

The Distribution of Badgers (*Taxidea taxus*) in Illinois

Barbara Ver Steeg and Richard E. Warner
Department of Natural Resources and Environmental Sciences
W-503 Turner Hall
1102 S. Goodwin
Urbana, Illinois 61801

ABSTRACT

Historical distribution of the badger (*Taxidea taxus*) in Illinois has been difficult to track and the current range has not been examined thoroughly. We collected historical data and current records from a variety of sources. From 1800-1950 the records were restricted to the northern two-thirds of the state. Currently badgers occur throughout the state. There is not enough evidence to either support or dispute a temporary range contraction during any period. The species has expanded into the southern one-third of the state from its pre-European settlement range, but timing of the expansion is unclear.

INTRODUCTION

The American badger is associated with open habitats such as prairies and rangelands (Lindzey 1982). When Europeans first settled in Illinois, tallgrass prairie communities dominated the northern two-thirds of the state (Anderson 1970, Schwegman 1973). The southern one-third of Illinois was primarily forested, but prairie patches of varying sizes were interspersed through some of the region (Anderson 1970; J. White, pers. comm.).

Pre-settlement distribution of badgers was likely restricted to the northern prairie region (Gremillion-Smith 1985). Hoffmeister and Mohr (1972) speculated that badgers were nearly extirpated in Illinois by the late 1800's but became reestablished in the northern one-half of Illinois by the 1970's. Recent records document range expansion into the southern part of the state (Klimstra and Roseberry 1969, Hubert 1978, 1979, and 1980, Gremillion-Smith 1985, Hoffmeister 1989), likely due to the clearing of forested regions (Gremillion-Smith 1985). However, a systematic evaluation of this species' current distribution in Illinois is lacking. In addition, historical data have not been scrutinized closely to determine possible changes in distribution since the 1800's. Thus, our objectives were to review historical data to infer possible changes in badger range since European settlement, circa 1820, and to elucidate current distribution of this species in Illinois.

METHODS

We surveyed scientific sources, popular and newspaper articles, and published county histories to locate records of badger occurrences from the 1800's to 1977 (Appendix).

We also surveyed Illinois mammal collections and contacted county and local historical societies for possible unpublished sources of records.

Badger sightings have been recorded with increasing frequency from 1800 to present. This is due to many factors, including the establishment of a state natural resources agency, training of wildlife biologists and zoologists, increased human population, and public education and awareness. Thus, observation effort among intervals within this time period clearly differs. Increased efforts began in 1977 among Illinois Department of Natural Resources (IDNR) staff to actively record badger sightings. Because this represents a distinct change in the effort made in determining badger distribution, we compare long term historical data only until 1977. All records following that period are included in the current distribution map.

We grouped historical badger records into three periods based on changes in land use practices (Warner 1994, Mankin and Warner 1997). From 1800 to 1900 (Period I), much of the prairie was converted to use for production of livestock. From about 1900 to 1950 (Period II) small farms with diverse cropping systems dominated the landscape. Period III (1950-1977) was characterized by intensive row crop farming with regular and frequent use of heavy equipment and chemical fertilizers and pesticides. The exact dates used to delineate these periods are somewhat arbitrary. Many of the records found in county histories did not provide precise dates. When these vague dates fell in the early 1900's we still included the sighting in the Period I map. In all these cases, the histories were certainly referring to badgers being present at the time of European settlement, but up to what date the species was considered present is not clear.

We collected current (1977-1995) badger records using a variety of methods as part of a broader six-year badger research program. Sources of records included IDNR records, nuisance animal permits and salvage permits. We obtained records from a federal aid-funded survey of archery deer hunters targeting furbearer sightings. This survey was conducted statewide from 1991-1996. The number of survey respondents ranged from 1,239-2,877. We also surveyed fur trappers in 1989 (Warner and Ver Steeg 1995) and retrieved similar information for 1993 (Anderson 1995). The respondents were distributed statewide and numbered 1,234 in 1989 and 577 in 1993. In addition, we collected sightings from the public which were reported in response to informational posters and project publicity. Lastly, we compiled reports from employees of the Illinois Department of Transportation of badgers found dead on the road, in response to a memo requesting this information.

The validity of badger sightings from counties without previous records was confirmed by follow-up discussion with observers. Several characteristics and behaviors of badgers were considered diagnostic in confirming authentic sightings, including detailed head and face markings, locomotion, scent, and vocalizations.

Reports from counties with previous records were also scrutinized for diagnostic features, but not all observers were contacted directly. For these records we relied on IDNR employees to evaluate reliability of observers from whom they collected reports.

We attempted to determine regions where badgers were potentially transient as opposed to resident by assuming that breeding would occur only if a resident population existed. We confirmed that badgers bred in a given county if a lactating female was reported (e.g., evidence often from recovered carcasses), or if juveniles were observed from March through August, when they are easily distinguishable from adults.

We used wildlife management units (WMU's, Hubert 1977) to delineate different regions within the state. WMU's are based on the natural divisions of Illinois (Schwegman 1973) and take into account regional differences in several factors, including original native vegetation, topography, soils, agricultural practices, human population, and harvest of some game species.

RESULTS

We found a large number of sightings prior to 1900 (Figure 1). All records were from county histories, published papers, or private journal accounts by naturalists, historians, and explorers. Most sightings were reported in county histories. We considered these reliable because local natural history observations were usually written by a person familiar with the county rather than an outside source referencing county public records. The distribution of these records reflects the original distribution of prairie in the state.

Records were less plentiful during the period 1900-1950, and they are distributed in the northern one-half of the state (Figure 2). A single scientific survey (Mohr 1943) accounted for most of these records. Others came from published natural history accounts, and a few from museum or university collections. We distinguished between natural history observations (notes on species occurrence) and scientific articles (reports on methodical collection of data on species distribution).

Records from Period III were concentrated in original prairie habitats, but one record came from a mostly-forested southeastern county where the species was not recorded previously (Figure 3). Records are from a variety of sources, including observations and reports by biologists, and a great number of museum specimens.

Badgers are currently distributed and breed throughout Illinois (Figure 4). We failed to confirm sightings of badgers in only four counties. Although breeding badgers have not been documented in every county, evidence of breeding badgers was obtained from all WMU's except the Wabash Border WMU.

DISCUSSION

Records of badgers from 1800-1900 are consistent with the hypothesis that the distribution of badgers mirrored that of the prairie (Figure 1). Although it is possible that badgers occurring in far southern Illinois were not recorded, we consider this unlikely. Early European settlers were concentrated in the southern one-fourth of the state (Pooley 1908), making it probable that badgers would have been noted had they been present. The map for 1900-1950 (Figure 2) suggests that badgers were restricted to the northern one-half of Illinois, whereas more recent data again show almost statewide distribution (Figure 3). These data are consistent with the hypothesis that the species was once nearly extirpated

in Illinois, eventually reestablishing in the northern one-half of the state (Hoffmeister and Mohr 1957).

However, the number of records is most limited during Period II. It is unclear whether badgers were not present, or little effort was made to record sightings. We found only one county history providing natural history observations during Period II, although this type of source accounts for many of the records in Period I.

Effort invested in scientific observations probably increased in Period II, when biologists began to add specimens of badgers to museum collections and a large scale review of monthly licensed trapper reports was conducted (Mohr 1943). Despite more organized efforts, distribution of an uncommon, secretive species with low economic value may still have been inadequately assessed. The report forms used by Mohr did not include a specific request for sightings of badgers, but instead allowed respondents to offer that information, which is probably an insufficient method for establishing distribution of this species. Survey respondents are less likely to volunteer information than to "check boxes" (Fowler 1988).

Furthermore, although Mohr's project was intended to be a comprehensive statewide survey of licensed fur takers, he estimated that less than 10% of all fur takers (licensed and unlicensed) responded. In addition, this study was conducted over a short period. The county histories available for Period I effectively provide multiple widely scattered observers recording species sightings over a period of decades. Mohr's study included multiple observers (fur takers), but they only reported sightings during 5 years. Thus, although Mohr's work represented a monumental effort and the best alternative in the 1930's-40's, it still probably did not reliably establish the distribution of badgers.

If badger density was relatively low in Period II, the number of sightings might also decline, even if the distribution of badgers remained relatively stable. Habitat deterioration is one of the most important factors in declines of wildlife species (Caughley and Sinclair 1994). Habitat quality for badgers has probably continued to decline through the three periods, from prairie to diverse farming to intensive farming; it was not least suitable during Period II. The most dramatic changes in Illinois' landscape occurred by the end of Period I. Most dry and mesic prairie had been converted to farm and pastureland, and most forests had been cleared (Mankin and Warner 1997). In Period II, replacement of native prairie by a mosaic of small farms led to an overall decline in typical badger habitat. However, recent work has shown that badgers are remarkably adaptable and able to survive in today's intensively farmed landscape, in part by using alternative grassland habitats such as pastures, hay fields, roadsides, and fencelines (Warner and Ver Steeg 1995). The amount of this grassy habitat was approximately 50% higher in Period II than in Period III (U.S. Bureau of the Census 1913, 1932, 1942, 1952, 1967, and 1977, Mankin and Warner 1997). Thus, we do not believe that lower abundance of badgers in Period II would be the result of changes in habitat quality.

Other possible causes of a decline in badger abundance in Period II include pesticide use and direct human impact from trapping and hunting. Neither factor should have caused badgers to be least abundant in Period II. Peak use of all pesticides, including the especially toxic and persistent chlorinated hydrocarbon pesticides, occurred in Illinois well

after 1950 (Illinois Department of Energy and Natural Resources 1994). The badger, a species that may have been harassed and killed by landowners who considered their burrows a nuisance, was legally protected in Illinois by 1937. Although trapping and hunting may have had localized effects on badger abundance, in Illinois the species has never had a high pelt value that would encourage extensive exploitation.

Data on the current distribution of badgers and documentation of breeding indicate that badgers are ubiquitous in Illinois. However, there are fewer records of breeding from southern counties (Figure 4), which might be accounted for by fewer total observations for this portion of the state. The expansion of badgers into this part of the state was facilitated by deforestation for agriculture and mining (Gremillion-Smith 1985). In the southernmost 16 counties, forested land dropped from 91% in 1820 to 29% in 1985 (Iverson et al. 1989). Although conversion of native prairie for agricultural use in much of Illinois caused a decline in habitat quality for badgers, conversion of forest for agriculture and mining increased the distribution of usable habitat for the species. The badger represents a native Illinois species that has benefited from forest fragmentation and loss.

In conclusion, we cannot resolve whether the abundance of badgers declined and/or their distribution contracted during Period II, or whether the apparent decline was due to lack of records. Because we did not find any biological basis for the range to have been constricted during 1900-1950, we consider it unlikely to have occurred. It seems clear from the historical data, however, that an expansion of the distribution of badgers into southern Illinois occurred sometime following European settlement, eventually resulting in the current statewide distribution.

ACKNOWLEDGMENTS

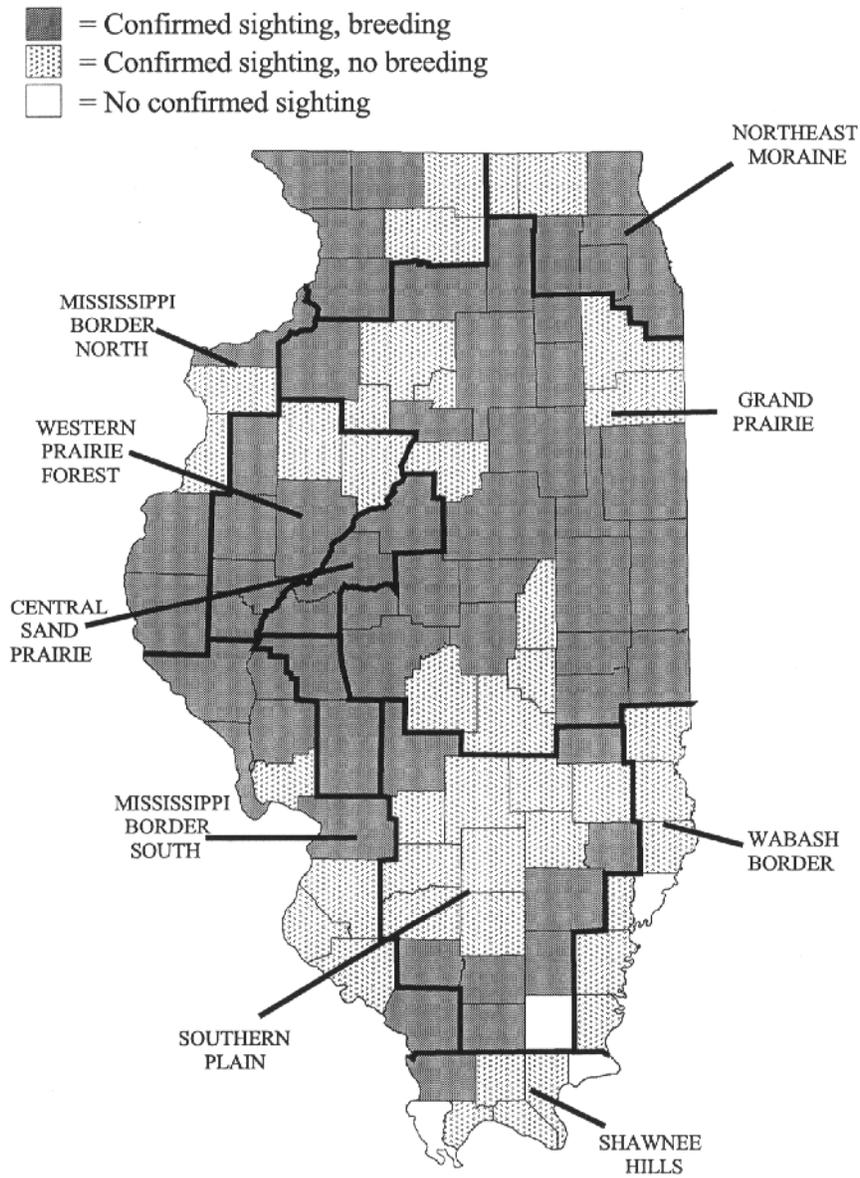
We thank Illinois Department of Natural Resources and Department of Transportation employees, and especially George Hubert, Tom Beissel and Jeff Ver Steeg, for collecting badger sighting information. We are grateful to Bob Bluett and George Hubert for their assistance and for reviewing earlier drafts of this manuscript. Ed Heske, Phil Mankin, Jeff Ver Steeg and two anonymous reviewers also contributed valuable comments on earlier drafts. Funding was provided by Federal Aid in Wildlife Restoration Project W-103-R through the Division of Wildlife Resources, Illinois Department of Natural Resources.

LITERATURE CITED

- Anderson, R. C. 1970. Prairies in the prairie state. *Ill. State Acad. Sci. Trans.* 63:214-221.
 Anderson, W.R. 1995. Illinois furbearer trapping survey, 1993-94. Job Completion Report, Federal Aid Proj. No. W-112-R-4, Study XV: Wildlife harvests. 52 pp.
 Caughley, G. and A.R.E. Sinclair. 1994. *Wildlife ecology and management*. Blackwell Scientific Publications, Boston. 334 pp.
 Fowler, F.J., Jr. 1988. *Survey research methods*. Sage Publications, Inc., Newbury Park, CA. 155 pp.

- Gremillion-Smith, C. 1985. Range extension of the badger (*Taxidea taxus*) in southern Illinois. Transactions of the Illinois Academy of Science 78:111-114.
- Hoffmeister, D.F. and C.O. Mohr. 1957. Fieldbook of Illinois mammals. Manual 4. Illinois Natural Hist. Survey, Urbana. 233 pp.
- Hoffmeister, D.F. 1989. Mammals of Illinois. Univ. Illinois Press, Urbana. 348pp.
- Hubert, G.F., Jr. 1977. Wildlife management unit survey. Illinois Dept. of Conserv., P-R Project Report, Federal Aid Project W-49-R-25, Study III, Job. 1. 46 pp.
- Hubert, G.F., Jr. 1978. Badger status evaluation. Illinois Dept. of Conserv., P-R Proj. Rep. W-49-R-25, Study I, Job 7. 12pp.
- Hubert, G.F., Jr. 1979. Badger status evaluation. Illinois Dept. of Conserv., P-R Proj. Rep. W-49-R-26, Study I, Job 7. 4pp.
- Hubert, G.F., Jr. 1980. Badger status evaluation. Illinois Dept. of Conserv., P-R Proj. Rep. W-49-R-27, Study VII, Jobs 1 & 2. 12 pp.
- Illinois Department of Energy and Natural Resources. 1994. The changing Illinois environment: critical trends. Vol. 3, Ecological resources. Illinois Department of Energy and Natural Resources, Springfield, IL. 242 pp.
- Iverson, L.R., R.L. Oliver, D.P. Tucker, P.G. Risser, C.D. Burnett, and R.G. Rayburn. 1989. The forest resources of Illinois: an atlas and analysis of spatial and temporal trends. Ill. Nat. Hist. Surv. Special Publ. 11. 181 pp.
- Klimstra, W.D. and J.L. Roseberry. 1969. Additional observations on some southern Illinois mammals. Trans. Ill. Acad. Sci. 62:413-417.
- Lindzey, F.G. 1982. The North American badger. Pp. 653-663 in Chapman, J.A. and G.A. Feldhammer eds., Wild mammals of North America: biology, management, and economics. Johns Hopkins University Press, Baltimore.
- Luman, D., M. Joselyn, and L. Suloway. 1996. Critical trends assessment project land cover database of Illinois, 1995. Illinois Natural History Survey and Illinois State Geological Survey, Champaign, IL.
- Mankin, P.J. and R.E. Warner. 1997. Mammals of Illinois and the Midwest: ecological and conservation issues for human-dominated landscapes. Pages 135-153 in Schwartz, M.W., ed., Conservation of highly fragmented landscapes. Chapman and Hall, New York. 436pp.
- Mohr, C.O. 1943. Illinois furbearer distribution and income. Illinois Natural History Survey Bulletin 22:505-537.
- Pooley, W.V. 1908. The settlement of Illinois from 1830 to 1850. Bull. Univ. Wisc., History Series 1(4):287-595.
- Schwegman, J.E. 1973. Comprehensive plan for the Illinois Nature Preserves System; Part 2: The natural divisions of Illinois. Illinois Nature Preserves Commission, Springfield, IL. 32 pp.
- U.S. Bureau of the Census. 1913. Thirteenth census of the United States taken in the year 1910. Vol. VI, Agriculture, Reports by states, with statistics for counties. U.S. Government Printing Office, Washington, D.C. 977 pp.
- U.S. Bureau of the Census. 1932. Fifteenth census of the United States: 1930. Agriculture, Vol. II, Part 1, The northern states. U.S. Government Printing Office, Washington, D.C. 1385 pp.
- U.S. Bureau of the Census. 1942. Sixteenth census of the United States: 1940. Agriculture, Vol. I, First and second series state reports, Part 1. U.S. Government Printing Office, Washington, D.C. 975 pp.
- U.S. Bureau of the Census. 1952. United States census of agriculture: 1950. Vol. I, Counties and state economic areas, Part 5. U.S. Government Printing Office, Washington, D.C. 322 pp.
- U.S. Bureau of the Census. 1967. 1964 Census of agriculture. Vol. 1, State and County Statistics, Part 12, Illinois. U.S. Government Printing Office, Washington, D.C. 411 pp.
- U.S. Bureau of the Census. 1977. 1974 Census of agriculture. Vol. 1, Part 13, Illinois state and county data. U.S. Government Printing Office, Washington, D.C. 618 pp.
- Warner, R.E. 1994. Agricultural land use and grassland habitat in Illinois: future shock for mid-western birds? Cons. Biol. 8:147-156.
- Warner, R.E. and B. Ver Steeg. 1995. Illinois badger studies, Univ. of Illinois Final P-R Report. Federal Aid Project W-103-R-1-6. 161 pp.

Figure 4. Current Illinois badger distribution. Heavy lines designate wildlife management units (Hubert 1977).



APPENDIX

Sources used to create historical distribution maps.

<u>Map</u>	<u>Source</u>
1800-1900	<p>_____. 1866. Logan County History. Interstate Publishing Co., Chicago. 909 pp.</p> <p>_____. 1878. History of Knox County, Illinois. Blakely, Brown & Marsh, Printers. Chicago. 718 pp.</p> <p>_____. 1878. The history of Jo Daviess County, Illinois. H.F. Kett and Company. Chicago. 845 pp.</p> <p>_____. 1879. History of Fulton County, Illinois. Chas. C. Chapman & Co. 1090 pp.</p> <p>_____. 1880. History of Christian County, Illinois. Brink, McDonough & Co., Philadelphia. 430 pp.</p> <p>_____. 1881. History of Mercer and Henderson Counties. H.H. Hill and Company, Publishers, Chicago. 1414 pp.</p> <p>_____. 1881. The history of Marion and Clinton Counties, Illinois. Brink, McDonough & Co., Philadelphia.</p> <p>_____. 1881. The history of St. Clair County, Illinois. Brink, McDonough & Co., Philadelphia.</p> <p>_____. 1882. Combined history of Schuyler and Brown Counties, Illinois. W.R. Brink & Co., Philadelphia. 412 pp.</p> <p>_____. 1929. Early history of Washington, Illinois and Vicinity. Tazewell County Reporter. Washington, Illinois. 148 pp.</p> <p>Angle, P.M., ed. 1968. Two years' residence on the English prairie of Illinois; By John Woods. R.R. Donnelley & Sons Company, Chicago. 237 pp.</p> <p>Baldwin, E. 1877. History of La Salle County, Illinois. Rand, McNally & Co., Chicago. 552 pp.</p> <p>Banton, O.T., ed. 1976. History of Macon County 1976. Macon County Hist. Soc. 555 pp.</p> <p>Bateman, N, P. Selby and W.A. Lorimer, eds. 1903. Historical encyclopedia of Illinois and history of Mercer County. Munsell Publishing Company, Chicago. 798 pp.</p> <p>Bateman, N. and P. Selby, eds. 1907. Historical encyclopedia of Illinois and history of St. Clair County. Vol II. Munsell Publishing Company, Chicago. 1171 pp.</p> <p>Bateman, N., P. Selby and H.F. Dyson, eds. 1908. Historical encyclopedia of Illinois and history of Schuyler County. Munsell Publishing Company, Chicago. 975 pp.</p> <p>Bateman, N. and P. Selby, eds. 1910. Illinois historical Lawrence County Biographical. Munsell Publishing Company, Chicago. 760 pp.</p> <p>Bateman, N. and P. Selby, eds. 1914. Historical encyclopedia of Illinois and history of Kendall County. Vol. II. Munsell Publishing Company, Chicago 1078 pp.</p>

- | <u>Map</u> | <u>Source</u> |
|------------|---|
| 1800-1900 | <p>Bateman, N., P. Selby and H.L. Fowkes, eds. 1918. Historical encyclopedia of Illinois and history of Christian County. Vol II. Munsell Publishing Company, Chicago. 1014 pp.</p> <p>Bateman, N., P. Selby and J. Heylin, eds. 1908. Historical encyclopedia of Illinois and history of Fulton County. Munsell Publishing Company, Chicago. 1183 pp.</p> <p>Bateman, N., P. Selby and C.E. Wilson. 1906. Historical encyclopedia of Illinois and history of Coles County. Munsell Publishing Company, Chicago. 886 pp.</p> <p>Conant, H. 1940. Des Plaines Hist. Quart. 2:57-61, 72-75, 84-87.</p> <p>Duis, E. 1874. The good old times in McLean County, Illinois. The Leader Publishing and Printing House, Bloomington, IL. 865 pp.</p> <p>Gregg, T. 1880. History of Hancock County, Illinois. Chas. C. Chapman & Co., Chicago. 1036 pp.</p> <p>Hair, J.T., compiler. 1866. Gazetteer of Madison County, Illinois. J.T. Hair, Alton, IL. 292 pp.</p> <p>Hicks, E.W. 1877. History of Kendall County, Illinois, from the earliest discoveries to the present time. Knickerbocker and Hodder, Steam Printers and Blank Book Makers, Aurora, IL. 438 pp.</p> <p>Keating, W.H., compiler. 1825. Narrative of an expedition to the source of St. Peter's River, Lake Winnepeek, Lake of the Woods, etc. Performed in the year 1823, by the order of the Hon. J.C. Calhoun, Secretary of War, under the command of Stephen H. Long, U.S.T.E. Geo. B. Whitaker, London, 2 vols.</p> <p>Kennicott, R. 1855. Catalogue of animals observed in Cook County, Illinois. Trans. Ill. State Agric. Soc. 1:577-595.</p> <p>Leonard, D.P. 1968. Big Bureau and bright prairies. De Saulniers & Company, Moline, IL. 260 pp.</p> <p>Piatt, E.C. 1883. History of Piatt County. Shepard and Johnston, Chicago, IL. 634 pp.</p> <p>Polson, T.E., ed. 1968. Corn, commerce, and country living: a history of Henry County, Illinois. De Saulniers & Company. Moline, IL. 360 pp.</p> <p>Thwaites, R.G., ed. 1905. Original journals of the Lewis and Clark Expedition, 1804-1806. Dodd, Meade, and Company, New York. 6 vols.</p> <p>Walker, C.A., ed. 1911. History of Macoupin County, Illinois. The S.J. Clarke Publishing Company, Chicago. Vol. I. 443 pp.</p> <p>Wright, J.A., ed. 1854. Prairie Farmer, 14: 320.</p> |
| 1901-1950 | <p>Cory, C.C. 1912. The mammals of Illinois and Wisconsin. Field Museum Publication 153, Zoology 11:1-505.</p> <p>Thiem, E.G., ed. 1968. Carroll County: a goodly heritage. Kable Printing Company, Mt. Morris, IL. 485 pp.</p> <p>University of Illinois Museum Collection</p> |
| 1951-1977 | <p>Anderson, E.P. 1951. The mammals of Fulton County, Illinois. Bull. Chicago Acad. Sci. 9:153-188.</p> <p>Burpee Museum Collection</p> <p>Gremillion-Smith, C. 1985. Trans. Ill. Acad. Sci. 78:111-114.</p> |

<u>Map</u>	<u>Source</u>
1851-1977	Hubert, G.H., Jr. 1978. Badger status evaluation. Illinois Dept. of Conserv., P-R Proj. Rep. W-49-R-25, Study I, Job 7. 12pp.
	Hubert, G.H., Jr. 1979. Badger status evaluation. Illinois Dept. of Conserv., P-R Proj. Rep. W-49-R-26, Study I, Job 7. 4pp.
	Hubert, G.H., Jr. 1980. Badger status evaluation. Illinois Dept. of Conserv., P-R Proj. Rep. W-49-R-27, Study VII, Jobs 1 & 2. 12 pp.
	Field Museum Collection
	Klimstra, W.D. and J.L. Roseberry. 1969. Additional observations on some southern Illinois mammals. Trans. Ill. Acad. Sci. 62:413-417.
	Knox College Museum Collection
	Koestner, E.J. 1941. Some recent records of central Illinois mammals. J.Tenn. Acad. Sci. 26:46-47.
	Lynn, R.W. 1968. Prelude to progress: the history of Mason County, Illinois 1818-1968. Mason County Board of Supervisors. 432 pp.
	Mohr, C.O. 1943. Illinois furbearer distribution and income. Ill. Nat. Hist. Surv. Bull. 22:505-537.
	Sanborn, C.C. 1930. Notes from northern and central Illinois. J. Mammal. 11:222-223.
	Thiem, E.G., ed. 1968. Carroll County: a goodly heritage. Kable Printing Company, Mt. Morris, IL. 485 pp.
	University of Illinois Museum Collection
	Wood, F.E. 1910. A study of the mammals of Champaign County, Illinois. Bull. Ill. State Lab. Natural Hist. 8:501-613.

