A Biological Survey and Assessment of The Little Vermilion River State Natural Area, Vermilion County, Illinois

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TABLE OF CONTENTS

Chapter 1. Introduction

Chapter 2. The Endangered and Threatened Flora and Unique Natural Features of the Little Vermilion River State Natural Area, Vermilion County, Illinois. William C. Handel, Mary Harper, David Ketzner, & Paul Tessene. 20 pp + 10 Fig.

Chapter 3. A Limited Survey of the Amphibians and Reptiles of the Little Vermilion River State Natural Area, Vermilion County, llinois. C.A. Phillips, J.E. Petzing, & J.M. Serb. 7 pp.

Chapter 4. A Limited Survey of the Birds of the Little Vermilion River State Natural Area, Vermilion County, Illinois. Steve .B. Amundsen. 38 pp.

Chapter 5. A Survey for the Fedearlly Endangered Indiana Bat (*Myotis sodalis*) at the Little Vermilion River State Natural Area, Vermilion County, Illinois. Joyce E. Hofmann. 9 pp.

Chapter 1. Introduction

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INTRODUCTION

The 1.044 acre Little Vermilion River State Natural Area (LVRSNA) is located in southeast Vermilion County, three miles souteast of Georgetown, twelve miles south of Danville, and two miles west of the Illinois-Indiana state line (Figure 1.1). The property is in McKendree and Love Townships with the majority in the former. It is in the Vermilion River Section of the Wabash Border Natural Division. The prominent natural feature is the Little Vermilion River which meanders 2.1 miles through the LVR. This stretch of the river is classified as Class "A" stream under the Biological Stream Characterization of Illinois Streams (IBSC Working Group 1995) which indicates a "unique aquatic resource". It is also considered a Biologically Significant Stream by Page et al. (1992). The major vegetation cover types found in the LVR are forest, oldfield & shrubland, wetland, and agricultural.

The main anthropogenic impacts in the LVRSNA are coal mining and agriculture. Small-scale mining operations were probably conducted along the river by local residents, perhaps as early as the 1820's. The large-scale operations were strip mines, the first of which was operated during the 1920's. The largest area of strip mining impact is north of the Little Vermilion River starting at the Walsh Bridge in the extreme northeast corner of Section 3 (T 18N, R 11W) and extending to a line drawn from County Road 670N east to County Road 650N. The impacted area is a thin arc one-eighth of a mile wide and approximately one mile long. It is characterized by a series of five to ten parrallel ridges each approximately 40 foot high. Other areas in the LVR showing evidence of past strip mining are shown in Figure 1.2. The majority of the strip mining on the LVR occurred between 1920 and 1951.

Agricultural impacts in the LVR are more extensive and continue today. The major agricultural impact on the LVR over the last 50 years has been crop production although cattle grazing has played a role, especially in the extreme southeast corner of the property. The percentage of LVR acreage in agriculture has varied over the past 50 years as can be seen by comparing the aerial photographs in Figures 1.3 and 1.4. Current agricultural impacts are limited to corn and soybean production, mainly in the upland plateaus (Figure 1.4).

The aquatic fauna of the LVR has been relatively well studied because of the natural quality of the Little Vermilion River. Several threatened or endangered species are known from the Little Vermilion River either within the boundaries of the LVR or nearby: Mussels: slippershell (*Alasmidonta viridis*), little spectalecase (*Villosa lienosa*), rainbow (*Villosa iris*);Fishes: bigeye shiner (*Notropis boops*), bigeye chub (*Hybopsis* [*Notropis*] *amblops*), river chub (*Nocomis micropogon*), eastern sand darter (*Etheostoma pellucidum*). The flora and terrestrial fauna of the LVR, on the other hand, are less well known. This study focuses on the plants, amphibians, reptiles, & birds of the LVR with an emphasis on threatened or endangered members of these groups. In addition, a survey was conducted for the federally endangered Indian bat.

For reporting purposes, the LVRSNA was divided into six vegetation tracts (Fig. 1.5). Locations of most of the common species encountered are reported to the level of Tract number. Locations of threatened, endangered, and locally significant species are more detailed.

LITERATURE CITED

Illinois Biological Stream Characterization Work Group. 1995. Biological stream characterization of Illinois streams 1995 [map]. Illinois Environmental Protection Agency, Illinois Department of Conservation, and Illinois Natural History Survey.

Page, L.M., K.S. Cummings, C.A. Mayer, S.L. Post, and M.E. Retzer. 1992. Biologically significant Illinois streams; An evaluation of the streams of Illinois based on aquatic biodiversity. Center For Biodiversity Technical Report 1992 (1). 485 pp.

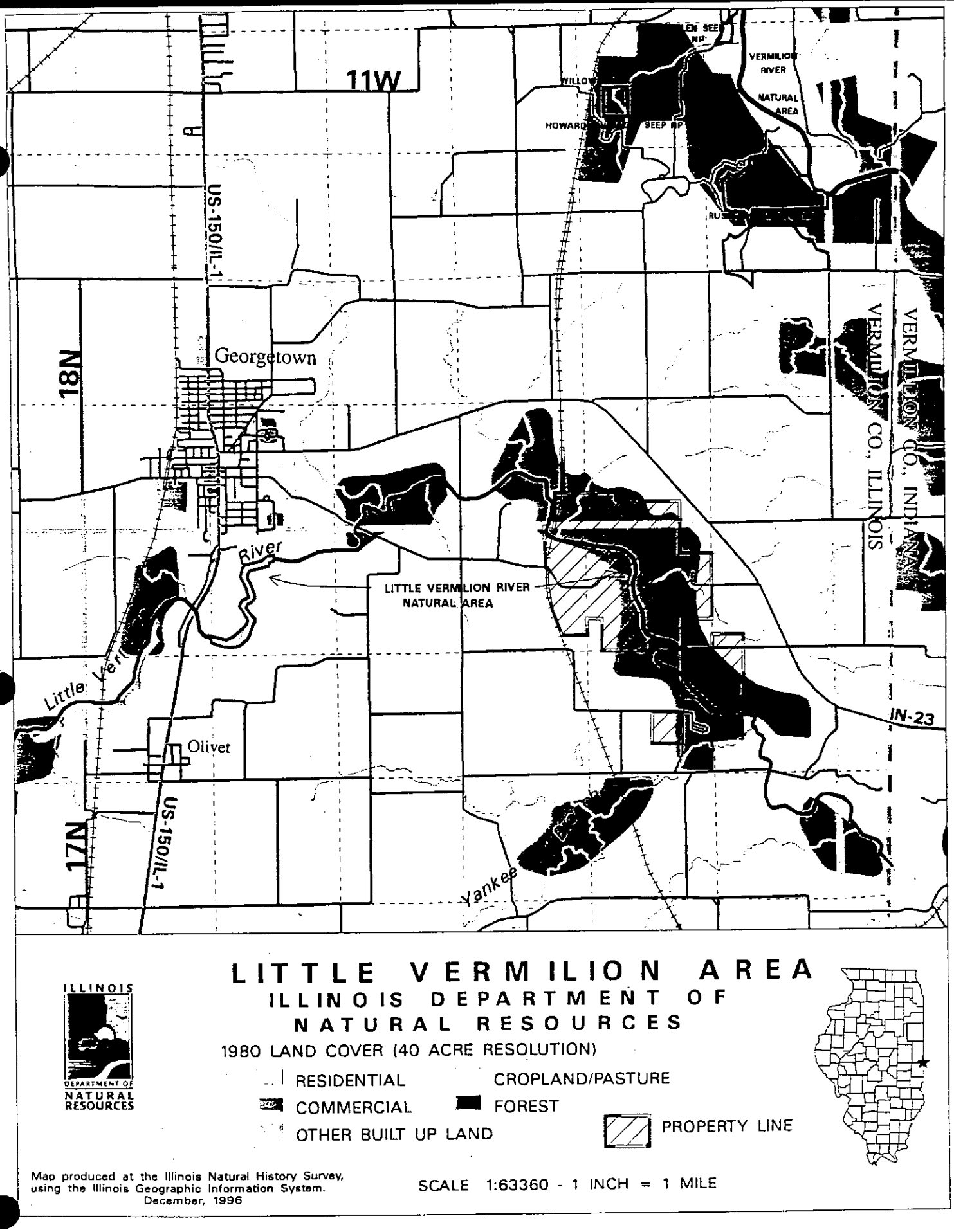

Figure 1.1 Map of the Little Vermilion River State Natural Area.

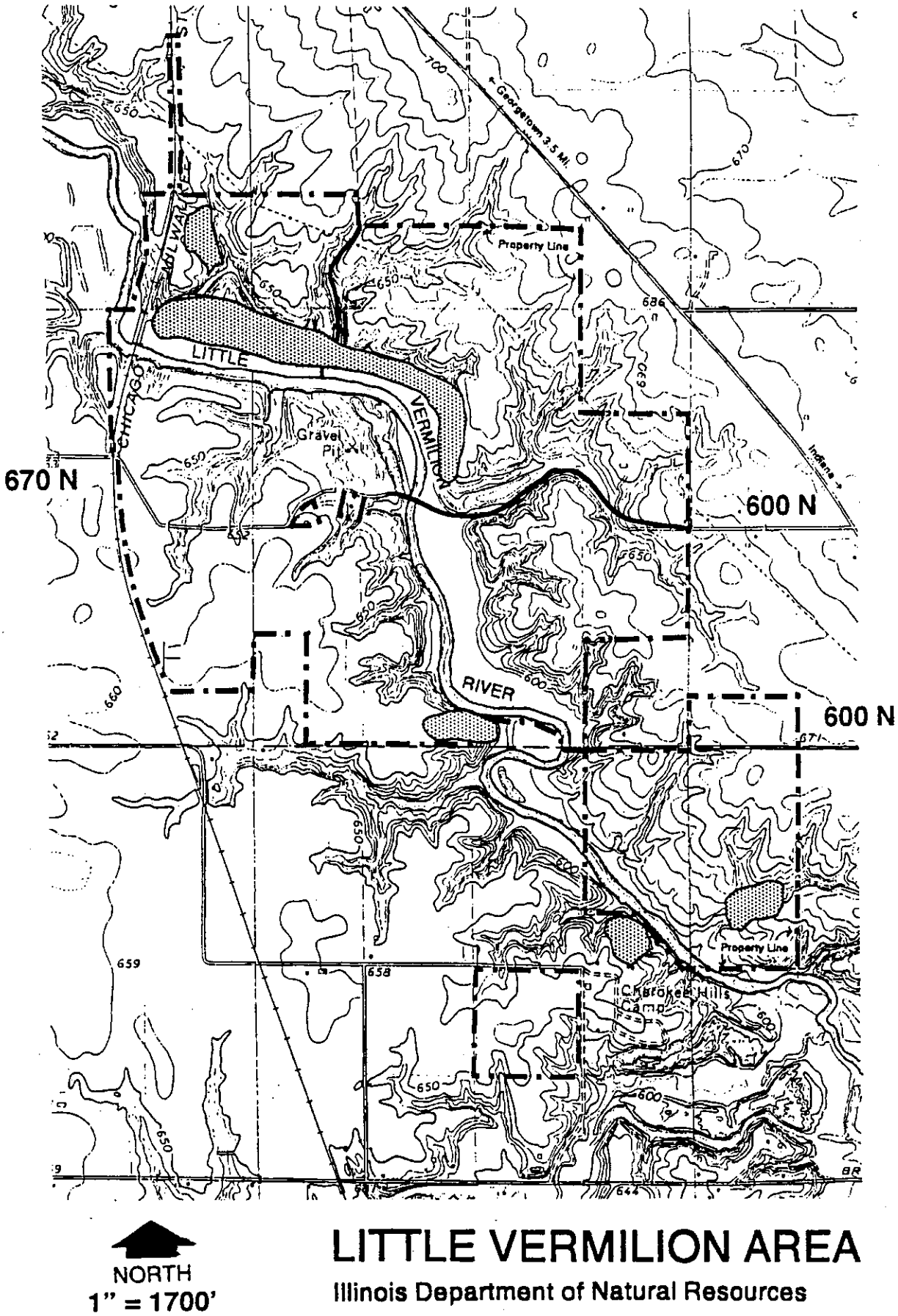

Figure 1.2 Major strip mining impacts at the LVRSNA, Vermilion County, Illinois.

Figure 1.3 1936 aerial photograph of the Little Vermilion River State Natural Area.

Figure 1.4 1983 aerial photograph of the Little Vermilion River State Natural Area.

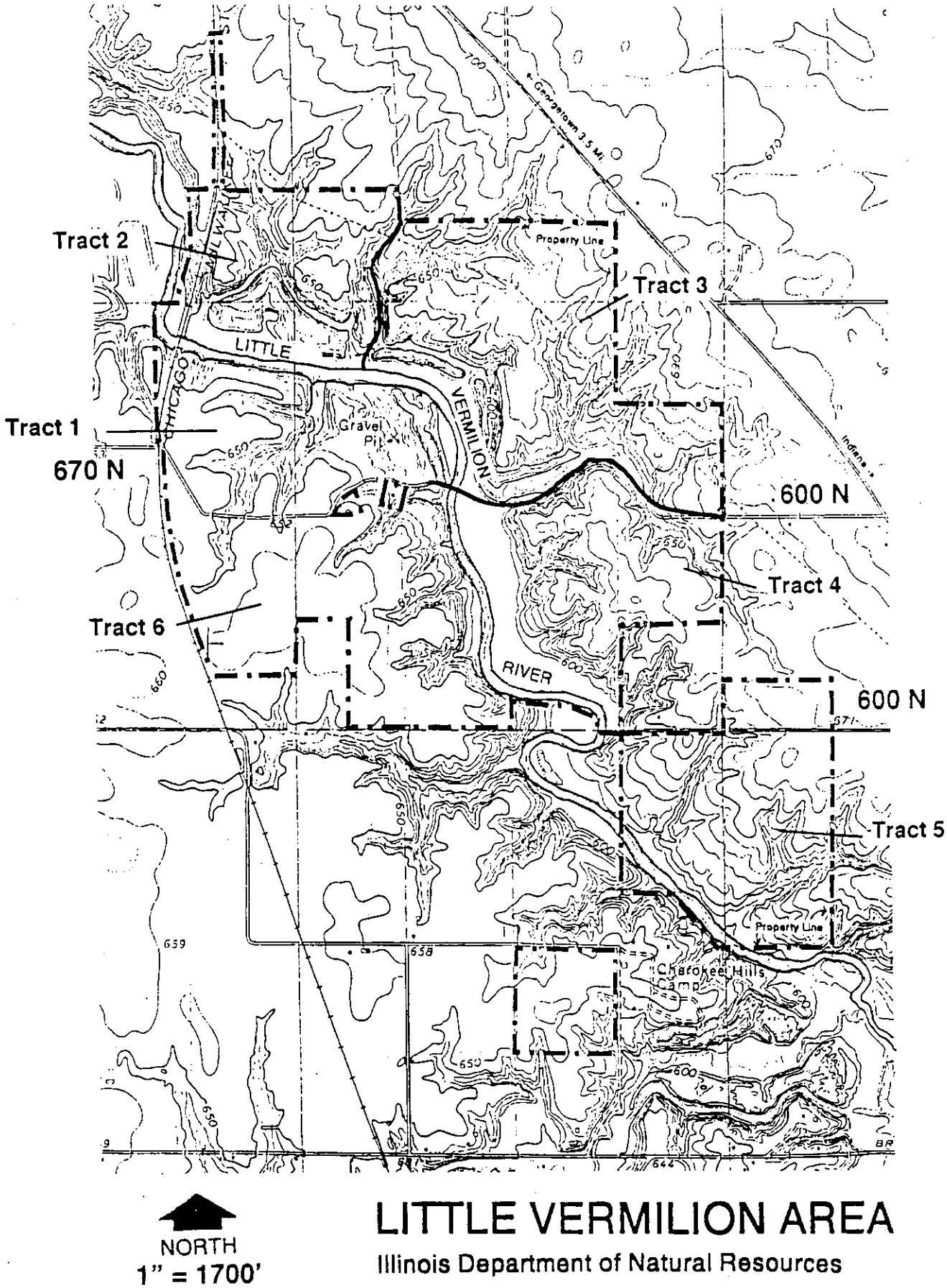

Figure 1.5 Vegetation tract designations for the 1995-1996 bio-survey at LVRSNA, Vermilion County, Illinois

Chapter 2. The Endangered and Threatened Flora and Unique Natural Features of the Little Vermilion River State Natural Area, Vermilion County, Illinois

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INTRODUCTION

The Little Vermilion River State Natural Area (LVRSNA) is located in the Vermilion Section of the Wabash Border Division. This section is characterized by rugged topography with beech-maple forests along the ravines of the Vermilion River and its tributaries (Schwegman 1973). The area has several vegetation types including: dry-mesic upland forest, mesic upland forest, mesic forest ravine, floodplain forest, seep, and upland and lowland successional old field. Many of the upland forests have plant species of eastern and southeastern deciduous forest origin; examples include *Carex careyana* (sedge), *Collinsonia canadensis* (horsebalm), *Conopholis americana* (cancer-root), *Epifagus Virginiana* (beech-drops), *Fagus grandifolia* (beech), *Hydrophyllum appendiculatum* (great waterleaf), *Jeffersonia diphylla* (twinleaf), *Lindera benzoin* (spicebush), *Luzula multiflora* (common woodrush), *Silene virginica* (firepink), *Valeriana pauciflora* (pink valerian), and *Veratrum woodii* (false hellebore).

METHODS

The site was visited approximately every two weeks during the growing season starting in the fall of 1995 and ending in November 1996. The primary emphasis was on locating endangered and threatened species and sensitive natural areas, such as seeps and remnant beech forests. A secondary emphasis was on describing the natural communities for species diversity, disturbance history, and unique features. During March 1996 a list was developed of potential endangered and threatened species based on known occurrences in the area, available habitat, and records from eastern Illinois (Herkert 1991) and western counties of Indiana (Deam 1940). The majority of the spring and early summer was spent surveying the forest tracts and seeps where the potential for endangered and threatened species was the greatest. Exceptional natural features were located and inventoried throughout the duration of the study. Designation of a site as an exceptional feature is based on several factors: 1) Concentrations of endangered, threatened, or watch-list species, 2) Populations of plants that aren't listed but are rare in the state or characteristic of undisturbed community types, 3) Overall species diversity and forest structure. Data on location, size, habitat, and plant associates were recorded for each population of endangered and threatened species. Because limited time was spent surveying the disturbed mined areas, only general vegetation cover was noted. Nomenclature in this report follows Mohlenbrock (1986). Soils information in this report was derived by National Resources Conservation Service (1996).

RESULTS

Fifty-five populations of five plant species listed as endangered or threatened in Illinois (Endangered Species Protection Board, 1994) were found during the survey (Table 2.8). Three additional populations of Illinois watch-list species were also found. During the study exceptional natural features were noted including mesic upland forest (beech - sugar maple - red oak) remnants, dry-mesic upland forest (white oak-black oak-shagbark hickory), and floodplain forest (Table 2.14). Locations of endangered, threatened, and watch-list species are illustrated on odd numbered maps 2.1 through 2.9. Information on the exceptional areas and plant communities are illustrated on even numbered maps 2.2 through 2.10.

Plant Communities

Mesic upland forest

The western extent of the beech-maple forest association ends in the Vermilion River watershed in east-central Illinois. At the western edge of this forest association, topographic and edaphic conditions supersede climate in controlling community vegetation (Lindsey 1966). The mesic upland forest community is usually confined to the cooler north- and east-facing forest slopes along ravines. The dominant tree species include sugar maple, beech, and red oak. The mesic upland forests have a typical southeastern shrub flora including flowering dogwood and spicebush. The herbaceous layer has a high diversity of ferns and other mesophytic species. Fire suppression and logging may have also played an important role in forest development at

LVRSNA. The upland forest edges are often dominated by sugar maple. It also occurs in even-age stands under oaks and hickories; this is often an indicator of past disturbance. When the upland forests were cleared, sugar maples may have migrated outward from the mesic forest slopes and ravines to form the monotypic stands that occur adjacent to many of the upland old field habitats.

Table 2.1 Species commonly found in mesic upland forest.
(**Bold** = species encountered most frequently).

Species	common name
Acer saccharum	**sugar maple**
Adiantum pedatum	**maidenhair fern**
Carex albursina	**sedge**
Carex communis	**sedge**
Carex laxiculmis	**sedge**
Carex pensylvanica	**sedge**
Collinsonia canadensis	**horsebalm**
Cornus florida	**flowering dogwood**
Fagus grandifolia	**beech**
Festuca obtusa	**nodding fescue**
Luzula multiflora	**common woodrush**
Parthenocissus quinquefolia	**Virginia creeper**
Polystichum acrostichoides	**Christmas fern**
Prenanthes alba	**lion's foot**
Quercus rubra	**red oak**
Sanicula gregaria	**common snakeroot**
Silene virginica	**firepink**
Solidago caesia	**bluestem goldenrod**
Tradescantia subaspera	**spiderwort**
Actaea pachypoda	doll's-eyes
Aesculus glabra	Ohio buckeye
Allium canadense	wild garlic
Antennaria plantaginifolia	cat's foot
Aralia racemosa	American spikenard
Arisaema triphyllum	Jack-in-the-pulpit
Asarum canadense	wild ginger
Asimina triloba	paw paw
Athyrium pycnocarpon	narrow-leaved spleenwort
Brachyelytrum erectum	long-awned wood grass
Bromus pubescens	Canada brome grass
Carex artitecta	sedge
Carex blanda	sedge
Carex careyana	sedge
Carex rosea	sedge
Carya cordiformis	bitternut
Carya ovata	shagbark hickory
Circaea lutetiana	enchanter's nightshade
Cryptotaenia canadensis	honewort
Cypripedium pubescens	yellow lady-slipper
Cystopteris protrusa	fragile fern
Elymus villosus	hairy wild rye
Euonymus obovatus	strawberry bush
Eupatorium rugosum	white snakeroot
Fraxinus americana	white ash
Fraxinus pennsylvanica	green ash
Galium aparine	annual bedstraw
Galium circaezans	bedstraw
Galium triflorum	sweet-scented bedstraw
Geranium maculatum	wild geranium
Geum vernum	spring avens

Table 2.1 concluded on next page

Table 2.1 concluded

Species	common name
Helianthus divaricatus	woodland sunflower
Hepatica nobilis var. *acuta*	sharp-lobed hepatica
Hybanthus concolor	green violet
Hydrangea arborescens	wild hydrangea
Hydrophyllum virginianum	Virginia waterleaf
Laportea canadensis	wood nettle
Lindera benzoin	spicebush
Lirodendron tulipifera	tulip poplar
Lonicera prolifera	honeysuckle
Osmorhiza claytonii	sweet cicely
Ostrya virginiana	hop hornbeam
Phlox divaricata	blue phlox
Poa sylvestris	woodland bluegrass
Podophyllum peltatum	Mayapple
Quercus alba	white oak
Ribes missouriense	gooseberry
Rosa multiflora	multiflora rose
Rubus allegheniensis	wild blackberry
Sanguinaria canadensis	bloodroot
Sassafras albidum	sassafras
Smilacina racemosa	false Solomon's's seal
Smilax hispida	bristly greenbrier
Solidago ulmifolia	elm-leaved goldenrod
Sphenopholis obtusata	wedge grass
Tilia americana	basswood
Toxicodendron radicans	poison ivy
Ulmus americana	American elm
Veratrum woodii	false hellebore
Viburnum prunifolium	black haw
Viola pubescens	yellow violet

Mesic forest ravine

The mesic forest ravines are similar in tree and shrub composition to the mesic upland forests, except that *Asimina triloba* (paw paw) and spicebush are the dominant shrubs and tree species such as sycamore and tulip poplar replace beech and maple in the overstory. The mesic ravines tend to have a high diversity of tree species with no one species as a true dominant. Seeps and springs are common throughout all the mesic forest ravines, and spring ephemerals are more abundant than in the other communities.

Table 2.2 Species commonly found in mesic forest ravines
(**Bold** = species encountered most frequently)

Species	common name
Acer saccharum	**sugar maple**
Aesculus glabra	**Ohio buckeye**
Arisaema triphyllum	**Jack-in-the-pulpit**
Asarum canadense	**wild ginger**
Asimina triloba	**paw paw**
Cardamine douglassii	**bitter cress**
Carex laxiculmis	**sedge**
Carpinus caroliniana	**blue beech**
Claytonia virginica	**spring beauty**
Collinsonia canadensis	**horsebalm**
Cornus florida	**flowering dogwood**
Cryptotaenia canadensis	**honewort**
Impatiens capensis	**jewelweed**

Table 2.2 concluded on next page

Table 2.2 concluded

Species	common name
Laportea canadensis	**wood nettle**
Lindera benzoin	**spicebush**
Lirodendron tulipifera	**tulip poplar**
Osmorhiza claytonii	**sweet cicely**
Parthenocissus quinquefolia	**Virginia creeper**
Phlox divaricata	**blue phlox**
Platanus occidentalis	**sycamore**
Podophyllum peltatum	**Mayapple**
Polygonum virginianum	**Virginia knotweed**
Sanicula gregaria	**common snakeroot**
Tilia americana	**basswood**
Acer negundo	box elder
Allium canadense	wild garlic
Allium tricoccum	ramps
Aristolochia serpentaria	birthwort
Carex emoryi	sedge
Carex hirtifolia	sedge
Carex prasina	sedge
Cinna arundinacea	stout wood reed
Cystopteris protrusa	fragile fern
Dicentra cucullaria	Dutchman's-breeches
Diospyros virginiana	persimmon
Eupatorium rugosum	white snakeroot
Festuca obtusa	nodding fescue
Fraxinus pennsylvanica	green ash
Geranium maculatum	wild geranium
Juglans nigra	walnut
Lilium michiganense	Michigan lily
Mertensia virginica	bluebells
Onoclea sensibilis	sensitive fern
Poa sylvestris	woodland bluegrass
Quercus mulhenbergii	yellow chestnut oak
Quercus alba	white oak
Quercus rubra	red oak
Sassafras albidum	sassafras
Solidago flexicaulis	broadleaf goldenrod
Staphylea trifolia	bladdernut
Ulmus americana	American elm
Ulmus rubra	slippery elm
Uvularia grandifolia	bellwort
Valeriana pauciflora	pink valerian
Verbesina alternifolia	wing stem
Viola pubescens	yellow violet

Dry-mesic upland forest

This community is scattered throughout the area, mostly on west- to south-facing slopes and on level uplands. The dominant tree species include *Carya ovata* (shagbark hickory), *Quercus alba* (white oak), and *Quercus velutina* (black oak). The shrub layer is relatively sparse, but contains individuals of *Cornus florida* (flowering dogwood), *Ostrya virginiana* (hop hornbeam), and *Sassafras albidum* (sassafras). The herbaceous layer is dominated by open woodland species including *Carex pensylvanica* (Penn sedge), *Galium concinnum* (shining bedstraw), and *Prenanthes alba* (lions foot). Tract 3 in the southern half of Forest Site 5 and Tract 6 in the northern section of Forest Site 13 are unique in herbaceous layer composition. These two areas have a flora that is similar to forests that occur on dry or shallow soils. *Danthonia spicata* (curly grass) and *Carex pensylvanica* (Penn sedge) are the dominant herbaceous cover. Other species include *Aureolaria flava* (smooth false foxglove), *Eupatorium sessilifolium* (upland boneset), and *Silene stellata* (starry campion. It is uncertain if this is the effect of past disturbance such as fire, grazing, or some other human activity. The soils are consistent with the other dry-mesic

forests which are mapped as either Xenia or Strawn series. The 1936 aerial photograph (Figure 1.3) shows these sites as forested; however, Forest Site 13 in Tract 6 may have been grazed at that time.

Table 2.3 Species commonly found in dry-mesic upland forests
(**Bold** = species encountered most frequently)

Species	common name
Agrostis perennans	**hair grass**
Anemone virginiana	**tall anemone**
Antennaria plantaginifolia	**pussy-toes**
Aureolaria flava	**smooth false foxglove**
Cacalia atriplicifolia	**pale Indian plantain**
Carex pensylvanica	**sedge**
Carex rosea	**sedge**
Carya ovata	**shagbark hickory**
Carya tomentosa	**mockernut hickory**
Cornus florida	**flowering dogwood**
Danthonia spicata	**curly grass**
Elymus villosus	**hairy wild rye**
Eupatorium rugosum	**white snakeroot**
Galium concinnum	**shining bedstraw**
Juglans nigra	**walnut**
Liparis liliifolia	**large twayblade**
Ostrya virginiana	**hop hornbeam**
Parthenocissus quinquefolia	**Virginia creeper**
Phegopteris hexagonoptera	**broad beech fern**
Prenanthes alba	**lion's foot**
Prunus serotina	**black cherry**
Quercus alba	**white oak**
Quercus imbricaria	**shingle oak**
Quercus rubra	**red oak**
Quercus velutina	**black oak**
Sassafras albidum	**sassafras**
Solidago caesia	**bluestem goldenrod**
Solidago nemoralis	**dyersweed**
Tradescantia virginiana	**spiderwort**
Acer saccharum	sugar maple
Agalinis tenuifolia	slender false foxglove
Agrimonia rostellata	woodland agrinmony
Amelanchier arborea	june berry
Arabis laevigata	smooth rock cress
Asimina triloba	paw paw
Aster shortii	Short's aster
Athyrium angustum	lady fern
Botrychium dissectum var. *dissectum*	bronze fern
Botrychium dissectum var *olbiquum*	bronze fern
Botrychium virginianum	rattlesnake fern
Carex communis	sedge
Carex hirtifolia	sedge
Carpinus caroliniana	blue beech
Cercis canadensis	red bud
Collinsonia canadensis	horsebalm
Corallorhiza odontorhiza	fall coral-root orchid
Cynoglossum virginianum	wild comfrey
Desmodium glutinosum	beggar's lice
Eupatorium altissimum	tall boneset
Eupatorium sessilifolium	upland boneset

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Table 2.3 concluded

Species	common name
Eupatorium altissimum	tall boneset
Eupatorium sessilifolium	upland boneset
Fraxinus americanus	white ash
Galium circaezans	bedstraw
Geranium maculatum	wild geranium
Hieracium scabrum	hairy hawkweed
Lirodendron tulipifera	tulip poplar
Osmorhiza claytonii	sweet cicely
Panicum acuminatum	panic grass
Panicum latifolium	panic grass
Phryma leptostachya	lopseed
Poa compressa	Canadian bluegrass
Podophyllum peltatum	Mayapple
Polystichum acrostichoides	Christmas fern
Potentila simplex	cinguefoil
Quercus falcata	southern red oak
Rosa multiflora	multiflora rose
Rubus allegheniensis	wild blackberry
Sanicula gregaria	common snakeroot
Scutellaria ovata	heart-leaved skullcap
Solidago juncea	early goldenrod
Solidago ulmifolia	elm-leaved goldenrod
Thalictrum dioicum	early meadow rue
Veratrum woodii	false hellebore
Vulpia octoflora	six-week fescue

Floodplain forest

The floodplain forest occurs along the Little Vermilion River. The dominant tree species include *Acer saccharinum* (silver maple), *Platanus occidentalis* (sycamore), *Aesculus glabra* (Ohio buckeye), and *Populus deltoides* (cottonwood). Many areas of floodplain forest have a diverse spring flora similar to the mesic upland ravines. Common species include *Asarum canadense* (wild ginger), *Mertensia virginica* (bluebells), and *Cardamine douglassii* (bitter cress).

Table 2.4 Species commonly found in floodplain forests
(**Bold** = species encountered most frequently)

Species	common name
Acer saccharinum	**silver maple**
Aesculus glabra	**Ohio buckeye**
Asarum canadense	**wild ginger**
Aster simplex	**aster**
Celtis occidentalis	**hackberry**
Cinna arundinacea	**stout wood reed**
Elymus virginicus	**wild rye**
Eupatorium coelestinum	**blue boneset**
Laportea canadensis	**wood nettle**
Mertensia virginica	**bluebells**
Pilea pumila	**clearweed**
Platanus occidentalis	**sycamore**
Polgonum cespitosum	**creeping knotweed**
Polygonum virginianum	**Virginia knotweed**
Populus deltoides	**cottonwood**
Rudbeckia laciniata	**goldenglow**
Verbesina alternifolia	**wing stem**
Zizia aurea	**golden Alexanders**

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Species	common name
Acalypha deamii	large-seeded mercury
Aster cordifolius	blue-wood atser
Aster lateriforus	side-flowered aster
Cryptotaenia canadensis	honewort
Fraxinus americanus	white ash
Juglans nigra	walnut
Leersia virginica	white grass
Lycopus virginicus	bugle weed
Maclura pomifera	Osage orange
Phlox paniculata	garden phlox
Polemonium reptans	Jacob's ladder
Polygonum punctatum	smartweed
Ptelea trifoliata	wafer ash
Quercus macrocarpa	bur oak
Salix nigra	balck willow
Samolus valerandii	brookweed
Sanicula gregaria	common snakeroot
Silphium perfoliatum	cup plant
Staphylea trifolia	bladdernut
Ulmus americana	American elm
Viola sororia	woolly blue violet
Viola striata	common white violet

Upland successional field habitat

These areas are floristically similar to abandoned southern Illinois old fields. Many are dominated by early successional woody species such as *Crataegus mollis* (hawthorn), *Cornus florida* (flowering dogwood), and *Sassafras albidum* (sassafras). Although these areas lack typical prairie vegetation, species composition suggests that they may have been adjacent to more dry open forest communities and were colonized when they were abandoned. These species include *Cacalia atriplicifolia* (Indian plantain), *Danthonia spicata* (curly grass), *Pycnanthemum pilosum* (hairy mountain mint), and *Solidago nemoralis* (dyersweed). Many moist swale areas are dominated by *Lycopodium digitatum* (ground pine), a plant that does well in disturbed old field habitat in southeastern Illinois.

Table 2.5 Species commonly found in upland successional fields
(**Bold** = species encountered most frequently)

Species	common name
Andropogon virginicus	**broom sedge**
Cacalia atriplicifolia	**pale Indian plantain**
Cornus florida	**flowering dogwood**
Crataegus mollis	**hawthorn**
Danthonia spicata	**curly grass**
Lirodendron tulipifera	**tulip poplar**
Lycopodium digitatum	**ground pine**
Pycnanthemum pilosum	**hairy mountain mint**
Quercus imbricaria	**shingle oak**
Sassafras albidum	**sassafras**
Solidago nemoralis	**dyersweed**
Acer saccharum	sugar maple
Daucus carota	wild carrot
Diospyros virginiana	persimmon
Euthamia graminifolia	grassleaf goldenrod
Fraxinus americana	white ash
Leucanthemum vulgare	ox-eye daisy
Populus grandidentata	big-tooth aspen

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Species	common name
Prunus serotina	black cherry
Rosa multiflora	multiflora rose
Rosa setigera	prairie rose
Rudbeckia triloba	brown-eyed Susan
Sassafras albidum	sassafras
Solidago juncea	early goldenrod
Spiranthes cernua	ladies' tresses
Vernonia fasciculata	common ironweed

Lowland successional field habitat

The bottomland fields adjacent to the Little Vermilion River are dominated by plants of wet-mesic floodplain and floodplain terrace habitats. Herbaceous species include *Rudbeckia laciniata* (goldenglow), *Verbensina alternifolia* (wing stem), and *Vernonia fasciculata* (ironweed). Typical early successional floodplain tree species include *Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (sycamore), *Populus deltoides* (cottonwood), and *Salix nigra* (black willow). One field has a more diverse flora than the others. It occurs on the eastern edge of Forest Site 3-1 in Tract 3. This area was not surveyed intensively during the spring so the sedge flora was not identified. A large population of *Gentiana andrewsii* (bottle gentian) occurs throughout the field adjacent to the road. Some species of gentians are excellent indicators of a specific habitat. *Gentiana puberulenta* (downy gentian) is a indicator of dry prairie habitats and *Gentiana alba* (cream gentian) is sometimes a good indicator of a potential savanna remnant. Bottle gentian, in my experience, usually grows in wet mid-successional habitats: prairies, open meadows, and wetland borders with low to medium competition. This field has a few species that occur in both prairies and woodland borders; these include *Aster novae-angliae* (New England aster) and *Zizia aurea* (golden Alexanders). Although no prairie grasses occur in this field, other fire-adapted plant species may respond favorably to a controlled burn.

Table 2.6 Species commonly found in bottomland successional fields
(**Bold** = species encountered most frequently)

Species	common name
Gentiana andrewsii	**bottle gentian (local)**
Heliopsis helianthoides	**false sunflower**
Elymus virginicus	**wild rye**
Fraxinus pennsylvanica	**green ash**
Platanus occidentalis	**sycamore**
Populus deltoides	**cottonwood**
Rudbeckia laciniata	**goldenglow**
Verbesina alternifolia	**wing stem**
Vernonia fasciculata	**common ironweed**
Zizia aurea	**golden Alexanders**
Acalypha deamii	large-seeded mercury
Acer saccharinum	silver maple
Aesculus glabra	Ohio buckeye
Aster cordifolius	bluewood atser
Aster lateriforus	side-flowered aster
Aster novae-angliae	New England aster
Aster simplex	panicled aster
Celtis occidentalis	hackberry
Cinna arundinacea	stout wood reed
Cryptotaenia canadensis	honewort
Eupatorium coelestinum	blue boneset
Euthamia graminifolia	grassleaf goldenrod
Fraxinus americanus	white ash
Juglans nigra	walnut

Table 2.6 concluded on next page

Table 2.6 concluded

Species	common name
Laportea canadensis	wood nettle
Leersia virginica	white grass
Lirodendron tulipifera	tulip poplar
Phlox paniculata	garden phlox
Polgonum cespitosum	creeping knotweed
Polygonum virginianum	Virginia knotweed
Quercus macrocarpa	bur oak
Rudbeckia triloba	brown-eyed Susan
Salix nigra	black willow
Silphium perfoliatum	cup plant

Seeps

Seeps are scattered throughout the upland forest slopes and the mesic forest ravines. They are typically low in species diversity. Some of the seeps may have resulted from mining during the early part of this century, which exposed the water table along the slopes.

Table 2.7 Species commonly found in seeps
(**Bold** = species encountered most frequently)

Species	common name
Carex emoryi	**sedge**
Carex prasina	**sedge**
***Carex* sp.**	**sedge**
Collinsonia canadensis	**horsebalm**
Cryptotaenia canadensis	**honewort**
Impatiens capensis	**jewelweed**
Laportea canadensis	**wood nettle**
Leersia virginica	**white grass**
Lobelia siphilitica	**great lobelia**
Caltha palustris	marsh marigold
Cinna arundinacea	stout wood reed
Eupatorium rugosum	white snakeroot
Pilea pumila	clearweed
Polygonum punctatum	dotted smartweed
Sanicula gregaria	common snakeroot
Verbesina alternifolia	wing stem

Disturbed successional forest

These forests were disturbed during the mining and agricultural practices 70+ years ago. Their species composition varies greatly depending on slope, aspect, and underlying substrate. They are relatively free of exotic vegetation, probably because they were recolonized before many exotics were introduced into the area. Except for the obvious physical alterations, they resemble the surrounding forests with regard to species composition.

Population Ecology of Endangered and Threatened Species

Table 2.8 Populations of endangered, threatened, and watch-list species

Species	Common Name	Illinois Status	Total Populations *
Acalypha deamii (Weath.) Ahles	large-seeded mercury	threatened	4
Carex communis Bailey	sedge	endangered	22
Carex laxiculmis Schwein.	sedge	threatened	20
Carex prasina Wahlenb.	sedge	endangered	5
Cypripedium pubescens Willd.	yellow lady's slipper	watch list	2
Juglans cinerea L.	butternut	watch list	1
Veratrum woodii Robbins	false hellebore	threatened	4

* refers to concentrations of plants: Single individuals of *Carex communis* and *Carex laxiculmis* were found scattered throughout. They were only included on the map if there were 3 or more plants in a given area.

1. Population ecology of *Carex laxiculmis* Schwein. sedge

Total population at LVRSNA in 1996 estimaterd at 1,000+ individual clumps

Carex laxiculmis is probably the most unrestricted "rare" species with regard to habitat requirements at LVRSNA. Although it is predominantly found on upland mesic forest slopes dominated by *Acer saccharum* (sugar maple), *Quercus rubra* (red oak), and *Cystopteris protrusa* (fragile fern), it is also found in dry-mesic forest tracts and occasionally in young successional forest habitat as well. This species occurs in dense small colonies of 10 - 30 individuals along forest slopes. It reaches its greatest density in Forest Sites 1 and 6. Large colonies are scattered throughout, with an estimated size of over 100 individuals in some colonies. In Forest Site 6 the population occurs throughout the forest ravine adjacent to the creek.

Table 2.9 List of species associated with *Carex laxiculmis* at LVRSNA.

		(total number of populations)																			
Associate	common name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Acer saccharum	sugar maple	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲				
Quercus rubra	red oak	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲							
Cystopteris protrusa	fragile fern	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲										
Sanicula gregaria	common snakeroot	▲	▲	▲	▲	▲	▲	▲	▲												
Arisaema triphyllum	Jack-in-the-pulpit	▲	▲	▲	▲	▲	▲	▲													
Cornus florida	flowering dogwood	▲	▲	▲	▲	▲	▲	▲													
Festuca obtusa	nodding fescue	▲	▲	▲	▲	▲	▲	▲													
Polystichum acrostichoides	Christmas fern	▲	▲	▲	▲	▲	▲	▲													
Solidago caesia	bluestem goldenrod	▲	▲	▲	▲	▲	▲	▲													
Carex communis	sedge	▲	▲	▲	▲	▲	▲														
Parthenocissus quinquefolia	Virginia creeper	▲	▲	▲	▲	▲	▲														
Polygonum virginianum	Virginia knotweed	▲	▲	▲	▲	▲	▲														
Prenanthes alba	lion's foot	▲	▲	▲	▲	▲	▲														
Asarum canadense	wild ginger	▲	▲	▲	▲	▲															
Carya cordiformis	bitternut hickory	▲	▲	▲	▲	▲															
Quercus alba	white oak	▲	▲	▲	▲	▲															
Aesculus glabra	Ohio buckeye	▲	▲	▲	▲																
Carex careyana	sedge	▲	▲	▲	▲																
Eupatorium rugosum	white snakeroot	▲	▲	▲	▲																
Fagus grandifolia	beech	▲	▲	▲	▲																
Geranium maculatum	wild geranium	▲	▲	▲	▲																
Lindera benzoin	spicebush	▲	▲	▲	▲																
Podophyllum peltatum	Mayapple	▲	▲	▲	▲																
Viola pubescens	yellow violet	▲	▲	▲	▲																
Asimina triloba	paw paw	▲	▲	▲																	
Bromus pubescens	Canada brome grass	▲	▲	▲																	
Carex pensylvanica	sedge	▲	▲	▲																	
Carpinus caroliniana	blue beech	▲	▲	▲																	
Collinsonia canadensis	horsebalm	▲	▲	▲																	
Elymus virginicus	wild rye	▲	▲	▲																	
Eupatorium purpureum	Joe-pye weed	▲	▲	▲																	
Fraxinus pennsylvanica	green ash	▲	▲	▲																	
Silene stellata	starry campion	▲	▲	▲																	
Silene virginica	firepink	▲	▲	▲																	
Tilia americana	basswood	▲	▲	▲																	
Carya ovata	shagbark hickory	▲	▲																		
Circaea lutetiana	enchanter's nightshade	▲	▲																		
Cryptotaenia canadensis	honewort	▲	▲																		
Fraxinus americanus	white ash	▲	▲																		
Galium aparine	annual bedstraw	▲	▲																		

Table 2.9 concluded on next page

Table 2.9 (concluded)

Associate	common name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Galium circaezans	bedstraw	▲	▲																		
Hepatica nobilis var. *acuta*	sharp-lobed hepatica	▲	▲																		
Hybanthus concolor	green violet	▲	▲																		
Laportea canadensis	wood nettle	▲	▲																		
Osmorhiza claytonii	sweet cicely	▲	▲																		
Phlox divaricata	blue phlox	▲	▲																		
Poa sylvestris	woodland bluegrass	▲	▲																		
Rosa multiflora	multiflora rose	▲	▲																		
Sassafras albidum	sassafras	▲	▲																		
Smilacina racemosa	false Solomon's seal	▲	▲																		
Toxicodendron radicans	poison ivy	▲	▲																		
Tradescantia subaspera	spiderwort	▲	▲																		
Veratrum woodii	false hellebore	▲	▲																		
Actaea pachypoda	doll's-eyes	▲																			
Adiantum pedatum	maidenhair fern	▲																			
Allium tricoccum	wild ramp	▲																			
Carex albursina	sedge	▲																			
Carex blanda	sedge	▲																			
Carex hirtifolia	sedge	▲																			
Hydrophyllum appendiculatum	great waterleaf	▲																			
Hydrophyllum virginianum	Virginia waterleaf	▲																			
Impatiens capensis	jewelweed	▲																			
Lirodendron tulipifera	tulip poplar	▲																			
Luzula multiflora	common woodrush	▲																			
Oxalis stricta	yellow wood sorrel	▲																			
Phegopteris hexogonoptera	broad beech fern	▲																			
Platanus occidentalis	sycamore	▲																			
Polymnia canadense	leafcup	▲																			
Prunus serotina	black cherry	▲																			
Ribes missouriense	gooseberry	▲																			
Sanguinaria canadensis	bloodroot	▲																			
Solidago ulmifolia	elm-leaved goldenrod	▲																			
Ulmus americana	American elm	▲																			

2. Population ecology of *Carex communis* Bailey sedge

Total population at LVRSNA in 1996 estimated at 530 - 560 individual clumps

Although there is an abundance of *Carex communis* at LVRSNA, it is much more restrictive in its habitat requirements than *Carex laxiculmis*. It usually occurs on steep northwest-to northeast-facing slopes. These slopes tend to have a microclimate that is generally cooler due to decreased solar radiation and higher moisture levels in the soils. In these habitats it is usually found at the crest of the slope and along the steep mesic ravines. Where *C. laxiculmis* is associated with *C. communis* it is usually found at the bottom of the slope in the ravine. The plant associates that occur in the majority of the *C. communis* populations are typical of eastern beech-maple forests. They include the following: *Acer saccharum* (sugar maple), *Fagus grandifolia* (beech), *Polystichum acrostichoides* (Christmas fern), *Quercus rubra* (red oak) and *Solidago caesia* (bluestem goldenrod) (Table 2.10). *C. communis* is well distributed throughout LVRSNA; however the largest populations occur in beech-maple forests in sites 1, 8, and 11.

Table 2.10 List of species associated with *Carex communis* at LVRSNA

(total number of populations)

Associates	common name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Acer saccharum	sugar maple	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲				
Polystichum acrostichoides	Christmas fern	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲						
Fagus grandifolia	beech	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲										
Quercus rubra	red oak	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲											
Solidago caesia	bluestem goldenrod	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲											
Carex pensylvanica	sedge	▲	▲	▲	▲	▲	▲	▲	▲	▲													
Parthenocissus quinquefolia	Virginia creeper	▲	▲	▲	▲	▲	▲	▲	▲	▲													
Prenanthes alba	lion's foot	▲	▲	▲	▲	▲	▲	▲															
Carex laxiculmis	sedge	▲	▲	▲	▲	▲	▲																
Carya ovata	shagbark hickory	▲	▲	▲	▲	▲	▲																
Cornus florida	flowering dogwood	▲	▲	▲	▲	▲	▲																
Festuca obtusa	nodding fescue	▲	▲	▲	▲	▲	▲																
Sanicula gregaria	common snakeroot	▲	▲	▲	▲	▲	▲																
Asarum canadense	wild ginger	▲	▲	▲	▲	▲																	
Carex rosea	sedge	▲	▲	▲	▲	▲																	
Cystopteris protrusa	fragile fern	▲	▲	▲	▲	▲																	
Hepatica nobilis var. *acuta*	sharp-lobed hepatica	▲	▲	▲	▲	▲																	
Bromus pubescens	Canada brome grass	▲	▲	▲	▲																		
Carex albursina	sedge	▲	▲	▲	▲																		
Eupatorium rugosum	white snakeroot	▲	▲	▲	▲																		
Aralia racemosa	American spikenard	▲	▲	▲																			
Carya cordiformis	bitternut hickory	▲	▲	▲																			
Collinsonia canadensis	horsebalm	▲	▲	▲																			
Fraxinus americanus	white ash	▲	▲	▲																			
Fraxinus pennsylvanica	green ash	▲	▲	▲																			
Laportea canadensis	wood nettle	▲	▲	▲																			
Lindera benzoin	spicebush	▲	▲	▲																			
Osmorhiza claytonii	sweet cicely	▲	▲	▲																			
Podophyllum peltatum	Mayapple	▲	▲	▲																			
Quercus alba	white oak	▲	▲	▲																			
Silene virginica	firepink	▲	▲	▲																			
Solidago ulmifolia	elm-leaved goldenrod	▲	▲	▲																			
Aesculus glabra	Ohio buckeye	▲	▲																				
Arisaema triphyllum	Jack-in-the-pulpit	▲	▲																				
Cryptotaenia canadensis	honewort	▲	▲																				
Elymus villosus	hairy wild rye	▲	▲																				
Galium triflorum	sweet-scented bedstraw	▲	▲																				
Hydrangea arborescens	wild hydrangea	▲	▲																				
Hydrophyllum virginianum	Virginia waterleaf	▲	▲																				
Luzula multiflora	common woodrush	▲	▲																				
Ostrya virginiana	hop hornbeam	▲	▲																				
Phlox divaricata	blue phlox	▲	▲																				
Poa sylvestris	woodland bluegrass	▲	▲																				
Rosa multiflora	multiflora rose	▲	▲																				
Sanguinaria canadensis	bloodroot	▲	▲																				
Silene stellata	starry campion	▲	▲																				
Sphenopholis obtusata	wedge grass	▲	▲																				
Tilia americana	basswood	▲	▲																				
Tradescantia subaspera	spiderwort	▲	▲																				
Actaea pachypoda	doll's-eyes	▲																					
Allium canadense	wild garlic	▲																					
Antennaria plantaginifolia	cat's foot	▲																					

Table 2.10 concluded on next page

Table 2.10 concluded

Associates	common name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
		(total number of populations)																					
Brachyelytrum erectum	long-awned wood grass	▲																					
Carex artitecta	sedge	▲																					
Carex blanda	sedge	▲																					
Carex careyana	sedge	▲																					
Circaea lutetiana	enchanter's nightshade	▲																					
Cypripedium pubescens	yellow lady-slipper	▲																					
Danthonia spicata	curly grass	▲																					
Euonymus obovatus	strawberry bush	▲																					
Galium aparine	annual bedstraw	▲																					
Galium circaezans	bedstraw	▲																					
Geranium maculatum	wild geranium	▲																					
Geum vernum	spring avens	▲																					
Helianthus divaricatus	woodland sunflower	▲																					
Hybanthus concolor	green violet	▲																					
Lirodendron tulipifera	tulip poplar	▲																					
Ribes missouriense	gooseberry	▲																					
Rubus allegheniensis	wild blackberry	▲																					
Sassafras albidum	sassafras	▲																					
Smilacina racemosa	false Solomon's seal	▲																					
Smilax hispida	bristly greenbrier	▲																					
Toxicodendron radicans	poison ivy	▲																					
Tradescantia virginiana	spiderwort	▲																					
Ulmus americana	American elm	▲																					
Viburnum prunifolium	black haw	▲																					
Viola pubescens	yellow violet	▲																					

3. Population ecology of *Carex prasina* Wahlenb. sedge

Total population at LVRSNA in 1996 was 20 clumps

Carex prasina is confined to seeps and springs on forested slopes and mesic ravines. The populations are usually found growing in or at the edge of the cold water flow. Associated plants include *Impatiens capensis* (jewelweed) and *Cryptotaenia canadensis* (honewort). The majority of *C. prasina* occurs in Forest Site 8 in the seeps and springs in the central ravine and in Forest Site 11 in seeps associated with a beech-maple forest. Two populations consist of only 2 clumps; these are on the hillside seeps in Forest Sites 5 and 9.

Table 2.11 List of species associated with *Carex prasina* at LVRSNA.

Associates	common name	1	2	3	4	5
		(total number of populations)				
Impatiens capensis	jewelweed	▲	▲	▲	▲	▲
Cryptotaenia canadensis	honewort	▲	▲	▲		
Acer negundo	boxelder	▲				
Acer saccharum	sugar maple	▲				
Allium canadense	wild garlic	▲				
Asarum canadense	wild ginger	▲				
Carex emoryi	sedge	▲				
Collinsonia canadensis	horsebalm	▲				
Laportea canadensis	wood nettle	▲				
Lirodendron tulipifera	tulip poplar	▲				
Onoclea sensibilis	sensitive fern	▲				
Parthenocissus quinquefolia	Virginia creeper	▲				
Poa sylvestris	woodland bluegrass	▲				

Table 2.11 concluded on next page

Table 2.11 concluded

Associates	common name	(total number of populations) 1	2	3	4	5
Polygonum virginianum	Virginia knotweed	▲				
Sanicula gregaria	common snakeroot	▲				
Solidago flexicaulis	broadleaf goldenrod	▲				
Ulmus americana	American elm	▲				
Valeriana pauciflora	pink valerian	▲				
Verbesina alternifolia	wing stem	▲				

4. Population ecology of *Veratrum woodii* Robbins false hellebore

Total population at LVRSNA in 1996 41 plants

Veratrum woodii occurs in a broad range of forested habitats at LVRSNA. Two populations are on north- and east-facing mesic slopes. One is in a dry-mesic upland forest on a west-facing slope. The Forest Site 2 population is in an area that appears to have been pasture or forest edge in 1936 (Figure 1.3) and is now an open forest with large white oaks but dominated by sugar maple in the understory layer. There were no flowering plants of *V. woodii* found during the survey. The three concentrations of *V. woodii* are in Forest Sites 2, 8, and 12.

Table 2.12 List of species associated with *Veratrum woodii* on at LVRSNA.

Associates	common name	(total number of populations) 1	2	3	4
Acer saccharum	sugar maple	▲	▲	▲	▲
Asarum canadense	wild ginger	▲	▲		
Carex laxiculmis	sedge	▲	▲		
Cornus floridana	flowering dogwood	▲	▲		
Quercus alba	white oak	▲	▲		
Quercus rubra	red oak	▲	▲		
Sanicula gregaria	common snakeroot	▲	▲		
Tradescantia virginiana	spiderwort	▲	▲		
Actaea pachypoda	doll's-eyes	▲			
Adiantum pedatum	maidenhair fern	▲			
Aesculus glabra	Ohio buckeye	▲			
Aralia racemosa	American spikenard	▲			
Carex pensylvanica	sedge	▲			
Carya cordiformis	bitternut	▲			
Cercis canadensis	red bud	▲			
Collinsonia canadensis	horsebalm	▲			
Cynoglossum virginianum	wild comfrey	▲			
Fraxinus americana	white ash	▲			
Fraxinus pensylvanica	green ash	▲			
Galium triflorum	sweet-scented bedstraw	▲			
Geranium maculatum	wild geranium	▲			
Hepatica nobilis var. *acuta*	sharp-lobed hepatica	▲			
Osmorhiza claytonii	sweet cicely	▲			
Podophyllum peltatum	Mayapple	▲			
Polygonum virginianum	Virginia knotweed	▲			
Polystichum acrostichoides	Christmas fern	▲			
Prenanthes alba	lion's foot	▲			
Prunus serotina	black cherry	▲			
Quercus velutina	black oak	▲			
Sanguinaria canadensis	bloodroot	▲			
Solidago flexicaulis	broadleaf goldenrod	▲			
Solidago ulmifolia	elm-leaved goldenrod	▲			
Tradescantia subaspera	spiderwort	▲			
Uvularia grandifolia	bellwort	▲			

5. Population ecology of *Acalypha deamii* (Weath.) Ahles large-seeded mercury
Total population at LVRSNA in 1996 was 47 individual plants

Acalypha deamii occurs in several floodplain forests at LVRSNA. This plant usually occurs in depressional swales along river courses in eastern Illinois. Based on our experience this species reaches its greatest abundance in bare water-scoured depressions and on edges of the river bank terraces. At LVRSNA, *A. deamii* is confined to the floodplain forests and areas along the Little Vermilion River. The largest population was found in the floodplain in a mown roadway that leads to the bottomland old fields in Tract 2. The rest of the floodplain in the vicinity was studied but no additional plants were found. *A. deamii* appears to need disturbance to flourish. The timely mowing may have reduced competition enough to allow for growth. The remaining populations were found in areas of disturbance such as areas scoured by floodwaters. As with other annuals, *Acalypha* seems to stay dormant for years until disturbance allows them to complete their life cycle. Because most of the floodplain habitat is relatively stable at LVRSNA, the areas where *A. deamii* can colonize in large numbers are restricted. This species probably occurs throughout the floodplain in the seed bank and the population will fluctuate depending on flooding and other disturbances. Species that were most often associated with *A. deamii* include *Acer saccharinum* (silver maple), *Cryptotaenia canadensis* (honewort), *Laportea canadensis* (wood nettle), *Leersia virginica* (white grass), and *Polygonum cespitosum* (creeping knotweed) (Table 2.13).

Table 2.13 List of species associated with *Acalypha deamii* at LVRSNA.

		(total number of populations)			
Associates	**common name**	**1**	**2**	**3**	**4**
Acer saccharinum	silver maple	▲	▲	▲	▲
Cryptotaenia canadensis	honewort	▲	▲	▲	
Laportea canadensis	wood nettle	▲	▲	▲	
Leersia virginica	cut grass	▲	▲	▲	
Polygonum cespitosum	creeping knotweed	▲	▲	▲	
Cinna arundinacea	stout wood reed	▲	▲		
Eupatorium coelestinum	blue boneset	▲	▲		
Acer negundo	boxelder	▲			
Aster lateriflorus	side-flower aster	▲			
Aster simplex	panicled aster	▲			
Celtis occidentalis	hackberry	▲			
Eupatorium rugosum	white snakeroot	▲			
Fraxinus pennsylvanica	green ash	▲			
Geum canadense	white avens	▲			
Heliopsis helianthoides	false sunflower	▲			
Lobelia siphilitica	great lobelia	▲			
Phytolacca americana	pokeweed	▲			
Pilea pumila	clearweed	▲			
Platanus occidentalis	sycamore	▲			
Polygonum punctatum	dotted knotweed	▲			
Smilax hispida	bristly greenbrier	▲			
Toxicodendron radicans	poison ivy	▲			
Ulmus americana	American elm	▲			
Verbena urticifolia	white vervain	▲			
Verbesina alternifolia	wing stem	▲			
Viola pratincola	common blue violet	▲			
Viola striata	white violet	▲			

Descriptions of Tracts 1-6 at LVRSNA
Endangered, Threatened, and Watch-listed Species and Unique Features

Table 2.14 Exceptional Natural features

Type	Site #	Tract	*E, T & WL	Other outstanding features
Mesic forest (beech-maple)	1	2	4	large stand of beech, high diversity, rare flora
Dry-mesic forest (oak-hickory)	2	2	2	several large white oaks
Mesic floodplain forest	3	2	2	high diversity of spring flora
Mesic forest	4	3	3	rich mesic ravine
Mesic to Dry- Mesic forest	5	3	9	dry-mesic and mesic slopes with high diversity
Mesic Forest	6	3	2	high diversity, several large beeches
Dry- mesic forest	7	3	1	overall high diversity
Mesic forest	8	4	9	very high species diversity, rich mesic ravine
Dry- mesic forest	9	4	5	high species diversity, well developed canopy
Dry-mesic forest	10	5	6	relatively young but diverse dry -mesic forest
Mesic forest	11	5	7	large stand of beech, several seep areas, rare flora
Mesic forest	12	6	3	beeches present, diverse steep forest slopes
Dry-mesic forest	13	6	1	dry forest with a high diversity

* refers to the number of endangered, threatened or watch-listed populations in each area

Tract 1

Carex laxiculmis	sedge	1 population

Of the six tracts at LVRSNA, the forests in Tract 1 are the most disturbed. Close to the Little Vermilion River the east- and north-facing slopes and the mesic ravine are more floristically diverse. Further up the valley however there is more disturbance. Many of the slopes are badly eroded and there are several stands of even-aged trees indicating logging or other past disturbances. Gravel mining has occurred to the east of the valley and has greatly altered forest structure. Many areas are exclusively dominated by sugar maple with low diversity in both the shrub and herbaceous layers. Along the railroad bed there are several disturbance-tolerant prairie and open woodland species, but no intact prairie community remains. Prairie species that occur along the railroad include *Aster novae-angliae* (New England aster), *Heliopsis helianthoides* (false sunflower), *Penstemon digitalis* (foxglove beardtongue), *Pycnanthemum pilosum* (hairy mountain mint), and *Ratibida pinnata* (yellow coneflower).

Tract 2

Upland mesic forest and mesic ravine #1

Carex laxiculmis	sedge	2 populations
Carex communis	sedge	1 population
Carex prasina	sedge	1 population
Conopholis americana	cancer-root	uncommon plant in Illinois of mature oak forests

Forest Site 1 has one of the highest diversities and densities of spring flora in the area. Compared to the other level upland forests it differs in canopy composition and density of spring ephemerals. The majority of the level upland forests at LVRSNA are dry-mesic upland forests, with white oak, black oak, and shagbark hickory dominant. In Forest Site 1, however red oak, beech, and sugar maple are the major components in the overstory. One of the best stands of beech occurs on the forest's southeast-facing slope

Dry-mesic forest # 2

Carex communis	sedge	1 population
Carex laxiculmis	sedge	1 population
Veratrum woodii	false hellebore	1 population

Forest Site 2 appears to be a recently developed forest. The 1936 aerial photograph (Figure 1.3) shows the area as a field or pasture and the 1983 aerial photograph (Figure 1.4) shows the forest was still open in the center. This may explain the few very large white oaks scattered throughout and an understory totally dominated by sugar maple. Most of the large white oaks are on the eastern side which appears to be partially forested in the 1936 aerial. *Veratrum woodii* is also on the eastern side.

Mesic floodplain forest #3

Acalypha deamii	large-seeded mercury	2 populations

Forest Site 3 is a large floodplain forest along the railroad bridge; eastward it becomes a narrow strip bordered by abandoned old fields. Most of this area appears to have been recently colonized by woody vegetation. The area adjacent to the bridge has a diverse spring flora similar in composition to the mesic forest ravines.

Tract 3

Floodplain forest #3-1

Acalypha deamii	large-seeded mercury	1 population

Floodplain forest #3-1 is a continuation from Tract 2 with similar species composition except that silver maple is more dominant throughout the area.

Mesic upland forest #4

Carex communis	sedge	3 populations

This forest has several populations of *C. communis* along the mesic forest slope. It also has two seep areas, one along the forest slope and the other at the valley along the border of Tract 2.

Mesic to dry- mesic forest #5

Carex communis	sedge	5 populations
Carex laxiculmis	sedge	3 populations
Carex prasina	sedge	1 population

Forest Site 5 occurs along an old mine bank area just east of the river. Although heavily disturbed along the top of the ridges, as well as in the man-made valley parallel to the river, the mesic ravines are still intact. Several large beeches occur along the slopes; however they never form forested stands as in other areas. These areas appear to have been forested at least as far back as 1936 (Figure 1.3). Many of the areas are extremely steep and have large populations of *C. communis* along northwest- and west-facing slopes. Several small seeps occur along these drainages. The west-facing slope is dry-mesic forest with an open canopy of white oak, black oak, and shagbark hickory.

Mesic Forest #6

Carex laxiculmis	sedge	2 populations

This is a large mature mesic forest and ravine with a well-developed canopy. A large stand of beech occurs along a northwest-facing slope adjacent to the powerlines. One small seep occurs in the mesic ravine.

Dry- mesic forest #7

Carex laxiculmis	sedge	1 population
Quercus falcata	Spanish oak	This species was not known from the Vermilion River Section of the Wabash Border Division.

This forest is a typical dry-mesic upland forest. *Quercus falcata* (Spanish oak) occurs in the center of the forest. The closest Illinois county in which Spanish oak occurs is Richland County (Mohlenbrock 1987). In Indiana this species occurs only in a two-county-wide belt along the Ohio River and up the Wabash drainage to Knox County (Deam 1940). This is a range extension of approximately 128 kilometers from the nearest known populations.

Tract 4

Mesic forest # 8

Carex communis	sedge	5 populations
Carex laxiculmis	sedge	2 populations
Carex prasina	sedge	1 population
Cypripedium pubescens	yellow lady-slipper	1 population
Veratrum woodii	false hellebore	1 population
Valeriana pauciflora	pink valerian	an uncommon plant of mesic ravines in southern and eastern Illinois

Forest Site 8 consists of north-facing slopes and ravines at the northern edge of Tract 4 as well as the ravine in the center of Forest Site 9. A smaller ravine at the southern property boundary was not included. It had more disturbance that the other ravines but did contain one population each of *C.*

communis, C. laxiculmis, and *C. prasina*. These slopes have a high diversity in the herbaceous layer and several mature stands of beech. The most diverse seep at LVRSNA is located at the head of a small ravine in the northern section of Site 8.

Dry-mesic forest # 9

Carex laxiculmis	sedge	4 populations
Veratrum woodii	false hellebore	1 population

Site 9 is a large dry-mesic forest dominated by white oak. On the west-facing slopes the shrub layer is open with flowering dogwood as the most common shrub. *Carex pensylvanica* (Penn sedge) was the dominant in the herbaceous layer. Other dry forest plants included *Cynoglossum virginianum* (wild comfrey), *Silene stellata* (starry campion), and *Tradescantia virginiana* (spiderwort). It appears that both Site 8 and Site 9 have been relatively undisturbed at least since 1936 (Figure 1.3). The aerial photograph indicates that the forest was relatively mature at that time. Sites 8 and 9 together comprise the largest and most diverse forested areas at LVRSNA.

Tract 5

Dry-mesic forest # 10

Carex laxiculmis	sedge	3 populations
Carex communis	sedge	3 populations

Forest Site 10 has several disturbances including some early mining activity, several dumping areas, and roads. Most of this forest was apparently pastured in the 1930's with a few areas of mature trees. Most of the forest is mature growth down to the river's edge with remnants of old fields still present in the western half next to the fence.

Mesic-forest # 11

Carex communis	sedge	2 populations
Carex laxiculmis	sedge	2 populations
Carex prasina	sedge	1 population
Cypripedium pubescens	yellow lady-slipper	1 population
Juglans cinera	butternut	1 population
Epifagus virginiana	beech-drops	a rare plant in Illinois of mature beech forests

This small forested area has one of the best-developed beech-maple forests at LVRSNA. Some of the beech are on the grazed pasture side of the fence. There are two seeps adjacent to the creek.

Tract 6

Mesic upland forest # 12

Carex communis	sedge	1 population
Carex laxiculmis	sedge	1 population
Veratrum woodii	false hellebore	1 population
Jeffersonia diphylla	twinleaf	an uncommon plant in Illinois of mesic forests

The majority of Tract 6 is agricultural cropfields except for the forest along the east bank of the Little Vermilion River and a large tract area in southwestern corner. The slopes have beech scattered along the slope but not to the extent that occurs in Tracts 2, 3, 4 and 5 on the west side of the river. The slopes have high diversity in the herbaceous layer.

Dry-mesic upland #13

Eupatorium sessilifolium	upland boneset	an uncommon plant of dry upland forest habitat

No endangered or threatened species occur in Site 13 but this is one of the most diverse dry-mesic forests a LVRSNA. It also acts as a buffer to disturbance from the surrounding agricultural fields.

SUMMARY AND RECOMMENDATIONS

There are several high-quality forested areas at LVRSNA. The highest densities of rare flora occur in Forest Sites 5, 8, 9, and 11. Forests with the least disturbance include Tract 2, Tract 4, Forest Site 11 in Tract 5, and Forest Sites 12 and 13 in Tract 6. Tract 2 and Tract 4 had the best overall diversity of forested tracts at LVRSNA. Trees of several age classes occur throughout the canopy and understory layers, a good indication of low disturbance. They also have a low number of thorny and exotic species throughout the area which usually indicates absence of past grazing.

Fire probably was never a common occurrence in the forests in the area due to the position of the river which would have protected the forests on the western side from frequent fire. Prairie species occur in small numbers but are confined along the railroad right-of-way. These could have migrated into the area from prairie remnants during the time the line was active. The presettlement land records indicate that the area between the Little Vermilion River and Forest Glen on the Vermilion River (4.8 km to the north) was primarily oak-hickory upland forest (pers. comm. Bob Szafoni 1996). Several dry-mesic forests in the area do have a species composition that indicates that fire may have occurred sporadically in the past and these areas may respond favorably to controlled burning. This is especially true in the areas where sugar maple is becoming the dominant species in the understory. This is very evident in Tract 3 along the border of the large old field where large even-age stands exist in several areas. This may be the effect of both past logging practices and fire suppression. In addition to the dry-mesic upland forested areas, upland and bottomland old field habitats could benefit from controlled burning depending on the management goals for the site.

Several exotic species occur at LVRSNA, but at present time they are confined to small isolated areas. Most common are *Lonicera japonica* (Japanese honeysuckle), *Rosa multiflora* (multiflora rose), *and Ornithogalum umbellatum* (star-of-Bethlehem). Japanese honeysuckle occurs along the road leading to the upland field in Tract 3 and along the road just past the gate entrance. Multiflora rose is scattered in old field habitats but is not a problem at the present time. Star-of-Bethlehem occurs in disturbed forests in Tract 3 and mined areas throughout the LVRSNA

LITERATURE CITED

Deam, C.C. 1940. Flora of Indiana. Indiana Department of Conservation. Division of Forestry. Indianapolis. 1236 pp.

Herkert J.R. editor. 1991. Endangered and threatened species of Illinois: Status and distribution, Volume 1 - Plants. Illinois Species Protection Board, Springfield, Illinois. 158 p.

Illinois Endangered Species Protection Board 1994. Checklist of Endangered and Threatened Animals and Plants of Illinois, Springfield 20 pp.

Lindsey A. A. 1966. Natural features of Indiana. Indiana Academy of Science, Indiana State Library. Indianapolis. 597 pp.

Mohlenbrock, R.H. 1986. Guide to the vascular flora of Illinois. Revised and enlarged edition. Southern Illinois University Press, Carbondale. 507 pp.

Mohlenbrock, R.H. 1987. The illustrated flora of Illinois. Flowering plants Smartweeds to Hazelnuts. Southern Illinois University Press, Carbondale. 228 pp.

Schwegman, J.E. 1973. Comprehensive plan for the Illinois Nature Preserves System. Part 2. The Natural Divisions of Illinois. Illinois Nature Preserves Commission, Rockford. 32pp. + map

Natural Resources Conservation Service. 1996. Soil survey of Vermilion County, Illinois. Illinois Agricultral Experimental Station Report 141 USDA-NRCS, Washington DC 241pp.+ 132 maps

Chapter 3. A Limited Survey of the Amphibians and Reptiles of The Little Vermilion River State Natural Area, Vermilion County, Illinois

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INTRODUCTION

A parcel of land owned by the Peabody Coal Company near Humrick in Vermilion County was acquired by the Illinois Department of Natural Resources (IDNR) in 1995. The site currently is designated the Little Vermilion River State Natural Area (LVRSNA) and encompasses 423 ha, primarily upland forest and successional fields. The LVRSNA includes a stretch of the Little Vermilion River which has been classified as a grade A stream, an indication that it is considered a "unique aquatic resource" (Illinois Biological Stream Characterization Work Group 1995). In an effort to formulate the best management plan for this property, the IDNR has requested an inventory of the existing amphibian and reptile species with an emphasis on threatened and endangered species. The results of that inventory are presented in this chapter.

The approach that I have used in this study is to 1) compile a list of the amphibian and reptile species whose ranges include the Little Vermilion River State Natural Area (LVRSNA) general vicinity (=Vermilion County), 2) search for historical records of species listed as endangered, threatened, or watch list in Illinois and candidates for Federal listing from Vermilion County, and 3) conduct fieldwork designed to determine which species (with emphasis on listed species) currently inhabit the LVRSNA and to identify unusually diverse herpetological communities in the LVRSNA. Nomenclature follows Collins (1990) unless noted.

SPECIES OF THE PROJECT AREA

Table 3.1 lists the reptiles and amphibians whose ranges include Vermilion County. This information was taken from range maps or species accounts in Smith (1961), Brandon and Ballard (1991), and Conant and Collins (1991). Of the 46 species in Table 3.1, the silvery salamander and massasauga are listed as endangered and Kirtland's snake is listed as threatened in Illinois.

HABITAT REQUIREMENTS & HISTORICAL RECORDS FOR LISTED SPECIES

Historical records for the three listed species were taken from the following sources: 1) specimens from museum, university, and private collections (referred to as vouchered records, see Appendix 3.1 for a list of the collections that were searched), 2) unvouchered records from the literature, 3) unvouchered records taken from reliable biologists and naturalists, and 4) the Illinois Department of Natural Resources Natural Heritage Database (INHD).

Silvery salamander--This salamander requires fishless ponds surrounded by upland forest. Rodent burrows are also important components of the habitat. The only known population of this salamander in Illinois exists in Middle Fork Woods Nature Preserve at Kickapoo State Park, approximately 30 km northwest of LVRSNA.

Kirtland's Water Snake--Wet prairies with abundant cover are preferred, especially those that are seasonally flooded and adjacent to upland habitats. *Clonophis* also utilize crayfish burrows as shelter although they have been taken in vacant lots in some urban areas where crayfish burrows have been completely destroyed. A specimen (INHS 9161) was collected in October, 1969 near Armstrong in northwest Vermilion County, approximately 60 km northwest of LVRSNA.

Massasauga--This venomous snake prefers wet prairie areas with heavy grass cover or floodplain forest adjacent to open fields. In some parts of their range, massasaugas move from moist prairie conditions to drier habitats in the spring (Seigel 1983). Massasaugas are often found in association with crayfish burrows which they use for shelter and hibernation (Maple and Orr 1968). They may also overwinter in mammal burrows, old tree stumps, and rock crevices. No records exist for this snake in Vermilion County.

Table 3.1. Amphibians and reptiles whose ranges are included in the general project area (Vermilion County). This information was taken from range maps or species accounts in Smith (1961), Brandon and Ballard (1991), and Conant and Collins (1991).

Amphibians (n=20)	
spotted salamander	*Ambystoma maculatun*
marbled salamander	*Ambystoma opacum*
smallmouth salamander§	*Ambystoma texanum*
tiger salamander	*Ambystoma tigrinum*
silvery salamander*	*Ambystoma platineum*
two-lined salamander§	*Eurycea cirrigera*
redback salamander.	*Plethodon cinereus*
slimy salamander§	*Pletodon glutinosus*
mudpuppy	*Necturus maculosus*
American toad§	*Bufo americanus*
Fowler's toad	*Bufo woodhousii fowlerii*
cricket frog§	*Acris crepitans*
western chorus frog§	*Pseudacris triseriata*
spring peeper§	*Pseudacris crucifer*
gray treefrog complex§	*Hyla versicolor-chrysoscelis*
bullfrog§	*Rana catesbeiana*
green frog§	*Rana clamitans*
plains leopard frog	*Rana blairi*
southern leopard frog	*Rana sphenocephala* #
wood frog§	*Rana sylvatica*
Reptiles (n=26)	
snapping turtle§	*Chelydra serpentina*
common musk turtle	*Sternotherus odoratus*
eastern box turtle§	*Terrapene carolina*
painted turtle§	*Chrysemys picta*
Blanding's turtle	*Emydoidea blandingii*
slider	*Trachemys scripta*
map turtle	*Graptemys geographica*
spiny softshell turtle§	*Apalone spinifera*
slender glass lizard	*Ophisaurus attenuatus*
ringneck snake§	*Diadophus punctatus*
worm snake	*Carphophis amoenus*
eastern hognose snake§	*Heterodon platirhinos*
smooth green snake	*Opheodrys vernalis*
racer§	*Coluber constrictor*
rat snake	*Elaphe obsoleta*
fox snake	*Elaphe vulpina*
prairie king snake§	*Lampropeltis calligaster*
milk snake	*Lampropeltis triangulum*
plains garter snake	*Thamnophis radix*
common garter snake§	*Thamnophis sirtalis*
brown snake§	*Storeria dekayi*
smooth earth snake	*Virginia valeriae*
northern water snake§	*Nerodia sipedon*
Kirtland's Snake*	*Clonophis kirtlandii*
massasauga*	*Sistrurus catenatus*

*listed as endangered or threatened in Illinois # *Rana utricularia* in Collins (1990)
§ documented occurrence in LVR from the surveys in this study or historical records

FIELD SURVEYS

Methods

Field surveys for amphibians and reptiles are usually conducted in a single effort because of the similarities of the two groups. They are both secretive in their habits and being ectothermic, they are generally active under a narrower temperature range than birds and mammals. However, there are also a number of differences between amphibians and reptiles that make combined surveys very difficult. Amphibians are restricted to moist conditions because they exchange gasses through their skin and lay eggs that usually must be submerged in water. Most amphibians also have an aquatic larval stage that may last several months to a year. Reptiles, on the other hand, are less restricted by available moisture and may go weeks without direct contact with water. All these factors combine to make amphibians and reptiles one of the most difficult vertebrate groups to survey, especially in a single effort.

The LVRSNA was visited 18 times from October, 1995 to October, 1996. The following survey methods were used throughout the area except in the highly impacted areas of agricultural lands: visual encounter surveys, road collecting, frog and toad auditory surveys, dip-netting and seining aquatic habitats, aquatic turtle trapping, and binocular surveys for basking turtles. Visual encounter surveys (VES) involve searching appropriate habitat (mainly turning cover items such as logs, rocks, and miscellaneous debris) and recording all species encountered. Road collecting takes advantage of the fact that many reptile species are attracted to roads which are often warmer than the surrounding substrate. This is especially true at dusk. Amphibians and reptiles are also killed as they attempt to cross roads during seasonal migrations to breeding areas or hibernacula. Frog and toad auditory surveys were conducted during the evening hours of warm spring days when breeding choruses are most likely to occur. Aquatic habitats were dip-netted or seined during most day time visits. Turtle traps were set in ponds 8 & 9 (Fig. 3.1) for four trap-days. Binocular surveys were conducted at the Gravel Pits (ponds 6 & 7, Fig. 3.1) and along the Little Vermilion River on sunny days. Relative abundance was recorded as rare, common, or abundant. Species were placed in one of these categories based on a combination of direct counts of individuals (or a relative score when direct counts were not possible e.g. when large numbers of amphibian larvae were encountered as a result of dip netting or seining)and a rough measure of the probability of observing each species. This was done because there is a poor correlation between numbers observed and relative abundance across species of amphibians and reptiles. The resulting relative abundance score is therefore very objective. Detailed descriptions of the survey methods can be found in Heyer, et al. (1994).

Communities were considered unusually diverse if listed species were present or high species richness (number of species) was detected. Species richness was compared to the number of species that would have been found in that habitat type prior to European settlement (those in Table 3.1). If 75% or more of the presettlement species are still present, an area is considered unusually diverse.

Results

Eleven amphibian species and ten reptile species were encountered in the LVR during field surveys. Table 3.2 is a listing of the species encountered, an indication of their abundance, habitat notes, and pond associations. The pickerel frog, *Rana palustris*, was documented for the first time in Vermilion County during our surveys. This record represents a range extension for this species; the nearest previously documented record is from Parke County, Indiana, approximately 50 km east of the LVRSNA.

Table 2.1. Amphibians and Reptiles Observed at the Little Vermilion River Site, 1995-6.

Common Name	Genus Species	Habitat Associations	Abundance	Tract No.	Comments
smallmouth salamander	*Ambystoma texanum*	floodplain forests, old fields	Abundant	all	found in all ponds except gravel pits
southern two-lined salamander	*Euryceacirrigera*	clear creeks and streams	Abundant	all	found in the LVR, and all tributaries
redbacksalamander	*Plethodon cinereus*	upland forests	Common	4,5,6	
slimy salamander	*Plethodon glutinosus*	upland forests	Common	3,4,5,6	
eastern American toad	*Bufo americanus*	ubiquitous	Abundant	all	
Blanchard's cricket frog	*Acris crepitans*	along pond shores, LVR & tributaries	Abundant	all	
gray treefrog complex	*Hyla versicolor-chrysoscelis*	ubiquitous	Common	all	heard calling throughout area
spring peeper	*Pseudacriscrucifer*	upland forests	Common	1,2	
western chorus frog	*Pseudacristriseriata*	ubiquitous	Common	all	found in all ponds except gravel pits
bullfrog	*Ranacatesbeiana*	all aquatic habitats	Common	all	
green frog	*Rana clamitans*	all aquatic habitats	Common	all	
pickerel frog	*Rana palustris*	seeps,wet meadows, and clear streams	Rare	6	
wood frog	*Rana sylvatica*	upland forest	Common	all	found in all ponds except gravel pits
snapping turtle	*Chelydraserpentina*	all aquatic habitats	Common	2,3	found in ponds # 1 & 10
painted turtle	*Chrysemys picta*	all aquatic habitats	Common	3	found in ponds # 10 & 11
eastern box turtle	*Terrapenecarolina*	ubiquitous	Common	all	
spiny softshell	*Apalone spinifera*	large ponds and rivers	Common	1	found in gravel pit (#6)
racer	*Coluber constrictor*	upland forest, old fields	Rare	5	found in junkpile in Tract 5
ringneck snake	*Diadophis punctatus*	upland forest, old fields	Rare	5	found in junkpile in Tract 5
prairie kingsnake	*Lampropeltis calligaster*	old field	Rare	3	found dead on Mill Rd just north of Tract 3
northern water snake	*Nerodiasipedon*	all aquatic habitats	Common	5	found in pond # 14
midland brown snake	*Storeria dekayi*	upland forests, wetlands	Rare	1	found along stream next to pond # 4
eastern garter snake	*Thamnophis sirtalis*	upland forests, wetlands	Common	1	found in gravel pit (#5) & along road nearby

DISCUSSION

Table 3.1 lists 20 species of amphibians and 26 species of reptiles that could potentially inhabit the LVRSNA but only one-half of these were documented at LVRSNA during the present study. In our opinion, the following species also occur at the LVRSNA but went undetected: the marbled salamander, spotted salamander, southern leopard frog, mudpuppy, map turtle, rat snake, fox snake, and plains garter snake. These species are all common to abundant in the general vicinity of the LVRSNA and suitable habitat occurs in the study area. Possibilities for listed species are discussed below.

Listed Species

No listed species were encountered during this study. Of the three listed species that could potentially inhabit the LVRSNA (silvery salamander, Kirtland's snake, and massasauga), there is suitable habitat only for the silvery salamander. Both the massasauga and Kirtland's snake require relatively undisturbed, wet prairie which is absent from the LVRSNA.

Silvery Salamander All of the silvery salamander's habitat requirements are met at the LVRSNA but it was not encountered during the present survey. The silvery salamander is a member of the mole salamander, family Ambystomatidae. Mole salamanders inhabit small mammal burrows and runs and come to the surface only for a few weeks in late winter to breed in fishless ponds in their upland forest habitat. Adults are only at breeding ponds for a few days to weeks but larvae and eggs can be detected for up to three months.

Eggs and larvae of the silvery salamander are difficult to distinguish from those of the smallmouth salamander but adults are morphologically distinct. We sampled all of the fishless ponds at the LVRSNA, and although we caught adult smallmouth salamanders, we did not encounter adult silvery salamanders. However, we also did not encounter the spotted salamander, even though it is abundant at Kickapoo State Park in ponds almost identical to those at LVRSNA. This leads us to believe that the silvery salamander may eventually be found breeding in the small ponds at the LVRSNA.

The most complete way to survey mole salamanders is to install a drift fence with pitfall traps around their breeding ponds. We did not utilize this method because of time constraints; drift fence-pitfall traps require a considerable effort to install and they must be visited at least daily while the traps are open. We recommend that the drift fence-pitfall trap technique be used at the LVRSNA to determine if the silvery salamander occurs there. The ponds most likely to be used by this species are numbers 2, 4, 8, and 9 (Fig. 3.1) because they are surrounded by mature upland forest.

Unusually Diverse Communities

No areas within the LVRSNA are unusually diverse in the sense of having 75% of the pre-settlement species still present. However, there are two features of the property that deserve special attention.

First, the upland forests have high densities of woodland salamanders (genus *Plethodon*). The slimy salamander (*P. glutinosus*) and the redback salamander (*P. cinereus*) were found under almost every downed log in the upland forests of Tracts 4 & 6 during our spring, 1996 visits. Although both of these species can tolerate a fair amount of disturbance and can inhabit relatively young second growth forest, neither can withstand large-scale clear cutting. The abundance of these salamanders at LVRSNA indicates that the area has probably not been completely cut-over in the past one hundred years.

Second, the property as a whole has an unusually large number of shallow ponds (Fig. 3.1) which makes it extremely important for amphibian conservation. In east-central Illinois eleven amphibian

species require fishless ponds for successful reproduction. Fish are very effective predators on amphibian adults, eggs, and larvae. One of the best strategies amphibians have for avoiding fish is to use ephemeral upland ponds for breeding. Upland ponds are rarely invaded by fish during flood events and even if they are, the fish are extirpated when the pond dries up in late summer. The problem for pond breeding amphibians is that ephemeral, upland ponds are very rare in the modern landscape. Most natural upland ponds were drained and filled during conversion to agriculture. Man-made ponds, even the smallest ones, are repeatedly stocked with panfish to the point that that regular drying and winter kills do little to reduce the fish populations. The small ponds at LVRSNA are exceptional not only because they have somehow remained fishless, but also because they show variation in size, shape, depth, and stage of succession. From a herpetological standpoint, the small ponds are the outstanding natural feature of LVRSNA.

LITERATURE CITED

Brandon, R.A. and S. Ballard. 1991. Inventories of amphibians and reptiles in Illinois. IDOC Report. 133 pp.

Collins, J.T., ed. 1990. Standard common and current scientific names for North American amphibians and reptiles. Society for the Study of Amphibians and Reptiles. Herpetological Circular No. 19. 41 pp.

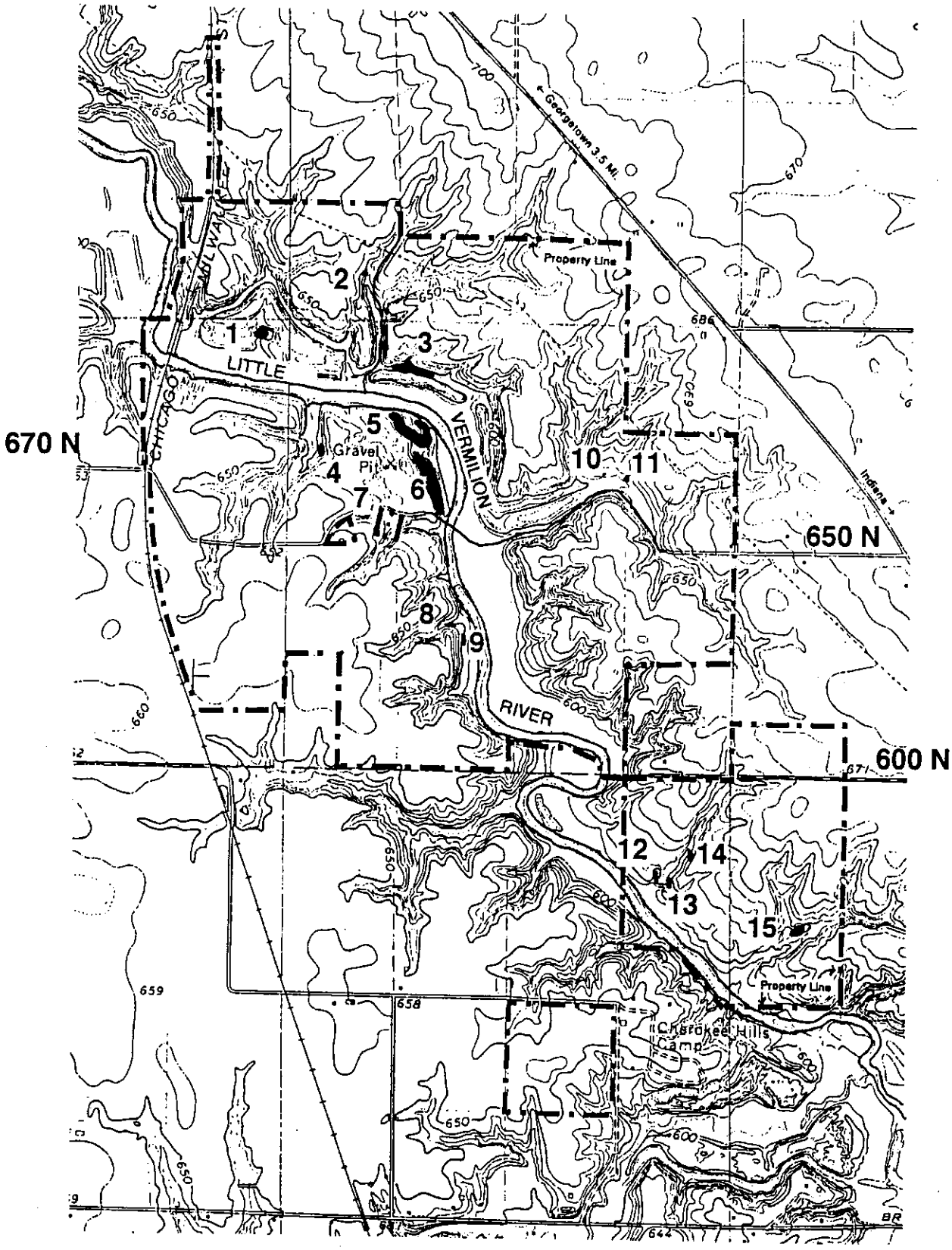
Conant, R. and J.T. Collins. 1991. Reptiles and Amphibians of Eastern/Central North America. Houghton Mifflin Company, Boston. 450 pp.

Heyer, W.R., M.A. Donnelly, R.W. McDiarmid, L. C. Hayek, M.S. Foster, Eds. 1994. Measuring and Monitoring Biodiversity: Standard Methods for Amphibians. Smithsonian Institution Press, Washington. 364 pp.

Maple, W.T. and L.P. Orr. 1968. Overwintering adaptations of *Sistrurus catenatus* in northeastern Ohio. Journal of Herpetology 2:179-180.

Seigel, R.A. 1983. Final report on the ecology and management of the massasauga, *Sistrurus catenatus*, at the Squaw Creek National Wildlife Management Area, Holt, County, Missouri. Unpublished Report to the Missouri Department of Conservation. 14 pp.

Smith, P.W. 1961. The Amphibians and Reptiles of Illinois. Illinois Natural History Survey Bulletin 28(1):1-298.



NORTH
1" = 1700'

LITTLE VERMILION AREA

Illinois Department of Natural Resources

Figure 3..1 Pond locations at the LVRSNA, Vermilion County, Illinois in 1995-1996.

Appendix 3.1. List of museum holdings searched for Illinois specimens.

Collection	Acronym
Academy of Natural Sciences, Philadelphia	ANSP
American Museum of Natural History	AMNH
Auburn University Museum	AUM
Burpee Museum of Natural History	BMNH
California Academy of Sciences	CAS
Carnegie Museum	CM
Chicago Academy of Sciences	CA
Field Museum of Natural History	FMNH
Florida Museum of Natural History	UF
H.D. Walley Collection	HDW
Los Angeles County Museum of Natural History	LACM
Louisiana State University	LSUS
Milwaukee Public Museum	MPM
Museum of Comparative Zoology	MCZ
National Museum of Natural History	USNM
Nebraska State Museum	UN
Principia College	PC
S.A. Minton Collection	SAM
Southern Illinois University-Carbondale	SIUC
Texas Cooperative Wildlife Collection	TCWC
Tulane University Museum of Natural History	TU
University of Illinois Museum of Natural History	UIMNH
University of Kansas Museum of Natural History	KU
University of Michigan Museum of Zoology	UMMZ
University of Wisconsin-Madison	UWZ
University of Wisconsin-Stevens Point	UWSP

Chapter 4. A Limited Survey of the Birds of The Little Vermilion River State Natural Area, Vermilion County, Illinois

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INTRODUCTION

Vermilion County, like most counties in Illinois, has witnessed severe changes in the quality and area of its natural habitats. In the 1820's, it is estimated that 20.8 and 79.1 percent of the county was covered by forest and prairie respectively (Iverson et al. 1989). Even though there is a slight trend towards an increase in forest area, only 31 percent of the historic coverage exists and virtually no natural prairie remains.

Habitat loss and fragmentation have well documented effects on bird communities and are implicated as causes in the general decline of neotropical migrants (Robbins et al. 1989; Askins et al. 1990). The obvious effect of habitat loss is the elimination of historic breeding, foraging, and resting areas for many species. Habitat fragmentation has more subtle and difficult to measure effects that include increased predation, parasitism and inter-specific competition (Wilcove 1985; Ambuel and Temple 1982; Robinson 1992) To counter these negative trends, it is imperative to preserve remaining habitats and restore those that are degraded.

The Illinois Department of Natural Resource's acquisition of the Little Vermilion River State Natural Area (LVRSNA) in Vermilion County is an important step in slowing the depletion of natural habitats. In an effort to formulate the best management plan for this property, the IDNR has requested an inventory of the existing bird community with an emphasis on interior woodland species. The results of that inventory are presented in this report.

HISTORICAL RECORDS

Four sources, the Illinois Natural Heritage Database, the Illinois Fish and Wildlife Information Service, the Illinois Breeding Bird Atlas and the Indiana Natural Heritage Data Center, where consulted to establish historic use of the area by endangered and threatened avian species, and to identify endangered and threatened species likely to occur within the project area. The search was limited to records at locations within a eight km radius of the study site. The results of this search are presented in Table 4.1.

Records of ten Illinois endangered, one federally endangered, and three Illinois threatened species were found for locations within 8-km of the LVRSNA site over the past 20 years (1975-1995) (Table 4.1). No records of endangered or threatened species were found on the Indiana database.

The study site was surveyed for the availability of breeding habitat for all of the species listed in Table 4.1. These assessments are based on published breeding requirements for these species (Bohlen 1989; Herkert 1992) (Appendix 4.1).

Adequate or marginal breeding habitat exists within the LVRSNA for six endangered or threatened species (Table 4.1).

METHODS

The year was divided into four census seasons corresponding to major periods of the avian life cycle in the midwest (Table 4.2). Because of the migratory habits of birds, during each of these seasons a different set of species will be present.

During the breeding season, birds were censused using a modified point count method (Hutto et al 1986). Thirty census points were established within the study area and each was visited twice during the breeding season. Figure 4.1 shows the location and Table 4.3 gives the

longitude/latitude and a brief habitat description of each census point. For all birds heard or seen, the species and distance and compass direction from observer were recorded. Censuses were usually conducted from 0545 to 1100 hours on days with no rain or high winds. Birds were counted for ten minuets at each census point. All individuals detected for an unlimited distance were recorded in order to compile a list of species present and relative frequency estimates. Overall population densities, expressed as number of individuals detected per sq. km, and relative abundance figures were computed based on 75-m radius circles centered on the census points.

During the winter, spring and fall seasons, a walking survey was conducted to generate a list of species present. General numbers of birds encountered were recorded so relative abundance could be estimated.

RESULTS

One hundred seventeen species representing 31 families were recorded at the LVRSNA during this study (Table 4.4). Endangered and threatened species encounters are covered in the seasonal summaries that follow.

Fall Season

Thirty four species representing 16 families were recorded at the LVRSNA during the fall survey (Table 4.5). These numbers are lower than expected, indicating that the heaviest migration waves were missed during this survey. The most abundant species encountered during these surveys were the Eastern Tufted Titmouse (*Parus bicolor*), the Blue Jay (*Cyanocitta cristata*), the Carolina Chickadee (*Parus carolinensis*) and the American Crow (*Corvus brachyrhynchos*), all of which are year round residents (Table 4.5).

One Illinois endangered species, the **Sharp-shinned Hawk** (***Accipiter striatus***) and one Illinois threatened species, the **Brown Creeper** (***Certhia americana***) were recorded at the LVRSNA during the fall survey.

Winter Season

Twenty nine species representing 18 families were recorded at the LVRSNA during the winter survey (Table 4.6). Seventy two percent (26 of 37) of the year round residents expected for this region of Illinois were recorded at this site (Campbell et al. 1988).

One Illinois threatened species, the **Brown Creeper**, was recorded at the LVRSNA during the winter survey. This is a common winter resident which utilizes a greater number of habitat types in winter than are accepted during the breeding season.

Spring Season

One hundred and seven species representing 27 families were recorded at the LVRSNA during the spring season survey (Table 4.7). The American Robin (*Turdus migratorius*) was the most abundant spring migrant encountered at this site followed by the Brown-headed Cowbird (*Molothrus ater*) and the resident Northern Cardinal (*Cardinalis cardinalis*) (Table 4.7).

One Illinois endangered species, the **Sharp-shinned Hawk**, one Illinois threatened species, the **Brown Creeper**, and one Illinois watch list species, the **Golden-winged Warbler** (***Vermivora chrysoptera***), were recorded at the LVRSNA during the spring season survey (Table 4.7).

Seven **Long-eared Owl** (***Asio otus*, Illinois endangered**) pellets were found under a number of Eastern Red Cedars (*Juniperus virginiana*) during a search in a bottomland old field (Figure 4.2). This indicates that this area was used as a winter roost for this species. A number of smaller pellets, either Eastern Screech Owl (*Otus asio*) or Northern Saw-whet Owl (*Aegolius acadicus*), were also located under the trees in this field.

Breeding Season

Sixty two species representing 23 families were recorded at the LVRSNA during the breeding season (Table 4.8). Relative abundance and number of birds detected per sq. km were extrapolated for birds detected within the 75-m radius circles around census points (Table 4.9). Approximately 73% (45) of these are at least partially dependent upon woodlands during the breeding season. Five of the encountered species, are highly area sensitive species and 18 are moderately area sensitive (Robbins et al. 1989; Hayden et al. 1985) (Table 4.9).

No Illinois endangered or threatened bird species were observed during the breeding season censuses conducted at the LVRSNA.

Breeding Bird Distribution: Most Abundant Forest Interior Migrant Species

Maps, showing the location of the census points at which the following six most abundant forest interior migrants were detected, were generated to show relative distribution patterns of those species within the LVRSNA (Figures 4.3 through 4.8).

Acadian Flycatcher (*Empidonax virescens*): This species was detected at 90% (Relative frequency = 0.90) of the census points, being absent at only those points located in old field sections of the site (Figure 4.3, Table 4.8). It had the highest relative abundance (0.074) and highest number of birds per sq. km (77.08) of all species encountered within the 75 m radius circles (Table 4.9).

Eastern Wood-pewee (*Contopus virens*): This species was detected at 87% (Relative frequency = 0.87) of the census points, also being absent only from non-forested sections of the study site (Figure 4.4, Table 4.8). It had the second highest relative abundance (0.063) and birds per sq. km (65.80) of all migrant species within the 75-m radius census circle (Table 4.9).

Great-crested Flycatcher (*Myiarchus crinitus*): This species was detected at 63% (Relative frequency = 0.63) of the census points. It was encountered in all habitat types and showed a more clumped distribution than the previous two Tyranid species (Figure 4.5, Table 4.8). It had a relative abundance of 0.034 and the extrapolated number of birds per sq. km was 35.72 (Table 4.9).

Red-eyed Vireo (*Vireo Olivaceus*): This species was detected at 57% of the census points (Relative frequency = 0.57) and showed a relatively even distribution over the site and an avoidance of open habitat (Figure 4.6, Table 4.8). It had a relative abundance of 0.034 and the extrapolated number of birds per sq. km was 35.72 (Table 4.9).

Wood Thrush (*Hylocichla mustelina*): This species was detected at 40% of the census points (Relative frequency 0.40) with a distribution confined to the larger forest blocks (Figure 4.7, Table 4.8). It had a relative abundance of 0.029 and the extrapolated number of birds per sq. km was 30.08 (Table 4.9).

Indigo Bunting (*Passerina cyanea*): This species was detected at 73% of the census points (Relative frequency = 0.73) and had a relatively even distribution through all habitat types (Figure 4.8, Table 4.8). It had the third highest relative abundance (0.058) and extrapolated

number of birds per sq. km (60.16) of all migratory species recorded during the breeding censuses (Table 4.9).

Heron Rookery

An established Great Blue Heron (*Ardea heridias*) rookery exists along the Little Vermilion River at this site (Figure 4.9). Thirty five nests were counted on 1 November 1995. A search, conducted on 20 November 1996, found the number of nests had increased to 48 over the 1996 breeding season. All nests found in 1996 were constructed in sycamore trees (*Plantanus occidentalis*) and arranged in five clusters containing one to thirty nests. The locations of the individual clusters are mapped on Figure 4.9. The nearest known heron colony in Illinois, located in 1992 on the Middle Fork River near Armstrong, is 44 km away (Illinois Natural Heritage Database).

In order to minimize disturbance, no intrusions to count active nests were made into the rookery during the breeding season.

DISCUSSION

The extensive area of mature forest at the LVRSNA supports breeding populations of a number of area sensitive and declining bird species, notably the Wood Thrush, Ovenbird (*Seiurus aurocapillus*), Acadian Flycatcher and Red-eyed Vireo. These forest tracts also have the potential to attract a number of Illinois endangered and threatened species, especially the Red-shouldered Hawk, (*Buteo lineatus*, Ilinois endangered), Brown Creeper, Veery (*Catharus fuscencens*, Illinois threatened), and Cooper's Hawk (*Accipiter cooperii* , Ilinois endangered), all of which have bred within the region (Table 4.1). The management plan for this site should emphasize maintaining the integrity of these forest tracts and encourage reforestation along their perimeter in order to preserve the existing bird populations and attract listed species.

Heterogeneity of habitat should also be preserved in order to maintain the avian diversity present at this site . The upland old fields and power line corridor contain breeding populations of grassland and edge species, such as White-eyed Vireo (*Vireo griseus*), Rose-breasted Grosbeak (*Pheucticus ludovicianus*), Yellow Warbler (*Dendroica petechia*), Common Yellowthroat (*Geothlypis trichas*) and Yellow-breasted Chat (*Icteria virens*). The floodplain old fields are not as species rich as their upland counterpart. However, the field containing the Long-eared Owl winter roost should be maintained to encouraged continued use by this species.

Special care should be taken to preserve the integrity of the expanding heron rookery. Access to this area should be restricted during all phases of nesting activity, especially during the courtship and egg-laying period.

LITERATURE CITED

Askins, A.R. and M.J. Philbrick. 1987. Effect of Changes in Regional Forest Abundance on the Decline and Recovery of a Forest Bird Community. Wison Bulletin 99(1): 7-21.

Ambuel, B. and S.A. Temple. 1983. Area-dependent changes in the bird communities and vegetation of southern Wisconsin forests. Ecology 64: 1057-1068.

Bohlen, H.D. 1989. The Birds of Illinois. Indiana Press, Bloomington. 221 pp.

Campbell, M.F., M.J. Easterday, and S. Bailey. 1988. Birds of the Middlefork Valley. Vermilion County Audubon Society. 32 pp.

Hayden, T.J., J. Faaborg, and C.L. Clawson. 1985. Estimates of minimum area requirements for Missouri forest birds. Transactions of the Missouri Academy of Science 19: 11-22.

Herkert, J.R. Ed. 1992. Endangered and Threatened Species of Illinois: Status and Distribution., Vol. 2-Animals. Illinois Endangered Species Protection Board. Springfield, IL. 142 pp.

Hutto, R.L., S.M. Pletchet, and P. Hendricks. 1986. A fixed-radius point count method for non breeding and breeding season use. The Auk 103: 593-602.

Iverson, L.R., R.L. Oliver, D.P. Tucker, P.G. Risser, C.D. Burnett, and R.G. Rayburn. 1989. The Forest Resources of Illinois: An Atlas and Analysis of Spatial and Temporal Trends. Illinois Natural History Survey Special Publication 11. 181 pp.

Robbins, C.S., D.K. Dawson, and B.A. Dowell. 1989. Habitat area requirements of breeding forest birds of the Middle Atlantic states. Wildlife Monographs 103: 1-34.

Robinson, S.R. 1992. Population dynamics of breeding neotropical migrants in a fragmented Illinois landscape. In J.M. Hagan, III and D.W. Johnston, (eds.), Ecology and Conservation of Neotropical Migrant Landbirds, pp. 408-418. Smithonian Inst. Press, Washington, D.C.

Wilcove, D.S. 1985. Nest predation in forest tracts and the decline of migratory songbirds. Ecology 66: 1211-1214.

Table 4.1. Records of Illinois endangered and threatened bird species occurring within a five mile radius of the Little Vermilion River State Natural Area, Vermilion County, Illinois. Sources: Illinois Natural Heritage Database (INH), Illinois Fish and Wildlife Information System (IFW) and Illinois Breeding Bird Survey (IBB) databases, 1974 to present.

Species	Status	Source	Activity	LVRSNA Breeding Habitat
American Bittern	I-E	IFW	Spring migrant	Absent
Great Egret	I-T	IFW	Fall migrant	Marginal
Little Blue Heron	I-E	IFW	Spring migrant	Absent
Bald Eagle	I-E, F-E	IFW	Winter wandering	Absent
Sharp-shinned Hawk	I-E	IFW, IBB	Fall migrant	Adequate
Cooper's Hawk	I-E	IFW,IBB,INH	Breeding	Adequate
Red-shouldered Hawk	I-E	IFW,IBB,INH	Breeding	Adequate
Sandhill Crane	I-E	IFW	Spring migrant	Absent
Long-eared Owl	I-E	IFW	Winter resident	Absent
Short-eared Owl	I-E	IFW	Winter resident	Absent
Brown Creeper	I-T	IFW,IBB,INH	Breeding	Adequate
Veery	I-T	IFW	Possible breeding	Adequate
Henslow's Sparrow	I-E	IFW,INH	Breeding	Absent

I-E= Illinois endangered, F-E= Federally endangered, I-T= Illinois threatened

Table 4.2. Census seasons.

Season	Inclusive Dates
Fall	1 September to 30 November, 1995
Winter	1 December to 28 February, 1995-96
Spring	1 March to 30 April, 1996
Breeding	1 May to 31 August, 1996

Table 4.3 Latitudinal and longitudinal coordinates and habitat descriptions of the census points used during the avian survey at the Little Vermilion River site.

Point	Lat/Long	Habitat description
1	39° 57' 17" N 87° 33' 42" W	Mesic ravine bottom; 30-50 yr.
2	39° 57' 10" N 87° 33' 38" W	Dry mesic upland forest; 30-50 yr.
3	39° 57' 09" N 87° 33' 33" W	Thorny upland old field
4	39° 57' 04" N 87° 33' 34" W	Shruby upland old field;
5	39° 57' 00" N 87° 33' 26" W	Dry mesic upland forest; strip-mined
6	39° 57' 00" N 87° 33' 28" W	Dry mesic upland forest; 40 60 yrs.
7	39° 56' 59" N 87° 33' 38" W	Mesic floodplain forest; 40 -60 yrs.
8	39° 57' 59" N 87° 34' 44" W	Mesic ravine bottom forest; young sugar maple
9	39° 58' 02" N 87° 34' 44" W	Upland mesic forest; 40-60 yrs.
10	39° 58' 02" N 87° 34' 37" W	Mesic floodplane; strip-mined
11	39° 57' 42" N 87° 34' 23" W	Upland dry mesic forest; 30-50 yrs.
12	39° 57' 36" N 87° 34' 59" W	Upland mesic forest; 50+ yrs.
13	39° 57' 29" N 87° 34' 20" W	Mesic floodplane forest; 40-60 yrs.
14	39° 57' 29" N 87° 34 24" W	Mesic upland forest; 50+ yrs.
15	39° 57' 22" N 87° 34' 20" W	Mesic upland forest; 50+yrs. w/ lots of saplings

Table 4.3 concluded on following page

Table 4.3 (Concluded). Latitudinal and longitudinal coordinates and habitat descriptions of thecensus points used during the avian survey at the Little Vermilion Riversite.

Point	Lat/Long	Habitat description
16	39° 58' 21" N 87° 34' 59" W	Mesic upland forest; 50+ yrs. many saplings
17	39° 58' 21" N 87° 34' 51" W	Mesic upland forest; 50+ yrs.
18	39° 58' 16" N 87° 34' 42" W	Mesic upland forest; 30-60 yrs.
19	39° 58' 18" N 87° 34' 36" W	Dry mesic upland forest; 50+ yrs.
20	39° 58' 17" N 87° 34' 29" W	Creek bottom forest; 30-50 yrs.
22	39° 58' 10" N 87° 34' 12" W	Upland old field;
23	39° 58 00" N 87° 34' 04" W	Dry mesic upland forest; 40-60 yrs.
24	39° 57 58" N 87° 34' 03" W	Mesic creek bottom forest; 40-60 yrs. sugar maple
25	39° 57' 43" N 87° 33' 48" W	Mesic upland forest; 50+ yrs.
26	39° 57 37" N 87° 33' 59" W	Dry mesic upland forest; 50+ yrs.
26A	39° 57' 34" N 87° 34' 06" W	Dry mesic upland forest; 50+ yrs.
27	39° 57' 55" N 87° 34' 17" W	Mesic floodplane forest; strip-mined 50+ yrs.
28	39° 58' 03" N 87° 34' 39" W	Mesic floodplane forest; strip-mined 50+ yrs.
29	39° 58' 06" N 87° 34' 49" W	Bottomland old field
30	39° 58' 09" N 87° 34' 54" W	Bottomland old field; cedars

Table 4.4 List of species observed during the avian Surveys conducted at the Little Vermilion River Site, Vermilion County, Illinois.
†= Illinois endangered, ††= Illinois threatened, #= Illinois watch list,
*= Non-native species.

Family (**Subfamily**) Common Name (*Species*)
Ardeidae
Great Blue Heron (*Ardea herodias*)
Anatidae
Canada Goose (*Branta canadensis*)
Wood Duck (*Aix sponsa*)
Mallard (*Anas platyrhynchos*)
Cathartidae
Turkey Vulture (*Cathartes aura*)
Accipitridae
Sharp-shinned Hawk (*Accipiter striatus*) †
Red-tailed Hawk (*Buteo jamaicensis*)
Rough-legged Hawk (*Buteo lagopus*)
Falconidae
American Kestrel (*Falco sparverius*)
Phasianidae
Wild Turkey (*Meleagris gallopavo*)
Ring-necked Pheasant (*Phasianus colchicus*) *
Northern Bobwhite (*Colinus virginianus*)
Charadriidae
Killdeer (*Charadris vociferus*)
Columbidae
Rock Dove (*Columba livia*) *
Mourning Dove (*Zenaida macroura*)
Cuculidae
Black-billed Cuckoo (*Coccyzus erythropthalmus*)
Yellow-billed Cuckoo (*Coccyzus americanus*)
Strigidae
Great Horned Owl (*Bubo virginianus*)
Barred Owl (*Stix varia*)
Caprimulgidae
Common Nighthawk (*Chordeiles minor*)
Apodidae
Chimney Swift (*Chaetura pelagica*)
Trochilidae
Ruby-throated Hummingbird (*Archilochus colubris*)
Alcedinidae
Belted Kingfisher (*Ceryle alcyon*)

Table 4.4 continued on following page.

Table 4.4 (Continued). List of Species observed during the Avian Surveys Conducted at the Little Vermilion River Site, Vermilion County, Illinois. †= Illinois endangered, ††= Illinois threatened, #= Illinois-watch list, *= Non-native species.

Family (Subfamily) Common Name (*Species*)
Picidae
Red-headed Woodpecker (*Melanerpes erythrocephalus*)
Red-bellied Woodpecker (*Melanerpes carolinus*)
Yellow-bellied Sapsucker (*Sphyrapicus varius*)
Downy Woodpecker (*Picoides pubescens*)
Hairy Woodpecker (*Picoides villosus*
Northern Flicker (*Colaptes auratus*)
Pileated Woodpecker (*Dryocopus pileatus*)
Tyrannidae
Eastern Wood-Pewee (*Contoputsvirens*)
Acadain Flycatcher (*Empidonax virescens*)
Least Flycatcher (*Empidonax minimus*)
Eastern Phoebe (*Sayornis phoebe*)
Great Crested Flycatcher (*Myiarchus crinitus*)
Eastern Kingbird (*Tyrannus tyrannus*)
Alaudidae
Horned Lark (*Eremophila alpestris*)
Hirundinidae
Barn Swallow (*Hirundo rustica*)
N. Rough-winged Swallow (*Stelgidopteryx serripennis*)
Corvidae
Blue Jay (*Cyanocitta cristata*)
American Crow (*Corvus brachyrhynchos*)
Paridae
Carolina Chickadee (*Parus carolinensis*)
Eastern Tufted Titmouse (*Parus bicolor*)
Sittidae
White-breasted Nuthatch (*Sitta carolinensis*)
Certhiidae
Brown Creeper (*Certhia americana*) ††
Troglodytidae
Carolina Wren (*Thryothorus ludovicianus*)
House Wren (*Troglodytes aedon*)
Winter Wren (*Troglodytes troglodyutes*)
Mucicapidae (Sylviinae)
Golden-crowned Kinglet (*Regulus satrapa*)
Ruby-crowned Kinglet (*Regulus calendula*)
Blue-gray Gnatcatcher (*Polioptila caerulea*)

Table 4.4 continued on following page.

Table 4.4 (Continued). List of Species observed during the Avian Surveys Conducted at the Little Vermilion River Site, Vermilion County, Illinois. †= Illinois endangered, ††= Illinois threatened, #= Illinois watch list, *= Non-native species.

Family (Subfamily) Common Name (*Species*)
Mucicapidae (Turdinae)
Eastern Bluebird (*Sialia sialis*)
Veery (*Catharus fuscescens*) ††
Gray-cheeked Thrush (*Catharsus minimus*)
Swainson's Thrush (*Catharsus ustulatus*)
Hermit Thrush (*Catharsus guttatus*)
Wood Thrush (*Hylocichla mustelina*)
American Robin (*Turdus migratorius*)
Mimidae
Gray Catbird (*Dumetella carolinensis*)
Brown Thrasher (*Toxostoma rufum*)
Bombycillidae
Cedar Waxwing (*Bombycilla cedrorum*)
Sturnidae
European Starling (*Sturnus vulgaris*) *
Vireonidae
White-eyed Vireo (*Vireo griseus*)
Solitary Vireo (*Vireo solitarius*)
Yellow-throated Vireo (*Vireo flavifrons*)
Warbling Vireo (*Vireo gilvus*)
Red-eyed Vireo (*Vireo olivaceus*)
Emberizidae (Parulinae)
Blue-winged Warbler (*Vermivora pinus*)
Golden-winged Warbler (*Vermivora chrysoptera*) #
Tennessee Warbler (*Vermivora peregrina*)
Orange-crowned Warbler (*Vermivora celata*)
Nashville Warbler (*Vermivora ruficapilla*)
Northern Parula (*Parula americana*)
Yellow Warbler (*Dendroica petechia*)
Chestnut-sided Warbler (*Dendroica pensylvanica*)
Magnolia Warbler (*Dendroica magnolia*)
Cape May Warbler (*Dendroica tigrina*)
Yellow-rumped Warbler (*Dendroica coronata*)
Black-throated Green Warbler (*Dendroica virens*)
Blackburnian Warbler (*Dendroica fusca*)
Yellow-throated Warbler (*Dendroica dominica*)
Palm Warbler (*Dendroica palmarum*)
Bay-breasted Warbler (*Dendroica castanea*)
Blackpoll Warbler (*Dendrocia striata*)

Table 4.4 concluded on following page.

Table 4.4 (Concluded). List of species observed during the avian surveys conducted at the Little Vermilion River Site, Vermilion County, Illinois. †= Illinois endangered, ††= Illinois threatened, #= Illinois watch list, *= Non-native species.

Family (Subfamily) Common Name (*Species*)
Cerulean Warbler (*Dendroica cerulea*) #
Black-and-white Warbler (*Mniotilta varia*)
American Redstart (*Setophaga ruticilla*)
Worm-eating Warbler (*Helmitheros vermivorus*)
Ovenbird (*Seiurus aurocapillus*)
Northern Waterthrush (*Seiurus noveboracensis*)
Louisiana Waterthrush (*Seiurus motacilla*)
Kentucky Warbler (*Oporornis formosus*)
Common Yellowthroat (*Geothlypis trichas*)
Canada Warbler (*Wilsonia canadensis*)
Yellow-breasted Chat (*Icteria virens*)
Emberizidae (Thraupinae)
Summer Tanager (*Piranga rubra*)
Scarlet Tanager (*Piranga olivacea*)
Emberizidae (Cardinalinae)
Northern Cardinal (*Cardinalis cardinalis*)
Rose-breasted Grosbeak (*Pheucticus ludovicianus*)
Indigo Bunting (*Passerina cyanea*)
Emberizidae (Emberizinae)
Eastern Towhee (*Pipilo erythrophthalmus*)
Chipping Sparrow (*Spizella passerina*)
Field Sparrow (*Spizella pusilla*)
Fox Sparrow (*Passerella iliaca*)
Song Sparrow (*Melospiza melodia*)
Swamp Sparrow (*Melospiza georgiana*)
White-throated Sparrow (*Zonotrichia albicollis*)
Dark-eyed Junco (*Junco hyemalis*)
Emberizidae (Icterinae)
Red-winged Blackbird (*Agelaius phoeniceus*)
Eastern Meadowlark (*Sturnella magana*)
Common Grackle (*Quiscalus quiscula*)
Brown-headed Cowbird (*Molothrus ater*)
Baltimore Oriole (*Icterus galbula*)
Fringillidae
American Goldfinch (*Carduelis tristis*)
Purple Finch (*Carpodacus purpureus*)
House Finch (*Carpodacus mexicanus*)
Passeridae
House Sparrow (*Passer domesticus*) *

Table 4.5. List of species observed during fall avian surveys conducted at the Little Vermilion River Site, Vermilion County, Illinois.
†= Illinois endangered, ††= Illinois threatened.

Family (Subfamily) Common Name (*Species*)	**Average Count Per Visit**	**Relative Abundance**
Ardeidae		
Great Blue Heron (*Ardea herodias*)	.3	.001
Anatidae		
Wood Duck (*Aix sponsa*)	1.7	.007
Cathartidae		
Turkey Vulture (*Cathartes aura*)	.3	.001
Accipitridae		
Sharp-shinned Hawk (*Accipiter striatus*) †	.3	.001
Red-tailed Hawk (*Buteo jamaicensis*)	1.3	.006
Falconidae		
American Kestrel (*Falco sparverius*)	.7	.003
Phasianidae		
Wild Turkey (*Meleagris gallopavo*)	.7	.003
Alcedinidae		
Belted Kingfisher (*Ceryle alcyon*)	1.0	.004
Picidae		
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	15.0	.066
Red-bellied Woodpecker (*Melanerpes carolinus*)	17.0	.074
Downy Woodpecker (*Picoides pubescens*)	18.0	.079
Hairy Woodpecker (*Picoides villosus*	1.3	.006
Northern Flicker (*Colaptes auratus*)	1.0	.004
Pileated Woodpecker (*Dryocopus pileatus*)	4.0	.018
Corvidae		
Blue Jay (*Cyanocitta cristata*)	29.0	.127
American Crow (*Corvus brachyrhynchos*)	32.0	.140
Paridae		
Carolina Chickadee (*Parus carolinensis*)	15.0	.066
Eastern Tufted Titmouse (*Parus bicolor*)	29.0	.127
Sittidae		
White-breasted Nuthatch (*Sitta carolinensis*)	22.0	.096
Certhiidae		
Brown Creeper (*Certhia americana*) ††	2.3	.010
Troglodytidae		
Carolina Wren (*Thryothorus ludovicianus*)	.3	.001
Winter Wren (*Troglodytes troglodyutes*)	.3	.001
Mucicapidae (Sylviinae)		
Golden-crowned Kinglet (*Regulus satrapa*)	4.0	.018
Ruby-crowned Kinglet (*Regulus calendula*)	.3	.001

Table 4.5 concluded on following page.

Table 4.5 (Concluded). List of species observed during the fall avian surveys conducted at the Little Vermilion River Site, Vermilion County, †= Illinois endangered, ††= Illinois threatened.

Family (Subfamily) Common Name (*Species*)	**Average Count Per Visit**	**Relative Abundance**
Mucicapidae (Turdinae)		
American Robin (*Turdus migratorius*)	1.0	.004
Emberizidae (Parulinae)		
Yellow-rumped Warbler (*Dendroica coronata*)	1.7	.007
Black-throated Green Warbler (*Dendroica virens*)	.3	.001
Emberizidae (Cardinalinae)		
Northern Cardinal (*Cardinalis cardinalis*)	3.0	.013
Emberizidae (Emberizinae)		
Eastern Towhee (*Pipilo erythrophthalmus*)	1.0	.004
Field Sparrow (*Spizella pusilla*)	.3	.001
White-throated Sparrow (*Zonotrichia albicollis*)	4.0	.018
Dark-eyed Junco (*Junco hyemalis*)	16.3	.072
Fringillidae		
American Goldfinch (*Carduelis tristis*)	3.3	.015
Purple Finch	.3	.001
Total	228.3	1.000

Table 4.6. List of species observed during the winter avian survey conducted at the Little Vermilion River Site, Vermilion County, Illinois. †= Illinois endangered, ††= Illinois threatened, *= Non-native species.

Family (Subfamily) Common Name (*Species*)	**Average Count Per Visit**	**Relative Abundance**
Ardeidae		
Great Blue Heron (*Ardea herodias*)	0.5	.004
Anatidae		
Mallard (*Anas platyrhynchos*)	0.5	.004
Accipitridae		
Red-tailed Hawk (*Buteo jamaicensis*)	3.0	.024
Charadriidae		
Killdeer (*Charadris vociferus*)	2.5	.020
Columbidae		
Mourning Dove (*Zenaida macroura*)	1.5	.012
Strigidae		
Barred Owl (*Stix varia*)	.05	.004
Alcedinidae		
Belted Kingfisher (*Ceryle alcyon*)	1.0	.008
Picidae		
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	2.0	.016
Red-bellied Woodpecker (*Melanerpes carolinus*)	7.5	.059
Downy Woodpecker (*Picoides pubescens*)	7.5	.059
Hairy Woodpecker (*Picoides villosus*	1.5	.012
Northern Flicker (*Colaptes auratus*)	1.0	.008
Pileated Woodpecker (*Dryocopus pileatus*)	1.0	.008
Alaudidae		
Horned Lark (*Eremophila alpestris*)	1.0	.008
Corvidae		
Blue Jay (*Cyanocitta cristata*)	13.0	.103
American Crow (*Corvus brachyrhynchos*)	6.0	.047
Paridae		
Carolina Chickadee (*Parus carolinensis*)	22.5	.178
Eastern Tufted Titmouse (*Parus bicolor*)	12.5	.099
Sittidae		
White-breasted Nuthatch (*Sitta carolinensis*)	7.5	.059
Certhiidae		
Brown Creeper (*Certhia americana*) ††	1.0	.008
Troglodytidae		
Carolina Wren (*Thryothorus ludovicianus*)	0.5	.004

Table 4.6 concluded on following page.

Table 4.6 (Concluded). List of species observed during the winter avian surveys conducted at the Little Vermilion River Site, Vermilion County, Illinois. ††= Illinois threatened, *= Non-native species.

Family (Subfamily) Common Name (*Species*)	**Average Count Per Visit**	**Relative Abundance**
Mucicapidae (Turdinae)		
Eastern Bluebird (*Sialia sialis*)	2.0	.016
American Robin (*Turdus migratorius*)	3.5	.028
Mimidae		
Brown Thrasher (*Toxostoma rufum*)	.05	.004
Sturnidae		
European Starling (*Sturnus vulgaris*) *	3.0	.024
Emberizidae (Cardinalinae)		
Northern Cardinal (*Cardinalis cardinalis*)	10.0	.079
Emberizidae (Emberizinae)		
Song Sparrow (*Melospiza melodia*)	2.0	.016
Dark-eyed Junco (*Junco hyemalis*)	9.0	.071
Emberizidae (Icterinae)		
Common Grackle (*Quiscalus quiscula*)	2.5	.020
Total	126.5	1.000

Table 4.7. List of species observed during the spring avian survey conducted at the Little Vermilion River Site, Vermilion County, Illinois. †= Illinois endangered, ††= Illinois threatened, #= Illinois watch list, *= Non-native species.

Family (Subfamily) Common Name (*Species*)	**Average Count Per Visit**	**Relative Abundance**
Ardeidae		
Great Blue Heron (*Ardea herodias*)	5.6	.019
Anatidae		
Canada Goose (*Branta canadensis*)	.4	.001
Wood Duck (*Aix sponsa*)	2.0	.007
Mallard (*Anas platyrhynchos*)	.2	.001
Cathartidae		
Turkey Vulture (*Cathartes aura*)	2.0	.007
Accipitridae		
Sharp-shinned Hawk (*Accipiter striatus*) †	.2	.001
Red-tailed Hawk (*Buteo jamaicensis*)	2.2	.008
Rough-legged Hawk (*Buteo lagopus*)	.2	.001
Falconidae		
American Kestrel (*Falco sparverius*)	1.0	.003
Phasianidae		
Wild Turkey (*Meleagris gallopavo*)	1.2	.004
Ring-necked Pheasant (*Phasianus colchicus*) *	.8	.003
Charadriidae		
Killdeer (*Charadris vociferus*)	.6	.002
Columbidae		
Rock Dove (*Columba livia*) *	.4	.001
Mourning Dove (*Zenaida macroura*)	5.0	.017
Strigidae		
Barred Owl (*Stix varia*)	.8	.003
Caprimulgidae		
Common Nighthawk (*Chordeiles minor*)	.2	.001
Apodidae		
Chimney Swift (*Chaetura pelagica*)	.6	.002
Alcedinidae		
Belted Kingfisher (*Ceryle alcyon*)	.8	.003
Picidae		
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	1.0	.003
Red-bellied Woodpecker (*Melanerpes carolinus*)	4.4	.015
Yellow-bellied Sapsucker (*Sphyrapicus varius*)	.4	.001
Downy Woodpecker (*Picoides pubescens*)	7.8	.027
Hairy Woodpecker (*Picoides villosus*	1.2	.004
Northern Flicker (*Colaptes auratus*)	2.6	.009
Pileated Woodpecker (*Dryocopus pileatus*)	1.0	.003

Table 4.7 continued on following page.

Table 4.7 (Continued). List of species observed during the spring avian survey conducted at the Little Vermilion River Site, Vermilion County, Illinois. †= Illinois endangered, ††= Illinois threatened, #= Illinois watch list, *= Non-native species.

Family (Subfamily) Common Name (*Species*)	Average Count Per Visit	Relative Abundance
Tyrannidae		
Eastern Wood-Pewee (*Contoputsvirens*)	1.2	.004
Acadain Flycatcher (*Empidonax virescens*)	1.0	.003
Least Flycatcher (*Empidonax minimus*)	.6	.002
Eastern Phoebe (*Sayornis phoebe*)	.8	.003
Great Crested Flycatcher (*Myiarchus crinitus*)	3.2	.011
Eastern Kingbird (*Tyrannus tyrannus*)	.2	.001
Hirundinidae		
N. Rough-winged Swallow (*Stelgidopteryx serripennis*)	1.6	.006
Corvidae		
Blue Jay (*Cyanocitta cristata*)	9.4	.033
American Crow (*Corvus brachyrhynchos*)	6.2	.022
Paridae		
Carolina Chickadee (*Parus carolinensis*)	8.6	.030
Eastern Tufted Titmouse (*Parus bicolor*)	11.0	.038
Sittidae		
White-breasted Nuthatch (*Sitta carolinensis*)	7.0	.024
Certhiidae		
Brown Creeper (*Certhia americana*) ††	1.4	.005
Troglodytidae		
Carolina Wren (*Thryothorus ludovicianus*)	2.0	.007
House Wren (*Troglodytes aedon*)	2.6	.009
Winter Wren (*Troglodytes troglodyutes*)	1.8	.006
Mucicapidae (Sylviinae)		
Golden-crowned Kinglet (*Regulus satrapa*)	1.0	.003
Ruby-crowned Kinglet (*Regulus calendula*)	1.6	.006
Blue-gray Gnatcatcher (*Polioptila caerulea*)	6.4	.022
Mucicapidae (Turdinae)		
Eastern Bluebird (*Sialia sialis*)	4.2	.015
Veery (*Catharus fuscescens*) ††	1.0	.003
Gray-cheeked Thrush (*Catharsus minimus*)	1.4	.005
Swainson's Thrush (*Catharsus ustulatus*)	3.2	.011
Hermit Thrush (*Catharsus guttatus*)	.4	.001
Wood Thrush (*Hylocichla mustelina*)	7.2	.025
American Robin (*Turdus migratorius*)	23.6	.082

Table 4.7 continued on following page.

Table 4.7 (Continued). List of species observed during the spring avian survey conducted at the Little Vermilion River Site, Vermilion County, Illinois. †= Illinois endangered, ††= Illinois threatened, #= Illinois watch list, *= Non-native species.

Family (Subfamily) Common Name (*Species*)	**Average Count Per Visit**	**Relative Abundance**
Mimidae		
Gray Catbird (*Dumetella carolinensis*)	.8	.003
Brown Thrasher (*Toxostoma rufum*)	2.2	.008
Sturnidae		
European Starling (*Sturnus vulgaris*) *	7.4	.026
Vireonidae		
White-eyed Vireo (*Vireo griseus*)	2.4	.008
Solitary Vireo (*Vireo solitarius*)	.2	.001
Yellow-throated Vireo (*Vireo flavifrons*)	1.0	.003
Warbling Vireo (*Vireo gilvus*)	1.4	.005
Red-eyed Vireo (*Vireo olivaceus*)	.6	.002
Emberizidae (Parulinae)		
Blue-winged Warbler (*Vermivora pinus*)	.2	.001
Golden-winged Warbler (*Vermivora chrysoptera*) #	.2	.001
Tennessee Warbler (*Vermivora peregrina*)	3.2	.011
Orange-crowned Warbler (*Vermivora celata*)	.4	.001
Nashville Warbler (*Vermivora ruficapilla*)	.6	.002
Northern Parula (*Parula americana*)	4.2	.015
Yellow Warbler (*Dendroica petechia*)	1.0	.003
Chestnut-sided Warbler (*Dendroica pensylvanica*)	2.2	.008
Magnolia Warbler (*Dendroica magnolia*)	1.8	.006
Cape May Warbler (*Dendroica tigrina*)	.4	.001
Yellow-rumped Warbler (*Dendroica coronata*)	9.4	.033
Black-throated Green Warbler (*Dendroica virens*)	1.6	.006
Blackburnian Warbler (*Dendroica fusca*)	1.4	.005
Yellow-throated Warbler (*Dendroica dominica*)	.4	.001
Palm Warbler (*Dendroica palmarum*)	1.8	.006
Bay-breasted Warbler (*Dendroica castanea*)	.2	.001
Blackpoll Warbler (*Dendrocia striata*)	.6	.002
Black-and-white Warbler (*Mniotilta varia*)	.4	.001
American Redstart (*Setophaga ruticilla*)	3.6	.013
Worm-eating Warbler (*Helmitheros vermivorus*)	.2	.001
Ovenbird (*Seiurus aurocapillus*)	2.2	.008
Northern Waterthrush (*Seiurus noveboracensis*)	1.2	.004
Louisiana Waterthrush (*Seiurus motacilla*)	2.8	.010
Kentucky Warbler (*Oporornis formosus*)	.6	.002
Common Yellowthroat (*Geothlypis trichas*)	1.2	.004
Canada Warbler (*Wilsonia canadensis*)	.2	.001
Yellow-breasted Chat (*Icteria virens*)	.6	.002

Table 4.7 concluded on following page.

Table 4.7 (Concluded). List of species observed during spring avian survey conducted at the Little Vermilion River Site, Vermilion County, Illinois.
†= Illinois endangered, ††= Illinois threatened, #= Illinois watch list, *= Non-native species.

Family (Subfamily) Common Name (*Species*)	**Average Count Per Visit**	**Relative Abundance**
Emberizidae (Thraupinae)		
Summer Tanager (*Piranga rubra)*	1.2	.004
Scarlet Tanager (*Piranga olivacea*)	.2	.001
Emberizidae (Cardinalinae)		
Northern Cardinal (*Cardinalis cardinalis*)	12.8	.045
Rose-breasted Grosbeak (*Pheucticus ludovicianus*)	1.4	.005
Indigo Bunting (*Passerina cyanea*)	4.6	.016
Emberizidae (Emberizinae)		
Eastern Towhee (*Pipilo erythrophthalmus*)	4.4	.015
Chipping Sparrow (*Spizella passerina*)	1.0	.003
Field Sparrow (*Spizella pusilla*)	5.0	.017
Fox Sparrow (*Passerella iliaca*)	2.6	.009
Song Sparrow (*Melospiza melodia*)	6.8	.024
Swamp Sparrow (*Melospiza georgiana*)	.2	.001
White-throated Sparrow (*Zonotrichia albicollis*)	8.2	.029
Dark-eyed Junco (*Junco hyemalis*)	5.6	.019
Emberizidae (Icterinae)		
Red-winged Blackbird (*Agelaius phoeniceus*)	1.6	.006
Eastern Meadowlark (*Sturnella magana*)	.6	.002
Common Grackle (*Quiscalus quiscula*)	.8	.003
Brown-headed Cowbird (*Molothrus ater*)	13.8	.048
Baltimore Oriole (*Icterus galbula*)	.2	.001
Fringillidae		
American Goldfinch (*Carduelis tristis*)	5.4	.019
House Finch (*Carpodacus mexicanus*)	.4	.001
Passeridae		
House Sparrow (*Passer domesticus*) *	.4	.001

Table 4.8. List of species observed during breeding season censuses conducted at the Little Vermilion River Site, Vermilion County, Illinois. #= Illinois watch list, *= Non-native species, **= Not observed during timed censuses.

Family (Subfamily) Common Name (*Species*)	**Total Individuals**	**Relative Frequency**
Ardeidae		
Great Blue Heron (*Ardea herodias*)	Rookery	**
Accipitridae		
Red-tailed Hawk (*Buteo jamaicensis*)	4	0.13
Phasianidae		
Wild Turkey (*Meleagris gallopavo*)	4	0.13
Ring-necked Pheasant (*Phasianus colchicus*) *	1	**
Northern Bobwhite (*Colinus virginianus*)	1	0.03
Columbidae		
Mourning Dove (*Zenaida macroura*)	13	0.40
Cuculidae		
Black-billed Cuckoo (*Coccyzus erythropthalmus*)	1	0.03
Yellow-billed Cuckoo (*Coccyzus americanus*)	5	0.17
Strigidae		
Great Horned Owl (*Bubo virginianus*)	1	0.03
Barred Owl (*Stix varia*)	2	0.03
Apodidae		
Chimney Swift (*Chaetura pelagica*)	1	0.03
Trochilidae		
Ruby-throated Hummingbird (*Archilochus colubris*)	17	0.53
Alcedinidae		
Belted Kingfisher (*Ceryle alcyon*)	1	0.03
Picidae		
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	1	0.03
Red-bellied Woodpecker (*Melanerpes carolinus*)	18	0.53
Downy Woodpecker (*Picoides pubescens*)	26	0.73
Hairy Woodpecker (*Picoides villosus*	5	0.17
Northern Flicker (*Colaptes auratus*)	13	0.23
Pileated Woodpecker (*Dryocopus pileatus*)	4	0.13
Tyrannidae		
Eastern Wood-Pewee (*Contoputsvirens*)	44	0.87
Acadain Flycatcher (*Empidonax virescens*)	41	0.90
Eastern Phoebe (*Sayornis phoebe*)	1	**
Great Crested Flycatcher (*Myiarchus crinitus*)	21	0.63
Eastern Kingbird (*Tyrannus tyrannus*)	1	0.03
Hirundinidae		
Barn Swallow (*Hirundo rustica*)	3	0.03

Table 4.8 continued on following page.

Table 4.8 (Continued). List of species observed during breeding season censuses conducted at the Little Vermilion River Site, Vermilion County, Illinois. #= Illinois watch list, *= Non-native species

Family (Subfamily) Common Name (*Species*)	**Total Individuals**	**Relative Frequency**
Corvidae		
Blue Jay (*Cyanocitta cristata*)	16	0.47
American Crow (*Corvus brachyrhynchos*)	5	0.17
Paridae		
Carolina Chickadee (*Parus carolinensis*)	29	0.70
Eastern Tufted Titmouse (*Parus bicolor*)	24	0.67
Sittidae		
White-breasted Nuthatch (*Sitta carolinensis*)	20	0.57
Troglodytidae		
Carolina Wren (*Thryothorus ludovicianus*)	9	0.27
House Wren (*Troglodytes aedon*)	16	0.43
Mucicapidae (Sylviinae)		
Blue-gray Gnatcatcher (*Polioptila caerulea*)	9	0.30
Mucicapidae (Turdinae)		
Wood Thrush (*Hylocichla mustelina*)	18	0.40
American Robin (*Turdus migratorius*)	13	0.33
Mimidae		
Gray Catbird (*Dumetella carolinensis*)	2	0.07
Bombycillidae		
Cedar Waxwing (*Bombycilla cedrorum*)	9	0.17
Sturnidae		
European Starling (*Sturnus vulgaris*) *	1	0.03
Vireonidae		
White-eyed Vireo (*Vireo griseus*)	9	0.27
Yellow-throated Vireo (*Vireo flavifrons*)	4	0.13
Warbling Vireo (*Vireo gilvus*)	2	0.07
Red-eyed Vireo (*Vireo olivaceus*)	20	0.57
Emberizidae (Parulinae)		
Northern Parula (*Parula americana*)	8	0.27
Yellow Warbler (*Dendroica petechia*)	5	0.13
Yellow-throated Warbler (*Dendroica dominica*)	2	0.07
Cerulean Warbler (*Dendroica cerulea*) #	1	0.03
Ovenbird (*Seiurus aurocapillus*)	5	0.13
Louisiana Waterthrush (*Seiurus motacilla*)	3	0.10
Kentucky Warbler (*Oporornis formosus*)	7	0.20
Common Yellowthroat (*Geothlypis trichas*)	12	0.37
Yellow-breasted Chat (*Icteria virens*)	2	0.03
Emberizidae (Thraupinae)		
Scarlet Tanager (*Piranga olivacea*)	12	0.40

Table 4.8 concluded on following page.

Table 4.8 (Concluded). List of species and relative frequency of birds observed during the breeding season censuses conducted at the Little Vermilion River Site, Vermilion County, Illinois. #= Illinois watch list, *= Non-native species

Family (Subfamily) Common Name (*Species*)	**Total Individuals**	**Relative Frequency**
Emberizidae (Cardinalinae)		
Northern Cardinal (*Cardinalis cardinalis*)	41	0.93
Rose-breasted Grosbeak (*Pheucticus ludovicianus*)	1	0.03
Indigo Bunting (*Passerina cyanea*)	32	0.73
Emberizidae (Emberizinae)		
Eastern Towhee (*Pipilo erythrophthalmus*)	12	0.40
Field Sparrow (*Spizella pusilla*)	16	0.33
Song Sparrow (*Melospiza melodia*)	6	0.20
Emberizidae (Icterinae)		
Red-winged Blackbird (*Agelaius phoeniceus*)	1	0.03
Brown-headed Cowbird (*Molothrus ater*)	27	0.77
Baltimore Oriole (*Icterus galbula*)	2	0.07
Fringillidae		
American Goldfinch (*Carduelis tristis*)	17	0.57

Table 4.9. List of species, number of individuals detected, individuals per sq. km, relative abundance and area sensitivity of birds detected within a 75-m radius of the census points during the breeding season censuses conducted at the Little Vermilion River site, Vermilion Co., Illinois.

Species Common Name	Total Individuals	Birds per Sq Km	Relative Abundance	Area Sensitivity *
Red-tailed Hawk	2	3.76	0.004	
Wild Turkey	3	5.64	0.005	
Mourning Dove	5	9.40	0.009	
Black-billed Cuckoo	1	1.88	0.002	
Great Horned Owl	1	1.88	0.002	
Yellow-billed Cuckoo	4	7.52	0.007	Moderate
Ruby-throated Hummingbird	17	31.96	0.031	
Red-bellied Woodpecker	15	28.20	0.027	Moderate
Red-headed Woodpecker	1	1.88	0.002	
Northern Flicker	11	20.68	0.020	
Downy Woodpecker	26	48.88	0.047	Moderate
Hairy Woodpecker	6	11.28	0.011	Moderate
Pileated Woodpecker	1	1.88	0.002	High
Eastern Wood Pewee	35	65.80	0.063	
Acadian Flycatcher	41	77.08	0.074	Moderate
Great-crested Flycatcher	19	35.72	0.034	Moderate
Eastern Kingbird	1	1.88	0.002	
Blue Jay	12	22.56	0.022	
American Crow	1	1.88	0.002	Moderate
Eastern Tufted Titmouse	24	45.12	0.043	Moderate
Carolina Chickadee	30	56.40	0.054	
White-breasted Nuthatch	19	35.72	0.034	Moderate
House Wren	13	24.44	0.023	
Carolina Wren	9	16.92	0.016	
Blue-gray Gnatcatcher	9	16.92	0.016	Moderate
Wood Thrush	16	30.08	0.029	Moderate
American Robin	13	24.44	0.023	
Gray Catbird	2	3.76	0.004	Moderate
Cedar Waxwing	7	13.16	0.013	
White-eyed Vireo	7	13.16	0.013	
Yellow-throated Vireo	4	7.52	0.007	
Red-eyed Vireo	19	35.72	0.034	Moderate
Warbling Vireo	2	3.76	0.004	
Northern Parula	8	15.04	0.014	High
Cerulean Warbler	1	1.88	0.002	High
Yellow-throated Warbler	2	3.76	0.004	
Yellow Warbler	6	11.28	0.011	
Kentucky Warbler	7	13.16	0.013	Moderate
Ovenbird	5	9.40	0.009	Moderate
Louisiana Waterthrush	3	5.64	0.005	High

* From Hayden et al. 1985 and Robbins et al. 1989.

Table 4.9 concluded on following page

Table 4.9 (Concluded). List of species, number of individuals detected, individuals per sq. Km, relative abundance and area sensitivity of birds detected within a 75 mradius of the census points during the breeding season censuses conducted at the Little Vermilion River site, Vermilion Co., Illinois.

Species Common Name	Total Individuals	Birds per Sq Km	Relative Abundance	Area Sensitivity*
Common Yellowthroat	10	18.80	0.018	
Yellow-breasted Chat	2	3.76	0.004	
Scarlet Tanager	11	20.68	0.020	Moderate
Northern Cardinal	35	65.80	0.063	
Rose-breasted Grosbeak	1	1.88	0.002	Moderate
Indigo Bunting	32	60.16	0.058	
Eastern Towhee	10	18.80	0.018	Moderate
Song Sparrow	4	7.52	0.007	
Field Sparrow	12	22.56	0.022	
Brown-headed Cowbird	27	50.76	0.049	
Baltimore Oriole	1	1.88	0.002	
American Goldfinch	2	3.76	0.004	
Total	555	1043.40	1.000	
Species Richness	52			

* From Hayden et al. 1985 and Robbins et al. 1989.

Appendix 4.1. Habitat requirements for species listed in Table 4.1. (From: Herkert, J.R.editor. 1992. Endangered and Threatened Species of Illinois: Status and Distribution, Volume 2 - Animals. Illinois Endangered Species Protection Board, Springfield, Illinois. 142 pp.)

American Bittern (*Botaurus lentignousus*, Ill. endangered): Nests and forages in tall emergent vegetation over water in fresh water marshes and along lake shores.

Great Egret (*Ardea alba*, Ill. threatened): Nests in single or mixed species colonies. Nests are placed in the upper branches of living and dead trees of various species. A wide range of aquatic habitat types are used for foraging.

Little Blue Heron (*Egretta caerulea*, IL endangered): Typically nests in association with other heron species. Nest usually in dense thickets of young trees. Feeds in shallow waters of lagoons, marshes and swampy areas.

Sandhill Crane (*Grus canadensis*, IL endangered): Nests in large undisturbed freshwater marshes and prairie ponds. Nest are usually a large mound of grass or uprooted plants placed on the ground or in shallow water.

Bald Eagle (*Haliaeetus leucocephalus*, Federally and IL endangered): Inhabit relatively undisturbed area near large rivers and lakes. Nest built in upper branches of large trees and often used by the same birds for many years.

Sharp-shinned Hawk (*Accipiter striatus*, Ill. endangered): Nests and forages in deciduous and coniferous forests and open woodlands. Nest is usually near trunk in tall conifer.

Cooper's Hawk (*Accipiter cooperii*, Ill. endangered): Nests and forages in mature deciduous forests but also occurs in open woodlands and along forest edges.

Red-shouldered Hawk (*Buteo lineatus*, IL endangered): Inhabits moist and riparian forests and wooded swamps. Forages in forest edge and open woodlands. The nest, which is often reused, is usually placed in the crotch of a large tree.

Long-eared Owl (*Asio otus*, IL endangered): Winters in gregarious flocks in dense pine stands. Nests in coniferous or mixed forests. Nest in old crow, hawk or squirrel nests but sometimes in cavities or on ground.

Short-eared Owl (*Asio flammeus*, IL endangered): Nests on the ground in open country including prairies, meadows, marshes, savannas and dunes. May prefer wet prairie habitat in Illinois, but may also use agricultural set-aside land. Nearly all recent Illinois records are from grassland areas at least 50 ha in size.

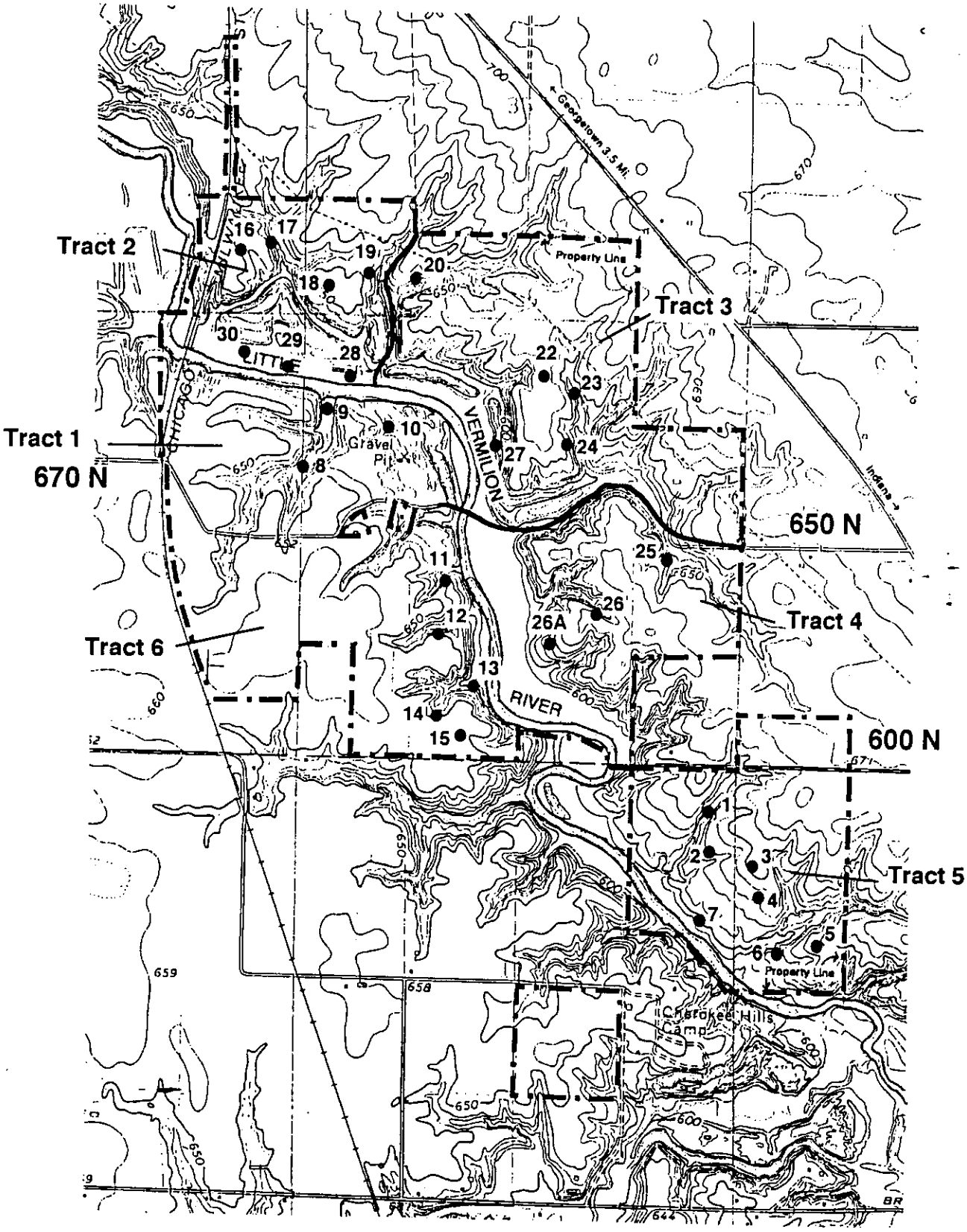
Appendix 4.1 concluded on following page

Appendix 4.1 (Concluded). Habitat requirements for species listed in Table 4.1. (From: Herkert, J.R.editor. 1992. Endangered and Threatened Species of Illinois: Status and Distribution, Volume 2 - Animals. Illinois Endangered Species Protection Board, Springfield, Illinois. 142 pp.)

Brown Creeper (*Certhia americana*, IL threatened): Inhabits deciduous and mixed woodlands with cypress swamps and flood plain forests being the preferred habitat in Illinois. Nest usually concealed behind loose and peeling bark on living or dead trees.

Veery (*Catharus fuscescens*, IL threatened): Usually nests in moist deciduous woods with relatively dense understory. Also in savannas, bogs and successional fields.

Henslow's Sparrow (*Ammodramus henslowii*, Ill. endangered): Nests and forages in tall, dense grasslands over 50 acres in size with a well developed thatch layer.



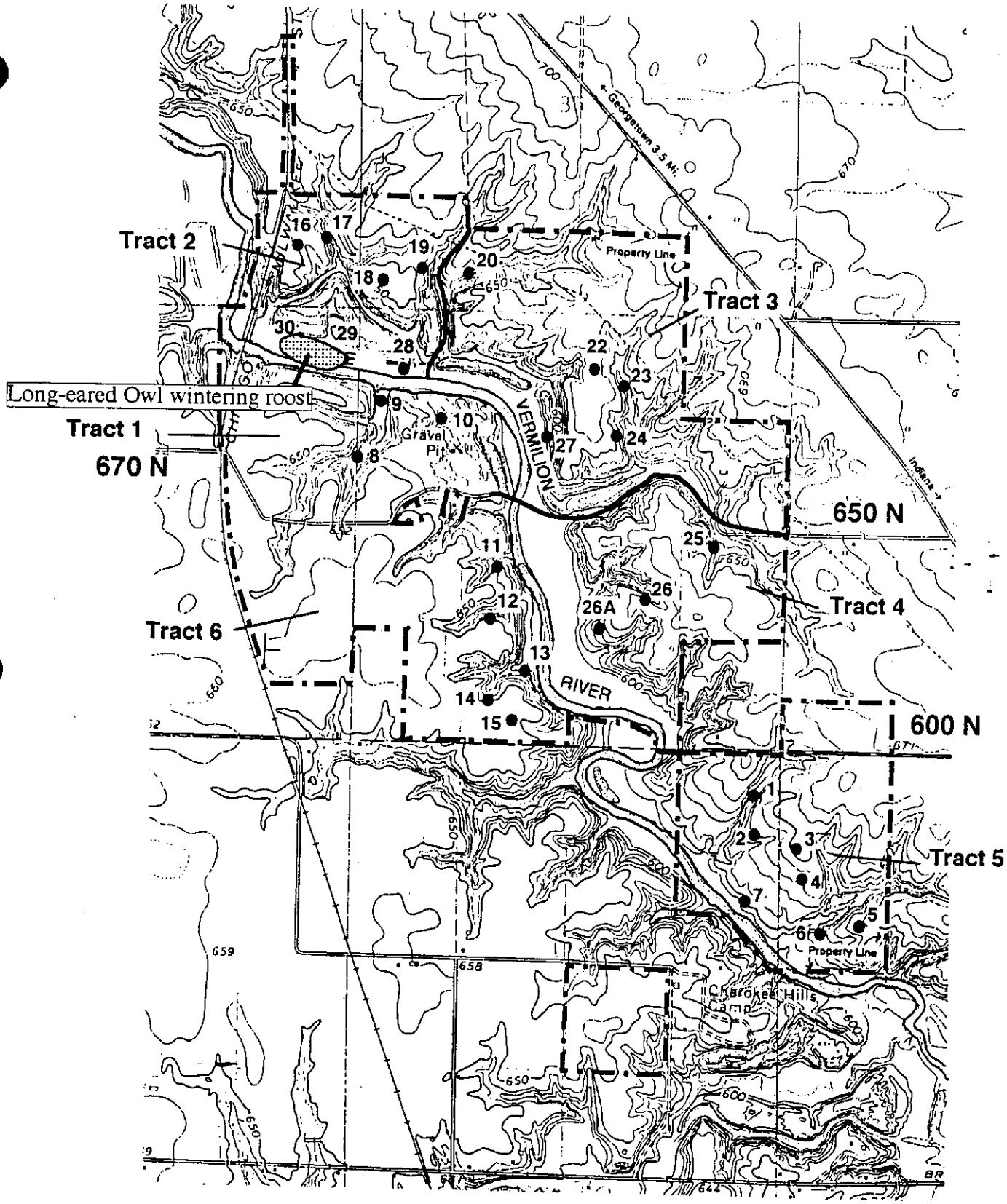
NORTH

1" = 1700'

LITTLE VERMILION AREA

Illinois Department of Natural Resources

Figure 4.1 Bird census point locations, 1995-1996.



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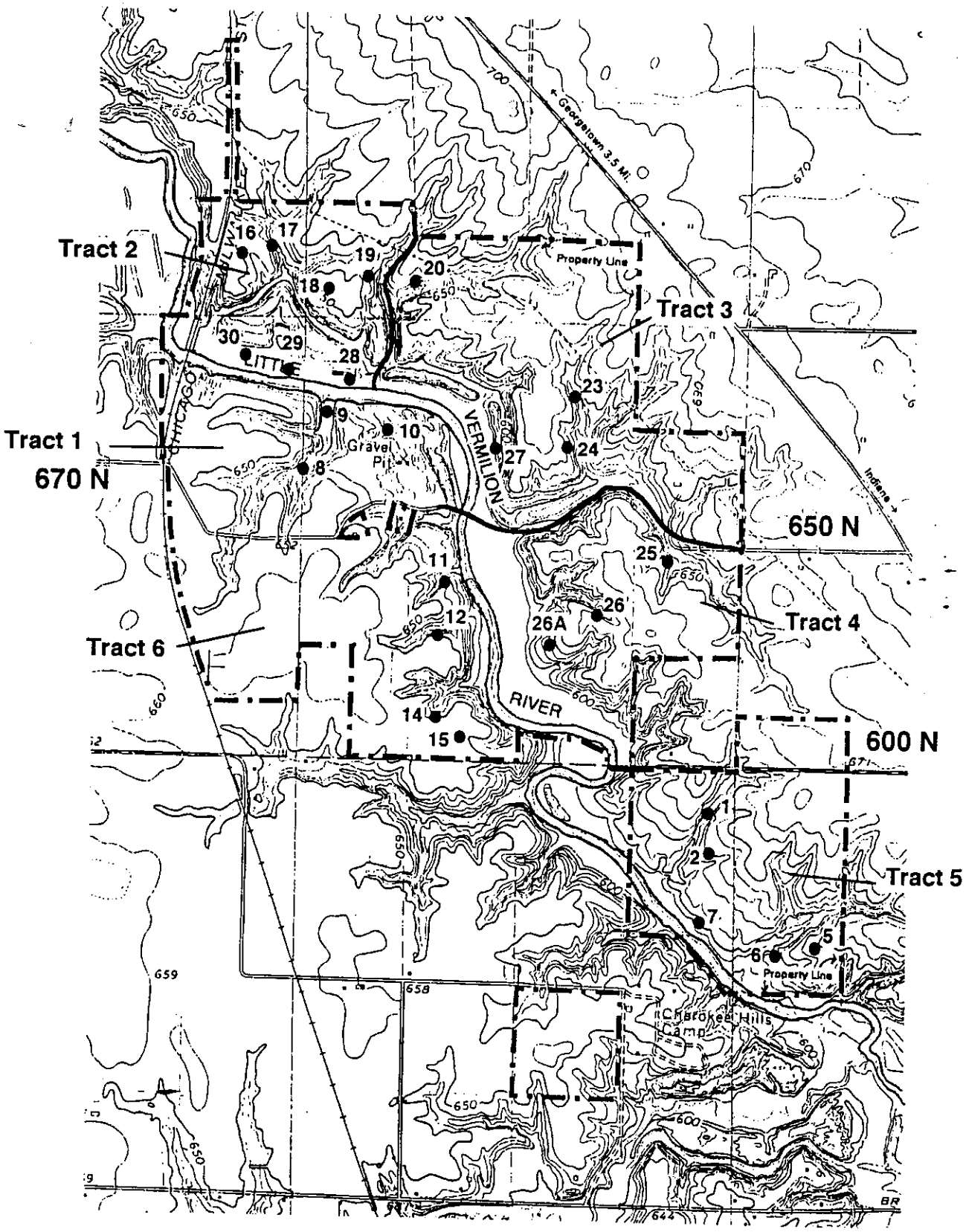
LITTLE VERMILION AREA

Illinois Department of Natural Resources

Figure 4.2 Location of Long-eared Owl winter roost, 1995-96.



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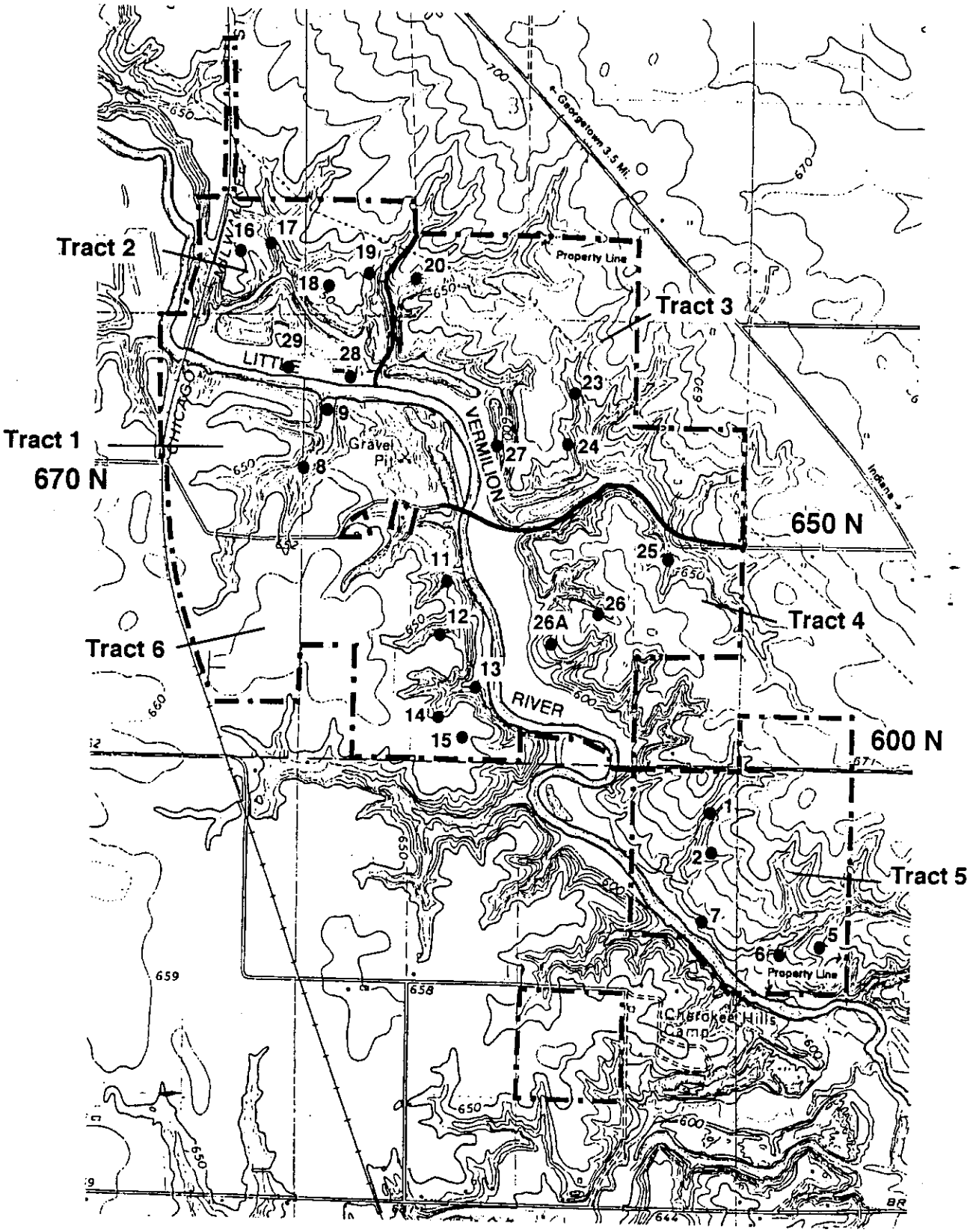
LITTLE VERMILION AREA

Illinois Department of Natural Resources

Figure 4.3 Census points from which Acadian Flycatchers were observed during 1996 breeding season.



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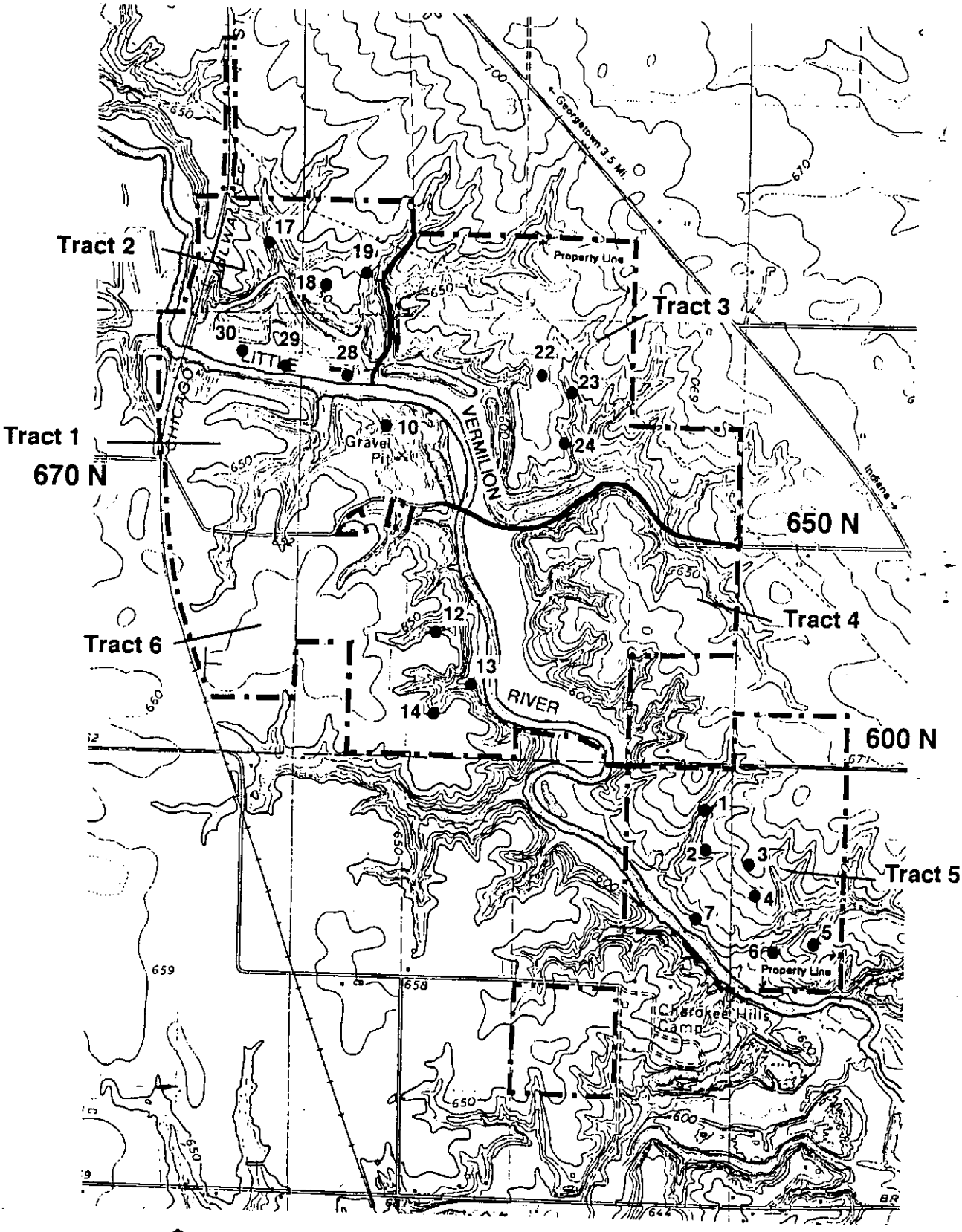
LITTLE VERMILION AREA

Illinois Department of Natural Resources

Figure 4.4 Census points from which Eastern Wood-Pewees were observed during the 1996 breeding season.



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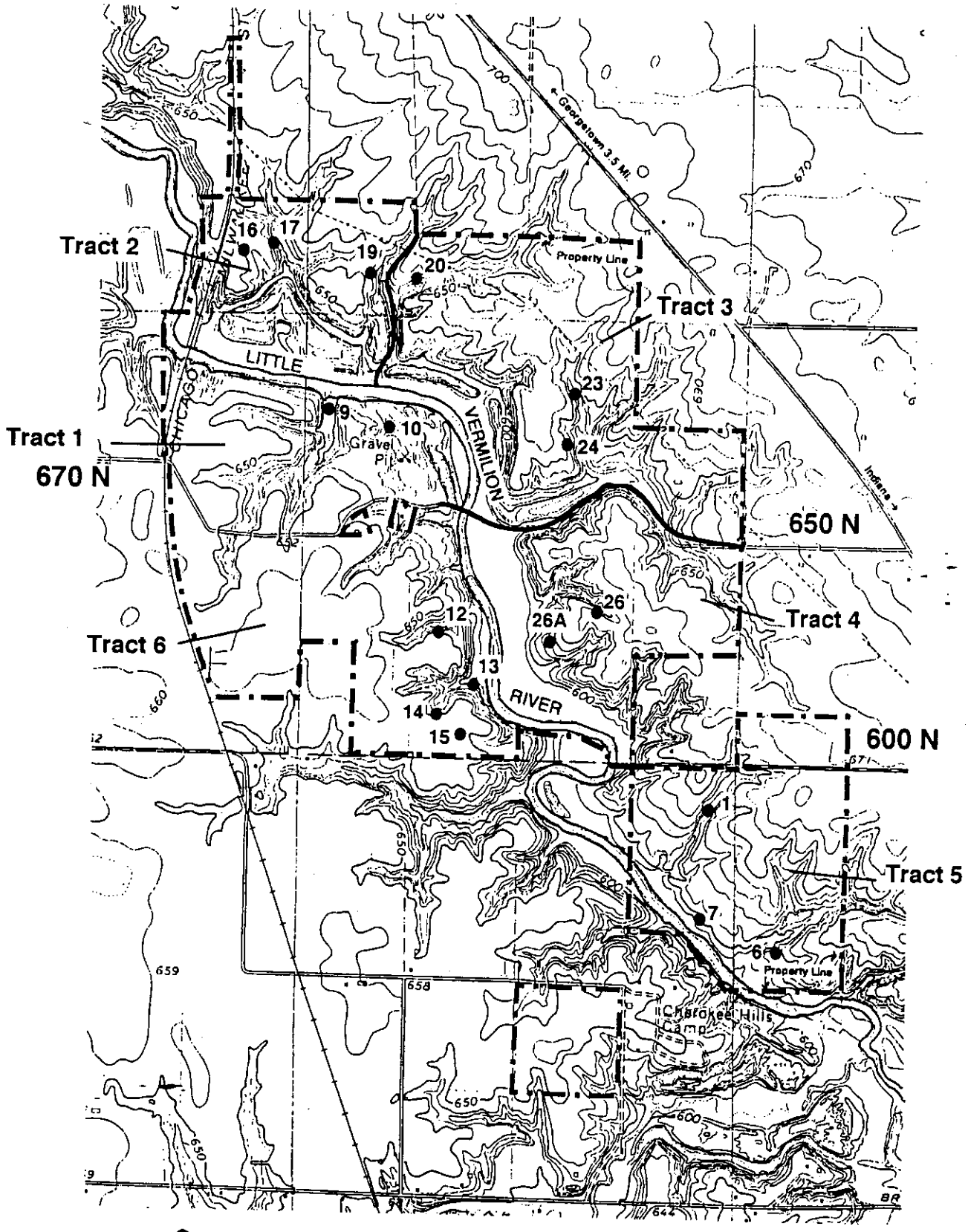
LITTLE VERMILION AREA

Illinois Department of Natural Resources

Figure 4.5 Census points from which Great-crested Flycatchers were observed during the 1996 breeding season.



NORTH
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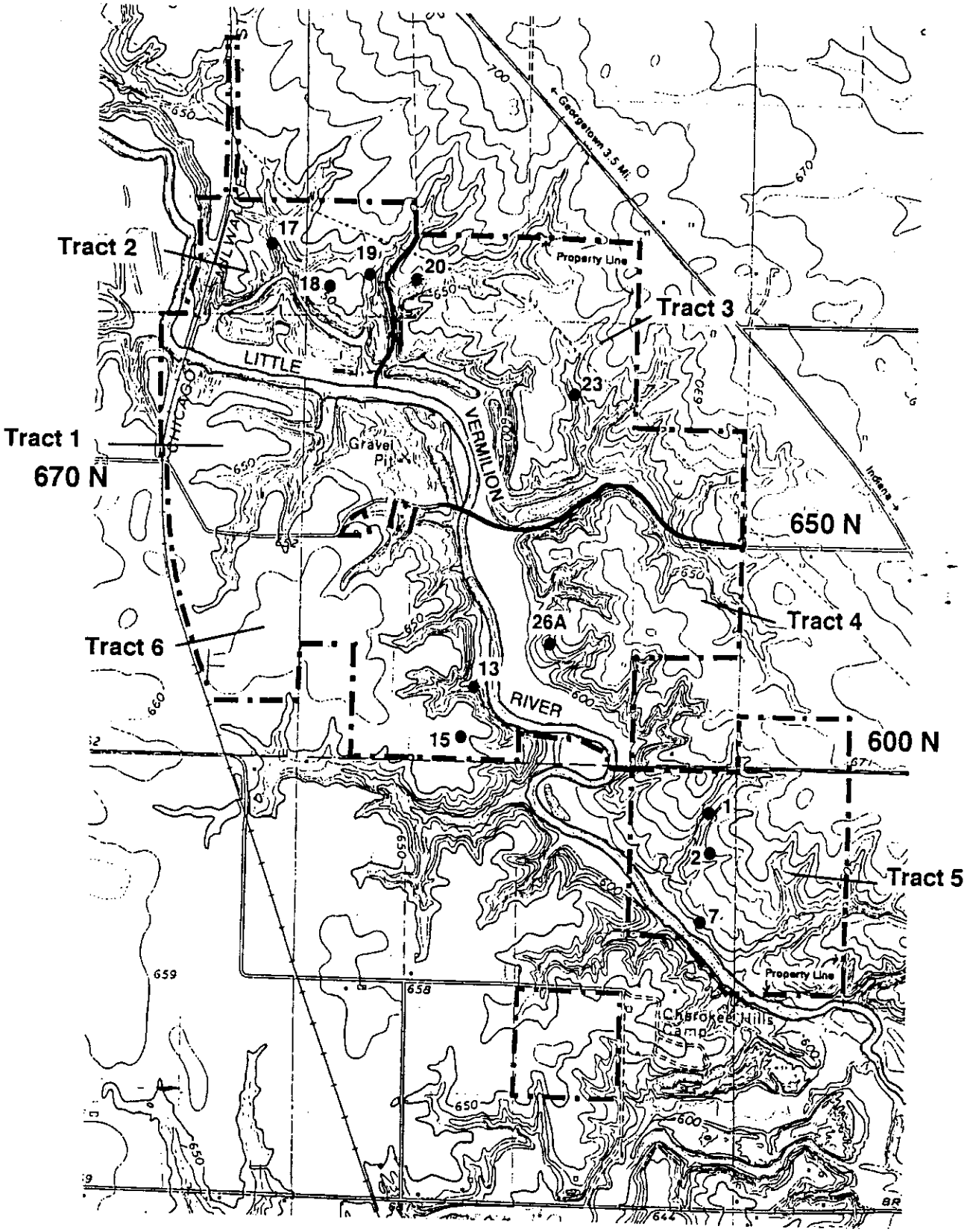
LITTLE VERMILION AREA

Illinois Department of Natural Resources

Figure 4.6 Census points from which Red-eyed Vireos were observed during the 1996 breeding season.



NORTH
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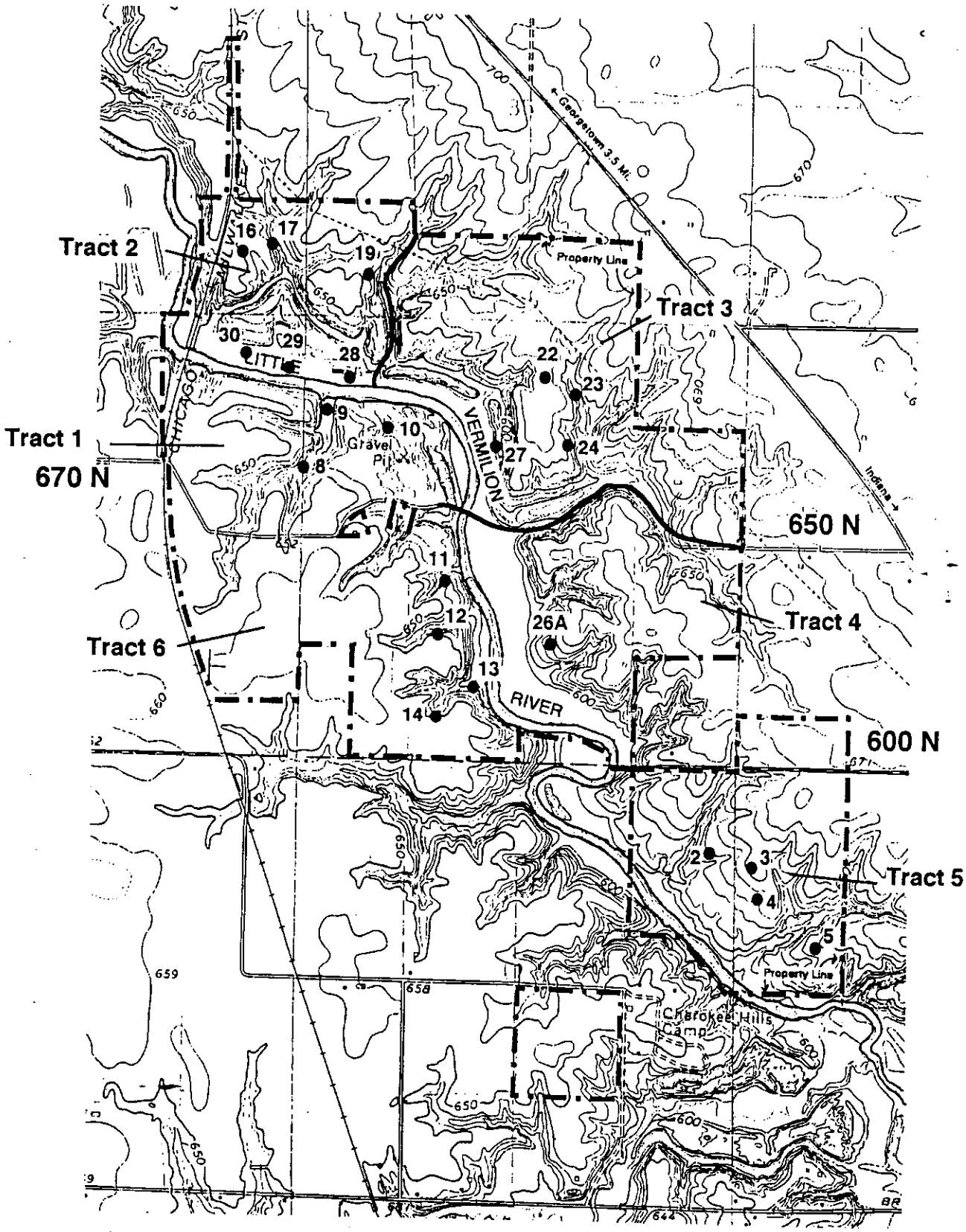
LITTLE VERMILION AREA

Illinois Department of Natural Resources

Figure 4.7 Census points from which Wood Thrushes were observed during the 1996 breeding season.



NORTH
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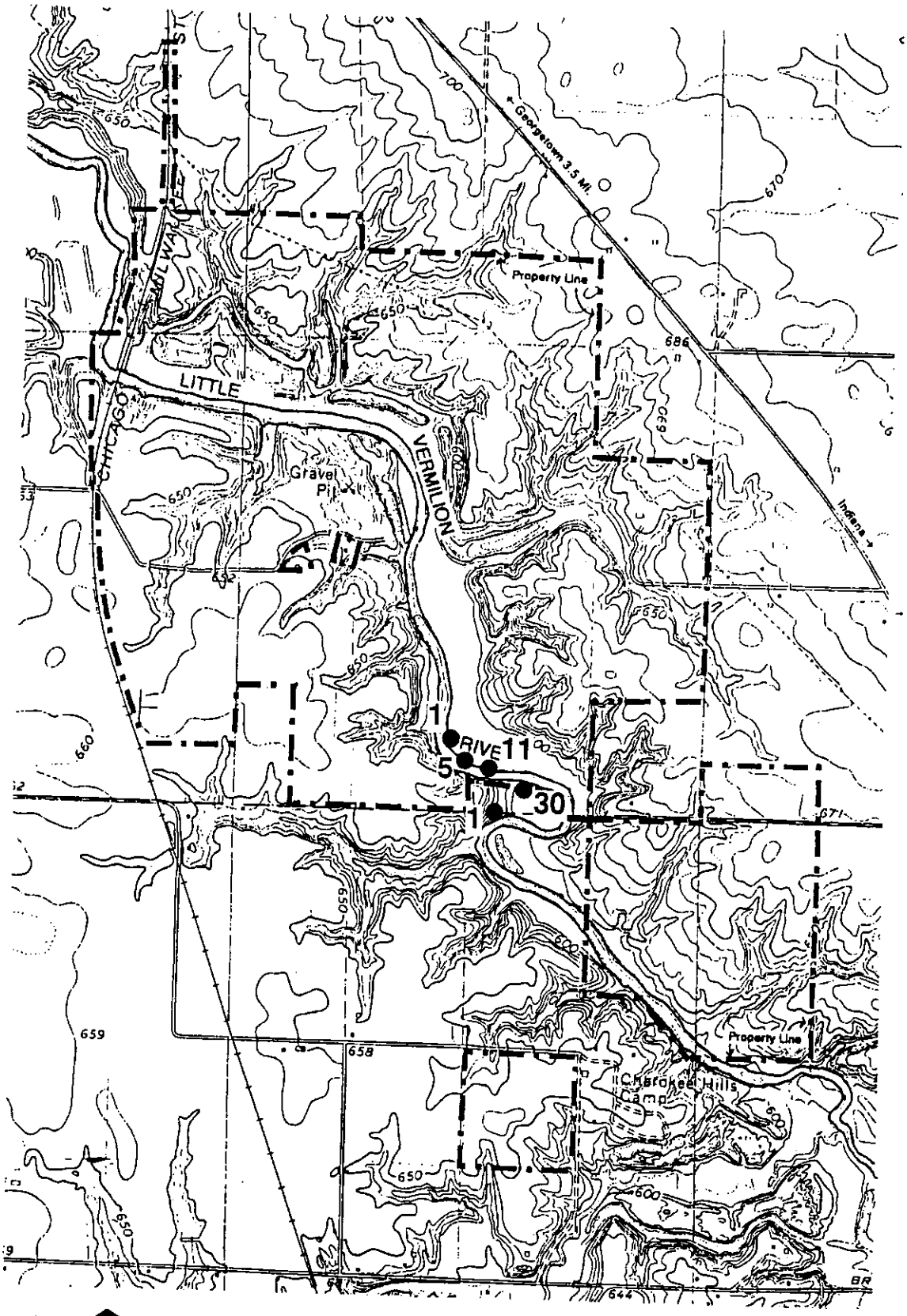
LITTLE VERMILION AREA

Illinois Department of Natural Resources

Figure 4.8 Census points from which Indigo Buntings were observed during the 1996 breeding season.



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LITTLE VERMILION AREA

Illinois Department of Natural Resources

Figure 4.9 Approximate location of heronry during 1995-1996 breeding seasons. Dots represent nest clusters. Numbers indicate active nests in each cluster.

Chapter 5. A Survey for the Federally Endangered Indiana Bat (*Myotis sodalis*) at the Little Vermilion River State Natural Area, Vermilion County, Illinois

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INTRODUCTION

A parcel of land owned by the Peabody Coal Company near Humrick in Vermilion County was acquired by the Illinois Department of Natural Resources (IDNR) in 1995. The site currently is designated the Little Vermilion River State Natural Area (LVRSNA) and encompasses 423 ha, primarily upland forest, successional fields and a stretch of the Little Vermilion River which has been classified as an A stream (IBSC Work Group 1995). As part of a biological survey of the site conducted by scientists from the Illinois Natural History Survey (INHS) during 1996, mist netting for bats was conducted along the Little Vermilion River to determine if the Indiana bat (*Myotis sodalis*), a state and federally endangered species (Illinois Endangered Species Protection Board 1994, U.S. Fish and Wildlife Service 1991), was present.

Indiana bats congregate in a limited number of caves and mines for hibernation, but are more widely dispersed during the summer (Barbour and Davis 1969). In the Midwest, reproductively active females are known to form maternity colonies in northern Indiana, southern Michigan, southern and central Illinois, northern Missouri, and southern Iowa (e.g. Kurta 1980, Clawson 1986, Clark et al. 1987, 3D/Environmental Services, Inc. 1993, Gardner et al. 1996). Indiana bat maternity colonies roost primarily beneath slabs of exfoliating bark on dead trees, but have also been found beneath the "shaggy" bark of certain live hickories (*Carya*) and in tree cavities (Cope et al. 1973; Humphrey et al. 1977; Gardner et al. 1991a; Callahan 1993; Kurta et al. 1993a, 1993b, 1996). Males and non-reproductive females may roost in caves or abandoned mines as well as trees during the summer. Roost trees used by this species have been located in both upland and floodplain forests (Gardner et al. 1991a, Callahan 1993). Most roost trees are relatively large with a diameter at breast height (dbh) of at least 30 cm (Gardner et al. 1991a; Callahan 1993; Kurta 1993a, 1996). Tree species that have been used by Indiana bat maternity colonies in Illinois are slippery elm (*Ulmus rubra*), northern red oak (*Quercus rubra*), shagbark hickory (*Carya ovata*), silver maple (*Acer saccharinum*), cottonwood (*Populus deltoides*), post oak (*Q. stellata*), bitternut hickory (C. *cordiformis*), white oak (*Q. alba*), American elm (*U. americana*), sycamore (*Platanus occidentalis*), sweet pignut hickory (*C. ovalis*), and green ash (*Fraxinus pennsylvanica*) (Gardner et al. 1991a; Kurta et al. 1993a; Gardner and Hofmann, unpublished data). Indiana bats forage both in and along the edges of the canopy of floodplain and upland forests (Humphrey et al. 1977, LaVal et al. 1977, Brack 1983, Clark et al. 1987, Gardner et al. 1991a).

A Habitat Suitability Index (HSI) model for the summer habitat of female and juvenile Indiana bats has been developed by Rommé et al. (1995). This model assumes that optimal roosting habitat would have intermediate canopy cover (60 to 80%), overstory trees with a mean dbh of at least 40 cm, more than 14 potential roost trees (snags) per hectare, an open understory (≤ 30% cover), and live trees belonging to species that would provide potential roost sites in the future. Optimal foraging habitat would have a moderately closed overstory canopy and an open understory. The suitability of an area can be reduced because of distance to water or limited forest cover. If less than 5% of an area is forested, the HSI of the site is assumed to be zero.

There are no records of Indiana bats from Vermilion County or adjacent Illinois counties in Hoffmeister (1989). A post-lactating female Indiana bat was captured on the Little Vermilion River east of Georgetown (T.18N, R.11W, SW/4 Sec. 33, Humrick 7.5' quadrangle) in August 1990 (Figure 5.1; Illinois Natural Heritage Database [INHD], IDNR, Division of Natural Heritage). This female was fitted with a radio-transmitter and tracked to two diurnal roost trees (Gardner and Hofmann, unpublished data). For three consecutive days she was found roosting in a dead, 34-cm-dbh sweet pignut hickory located near the edge of a grazed, forested drainage (T.17N, R.11W, NW/4 Sec. 12; Figure 5.1). This tree was located within what is now the LVRSNA. During the next two days the female roosted in a dead, 48-cm-dbh green ash on the bank of the river (T.17N, R.11W, NW/4 Sec. 4; Figure 5.1). In July 1994 three juvenile male Indiana bats were mist-netted on the Little Vermilion River north of Humrick and downstream of the LVRSNA (T.17N, R.11W, NW/4 Sec. 13, Humrick 7.5' quadrangle; Figure 5.1; INHD).

METHODS

Mist netting was conducted at two sites on the Little Vermilion River within the LVRSNA during July 1996 (Figure 5.2). Black nylon mist nets (38-mm mesh) that were 12 m in length and could be spread to a width of 2.6 m were used (Avinet, Inc., Dryden, NY). The mist nets were suspended above the river between a pair of 6.2-m tall metal poles. Two nets were stacked vertically and loops at the ends of the nets were attached to a rope and pulley system on each pole. Using the pulley systems, the top of the uppermost net could be raised to a height of 6.2 m and the nets could be lowered to remove bats. The nets were positioned so that they were perpendicular to the river channel and under overhanging branches of trees on the banks. Thus, when the nets were raised they blocked most of the flyway above the river. An additional 12 m net was spread just above water level and adjacent to the high net set in order to catch low-flying bats. A detailed description of this mist-netting system is given in Gardner et al. (1989). The nets were raised at dusk (approximately 2100 h) and checked at 10- to 15-min intervals until midnight or later. Mist netting was conducted on nights when environmental conditions were considered favorable for capturing bats, i.e. no precipitation, no bright moonlight, no strong winds, and temperatures above 9°C (Gardner et al. 1991b).

The following data were recorded for each bat captured: species, sex, age class (juvenile or adult), reproductive condition, and weight. Age class was determined by the degree of closure of the phalangeal epiphyses; juveniles (i.e. young of the year) are recognizable because of the incomplete ossification of the epiphyses (Barbour and Davis 1969). The reproductive condition of males was assessed by the size of the epididymides which are covered by pigmented sheaths and located lateral to the tail. Sexually mature males have enlarged or distended epididymides which can be seen through the interfemoral membrane (Racey 1988). Pregnant females were recognized by gently palpating the fetus through the abdomen, and lactating and post-lactating females by examination of the teats. Weights were determined by suspending the bats from a Pesola scale and recorded to the nearest 0.1 g. Bats were released at the capture site immediately after examination.

RESULTS

Net site A was located in the northern portion of the LVRSNA where the Little Vermilion River flows to the east (T.17N, R.11W, NW/4 Sec. 2, Humrick 7.5' quadrangle; Figure 5.2). At the net site the river channel was approximately 15 m wide and water about 0.5 m deep filled nearly the entire channel. Just upstream where a large, partially vegetated gravel bar had been exposed the water was much narrower. The water was flowing at the netting location, but along most of this stretch of the river the water was in pools. The river bottom consisted primarily of sand and gravel. Because of the width of the channel there was no canopy above most of the river. The net site was selected because it was a place where the branches of trees on the two banks almost met. A relatively steep slope covered with upland forest rose from the south side of the river. The north bank was 2 m high with a terrace forest on top. Trees occurring along the river banks included sycamores, cottonwoods, box elders (*Acer negundo*), and silver maples. Mist netting was conducted on the night of 16 July 1996. The nets were raised at 2050 h and checked until 2400 h. The sky was cloudy, the air calm, and the temperature at dusk 24°C. There was an abundance of flying insects at the site, including an unusually large number of dobsonflies (*Corydalus cornatus*) which became entangled in the nets.

Three bats representing three species were captured at this site (Table 5.1). A lactating female Indiana bat was caught relatively early during the netting session (at 2120 h) and appeared to be flying upstream when she entered the net. A red celluloid split-ring bird band (size XCL) marked with the number 179 was placed on the left forearm of this bat for future identification.

Table 5.1. Bat capture data for site A, Little Vermilion River, Vermilion County, 16 July 1996

Species	Common Name	No.	Age	Sex	Reprod.
Myotis septentrionalis	northern long-eared bat	1	A	M	NR
Myotis sodalis	Indiana bat	1	A	F	L
Pipistrellus subflavus	eastern pipistrelle	1	A	F	PG

Sex: M = male, F = female; Age: A = adult; Reproductive condition: PG = pregnant, L = lactating, NR = non-reproductive

Net site B was located downstream of site A where the Little Vermilion River flows to the south (T.17N, R.11W, SW/4 Sec. 2, Humrick 7.5' quadrangle; Figure 5.2). The channel in this area was about 20 m wide. At the net site most of the channel was filled with water although a large gravel bar was exposed just upstream. The water was very shallow (0.15 m) and relatively clear. The nets were placed across a riffle, but most of this stretch of the river consisted of pools, with riffles located 200-300 m apart. The substrate was composed primarily of sand and gravel. The channel was too wide for trees on the banks to form a closed canopy above the river. The net site was located at a place where the branches of a sycamore and a basswood (*Tilia americana*) on opposite banks almost met above the water. Both river banks were steep and approximately 2 m high. A large tract of upland forest occurred on the west side of the river. On the east bank there was a narrow (10 m) wooded riparian zone beyond which lay a large successional field. Mist netting was conducted on the night of 17 July 1996. The nets were raised at 2040 h and checked until 0100 h. The sky was partly cloudy, but moonlight was minimal because there had been a new moon two nights earlier. The air was calm and the temperature at dusk was approximately 25°C. The abundance of flying insects at this site was somewhat lower than it had been at site A.

Six individuals representing five species were captured at site B (Table 5.2). Four of these species had not been caught at site A, bringing the total number of species recorded in the LVRSNA to seven.

Table 5.2. Bat capture data for site B, Little Vermilion River, Vermilion County, 17 July 1996

Species	Common Name	No.	Age	Sex	Reprod.
Eptesicus fuscus	big brown bat	1	A	F	L
Lasiurus borealis	red bat	1	J	F	NR
Lasiurus cinereus	hoary bat	1	A	F	L
Myotis lucifugus	little brown bat	2	A	F	L
Pipistrellus subflavus	eastern pipistrelle	1	A	F	L

Sex: F = female; Age: A = adult, J = juvenile; Reproductive condition: L = lactating, NR = non-reproductive

DISCUSSION

Mist netting along the Little Vermilion River within the LVRSNA during 1996 resulted in the capture of a lactating female Indiana bat. This confirms the presence of an Indiana bat maternity colony in the vicinity. The existence of this colony had been revealed by captures of a post-

lactating female and three juveniles in 1990 and 1994, respectively (INHD). Indiana bats are known to display loyalty to their summer ranges so it is highly likely that the species will continue to use this area in the future (Cope et al. 1973, Humphrey et al. 1977, Gardner et al. 1996, Kurta et al. 1996). At the time of her capture the female Indiana bat was either foraging above the river or using the river as a travel corridor between a diurnal roost tree and a foraging area. The roost trees used by members of this colony may be located within the LVRSNA or on adjacent private property. It has been demonstrated by radiotelemetry that Indiana bats may fly long distances to forage. In west-central Illinois pregnant and lactating females traveled a mean distance of 1 km from their roost to the center of their foraging areas (Gardner et al. 1991a). In an Indiana study the distance from an individual's diurnal roost to the center of its foraging area ranged from 0 to 3.7 km and the maximum distance a bat was found from a roost was 4.6 km (Black et al. 1996). Indiana bats use more than one roost tree during the summer; for example a colony in Michigan roosted in up to 18 trees during a summer, although only two to four trees were heavily used each year (Kurta et al. 1996). Roost trees used by a colony may be confined to a small area (the mean distance between roost trees in Michigan was 38.7 m [Kurta et al. 1996]), but may be separated by as much as 3 km (Callahan 1993). The only efficient method for identifying specific roost trees used by members of the LVRSNA maternity colony would be to obtain a federal permit to radio-track one or more reproductive females during the summer of 1997.

If the roost trees used by this colony are located in the LVRSNA an obvious management goal for the site would be maintaining its suitability as roosting habitat for Indiana bats. If the trees are located on private property it may be advisable to consult the landowners and determine if they are amenable to limiting tree removal to the period when bats would not be present (1 September until 15 April) or having IDNR personnel check potential roost trees for occupancy by bats before they were cut during the spring or summer. Otherwise, it would be important for the LVRSNA to provide suitable Indiana bat habitat in case alteration of nearby habitat deprives the colony of roosting sites.

As described in the introduction to this chapter, Indiana bat maternity colonies use dead trees with exfoliating bark, tree cavities, and some live hickories as roost sites. Because bats occupy several trees each summer an area should have a relatively large number of potential roost trees. There is also a natural attrition of roost trees because eventually the bark will slough off or the tree will fall. Additional potential roost trees must continually become available to replace trees that are no longer suitable. Therefore, the HSI model for female and juvenile Indiana bats states that optimal roosting habitat would have more than 14 potential roost trees (large snags) per ha and a high proportion of tree species that would provide potential roost sites in the future (Rommé et al. 1995). Although the forest is relatively young in some areas of the LVRSNA, other parts of the site are covered with mature forest. During visits to the site not many large-diameter snags were observed. However, numerous sycamores containing cavities were found to occur along the river and large shagbark hickories were found in the uplands. The species composition of forests at the LVRSNA is highly favorable for Indiana bat roosting habitat. Dominant upland species include red oak, black oak (*Q. velutina*), and white oak as well as shagbark hickory. Dominants in the floodplain forest include sycamore, cottonwood, silver maple, and green ash. Other favorable features of the LVRSNA are the overall amount of forest cover on the site and the presence of water (Little Vermilion River and ponds). The area has the potential to provide optimal Indiana bat roosting habitat in the future as mid-successional forest matures and individual trees senesce and die. Management of the area as Indiana bat habitat would simply require the preservation of large snags as well as live shagbark hickories and riparian sycamores with cavities.

The LVRSNA is also noteworthy for the species richness of its bat fauna; seven of the nine species that could occur in central Illinois were caught during this survey. Captures of lactating females and a juvenile indicated that five species, in addition to the Indiana bat, breed in the area. Red (*Lasiurus borealis*) and hoary (*L. cinereus*) bats are solitary species in which a female and her young roost among the foliage of trees (Barbour and Davis 1969). Eastern pipistrelles (*Pipistrellus*

subflavus) appear to form small maternity colonies that may roost in trees or buildings (Barbour and Davis 1969, Hoffmeister 1989). Little brown (*Myotis lucifugus*) and big brown (*Eptesicus fuscus*) bat maternity colonies commonly roost in buildings (Barbour and Davis 1969). Buildings at the LVRSNA could be checked for the presence of maternity colonies during the summer of 1997. If bats are using a building, it should be maintained at least until the autumn. If the demolition of such a building is necessary, large (nursery) bat houses could be erected in the vicinity to accommodate the colony when it returns to the site the following spring. Nursery houses could also be erected on the LVRSNA to provide roosts for colonies that might be evicted from adjacent private property.

Acknowledgments

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Literature Cited

Barbour, R.W. and W.H. Davis. 1969. Bats of America. The University Press of Kentucky, Lexington. 286 pp.

Black, A., R. Rommé, J. Salyers, and A. Schmidt. 1996. Radiotelemetry of Indiana bats at the Indianapolis International Airport. Twenty-sixth North American Bat Research Symposium, Bloomington, IL.

Brack, V., Jr. 1983. The foraging ecology of bats in Indiana with emphasis on the endangered Indiana bat, *Myotis sodalis*. Ph.D. dissertation, Purdue University, West Lafayette, IN.

Callahan III, E.D. 1993. Indiana bat summer habitat requirements. M.S. thesis, University of Missouri, Columbia. 74 pp.

Clark, B.K., J.B. Bowles, and B.S. Clark. 1987. Summer habitat of the endangered Indiana bat in Iowa. American Midland Naturalist 118:32-39.

Clawson, R. L. 1986. An investigation of the summer distribution and status of Indiana bats in Missouri. Unpubl. report, Missouri Department of Conservation, Columbia. 16 pp.

Cope, J.B., A.R. Richter, and R.S. Mills. 1973. A summer concentration of the Indiana bat, *Myotis sodalis*, in Wayne County, Indiana. Proceedings of the Indiana Academy of Science 83:482-484.

Gardner, J.E., J.D. Garner, and J.E. Hofmann. 1989. A portable mist netting system for capturing bats with emphasis on *Myotis sodalis* (Indiana bat). Bat Research News 30:1-8.

Gardner, J.E., J.D. Garner, and J.E. Hofmann. 1991a. Summer roost selection and roosting behavior of *Myotis sodalis* (Indiana bat) in Illinois. Final report, submitted to Endangered Species Coordinator, Region 3, U.S. Fish and Wildlife Service and Indiana/Gray Bat Recovery Team, U.S. Fish and Wildlife Service. vii+56 pp.

Gardner, J.E., J.D. Garner, and J.E. Hofmann. 1991b. Summary of *Myotis sodalis* summer habitat studies in Illinois: with recommendations for impact assessment. Unpubl. report, presented at Indiana/Gray Bat Recovery Team meeting, Columbia, MO. 28 pp.

Gardner, J.E., J.E. Hofmann, and J.D. Garner. 1996. Summer distribution of the federally endangered Indiana bat (*Myotis sodalis*) in Illinois. Transactions of the Illinois State Academy of Science 89:187-196.

Hoffmeister, D.F. 1989. Mammals of Illinois. University of Illinois Press, Urbana. 348 pp.

Humphrey, S.R., A.R. Richter, and J.B. Cope. 1977. Summer habitat and ecology of the endangered Indiana bat, *Myotis sodalis*. Journal of Mammalogy 58:334-346.

Illinois Biological Stream Characterization Work Group. 1995. Biological stream characterization of Illinois streams 1995 [map]. Illinois Environmental Protection Agency, Illinois Department of Conservation, and Illinois Natural History Survey.

Illinois Endangered Species Protection Board. 1994. Checklist of endangered and threatened animals and plants of Illinois. Illinois Department of Conservation, Springfield. ii+20 pp.

Kurta, A. 1980. Status of the Indiana bat, *Myotis* sodalis, in Michigan. Michigan Academician 13:31-36.

Kurta, A., J. Kath, E.L. Smith, R. Foster, M.W. Orick, and R. Ross. 1993a. A maternity roost of the endangered Indiana bat (*Myotis sodalis*) in an unshaded, hollow sycamore tree (*Platanus occidentalis*). American Midland Naturalist 130:405-407.

Kurta, A., D. King, J.A. Teramino, J.M. Stribley, and K.J. Williams. 1993b. Summer roosts of the endangered Indiana bat (*Myotis sodalis*) on the northern edge of its range. American Midland Naturalist 129:132-138.

Kurta, A., K.J. Williams, and R. Mies. 1996. Ecological, behavioural, and thermal observations of a peripheral population of Indiana bats (*Myotis sodalis*). Pages 102-117 *in* Bats and Forests Symposium. R.M.R. Barclay and R.M. Brigham, eds. Research Branch, British Columbia Ministry of Forests, Victoria, Working Paper 23:1-292.

LaVal, R.K., R.L. Clawson, M.L. LaVal, and W. Caire. 1977. Foraging behavior and nocturnal activity patterns of Missouri bats, with emphasis on the endangered species *Myotis grisescens* and *Myotis sodalis*. Journal of Mammalogy 58:592-599.

Racey, P.A. 1988. Reproductive assessment in bats. Pages 31-45. *in* Ecological and behavioral methods for the study of bats. T.H. Kunz, ed. Smithsonian Institution Press, Washington, D.C. 533 pp.

Rommé, R.C., K. Tyrell, and V. Brack, Jr. 1995. Literature summary and habitat suitability index model: components of summer habitat for the Indiana bat, *Myotis sodalis*. Final report, submitted to Indiana Department of Natural Resources. 190 pp.

3D/Environmental Services, Inc. 1993. A model of summer habitat use by the federally endangered Indiana bat (*Myotis sodalis*) in Indiana: compilation of data from 1990-1992 field studies. Unpubl. report, submitted to Indiana Department of Natural Resources, Endangered Species Program. Project E-1-7, Study No.8.

U.S. Fish and Wildlife Service. 1991. Endangered and threatened wildlife and plants; animal candidate review for listing as endangered and threatened species. 50 CFR Part 17. Federal Register 56(225):58804-58836.