A status survey of the Franklin's Ground Squirrel (*Spermophilus franklinii*) in Illinois

prepared by

Jason Martin, University of Illinois

Ed Heske and Joyce Hofmann,
Illinois Natural History Survey

Center for Biodiversity
Technical Report 2002(18)

Center for Biodiversity
Illinois Natural History Survey
607 E. Peabody Drive
Champaign, IL 61820

FINAL REPORT
November 2002

Prepared for:

Glenn Kruse
Illinois Department of Natural Resources
Endangered Species Protection Board
524 South Second Street
Springfield, Illinois 62701-1787

Table of Contents

Introduction..... 1

Methods
Historical data collection and mail survey..... 4
Live-trapping survey..... 5

Results
Historical data collection and mail survey..... 7
Live-trapping survey..... 9

Discussion..... 10

Acknowledgments..... 16

References..... 17

Table..... 20

Figures legends..... 21

Figures..... 22

Appendices
Franklin's ground squirrel mail survey..... 25
Trapping site descriptions and maps..... 26
Suggested sites for future live-trapping surveys..... 72

Introduction

Sightings and other records of the Franklin's ground squirrel (*Spermophilus franklinii*) in Illinois have become uncommon in recent decades. Van Petten and Schramm (1972) described the species as occurring in Illinois with "increasing rarity". Lewis and Rongstad (1992) solicited the opinions of Illinois wildlife managers, natural heritage biologists, forest preserve districts, and state parks and recreation personnel concerning the status of Franklin's ground squirrel (FGS) and concluded that the species is in a state of decline, although quantifiable data supporting this conclusion was lacking. A survey of 15 sites containing potentially suitable habitat, some of which historically harbored FGS, in Vermilion, Champaign, and Piatt counties conducted by Hofmann (1998) detected only one ground squirrel.

Franklin's ground squirrel is primarily an inhabitant of the northern Great Plains from east-central Alberta and southern Saskatchewan to Kansas and Missouri (Hall, 1981). Within Illinois, both Mohr (1943) and Hoffmeister (1989) described the species as occurring throughout the upper two-thirds of the state, roughly north of a line connecting Clark and Madison counties. This demarcation coincides with the boundary between the Grand Prairie Natural Division and the Southern Till Plain Division suggesting that soil type and glacial history may be an important factor in locating suitable Franklin's ground squirrel habitat. Hoffmeister (1989) suggests that the shallow soil and underlying hardpan characteristic of southern Illinois prevents these relatively weak diggers from expanding their range into this area.

Historically FGS has probably never been as common in Illinois as the thirteen-lined ground squirrel (*Spermophius tridecemlineatus*). A report published by the U.S.

Department of Agriculture suggested that FGS also is not as common in Illinois as it is in other parts of its range (Bailey, 1893). Unfortunately thorough historical population estimates are not available so long-term population trends of FGS can only be guessed at.

The preferred habitat of Franklin's ground squirrel includes the relatively tall, dense vegetative components of the tallgrass and mid-grass prairies. The species avoids open, mowed, and grazed areas (Haberman and Fleharty, 1971). A preference for shrubby areas and woodland-field ecotones has also been noted (Murie, 1973). The overall decline of prairie habitat due to agricultural practices and urban development has been pointed to by many as a major driving force behind the possible decline of the species. Sowls (1948) described FGS in a portion of Saskatchewan as appearing to retreat before the advance of agriculture.

Choromanski-Norris et al. (1989) found that Franklin's ground squirrels prefer areas that are "characterized by relatively long periods of no disturbance to vegetation or soil." Large contiguous areas fitting these criteria are rare in Illinois. According to statistics published by the Illinois Farm Bureau, 83.7% of Illinois is cropland or pasture, 11.9% is woodland, and most of the remaining 4.4% of the landcover is urban, industrial, or transportation related (Illinois Farm Bureau, 1997). Of the original 20 million acres of prairie that once covered the state only about 2300 acres remain (Neely and Heister, 1987). For more than a century FGS populations in Illinois have been repeatedly compacted into the continually decreasing habitat patches. In Indiana, FGS has shown a preference for the relatively undisturbed remnant grassland habitat that remains along railroad rights-of-way and fencerows (Benjamin, 1991). A similar preference for these

types of patches, as well as for grassland patches existing in unmowed roadside ditches, fallow fields, and prairie cemeteries, can be assumed for FGS in Illinois.

The activity patterns and secretive behavior of Franklin's ground squirrel call into question the dependability and accuracy of existing observational records, or more precisely the lack thereof. The squirrels spend very little of their time above ground. Emergence from hibernation occurs sometime between mid-April and mid-May. Males re-enter hibernation in mid-July or early August and females generally follow a few weeks later in early September. Juveniles of the year immerge in late September (Murie, 1973; Choromanski-Norris et al., 1986; Iverson and Turner, 1972; Krohne and Schramm, 1994). The species is strictly diurnal and fairly active for most of the daylight hours but a reduction in activity has been noted during inclement weather conditions (Krohne, et al., 1973; Sowls, 1948). Sowls (1948) estimated that individuals spend up to 90% of their lives below ground.

According to Haberman and Fleharty (1971), individual squirrels may move several times after leaving the hibernation burrow. This behavior can also make observational data unreliable. Cyclic fluctuations in local population numbers have also been known to occur (Sowls, 1948; Erlien and Tester, 1984). Additionally, the species' preference for thick vegetative cover and avoidance of open spaces makes the gathering of observational records extremely difficult.

In this study, opinions pertaining to the current status of the Franklin's ground squirrel in Illinois were solicited from wildlife professionals from across the state. We then attempted to confirm these personal accounts of occurrences and anecdotal evidence of population trends by conducting a live-trapping survey. These results were compared

with the species' historical range within the state. Information pertaining to the species' distribution and demography in Illinois is sorely needed in order to determine if conservation actions are appropriate.

Methods

Historical records and mail survey

Known historical locations of Franklin's ground squirrels in Illinois were compiled into a GIS data layer using ArcView 3.2a (Environmental Systems Research Institute, 2000) (Fig. 1A). These data were based primarily on vouchered museum specimens held by the following institutions: Field Museum of Natural History (Chicago), Smithsonian Institute – National Museum of Natural History (Washington, D.C.), American Museum of Natural History (New York City), Carnegie Museum (Pittsburgh), Western Illinois University (Macomb), Southern Illinois University (Carbondale), Illinois State University (Normal), University of Illinois Museum of Natural History/Illinois Natural History Survey (Champaign-Urbana), University of Michigan (Ann Arbor), and Florida Museum of Natural History (Gainesville). Several Illinois biologists also provided location information based on confirmed sightings or successful trapping. In total, 106 data points were gathered referencing specimens from the 1880's through the late 1990's.

A mail survey (Appendix 1) was then sent to individuals and organizations throughout the known historical range of the species in Illinois that we deemed would be familiar with FGS. The 166 recipients included 6 conservation/conservancy districts,

12 forest preserve districts, 15 Illinois Department of Natural Resources (IDNR) Natural Heritage Biologists, 31 IDNR Wildlife Biologists, 7 state nature preserves and 95 state parks and recreation areas. The intent of this survey was to solicit information on extant FGS populations, locations where the species used to occur but no longer does, unconfirmed reports of sightings and areas where suitable habitat may still exist. This information was plotted onto a second GIS data layer (Fig. 1B). Survey recipients also were asked to express their opinion concerning current population trends of FGS in the region of the state with which they were familiar.

Live-trapping survey

The historical location and mail survey GIS data layers were examined in the context of current landcover information originating from the Critical Trends Assessment Landcover Database of Illinois 1991-1995 (Luman et.al., 1996). Eleven areas were chosen for field surveys based on the reported presence of FGS, occurrence of appropriate habitat or historical occupancy (Fig. 1C). Each area usually contained multiple trapping sites, henceforth referred to as "areas" and "sites" respectively.

A total of 26 sites were chosen for trapping, 12 of which were located in linear railroad right-of-way corridors and 14 in non-linear areas, such as open fields or prairies. Eleven of the sites were selected on the basis of historical occupancy or recent FGS sightings and 15 were chosen based on recommendations provided in the mail survey. Descriptions of the trapping sites and maps of each area are provided in Appendix 2.

Upon arrival at a site we initially searched for physical indications of FGS activity, i.e. runways and burrow entrances, and listened for the species' high-pitched trill call. Time spent searching for these signs varied depending on the size of the site.

Between 20 and 40 single-door, collapsible Tomahawk live traps (Tomahawk Live Trap Co., Tomahawk, WI) measuring 48 X 16.5 x 16.5 cm were distributed among the sites within each area. Traps were placed near burrow entrances or along well-worn runways if they were present. If no signs of FGS activity were found, then traps were placed in suitable habitat in a pattern that maximized coverage for that particular site. In linear sites, such as railroad rights-of-way, traps were arranged along a single transect, while in more open areas, i.e. prairie restorations or fields, they were arranged in a grid pattern.

Traps were baited with a mixture of peanut butter and sunflower seeds. All traps were placed in the field following the initial site assessment, but not opened and set until the next morning, between 0700 and 0800 h. On the first two days, the traps were checked at 1200 h and 1800 h, and then closed for the night. On the third day, the traps were opened again in the morning, but were checked and picked up at 1200 h. Area 1 (Grundy/Will County) and Area 2 (Coles County) departed from this schedule in that all traps were left open over night. This procedure was discontinued for the remainder of the survey after it was determined that there was no chance of catching ground squirrels during this extra time. In certain instances traps were moved from their original locations to reduce the capture of non-target species, such as the thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), and to increase trapping effort.

Sex, age (adult or juvenile), reproductive condition and weight (to the nearest 5 grams using a Pesola scale) were recorded for all FGS captured. A patch of fur was clipped from the rump of each individual to identify previously captured animals. A description of the overall structure of the habitat being trapped was recorded, including a list of dominant plant species. Trapping was conducted from 7 May and 12 July 2001 (10 areas), and from 16 July through 18 July 2002 (1 area).

Results

Historical records and mail survey

Historical locations of Franklin's ground squirrel occurrence covered most of the northern two-thirds of Illinois (Fig. 1A), as previously described by Mohr (1943) and Hoffmeister (1989). More specimens have been collected near Chicago and in east-central Illinois, specifically Champaign County, than in other parts of the state. This can be attributed to the concentration of major universities, research institutions and population centers in these localities and the resulting higher probability of interaction with the species.

We received 77 responses to the mail survey (Table 1). Three pairs of biologists responded jointly and several of the surveys that were sent to state parks, natural areas and nature preserves were forwarded to regional IDNR personnel who had already responded to the survey. One state park site manager responded in reference to two separate sites.

Survey recipients were asked to report any extant, extirpated or unconfirmed populations or the overall absence of FGS from the portion of the state with which they

were familiar (Fig. 2). Only 9 of the respondents replied that they knew of extant populations, describing a total of 11 individual colonies. Like the historical data points, the majority of these occurred near Chicago or in Champaign County. Six colonies were reported to occur among Cook and Will counties, three were interspersed in Champaign, Douglas, and Coles counties, one occurred in Christian County, and the last was located in Macoupin County.

Twenty-two of the respondents reported a total of 44 possible populations based on unconfirmed sightings coupled with the existence of historical records and/or the occurrence of appropriate habitat. These potential populations were distributed throughout the northern two-thirds of the state. Two of them were located below the Madison-Clark County line, referencing possible sightings slightly beyond the normally accepted southern extent of the species' range in Illinois. Eight respondents reported that they knew of extirpated populations of FGS in their region of the state and 45 respondents reported that the species was not present in their areas at all.

Survey recipients were asked to report any discernible trends in FGS populations with which they were familiar (Fig. 3). There were no reports of populations that are currently increasing in size and only three reports of stable populations. Ten respondents expressed concern that FGS is in a state of decline in their region of Illinois. The vast majority of the respondents (63) did not feel sufficiently familiar with the species or its local distribution to form an opinion about its current status.

When asked to suggest a cause for the possible decline of Franklin's ground squirrel, ten respondents attributed the possible trend to loss of suitable habitat. Two

respondents referred to habitat fragmentation and one postulated an increase in predation by predators occupying habitat edge (Fig. 4).

Live-trapping survey

Franklin's ground squirrels were captured at three of the 26 trapping sites (two of the 11 areas) (Fig. 1C), all three of which were chosen on the basis of recommendations made in mail survey responses. None of the nine trapping sites located in areas of historical occupancy yielded any FGS captures. Two of the capture sites were linear habitats (railroad rights-of-way) and one was a non-linear habitat (a 12-hectare (30-acre) prairie restoration). Eleven adults (6 scrotal males, 5 females) were captured between 29 May and 1 June 2001 at the Barnhart Grove Prairie Restoration located 2 miles south of Urbana, in Champaign County. The other two capture sites were situated approximately 3 km apart along an active railroad line east of Hoopeston, in the extreme northeastern corner of Vermilion County, at the County Road 2100E and County Road 2250E crossings. No FGS were captured along the right-of-way between these two sites. Combined, the Vermilion County sites, which were trapped from 9-12 July 2001, yielded 5 adults (2 scrotal males, 3 females) and 18 juveniles (9 males, 9 females).

Eight mammal species in addition to FGS were captured during the survey along with three bird species. The most commonly captured non-target species was the thirteen-lined ground squirrel, which occurred in high numbers at seven of the sites.

In addition to the sites surveyed, two areas of probable FGS occurrence were located during our study (Fig. 1C). In October 2000, a Franklin's ground squirrel was seen just north of Weldon Springs State Park in DeWitt County (David Thomas, Illinois

Natural History Survey, pers. comm.). We searched prairie restorations and grasslands within the park boundary and did not find any signs of FGS activity. However when a wider area outside the park was searched, burrows and short runways typical of FGS were located in a small grassy area on private property, and an alarm call was heard. The landowner clearly described FGS as the species present.

In May 2002, a road-killed Franklin's ground squirrel was found in southern Menard County (Bob Bluett-IDNR, pers. comm.). We determined that the nearest potentially suitable FGS habitat was located about 2 km to the east along an inactive railroad grade but we did not detect any signs indicating the presence of FGS either along the railroad or in several nearby grassland areas. However, given the time of year and the distance that this specimen was found from appropriate habitat, this squirrel was probably a young adult dispersering from either the railway or another grassland area.

Discussion

Three states adjacent to Illinois have already determined that conservation efforts are warranted for the Franklin's ground squirrel. It is listed as "endangered" in Indiana (Indiana Department of Natural Resources, 1993), as a "species of special concern" in Wisconsin (Wisconsin Department of Natural Resources, 1993), and as "rare" in Iowa (Bowles et. al., 1998). Based on these listings, and on the opinions expressed in our mail survey and the absence of the species from the majority of our live-trapping survey sites, it is our opinion that Franklin's ground squirrel is in need of conservation actions in Illinois as well. However, while it seems that FGS has declined within the state over the past several decades, the magnitude and rate of this decline are unknown due to the

inherent difficulties in locating this elusive species. There are also several gaps in knowledge pertaining to the ecology of FGS that must be filled before effective conservation strategies can be designed.

The dense vegetation characteristics of FGS habitat may have made the location of burrows and the sighting of individual squirrels difficult at some sites; however, according to Sowls (1948), Franklin's ground squirrels are very easy to trap and our experiences confirm this. Ground squirrels were always captured within a few hours of setting the traps on the first day at our successful sites. We are confident that if ground squirrels were not captured at a site during our trapping session, they were not present.

The disappearance of local FGS populations may not always be attributable to extirpation, but could result from a tendency for colonies to shift their areas of occupancy in response to naturally occurring perturbations, such as an increase in ectoparasite load within burrow systems or the presence of predators. Four survey respondents were confident that a sizeable stable population of FGS occurred at the Des Plaines Conservation Area and Game Farm in northeastern Illinois. Game Farm personnel commonly saw Franklin's ground squirrels on the site as recently as the summer of 2000. Burrows were located when we surveyed this area but no squirrels were captured or seen. Additionally, Game Farm personnel did not observe any ground squirrels in 2001 or 2002. Seemingly appropriate FGS habitat still occurs in the Conservation Area and Game Farm, and patches of suitable habitat extend eastward through southern Cook County in the form of Forest Preserve District properties and railroad rights-of-way. In October 2001, a dead Franklin's ground squirrel was found along a railway nearby the Conservation Area (E. Smith, IDNR, pers. comm.) suggesting that the species still

persists in the region. If colonies of FGS tend to shift location over time, this could account for the observed absence of the species from some of the locations of known historical occupancy.

The presence of several separate colonies in an area, and the resulting metapopulation interactions, may help to buffer the regional decline of the species. During the summer of 2002, we radio-tracked 14 juvenile FGS in Champaign County and found that they are capable of dispersing through unharvested agricultural fields to other FGS colonies occupying grassland patches up to 5 km (3 miles) from the natal colony. Data on this portion of the study are still being analyzed but it is clear that maintaining habitat in large contiguous patches or clusters of smaller patches may have important ramifications on the regional persistence of FGS.

Cyclic fluctuations in local populations of Franklin's ground squirrel have been noted (Sowls, 1948; Erlien and Tester, 1984) and have been suggested as a possible explanation for the species' scarcity in short-term studies (e.g. Hofmann, 1998). Cyclic lows might explain the absence of ground squirrels from some of the sites that we surveyed, but we consider it unlikely that localized population fluctuations would result in the species' apparent statewide rarity. This being said, more exhaustive surveys are recommended to confirm our conclusions. Several sites, listed in Appendix 3 and shown in Fig. 1D, are recommended for additional surveys based on recent FGS sightings or recently collected specimens.

The patchy local distribution of FGS further complicates attempts to locate populations of the species. Whether this pattern of distribution is normal or the consequence of habitat alteration, single FGS populations become proverbial "needles in

haystacks". Even with extensive trapping effort, a small population of FGS could be missed by only a few kilometers. For example, no Franklin's ground squirrels were captured during our trapping session at the Spring Bluff Nature Preserve or Illinois Beach State Park in the extreme northeast corner of the state; however, the species does occur in Chiwaukee Prairie, a Nature Conservancy property that borders the Preserve to the north in Wisconsin (J. Huebschman, pers. comm.; J. Martin, pers. obs.). Squirrels may be using a railroad right-of-way that runs between the prairie and the west side of the Nature Preserve. The right-of-way was surrounded by a wetland and private property, therefore we were not able to trap it.

The Sand Ridge Nature Center, located in southern Cook County, has a photograph on file of a Franklin's ground squirrel taken in their very small (less than 1 acre) prairie restoration in the late 1980's but no ground squirrels have been seen there since. Suitable habitat still exists nearby in some of the Cook County Forest Preserve District's properties and along railroad rights-of-way, and FGS is known to occur just north of there near Lake Calumet. The Nature Center prairie is too small to support a population of FGS therefore the squirrel likely originated from one of these other areas.

Pesticide use has played a role in the decline of Franklin's ground squirrel. Dieldrin is a highly toxic insecticide that was popularly used throughout the agricultural regions of the United States from 1950 until it was banned in 1974. In 1954 and 1955, dieldrin was applied to a portion of Iroquois County (Scott et. al., 1959). Both thirteen-lined and Franklin's ground squirrels, which Scott described as being of common occurrence prior to the application, experienced "virtually annihilative losses" in the treated area. Dead ground squirrels were found displaying characteristics of poisoning

and autopsies revealed the presence of dieldrin in their tissues. Deleterious effects on other ground squirrel populations resulting from pesticide use are likely. The extent to which pesticides facilitated the decline of FGS is unknown, but their impact must have been magnified by demographic constraints already placed on the species by habitat fragmentation and loss.

The lack of information pertaining to the ecological requirements of FGS may have resulted in the failure of two attempted introductions in Illinois. Franklin's ground squirrels were released into the Gensburg-Markham restored prairie on the south side of Chicago in 1983 and 1984 (Panzer, 1986), but FGS have not been seen on the site since 1987 and we did not capture any squirrels there. The lack of dispersal options available to this population due to the surrounding urban sprawl and the resulting genetic isolation must have made the colony extremely susceptible to extirpation due to demographic stochasticity or a number of other ecological factors.

Another introduced population of FGS at the Knox College Biological Field Station in the west-central portion of the state (Van Petten and Schramm, 1972) was well documented for a number of years but also seems to have disappeared. This population may have been eliminated due to an increase in the local populations of potential ground squirrel predators, such as coyotes (*Canis latrans*), or it may have simply shifted its area of occupancy.

The three successfully trapped sites all appeared to provide suitable habitat for FGS and seemed to harbor viable populations based on the number of squirrels captured at each site and the presence of reproducing individuals. These sites, however, may be quite different ecologically. The Champaign County site was a 12-ha (30 acre) restored

prairie containing a heterogeneous mixture of native prairie flora and cool season grasses, whereas the Vermilion County sites were located in a narrow strip of degraded grassland habitat composed primarily of nonnative weedy species. Studies investigating if reproductive success and general population dynamics differ between populations such as these due to differences in habitat structure and quality would be valuable.

Franklin's ground squirrel has been described as consuming a wide variety of food items, animal as well as plant (Sowls, 1948). Food sources appeared to be plentiful at all three of the successful sites, however abundance of vegetation does not necessarily indicate high nutritional content. Sherman and Runge (in press) concluded that a long-term alteration in floral species composition and the resulting change in the nutritional value of available forage contributed to the collapse of a population of northern Idaho ground squirrels (*Spermophilus brunneus brunneus*). A comparison of the availability and quality of food at sites where Franklin's ground squirrels are known to occur could help assess the relative importance of nutritional aspects of FGS habitat.

Demographic studies of populations that occupy railroad corridors and roadsides could provide insight into the consequences of FGS being restricted to linear habitats by the current intensive agricultural practices in Illinois. An increase in interspecific resource competition and predation risk in linear habitats may result in these areas acting as ecological traps (Little et. al., 2002). Conversely, these corridors may serve as critical pathways for dispersal between larger habitat patches and may prevent these patches from becoming ecologically and genetically isolated (Bennett, 1998).

Thirteen-lined ground squirrels are known to occupy some of the same areas as FGS throughout their shared geographic range (Erlien and Tester 1984). The ability of

thirteen-lined ground squirrel to utilize a more disturbed habitat than FGS, such as lawns, might give it a competitive edge. Resource overlap and interspecific competition may occur between these two species, especially in areas that contain habitat subject to intermittent management practices, such as occasionally mowed roadsides and herbicided railroad rights-of-way. The extent and consequences of this competition need to be studied.

Murie (1973) hypothesized that Franklin's ground squirrels differ from other ground squirrel species in social organization and several behavioral traits. Several studies have found the adult sex ratio of FGS populations to be near 1:1 (Haggerty, 1968; Murie, 1973; Ellis, 1982). Our results show a similar ratio for both adults and juveniles. Populations of many other species of ground squirrels typically have a greater number of adult females than males due to a higher rate of dispersal by juvenile males, and resulting higher mortality (McCarley, 1966; Sheppard, 1972; Byrom and Krebs, 1999). If the 1:1 sex ratio of Franklin's ground squirrel is partly a consequence of similar dispersal rates of male and female juveniles, then the persistence of individual populations would be more sensitive to disruption of metapopulation structure than if juvenile females were strongly philopatric. Demographic studies of Franklin's ground squirrel, particularly studies of social organization, dispersal and regional population structure, are clearly needed.

Acknowledgments

This project was made possible through funding provided by the Illinois Endangered Species Protection Board. We would like to thank Pat Brown, for his advice and guidance, and Tari Weicherding and Shana Lavin for their help with the GIS portions

of this study. Thanks also to the Barnhart family, the Coles County Airport, the Douglas-Hart Nature Center, and the Kibbe Life Science Field Station of Western Illinois University for allowing us access to their properties and for the use of their facilities.

References

Bailey, V. 1893. The prairie ground squirrels or spermophiles of the Mississippi Valley. U.S. Department of Agriculture, Division of Ornithology and Mammalogy, 4:1-69.

Benjamin, P.M. 1991. The ecology of Franklin's ground squirrel in Indiana. M.S. Thesis. Indiana State University, Terra Haute, IN.

Bennett, A.F. 1998. Linkages in the landscape: the role of corridors and connectivity in wildlife conservation. IUCN, Gland, Switzerland and Cambridge, UK. 254 pp.

Birkenholz, D.E. 1973. Mammals of Goose Lake Prairie Nature Preserve. Natural History Miscellanea, The Chicago Academy of Sciences 191.

Bowles, J.B., D.L. Howell, R.P. Lampe, and H.P. Whidden. 1998. Mammals of Iowa: Holocene to the end of the 20th Century. Journal of Iowa Academy of Science. 105(3):123-132.

Byrom, A.E. and C.J. Krebs. 1999. Natal dispersal of juvenile arctic ground squirrels in the boreal forest. Canadian Journal of Zoology 77:1048-1059.

Choromanski-Norris, J., E.K. Fritzell, and A.B. Sargeant. 1986. Seasonal activity cycle and weight changes of the Franklin's ground squirrel. American Midland Naturalist 116:101-107.

Choromanski-Norris, J., E.K. Fritzell, and A.B. Sargeant. 1989. Movements and habitat use of Franklin's ground squirrels in duck-nesting habitat. Journal of Wildlife Management 53:324-331.

Ellis, L.S. 1982. Life-history studies of Franklin's ground squirrel, *Spermophilus franklinii*, in Missouri. M.S. Thesis, Northeast Missouri State University, Kirksville.

Erlien, D.A. and J.R. Tester. 1984. Population ecology of sciurids in northwestern Minnesota. Canadian Field-Naturalist 98:1-6.

Haberman, C.G. and E.D. Fleharty. 1971. Natural history notes on Franklin's ground squirrel in Boone County, Nebraska. Transactions of the Kansas Academy of Science 74:76-80.

Haggerty, S.M. 1968. The ecology of the Franklin's ground squirrel (*Citellus franklinii*) at Itasca State Park, Minnesota. M.S. Thesis, University of Minnesota, Minneapolis-St. Paul.

Hall, E.R. 1981. The mammals of North America, second edition. John Wiley and Sons, New York. 1181 pp.

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

Hofmann, J.E. 1998. A survey of Franklin's Ground Squirrel (*Spermophilus franklinii*) in east-central Illinois. Illinois Natural History Survey, Center for Biodiversity Technical Report (11). 32 pp.

Illinois Farm Bureau. 1997. Natural Resource Inventory. Farm & Food Facts, Land Use In Illinois. http://www.ilfb.org/viewdriveline.asp?dlid=3.

Indiana Department of Natural Resources. 1993. Indiana's rare plant and animals: a checklist of endangered and threatened species. Indianapolis. 26 pp.

Iverson, S.L. and B.N. Turner. 1972. Natural history of a Manitoba population of Franklin's ground squirrels. Canadian Field-Naturalist 86:145-149.

Krohne, D.T., J. Hauffe, and P. Schramm. 1973. Radio-tracking the Franklin's ground squirrel in a restored prairie. Pages 84-88 *in* Proceedings of the Third Midwest Prairie Conference. L.C. Hulbert, ed. Kansas State University, Manhattan.

Krohne, D.T. and P. Schramm. 1994. Hibernation and life history of the Franklin's Ground squirrel (*Spermophilus franklinii*) in a restored prairie. Proceedings of the Thirteenth North American Prairie Conference. R.G. Wickett, et al. eds. Windsor, Ontario, Canada.

Lewis, T.L. and O.J. Rongstad. 1992. The distribution of Franklin's ground squirrel in Wisconsin and Illinois. Transactions of the Wisconsin Academy of Sciences, Arts & Letters 80:57-62.

Little, S. J., R.G. Harcourt and A.P. Clevenger. 2002. Do wildlife passages act as prey-traps? Biological Conservation 107:135-145.

Luman, D., M. Joselyn and L. Suloway. 1996. Critical Trends Assessment Landcover Database of Illinois, 1991-1995: IDNR GIS database, Illinois Department of Natural Resources, Champaign.

McCarley, H. 1966. Annual cycle, population dynamics and adaptive behavior of *Citellus tridecemlineatus*. 47:294-316.

McFall, Don and Jean Karnes. eds. 1995. A directory of Illinois Nature Preserves, Volume 2. Illinois Department of Natural Resources, Springfield, Illinois. 327 pp.

Mohr, C.O. 1943. Distribution of ground squirrels in Illinois. Transactions of the Illinois State Academy of Science 36(2):177-178.

Murie, J.O. 1973. Population characteristics and phenology of a Franklin ground squirrel (*Spermophilus franklinii*) colony in Alberta, Canada. American Midland Naturalist 90:334-340.

Neely, R.D. and C.G. Heister, compilers. 1987. The natural resources of Illinois: Introduction and guide. Illinois Natural History Survey Special Publication 6. 224 pp.

Panzer, R. 1986. Franklin's ground squirrel translocation to an Illinois prairie preserve. Restoration and Management Notes 4:27.

Schwegman, J.E. 1973. Comprehensive plan for the Illinois Nature Preserves System. Part 2. The natural divisions of Illinois. Illinois Nature Preserves Commmissions, Rockford. 32 pp.+map.

Scott, T.G., Y.L. Willis, and J.A. Ellis. 1959. Some effects of a field application of dieldrin on wildlife. Journal of Wildlife Management 23(4):409-427.

Sheppard, D.H. 1972. Reproduction of Richardson's ground squirrel (*Spermophilus richardonii*) in southern Saskatchewan. Canadian Journal of Zoology 50:1577-1581.

Sowls, L.K. 1948. The Franklin ground squirrel, *Citellus franklinii* (Sabine), and its relationship to nesting ducks. Journal of Mammalogy 29:113-137.

Van Petten, A. and P. Schramm. 1972. Introduction, dispersal, and population increase of the Franklin's ground squirrel, *Spermophilus franklinii*, in a restored prairie. Pages 166-173 *in* Proceedings of the Second Midwest Prairie Conference. J.H. Zimmerman, ed. University of Wisconsin-Madison.

Wisconsin Department of Natural Resources. 1993. Wisconsin natural heritage working lists. Wisconsin Natural Heritage Program, Bureau of Endangered Resources, Madison. 18 pp.

Table 1. Response rates to the Franklin's ground squirrel mail survey.

TYPE OF RECIPIENT	SENT	RETURNED	%
Conservation/Conservancy Districts	6	3	50%
Forest Preserve Districts	12	6	50%
Natural Heritage Biologists	15	10	67%
IDNR Wildlife Biologists	31	22	71%
Nature Preserves	7	3	43%
State Parks and Natural Areas	95	33	35%
TOTAL:	**166**	**77**	**46%**

Figure Legend

Fig. 1. – **A)** Locations of known historical FGS occurrence. **B)** Locations of FGS occurrence as reported in mail survey responses (triangles = known populations; question marks = suggested locations of possible occupancy). **C)** Areas where live-trapping surveys were conducted (open circles = unsuccessful areas; closed circles = successful areas) and two additional areas of probable occurrence (plus = Menard County; star = Weldon Springs State Park). **D)** Suggested sites for future surveys (see Appendix 3): V = Vermont Cemetery Prairie, M = Manito Prairie Nature Preserve, T = Taylorville Railroad, J = Jubilee College State Park, W = Williamsburg Hill.

Fig. 2. – Categorical information provided by mail survey recipients referring to the presence or absence of FGS populations in the area of the state with which they were familiar. Several respondents knew of multiple local populations and therefore responded to more than one category.

Fig. 3. – Opinions expressed by mail survey recipients about current trends in FGS populations with which they were familiar.

Fig. 4. – Explanations offered by mail survey recipients for the possible decline of FGS in Illinois.

Fig. 1.

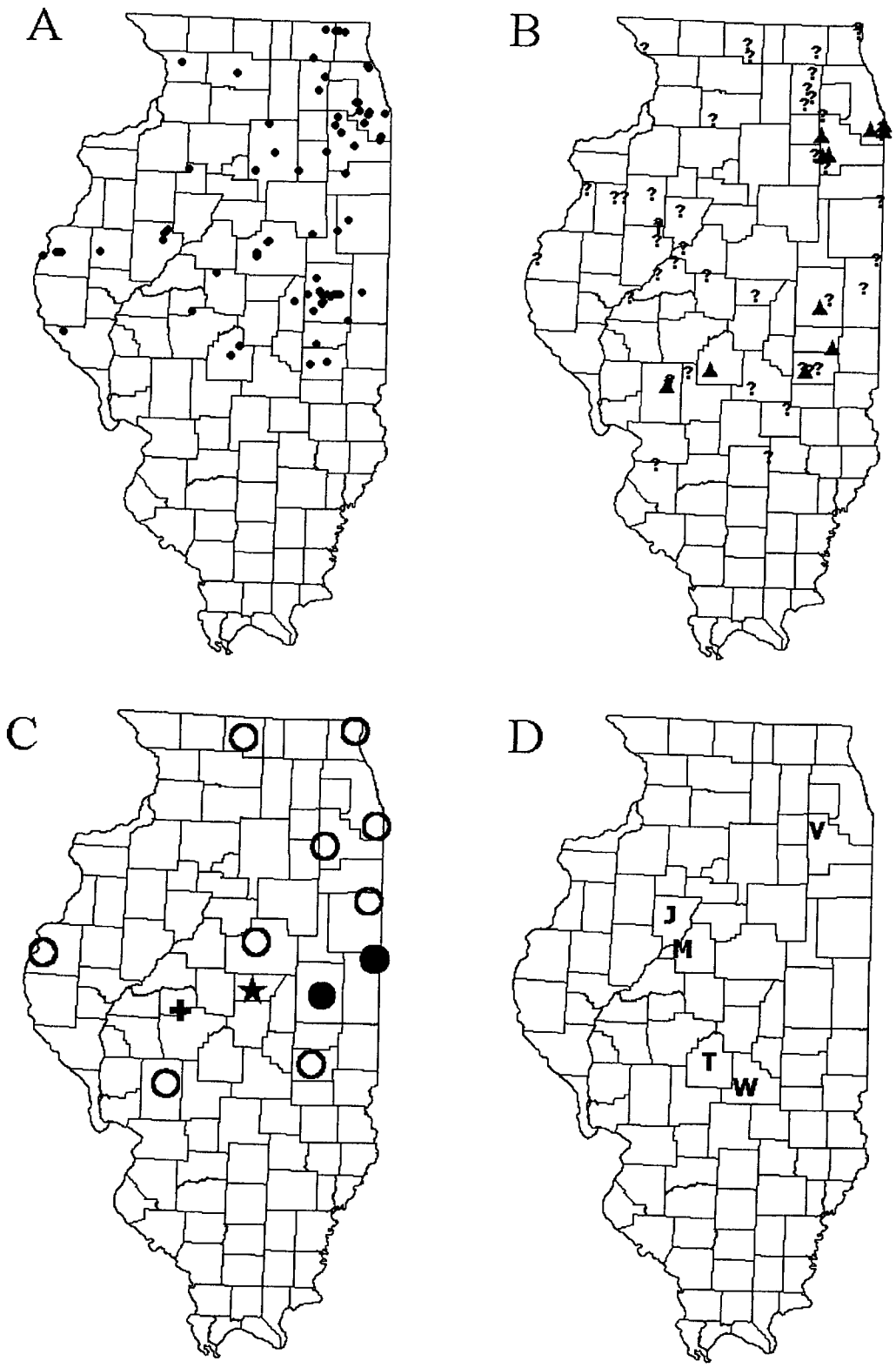


Fig. 2.

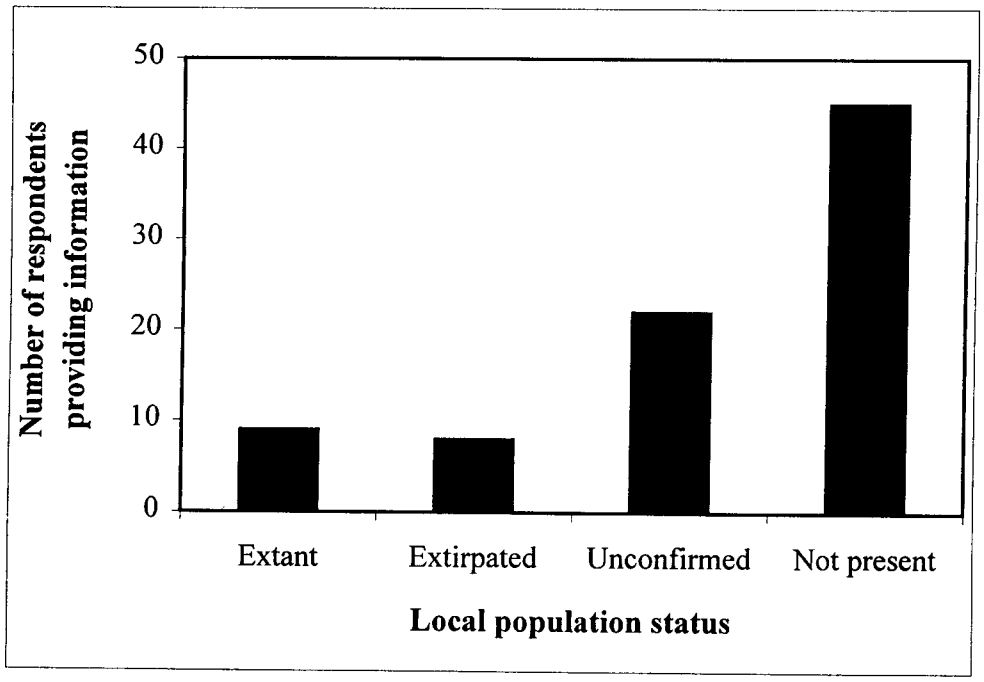

Number of respondents providing information
50
40
30
20
10
0
Extant
Extirpated
Unconfirmed
Not present
Local population status

Fig. 3.

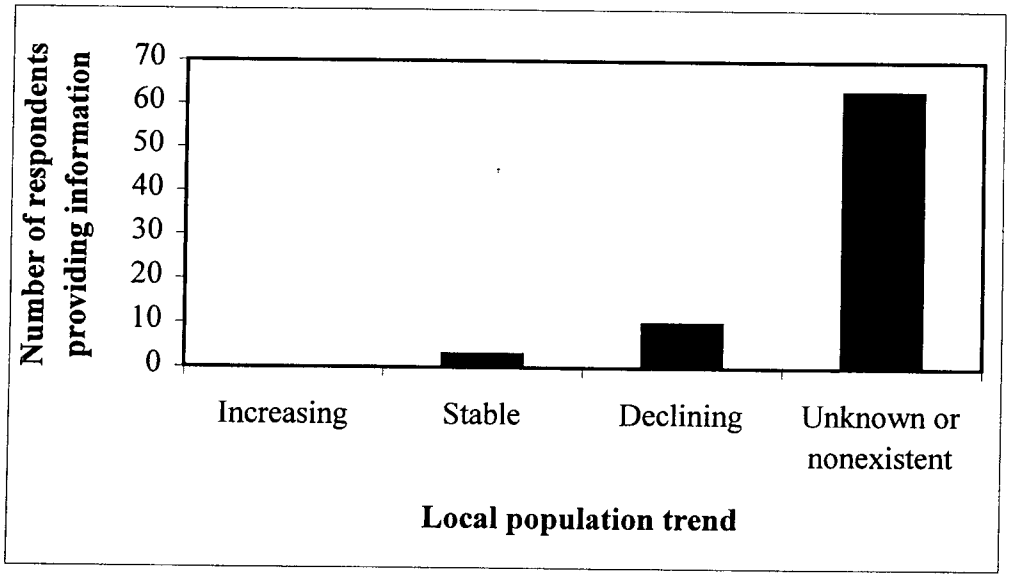
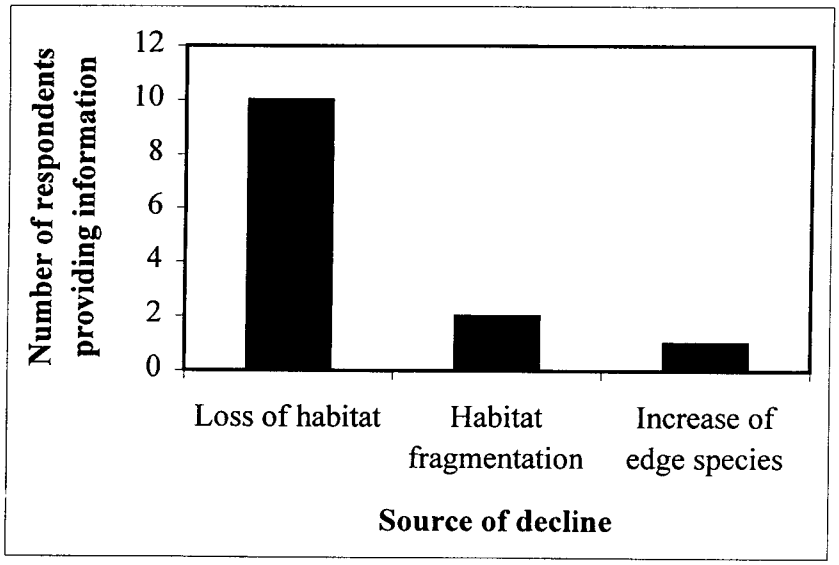

Number of respondents providing information
70
60
50
40
30
20
10
0
Increasing
Stable
Declining
Unknown or nonexistent
Local population trend

Fig. 4.


Number of respondents providing information
12
10
8
6
4
2
0
Loss of habitat
Habitat fragmentation
Increase of edge species
Source of decline

Appendix 1: Survey form distributed to wildlife professionals in Illinois to gather information about the current status of FGS within the state.

Name: Phone/Email:

Affiliation/Position: County(s):

1. Please list locations where you know that Franklin's ground squirrels (*S. franklinii*) occur in your area.

2. Please list locations where you know that Franklin's ground squirrels used to occur, but no longer do.

3. Please list locations of any unconfirmed sightings that have been reported to you.

4. Please list locations where this species might occur (due to past records, suitability of habitat, etc.) even if you cannot confirm their presence.

5. In your opinion, is the Franklin's ground squirrel population in your area stable, declining, or increasing? If you think that the species is declining, to what do you attribute this?

Appendix 2: Descriptions and maps of trapping sites, and species captured at each site. (Note: Plant species lists for each site are not exhaustive and are only meant to serve as a representative sample of the overall habitat structure.)

AREA 1. Grundy and Will counties

Dates trapped: 7-10 May 2001

Site A: Goose Lake Prairie State Natural Area

Species captured: none

This location was chosen due to a known historical presence of *S. franklinii* based on a description of the preserve's mammal fauna (Birkenholz 1973) as well as on personal correspondence with the site supervisor. The 1148.5-hectare (2,838-acre) site, located about 80.5 km (50 miles) southwest of Chicago, contains the largest remnant tract of tallgrass prairie in the state, pothole marshes, and reclaimed farmland and strip-mines. Twenty traps were placed throughout the prairie along the nature trail.

Plant Species: *Baptisia leucantha* (white false indigo), *Dodecatheon meadia* (shooting star), *Aster novi-angliae* (New England aster), *Solidago* spp. (goldenrod), *Andropogon gerardii* (big bluestem), *Sorghastrum nutans* (Indian grass), *Panicum virgatum* (switch grass), *Spartina pectinata* (prairie cordgrass)

Site B: Des Plaines Wildlife and Conservation Area

Species captured: *Spermophilus tridecemlineatus* (thirteen-lined ground squirrel)

This site historically had a population of *S. franklinii* residing on it. Thirteen traps in total were set in the prairie field located just west of the park office and along the railroad tracks east of the office. Several burrow entrances measuring 7-8 cm (3-4 inches) in diameter were located along the track bed and in the field.

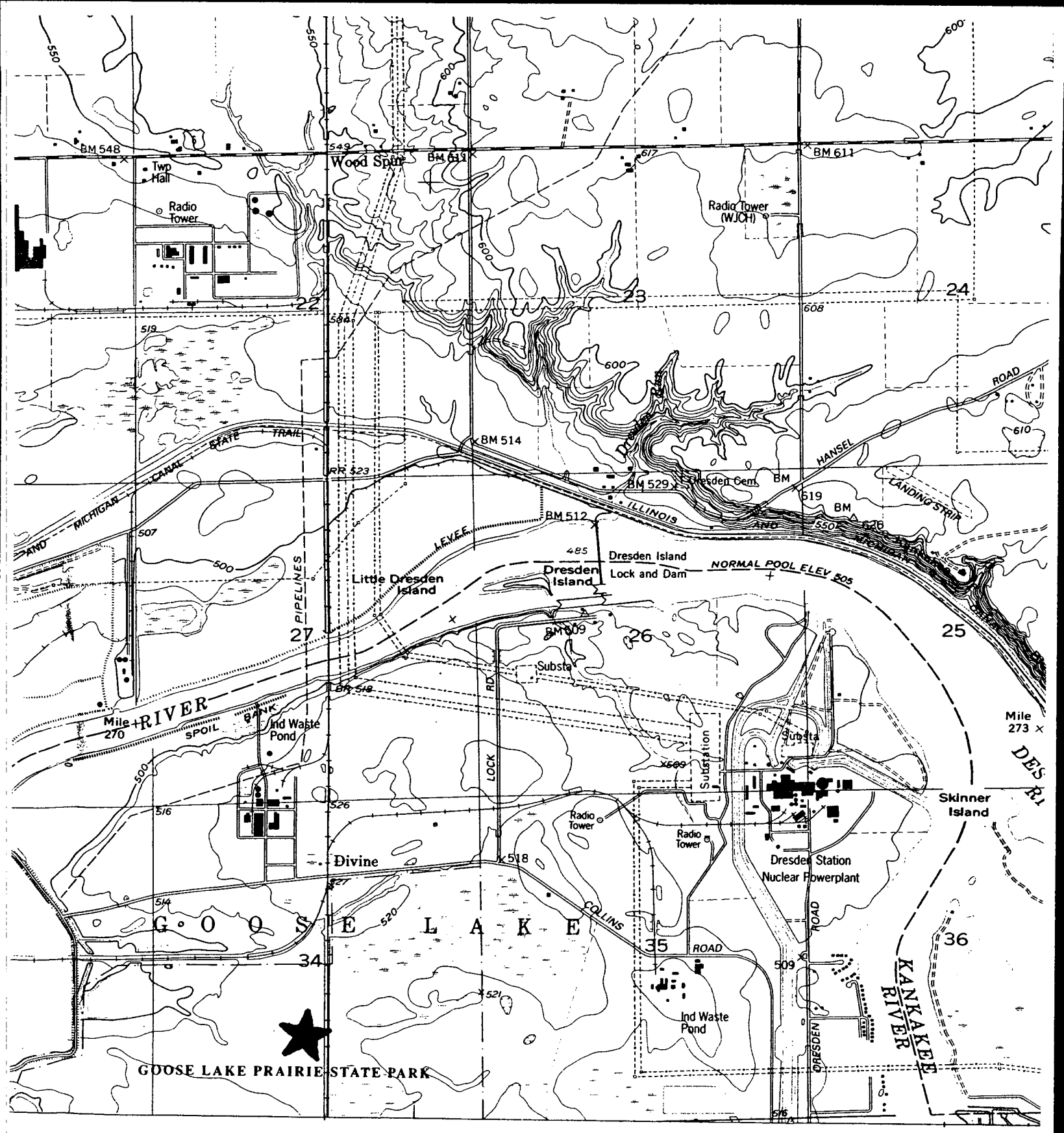
Plant species: Solidago spp. (goldenrod), *Silphium terebinthinaceum* (prairie dock), *Silphium laciniatum* (compass plant), *Asclepias* spp. (milkweed), *Tradescantia virginiana* (spiderwort), *Eryngium yuccifolium* (rattlesnake master), *Andropogon gerardii* (big bluestem), *Sorghastrum nutans* (Indian grass), *Bromus* spp. (brome grass)

Site C: Des Plaines Game Farm

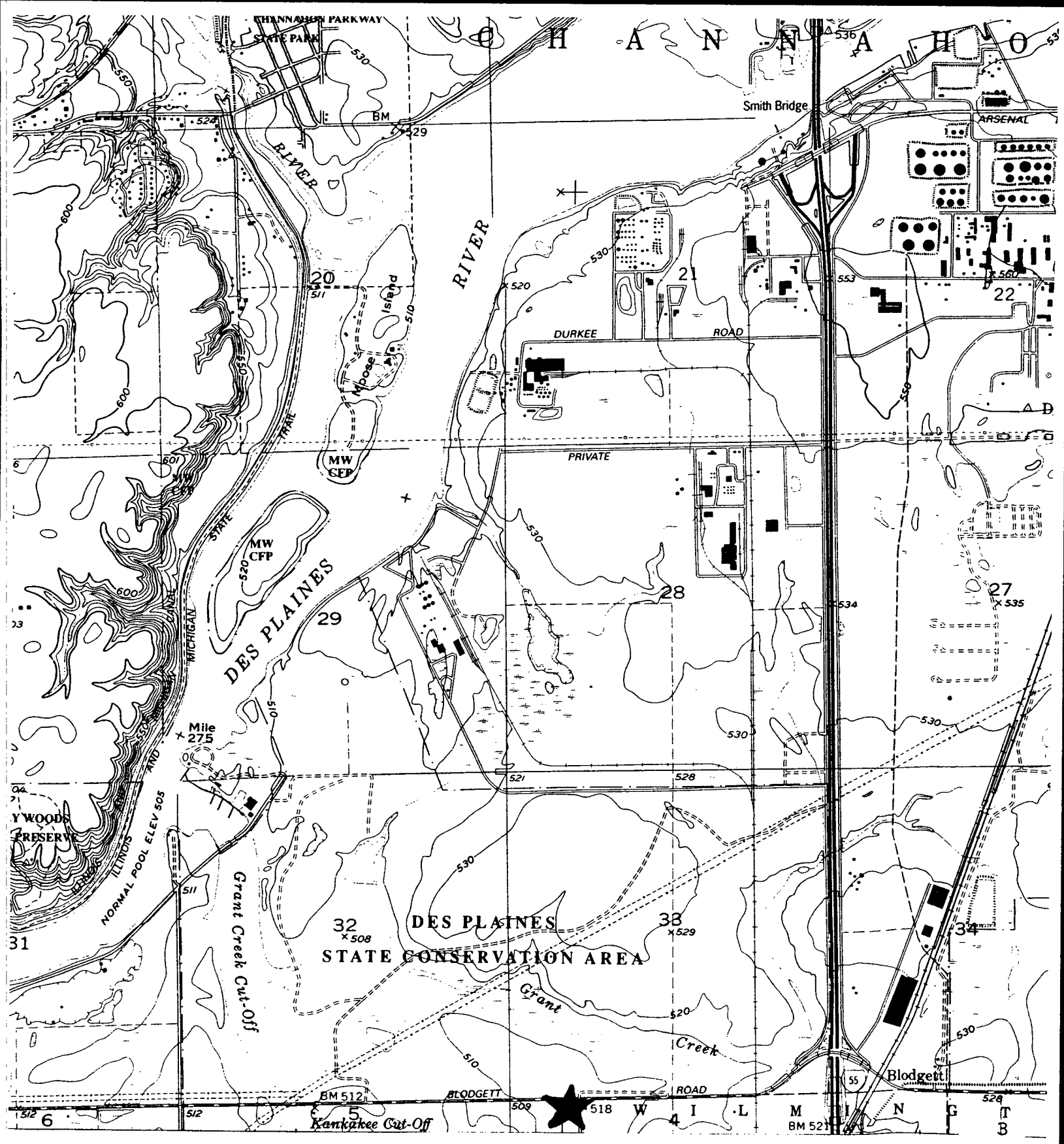
Species captured: *Rattus norvegicus* (Norway rat)

Franklin's ground squirrels were regularly seen on the property as recently as the summer of 2000. Many ground squirrel burrows were located in and around several of the pheasant enclosures and ten traps were set in these large net-covered pens. The ground cover in the pens was primarily mowed and un-mowed brome grass.

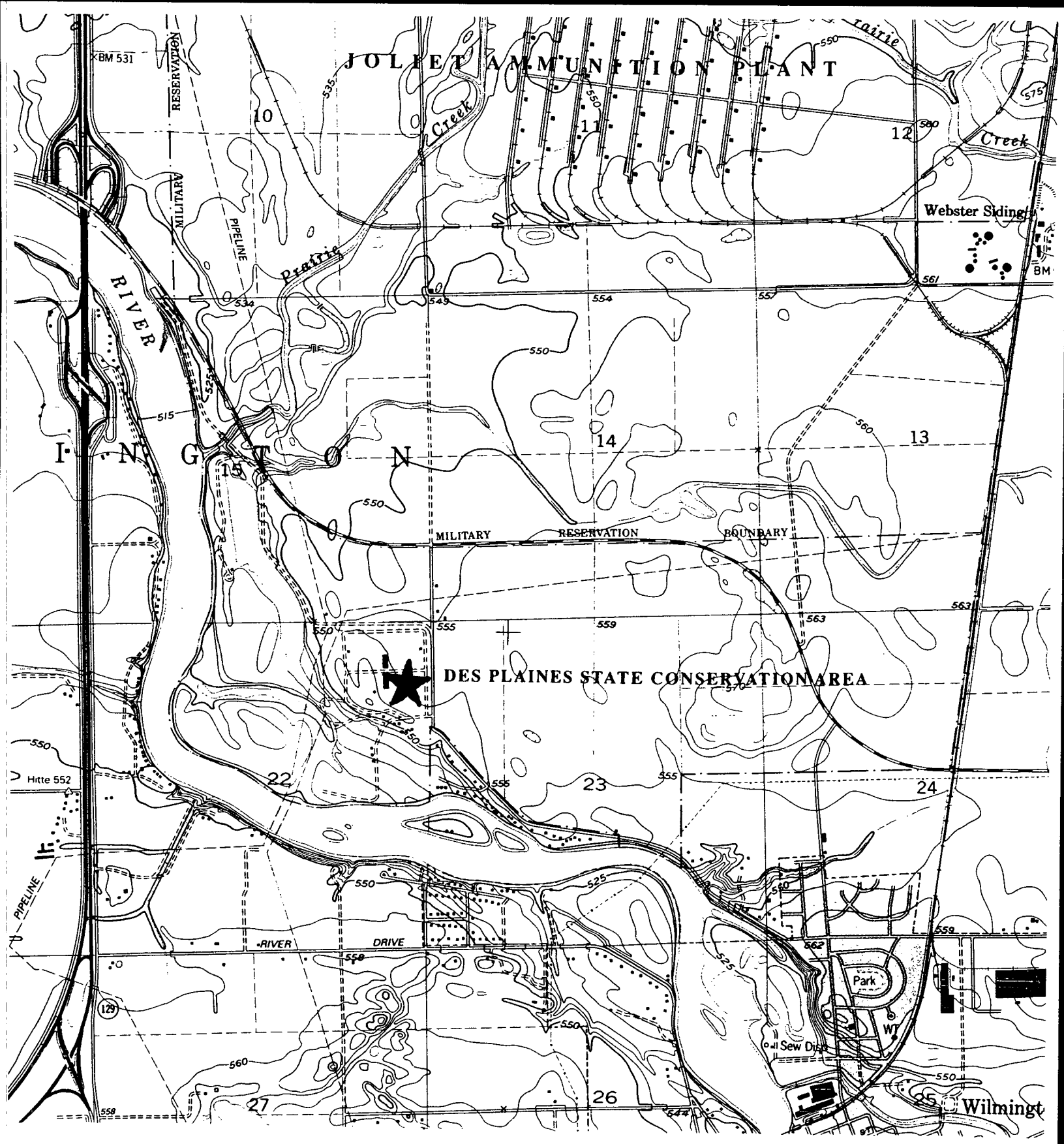
Plant species: *Bromus* spp. (brome grass)



Area 1, Site A: Goose Lake Prairie State Natural Area, Grundy County
(Wilmington 7.5' quadrangle)



Area 1, Site B: Des Plaines Wildlife and Conservation Area, Will County
(Minooka 7.5' quadrangle)



Area 1, Site C: Des Plaines Game Farm, Will County
(Minooka 7.5' quadrangle)

AREA 2. Coles County

Dates trapped: 14-17 May 2001

Site A: Charleston-Mattoon Bike Trail

Species captured: *Dumetella carolinensis* (gray catbird), *Turdus migratorius* (American robin), *Quiscalus quiscula* (common grackle), *Didelphis virginiana* (Virginia opossum)

Seventeen traps were set along this old railroad grade immediately east and west of the Interstate 57 overpass, east of Mattoon. The tracks have been removed and it is now maintained as a recreational trail. Franklin's ground squirrel sightings were reported along this section of the trail as well as along a nearby roadway. A shrub line extended north from the 5-m (16.5-ft) wide mowed grass and gravel trail for 15-20 m (50-65 ft) before terminating at a cemetery. A narrower grass/shrub line, drainage culvert, and mowed grass patch containing possible burrow entrances lay on the south of the trail on the east side of the overpass. On the south side of the trail to the west of the overpass an un-mowed grass field extended for about 75 m (246 ft) to an agricultural field.

Plant Species: *Rhus radicans* (poison ivy), *Solidago* spp. (goldenrod), *Taraxacum officinale* (common dandelion), *Rubus allegheniensis* (common blackberry), *Vitis riparia* (riverbank grape), *Asclepias* spp. (milkweed), *Daucus carota* (wild carrot), *Festuca* spp. (fescue grass), *Poa pratensis* (Kentucky bluegrass), *Bromus* spp. (brome grass), *Populus deltoides* (cottonwood), *Rhus glabra* (smooth sumac), *Elaeagnus angustifolia* (Russian-olive)

Site B: Coles County Airport

Species captured: *Didelphis virginiana* (Virginia opossum), *Sylvilagus floridanus* (eastern cottontail)

Four traps were set along a grassy, roadside ditch and tree line at the southwest corner of a pond located in the southeast extent of the airport property. Eleven traps were set along a drainage ditch containing small trees and shrub cover in the southwest portion of the property. A 50-meter (165-ft) wide strip of un-mowed grass surrounded the ditch. Crop fields further surrounded the entire area. Several potential burrow entrances were observed near the ditch and along the adjacent roadside.

Plant species: *Solidago* spp. (goldenrod), *Poa pratensis* (Kentucky bluegrass), *Bromus* spp. (brome grass), *Typha latifolia* (cattail), *Gleditsia triacanthos* (honey locust), *Acer rubrum* (red maple), *Salix nigra* (black willow)

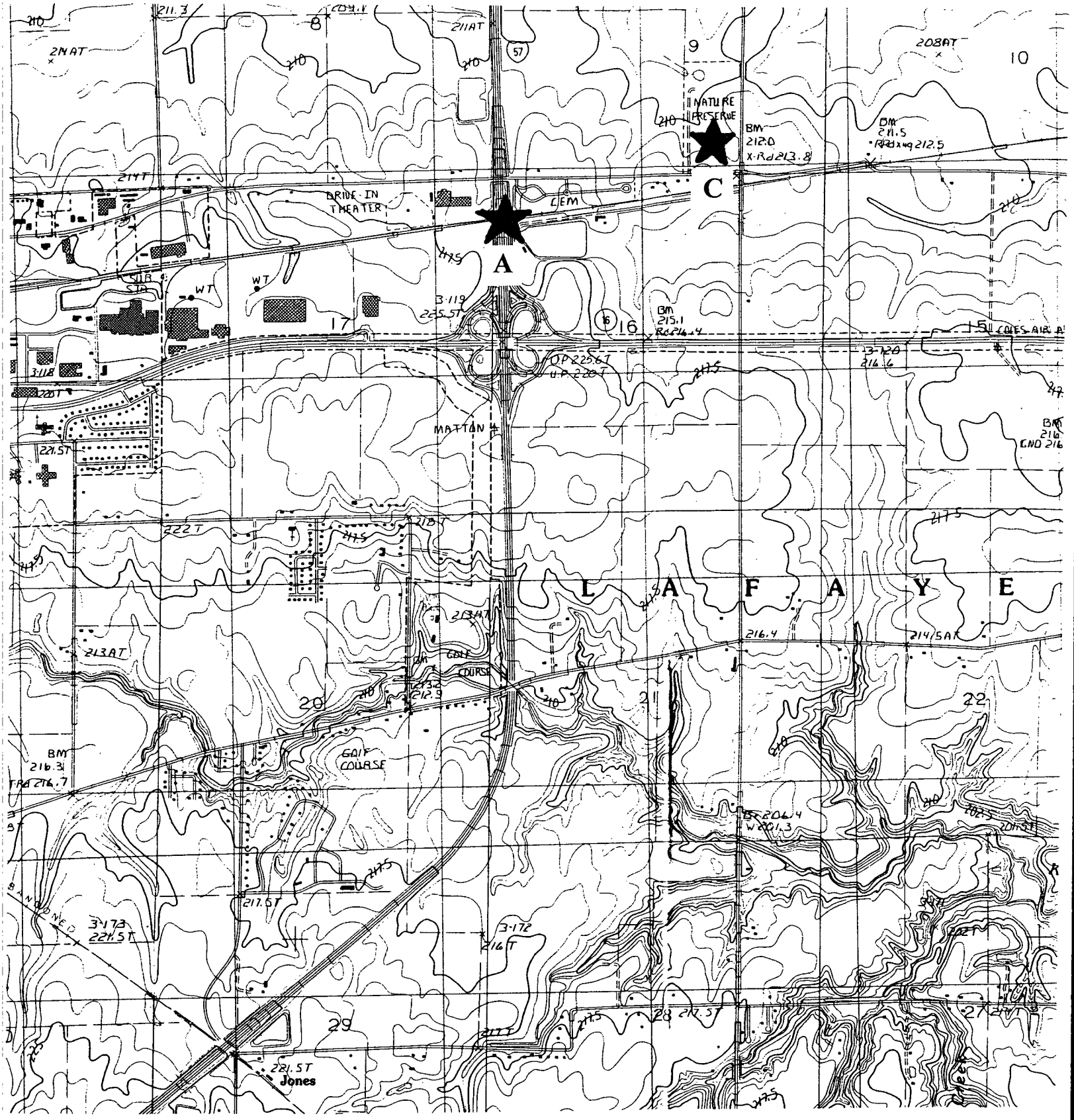
Site C: Douglas-Hart Nature Center

Species captured: none

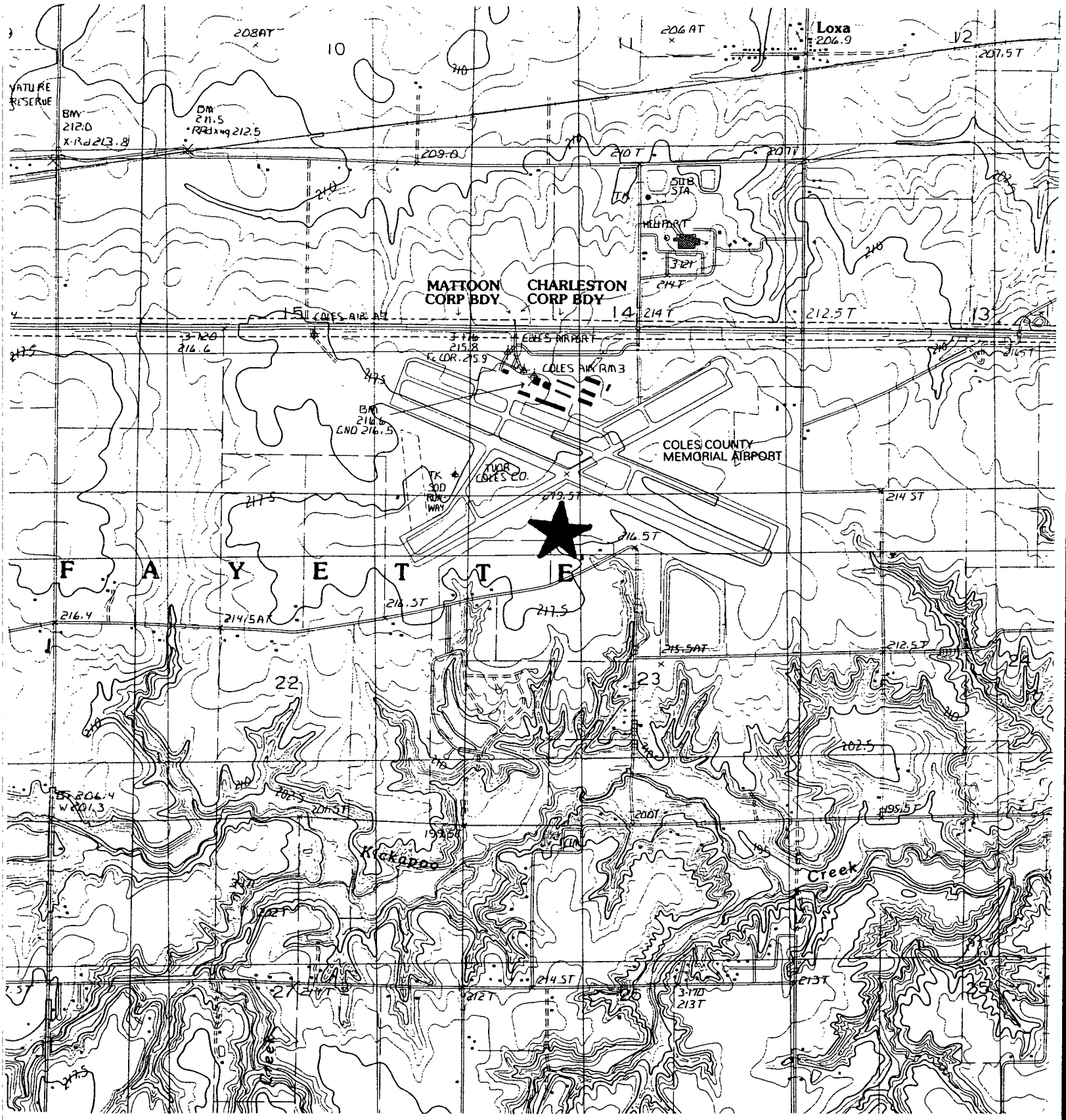
This site was selected due to its proximity to the Charleston-Mattoon Bike Trail. Four traps were set along the tree-lined edge of the small tall-grass prairie restoration at the southeast corner of the property. Six more traps were set along the tree line near the prairie and wetland to the north.

Plant species: *Solidago* spp. (goldenrod), *Silphium terebinthinaceum* (prairie dock), *Silphium laciniatum* (compass plant), *Asclepias* spp. (milkweed), *Parthenium integrifolium* (American feverfew), *Eryngium yuccifolium* (rattlesnake master), *Aster novae-angliae* (New England aster), *Rosa Carolina*

(Carolina rose), *Andropogon gerardii* (big bluestem), *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indian grass), *Vitis riparia* (riverbank grape), *Quercus alba* (white oak), *Liriodendron tulipifera* (tulip tree), *Populus deltoids* (cottonwood)



Area 2, Site A: Charleston-Mattoon Bike Trail, Coles County
Area 2, Site C: Douglas Hart Nature Center, Coles County
(Mattoon East 7.5' quadrangle)



Area 2, Site B: Coles County Airport, Coles County
(Mattoon East 7.5' quadrangle)

AREA 3. Macoupin County

Dates trapped: 21-24 May 2001

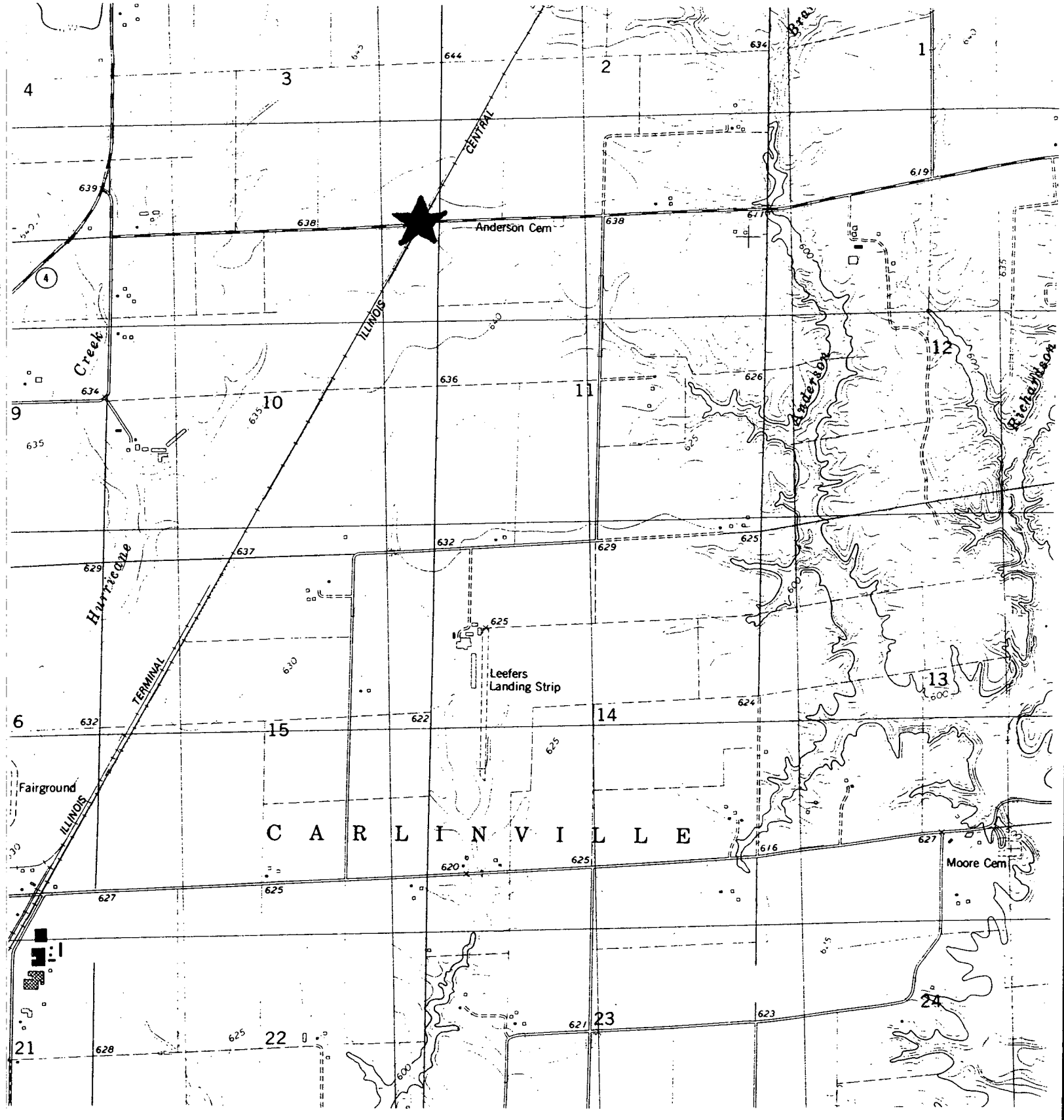
Site A. Carlinville Railroad Prairie

Species Captured: *Sylvilagus floridanus* (eastern cottontail), *Spermophilus tridecemlineatus* (thirteen-lined ground squirrel), *Didelphis virginiana* (Virginia opossum), *Mustela frenata* (long-tailed weasel)

This site was chosen due to the presence of appropriate habitat and a reported sighting along a nearby roadway. Many burrow entrances were seen along the sides of the railroad grade. Forty traps were set along a 550-m (1805-ft) stretch of the tracks northeast of Carlinville, centered at the Schale Road crossing. Agricultural fields lay beyond an 18-m (59-ft) wide mesic buffer strip on the west side of the grade that was thickly covered with forbs, weeds and some small trees. To the east of the track bed and north of the road, the vegetation buffer was narrow, 10 m (33 ft), and provided only sparse cover. On the east side of the tracks and south of the road, the right-of-way was at its widest, composed of a mixture of tall grasses, forbs, and a few clumps of trees. This section extended for 25 m (82 ft) from the tracks to another crop field.

Plant species: *Cirsium* spp. (thistle), *Solidago* spp. (goldenrod), *Asclepias* spp. (milkweed), *Silphium laciniatum* (compass plant), *Vitis riparia* (riverbank grape), *Tradescantia virginiana* (spiderwort), *Iris versicolor* (large blue flag iris), *Ambrosia artemisiifolia* (common ragweed), *Rhus radicans* (poison ivy), *Pastinaca sativa* (wild parsnip), *Rosa palustris* (swamp rose), *Sorghastrum*

nutans (Indian grass), *Andropogon gerardii* (big bluestem), *Salix interior* (sandbar willow), *Rhus glabra* (smooth sumac), *Acer saccharinum* (silver maple)



Area 3, Site A: Carlinville Railroad Prairie, Macoupin County
(Carlinville East 7.5' quadrangle)

AREA 4. Champaign County

Dates trapped: 29 May – 1 June 2001

Site A. Barnhart Grove Prairie Restoration

Species captured: *Spermophilus franklinii* (Franklin's ground squirrel - 11 adults), *Sylvilagus floridanus* (eastern cottontail)

This 12-hectare (30-acre) prairie restoration, planted 1987-1990, is located 3 km (2 miles) south of Urbana. Franklin's ground squirrels have been seen regularly at this site since 1989. FGS were captured in the oldest mixed prairie plot and along the length of a 20-30 m (66-98 ft) wide strip of un-mowed brome grass next to the entrance roadway. Burrow entrances were found in the prairie and along the road, most of which were near small clumps of trees or shrubs. A total of twelve traps were set at this site.

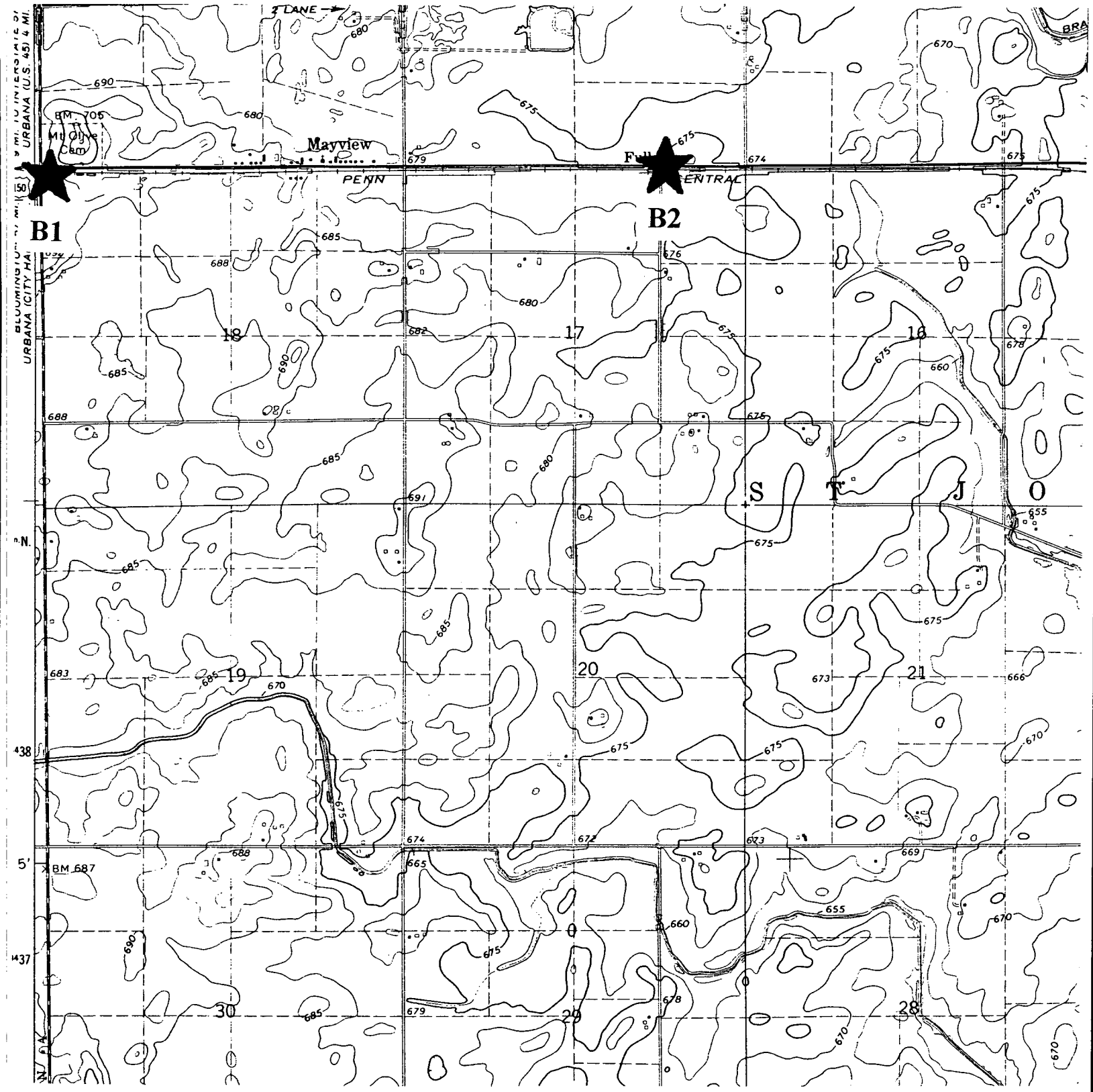
Plant species: *Allium canadense* (wild onion), *Coreopsis palmata* (prairie coreopsis), *Fragaria virginiana* (wild strawberry), *Tradescantia ohiensis* (spiderwort), *Achillea millefolium* (yarrow), *Asclepias tuberosa* (butterfly weed), *Asclepias* spp. (milkweed), *Aster* spp. (aster), *Cassia chamaecrista* (partridge pea), *Echinacea pallida* (pale purple coneflower), *Eryngium yuccifolium* (rattlesnake master), *Rudbeckia serotina* (black-eyed Susan), *Solidago* spp. (goldenrod), *Sisyrinchium albidum* (common blue-eyed grass), *Carex* spp. (sedge), Panicum *virgatum* (switch grass), *Bouteloua curtipendula* (side-oats grama), *Andropogon gerardii* (big bluestem),

Site B. Mayview-St. Joseph RR (Cottonwood Rd.- Site B1, 2000E Rd.- Site B2)

Species captured: *Quiscalus quiscula* (common grackle), *Sylvilagus floridanus* (eastern cottontail)

J.E. Hofmann captured a single Franklin's ground squirrel at this site in May 1998. Thirty traps were set along the length of this abandoned railroad bed, eight at the Cottonwood Road crossing and twenty-five at the 2000E Road crossing. A 10-meter (33-ft) wide right-of-way separates the bed from US Rte 150 to the north and a 20-meter (66-ft) wide buffer divides the area from a crop field to the south. The vegetation along the railroad grade itself and in the rights-of-way represent a degraded prairie remnant and contains many non-native species.

Plant species: *Asclepias* spp. (milkweed), *Cirsium* spp. (thistle), *Erigeron strigosus* (daisy fleabane), *Helianthus* spp. (sunflower), *Pastinaca sativa* (wild parsnip), *Ambrosia trifida* (giant ragweed), *Rubus allegheniensis* (wild blackberry), *Bromus* spp. (brome grass), *Spartina pectinata* (prairie cordgrass), *Agrostis alba* (red top), *Conium maculatum* (poison hemlock)



Area 4, Site B: Mayview-St. Joseph RR, Champaign County
Site B1- Cottonwood Rd. crossing, Site B2- 2000E Rd. crossing
(St. Joseph 7.5' quadrangle)

AREA 5. Hancock County

Dates trapped: 4-7 June 2001

Site A. Elvaston Railroad – US Route 136 crossing

Species captured: none

Four museum specimens were collected from Elvaston in the late 1960's and early 1970's. Suitable habitat was determined to exist along the railroad that runs northeast and southwest of the town. Four traps were set immediately south of U.S. Route 136, between the roadway and railroad tracks, around the intermittently shrubby perimeter of a small, low-lying field covered predominantly by brome grass and goldenrod. Eight additional traps were set in the 10-15 m (33-50 ft) wide railroad right-of-way on the north side of the road. This area was also dominated by brome grass but it contained many forbs. Agricultural fields surrounded the entire site.

Plant species: *Solidago* spp. (goldenrod), *Tragopogon pratensis* (yellow goatsbeard), *Amianthium canadense* (wild garlic), *Trifolium pratense* (red clover), *Potentilla recta* (rough-fruited cinquefoil), *Silphium laciniatum* (compass plant), *Lobelia spicata* (spiked lobelia), *Bromus* spp. (brome grass), *Festuca* spp. (fescue grass), *Agrostis alba* (red top), *Hordeum jubatum* (foxtail barley), *Ulmus americana* (American elm), *Morus alba* (white mulberry)

Site B. Elvaston Railroad – 1200E Road crossing

Species captured: *Spermophilus tridecemlineatus* (thirteen-lined ground squirrel)

Eight traps were set in a 10-meter (33-ft) wide strip of brome dominated railroad right-of-way north of the track bed and west of 1200E Road. A drainage ditch divided the right-of-way from the grade. An agricultural fielded boarded the strip on the far side.

Plant species: *Solidago* spp. (goldenrod), *Pastinaca sativa* (wild parsnip), *Silphium laciniatum* (compass plant), *Cirsium* spp. (thistle), *Oenothera fruticosa* (sundrops), *Conium maculatum* (poison hemlock), *Bromus* spp. (brome grass), *Poa pratensis* (Kentucky bluegrass)

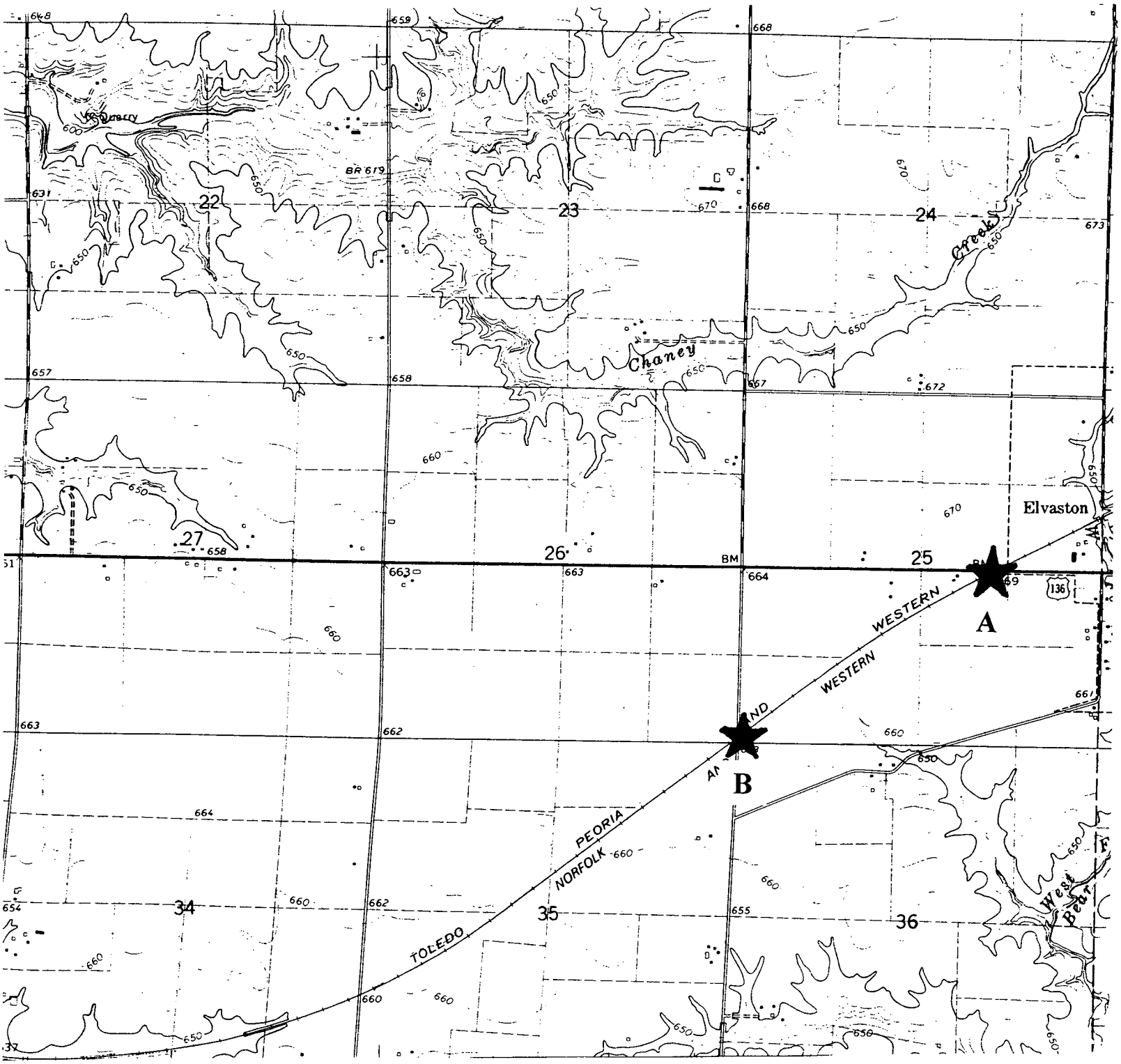
Site C. Kibbe Life Science Field Station of Western Illinois University

Species captured: none

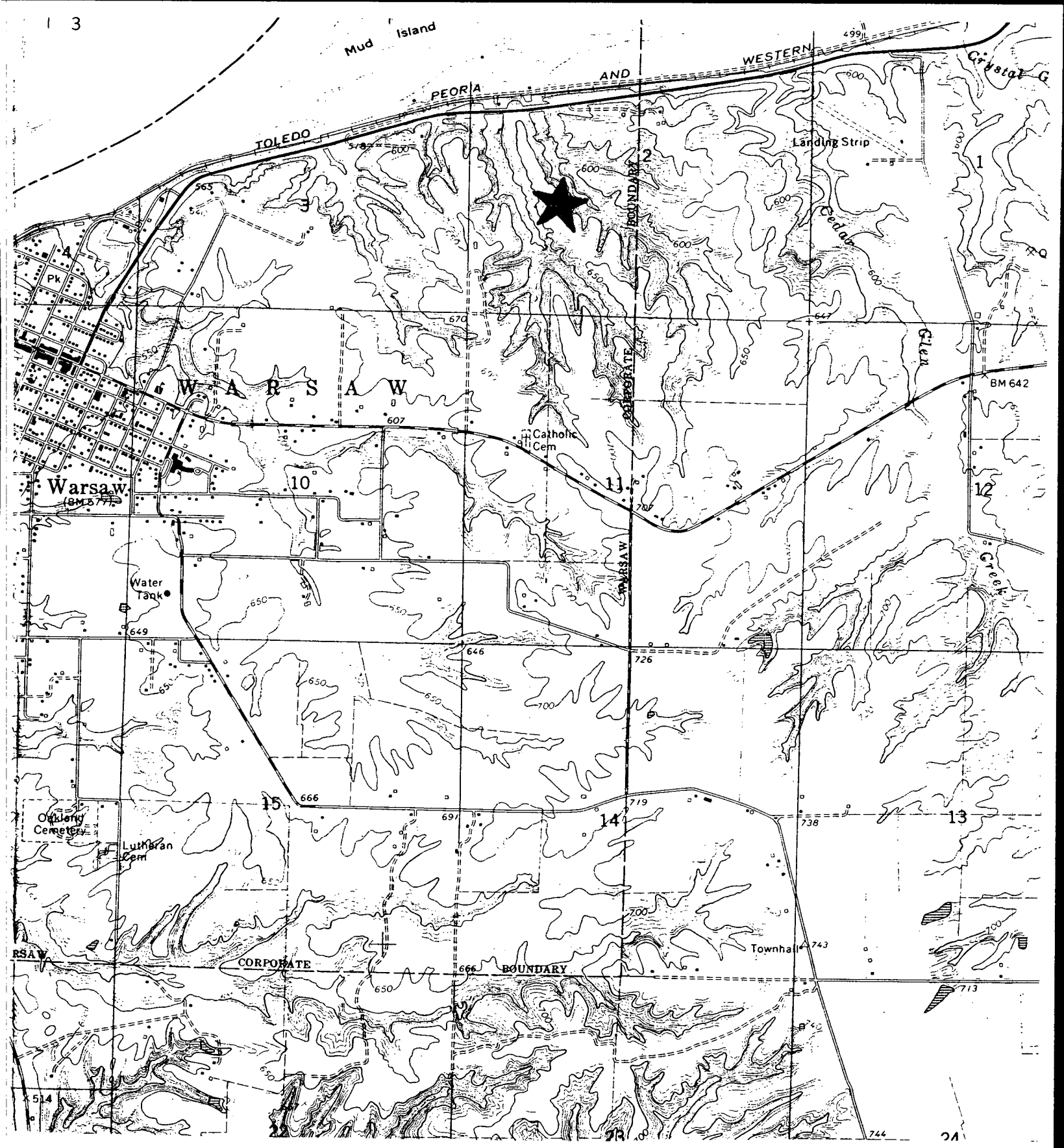
Two hilltop prairies, each approximately .5 km (.31 miles) long, were determined to contain suitable habitat. The north prairie was dominated by mature Indian grass and switch grass while the south field contained shorter grasses and a higher concentration of shrubs and goldenrod. Sixteen traps were set between these two fields.

Plant species: *Asclepias* spp. (milkweed), *Fragaria virginiana* (wild strawberry), *Rosa setigera* (prairie rose), *Monarda didyma* (Oswego tea), *Lobelia spicata* (spiked lobelia), *Phlox pilosa* (downy phlox), *Coronilla varia* (crown vetch), *Erigeron strigosus* (lesser daisy fleabane), *Solidago* spp. (goldenrod), *Coreopsis*

verticillata (whorled coreopsis), *Rhus radicans* (poison ivy), *Rosa multiflora* (multiflora rose), *Bromus* spp. (brome grass), *Sorghastrum nutans* (Indian grass), *Panicum virgatum* (switch grass), *Rhus glabra* (smooth sumac), *Quercus stellata* (post oak), *Cornus drummondii* (rough-leaved dogwood)



Area 5, Site A: Elvaston RR – U.S. Route 136 crossing, Hancock County
Area 5, Site B: Elvaston RR – 1200E Rd. crossing, Hancock County
(Hamilton 7.5' quadrangle)



Area 5, Site C: Kibbe Life Science Field Station, Hancock County
(Warsaw 7.5' quadrangle)

AREA 6. Iroquois County

Dates trapped: 11-14 June 2001

Site A. Gilman – South Railroad

Species captured: *Spermophilus tridecemlineatus* (thirteen-lined ground squirrel)

A museum specimen was collected from Gilman in 1960. It was determined that appropriate habitat still exists along the railroad rights-of-way running north, south, east, and west of Gilman. Eight traps were set on the west side of the two parallel tracks immediately south of U.S. Route 24. The tracks were on top of a steep, very high grade. A wet ditch lay to the east of the tracks and a 15-m (50-ft) wide degraded vegetative buffer strip existed on the west slope of the grade. A drainage ditch lay at the base of this slope with a mowed grass field beyond.

Plant species: *Solidago* spp. (goldenrod), *Amianthium canadense* (wild garlic), *Silphium terebinthinaceum* (prairie dock), *Pastinaca sativa* (wild parsnip), *Silphium laciniatum* (compass plant), *Tradescantia virginiana* (spiderwort), *Asclepias* spp. (milkweed), *Verbascum thapsus* (common mullein), *Aruncus dioicus* (yellow goatsbeard), *Cichorium intybus* (chicory), *Erigeron annuus* (daisy fleabane), *Cirsium* spp. (thistle), *Schizachyrium scoparium* (little bluestem), *Populus deltoids* (cottonwood)

Site B. Gilman – Crescent City RR (900E Rd.- Site B1, 1300E Rd.- Site B2)

Species captured: *Spermophilus tridecemlineatus* (thirteen-lined ground squirrel)

A total of 28 traps was set along the railroad corridor running parallel to U.S. Route 24 between Gilman and Crescent City, 16 at the 900E Rd. crossing and 12 at the 1300E Rd. crossing. To the north of the grade a 10-20 meter (33-66 ft) wide buffer strip separated the tracks from crop fields. This area was primarily flat and covered with grasses and forbs but it became very wet adjacent to 1300E Rd. A 10-meter (33-ft) wide strip of grasses, forbs, and shrubs extended to the south of the tracks and abruptly terminated at a very large drainage ditch. Plant species: *Asclepias* spp. (milkweed), *Erigeron annuus* (daisy fleabane), *Solidago* spp. (goldenrod), *Pastinaca sativa* (wild parsnip), *Tradescantia virginiana* (spiderwort), *Aruncus dioicus* (yellow goatsbeard), *Silphium terebinthinaceum* (prairie dock), *Silphium laciniatum* (compass plant), *Cichorium intybus* (chicory), *Taraxacum officinale* (common dandelion), *Trifolium pratense* (red clover), *Equisitum* spp. (horsetail), *Festuca* spp. (fescue grass), *Populus deltoides* (cottonwood)

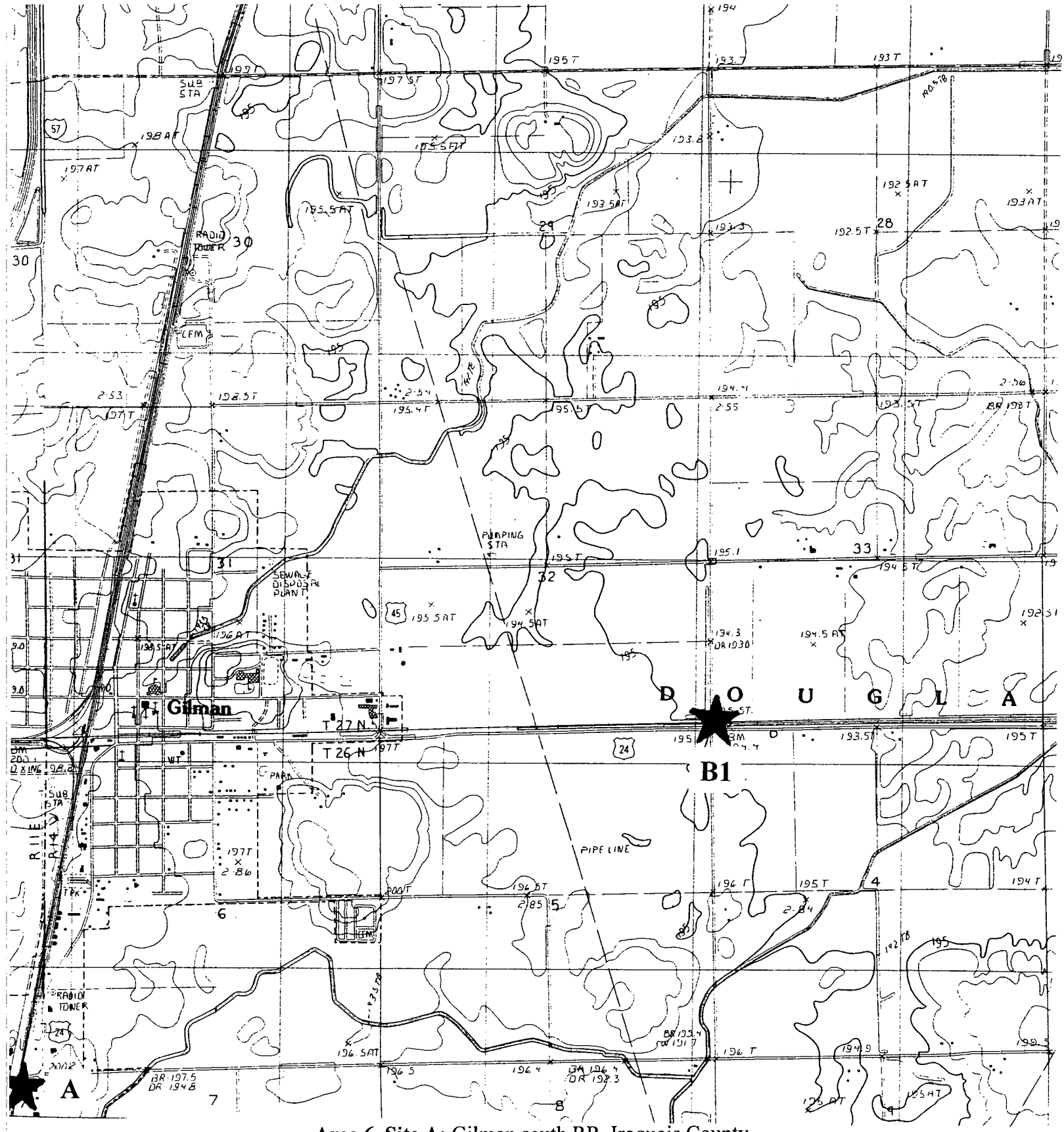
Site C. Hooper Branch Nature Preserve / Iroquois County Conservation Area

Species captured: none

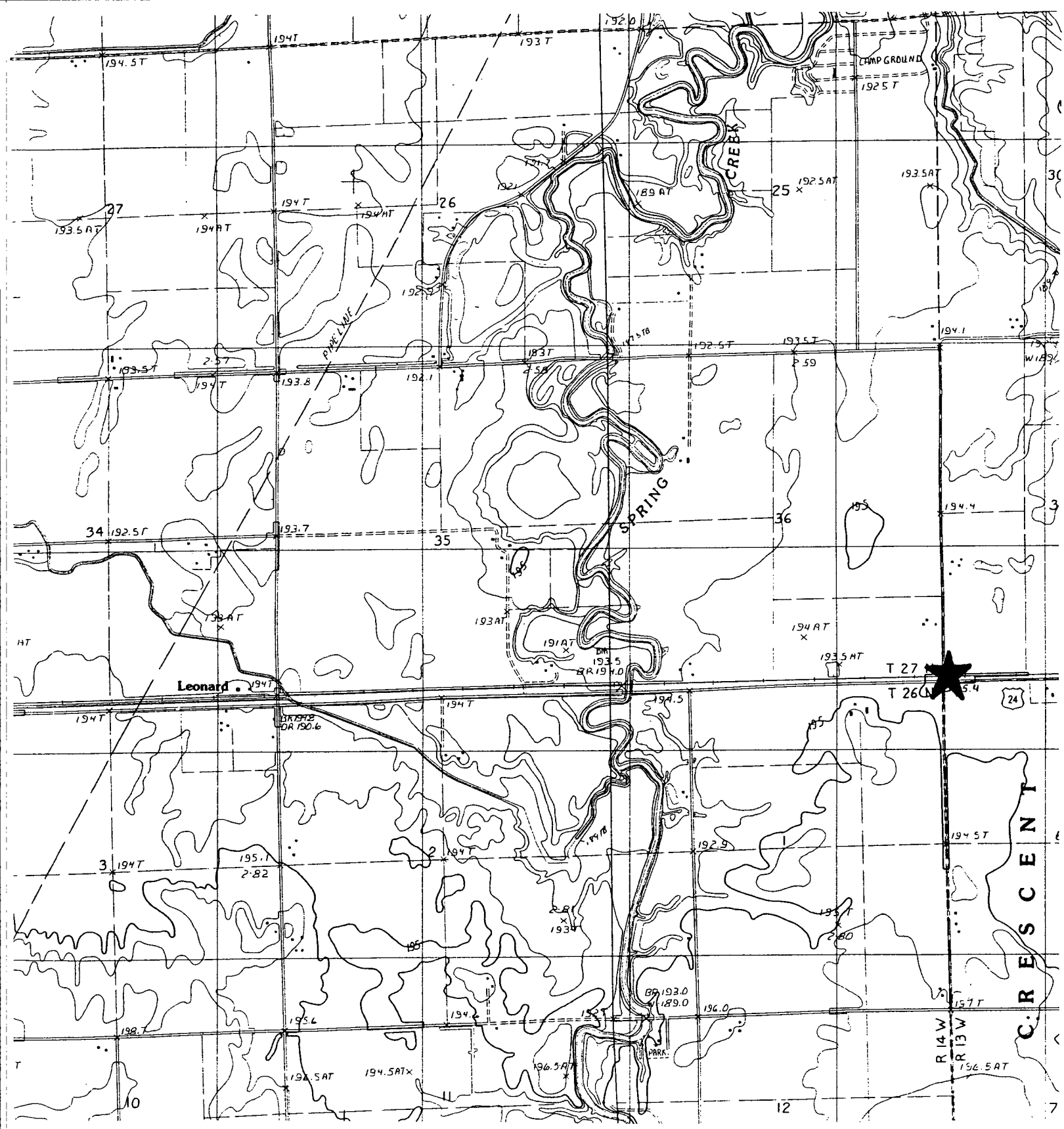
The Hooper Branch Nature Preserve is primarily an oak savanna with sandy soil. It was suggested that appropriate habitat existed in this area as well as immediately south in the sedge meadows and prairies of the Iroquois County

Conservation Area. Two traps were set in a small field and along the roadside on the west edge of the Nature Preserve. Three traps were set along an un-mowed, 3-meter (10-ft) wide roadside on the north side of the Conservation Area.

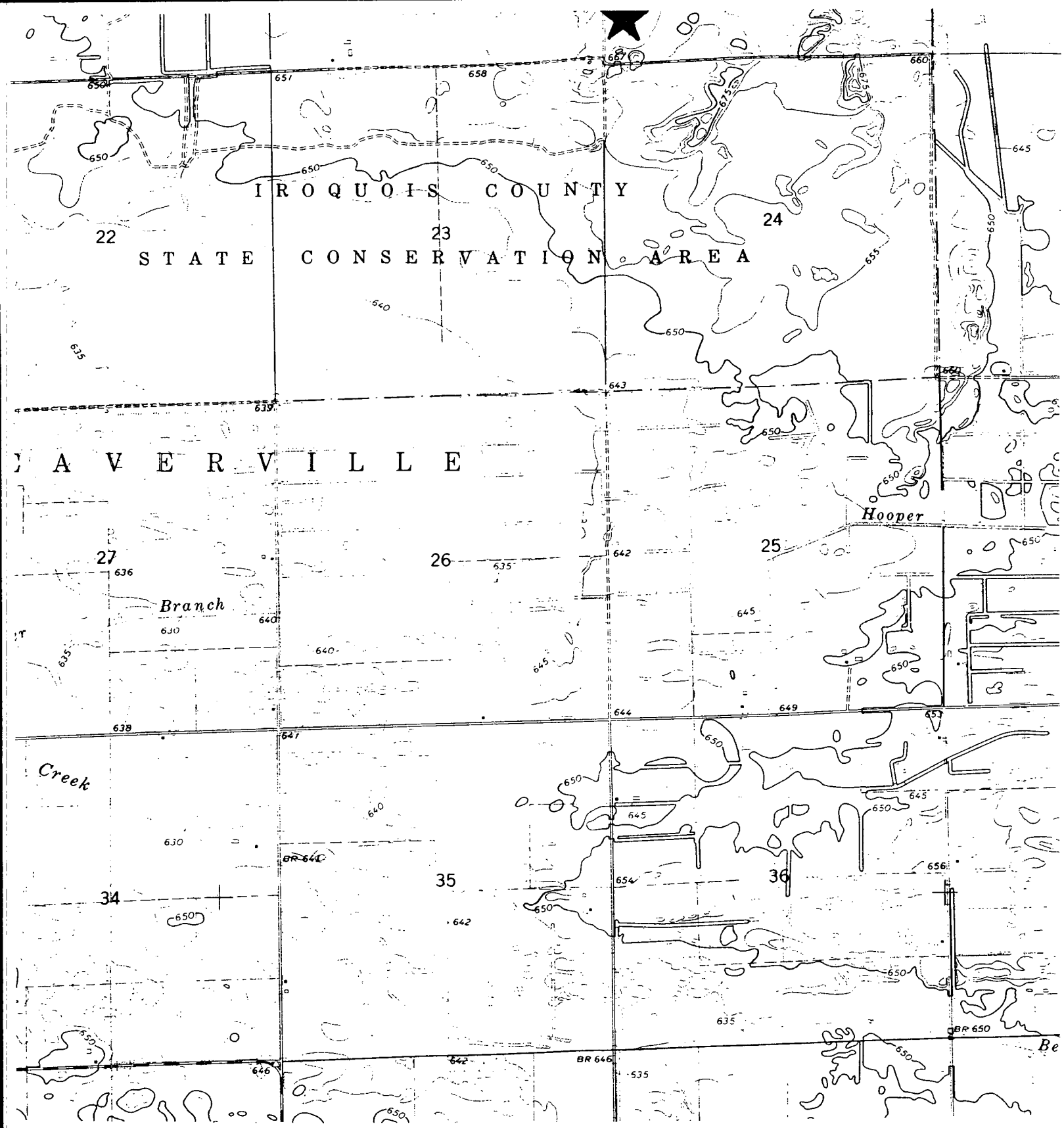
Plant species: *Tradescantia virginiana* (spiderwort), *Festuca* spp. (fescue grass), *Bromus* spp. (brome grass), *Agrostis alba* (redtop), *Vitis riparia* (riverbank grape), *Parthenocissus quinquefolia* (Virginia creeper), *Ligustrum vulgare* (common privet), *Salix nigra* (black willow), *Quercus velutina* (black oak)



Area 6, Site A: Gilman south RR, Iroquois County
Area 6, Site B1: Gilman-Cresent City RR, 900E Rd. crossing, Iroquois County
(Gilman 7.5' quadrangle)



Area 6, Site B2: Gilman-Cresent City RR, 1300 Rd. crossing, Iroquois County
(Gilman 7.5' quadrangle)



Area 6, Site C: Hooper Branch Nature Preserve, Iroquois County
(Donovan 7.5' quadrangle)

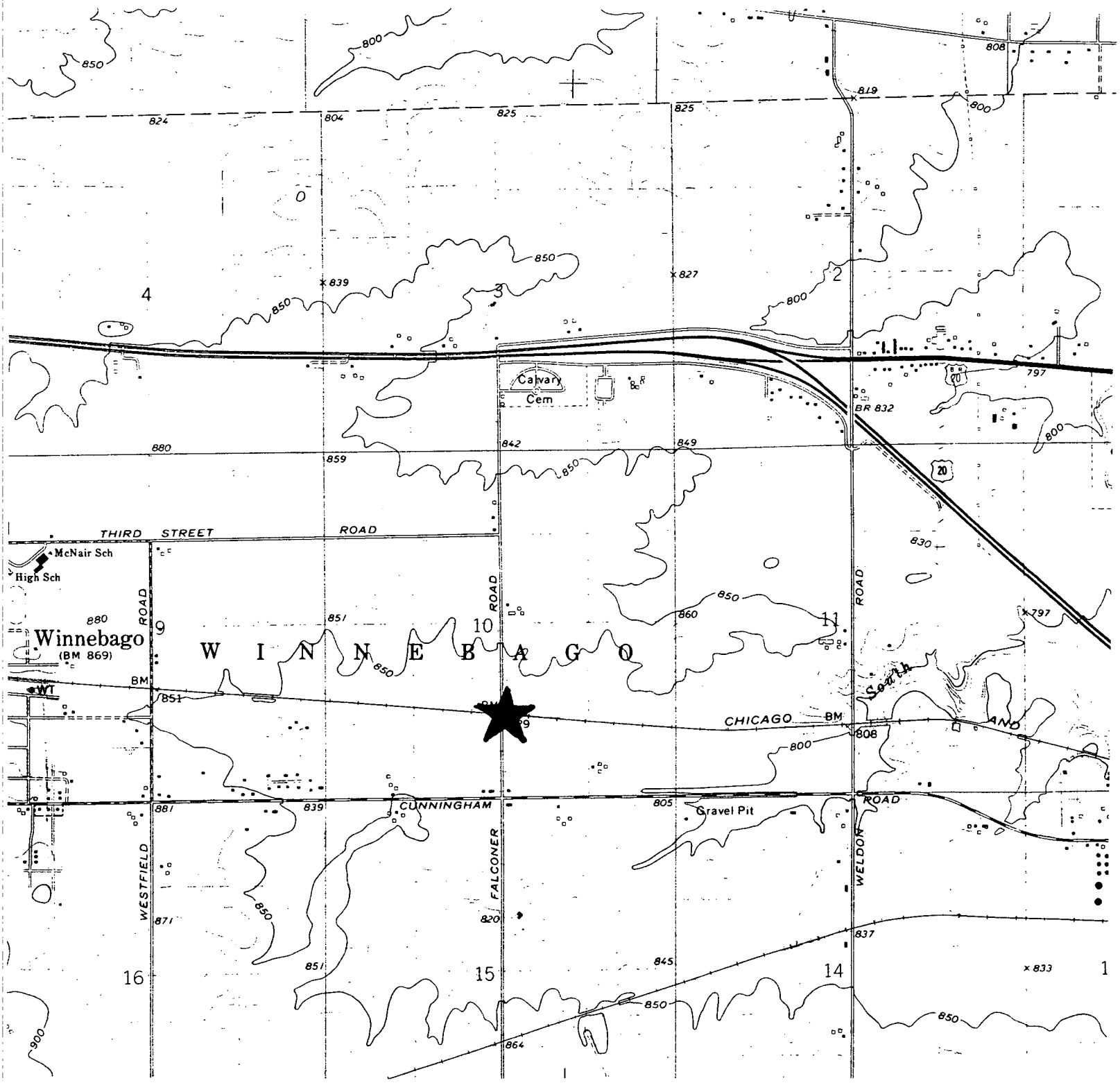
Site B. Winnebago-Rockford railroad recreation trail

Species captured: *Spermophilus tridecemlineatus* (thirteen-lined ground squirrel)

This abandoned, un-graded railway runs west of Rockford towards Winnebago. The tracks have been removed and the area is now maintained as a recreational trail. The trail itself is a 2-3 m (7-10 ft) wide mowed path with a 15-20 m (50-65 ft) wide degraded prairie buffer on each side separating it from crop fields. Ten traps were set along a 300-m (984-ft) stretch of the buffer at the Falconer Road crossing. Several thirteen-lined ground squirrel burrows were located along the adjacent mowed roadside.

Plant species: *Taraxacum officinale* (common dandelion), *Ambrosia trifida* (great ragweed), *Solidago* spp. (goldenrod), *Tragopogon pratensis* (yellow goatsbeard), *Lychnis alba* (white campion), *Asclepias* spp. (milkweed), *Pastinaca sativa* (wild parsnip), *Potentilla recta* (rough-fruited cinquefoil), *Verbascum thapsus* (common mullein), *Silphium terebinthinaceum* (prairie dock), *Cirsium* spp. (thistle), *Echinacea purpurea* (purple coneflower), *Silphium laciniatum* (compass plant), *Baptisia leucantha* (white false indigo), *Tradescantia virginiana* (spiderwort), *Trifolium repens* (white clover), *Fragaria virginiana* (wild strawberry), *Carex* spp. (sedge), *Bromus* spp. (brome grass), *Lonicera* spp. (honeysuckle)

Area 7, Site A: Searls Park Prairie Nature Preserve, Winnebago County
(Rockford North 7.5' quadrangle)



Area 7, Site B: Winnebago-Rockford RR recreation trail, Winnebago County
(Winnebago 7.5' quadrangle)

AREA 8. Lake County

Dates trapped: 25-28 June 2001

Site A. Spring Bluff Nature Preserve – North

Species captured: none

S. franklinii sightings have been recorded regularly just north of the preserve across the Wisconsin state border in Chiwaukee Prairie. The Spring Bluff Nature Preserve is a combination of sand prairie and marsh. Fifteen traps were set on the north side of the preserve behind the parking lot of the North Point Marina boathouse. The trapline ran parallel to the state border along a sparsely vegetated, slightly raised stretch of land that measured 500 m (1640 ft) long and 60-80 m (197-262 ft) wide. Lower areas to the north and south were much more mesic and a cattail marsh lay to the west. This was the closest that we could get to Chiwaukee Prairie and remain in Illinois.

Plant species: *Tradescantia virginiana* (spiderwort), *Asclepias* spp. (milkweed), *Tragopogon pratensis* (yellow goatsbeard), *Solidago* spp. (goldenrod), *Verbascum thapsus* (common mullein), *Achillea millefolium* (yarrow), *Rubus* spp. (dewberry), *Vitis riparia* (riverbank grape), *Schizachyrium scoparium* (little bluestem), *Sporobolus heterolepis* (prairie dropseed), *Stipa spartea* (porcupine grass), *Equisetum* spp. (horsetail), *Populus deltoides* (cottonwood), *Salix interior* (sandbar willow)

Site B. Spring Bluff Nature Preserve – South / North Point Marina

Species captured: *Marmota monax* (woodchuck)

Ten traps were set in a cordgrass and sedge field located in the southwestern corner of the nature preserve adjacent to the 7th Street entrance of the North Point Marina and to the railroad tracks that run southward from Chiwaukee Prairie through Illinois Beach State Park. Fifteen additional traps were set just south of 7th Street, also adjacent to the railway, within the State Park property in an area dominated by sedges and shrubs. Both of these areas were very wet but drier patches with sandy soil were scattered throughout.

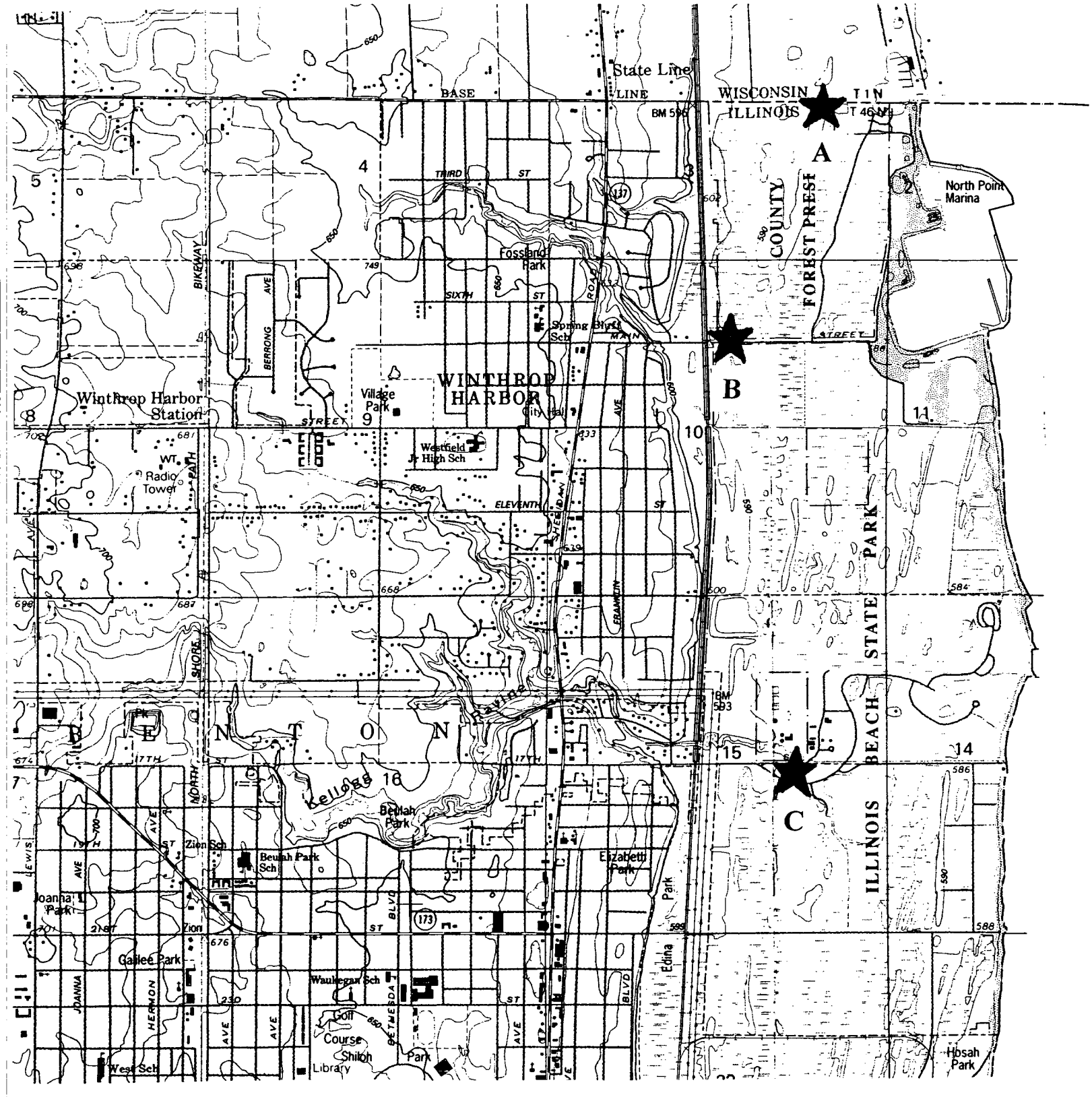
Plant species: *Solidago* spp. (goldenrod), *Asclepias* spp. (milkweed), *Silphium terebinthinaceum* (prairie dock), *Rosa setigera* (prairie rose), *Rudbeckia serotina* (black-eyed susan), *Tradescantia virginiana* (spiderwort), *Asparagus officinalis* (asparagus), *Trifolium repens* (white clover), *Phlox glaberrima* (smooth phlox), *Vitis riparia* (riverbank grape), *Rubus* spp. (dewberry), *Convolvulus sepium* (hedge bindweed), *Vicia americana* (American vetch), *Prunella vulgaris* (selfheal), *Carex* spp. (sedge), *Bromus* spp. (brome grass), *Poa pratensis* (Kentucky bluegrass), *Agrostis alba* (redtop), *Spartina pectinata* (prairie cordgrass), *Rhus glabra* (smooth sumac), *Quercus alba* (white oak), *Salix interior* (sandbar willow)

Site C. Illinois Beach State Park – Camp Logan

Species captured: *Spermophilus tridecemlineatus* (thirteen-lined ground squirrel)

Five traps were moved on the second day from the North Point Marina site to the large, sandy soil prairie fields of the Camp Logan multiple-use area, located in the North Unit of Illinois Beach State Park. Potential ground squirrel burrows were located along the edges of these prairies and thirteen-lined ground squirrels were observed.

Plant species: *Solidago* spp. (goldenrod), *Asclepias* spp. (milkweed), *Achillea millefolium* (yarrow), *Verbascum thapsus* (common mullein), *Rosa setigera* (prairie rose), *Rudbeckia serotina* (black-eyed susan), *Potentilla recta* (rough-fruited cinquefoil), *Erigeron annuus* (daisy fleabane), *Tradescantia virginiana* (spiderwort), *Mirabilis nyctaginea* (heart-leaved umbrellawort), *Lychnis alba* (white campion), *Vitis riparia* (riverbank grape), *Rubus* spp. (dewberry), *Tragopogon pratensis* (yellow goatsbeard), *Sorghastrum nutans* (Indian grass), *Bromus* spp. (brome grass), *Sporobolus heterolepis* (prairie dropseed), *Quercus velutina* (black oak), *Salix interior* (sandbar willow)



Area 8, Site A: Spring Bluff Nature Preserve – north, Lake County
Area 8, Site B: Spring Bluff Nature Preserve – south, Lake County
Area 8, Site C: Illinois Beach State Park – Camp Logan, Lake County
(Zion 7.5' quadrangle)

AREA 9. Cook County

Dates trapped: 2-5 July 2001

Site A. Gensburg-Markham Prairie Nature Preserve

Species captured: none

Franklin's ground squirrels were introduced onto this 42.5-hectare (105-acre) prairie restoration, located in the southern portion of the Chicago metropolitan area, in the early 1980's. The vegetation here was a unique mixture of black silt loam prairie and sand prairie due to the presence of both associated soil types. The eastern and central portions of the property contained wet sedge meadows. Thirty traps were set in the western, northern, and southern areas, which were generally drier.

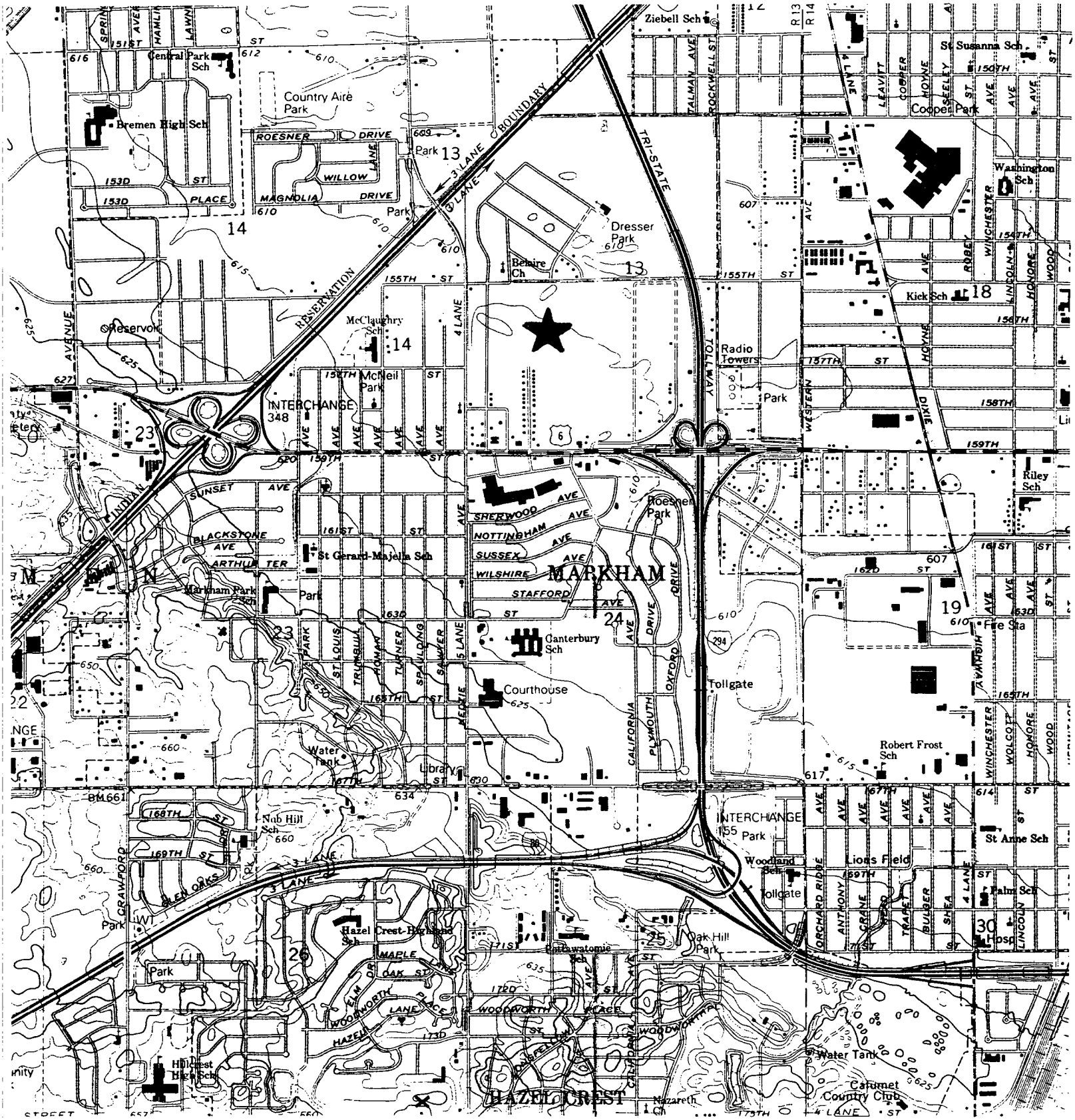
Plant species: *Veronicastrum virginicum* (Culver's root), *Chrysanthemum leucanthemum* (oxeye daisy), *Fragaria virginiana* (wild strawberry), *Verbascum thapsus* (common mullein), *Solidago* spp. (goldenrod), *Asclepias* spp. (milkweed), *Lilium superbum* (Turk's-cap lily), *Silphium perfoliatum* (cup plant), *Allium cernuum* (wild onion), *Solidago* spp. (goldenrod), *Cirsium* spp. (thistle), *Hypericum perforatum* (common St. Johnswort), *Coreopsis palmata* (prairie coreopsis), *Eryngium yuccifolium* (rattlesnake master), *Baptisia leucantha* (white false indigo), *Ambrosia trifida* (great ragweed), *Parthenium integrifolium* (wild quinine), *Tradescantia virginiana* (spiderwort), *Andropogon gerardii* (big bluestem), *Sorghastrum nutans* (Indian grass), *Sporobolus heterolepis* (prairie dropseed), *Rhus glabra* (smooth sumac), *Rhamnus cathartica* (common buckthorn)

Site B. Sand Ridge Nature Preserve

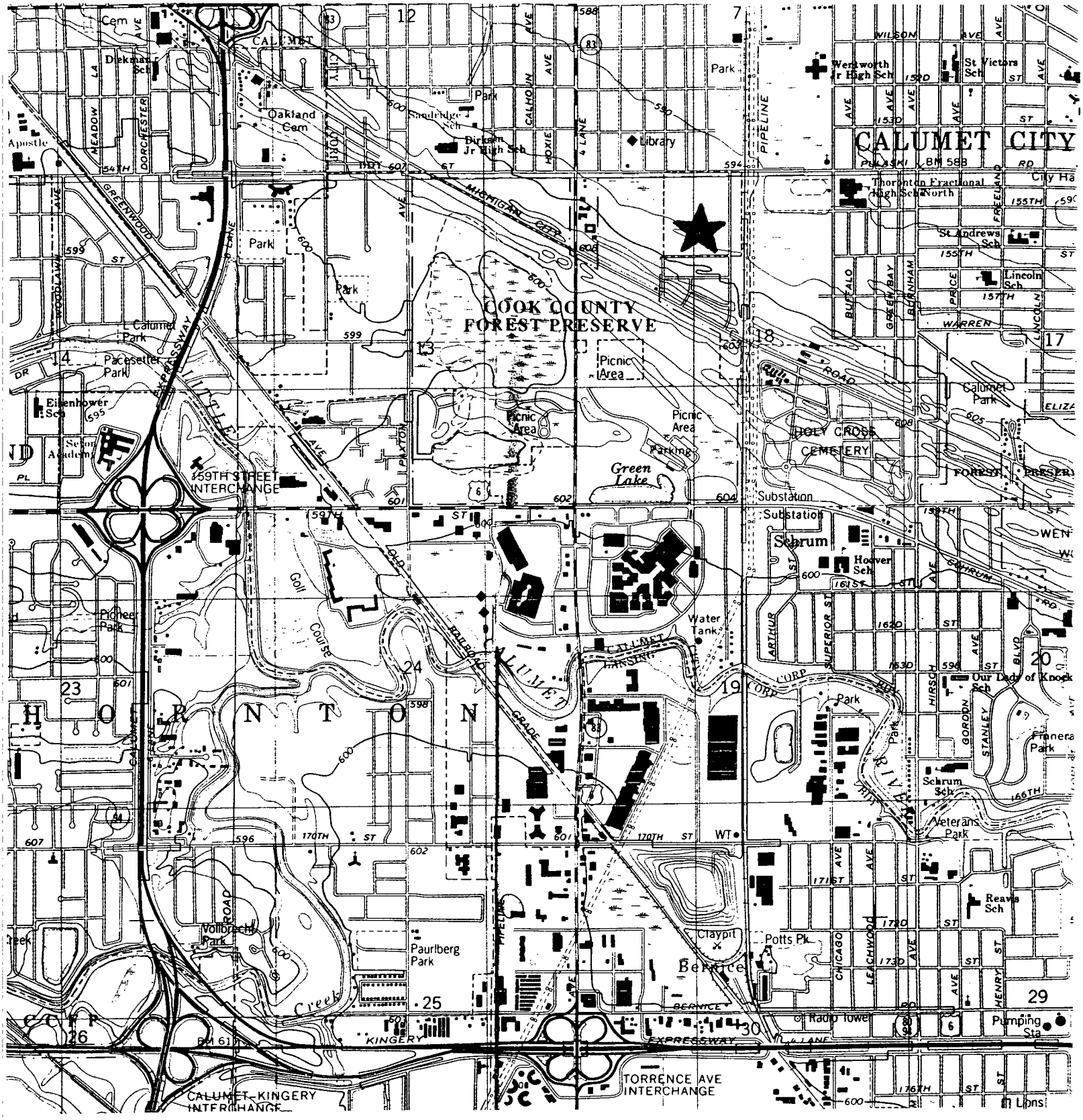
Species captured: *Sciurus carolinensis* (eastern gray squirrel)

Ten traps were set in the sand prairie in the northeastern corner of the preserve. The Sand Ridge Nature Center, located on the west side of the preserve, has a photograph on file of a Franklin's ground squirrel taken on their property in the early 1980's. No ground squirrels have been seen in this area since then but there are several nearby railroad rights-of-way and Cook County Forest Preserve District properties that may harbor remnant populations or serve as dispersal corridors.

Plant species: *Veronicastrum virginicum* (Culver's root), *Asclepias tuberosa* (butterfly weed), *Solidago* spp. (goldenrod), *Asclepias* spp. (milkweed), *Phlox pilosa* (downy phlox), *Lilium tigrinum* (tiger lily), *Coronilla varia* (crown vetch), *Erigeron annuus* (daisy fleabane), *Rudbeckia serotina* (black-eyed Susan), *Ambrosia trifida* (great ragweed), *Rubus* spp. (dewberry), *Schizachyrium scoparium* (little bluestem), *Populus deltoides* (cottonwood)



Area 9, Site A: Gensburg-Markham Prairie Nature Preserve, Cook County
(Harvey 7.5' quadrangle)



Area 9, Site B: Sand Ridge Nature Preserve, Cook County
(Calumet City 7.5' quadrangle)

AREA 10. Vermilion County

Dates trapped: 9-12 July 2001

Site A. Hoopeston Railroad – 2100E Road crossing

Species captured: *Spermophilus franklinii* (Franklin's ground squirrel - 14 juveniles, 2 adults)

This stretch of railroad was a suggested site of Franklin's ground squirrel occupancy. The right-of-way consisted of a 10-m (33-ft) wide buffer of weedy vegetation to the north and south, with crop fields beyond. A drainage ditch divided the buffer and field on the north. Twenty traps were set along a 0.8-km (0.5-mile) stretch of tracks centered on the road crossing.

Plant species: *Ambrosia trifida* (great ragweed), *Tradescantia virginiana* (spiderwort), *Rosa setigera* (prairie rose), *Coronilla varia* (crown vetch), *Asclepias* spp. (milkweed), *Convolvulus arvensis* (field bindweed), *Silphium terebinthinaceum* (prairie dock), *Silphium laciniatum* (compass plant), *Rubus allegheniensis* (common blackberry), *Cirsium* spp. (thistle), *Pastinaca sativa* (wild parsnip), *Rudbeckia serotina* (black-eyed Susan), *Daucus carota* (wild carrot), *Cichorium intybus* (chicory), *Tragopogon pratensis* (yellow goatsbeard)

Site B. Hoopeston Railroad – 2250E Road crossing

Species captured: *Spermophilus franklinii* (Franklin's ground squirrel - 4 juveniles, 3 adults)

Twenty traps were set along 0.8 km (0.5 miles) of the tracks to the west of 2250E Rd. that delineates the Illinois/Indiana state border. A 5-m (16-ft) buffer

composed primarily of brome grass separated the track bed from a crop field to the south. To the north of the tracks, a 15-m (49-ft) wide strip containing some trees and large patches of horsetail divided the tracks from a deep drainage ditch containing standing water and an agricultural field beyond.

Plant species: *Tradescantia virginiana* (spiderwort), *Asclepias* spp. (milkweed), *Cirsium* spp. (thistle), *Daucus carota* (wild carrot), *Convolvulus arvensis* (field bindweed), *Rubus allegheniensis* (common blackberry), *Tragopogon pratensis* (yellow goatsbeard), *Silphium terebinthinaceum* (prairie dock), *Asparagus officinalis* (asparagus), *Equisitum* spp. (horsetail), *Bromus* spp. (brome grass), *Salix nigra*

AREA 11. McLean County

Dates trapped: 16-18 July 2002

Site A. Railroad northeast of Towanda

Species captured: none

Two specimens in the Illinois State University collection were obtained from this area in the 1960's. Ten traps were set in the railroad right-of-way between the 2100E Road crossing and Towanda. Some of the traps were moved to adjacent sections of the right-of-way on the second day of trapping in order to maximize coverage of the area. Weedy vegetation extended from the grade eastward through a drainage ditch for roughly 10 meters (33 feet) before terminating at an agricultural field. On the west side of the tracks, a 20-meter (66 feet) wide strip of similar vegetation separated the grade from a road.

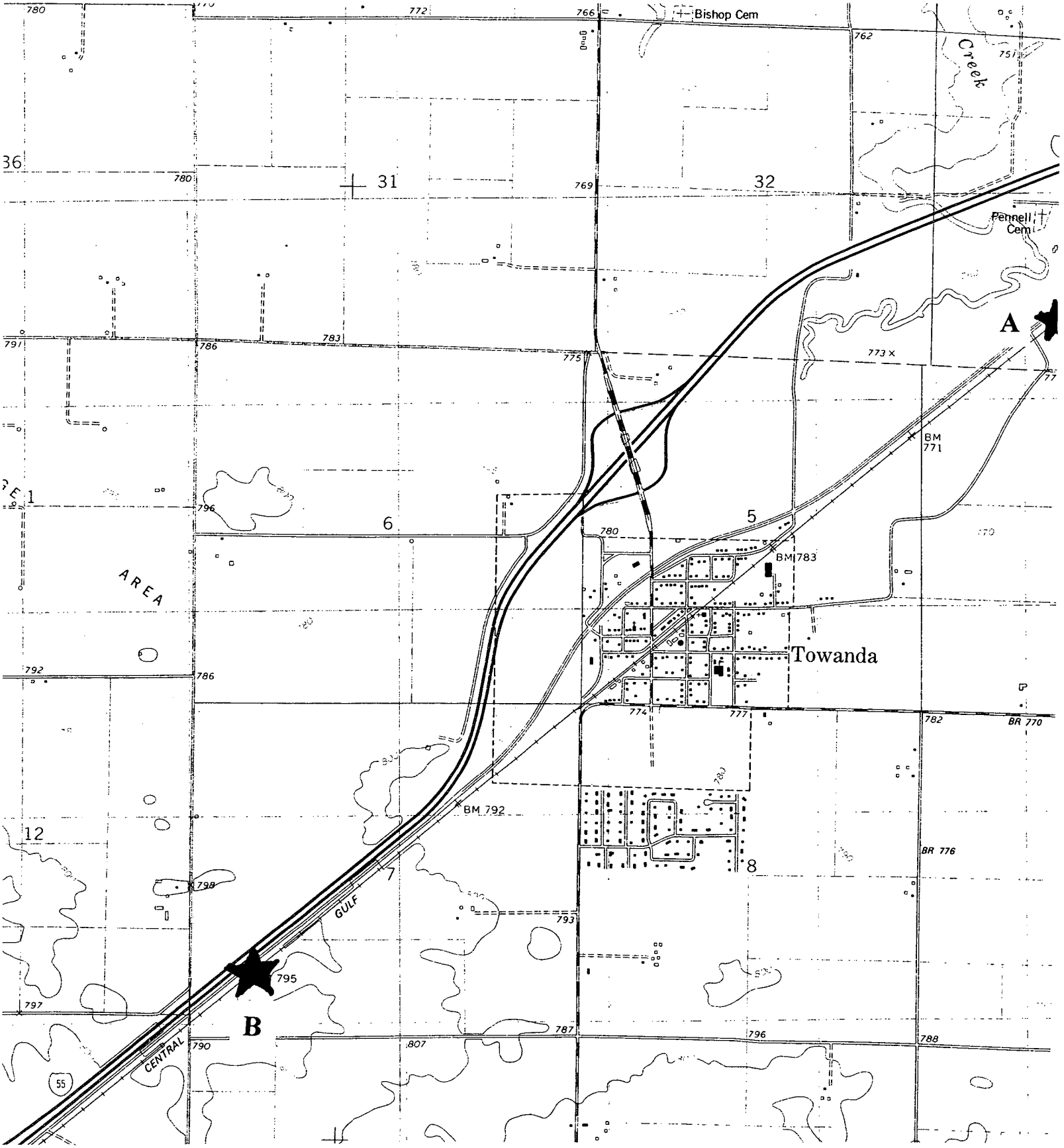
Plant species: *Pastinaca sativa* (wild parsnip), *Solidago* spp. (goldenrod), *Ambrosia trifida* (great ragweed), *Melilotus alba* (white sweet clover), *Conium maculatum* (poison hemlock), *Asclepias* spp. (milkweed), *Lychnis alba* (white campion), *Helianthus microcephalus* (small wood sunflower), *Monarda media* (purple bergamot), *Rudbeckia serotina* (black-eyed Susan), *Verbena stricta* (hoary vervain), *Equisitum* spp. (horsetail), *Typha latifolia* (cattail), *Hordeum jubatum* (foxtail barley), *Bromus* spp. (brome grass), *Poa pratensis* (Kentucky bluegrass)

Site B. Railroad southwest of Towanda

Species captured: none

Ten traps were set along this section of railroad right-of-way that contained large, vegetated mounds on both sides of the tracks. The buffer extended eastward for about 10 meters (33 feet) to a crop field and 20 meters (66 feet) to the west to a roadway. Thirteen-lined ground squirrels were seen in a mowed field along the tracks immediately south of Towanda.

Plant species: *Pastinaca sativa* (wild parsnip), *Solidago* spp. (goldenrod), *Ambrosia trifida* (great ragweed), *Daucus carota* (Queen Anne's lace), *Conium maculatum* (poison hemlock), *Asclepias* spp. (milkweed), *Cirsium* spp. (thistle), *Tragopogon pratensis* (yellow goatsbeard), *Hypericum perforatum* (common St. Johnswort), *Verbascum thapsus* (common mullein), *Convolvulus arvensis* (field bindweed), *Silphium terebinthinaceum* (prairie dock), *Rosa* spp. (rose), *Helianthus microcephalus* (small wood sunflower), *Monarda media* (purple bergamot), *Rudbeckia serotina* (black-eyed Susan), *Equisitum* spp. (horsetail), *Bromus* spp. (brome grass), *Rubus allegheniensis* (common blackberry)



Area 11, Site A: Railroad northeast of Towanda
Area 11, Site B: Railroad southwest of Towanda
(Normal East 7.5' quadrangle)

Appendix 3: Sites that were not included in this survey but may harbor remnant Franklin's ground squirrel populations.

Vermont Cemetery Prairie, Will County - This small site is located adjacent to a railroad right-of-way near Plainfield and was one of the sources for the Gensburg-Markham Prairie introduction.

Powderhorn Prairie Natural Area and vicinity of Lake Calumet and Powderhorn Lake, Cook County – Photographs of Franklin's ground squirrels were taken in this area by McHenry County Conservation District staff in 1997.

Manito Prairie Nature Preserve, Tazewell County – There are records of the species existing in the preserve in the 1980's. The Directory of Illinois Nature Preserves (McFall and Karnes 1995) also lists the Franklin's ground squirrel as a resident mammal.

Railroad ROW northeast and southwest of Taylorville, Christian County – Franklin's ground squirrel sightings were reported in the mid-1980's and mid-1990's.

Jubilee College State Park, Peoria County – A sighting was reported from the mid 1980's along the side of Brimfield-Jubilee Road on the north side of the park.

Williamsburg Hill area, Shelby County – An individual was observed and photographed in this area in June 1989.