 November) (4).

This species is divided into two subspecies, *E. s. servus* (Say) and *E. s. euschistoides* (Vollenhoven). Southern Illinois is located within a broad band of intergradation between the two subspecies, which extends from Maryland to Kansas (Sailer 1954). Individuals in southern Illinois show combinations of characters used to distinguish the subspecies (McPherson 1982).

This species was the most abundant and widespread of the pentatomoids during the original survey and bivoltine. It was collected from several plant species, several of which involved feeding records and/or presence of immature stages: *Apocynum cannabinum* (A, F), *Cirsium arvense* (L.) (A, F, N), *Dactylis glomerata* L. (N), *Daucus carota* (A, F, N), *Elymus canadensis* (F, N), *Elymus virginicus* (A, F, C), *Erigeron philadelphicus* (A, F), *Geranium carolinianum* (A, F, E, N), *Lactuca scariola* L. (A, F), *Melilotus alba* (A, F), *Melilotus officinalis* (A, F), *Panicum* sp. (N), *Perilla frutescens* (A, F), *Phleum pratense* (A, F), *Plantago lanceolata* L. (A, F), *Rumex crispus* (A, F, N), *Sambucus canadense* L. (A, F), *Solidago* sp. (N), *Sorghum halepense* (A, F, N), *Tradescantia subaspera* (F, N), and *Verbascum thapsus* (A, F, C, N).

During the resurvey, 454 specimens (239 adults, 215 nymphs) were collected by sweeping vegetation and handpicking at all sites except site 1, with most (53.3%) taken at sites 8 (n = 48), 9 (n = 41), 13 (n = 44), 15 (n = 51), and 17 (n = 58). Second instars (n = 10) were collected from mid-May to early June (n = 3) and from late July to mid-September (n = 7); third instars (n = 49) from mid-May to mid-July (n = 27) and from late July to late September (n = 22); fourth instars (n = 62) from early June to late September with peaks of abundance during mid-June (n = 13) and late August (n = 14); and fifth instars (n = 94) from early June to the third week of October with peaks of abundance from mid-June to early July (n = 27) and late August to mid-September (n = 40). Adults occurred from the third week of April to mid-November with peaks of abundance

from mid-August to early September (n = 43) and from early October to the third week of October (n = 59). These data support earlier reports (McPherson and Mohlenbrock 1976, Munyaneza and McPherson 1994) that this species is bivoltine in or near Pine Hills.

Host plants included *Cassia fasciculata* Michaux (N), *Desmanthus illinoensis* (A, F), *Elymus canadensis* (F, N), *Glycine max* L. (A), *Parthenocissus quinquefolia* (A), *Rumex crispus* (A), *Scrophularia marilandica* L. (A, C, F, N), *Teucrium canadense* (N), *Verbascum thapsus* (A, C, F, N), and *Verbesina alternifolia* (A).

E. tristigmus tristigmus (Say). (23 April - 1 December) (4).

This subspecies was abundant during the original survey and bivoltine. It was limited in distribution, with most individuals found near water at sites 1, 6, and 12. It was collected from a wide range of plants, several of which involved feeding records and/or presence of immature stages: *Boehmeria cylindrica* (L.) (A, N), *Geranium carolinianum* (N), *Perilla frutescens* (A, F, N), *Rubus allegheniensis* (N), *Setaria viridis* (F, N), *Tradescantia subaspera* (A, F, C, N), *Ulmus rubra* (A, E), *Verbascum thapsus* (A, F, C, N), and *Vernonia missurica* Rafinesque (A, F).

During the resurvey, this subspecies was the most common pentatomoid at Pine Hills. A total of 839 specimens (333 adults, 506 nymphs) was collected by sweeping and handpicking from all sites, with most (55.5%) taken at sites 2 (n = 103), 3 (n = 91), 5 (n = 98), 6 (n = 94), and 11 (n = 80). Second instars (n = 33) were collected from mid-May to the third week of June (n = 21) and mid-August to the third week of September (n = 12); third instars (n = 62) from late May to early July (n = 36) and from early August to the third week of October (n = 26); fourth instars (n = 138) from early June to late July (n = 64) and mid-August to mid-October (n = 74) with peaks of abundance from early June to the third week of June (n = 57) and early to late September (n = 60); and fifth instars (n = 273) from the second week of June to late July (n = 80) and the second week of August to late October (n = 193) with peaks of abundance from mid-June to early July (n = 61) and early to late September (n = 203). Adults occurred from the third week of April to early December with peaks of abundance from early to late July (n = 82) and from late September to the third week of October (n = 139). These data support earlier reports (McPherson 1975, McPherson and Mohlenbrock 1976) that this subspecies is bivoltine in Pine Hills.

Host plants included *Agastache nepetoides* (A), *Eupatorium rugosum* (A), *Perilla frutescens* (A, N), *Polygonum virginianum* L. (A, F), *Scrophularia marilandica* (A, F, N), *Sorghum halepense* (A), *Tradescantia subaspera* (A, F, N), *Verbascum thapsus* (A, C, N), *Verbesina alternifolia* (A, F, N), and *Verbesina helianthoides* (A, F).

E. variolarius (Palisot de Beauvois). (30 March - 6 November) (3).

This species was common during the original survey and was collected primarily as adults. Most specimens were collected at site 13, others at sites 1, 3, 7, and 9. Host plants included *Hordeum pusillum* Nuttall (A, F) and *Verbascum thapsus* (A, F, N).

During the resurvey, 123 specimens (86 adults, 37 nymphs) were collected by sweeping vegetation and handpicking at all sites except site 4, with most (50.4%) taken at sites 8 (n = 13), 9 (n = 13), 13 (n = 20), and 17 (n = 16). Of the 37 nymphs collected, 35 (2nds-5ths) were found from mid-May to early July; the remaining two were fifth instars, one collected on 25 September 1993 and the other on 9 September 1994. Spring/summer and summer/fall peaks for the adults and instars were not evident, indicating that *E. variolarius* is univoltine. This also has been suggested by earlier authors including, most recently, Munyaneza and McPherson (1994).

Host plants included *Verbascum thapsus* (A, N) and *Verbesina alternifolia* (A, F, N).

Genus *Proxys* Spinola

P. punctulatus (Palisot de Beauvois). (2 June - 3 October) (3).

This species was common during the original survey and at least partially bivoltine. The only host plant recorded was *Tradescantia subaspera* (A, F, C, E, N), which was found at sites 1-5.

During the resurvey, 177 specimens (90 adults, 87 nymphs) were collected by sweeping vegetation at sites 2-6, 10, and 15-17, with most (78.0%) taken at sites 4 (n = 97) and 15 (n = 41). Eggs were found during the second and third weeks of July and in early August. First (n = 1) and second (n = 9) instars were collected during the second and third weeks of July (n = 5) and in mid-August (n = 5); third instars (n = 13) from the second week of July to early September; fourth instars (n = 40) from early July to the third week of September; and fifth instars (n = 24) from mid-July to the third week of September, except for one fifth instar collected 22 June 1994. Adults occurred from early June to early October with a slight peak (n = 23) from late July to early August. These data suggest either a univoltine or partially bivoltine life cycle. Vangeison and McPherson (1975) and McPherson and Mohlenbrock (1976) felt this species is at least partially bivoltine in Pine Hills.

Common host plants included *Tradescantia subaspera* (A, C, E, F, N) and the congeneric species *Commelina communis* (A, F, N). This bug also was collected from *Campsis radicans* (N), *Chenopodium album* L. (A), *Laportea canadensis* (L.) (A), *Phryma leptostachya* L. (A), *Rhus aromatica* (A), and *Rubus occidentalis* (A).

Genus *Coenus* Dallas

C. delius (Say). (19 May - 20 October) (2).

This species was uncommon during the original survey. It was collected by sweeping grassy areas at sites 6 and 13. Host plants included *Elymus virginicus* (A, F, N), *Phleum pratense* (A, F), and *Verbascum thapsus* (A).

During the resurvey, 96 specimens (49 adults, 47 nymphs) were collected by sweeping vegetation at sites 6-10, with most (84.4%) taken at sites 7 (n = 22) and 8 (n = 59). Second through fifth instars were collected from early June to mid-July (n = 17), and mid-May through mid-June (n = 30) in 1993 and 1994, respectively. Adults occurred from the third week of May to mid-July and the third week of September to the third week of October with a peak of abundance from late September to mid-October (n = 27). These data support earlier reports (e.g., Stoner 1920, Esselbaugh 1948, Oetting and Yonke 1971) that this species is univoltine. The only host plant recorded was *Melilotus alba* (A).

Genus *Hymenarcys* Amyot and Serville

H. nervosa (Say). (14 April - 21 August) (1).

This species was common during the original survey and possibly univoltine. It was collected most frequently at sites 1, 7, and 13. Host plants included *Geranium carolinianum* (A, F, E, N), *Muhlenbergia schreberi* J. F. Gmelin (N), *Perilla frutescens* (A), and *Verbascum thapsus* (A, C).

During the resurvey, 35 specimens (20 adults, 15 nymphs), were collected by sweeping vegetation at sites 7, 8, 9, 13, and 17, with most (80.0%) taken at sites 7 (n = 15) and 8 (n = 13). Of the nymphs, only fourth and fifth instars were collected; they were found from early June through early July, with a peak of abundance (n = 10) on June 15. Adults rarely were collected after July. These data support McPherson and Mohlenbrock's (1976) suggestion that this species is univoltine in Pine Hills. Host plants included *Melilotus officinalis* (A), *Parthenocissus quinquefolia* (A), and *Verbascum thapsus* (A).

Genus *Cosmopepla* Stål

C. bimaculata (Thomas). (23 April - 23 October) (3).

This species was abundant during the original survey; found most frequently at sites 1, 6, 10, 11, and 12; and thought to be bivoltine. It was collected

from several host plants included *Bromus secalinus* L. (A, F), *Campsis radicans* (A, C), *Daucus carota* (A, F), *Geranium carolinianum* (A, F, C, N), *Phleum pratense* (A), *Plantago lanceolata* (F, N), *Rumex crispus* (A, F), *Teucrium canadense* L. (A, F, N), *Verbascum thapsus* (A, C), and *Veronica arvensis* (A, F, C).

During the resurvey, 215 specimens (70 adults, 145 nymphs) were collected by sweeping vegetation and handpicking at sites 3, 6-12, and 15-17, with most (81.4%) taken at sites 8 (n = 50) and 15 (n = 125).

The number of generations per year for *C. bimaculata* is somewhat problematic. Young instars (1sts-3rds) (n = 45) were collected in late June (n = 6) and late July to mid-September (n = 39) and older instars (4ths-5ths) (n = 100) from early to late June (n = 31) and from the second week of August to mid-September (n = 69). Adults occurred from the third week of April to the third week of October with peaks of abundance from mid- to late June (n = 17) and from late August to mid-September (n = 30). These data indicate that *C. bimaculata* is bivoltine in Pine Hills, as suggested earlier by McPherson (1976) and McPherson and Mohlenbrock (1976). Combining these data with those of the original survey further supports this conclusion (McPherson and Tecic 1997). The apparent first generation was found on *Geranium carolinianum* (A, C, E, F, N) and *Verbascum thapsus* (A, F, N) and the apparent second generation on *Scrophularia marilandica* (A, C, E, F, N) and *Teucrium canadense* (A, E, F, N). Additional host plants included *Bromus inermis* Leysser (A) and *Campsis radicans* (A).

Genus *Meneclis* Stål

M. insertus (Say). (June 14) (1).

An adult was collected during the original survey. It was swept from vegetation at the forest edge at site 1 on 22 June 1973.

During the resurvey, one adult and one fifth instar were collected with the overnight fluorescent light trap at site 14 on 14 June and 2 June 1994, respectively. No host plants were recorded.

Genus *Thyanta* Stål

T. calceata (Say). (August 3) (1).

This species was common during the original survey, collected almost exclusively at site 13, and reported to probably be bivoltine. Host plants included *Bromus commutatus* Schrader (A), *Rubus allegheniensis* (A, N), and *Verbascum thapsus* (A, F, C, N).

Since that time, McPherson (1977) has conducted additional work on the life history of this species at Pine Hills and feels the data strongly indicate that *T. calceata* is bivoltine.

During the resurvey, this species was rare. Only one adult and two nymphs were collected by sweeping vegetation at site 11 on 20 July (1-4th), 3 August (A), and 15 September (1-5th) 1994. No host plants were recorded.

This species' marked decrease in abundance (from common to rare) between the two surveys probably was the result of the marked decrease in *Verbascum thapsus* at site 13 (see earlier discussion of upland sites resurvey). Almost all specimens during the original survey were collected at site 13, and *V. thapsus* was the only plant upon which this bug was noted feeding.

T. custator accerra McAtee. (7 October - 6 November) (1).

This subspecies was listed in the original survey as *Thyanta pallido-virens accerra* (McAtee). However, the genus was revised by Rider and Chapin (1992) and the original name of the subspecies resurrected.

This subspecies was rare during the original survey. Most specimens were collected as adults and swept from grassy areas at sites 9 and 13. No host plants were recorded.

During the resurvey, three adults and three fifth instars were swept from vegetation at sites 9, 11, and 12. The adults were collected at site 9 on 6 November and site 11 on 7 and 16 October 1994 and the nymphs at sites 9, 11, and 12 on 18 September, 1992, 7 October 1994, and 30 September 1994, respectively. No host plants were recorded.

Genus *Acrosternum* Fieber

A. hilare (Say). (8 May - 28 October) (3).

This species was common during the original survey, widespread, and apparently bivoltine. Host plants included *Allium canadense* L. (A), *Ceanothus americanus* (N), *Impatiens capensis* (= *I. biflora*) (A, F, N), *Perilla frutescens* (F, N), *Rhus glabra* (A, F), *Rubus allegheniensis* (N), *Tradescantia subaspera* (N), *Ulmus rubra* (A), *Verbascum thapsus* (A, E, N), *Verbesina alternifolia* (N), and *Vitis aestivalis* Michaux (A, N). It also was collected at blacklight.

During the resurvey, 346 specimens (91 adults, 255 nymphs) were collected by sweeping vegetation and handpicking at all sites except site 1, with most (61.0%) taken at sites 9 (n = 34), 11 (n = 66), 13 (n = 34), 15 (n = 37), and 17 (n = 40). Young instars (1sts-3rds) (n = 106) were collected from mid-June to the third week of July (n = 70) and mid-August to early October (n = 36) with peaks of abundance from late June to mid-July (n = 58) and mid-September (n = 20). Older instars (4ths-5ths) (n = 149) were collected from late June to the third week of October with peaks of abundance from mid- to late July (n = 47) and from mid-September to early October (n = 47). Adults occurred from early May to late October (n = 91) with no peaks of abundance readily apparent. However, based on the nymphal data, the results support McPherson and Mohlenbrock's (1976) suggestion that this bug is bivoltine in Pine Hills. Combining these data with those of the original survey further supports this conclusion (McPherson and Tecic 1997).

Host plants included *Ambrosia trifida* (N), *Celtis occidentalis* (N), *Cercis canadensis* (A, N), *Cornus drummondii* (F, N), *Elymus virginicus* (A), *Eupatorium rugosum* (N), *Hybanthus concolor* (Forster) (A), *Impatiens pallida* (A, F, N), *Teucrium canadense* (A), *Verbascum thapsus* (A, N), *Vicia villosa* (N, F), and *Vitis aestivalis* (A). *A. hilare* again was collected at blacklight.

Genus *Banasa* Stål

B. dimiata (Say). (5 November - 6 November) (1).

This species was rare during the original survey. All but one specimen were collected at blacklight, primarily at sites 6 and 17. The remaining specimen, an adult male, was swept from roadside vegetation at site 7 on 10 May 1974.

During the resurvey, three adults and two fifth instars were collected. One adult and the fifth instars were taken in 1994, the adult by sweeping vegetation at site 5 on 6 November and the fifth instars by sweeping near *Cornus drummondii* at site 6 on 15 and 29 June. The other two adults were collected from leaf litter at site 5 on 5 November 1993. No host plants were recorded. Although specimens were collected at blacklight during the original survey, none was collected with either light trap during the resurvey.

Subfamily Asopinae

Genus *Stiretrus* Laporte

S. anchorago (Say). (12 June - 25 September) (1).

This species was rare during the original survey and possibly bivoltine. Most specimens were collected at site 13. Plant associations included *Ceanothus americanus* (N), *Rhus copallina* L. (A, N), *Rhus glabra* (A, N), *Rubus allegheniensis* (E), *Solidago* sp. (A), *Verbascum thapsus* (A, N), and *Vitis* sp. (A). No prey species were recorded.

During the resurvey, 24 specimens (8 adults, 16 nymphs) were collected by sweeping vegetation at sites 2, 3, 7, 8, and 12-17, with most (45.8%) taken at

site 15 (n = 11). Young instars (2nds-3rds) (n = 6) were collected from mid- to late June (n = 5) and on 12 September 1993 (n = 1). Older instars (4ths-5ths) (n = 10) were found from early to mid-July (n = 6) and from early to late September (n = 4). Adults occurred from mid-June to late September, with most (n = 6) collected in late July. These data support McPherson and Mohlenbrock's (1976) opinion that this species is bivoltine in Pine Hills. No plant associations or prey species were recorded.

Genus *Apoecilus* Stål

(as *Apateticus* Dallas in McPherson and Mohlenbrock [1976])

A. cynicus (Say). (15 June - 21 August) (1).

Thomas (1992), in his review of the asopine pentatomids of the Western Hemisphere, noted that *A. cynicus* is not a member of *Apateticus* but a member of *Apoecilus*.

This species was rare during the original survey and possibly univoltine. Most specimens were collected at sites 6 and 17 on tree foliage at the edges of open woods. Plant associations included *Acer negundo* (N), *Acer saccharum* (N), *Celtis laevigata* (N), *Rhus glabra* (A), *Solidago* sp. (A), *Verbesina alternifolia* (N), and roadside grasses (N). No prey species were recorded.

During the resurvey, two adults were collected by sweeping trees and herbaceous vegetation at sites 13 and 14. No plant associations or prey species were recorded.

Genus *Podisus* Herrich-Schaeffer

P. maculiventris (Say). (3 May - 5 November) (1).

This species was common during the original survey, widely distributed, and apparently bivoltine. Plant associations included *Apocynum cannabinum* (A), *Diospyros virginiana* L. (N), *Polymnia canadensis* L. (A), *Solidago* sp. (A), *Toxicodendron radicans* (N), *Tradescantia subaspera* (N), *Trifolium repens* L. (N), and *Verbesina alternifolia* (N). This species also was collected at blacklight.

During the resurvey, this species was the most common of the predaceous stink bugs. Ninety-six specimens (19 adults, 77 nymphs) were collected by sweeping vegetation and handpicking at all sites except 8 and 14. Distribution among these sites was relatively equal, with most (15.6%) taken at site 5 (n = 15). Young instars (2nds-3rds) (n = 32) were found from early May to the third week of June (n = 25) and from late July to late September (n = 7). Older instars (4ths-5ths) (n = 45) were collected from mid-May to early July (n = 30) and late July to early October (n = 15). Adults occurred from early May to early November with no obvious peaks of abundance. These data support McPherson and Mohlenbrock's (1976) opinion that this species is bivoltine in Pine Hills. Plant associations included *Salix nigra* L. (N), *Toxicodendron radicans* (N), *Ulmus americana* (N), and *Vicia villosa* (A, C). No prey species were recorded.

Species Not Found During Resurvey.

Superfamily Pentatomoidea

Family Scutelleridae

Subfamily Tetyrinae

Genus *Homaemus* Dallas

H. parvulus (Germar).

During the original survey, an adult female was collected by sweeping *Dactylis glomerata* L. adjacent to the hill prairie at site 16 on 29 June 1972. An additional specimen (adult male), housed in the SIUEC, was collected at Pine Hills on 7 May 1966. The flora at site 16 has changed significantly over the past 20-25 years, so the absence of this stink bug was not surprising.

Family Corimelaenidae

Genus *Galgupha* Amyot and Serville*G. carinata* McAtee and Malloch.

This is an uncommon species and was a state record for Illinois when it was collected at Pine Hills (McPherson 1974a). During the original study, an adult male and female were collected by sweeping roadside vegetation at site 10 on 25 May and 27 July 1973, respectively. No host plants were recorded.

Family Cydnidae

Subfamily Amnestinae

Genus *Amnestus* Dallas*A. pusillus* Uhler.

During the original survey, this species was rare and limited in distribution. It was collected only as adults (sex and number not given) by sweeping roadside vegetation at site 6.

A. spinifrons (Say).

During the original survey, two adult females were collected by sweeping low-lying vegetation at site 1 on 1 June 1973 and 26 April 1974. An adult male, housed in the SIUEC, was collected at Pine Hills on 7 May 1966.

Absence of this species during the resurvey was not surprising because it was rare during the original survey, and the vegetation at site 1 has changed significantly during the past 20-25 years (see discussion, p. 48).

Family Pentatomidae

Subfamily Pentatominae

Genus *Holcostethus* Kirkaldy*H. limbolarius* (Stål).

During the original survey, this species was uncommon and limited in distribution. It was collected as adults and third-fifth instars, primarily by sweeping roadside vegetation at sites 9, 13, and 15. The only host plant recorded was *Verbascum thapsus* (A), which no longer is common.

Genus *Hymenareys* Amyot and Serville*H. aequalis* (Say).

During the original survey, an adult male and female were collected by sweeping low-lying vegetation at sites 1 and 8 on 1 June and 13 July 1973, respectively. No host plants were recorded.

Genus *Aelia* Fabricius*A. americana* Dallas.

This species is rare in Illinois, having been collected only in the southern part of the state (McPherson 1982). No specimens of this species were found at Pine Hills during the original survey; however, an adult male, housed in the SIUEC, was collected at Pine Hills on 26 May 1961. This and four additional southern Illinois specimens represented a state record (McPherson 1974c).

Genus *Neottiglossa* Kirby*N. cavifrons* Stål.

During the original survey, an adult male and female were collected by sweeping roadside grasses at site 15 on 18 and 4 May 1973, respectively; a second adult female was swept from roadside vegetation at site 8 on 10 May 1974. Much of the roadside vegetation reported for site 15 in the original survey is no longer present because of woody encroachment, which shades the area.

N. sulcifrons Stål.

This species was not found during the original survey, but two adult females, housed in the SIUEC, were collected at Pine Hills on 27 April 1965.

Genus *Nezara* Amyot and Serville

N. viridula (L.).

During the original survey, a third instar was collected at Pine Hills by sweeping roadside vegetation at site 8; it represented a state record (McPherson and Cuda 1974). Southern Illinois is near the northern limit of this species' range (McPherson and Mohlenbrock 1976).

Genus *Banasa* Stål

B. calva (Say).

During the original survey, an adult male and female were collected at blacklight at sites 6 and 17 on 15 May 1971 and 13 July 1972, respectively. A second adult male was collected by another individual on 11 April 1972.

Genus *Dendrocoris* Bergroth

D. humeralis (Uhler).

During the original survey, this species was rare and most frequently collected as adults at sites 6, 13, and 17; one fifth instar was collected on *Bromus* sp. at site 6 on 26 June 1974.

Subfamily Asopinae

Genus *Podisus* Herrich-Schaeffer

Podisus placidus Uhler.

During the original survey, an adult male was collected by sweeping *Lindera benzoin* at site 1 on 15 June 1972.

SUMMARY AND CONCLUSIONS

The changes that have occurred in the character and plant composition of several of the collecting sites since the original survey presumably have resulted from differences in roadside management. These differences have encouraged woody plant encroachment at some sites, thereby affecting the herbaceous vegetation, and have influenced herbaceous plant composition at other sites. Some sites have shown little change.

Changes in plant composition have included native and exotic species. Exotic species have become an increasingly prominent component of the vegetative communities. The exotic that has had the most influence on the diversity and abundance of the pentatomoids has been *Verbascum thapsus* (see below).

The pentatomoids were associated with approximately 100 plant species during the two surveys, including 25 exotics (Table 1). Some bugs were noted feeding and/or reproducing on several plant species (e.g., *Corimelaena l. lateralis*, *Mormidea lugens*, *Euschistus servus*, *Euschistus t. tristigmus*, *Cosmopepla bimaculata*, *Acrosternum hilare*), whereas others were more limited in their associations (e.g., *Trichopepla semivittata*, *Oebalus p. pugnax*, *Euschistus politus*, *Euschistus variolarius*, *Proxys punctulatus*, *Coenus delius*, *Thyanta calceata*).

As noted earlier, of the 49 pentatomoid species and subspecies listed during the original survey, 36 were collected during the resurvey (Table 2). Two additional species were found: *Galgupha ovalis*, which was listed in the original survey as likely to occur at Pine Hills; and *Corimelaena obscura*, which was described subsequent to the earlier survey. During both surveys, pentatomids (stink bugs) represented the majority of taxa collected, 32 of 49 taxa during the

original survey and 23 of 36 taxa during the resurvey. Of the 13 not found during the resurvey, 10 were rare during the original survey; and two, *Aelia americana* and *Neotiglossa sulcifrons*, were based on specimens deposited in the SIUEC that had been collected prior to the original survey. These 12, therefore, may still be present but may have been overlooked during the resurvey.

The thirteenth species, *Holcostethus limbolarius*, was not found during the resurvey and was uncommon during the original survey. During the earlier survey, it was collected by sweeping roadside vegetation at sites 9, 13, and 15. The only host plant recorded was *Verbascum thapsus* (A), but no feeding, copulation, or nymphs were noted. Although site 9 has remained relatively unchanged (i.e., still dominated by herbaceous vegetation), sites 13 and 15 have experienced woody encroachment, and the abundance of *V. thapsus* at site 13 has decreased dramatically. Thus, absence of this bug during the resurvey was not surprising.

The importance of the decrease in abundance of *Verbascum thapsus* on the decrease in pentatomoid diversity and abundance cannot be overstated. Fourteen taxa, including *Holcostethus limbolarius*, were collected from *V. thapsus* during the original survey (see Table 5, McPherson and Mohlenbrock 1976). Of these, only *Euschistus politus*, *E. servus*, *E. t. tristigmus*, *E. variolarius*, and *Thyanta calceata* were observed feeding on this plant. Of these, *E. politus* and *T. calceata* were observed feeding on no other plant and both showed a noticeable decrease in abundance (i.e., 3 to 2 and 3 to 1, respectively) during the resurvey (Table 2).

Several of the other pentatomoids also showed marked decreases in relative abundance (i.e., *Corimelaena agrella*, *Galgupha aterrima*, *G. atra*, *Hymenarcys nervosa*, *Podisus maculiventris*), but the cause and effect relationship is not readily apparent.

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