



# ILLINOIS NATURAL HISTORY SURVEY

## T E C H N I C A L   R E P O R T

### Habitat Inventory and Search for Ivory-billed Woodpeckers in the Cache River Watershed, Illinois

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# **Habitat Inventory and Search for Ivory-billed Woodpeckers in the Cache River Watershed, Illinois**

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## **Background and Justification**

The Ivory-billed Woodpecker (*Campephilus principalis*) historically was a common occupant of floodplain forests of the southeastern United States. By 1900, its numbers and range had been reduced substantially as a result of habitat loss and various types of persecution. The last known population was studied in a remnant patch of old-growth forest known as the Singer Tract in northeast Louisiana during the late 1930's by J. Tanner. The Singer Tract was subsequently logged and the population of Ivory-billed Woodpeckers (IBWOs) did not persist. Since then, many individual sightings of IBWOs have occurred, mostly in or near the few remaining large patches of contiguous bottomland forest in the southeastern U.S. For many years the IBWO was thought to be extinct because of the lack of compelling evidence to the contrary. During the past six decades, efforts to conserve and restore bottomland forest ecosystems have resulted in the protection of a number of mature bottomland forests and in the completion of several large-scale reforestation projects within the historic range of the IBWO.

In 2004, the IBWO was “rediscovered” in the Cache and lower White River basins in Arkansas. This evidence coupled with more recent evidence of the presence of IBWOs along the Florida panhandle and in South Carolina has motivated numerous agencies, NGOs, and individuals to initiate, coordinate and continue efforts to search for IBWOs in mature bottomland forests throughout their historic range. These searches are being coordinated range-wide, but are organized and conducted at the state-level whereby areas of substantial mature bottomland forest (promising habitat) and/or locations where sightings of IBWOs have been reported are searched.

The northern extent of the historical range of the Ivory-billed Woodpecker was thought to include the southern tip of Illinois, particularly along the Mississippi and Ohio Rivers. Audubon noted seeing Ivory-billed Woodpeckers along the Mississippi River from near the confluence of the Ohio and Mississippi Rivers to as far north as the Missouri River, and Robert Ridgeway believed that he saw one not far from the confluence of the Wabash and Ohio Rivers in the mid-1800s. There is little to no information available on habitat use or historic numbers of birds in these areas, but IBWOs likely occurred in the once-vast bottomland forests associated with the floodplains of these major river systems. What little old-growth bottomland forest remains in Illinois is moderately to highly fragmented and found primarily in the Cache River watershed in southernmost Illinois. There are presently several thousand acres of old-growth and mature bottomland/swamp forest along the Cache River in Illinois, and an ongoing effort by conservationists has resulted in the conversion of over 15,000 acres of agricultural land to early-successional bottomland forest within the watershed during the past 20 years.

The Cache River watershed of Illinois presently contains >10,000 ha of mature bottomland forest habitat distributed among a National Wildlife Refuge (Cypress Creek NWR) and state-owned Nature Preserves and Natural Areas. Several thousand more hectares will likely be reforested in the coming years. The Cache River watershed in Illinois provides possibly the best habitat for woodpeckers in the state and is home to thousands of Pileated (*Dryocopus pileatus*), Red-bellied (*Melanerpes carolinus*), and Downy (*Picoides pubescens*) Woodpeckers year-round, and also hosts thousands of Red-headed Woodpeckers (*Melanerpes erythrocephalus*) each winter. Tens of thousands of field hours logged in the mature bottomland forests of the Cache River watershed by Avian Ecologists and their research assistants since 1993 have yielded no evidence of the presence of IBWOs. However, other individuals have made unsubstantiated

reports of IBWO sightings from at least two separate locations within the watershed since the beginning of 2005. The combination of habitat, overall woodpecker densities, and recent unsubstantiated sightings of IBWOs warranted an intensification of search efforts in the Cache River watershed of Illinois.

### **Goals and Objectives**

The goals of this proposed research were to search for IBWOs in the Cache River watershed (CRW) of Illinois, inventory habitat, deploy multiple cameras (color and black-and-white) to monitor trees with bark-scaling or large cavities, and coordinate with local as well as national search and inventory efforts. Our specific objectives were to:

1. Actively/Systematically search for IBWOs at the locations (a 2-km<sup>2</sup> area of mature forest centered on each sighting) of where two unsubstantiated sightings of IBWOs have occurred (e.g., Section 8 Woods, and Heron Pond).
2. Actively/Systematically search 8 additional 2-km<sup>2</sup> plots of “suitable” habitat including 4 plots associated with a “trigger” patch (one of the plots in number 1 above), for a total of 10 plots of mature forest searched.
3. Conduct point counts throughout each of the 10 2-km<sup>2</sup> plots to document the diversity and densities of woodpeckers in the watershed during the winter/early-spring period (January-April).
4. Deploy RECONYX cameras to collect images at trees with “promising” cavities or bark scaling and document the visitation to trees by various bird species.

5. Assess and inventory habitat in each of the 10 2-km<sup>2</sup> plots that were searched, and provide information to the region-wide effort that is using site-occupancy modeling techniques to predict where IBWOs are more likely to occur.
6. Passively search for IBWOs within an additional 1,300 ha of mature bottomland forest that was visited every 3-4 days by researchers studying the bottomland forest bird community during the breeding season (April-June).

### **Methodology**

1. Active/Systematic searches were conducted within a 2-km<sup>2</sup> area (centered on the location of sightings) of each of the two locations where unsubstantiated sightings of IBWO have been reported. Searches were conducted during January through April 2008 and followed the general protocols outlined in the Cornell Search Plan, the South Carolina Specific Monitoring and Survey Techniques, and the Region-wide Search Proposal (including the adaptive design) put forth by R. Cooper et al. as part of the IBWO Search and Recovery Plan. Active searches involved slowly, quietly, discretely surveying the two areas of primary interest. Trained searchers looked and listened for IBWOs throughout each area as they walked or kayaked through appropriate habitat along transects separated by approximately 100 m. Searchers covered approximately half of a given 2-km<sup>2</sup> plot of forest during a 5-6 hour period on a given day and these 2 plots were visited at least 3 times.
2. We searched for IBWOs on an additional 8 2-km<sup>2</sup> plots of “suitable” habitat (mature forest of varying quality) for a total of 10 plots (Fig. 1). These 10 plots included the 2 mentioned above (in number 1 of the goals section), 4 plots in association with a

“trigger” patch (the “trigger” is one of the 2 locations mentioned above in number 1 of the goals and methods sections), and 4 other plots chosen from other areas of suitable habitat within the CRW. Five of the focal plots were each searched systematically at least three times during January-April, and the remaining 5 (the “trigger” and its 4 associated patches) were each searched systematically at least five times during the same period (per the adaptive design for the IBWO occupancy protocol).

3. We established 10 or 11 census stations within each of the 10 2-km<sup>2</sup> plots of forest and used a standardized point-count method to document the relative abundance and diversity of woodpeckers during the winter/early spring (January through March 2008). Point-count stations were separated from each other by 300 m. Point counts occurred during morning hours (from a half-hour after sunrise to 1200 hours during the winter) on days with no precipitation and calm to no wind. We visited each point one time during the time period and recorded the location of each census point with a GPS unit. At each point we recorded the compass bearing of and estimated distance to each individual bird heard and seen. Data from these censuses resulted in a list of the species present on the sites (diversity) as well as an estimate of the relative abundance for each species.
4. We searched for trees containing large cavities and trees where bark was being scaled. We used existing classification schemes to categorize cavities and bark scaling as either a) probably associated with a large woodpecker, or b) unlikely associated with a large woodpecker. Those trees with particularly promising cavities or foraging sign (bark scaling) were put on a priority list for RECONYX camera deployment. We used 4 color-image and 2 black-and-white image RECONYX cameras for deployment within the various habitat patches. Cameras were programmed to take an image every 2-10 seconds

from 30 minutes before sunrise to sunset each day. Cameras were deployed for 3-7 days at a time or longer if a) there were no other trees on the priority list or b) there continued to be interesting activity at the location. Memory cards were swapped out (replaced with an empty card) as necessary (depending on memory card size and rate of image-taking) and images downloaded and screened within 1-3 days of memory card collection. With RECONYX camera deployment, our hope was to get an image of an IBWO if one exists in the Cache River watershed, but also to get several images of Pileated Woodpeckers (PIWOs). Given the high density of PIWOs in the watershed, we hoped to document any variation in plumage (amount and location of black and white on feathers) among individual PIWOs that may confuse observers and lead to reports of IBWOs being seen.

5. Habitat surveys and inventories were completed on the 10 actively-searched plots of forest. On each plot, measurements were taken at 5 0.2-acre sub-plots along each of 4 transects (20 sub-plots per plot). These habitat sub-plots coincided with our bird census points whenever possible. In each plot we recorded the number of large (24 to 35-inch dbh) and very large (>36-inch dbh) trees, number of snags (>10-inch dbh), and the dominant tree species.
6. Passive searches for IBWOs occurred on an additional 1,300 ha of mature bottomland forest comprising 12 study sites which were visited every 3-4 days from early April through June to monitor breeding populations of Prothonotary Warblers (*Protonotaria citrea*). Trained field technicians (associated with the research program of J. Hoover) looked and listened for IBWOs while monitoring study populations of Prothonotary Warblers.

7. Data collected from our habitat inventory is being shared with the Site-Occupancy Modeling Team and includes information from the 10 2-km<sup>2</sup> plots of forest. Results from our search efforts are being shared with USFWS, other members of the Joint Venture Partnership in the Cache River watershed (IDNR, IL TNC) as well as with members of the region-wide IBWO search and recovery team (including Cornell and the search teams from all of the states within the historic range of the IBWO).

## **Results and Discussion**

From January through June of 2008, totals of 3,200 person-hours in the field and 1,400 person-hours screening digital images were involved in completing this research project. We visited and searched for IBWOs within the 10 2-km<sup>2</sup> plots of forest (Fig. 1) multiple times, conducted 108 point-counts across the 10 plots, and collected basic forest structure data from nearly 200 sub-plots. In short, we obtained no conclusive evidence of an IBWO being present within the areas we searched.

We recorded 47 species of bird with our point counts (Table 1). Eleven of these species were only detected at distances greater than 100 m from point-count stations, and we were unable to estimate relative abundances for them. Of the remaining 36 species of bird, the most abundant included the Tufted Titmouse (scientific names given in Table 1), Carolina Chickadee, White-breasted Nuthatch, Blue Jay, and various species of woodpecker (Table 1). The two species of woodpecker most commonly mistaken for IBWOs (Pileated and Red-headed) were moderately (0.4 per 10 ha) and highly (2.6 per 10 ha) abundant, respectively. During the winter and early spring months, one can encounter many individuals of both species during the course of walking through mature bottomland forest habitat. The relatively diverse and abundant

woodpeckers are indicative of a mature bottomland forest with ample large trees, standing dead and decaying trees (snags) for nesting and roosting, and food in the form of mast and insects capable of supporting a thriving woodpecker community.

During our search and inventory efforts, we encountered a number of things that sounded somewhat like the “kent” calls or “double-knocks” associated with IBWOs. In all cases, we attempted to track down the sound and determine what was producing it, or hear it enough times to figure out what the sound was and was not. Several different bird species produced sounds that from a distance were “similar” to what would be expected from an IBWO. The variety of species that made sounds similar to an IBWO “kent” call included White-breasted Nuthatch, Blue Jay, Common Grackle, Fish Crow, Wood Duck, and a distant solitary Canada Goose. These sounds were all part of the typical repertoire for this group of species. “Double-knocks” were heard coming from a Pileated Woodpecker, a Hairy Woodpecker on a very large hollowed-out tree, and very distant shotgun blasts and their associated echoes.

In total we screened 2.5 million images at different locations in the search area (Fig. 2). Of this total, there were 129 images of PIWOs (including some from 2 nests, some from bark-scaled trees, and some of birds perched on the trunks of trees with no cavities or bark-scaling) and 67 images of Red-headed Woodpeckers (RHWOs; mostly on bark-scaled trees). We also recorded images of other wildlife (e.g., white-tailed deer, bobcat, fox squirrel, raccoon, Wild Turkey, Wood Duck, Hooded Merganser, Yellow-crowned and Great Blue Heron, and other bird species). We were able to identify all of the objects detected in the images that we screened either to species or to say with certainty that the object was not an IBWO. While the lack of an image of an IBWO does not negate the possibility of one existing in the Cache River watershed

in Illinois, we were unable to obtain any photographic evidence in support of the unsubstantiated reports of sightings of IBWOs that have come from the Cache River watershed in Illinois.

One of our initial goals was to use the cameras in an attempt to determine amounts and kinds of bark scaling that could and could not be attributed to PIWOs. We did not pursue this avenue of research once we realized that in order to meet this goal, we needed to aim our cameras at non-scaled trees and hope that a woodpecker would eventually start the bark scaling process. This would have taken our cameras away from our primary goal of trying to get an image of an IBWO in the search area (if an IBWO existed there). Instead, we focused our cameras on trees that were already in the process of being bark-scaled and found that a variety of species visited the bark-scaled portions of trees once the process had begun (e.g., Pileated, Red-headed, Red-bellied, Downy and Hairy Woodpeckers, Northern Flickers). Therefore, it is difficult to say whether any one species of woodpecker is responsible for initiating the extensive bark scaling that exists throughout the Cache River watershed and many species seem to contribute to the removal of bark from dead and dying trees once the process has begun.

Data on the basic structure of the forest within our search area were derived from vegetation surveys conducted at 173 points distributed throughout the search plots. Our focus was on the basic structure of the forest in terms of the numbers of medium (24-35 inch dbh) to large (>36 inch dbh) living trees, and snags (dead and dying trees) >10 inch dbh. The presence of large hardwood trees (for nest sites) and numerous snags (foraging substrate) is thought to be critical for the presence of large woodpeckers including PIWOs in the present time and IBWOs historically. Averaged over all of the search plots, the mature bottomland forests in the Cache contained substantial numbers of large trees including 11 24-35 inch dbh trees/acre, 4 >36 inch dbh trees/acre, and nearly 6 snags/acre. The primary overstory tree species included oaks,

hickories, baldcypress, tupelo, hackberry and sycamore. Historic habitat for IBWOs has been described often as extensive old forests with large trees and numerous snags. Large birds that nest and roost in tree cavities require large trees so that they can nest high above ground making it harder for predators to find or gain access their nest and roost sites. Also, large old trees tend to have thicker bark and a better microclimate for the wood-boring beetles that are the mainstay of both PIWO and IBWO diets.

The forests of the Cache River watershed may be extensive by Illinois' standards, but they are relatively small and fragmented compared to the vast areas of old bottomland forest that once existed in the places where IBWOs were historically more common (e.g. Florida, Louisiana, Georgia and South Carolina). There are several natural forces that continue to occur in the Cache River watershed in Illinois that help to maintain the presence of the large dead and dying trees that are important to woodpecker populations. These forces include beavers, ice storms, violent weather (wind, lightening and tornadoes), and flooding. Taken together, it may be possible for an IBWO to exist in the Cache River watershed in Illinois, but we currently lack the unequivocal evidence necessary to confirm this possibility. As part of the region-wide search efforts going on in the southeastern states where IBWOs occurred historically, we will continue our search in Illinois (specifically in the Cache River watershed) for at least another year.

Table 1. Species detected during point-counts (n=108) within 10 bottomland forest plots during the winter (January-March) of 2008 in the Cache River watershed in southern Illinois. Relative abundances given as the average number of individuals detected per 100-m radius point count and average number per 10 ha. Woodpecker species given in bold, species arranged alphabetically based on 4-letter code.				
Species code	Species	Average number per*		
		100-m radius point count		10 ha
AMCR	American Crow ( <i>Corvus brachyrhynchos</i> )	0.083		0.265
AMGO	American Goldfinch ( <i>Carduelis tristis</i> )	0.083		0.265
AMRO	American Robin ( <i>Turdus migratorius</i> )	0.009		0.029
BAEA	Bald Eagle ( <i>Haliaeetus leucocephalus</i> )	D		D
BAOW	Barred Owl ( <i>Strix varia</i> )	D		D
BEKI	Belted Kingfisher ( <i>Megacerlye alcyon</i> )	D		D
BLJA	Blue Jay ( <i>Cyanocitta cristata</i> )	0.315		1.003
BLVU	Black Vulture ( <i>Coragyps atratus</i> )	D		D
BRCR	Brown Creeper ( <i>Certhia familiaris</i> )	0.120		0.383
CACH	Carolina Chickadee ( <i>Parus carolinensis</i> )	0.472		1.504
CAGO	Canada Goose ( <i>Branta canadensis</i> )	0.037		0.118
CARW	Carolina Wren ( <i>Thryothorus ludovicianus</i> )	0.398		1.268
COGR	Common Grackle ( <i>Quiscalus quiscula</i> )	0.074		0.236
DEJU	Dark-eyed Junco ( <i>Junco hyemalis</i> )	0.009		0.029
<b>DOWO</b>	<b>Downy Woodpecker (<i>Picoides pubescens</i>)</b>	<b>0.472</b>		<b>1.504</b>
EABL	Eastern Bluebird ( <i>Sialia sialis</i> )	0.028		0.088
EAPH	Eastern Phoebe ( <i>Sayornis phoebe</i> )	0.009		0.029
GADW	Gadwall ( <i>Anas strepera</i> )	0.046		0.147
GCKI	Golden-crowned Kinglet ( <i>Regulus satrapa</i> )	0.056		0.177
GWFG	Greater White-fronted Goose ( <i>Anser albifrons</i> )	D		D
<b>HAWO</b>	<b>Hairy Woodpecker (<i>Picoides villosus</i>)</b>	<b>0.046</b>		<b>0.147</b>
HETH	Hermit Thrush ( <i>Catharus guttatus</i> )	0.009		0.029
HOME	Hooded Merganser ( <i>Lophodytes cucullatus</i> )	0.009		0.029
KILL	Killdeer ( <i>Charadrius vociferus</i> )	D		D
MALL	Mallard ( <i>Anas platyrhynchos</i> )	0.046		0.147
NOCA	Northern Cardinal ( <i>Cardinalis cardinalis</i> )	0.120		0.383
<b>NOFL</b>	<b>Northern Flicker (<i>Colaptes auratus</i>)</b>	<b>0.093</b>		<b>0.295</b>
<b>PIWO</b>	<b>Pileated Woodpecker (<i>Dryocopus pileatus</i>)</b>	<b>0.120</b>		<b>0.383</b>
<b>RBWO</b>	<b>Red-bellied Woodpecker (<i>Melanerpes carolinus</i>)</b>	<b>0.500</b>		<b>1.592</b>
<b>RHWO</b>	<b>Red-headed Woodpecker (<i>Melanerpes erythrocephalus</i>)</b>	<b>0.806</b>		<b>2.565</b>
RSHA	Red-shouldered Hawk ( <i>Buteo lineatus</i> )	0.139		0.442
RSTO	Rufous-sided Towhee ( <i>Pipilo erythrophthalmus</i> )	0.009		0.029
RTHA	Red-tailed Hawk ( <i>Buteo jamaicensis</i> )	D		D
RWBL	Red-winged Blackbird ( <i>Agelaius phoeniceus</i> )	D		D
SACR	Sandhill Crane ( <i>Grus canadensis</i> )	D		D
SNGO	Snow Goose ( <i>Chen caerulescens</i> )	D		D
SOSP	Song Sparrow ( <i>Melospiza melodia</i> )	0.019		0.059
SWSP	Swamp Sparrow ( <i>Melospiza georgiana</i> )	0.074		0.236
TUTI	Tufted Titmouse ( <i>Parus bicolor</i> )	0.963		3.067
TUVU	Turkey Vulture ( <i>Cathartes aura</i> )	D		D
WBNU	White-breasted Nuthatch ( <i>Sitta carolinensis</i> )	0.593		1.887
WITU	Wild Turkey ( <i>Meleagris galopavo</i> )	0.019		0.059
WIWR	Winter Wren ( <i>Troglodytes troglodytes</i> )	0.231		0.737
WODU	Wood Duck ( <i>Aix sponsa</i> )	0.019		0.059
WTSP	White-throated Sparrow ( <i>Zonotrichia albicollis</i> )	0.324		1.032
<b>YBSA</b>	<b>Yellow-bellied Sapsucker (<i>Sphyrapicus varius</i>)</b>	<b>0.046</b>		<b>0.147</b>
YRWA	Yellow-rumped Warbler ( <i>Dendroica coronata</i> )	0.028		0.088

\* D represents that a species was detected, but not ever within 100 m of a point-count station

## Figure Legends

Figure 1. Location of 10 2-km<sup>2</sup> search plots in southern Illinois, 2008. Each plot was visited at least 3 times during January-April 2008. The plot with “T” inside was a trigger plot (unsubstantiated observation of an Ivory-billed Woodpecker reported) and was visited 5 times. There were 20 bird/vegetation points located within each plot.

Figure 2. Locations of RECONYX camera deployments in southern Illinois, 2008. Each point represents deployment of 1-3 cameras for at least 4 days. Cameras were deployed to locations where bark was being scaled off of trees (presumably by woodpeckers) or where a tree contained a large (i.e., > 3-inch diameter) cavity that looked suitable for a large woodpecker to use for nesting or roosting.

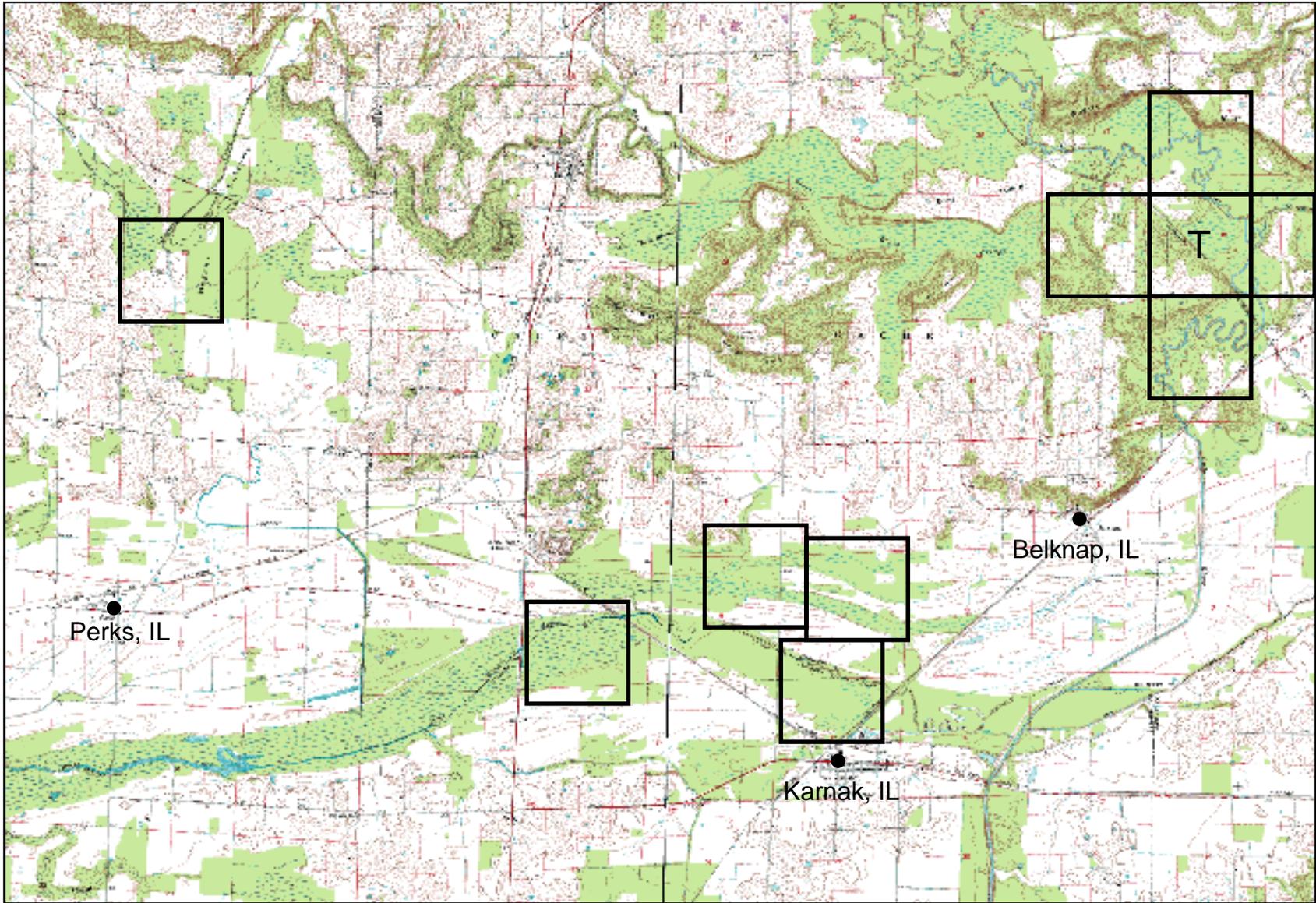
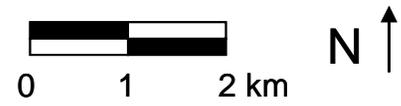


Figure 1



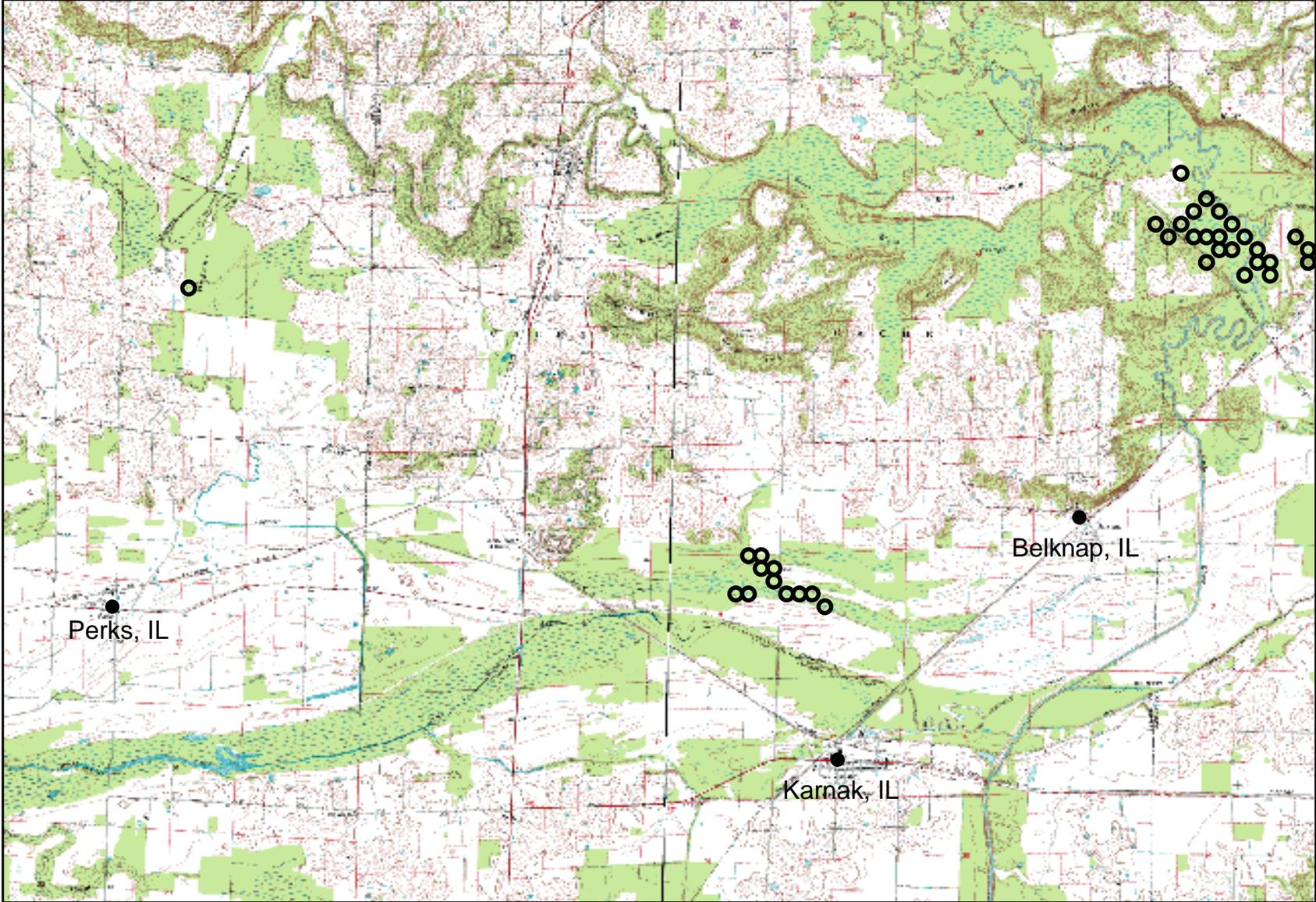


Figure 2

