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# RANGE EXPANSION OF THE BADGER (*TAXIDEA TAXUS*) IN INDIANA

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ABSTRACT: In a 1955 mail survey, Indiana conservation officers reported the North American badger (*Taxidea taxus*) from 33 counties in Indiana. To assess the species' current (1997) status, 230 natural resource managers, biologists, and conservation officers were surveyed regarding the presence of badgers in their respective districts between 1994 and 1996. A total of 193 sightings (either the badgers themselves or their sign) was reported by 96 respondents in 59 counties (an increase of 26 counties over the 1955 survey), including 14 new county records. Over the same period, badger occurrences from two additional counties were obtained from the Indiana Natural Heritage Program's data base. Thus, badgers were reported from 61 counties during the 1994-1996 period. A search of other data sources (*e.g.*, occurrences in the Indiana Natural Heritage Program's data base prior to 1994 and the published literature) showed the presence of badgers in 21 more counties (for a total of 82) and included 5 more new county records. A cumulative distribution map for the badger in Indiana was prepared using the information collected.

KEYWORDS: Badger, distribution, Indiana, *Taxidea taxus*.

## INTRODUCTION

The North American badger (*Taxidea taxus*) is a medium-sized, fossorial carnivore associated with prairies, open grasslands, old fields, and other treeless habitats in the western and north-central United States (Long and Killingley, 1983; Messick, 1987). The species' current range extends north into western Canada and Ontario and south into central Mexico and Baja California (Messick, 1987). Western Ohio marks the eastern boundary of the badger's distribution (Whitaker and Hamilton, 1998), although isolated records exist in Connecticut and New York, possibly the result of animals that escaped or were released from captivity (Nugent and Choate, 1970).

Indiana is near the eastern edge of the badger's geographic range in the United States (Long and Killingley, 1983; Messick, 1987). The species was probably never common in Indiana, and early accounts (*e.g.*, Evermann and Butler, 1894; Hahn, 1909) provided few records, most of which were restricted to the northeastern corner of the State. Lyon (1936) summarized the published records from 24 counties and showed that badgers occurred throughout the northern third of Indiana with disjunct records in Franklin and Vermillion Counties. In a 1955 mail survey, conservation officers reported badgers from 33 counties (Figure 1),

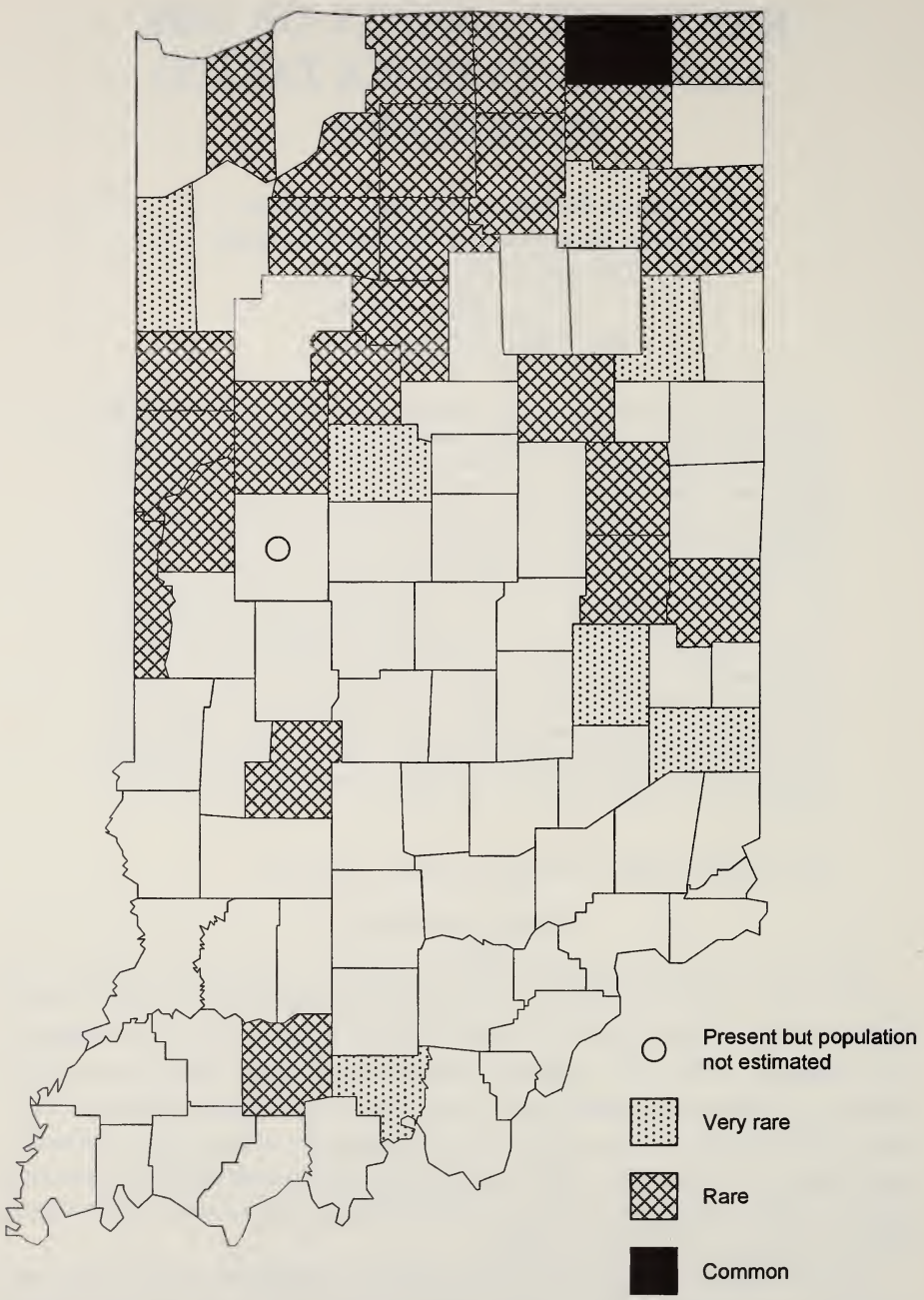


Figure 1. Distribution and relative abundance of the badger in 33 counties in Indiana in 1955 (Brooks, 1959).

including Dubois and Crawford Counties in southern Indiana (Brooks, 1959). Mumford (1969) assembled records from 53 counties and concluded that badgers were most numerous in northeastern Indiana but were still extending their range southward and southeastward. More recently, Mumford and Whitaker (1982) listed reports from 63 counties. Of these 63 counties, specimen records were available from 26.

Badgers have been listed as endangered by the Indiana Department of Natural Resources since 1969. Since the initial status assessment by Lyon (1932), the badger has continued to expand its range, bringing into question the validity of its endangered species designation and the necessity of its protected status. Our objective was to compare the current distribution of the badger in Indiana with that reported by Brooks (1959), who used a similar survey protocol. We also used other data sources (*e.g.*, the Indiana Natural Heritage Program's data base and the published literature) to prepare a cumulative distribution map for the badger in Indiana.

## METHODS

**1997 Mail Survey.** In May 1997, a seven-question survey was mailed to 230 employees of the Indiana Department of Natural Resources (157 conservation officers, 60 property managers, and 13 district wildlife biologists). Recipients were asked for the locations of badger road-kills, incidental captures, sightings, or sign (*e.g.*, den sites) that they either had observed first-hand or had heard of second-hand between 1994 and 1996 in their respective districts. Any evidence of the badger's reproduction (*e.g.*, pregnant or lactating females as well as juveniles) and their estimated distribution within each county were requested. Respondents were also asked to assess trends (*i.e.*, nonexistent, unknown, increasing, stable, or decreasing) and factors affecting local badger populations during the previous 10 years. We requested that they return the surveys within 1 month and mailed non-respondents a second survey after this deadline.

**Indiana Natural Heritage Program.** Information on the occurrence of badgers between 1994 and 1996 in the Indiana Natural Heritage Program's data base was used to supplement the 1997 mail survey. The date, location, description of account, and source were requested for each occurrence. Each occurrence was cross-referenced with results of the mail survey to eliminate duplicate reports.

**Cumulative Distribution Map.** Because we limited our survey to records between 1994 and 1996, our results may not be fully representative of the species' geographic range in Indiana. To prepare a more complete distribution map, occurrences in the Indiana Natural Heritage Program's data base prior to 1994 and the published literature were used to determine the presence of badgers in counties reported as not occupied in our survey.

## RESULTS

**1997 Mail Survey.** After 2 mailings, 201 completed surveys were returned (an 87.4% response rate). Badgers were reported on only 96 of those surveys.

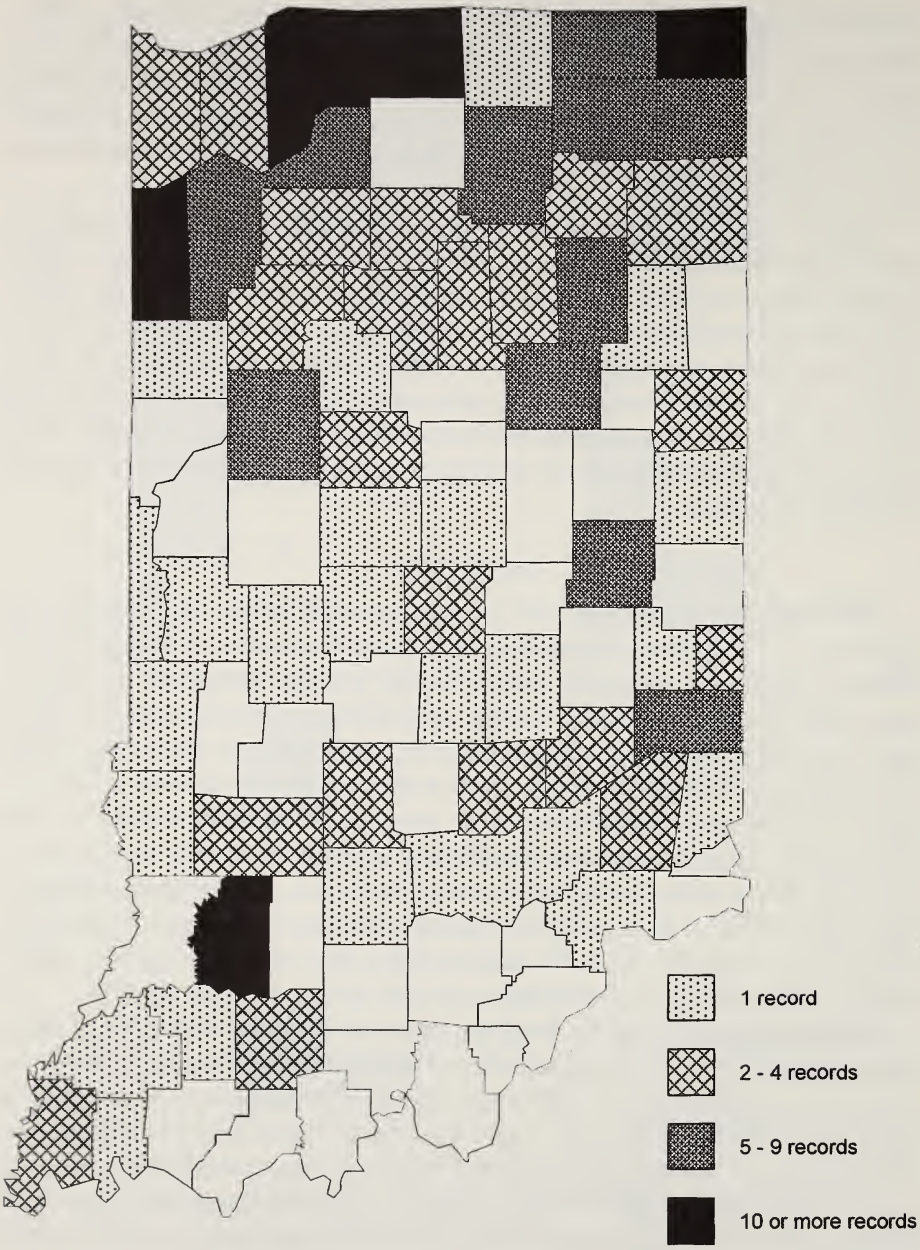


Figure 2. Distribution and relative abundance of the badger in 61 counties in Indiana between 1994 and 1996 as determined from our 1997 mail survey (193 records) and the Indiana Natural Heritage Program's data base (22 occurrences).

First-hand records of badgers or their sign ($n$ = 100) were reported in 39 counties by 52 respondents; second-hand records ($n$ = 93) were reported in 48 counties (20 of which were not documented by first-hand records) by 72 respondents (Figure 2). First-hand records consisted of road-killed badgers ($n$ = 40), incidental captures in traps legally set for other furbearers ($n$ = 27), sightings ($n$ = 16), reports of badger sign ($n$ = 11), and unspecified mortalities ($n$ = 6). Second-hand records consisted of sightings ($n$ = 51), road-kills ($n$ = 19), incidental captures ($n$ = 16), sign ($n$ = 5), and unspecified mortalities ($n$ = 2). Evidence of reproduction was reported by 18 respondents from 12 counties (Benton, Daviess, Henry, Huntington, Jackson, Jay, LaGrange, Newton, Noble, Pulaski, Starke, and Steuben). Most reports of reproduction were from the northern third of Indiana, but those from Daviess, Henry, and Jackson Counties indicate reproduction in the central and southern regions of the State.

Population trends over the last 10 years were reported by 160 respondents (80%) for 92 counties. Due to overlapping districts, we received more than one response for 78 counties (283 total responses), and the reported trends within counties were often inconsistent. Most respondents ($n$ = 175 (62%)) stated that population trends were unknown. Thirty-nine (14%) felt that badger populations were stable, and 31 (11%) indicated that badger populations were increasing. Only 9 respondents (3%) believed that badger populations had declined in the last 10 years, while 28 (10%) thought badgers did not exist in their respective counties. Factors believed to negatively impact badger populations were land development, incidental trapping, and recent agricultural practices (*i.e.*, intensive cultivation, consolidation of small farms, and loss of fence rows). Other respondents cited improvement or creation of suitable habitat (*e.g.*, Conservation Reserve Program), protected status, and a decline in trapping pressure and trap-related mortalities as factors having a positive influence on badger populations.

**Indiana Natural Heritage Program.** The Indiana Natural Heritage Program's data base recorded 27 badger occurrences between 1994 and 1996. Five had been reported in the mail survey and were eliminated from further analysis. The remaining 22 occurrences were from 11 counties and included road-killed badgers ($n$ = 11), sightings ($n$ = 8), incidental captures ($n$ = 2), and an active den ($n$ = 1). These data included records from 2 counties (Boone and Miami) where badgers were not reported in the mail survey.

**Cumulative Distribution Map.** The Indiana Natural Heritage Program's data base recorded badger occurrences prior to 1994 in 17 additional counties, primarily in central and southern Indiana (Figure 3). The most recent occurrence in 8 of these counties occurred in the 5 years preceding our survey. Four additional counties (Blackford, Crawford, Howard, and Tipton) were listed by Mumford and Whitaker (1982). Badgers have been reported from a total of 82 counties in Indiana (Figure 3). Of the remaining 10 counties, we suspect that badgers occur in Adams County in east-central Indiana because they occupy adjacent counties. Other counties that lack records are predominately forested (*e.g.*, Brown,

Martin, and Perry Counties), provide limited habitat suitable for badgers, or are in extreme southern Indiana.

## DISCUSSION

The mail survey documented the occurrence of badgers in 59 counties in Indiana, an increase of 26 counties over those reported by Brooks (1959). Occurrences in the Indiana Natural Heritage Program's data base added 2 more counties, increasing the total to 61 counties reporting badgers between 1994 and 1996. In 1955, badgers were considered common only in LaGrange County, rare in 24 counties, and very rare in the remaining 7 counties (Figure 1). We found badger reports most numerous in the northern third of Indiana, particularly in the Northeast Morainal and Northwest Tall Grass Prairie Natural Regions (Figure 2). Badgers appear less common in the central region but have colonized portions of southwestern and southeastern Indiana. The high number of records from Daviess County ($n = 13$) in southwestern Indiana may be an anomaly, resulting from 8 sightings on a single property (Glendale Fish and Wildlife Area), 4 of which were reported in a single year.

The most recent distribution map for Indiana badgers listed records from 63 counties (Mumford and Whitaker, 1982). Our survey documented the presence of badgers in 14 new counties; occurrences in the Indiana Natural Heritage Program's data base before 1994 added 5 previously unreported counties (Table 1). Although museum specimens were not available for these records, we consider them legitimate because most were either road-kills or incidental captures. The only possible exceptions were the reports from Monroe County, which were sighting reports ($n = 4$).

In Illinois, badgers have home ranges markedly larger than those reported in the western United States, perhaps due to the lower population densities of small mammals and other potential prey (Warner and Ver Steeg, 1995). As in Illinois, much of Indiana's landscape is also dominated by agriculture, and badgers probably exhibit equally low population densities. However, badgers are now distributed far beyond their original range (*sensu* Lyon, 1932), and they may no longer meet the definition of an endangered species in Indiana (*i.e.*, any animal species whose prospects for survival or recruitment in the State are in immediate jeopardy and who is in danger of disappearing from the State). Although still relatively uncommon, badgers are established in suitable areas in the northern third of the State and have expanded their range into portions of southern Indiana.

Several factors have favored their range expansion. First, badgers were legal furbearers in Indiana until 1966. From 1953 to 1966, an average of 6.5 badger pelts (range 3-18) was sold to fur houses each year (Lehman, 1982). The season for badgers was closed in 1967. Second and of greater significance, is the marked decline in trapping that has occurred in Indiana over the last 20 years. More than 22,000 trappers were licensed in 1980, less than 10,000 in 1985-1986, and fewer than 5,000 during the 9 fur-harvest seasons between 1989 and 1998

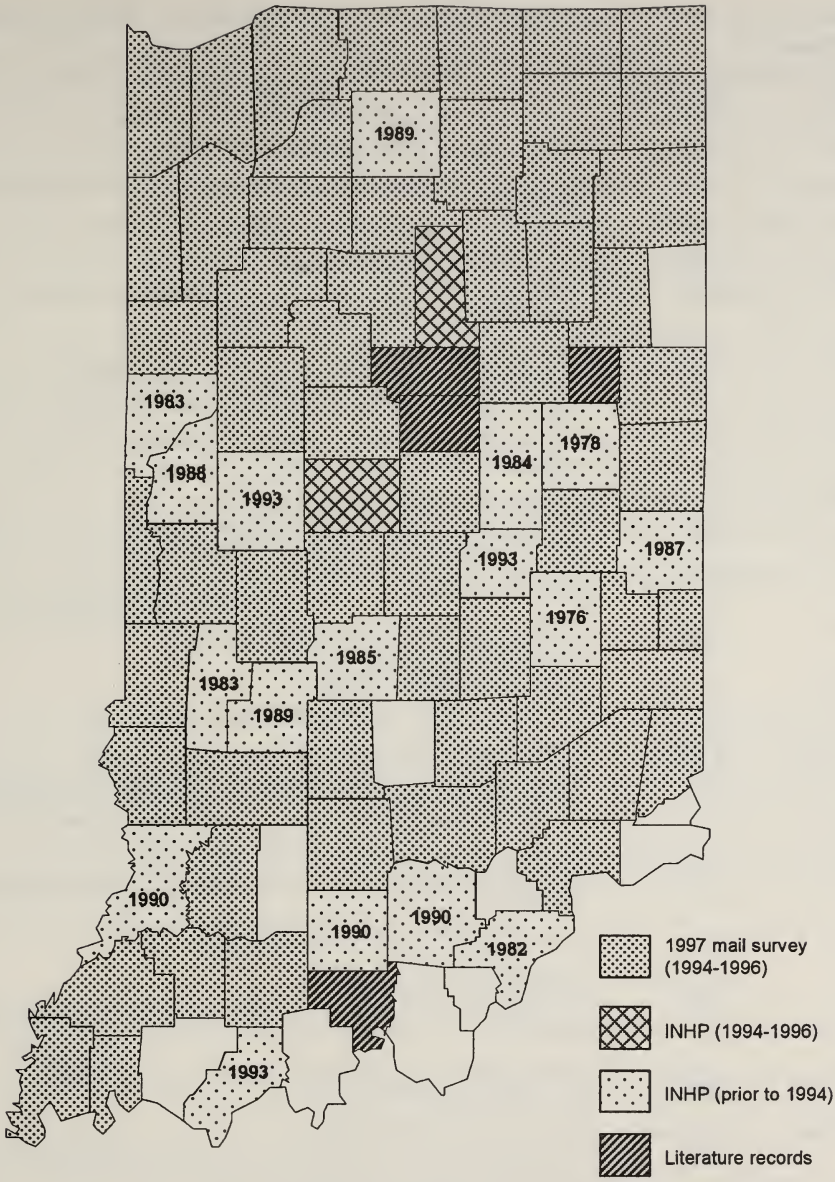


Figure 3. Cumulative distribution of the badger in 82 counties in Indiana as determined from our 1997 mail survey, the Indiana Natural Heritage Program's data base, and a review of the literature. The dates found in some counties ($n$ = 17) indicate the most recent report of the badger from that county prior to 1994 in the Indiana Natural Heritage Program's data base. Counties with literature records ($n$ = 4) were cited by Mumford and Whitaker (1982).

Table 1. Source and documentation for the new county records ($n$ = 19) for the badger in Indiana.

| County | Source | Documentation |
|---|---|---|
| Clark | INHP[1] | 1982 incidental capture in Washington Township |
| Decatur | This study[2] | Road-kill in Sand Creek Township; incidental capture in Washington Township |
| | INHP | 1987 incidental capture in Clinton Township |
| Fayette | This study | Road-kill in Connersville Township |
| | INHP | 1985 incidental capture in Jackson Township; 1986 incidental captures in Orange and Jennings townships |
| Gibson | This study | Road-kill in Barton Township |
| | INHP | 1987 sighting in Union Township; 1989 road-kills in Patoka and Montgomery townships; 1993 road-kill in Patoka Township |
| Hancock | INHP | 1988 road-kills in Center and Brandywine Townships; 1993 road-kill in Jackson Township |
| Jackson | This study | Road-kill in Brownstown Township |
| | INHP | 1983 incidental capture in Brownstown Township; 1987 mortality in Carr Township; 1993 road-kill in Redding Township |
| Jay | This study | Incidental capture in Penn Township; sighting in unspecified township |
| Jefferson | This study | Sighting in unspecified township in the northeastern portion of the County |
| | INHP | 1985 sighting and road-kill in Madison Township |
| Jennings | This study | Sighting in Campbell Township |
| | INHP | 1981 sighting in Spencer Township |
| Lawrence | This study | Road-kill in unspecified township |
| | INHP | 1982 mortality in Marion Township; 1993 road-kill in Marshall Township; 1987 mortality in Spice Valley Township; 1989 mortality in Shawswick Township; 1993 sighting in Spice Valley Township |
| Monroe | This study | Sightings in Bean Blossom and Clear Creek Townships |
| | INHP | 1981 sighting in unspecified township; sighting (no date) in Bloomington Township |
| Orange | INHP | 1990 incidental capture in Southeast Township |
| Pike | This study | Sighting in Marion Township |
| | INHP | 1984 road-kill in Washington Township; 1989 road-kill in Washington Township |
| Posey | This study | Incidental capture in Black Township; sighting in Lynn Township |
| | INHP | 1987 sighting in Robb Township |
| Randolph | This study | Sighting in Greensfork Township |
| | INHP | 1983 sighting in Monroe Township; 1987 road-kill in Union Township |
| Ripley | This study | Road-kills in Center and Jackson Townships |
| Shelby | This study | Den in Jackson Township |
| | INHP | 1981 incidental capture in Jackson Township; 1983 incidental capture in Addison Township |
| Spencer | INHP | 1992 road-kill in Jackson Township; 1993 road-kill in Luce Township |
| Washington | INHP | 1985 incidental capture in Washington Township; 1989 sightings in Pierce and Washington Townships; 1989 accidental capture in Jefferson Township |

[1] INHP denotes records prior to 1994 obtained from the Indiana Natural Heritage Program's data base.
[2] This study denotes records between 1994 and 1996 obtained during our 1997 mail survey.

(Lehman, 1999). Badgers are of limited importance in the fur market (Obbard, *et al.*, 1987), and most are incidentally captured in traps set for other species, primarily coyotes (*Canis latrans;* Messick, 1987). Third, badgers have been protected in Indiana for the last 30 years; thus, any animals incidentally captured had to be released. Finally, changes in land use practices that have created habitats more favorable for grassland-dependent species may have encouraged the range expansion of badgers. Mumford and Whitaker (1982) reported badgers from disturbed habitats (*e.g.*, abandoned gravel pits and railroad rights-of-way) and noted that their southward expansion was similar to that of another prairie mammal, the thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*). In Illinois, Gremillion-Smith (1985) suggested that the conversion of forest into row crops and pastures, improved drainage, and surface coal mining operations produced soils more suitable for burrow systems and grassy habitats capable of supporting higher rodent populations. Reclaimed strip mines, particularly in western and southwestern Indiana, provide expanses of open grassy habitats that may be suitable for foraging and provide denning sites for badgers. Fallow fields and pastures in southern Indiana may also provide additional habitats for badgers and their prey.

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