State Wildlife Grants Program
Division of Ecological Services
Minnesota Department of Natural Resources

Rare Animals in the Hardwood Hills and Pine Moraines and Outwash Plains Ecological Subsections of West-Central Minnesota
Final Report

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Abstract

The Minnesota County Biological Survey (MCBS) conducted animal surveys during the 2004 field season in portions of the Hardwood Hills ecological subsection and the Pine Moraines and Outwash Plains ecological subsection that are included in Todd, Otter Tail, and Douglas counties. Surveys were conducted for small mammals, breeding-season birds, amphibians, reptiles, nongame fish, and terrestrial invertebrates, focusing on federally- and state-listed species.

Rare species data were entered into the Natural Heritage Program's Biotics database and common species locational data were added to AniMap (MCBS's online interactive mapping tool located on the Department of Natural Resource's website). From these surveys, the MCBS documented a total of 282 animal species in Todd, Otter Tail, and Douglas counties, including over 230 new records for 30 rare animals and animals of regional interest.

Introduction

The Minnesota County Biological Survey (MCBS) was initiated in 1987 in recognition of the need to assess the status of the state's biological diversity and its rare natural resources. It is a systematic survey of Minnesota's rare biological features. MCBS identifies significant natural areas and collects and interprets data on the distribution and ecology of rare animals, rare plants, and native plant communities. The information gathered by MCBS serves as a foundation for the conservation of critical components of Minnesota's biological diversity.

Animal surveys were conducted in portions of the Hardwood Hills ecological subsection and the Pine Moraines and Outwash Plains ecological subsection contained in the west-central counties of Todd, Otter Tail, and Douglas. This area lies in a region of marked transitional change between the Prairie Parkland, Eastern Broadleaf Forest, and Laurentian Mixed Forest provinces (Fig. 1). The region is unique in having these three major ecological provinces present in close proximity and provides the opportunity to document both rare and common animal species associated with prairie, forest, peatland, and other habitats. As such, these counties have the potential of supporting a highly diverse native fauna and yielding unusual distributional extensions (Table 1).

During 2004, MCBS conducted field surveys for rare small mammals, breeding-season birds, reptiles, amphibians, fish, and terrestrial invertebrates in Todd, Otter Tail, and Douglas counties. Some surveys, such as nongame fish, extended into the 2005 field season. Targeted rare species were selected on the basis of historical records and the presence of appropriate habitat (Table 1).

These included species that were federally-listed as endangered or threatened; species that were state-listed as endangered, threatened, or of special concern; rare but unlisted species that were tracked by the Natural Heritage and Nongame Research Program; and aggregations of animals, such as colonial waterbird nesting sites or bat hibernacula, that also were tracked by the Natural Heritage and Nongame Research Program. MCBS documented the occurrences of animal species, both rare and common, by voucher specimens, photo-documentation, audio recordings, and/or sight or auditory records by an expert observer. The data from these surveys were compiled and entered into appropriate databases. All rare species data have been entered into the Natural Heritage Program's Biotics database and are available in more detail from the Natural Heritage Program. Common species locational data were added to MCBS's online interactive mapping tool, AniMap, and are available to the public on the Department of Natural Resource's website.

This report summarizes the efforts and findings of the MCBS animal surveys, conducted in 2004 and 2005 in Todd, Otter Tail and Douglas counties. A total of 282 animal species were documented, 73 of which were new county records for mammals, amphibians, reptiles and fish. In addition, over 230 new locational records for 30 rare animals and animals of regional interest were obtained. Techniques used during these surveys are described in the ***Methods*** section, details of the survey findings are summarized by animal group under ***Results and Discussion***, and areas of importance to rare and uncommon animals are identified in ***Important Areas for Rare Animals***. Additional information about the rare animals described in this report can be found in *Minnesota's Endangered Flora and Fauna* (Coffin and Pfannmuller 1988).

Methods

Survey Site Selection

Prior to conducting field surveys, information on past records of animal occurrences in Todd, Otter Tail, and Douglas counties were compiled from the literature, museum specimens, and the Natural Heritage Program's Biotics database. Landscape features and vegetational information were obtained by review of aerial photography and soil and topographic maps, and through discussions with MCBS plant ecologists and land managers, who work in these counties. Based on review of this information, a list of rare animals, animal aggregations, and animal species of regional interest was compiled (Table 1). Potential sites containing preferred habitat for the targeted animals were identified and ground reconnaissance was conducted to confirm the suitability of these sites for subsequent field surveys.

Survey Timing and Techniques

Small Mammal Surveys

Small mammal surveys were conducted between 10 August and 16 September 2004. Several trap types, including Sherman live traps, Museum Special snap traps, cone pitfall traps, and Victor rat traps, were set in a grid array of 40 stations, whenever possible (Fig. 2). In several cases, the habitat was small or irregularly shaped, affecting the size or shape of the trap grid. Stations were spaced 15 meters apart, with one or two traps set at each station. The traps used are designed to capture mammals squirrel-sized and smaller, so they would not trap or injure Eastern Spotted Skunks (*Spilogale putorius*), a state threatened species. To ensure that no cultural features were disturbed when trapping in state parks, pitfall traps, which extend into the ground approximately 10 inches, were not used.

All traps, except for pitfall traps, were baited with a mixture of peanut butter and oatmeal. The grids were run for 4 days and checked twice a day. During each check, live animals were processed in the field, marked with a permanent marker, and released. Data obtained from each capture included species identification, sex, reproductive condition, age, weight, and molt. Standard measurements also were recorded from collected specimens and representative examples were prepared as voucher specimens (Fig. 3).

Cage traps were set for Eastern Spotted Skunks, a state threatened species. Traps were set in Douglas County, 26-28 April 2004, in areas of mixed woodland, grassland, and wetland. One trap was placed at each location and baited with canned cat food. Traps were set for 2 nights and checked once a day in the morning. Trapping in Otter Tail and Todd counties was not conducted due to poor trapping success in Douglas County. Mammals observed incidental to standard survey activities were also recorded and contributed to county species lists.

Foraging Bat Surveys

Forging bats were surveyed during July and August using ANABAT bat detectors that record the ultrasonic calls made by bats (Corben and O'Farrell 1999). The calls were recorded as electronic files that were later reviewed to identify species. Surveys were either conducted for several nights at one location (night sets), or roads and trails in a particular area were traveled during a single night (cruising). For night sets, ANABAT detectors were placed on tripods in protective boxes and set to run from one-half hour before sunset, until one-half

hour after sunrise (Fig. 4). These sets were run for 6 nights. Cruising surveys were conducted by vehicle or on foot under suitable weather conditions (little-to-no rain or wind), beginning when the first bat was detected (usually around sunset) and continuing until bat activity dropped off (usually around midnight). Brief stops were made at areas likely to have foraging bats, such as lake shores, bridges over rivers and streams, and security lights.

Breeding-season Birds Surveys

Field surveys for breeding birds were conducted from 1 June to 2 July 2004, with training of staff occurring 25-28 May 2004. For the early breeding Red-shouldered Hawks, tape playback surveys were conducted from 27 April to 13 May 2004.

Point counts were the primary survey method employed by MCBS in 2004. At several points within a given habitat, all birds seen or heard singing within a 50-meter radius during a 5-minute interval were identified and evidence of breeding or nesting was recorded. Birds detected outside the 50-meter radius, were also recorded to generate a species list for the site or area. Point counts were spaced a minimum of 250 meters apart and at least 150 meters from the edge of a habitat. Point counts were conducted from approximately 15 minutes before sunrise to about 4 hours after sunrise, during suitable weather conditions (i.e., wind less than 10 mph, precipitation no greater than a light rain). Bird lists were also created when 5 or more bird species were recorded at a location, outside of a standardized point count.

For Red-shouldered Hawks, tape-recorded playbacks of bird calls were played through an amplified speaker to elicit responses by resident birds. All species reacting to the call were recorded and their behavior noted.

Road surveys were conducted to locate large or conspicuous birds associated with open country, such as agricultural areas and grasslands (Fig. 5). Routes were selected that bisected or ran along areas of potential habitat for targeted species. Observers drove slowly, stopping every one-quarter to half-mile to listen and scan for birds.

Amphibian and Reptile Surveys

Field surveys for amphibians and reptiles were conducted from 20 April through 14 July 2004 utilizing a variety of survey techniques.

Turtles were documented by scanning wetlands and riparian habitats for basking turtles and by capturing turtles in hoop nets (Fig. 6). Traps were set from 17 May through 17 June 2004. Captured turtles were identified to species, aged, sexed, and checked for reproductive condition prior to release. Searches also were conducted in open, sandy areas near wetlands in early June to locate nesting females or predated turtle nests.

Anuran call surveys were conducted after dusk by listening for and identifying calls of adult male frogs. Surveys were conducted at selected wetlands where calls were clearly audible from the road. Anuran calls were identified to species and given a call intensity value. This

technique was used from 20 April to 16 June 2004 to obtain information during early-, mid-, and late-season calling periods.

Aquatic and terrestrial herpetofaunal searches were conducted between 20 April and 14 July 2004. Terrestrial searches were used to locate amphibians and reptiles by turning over logs and rocks and searching an area in a systematic manner (Fig. 7). Basking surfaces or rock crevices were also examined (Fig. 8). In 2004, terrestrial searches targeted snakes in open grassland habitats and amphibians in mesic forest sites.

Aquatic searches targeted amphibian egg masses, larvae, and metamorphs. Dipnets were used to capture larval stages of frogs, toads, and salamanders for collection or photo-documentation (Fig. 9). In 2004, aquatic searches focused on amphibians in seasonal wetlands in forest habitats between 28 April and 3 June.

Road surveys targeted amphibians and reptiles during migration or dispersal periods, when herp movements across roads increased in frequency. Amphibians and reptiles observed incidental to standardized survey activities were also recorded and contributed to county species lists.

Nongame Fish Surveys

Surveys for rare nongame fish were conducted 7 - 17 June 2004, 4 - 7 October 2004, and 16 May – 19 July 2005 at selected lakes and rivers (Fig. 10). Candidate lakes were selected on a basis of water transparency (6 feet minimum) and associated intolerant species (Banded

Killifish, Blacknose Shiner, and Blackchin Shiner) that were reported from previous fish surveys conducted by Department of Natural Resources'(MNDNR) Divsion Wildlife and Fisheries.

Drag seines and dip nets were the most effective sampling gear for the target species. The drag seine, which is a twelve-feet-long by six-feet-deep mesh bag, was dragged along the edge of submergent vegetation to catch any fish fleeing from cover. Where no defined edge existed, the seine was used to envelop a patch of vegetation, then observers kicked through the vegetation and lifted the seine. A dip net, which is 12-inch square frame with a mesh sock on a 6-foot handle, was used in wadable depths as either a dip or kick net. In non-wadable depths, the dip net was used from either a stationary or moving boat.

The surveys consisted of two phases. Reconnaissance surveys were restricted to public accesses using only wadable methods. If one of the target species was collected or all 3 intolerant associates were present in abundant numbers, a follow-up survey was made with a boat to sample undeveloped shorelines and non-wadable vegetation. At each site, all fish species captured were identified and released. Target fish species were identified, counted, and voucher specimens collected. Submergent vegetation was described at each sampling site.

Terrestrial Invertebrates

Surveys for rare jumping spiders were conducted under contract. The final report submitted by the contractor is included as Appendix 1 (*Initial Jumping Spider Surveys for Otter Tail, Douglas, and Todd Counties, MN (with several additional records)* by William J. Ehmann). As described in the report, jumping spider surveys were conducted using various techniques, including sweep nets, limb-beating, and hand-searches. Surveys were conducted between 13 July and 23 August 2004. Specimens were preserved, identified using published authorities, sexed when possible, and linked both to archival vial tags and a digital database.

Limited field surveys were conducted, under contract, for rare tiger beetles during September 2004. Surveys were conducted by walking through suitable habitat, often along trails and back roads, and collecting tiger beetles with a handheld net.

Additional information on MCBS animal survey techniques may be found on the DNR website: (*http://www.dnr.state.mn.us/ecological_services/mcbs/procedures_animals.html*).

Information management

Data collected during the MCBS animal surveys were recorded on field forms or entered directly onto PDAs or other digital media and later entered or converted into electronic data files. All records of rare animals were entered into the Natural Heritage Program's Biotics database. Information obtained about common animals was made available through AniMap on the MNDNR's website (*http://www.dnr.state.mn.us/maps/animap/index.html*). This interactive

mapping tool allows the user to obtain lists of mammals, breeding-season birds, or amphibians and reptiles that have been documented by the MCBS in a particular county, township, or state-managed area, or to obtain a map of all locations where a particular species has been recorded.

Voucher specimens were prepared in the field or shortly after the field season. Final repository of these specimens is the J. F. Bell Museum of Natural History at the University of Minnesota for vertebrates and the Insect Collection in the Department of Entomology, University of Minnesota, for invertebrates. Additional small mammal specimens, not needed as vouchers, were prepared and are housed in The Science Museum of Minnesota's collections in St. Paul. Documentation of some amphibian and reptile species was by audio recordings or digital photographs. These recordings and images, as well as images of survey sites and survey activities, are maintained in the Image Library at the Department of Natural Resources in St. Paul.

Results and Discussion

Mammal Surveys (Figures 11-12)

Staff: Gerda Nordquist, MCBS Mammalogist
Elizabeth Harper, Field Survey Assistant
Kelly Lynch, Field Survey Assistant
Christi Spak, Field Survey Assistant
Aren Gunderson, Field Survey Assistant
Dick Oehlenschlager, Contractor

Survey Activities:

1. ***Small mammal trap grids*** were run from 10 August through 16 September 2004.

Summary of search efforts:

Todd County	7 grids
Otter Tail County	6 grids
Douglas County	15 grids
TOTAL	**28 grids**

2. ***Specialty traps*** targeting Eastern Spotted Skunks were set 26-28 April 2004.

Summary of search efforts:

Douglas County	15 traps

3. ***Foraging bats*** cruising surveys were conducted between 12 July and 17 August 2004. Night sets were run from 18 to 30 August 2004.

Summary of search efforts:

Todd County	3 routes, 1 set
Otter Tail County	2 routes
Douglas County	1 route, 2 sets
TOTAL	**6 routes, 3 sets**

Results:

Thirty-five mammal species were documented during MCBS surveys, including 2 state special concern species, the Northern Myotis (*Myotis septentrionalis*) and Prairie Vole (*Microtus ochrogaster*), and 3 bat species of regional interest (Table 2). Based on occurrence records in Hazard (1982), 37 new county records were obtained -- 16 in Douglas County, 3 in Otter Tail County, and 18 in Todd County (Table 2). No Eastern Spotted Skunks were documented, nor were any sightings of this species reported during the survey period. During MCBS surveys, in 1999, in the prairie portion of western Otter Tail, the Plains Pocket Mouse (*Perognathus flavescens*) was documented (Scambler Township, T137N, R43W). This state special concern species was not found during 2004 surveys of central and eastern Otter Tail.

Prairie Voles were found at 4 locations -- Orange WPA (Orange Township, T127N, R36W) in Douglas County, and Quistorff WMA, Sogge WPA, and West Union WPA (West Union Township, T127N, R35W) in Todd County. Despite appropriate habitat elsewhere, such as the extensive grassland tracts north and east of Lake Christina in Otter Tail County (Eagle Lake Township, T131N, R40W) and Douglas County (Lund Township, T130N, R40W), no other records for this species or for any other rare grassland small mammal were obtained. The Northern Grasshopper Mouse (*Onychomys leucogaster*), a rare prairie-associated small mammal, was recorded from southeastern Otter Tail County (Hazard 1982), but was not found during the MCBS surveys.

The last verified record of the Eastern Spotted Skunk in Minnesota was in 1992, where one was trapped at Kube WPA (Aastad Township, T131N, R43W) by staff from the USFWS Fergus Falls Wetland Management District. Attempts to capture Eastern Spotted Skunks in this area by MCBS in 1994, as well as continued trapping by the USFWS, has failed to obtain any new records of this species.

The Northern Myotis, one of two state special concern bats, was recorded from 3 locations, -- Big Swan Lake (Burnhamville Township, T128N, R32W) and on private property in Kandota Township (T127N, R34W) in Todd County; on private property in Lund Township (T130N, R40W) and a possible record at Lake Carlos State Park (Carlos Township, T129N, R27W) in Douglas County. Bat species of regional interest, the Silver-haired Bat (*Lasionycteris noctivagans*), Eastern Red Bat (*Lasiurus borealis*), and Hoary Bat (*Lasiurus cinereus*), were

documented in all three counties, as were the more common species, Little Brown Myotis (*Myotis lucifugus*) and Big Brown Bat (*Eptesicus fuscus*).

Breeding-Season Bird Surveys (Figure 13)

Staff: Steve Stucker, MCBS Ornithologist
Karl Bardon, Field Survey Assistant
John Richardson, Field Survey Assistant
Carol Schumacher, Field Survey Assistant
Mark "Sparky" Stensaas, Contractor

Survey Activities:

1. ***Point-count surveys*** were conducted in a variety of habitats from 1 June to 2 July 2004. When weather conditions were not appropriate for standardized point counts, ***species lists*** were compiled.

Summary of search efforts:

Todd County	56 point counts, 14 species lists
Otter Tail County	89 point counts, 86 species lists
Douglas County	115 point counts, 13 species lists
TOTAL	**260 points counts, 113 species lists**

2. Taped playback for Red-shouldered Hawks was conducted between 27 April and 13 May 2004.

Summary of search efforts:

Todd County	8 stops
Otter Tail County	41 stops
Douglas County	10 stops
TOTAL	**59 stops**

Results:

The 2004 MCBS bird surveys resulted in the detection of 171 total species; 146 in Todd, 161 in Otter Tail, and 149 in Douglas counties. These include 1 state endangered species, Henslow's

Sparrow (*Ammodramus henslowii*), and 1 state threatened species, Wilson's Phalarope (*Phalaropus tricolor*). One additional state threatened species, Trumpeter Swan (*Cygnus buccinator*), also was observed in these counties. Seven state special concern species were found, including Red-shouldered Hawk (*Buteo lineatus*), Yellow Rail (*Coturnicops noveboracensis*), Marbled Godwit (*Limosa fedoa*), Short-eared Owl (*Asio flammeus*), Acadian Flycatcher (*Empidonax virescens*), Cerulean Warbler (*Dendroica cerulea*), and Nelson's Sharp-tailed Sparrow (*Ammodramus nelsoni*). Five additional special concern species were observed: Greater Prairie-Chicken (*Tympanuchus cupido*), American White Pelican (*Pelecanus erythrorhynchos*), Bald Eagle (*Haliaeetus leucocephalus*), Franklin's Gull (*Larus pipixcan*), and Forster's Tern (*Sterna forsteri*). However, most sightings of the latter 5 species were non-breeding individuals, therefore records were not entered into Biotics. Four species of regional interest, American Bittern (*Botaurus lentiginosus*), Sandhill Crane (*Grus canadensis*), Upland Sandpiper (*Bartramia longicauda*), and Lark Sparrow (*Chondestes grammacus*), were also found (Table 3). Of the 4 species of regional interest, only Lark Sparrows are not tracked by the Natural Heritage and Nongame Research Program. These observations led to 123 rare bird records for the season (Table 4).

The Cerulean Warbler, a species associated with mature deciduous forest, is near the northwestern limits of its nationwide breeding distribution in these counties. Singing males were found at Lake Carlos State Park (Carlos Township, T129N, R37W), Douglas County, and Ruff-Nik Wildlife Management Area (Turtle Creek Township, T131N, R32W) in Todd County. Otter Tail County had 6 singing males; 2 at Maplewood State Park (Maplewood Township, T135N, R42W), 3 in northern Candor Township (T137N, R41W), and 1 on the south side of

Dead Lake (Dead Lake Township, T135N, R40W). One singing male Acadian Flycatcher was discovered at Runestone County Park (Solem Township, T127N, R40W), Douglas County, far northwest of its known breeding range. Another deciduous forest species, the Red-shouldered Hawk, was found at 11 locations in Douglas County, 23 in Otter Tail County, and 10 in Todd County.

Two species characteristic of sedge wetlands, the Yellow Rail and Nelson's Sharp-tailed Sparrow, were well-represented at scattered locations in Todd County (4 sites for each species). In addition, one Yellow Rail was found in Otter Tail County, and Nelson's Sharp-tailed Sparrow was found at one location in Douglas County and another in Otter Tail.

Wilson's Phalarope was observed at 4 locations in Douglas County, 1 in Otter Tail, and 3 in Todd. This species typically breeds in sedge or grassy wetlands near shallow pools of open water.

Grassland species included the Marbled Godwit and Henslow's Sparrow. Godwits were found at 4 locations in extreme western Otter Tail County, one location in southeastern Douglas, and one in southwestern Todd County. Henslow's Sparrow was found at 4 locations in Otter Tail County, primarily in the southwestern portion of the county, and one in Todd County at West Union WPA.

Amphibian and Reptile Surveys (Figure 14)

Staff: Carol Hall, MCBS Herpetologist
Elizabeth Harper, Field Survey Assistant

Kelly Lynch, Field Survey Assistant
Christi Spak, Field Survey Assistant

Survey Activities:

1. ***Turtle traps*** were set 17 May to 17 June 2004 in selected wetland complexes.

Summary of search efforts:	
Todd County	5 wetland complexes
Otter Tail County	1 wetland complex
Douglas County	3 wetland complexes
TOTAL	**9 wetlands complexes trapped**

2. ***Breeding anuran surveys*** were conducted from 20 April to 16 June 2004 at wetlands and lakes when frogs and toads were calling.

Summary of search efforts:	
Todd County	37 stops
Otter Tail County	12 stops
Douglas County	98 stops
TOTAL	**147 stops**

3. ***Aquatic and terrestrial searches*** were conducted between 20 April and 14 July 2004.

Summary of search efforts:	
Todd County	86 search locations within 25 sites
Otter Tail County	40 search location within 12 sites
Douglas County	38 search locations within10 sites
TOTAL	**164 searches**

4. ***Backpack shocking and seining*** for Mudpuppies were conducted 24 May, 29 June, and 14 September 2005.

Summary of search efforts:	
Todd County	0 search locations
Otter Tail County	2 search locations
Douglas County	1 search location
TOTAL	**3 search locations**

Results:

Nine species of herpetofauna were targeted in Todd, Otter Tail and Douglas counties (Table 1). A total of 22 species, 14 amphibians and 8 reptiles, were documented (Table 5). The Common Snapping Turtle (*Chelydra serpentina*), state special concern, was the only listed species located in these counties, however, 3 species of regional interest, the Mudpuppy (*Necturus maculosus*), the Bullfrog (*Rana catesbeiana*) and Spiny Softshell (*Apalone spinifera*) were documented (Table 5). Mudpuppies were found at 3 locations, the Common Snapping Turtle at over 3 locations, the Bullfrog at 2 locations, and the Spiny Softshell at 1 location. Additionally, the surveys recorded 23 new county records (based on Oldfield and Moriarty 1994); 10 in Todd County, 3 in Otter Tail County, and 10 in Douglas County (Table 5).

Nongame Fish Surveys (Figure 15)

Staff: Konrad Schmidt, Ecological Services Nongame Fish Specialist
Jayna DeVore, Field Survey Assistant
Jake Lehner, Field Survey Assistant
Tyler Pavlowich, Field Survey Assistant
Christi Spak, Field Survey Assistant
Justin Swart, Field Survey Assistant

Survey Activities:

Nongame fish surveys were conducted during June and October 2004, and May to July 2005.

Summary of search efforts:

	2004 survey locations	2005 survey locations
Todd County	24 on lakes, 2 on streams	9 on lakes
Otter Tail County	37 on lakes, 7 on streams	55 on lakes
Douglas County	28 on lakes	19 on lakes, 10 on streams
TOTAL	**89 on lakes, 9 on streams**	**83 on lakes, 10 on streams**

Results:

A total of 37 fish species were located during the surveys, including the two targeted special concern species, the Least Darter (*Etheostoma microperca*) and Pugnose Shiner (*Notropis anogenus*) (Table 6). Two species of regional interest, the Weed Shiner (*Notropis texanus*) and Rainbow Darter (*Etheostoma caeruleum*), also were found, both in Otter Tail County (Table 6). The MCBS surveys of Todd, Otter Tail and Douglas counties resulted in 89 new records of rare fish (Table 7).

Historical records of Pugnose Shiners, Least Darters, and their intolerant associates (Blacknose Shiners, Blackchin Shiner, and Banded Killifish) reveal a loss of many populations in the southern third of Minnesota from the conversion of prairie and hardwood forests to row crops and continued urban development. These species are environmental indicators requiring clear water and dense, extensive beds of submerged vegetation for their survival. Soil erosion from agriculture practices and shoreline development increases turbidity and phosphorous in fertilizers promote algal blooms also reducing water transparency, which eliminates the aquatic vegetation vital to these fishes.

Terrestrial Invertebrate Surveys (Figure 16)

1. ***Jumping spiders*** were collected from selected habitats during July and August 2004.

Staff: Dr. William Ehmann, Contractor

Survey Activities:

Summary of search efforts*

Todd County	3 locations, 4 sample sites
Otter Tail County	8 locations, 25 sample sites
Douglas County	3 locations, 4 sample sites
TOTAL	**14 locations, 33 sample sites**

* numbers indicate locations where jumping spiders were collected; surveys locations without jumping spiders were not included in the report.

Results:

Fifteen species of jumping spiders were located during surveys, including the state special concern species, *Marpissa grata* (Table 9). Specimens of *M. grata* were located at two sites near water at Agassiz Beachline WPA (Carlisle Township, T133N, R44W) and at a drier site dominated by big bluestem at One Mile Lake Nature Area (Buse Township, T132N, R43W), both in Otter Tail County. These records establish the tenth county of historical occurrence for *M. grata*, which is endemic to Iowa, Michigan, and Minnesota, and suggest that other populations will be found. No other special concern species were collected, but 13 new county records were recorded (based on Ehmann 1999, 2002; Ehmann and Boyd 1997) (Table 9, Appendix 2).

2. *Tiger beetle surveys* were conducted during September, 2004.

Staff: Wayne Steffens, contractor

Survey Activities:

Based on reconnaissance of the area, there appeared to be little suitable habitat for rare tiger beetles. Two non-target species were located (Table 8). The following is taken from the final report that also included surveys in areas outside Todd, Otter Tail, and Douglas counties (Steffens 2005).

> Habitat evaluations and preliminary status surveys were conducted for the rare tiger beetles *Cicindela patruela*, *C. limbata nympha*, *C. lepida* and *C. fulgida westbournei* in west-central and northwest Minnesota in September 2004. Potential habitat areas were identified using Natural Heritage historical occurrence data, aerial photos, and NRCS soil

maps. Surveys were conducted by walking through suitable habitat, often along trails and back roads, and collecting tiger beetles with a handheld net.

Philbrook State Wildlife Management Area, Todd Co.

This rolling site has sandy soils but is considerably more mesic than *C. patruela* prefers. There was one exception, where the road/trail crosses a small dry opening (WP350) just north of Mud Lake (Appendix B). *C. formosa* and *C. scutellaris* were collected. This one spot seemed potentially suitable for *C. patruela* as well, and soil maps show it to be on a small area of Menahga soil, 458B. However, the habitat is so limited that only a very small population of *C. patruela* could exist here, and so it should be a lower priority for a return visit. A historical site where C. *patruela* was last observed in the early 1970's (colony destroyed, Huber 1988), is only 1-2 miles SE of here, so there may be some additional habitat in the area. The Section that earlier occurred was found in is dominated by Menahga soils, especially 458B and 458C.

Important Areas for Rare Animals

The Hardwood Hills Ecological Subsection, part of the Eastern Broadleaf Forest Province, extends through much of Todd County, northeastern Douglas County, and diagonally through the center of Otter Tail County. This is rolling morainal landscape is marked by numerous lakes and wetlands, deciduous forests, and prairie openings (MNDNR 2005). The northeastern corners of Otter Tail and Todd counties fall within the Pine Moraines and Outwash Plains Ecological Subsection of the Laurentian Mixed Forest Province. The morainal features here typically

support dry upland coniferous forests, while the lake plain areas contain rich swamp forests and sedge meadows (MNDNR 2003).

The region encompassed by these three counties has come under increasing pressure from human recreational and housing demands. Lakeshores and wetlands have been particularly impacted by home development, OHV use, and the aquaculture industry. At the same time, this area contains important habitat for several of Minnesota's rare animal species. Areas of particular importance are discussed below, and are highlighted to the township in Figure 17. This figure also displays the site boundaries of potential important areas of native vegetation that have been delineated by MCBS plant ecologists working in Todd, Otter Tail and Douglas Counties.

Upland Decidous Forests

Douglas County
Miltona Township, T130N, R37W
Lake Carlos State Park, Carlos Township, T129N, R37W
Moe Township, T128N, R39W
Runestone County Park, Solem Township, T127N, R40W

Otter Tail County
Candor Township, T137N, R41W
Sonnenberg WMA, Hobart Township, T137N, R40W
Maplewood State Park, Maplewood Township, T135N, R42W
Dead Lake Township, T135N, R40W
Glendalough State Park, Girard Township, T133N, R39W

Todd County
Ruff-Nik WMA, Turtle Creek Township, T131N, R32W
Grey Eagle and Elgin WMAs, Birchdale Township, T127N, R33W
Oak Ridge WMA, Grey Eagle Township, T127N, R32W

Birds: Extensive mature, mesic deciduous forests, interspersed with small lakes and wetland openings on varied topography provide important habitat for Red-shouldered Hawks and Cerulean Warblers, both state special concern species. In Douglas County, examples of such forests were found in and around Lake Carlos State Park, although somewhat fragmented, and in other locations in Carlos and Miltona townships. Runestone County Park also has good quality, mature mesic deciduous forest. An Acadian Flycatcher was found at the site, far outside of its known breeding range. In Otter Tail County, Candor Township and Maplewood State Park had the best tracts of this habitat. Important closed-canopy forest extends northward from Dead Lake WMA to Becker County. Glendalough State Park also provides an important forested area for Red-shouldered Hawks. Tracts in Todd County providing important habitat for Red-shouldered Hawks and Cerulean Warblers include Ruff-Nik, Oak Ridge, Grey Eagle, and Elgin WMAs.

Amphibians and Reptiles: A wide range of forest-associated wetland types, including small seasonal ponds and semi-permanent and permanent emergent marshes, provide crucial breeding habitat for forest-dwelling salamanders and frogs. Important sites in Otter Tail County include Maplewood State Park, and the Sonnenberg WMA and adjacent private tracts north to Cook's Lake and Becker County. In Douglas County, important habitat for forest amphibians include Lake Carlos State Park, and the forested rolling terrain in Moe Township near Lobster Lake which constitutes some of the only habitat of this type in the southwest portion of the county.

Prairies and Grasslands

Douglas County
Lund Township, T130N, R40W
Orange and Schultz WPAs, Orange Township, T127N, R36W

Otter Tail County
Scambler Township, T137N, R43W
Wirth WPA, Hobart Township, T137N, R40W
Glendalough State Park, Everts Township, T133N, R40W
Agassiz Beachline WPA, Carlisle Township, T133N, R44W
Ridgeway WPA, Orwell Township, T132N, R44W
One Mile Lake Nature Area, Buse Township, T132N, R43W
Otter Tail Prairie SNA and Rabbit River WPA, Western Township, T131N, R44W
Ten Mile and Nicholson WPAs, Tumuli Township, T131N, R42W
Seven Sisters Prairie (TNC), Eagle Lake Township, T131N, R40W

Todd County
Quistorff, Spohn, and West Union WMAs, West Union WPA, West Union Township, T127N, R35W

Small mammals: All terrestrial small mammals identified as target species for the 2004 MCBS surveys were prairie-associated species. None of the 3 state special concern species was documented from Douglas, Otter Tail, and Todd counties prior to MCBS surveys. During 1999 surveys, the Prairie Vole and Plains Pocket Mouse were recorded from Scambler Township in Otter Tail County, but not in other apparently suitable habitats in the south-central part of the county. Prairie Voles were documented in Todd and Douglas counties during 2004 surveys in West Union and Orange townships, respectively. Some of these sites contained areas of dense non-native grasses, which usually preclude the occurrence of this species. On the other hand, the size and quality of grassland habitats in the Lake Christina area of Otter Tail and Douglas counties (Eagle Lake and Lund townships, respectively) was of much better quality, yet no Prairie Voles were found.

Birds: Native prairie and disturbed grasslands, many of which are located on state wildlife management areas and federal waterfowl production areas, provide important habitat for several grassland birds. Rare bird species in these areas include Greater Prairie-Chicken, Yellow Rail,

Upland Sandpiper, Marbled Godwit, Wilson's Phalarope, Henslow's Sparrow, and Nelson's Sharp-tailed Sparrow. Important managed areas include Otter Tail Prairie SNA, and Rabbit River, Agassiz Beachline, Ridgeway, Ten Mile, and Nicholson WPAs. Grazed prairies with scattered trees, particularly in Scambler Township, support a population of Lark Sparrows. Henslow's Sparrows were found in the restored prairie at Glendalough State Park. Habitat similar to these sites occurs in the south-central part of Otter Tail County, on and around Seven Sisters Prairie.

Several areas of native prairie and disturbed/restored grasslands occur on managed areas, as well as some private lands, in southeastern Douglas County. Rare or uncommon birds found here include Swainson's Hawk, Upland Sandpiper, and Marbled Godwit. Important managed areas were Orange and Schultz Lake WPAs. In Todd County, important tracts of native prairie and grasslands in the southwest corner provide habitat for several rare or uncommon birds, including Swainson's Hawk, Upland Sandpiper, and Marbled Godwit. Important managed areas include West Union WPA, and Quistorff, Spohn, and West Union WMAs.

Amphibians and Reptiles: Open grassland habitats, with well-drained soils and sparse vegetation, provide important sites for snakes, lizards, and nesting turtles. Although no rare reptiles were documented from these habitats, the possibility still exists that Western Hog-nosed Snakes could occur here. The best examples of this habitat include the area around Nelson WPA (in Scambler Township) and Agassiz Beachline WPA. Great Plains and Canadian Toads were documented in wetlands in these grassland habitats.

One of the most important grassland areas for reptiles within the Hardwood Hills Subsection is in the rolling hills of southern Eagle Lake township in Otter Tail County, encompassing TNC's Seven Sisters Prairie and nearby grasslands. This area extends into grasslands east of Lake Christina in Douglas County. Although no Western Hog-nosed Snakes were documented during MCBS surveys, an Otter Tail County private landowner reported observations of this species on his property in recent years. Smooth Greensnakes and several common grassland species also were documented from this area.

Jumping Spiders: Five specimens of the state-listed special concern species, *Marpissa grata*, were taken from two sites near water at Agassiz Beachline WPA and from a drier site dominated by big bluestem at One Mile Lake Nature Area (Fergus Falls), both in Otter Tail Co. No other special concern species were collected, despite increased use of hand-searches. The heavily disturbed character of west-central Minnesota may partly explain these results. Otter Tail County lacks some habitat diversity that would support more than moderate populations of jumping spider populations. However, based on one, limited expedition, this county was much more interesting than Douglas and Todd counties. Good spider diversity was found at Agassiz Beachline WPA, Seven Sisters Prairie, and Wirth WPA .

Wetlands, Lakes, and Rivers

Douglas County
Long Prairie River downstream of Lake Carlos, Carlos and Belle River Townships, T129N, R36, 37 W
Alvin and Mina Lakes, Lake Lakota, La Grand Township, T128N, R38W

Otter Tail County
Lake Lida, Lida Township, 136N, R42W
Twenty-one Lake, Maplewood Towship, T135N, R42W
Otter Tail River downstream of Phelps Mill, Maine Township, T134N, R41W

Leaf River, Leaf Lake and Deer Creek Townships, T134N, R37, 38W
Molly Stark Lake, Girard Township, T133N, R39W
Pomme de Terre River headwaters near Dalton, Dane Prairie, Tordenskjold, and Tumuli Townships, T131N, R42W T132N, R42W
German Lake, Township, T132N, R41W

Todd County
Germania Township, T132N, R34W
Long Prairie River, Ward Township, T131N, R33W
Lake Osakis, Gordon Township, T128N, R35W
Charlotte Lake, Long Prairie Township, T129N, R33W
Mons Lake, Burnhamville Township, T128N, R32W
Cedar Lake, Kandota Township, T127N, R34W T135N, R42W
Bass Lake, Grey Eagle Township, T127N, R32W

Birds: A wide variety of open wetlands, characterized by sedge, cattail, shrub swamps, and scattered stands of tamarack, extend along the Leaf River, in Otter Tail County. Rare species found in this area included American Bitterns, Yellow Rails, and Nelson's Sharp-tailed Sparrows. Lowland conifer stands in the area were not surveyed for birds, but may harbor interesting species. Lake Osakis (Otter Tail and Todd counties) is well known as an important nesting area for Western Grebes and other water birds. The state threatened Wilson's Phalarope was found in wet pastures and mud flats along the southwestern side of the lake. Numerous tracts of sedge-dominated wetlands, including hayed areas, are scattered throughout Todd County. Several of these sites provide important habitat for rare birds such as Yellow Rail, Wilson's Phalarope, and Nelson's Sharp-tailed Sparrow. Larger tracts of sedge wetlands are located in Germania Township and along the Long Prairie River.

Amphibians and Reptiles: Although Blanding's Turtles were not observed during MCBS surveys, they were previously reported from eastern Todd County. These may have dispersed from the large population known to occur in the nearby Camp Ripley and Brainerd/Baxter area.

A local individual reported observing a Blanding's Turtle near Vining, in Otter Tail County, however, further investigation revealed that this turtle originated from a wetland complex in the southeastern part of the county. The wetlands and associated sandy uplands in this part of Otter Tail County offer suitable habitat for this species. Spiny Softshells occur in the Crow Wing River and likely occur within larger tributaries such as the Long Prairie River in Todd County. Large sandbars and south-facing cutbanks along the river provide important nesting sites for this species that rarely travels far from water. A Spiny Softshell was documented in the Otter Tail River near Phelps Mill during MCBS surveys in 1999.

Mudpuppies have been documented in deep lakes associated with the Red River Watershed, including Lake Lida and Molly Stark Lake (Otter Tail County). A local aquaculture dealer has reported collecting them from several deep lakes with connections to the Otter Tail River. Mudpuppies were reported from Lake Latoka (Douglas County) in the mid-1990s, when local DNR Fisheries personnel reported a die-off. This record is one of the few locations for this species in the Mississippi River watershed above the St. Anthony Falls. The Bullfrog, a species of special concern, was documented in Douglas County but is not native to the area. According to locals, Bullfrogs were introduced into lakes and wetlands in the Alexandria area in the 1950's. They are present in many lakes and wetlands in central Douglas County and may impact local amphibian populations.

Nongame Fish: All lakes and streams that still support Pugnose Shiners and/or Least Darters should be considered significant areas due to the documented decline in the historic distribution

of both species in Minnesota. However, the Pugnose Shiner could be considered the species more at risk over its historic range outside of Minnesota.

Significant areas would include all the lakes and rivers where it occurs. In Douglas County, 14 lakes contain one or both species. Important areas -- notable for clear water, the presence of submergent and surrounding native vegetation, and minimal lakeshore development -- are Alvin Lake, Mina Lake, and the Long Prairie River downstream of Lake Carlos. The Long Prairie River and headwater lakes in Douglas County support the Pugnose Shiner, Least Darter, and Greater Redhorse. Three lakes in Todd County, Bass, Cedar, and Charlotte lakes, support the target species.

Pugnose Shiners and/or Least Darters were documented in 16 lakes sampled in Otter Tail County. Important areas were German Lake, Twenty-one Lake, the Otter Tail River downstream of Phelps Mill, and the Pomme de Terre River headwaters near Dalton. The Otter Tail River in Otter Tail County has the greatest fish diversity of any stream in the Red River of the North drainage, and also is one of the clearest in the state. Both Pugnose Shiners and Least Darters occur in this system. The Lake Sturgeon, another special concern species, is being reintroduced into the watershed. Other species of regional interest include the Northern Hog Sucker, Greater Redhorse, Weed Shiner, and Rainbow Darter. The Pomme de Terre River and headwater lakes in Otter Tail County are similar to the Otter Tail River and associated lakes in supporting a high species diversity and excellent water clarity. Special concern species again include both the Pugnose Shiner and Least Darter, and also of regional interest, the Weed Shiner and Rainbow Darter.

Lowland Conifer Swamp

Douglas County
Spruce Creek WMA, Spruce Hill Township, T130N, R36W

Birds: Spruce Creek WMA and adjacent areas along Spruce Creek support a relatively extensive area of lowland coniferous forest habitat. Several coniferous forest birds occur here, far southwest of their primary breeding range, including Red-breasted Nuthatch, Golden-crowned Kinglet, Nashville Warbler, Blackburnian Warbler, Northern Waterthrush, and White-throated Sparrow.

Jack Pine Woodlands

Todd County
Villard Township, T133N, R32W

Birds: Jack pine stands, primarily in Villard Township, support coniferous forest species such as Whip-poor-will (dry, semi-open jack pine areas), Hermit Thrush, and Common Raven.
Amphibians and Reptiles: Although none were observed during 2004 surveys, Eastern Hog-nosed Snakes were previously documented in this area of sandy soils and jack pine openings.

Acknowledgements

We wish to thank the Minnesota State Wildife Grants Program for funding these surveys. Without this financial support the breadth of animals surveys described in this report would not have been possible. Thanks also is extended to State and Federal Wildlife Managers and State Park personnel for valuable advice on potential survey sites on lands under their management. We also appreciate the many private landowners who allowed us to conduct surveys on their property.

LITERATURE CITED

Coffin, B. and L. Pfannmuller, eds. 1988. Minnesota's endangered flora and fauna. University of Minnesota Press, Minneapolis.

Corben, C., and M. J. O'Farrell. 1999. Techniques for the effective use of Anabat in identifying free-flying bat species. (Copies available directly from the authors: corben@delphi.com, mikeof@accessnv.com).

Ehmann, W. J. and B. E. Boyd. 1997. Surveys for proposed special concern jumping spiders of Minnesota: a conservation biology research award project. Final report submitted to the Minnesota Department of Natural Resources.

Ehmann, W. J. 2002. Conservation biology of special concern jumping spiders (Araneae: Salticidae) of Minnesota: a conservation biology research award project. Final Report submitted to the Minnesota Department of Natural Resources.

Hazard, E. B. 1982. The mammals of Minnesota. University of Minnesota Press, Minneapolis.

Huber, R. 1988. Chapter 10. Tiger beetles. Pp. 407-420, *in* Minnesota's endangered flora and fauna (B. Coffin, and L Pfanmuller, eds.). University of Minnesota Press, Minneapolis.

MNDNR. 1983. Statement of need and reasonableness in the matter of proposed adoption of rules of the Department of Natural Resources designating species of wild animals and plants as endangered, threatened or of special concern. State of Minnesota, Department of Natural Resources, Division of Fish and Wildlife, St. Paul.

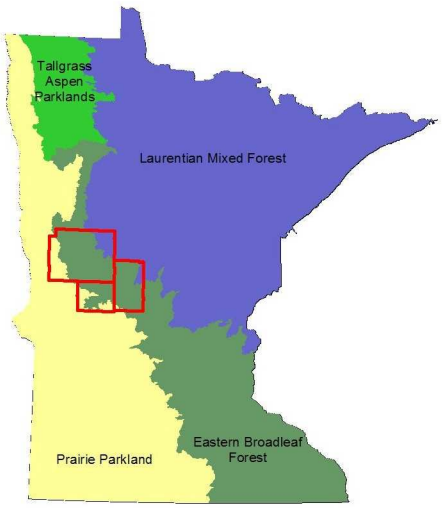
MNDNR. 2003. Field guide to the native plant communities of Minnesota: the Laurentian Mixed Forest Province. Ecological Land Classification Program, Minnesota County Biological Survey, and Natural Heritage and Nongame Research Program. MNDNR, St. Paul, Minnesota.

MNDNR. 2005. Field guide to the native plant communities of Minnesota: the Eastern Broadleaf Forest Province. Ecological Land Classification Program, Minnesota County Biological Survey, and Natural Heritage and Nongame Research Program. MNDNR, St. Paul, Minnesota.

Oldfield, B., and J. J. Moriarty. 1994. Amphibians and reptiles native to Minnesota. University of Minnesota Press, Minneapolis.

Steffens, W. P. 2005. Rare tiger beetle surveys in central and northwest Minnesota, fall 2004. Final report submitted to the Minnesota County Biological Survey, Department of Natural Resources.

Figures



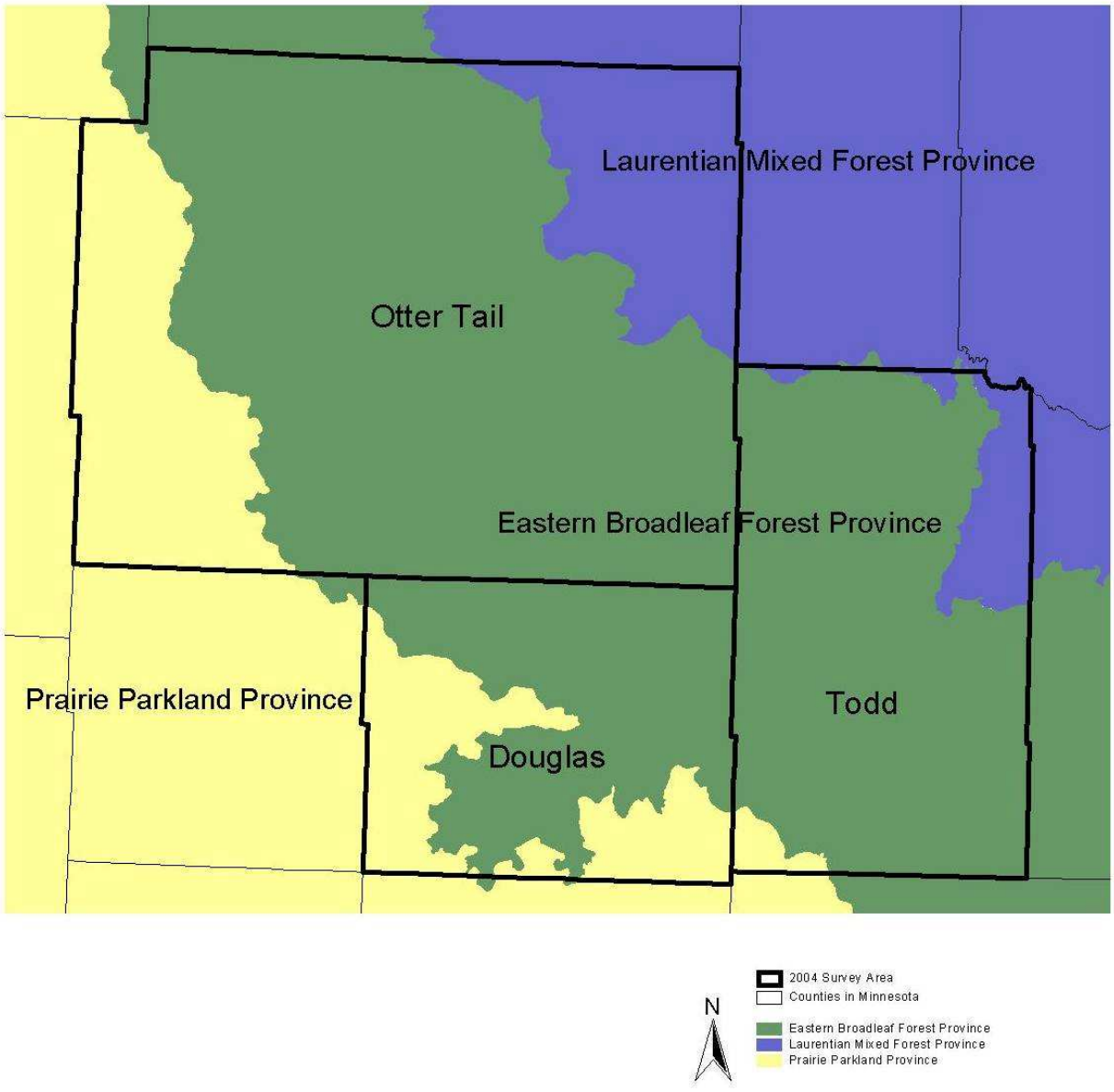


Figure 1. 2004 field season study area overlain upon the ecological provinces.

Figure 2. Checking small mammal trap grid, Todd County.

Figure 3. Preparing small mammal specimens.

Figure 4. Bat detector (in box) set, Douglas County.

Figure 5. Road bird survey, Douglas County.

Figure 6. Turtle trapping, Todd County.

Figure 7. Terrestrial herp search, Todd County.

Figure 8. Terrestrial herp search, Todd County.

Figure 9. Aquatic herp search, Douglas County.

Figure 10. Fish surveys with seine net and float tube.

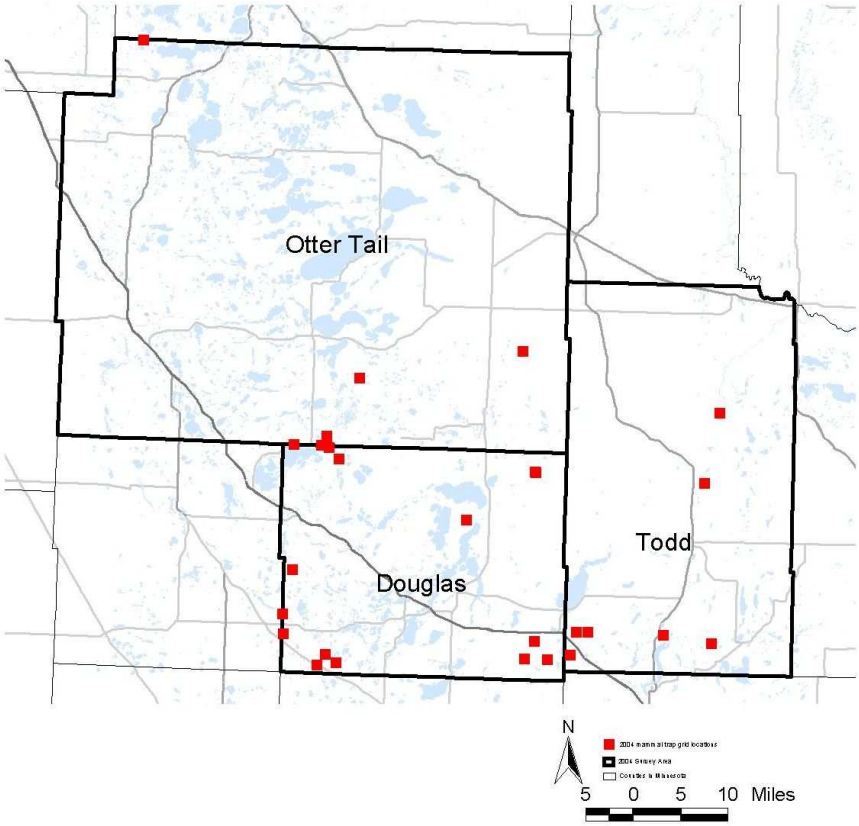


Figure 11. Locations of small mammal trap grids.

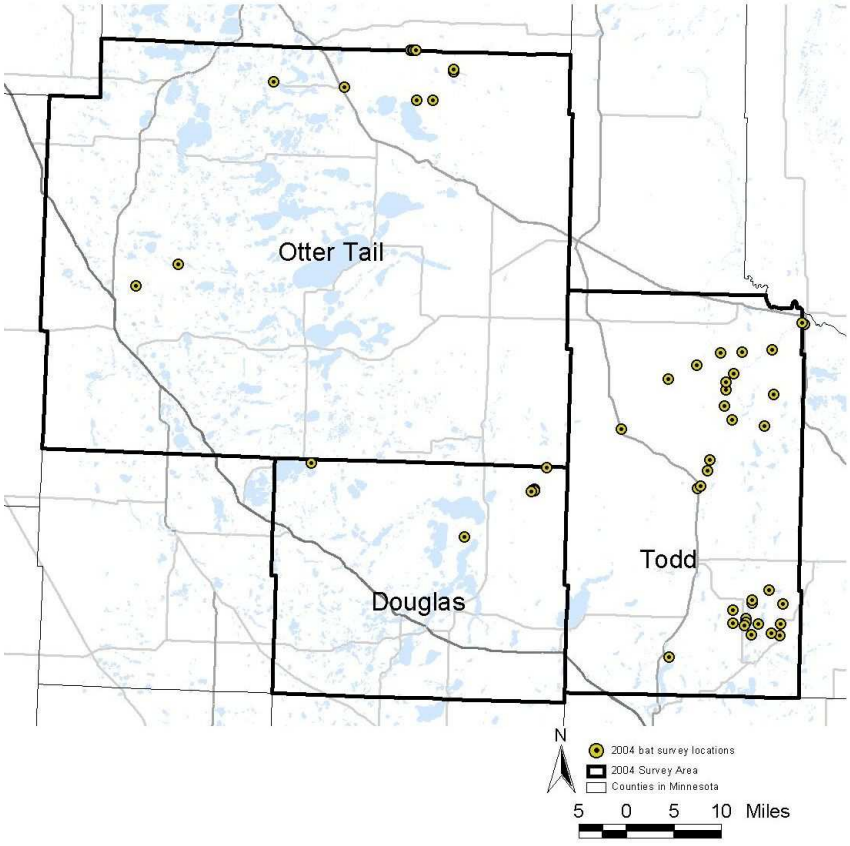


Figure 12. Locations of foraging bat surveys.

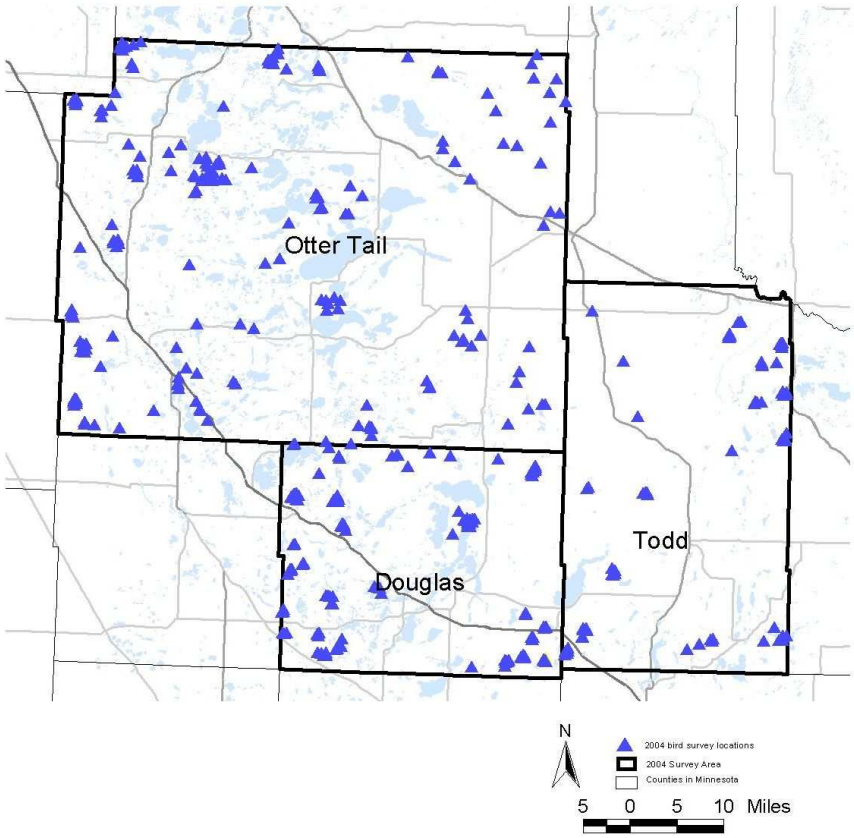


Figure 13. Locations of bird point counts and Red-shouldered Hawk playback surveys.

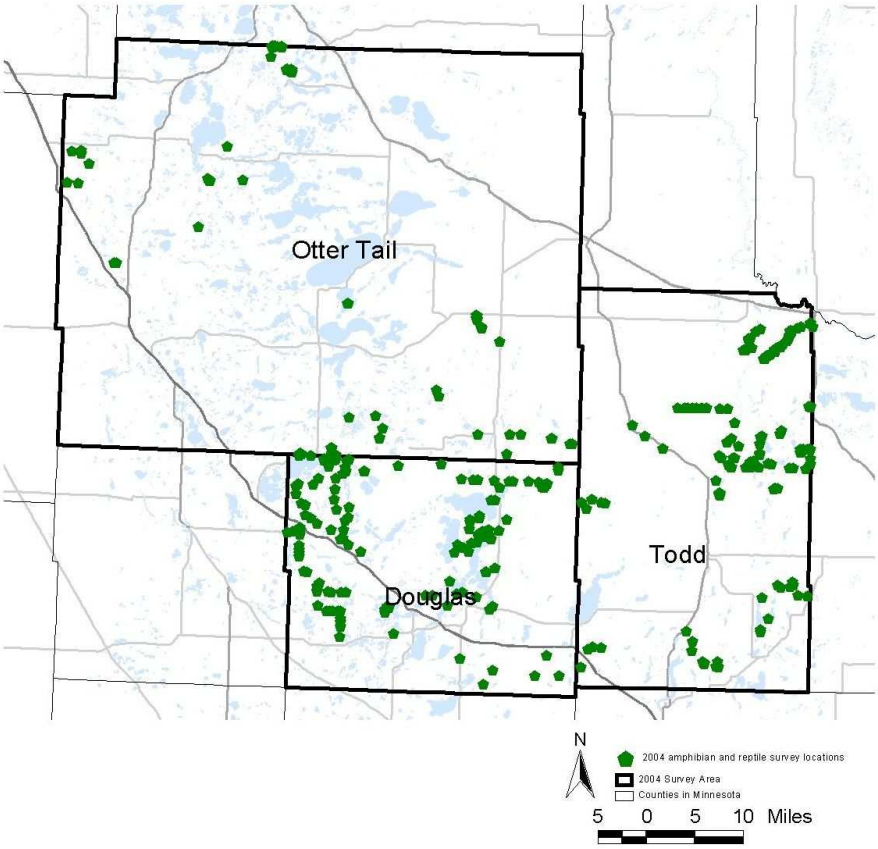


Figure 14. Locations of amphibian and reptile surveys.

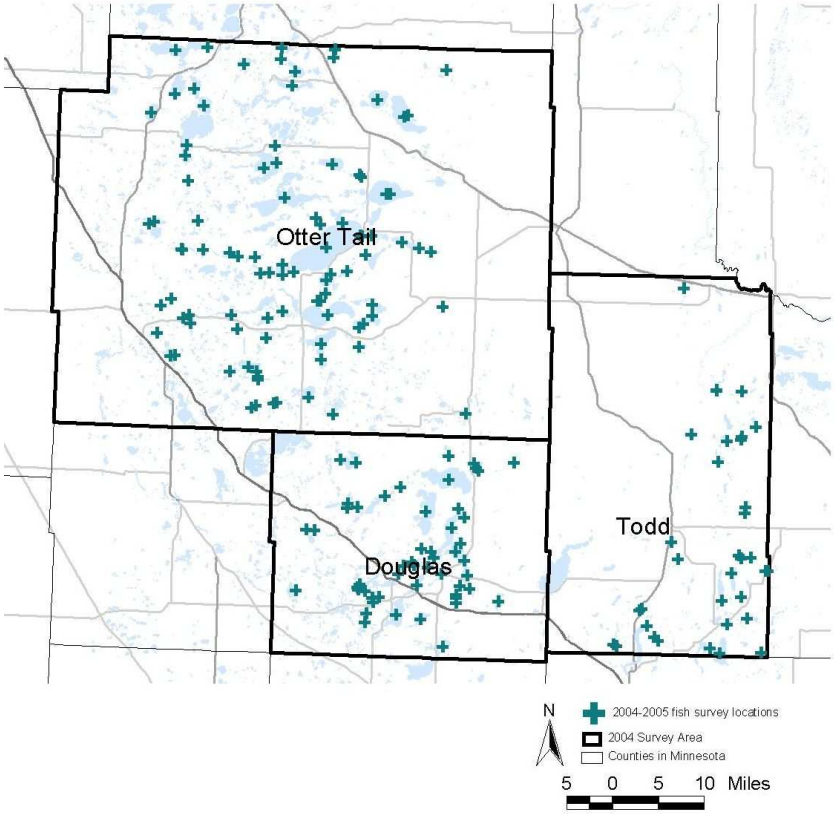


Figure 15. Locations of fish surveys.

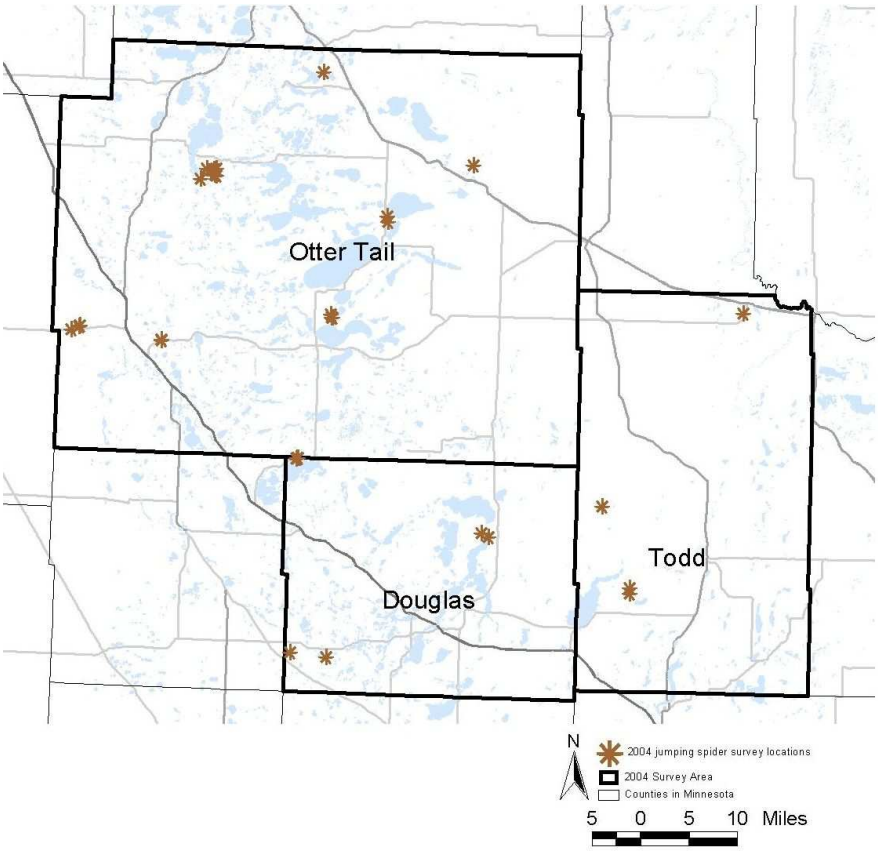


Figure 16. Locations of jumping spider surveys.

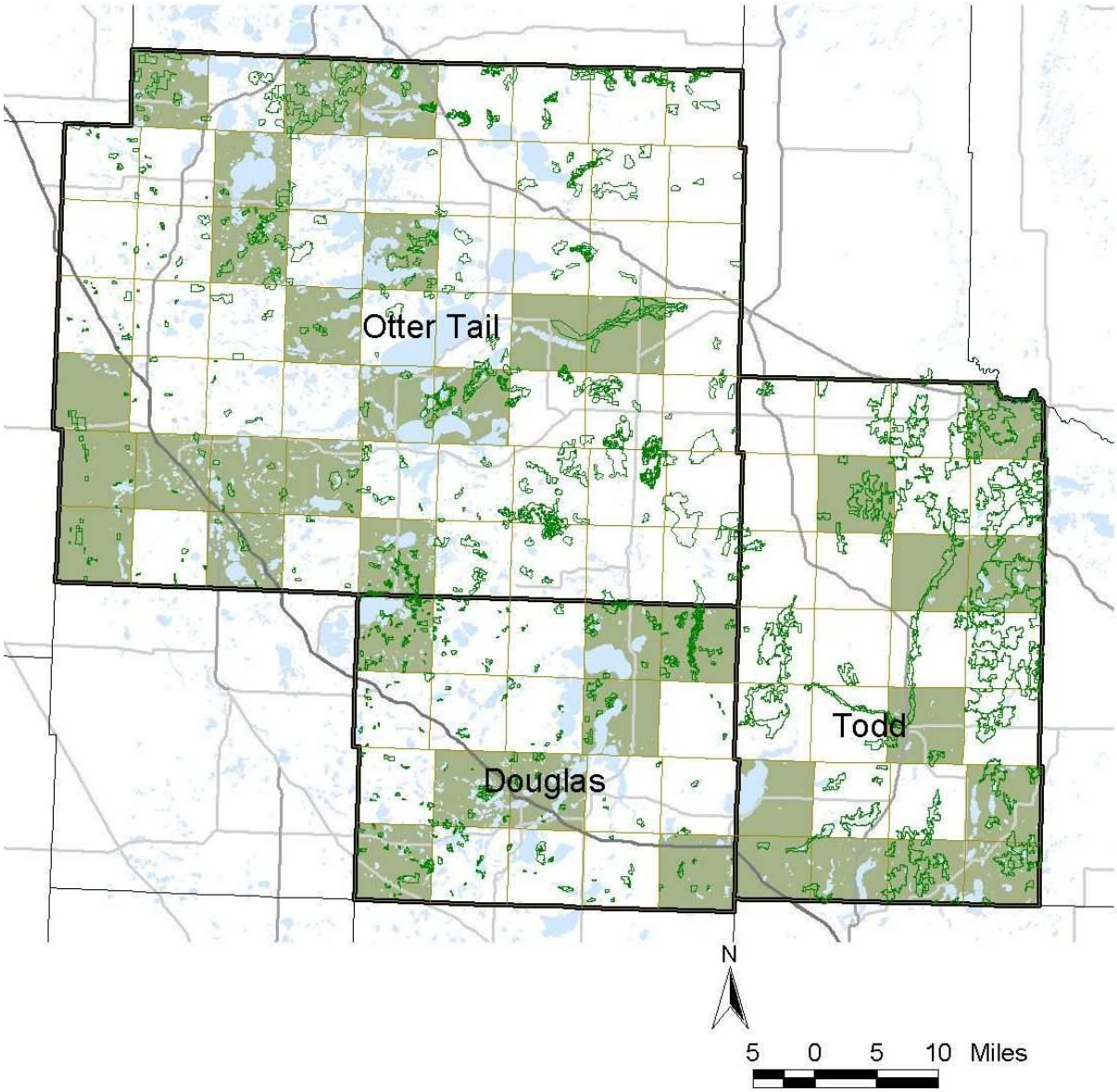


Figure 17. Important areas for rare animals and plants.

Tables

Table 1. Rare animals potentially occurring in the Hardwood Hills and Pine Moraines and Outwash Plains subsections of Otter Tail, Douglas, and Todd counties.

Species	State Status
MAMMALS	
Eastern Spotted Skunk (*Spilogale putorius*)	Threatened
Northern Myotis (*Myotis septentrionalis*)	Special Concern
Eastern Pipistrelle (*Pipistrellus subflavus*)	Special Concern
Gray Wolf (*Canus lupus*)	Special Concern
Least Weasel (*Mustela nivalis*)	Special Concern
Mountain Lion (*Felis concolor*)	Special Concern
Plains Pocket Mouse (*Perognathus flavescens*)	Special Concern
Prairie Vole (*Microtus ochrogaster*)	Special Concern
Lynx (*Lynx canadensis*)	Federally Threatened
Other mammals of regional interest	
Eastern Red Bat (*Lasiurus borealis*)	
Hoary Bat (*Lasiurus cinereus*)	
Silver-haired Bat (*Lasionycteris noctivagans*)	
Franklin's Ground Squirrel (*Spermophilus franklinii*)	
Richardson's Ground Squirrel (*Spermophilus richardsoni*)	
Western Harvest Mouse (*Reithrodontomys megalotis*)	
Northern Grasshopper Mouse (*Onychomys leucogaster*)	
White-tailed Jackrabbit (*Lepus townsendii*)	
BREEDING-SEASON BIRDS	
Henslow's Sparrow (*Ammodramus henslowii*)	Endangered
Trumpeter Swan (*Cygnus buccinator*)	Threatened
Wilson's Phalarope (*Phalaropus tricolor*)	Threatened
Loggerhead Shrike (*Lanius ludovicianus*)	Threatened
Greater Prairie-Chicken (*Tympanuchus cupido*)	Special Concern
American White Pelican (*Pelecanus erythrorhynchos*)	Special Concern
Bald Eagle (*Haliaeetus leucocephalus)*	Special Concern
Red-shouldered Hawk (*Buteo lineatus*)	Special Concern
Yellow Rail (*Coturnicops noveboracensis*)	Special Concern
Marbled Godwit (*Limosa fedoa*)	Special Concern
Franklin's Gull (*Larus pipixcan*)	Special Concern
Forster's Tern (*Sterna forsteri*)	Special Concern
Short-eared Owl (*Asio flammeus*)	Special Concern
Cerulean Warbler (*Dendroica cerulea*)	Special Concern
Nelson's Sharp-tailed Sparrow (*Ammodramus nelsoni*)	Special Concern
Other birds of regional interest	
American Bittern (*Botaurus lentiginosus*)	
Sandhill Crane (*Grus canadensis*)	
Upland Sandpiper (*Bartramia longicauda*)	
Lark Sparrow (*Chondestes grammacus*)	

Species	State Status
AMPHIBIANS AND REPTILES	
Blanding's Turtle (*Emydoidea blandingii*)	Threatened
Common Snapping Turtle (*Chelydra serpentina*)	Special Concern
Gophersnake (*Pituophis catenifer*)	Special Concern
Western Hog-nosed Snake (*Heterodon nasicus*)	Special Concern
Other herpetofauna of regional interest	
Mudpuppy (*Necturus maculosus*)	
Bullfrog (*Rana catesbeiana*)	
Common Map Yurtle (*Graptemys geographica*)	
Spiny Softshell (*Apalone spinifera*)	
Eastern Hog-nosed Snake (*Heterodon platirhinos*)	
FISH	
Pugnose Shiner (*Notropis anogenus*)	Special Concern
Least Darter (*Etheostoma microperca*)	Special Concern
Other fish of regional interest	
Greater Redhorse (*Moxostoma valenciennesi*)	
Weed Shiner (*Notropis texanus*)	
Rainbow Darter (*Etheostoma caeruleum*)	
BUTTERFLIES and MOTHS	
Dakota Skipper (*Hesperia dacotae*)	Threatened
Powesheik Skipper (*Oarisma powesheik*)	Special Concern
Arogos Skipper (*Atryone arogos*)	Special Concern
Regal Fritillary (*Speyeria idalia*)	Special Concern
Phlox moth (*Schinia indiana*)	Special Concern
Other lepidoptera of regional interest	
Bog Copper (*Epidemia epixanthe michiganensis*)	
Pawnee/Leonard's Skipper (*Hesperia leonardus* ssp.)	
TIGER BEETLES	
Cicindela limbata nympha	Endangered
Cicindela lepida	Threatened
Cicindela patruela patruela	Special Concern
LEAFHOPPERS	
Red-tailed Prairie Leafhopper (*Aflexia rubranura*)	Special Concern
JUMPING SPIDERS	
Marpissa grata	Special Concern
Metaphidippus arizonensis	Special Concern
Paradamoetas fontana	Special Concern
Pelegrina arizonensis	Special Concern
Phidippus apacheanus	Special Concern

Table 2. Mammals documented during the 2004 County Biological Survey of Todd, Otter Tail and Douglas Counties.

Family	Species	Common Name	Counties Todd	Otter Tail	Douglas
Shrews and Moles	*Sorex arcticus*	Arctic Shrew	**X**	x	**X**
Shrews and Moles	*Sorex cinereus*	Masked Shrew	**X**	x	**X**
Shrews and Moles	*Sorex haydeni*	Hayden's Shrew	**X**	**X**	**X**
Shrews and Moles	*Blarina brevicauda*	Northern Short-tailed Shrew	x	x	x
Bats	*Myotis lucifugus*	Little Brown Myotis	**X**	x	x
Bats	***Myotis septentrionalis***	**Northern Myotis**	**X**		**X**
Bats	*Eptesicus fuscus*	Big Brown Bat	**X**	**X**	**X**
Bats	*Lasionycteris noctivagans**	Silver-haired Bat	**X**		**X**
Bats	*Lasiurus borealis**	Eastern Red Bat	**X**		**X**
Bats	*Lasiurus cinereus**	Hoary Bat	**X**		**X**
Foxes	*Vulpes vulpes*	Red Fox	x		x
Raccoons	*Procyon lotor*	Northern Raccoon	x	x	x
Weasels, Otters, and Badgers	*Mustela erminea*	Ermine	**X**	x	**X**
Weasels, Otters, and Badgers	*Mustela vison*	American Mink	**X**		x
Weasels, Otters, and Badgers	*Taxidea taxus*	American Badger		x	
Weasels, Otters, and Badgers	*Lutra canadensis*	Northern River Otter	x		
Weasels, Otters, and Badgers	*Mephitis mephitis*	Striped Skunk	x	x	
Deer	*Odocoileus virginianus*	White-tailed Deer	x	x	**X**
Chipmunks	*Tamias striatus*	Eastern Chipmunk		x	
Marmots	*Marmota monax*	Woodchuck		x	x
Ground Squirrels	*Spermophilus tridecemlineatus*	Thirteen-lined Ground Squirrel	**X**	x	x
Tree Squirrels	*Sciurus carolinensis*	Eastern Gray Squirrel	x		
Tree Squirrels	*Sciurus niger*	Eastern Fox Squirrel		x	**X**
Pocket Gophers	*Geomys bursarius*	Plains Pocket Gopher	x	x	**X**
Beavers	*Castor canadensis*	American Beaver		x	**X**
Mice, Rats and Voles	*Peromyscus leucopus*	White-footed Mouse	x	x	**X**

Table 2. Continued.

Family	Species	Common Name	Counties Todd	Otter Tail	Douglas
Mice, Rats and Voles	*Peromyscus maniculatus bairdii*	Prairie Deer Mouse	x	x	**X**
Mice, Rats and Voles	*Rattus norvegicus*	Norway Rat		**X**	
Mice, Rats and Voles	*Mus musculus*	House Mouse	**X**		
Mice, Rats and Voles	*Clethrionomys gapperi*	Southern Red-backed Vole	x		x
Mice, Rats and Voles	***Microtus ochrogaster***	**Prairie Vole**	**X**		**X**
Mice, Rats and Voles	*Microtus pennsylvanicus*	Meadow Vole	**X**	x	x
Muskrat	*Ondatra zibethicus*	Common Muskrat	**X**		
Jumping Mice	*Zapus hudsonius*	Meadow Jumping Mouse	**X**	x	x
Rabbits and hares	*Lepus townsendii*	White-tailed Jackrabbit	**X**	x	
		Total species documented:	29	23	26
		New county records:	18	3	16

x = Present in county
X = County record (new county records as compared to Hazard 1982)
Listed species appear in bold
* = species of regional interest

Table 3. Birds documented during the 2004 County Biological Survey of Todd, Otter Tail and Douglas Counties.

Family Name	Species	Common Name	Counties Todd	Otter Tail	Douglas
Ducks, Geese, and Swans	*Branta canadensis*	Canada Goose	X	X	X
Ducks, Geese, and Swans	***Cygnus buccinator***	**Trumpeter Swan**	X	X	
Ducks, Geese, and Swans	*Aix sponsa*	Wood Duck	X	X	X
Ducks, Geese, and Swans	*Anas strepera*	Gadwall		X	X
Ducks, Geese, and Swans	*Anas americana*	American Wigeon		X	
Ducks, Geese, and Swans	*Anas platyrhynchos*	Mallard	X	X	X
Ducks, Geese, and Swans	*Anas discors*	Blue-winged Teal	X	X	X
Ducks, Geese, and Swans	*Anas clypeata*	Northern Shoveler	X	X	X
Ducks, Geese, and Swans	*Anas acuta*	Northern Pintail		X	
Ducks, Geese, and Swans	*Anas crecca*	Green-winged Teal	X	X	X
Ducks, Geese, and Swans	*Aythya valisineria*	Canvasback	X	X	X
Ducks, Geese, and Swans	*Aythya americana*	Redhead	X	X	X
Ducks, Geese, and Swans	*Aythya collaris*	Ring-necked Duck	X	X	X
Ducks, Geese, and Swans	*Aythya affinis*	Lesser Scaup		X	
Ducks, Geese, and Swans	*Bucephala clangula*	Common Goldeneye		X	
Ducks, Geese, and Swans	*Lophodytes cucullatus*	Hooded Merganser	X	X	X
Ducks, Geese, and Swans	*Mergus merganser*	Common Merganser		X	
Ducks, Geese, and Swans	*Oxyura jamaicensis*	Ruddy Duck	X	X	X
Partridges, Grouse, and Turkeys	*Perdix perdix*	Gray Partridge		X	X
Partridges, Grouse, and Turkeys	*Phasianus colchicus*	Ring-necked Pheasant	X	X	X
Partridges, Grouse, and Turkeys	*Bonasa umbellus*	Ruffed Grouse	X	X	X
Partridges, Grouse, and Turkeys	***Tympanuchus cupido***	**Greater Prairie-Chicken**		X	
Partridges, Grouse, and Turkeys	*Meleagris gallopavo*	Wild Turkey	X	X	X
Loons	*Gavia immer*	Common Loon	X	X	X
Grebes	*Podilymbus podiceps*	Pied-billed Grebe	X	X	X
Grebes	*Podiceps grisegena*	Red-necked Grebe	X	X	X
Grebes	*Podiceps nigricollis*	Eared Grebe			X
Grebes	*Aechmophorus occidentalis*	Western Grebe	X	X	X
Pelicans	***Pelecanus erythrorhynchos***	**American White Pelican**	X	X	X
Cormorants	*Phalacrocorax auritus*	Double-crested Cormorant	X	X	X

Table 3. Continued.

Family Name	Species	Common Name	Counties Todd	Otter Tail	Douglas
Herons and Bitterns	*Botaurus lentiginosus**	American Bittern	X	X	X
Herons and Bitterns	*Ixobrychus exilis*	Least Bittern	X	X	X
Herons and Bitterns	*Ardea herodias*	Great Blue Heron	X	X	X
Herons and Bitterns	*Ardea alba*	Great Egret	X	X	X
Herons and Bitterns	*Butorides virescens*	Green Heron	X	X	X
Herons and Bitterns	*Nycticorax nycticorax*	Black-crowned Night-Heron		X	X
New World Vultures	*Cathartes aura*	Turkey Vulture	X	X	X
Hawks and Eagles	*Pandion haliaetus*	Osprey	X	X	
Hawks and Eagles	***Haliaeetus leucocephalus***	**Bald Eagle**	X	X	X
Hawks and Eagles	*Circus cyaneus*	Northern Harrier	X	X	X
Hawks and Eagles	*Accipiter cooperii*	Cooper's Hawk	X	X	X
Hawks and Eagles	***Buteo lineatus***	**Red-shouldered Hawk**	X	X	X
Hawks and Eagles	*Buteo platypterus*	Broad-winged Hawk	X	X	X
Hawks and Eagles	*Buteo swainsoni*	Swainson's Hawk	X	X	X
Hawks and Eagles	*Buteo jamaicensis*	Red-tailed Hawk	X	X	X
Falcons	*Falco sparverius*	American Kestrel	X	X	X
Falcons	*Falco columbarius*	Merlin		X	
Rails, Gallinules, and Coots	***Coturnicops noveboracensis***	**Yellow Rail**	X	X	
Rails, Gallinules, and Coots	*Rallus limicola*	Virginia Rail	X	X	X
Rails, Gallinules, and Coots	*Porzana carolina*	Sora	X	X	X
Rails, Gallinules, and Coots	*Fulica americana*	American Coot	X	X	X
Cranes	*Grus canadensis**	Sandhill Crane	X	X	X
Plovers	*Charadrius vociferus*	Killdeer	X	X	X
Sandpipers and Phalaropes	*Actitis macularius*	Spotted Sandpiper	X	X	X
Sandpipers and Phalaropes	*Bartramia longicauda**	Upland Sandpiper	X	X	X
Sandpipers and Phalaropes	***Limosa fedoa***	**Marbled Godwit**	X	X	X
Sandpipers and Phalaropes	*Gallinago delicata*	Wilson's Snipe	X	X	X
Sandpipers and Phalaropes	*Scolopax minor*	American Woodcock	X		X
Sandpipers and Phalaropes	***Phalaropus tricolor***	**Wilson's Phalarope**	X	X	X
Gulls and Terns	***Larus pipixcan***	**Franklin's Gull**	X	X	X

Table 3. Continued.

Family Name	Species	Common Name	Counties Todd	Otter Tail	Douglas
Gulls and Terns	*Larus delawarensis*	Ring-billed Gull	X	X	X
Gulls and Terns	***Sterna forsteri***	**Forster's Tern**	X	X	X
Gulls and Terns	*Chlidonias niger*	Black Tern	X	X	X
Pigeons and Doves	*Columba livia*	Rock Pigeon	X	X	X
Pigeons and Doves	*Zenaida macroura*	Mourning Dove	X	X	X
Cuckoos	*Coccyzus erythropthalmus*	Black-billed Cuckoo	X	X	X
Cuckoos	*Coccyzus americanus*	Yellow-billed Cuckoo		X	X
Owls	*Bubo virginianus*	Great Horned Owl	X	X	X
Owls	*Strix varia*	Barred Owl	X	X	X
Owls	*Asio otus*	Long-eared Owl			X
Owls	***Asio flammeus***	**Short-eared Owl**		X	
Nighthawks and Nightjars	*Chordeiles minor*	Common Nighthawk	X	X	X
Nighthawks and Nightjars	*Caprimulgus vociferus*	Whip-poor-will	X		
Swifts	*Chaetura pelagica*	Chimney Swift	X	X	X
Hummingbirds	*Archilochus colubris*	Ruby-throated Hummingbird	X	X	X
Kingfishers	*Ceryle alcyon*	Belted Kingfisher	X	X	X
Woodpeckers	*Melanerpes erythrocephalus*	Red-headed Woodpecker	X	X	X
Woodpeckers	*Melanerpes carolinus*	Red-bellied Woodpecker	X	X	X
Woodpeckers	*Sphyrapicus varius*	Yellow-bellied Sapsucker	X	X	X
Woodpeckers	*Picoides pubescens*	Downy Woodpecker	X	X	X
Woodpeckers	*Picoides villosus*	Hairy Woodpecker	X	X	X
Woodpeckers	*Colaptes auratus*	Northern Flicker	X	X	X
Woodpeckers	*Dryocopus pileatus*	Pileated Woodpecker	X	X	X
Tyrant Flycatchers	*Contopus virens*	Eastern Wood-Pewee	X	X	X
Tyrant Flycatchers	***Empidonax virescens***	**Acadian Flycatcher**			X
Tyrant Flycatchers	*Empidonax alnorum*	Alder Flycatcher	X	X	X
Tyrant Flycatchers	*Empidonax traillii*	Willow Flycatcher	X	X	X
Tyrant Flycatchers	*Empidonax minimus*	Least Flycatcher	X	X	X
Tyrant Flycatchers	*Sayornis phoebe*	Eastern Phoebe	X	X	X
Tyrant Flycatchers	*Myiarchus crinitus*	Great Crested Flycatcher	X	X	X

Table 3. Continued.

Family Name	Species	Common Name	Counties		
			Todd	Otter Tail	Douglas
Tyrant Flycatchers	*Tyrannus verticalis*	Western Kingbird		X	
Tyrant Flycatchers	*Tyrannus tyrannus*	Eastern Kingbird	X	X	X
Vireos	*Vireo flavifrons*	Yellow-throated Vireo	X	X	X
Vireos	*Vireo gilvus*	Warbling Vireo	X	X	X
Vireos	*Vireo olivaceus*	Red-eyed Vireo	X	X	X
Jays, Magpies, and Crows	*Cyanocitta cristata*	Blue Jay	X	X	X
Jays, Magpies, and Crows	*Corvus brachyrhynchos*	American Crow	X	X	X
Jays, Magpies, and Crows	*Corvus corax*	Common Raven	X	X	
Larks	*Eremophila alpestris*	Horned Lark	X	X	X
Swallows	*Progne subis*	Purple Martin	X	X	X
Swallows	*Tachycineta bicolor*	Tree Swallow	X	X	X
Swallows	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow	X	X	X
Swallows	*Riparia riparia*	Bank Swallow	X	X	X
Swallows	*Petrochelidon pyrrhonata*	Cliff Swallow	X	X	X
Swallows	*Hirundo rustica*	Barn Swallow	X	X	X
Chickadees and Titmice	*Poecile atricapillus*	Black-capped Chickadee	X	X	X
Nuthatches	*Sitta canadensis*	Red-breasted Nuthatch		X	X
Nuthatches	*Sitta carolinensis*	White-breasted Nuthatch	X	X	X
Creepers	*Certhia americana*	Brown Creeper	X	X	
Wrens	*Troglodytes aedon*	House Wren	X	X	X
Wrens	*Troglodytes troglodytes*	Winter Wren		X	
Wrens	*Cistothorus platensis*	Sedge Wren	X	X	X
Wrens	*Cistothorus palustris*	Marsh Wren	X	X	X
Kinglets	*Regulus satrapa*	Golden-crowned Kinglet			X
Gnatcatchers	*Polioptila caerulea*	Blue-gray Gnatcatcher	X	X	X
Thrushes	*Sialia sialis*	Eastern Bluebird	X	X	X
Thrushes	*Catharus fuscescens*	Veery	X	X	X
Thrushes	*Catharus guttatus*	Hermit Thrush	X	X	
Thrushes	*Hylocichla mustelina*	Wood Thrush	X	X	X
Thrushes	*Turdus migratorius*	American Robin	X	X	X

Table 3. Continued.

Family Name	Species	Common Name	Counties Todd	Otter Tail	Douglas
Mockingbirds and Thrashers	*Dumetella carolinensis*	Gray Catbird	X	X	X
Mockingbirds and Thrashers	*Toxostoma rufum*	Brown Thrasher	X	X	X
Starlings	*Sturnus vulgaris*	European Starling	X	X	X
Waxwings	*Bombycilla cedrorum*	Cedar Waxwing	X	X	X
New World Warblers	*Vermivora chrysoptera*	Golden-winged Warbler	X	X	X
New World Warblers	*Vermivora ruficapilla*	Nashville Warbler		X	X
New World Warblers	*Dendroica petechia*	Yellow Warbler	X	X	X
New World Warblers	*Dendroica pensylvanica*	Chestnut-sided Warbler	X	X	X
New World Warblers	*Dendroica coronata*	Yellow-rumped Warbler	X		
New World Warblers	*Dendroica virens*	Black-throated Green Warbler	X		X
New World Warblers	***Dendroica cerulea***	**Cerulean Warbler**	X	X	X
New World Warblers	*Dendroica fusca*	Blackburnian Warbler			X
New World Warblers	*Dendroica pinus*	Pine Warbler	X	X	
New World Warblers	*Mniotilta varia*	Black-and-white Warbler	X	X	X
New World Warblers	*Setophaga ruticilla*	American Redstart	X	X	X
New World Warblers	*Seiurus aurocapilla*	Ovenbird	X	X	X
New World Warblers	*Seiurus noveboracensis*	Northern Waterthrush		X	X
New World Warblers	*Oporornis philadelphicus*	Mourning Warbler	X	X	
New World Warblers	*Geothlypis trichas*	Common Yellowthroat	X	X	X
Tanagers	*Piranga olivacea*	Scarlet Tanager	X	X	X
Towhees, Sparrows, and Longspurs	*Spizella passerina*	Chipping Sparrow	X	X	X
Towhees, Sparrows, and Longspurs	*Spizella pallida*	Clay-colored Sparrow	X	X	X
Towhees, Sparrows, and Longspurs	*Spizella pusilla*	Field Sparrow	X	X	X
Towhees, Sparrows, and Longspurs	*Pooecetes gramineus*	Vesper Sparrow	X	X	X
Towhees, Sparrows, and Longspurs	*Chondestes grammacus**	Lark Sparrow		X	
Towhees, Sparrows, and Longspurs	*Passerculus sandwichensis*	Savannah Sparrow	X	X	X
Towhees, Sparrows, and Longspurs	*Ammodramus savannarum*	Grasshopper Sparrow	X	X	X
Towhees, Sparrows, and Longspurs	***Ammodramus henslowii***	**Henslow's Sparrow**	X	X	
Towhees, Sparrows, and Longspurs	*Ammodramus leconteii*	Le Conte's Sparrow	X	X	X
Towhees, Sparrows, and Longspurs	***Ammodramus nelsoni***	**Nelson's Sharp-tailed Sparrow**	X	X	X

Table 3. Continued.

Family Name	Species	Common Name	Counties Todd	Otter Tail	Douglas
Towhees, Sparrows, and Longspurs	*Melospiza melodia*	Song Sparrow	X	X	X
Towhees, Sparrows, and Longspurs	*Melospiza georgiana*	Swamp Sparrow	X	X	X
Towhees, Sparrows, and Longspurs	*Zonotrichia albicollis*	White-throated Sparrow		X	X
Cardinals and Grosbeaks	*Cardinalis cardinalis*	Northern Cardinal	X	X	X
Cardinals and Grosbeaks	*Pheucticus ludovicianus*	Rose-breasted Grosbeak	X	X	X
Cardinals and Grosbeaks	*Passerina cyanea*	Indigo Bunting	X	X	X
Cardinals and Grosbeaks	*Spiza americana*	Dickcissel	X		X
New World Blackbirds and Orioles	*Dolichonyx oryzivorus*	Bobolink	X	X	X
New World Blackbirds and Orioles	*Agelaius phoeniceus*	Red-winged Blackbird	X	X	X
New World Blackbirds and Orioles	*Sturnella magna*	Eastern Meadowlark	X	X	X
New World Blackbirds and Orioles	*Sturnella neglecta*	Western Meadowlark	X	X	X
New World Blackbirds and Orioles	*Xanthocephalus xanthocephalus*	Yellow-headed Blackbird	X	X	X
New World Blackbirds and Orioles	*Euphagus cyanocephalus*	Brewer's Blackbird	X	X	X
New World Blackbirds and Orioles	*Quiscalus quiscula*	Common Grackle	X	X	X
New World Blackbirds and Orioles	*Molothrus ater*	Brown-headed Cowbird	X	X	X
New World Blackbirds and Orioles	*Icterus spurius*	Orchard Oriole	X	X	X
New World Blackbirds and Orioles	*Icterus galbula*	Baltimore Oriole	X	X	X
Finches	*Carpodacus purpureus*	Purple Finch		X	X
Finches	*Carpodacus mexicanus*	House Finch	X	X	X
Finches	*Carduelis tristis*	American Goldfinch	X	X	X
Old World Sparrows	*Passer domesticus*	House Sparrow	X	X	X
		Total species documented:	146	161	149

X = Present in county
Listed species appear in bold
* = species of regional interest

Table 4. Number of records of listed species of birds documented during the 2004 County Biological Survey of Todd, Otter Tail and Douglas Counties.

Family Name	Species	Common Name	Counties			All
			Todd	Otter Tail	Douglas	Counties
Herons and Bitterns	*Botaurus lentiginosus**	American Bittern	3	5	2	10
Hawks and Eagles	***Buteo lineatus***	**Red-shouldered Hawk**	10	23	11	44
Rails, Gallinules, and Coots	***Coturnicops noveboracensis***	**Yellow Rail**	4	1	0	5
Cranes	*Grus canadensis**	Sandhill Crane	7	13	2	22
Sandpipers and Phalaropes	*Bartramia longicauda**	Upland Sandpiper	1	4	2	7
Sandpipers and Phalaropes	***Limosa fedoa***	**Marbled Godwit**	1	4	1	6
Sandpipers and Phalaropes	***Phalaropus tricolor***	**Wilson's Phalarope**	3	1	4	8
Owls	***Asio flammeus***	**Short-eared Owl**	0	1	0	1
Tyrant Flycatchers	***Empidonax virescens***	**Acadian Flycatcher**	0	0	1	1
New World Warblers	***Dendroica cerulea***	**Cerulean Warbler**	1	6	1	8
Towhees, Sparrows, and Longspurs	***Ammodramus henslowii***	**Henslow's Sparrow**	1	4	0	5
Towhees, Sparrows, and Longspurs	***Ammodramus nelsoni***	**Nelson's Sharp-tailed Sparrow**	4	1	1	6
		Total records:	35	63	25	123

Listed species appear in bold

* = species of regional interest

Table 5. Amphibian and reptiles documented during the 2004 County Biological Survey of Todd, Otter Tail and Douglas Counties.

Family	Species	Common Name	Counties Todd	Otter Tail	Douglas
Salamanders	*Necturus maculosus**	Mudpuppy		x	**X**
Salamanders	*Ambystoma laterale*	Blue-spotted Salamander	**X**	**X**	x
Salamanders	*Ambystoma tigrinum*	Tiger Salamander	x	x	
Frogs and Toads	*Bufo americanus*	American Toad	x	x	x
Frogs and Toads	*Bufo hemiophrys*	Canadian Toad	**X**	x	**X**
Frogs and Toads	*Hyla chrysoscelis*	Cope's Gray Treefrog	x	x	**X**
Frogs and Toads	*Hyla versicolor*	Gray Treefrog	**X**	x	**X**
Frogs and Toads	*Pseudacris crucifer*	Spring Peeper	**X**	**X**	
Frogs and Toads	*Pseudacris triseriata*	Western Chorus Frog	**X**	**X**	**X**
Frogs and Toads	*Rana catesbeiana**	American Bullfrog			x
Frogs and Toads	*Rana clamitans*	Green Frog	**X**		
Frogs and Toads	*Rana pipiens*	Northern Leopard Frog	x	x	x
Frogs and Toads	*Rana septentrionalis*	Mink Frog	x		x
Frogs and Toads	*Rana sylvatica*	Wood Frog	**X**	x	**X**
Turtles	***Chelydra serpentina***	**Snapping Turtle**	**X**	x	**X**
Turtles	*Chrysemys picta*	Painted Turtle	x	x	**X**
Turtles	*Apalone spinifera**	Spiny Softshell	x		
Lizards	*Eumeces septentrionalis*	Prairie Skink	**X**	x	**X**
Snakes	*Storeria occipitomaculata*	Red-bellied Snake		x	
Snakes	*Thamnophis radix*	Plains Gartersnake	**X**	x	x
Snakes	*Thamnophis sirtalis*	Common Gartersnake	x	x	x
Snakes	*Opheodrys vernalis*	Smooth Greensnake		x	**X**
		Total species documented:	18	17	16
		New county records:	10	3	10

x = Present in county
X = County record (new county records as compared to Oldfield and Moriarty 1994)
Listed species appear in bold
* = species of regional interest

Table 6. Fish species documented during the 2004-2005 County Biological Survey of Todd, Otter Tail and Douglas Counties.

Family	Species	Common Name	Counties Todd	Otter Tail	Douglas
Bowfins	*Amia calva*	Bowfin		X	X
Suckers	*Catostomus commersoni*	White Sucker	X		X
Sunfishes	*Ambloplites rupestris*	Rock Bass		X	
Sunfishes	*Lepomis cyanellus*	Green Sunfish	X	X	X
Sunfishes	*Lepomis gibbosus*	Pumpkinseed	X	X	X
Sunfishes	*Lepomis macrochirus*	Bluegill	X	X	X
Sunfishes	*Micropterus salmoides*	Largemouth Bass	X	X	X
Sunfishes	*Pomoxis nigromaculatus*	Black Crappie	X	X	X
Minnows	*Cyprinus carpio*	Common Carp			X
Minnows	*Hybognathus hankinsoni*	Brassy Minnow		X	
Minnows	*Luxilus cornutus*	Common Shiner	X	X	X
Minnows	*Nocomis biguttatus*	Hornyhead Chub		X	
Minnows	*Notemigonus crysoleucas*	Golden Shiner	X	X	X
Minnows	***Notropis anogenus***	**Pugnose Shiner**	X	X	X
Minnows	*Notropis dorsalis*	Bigmouth Shiner		X	
Minnows	*Notropis heterodon*	Blackchin Shiner	X	X	X
Minnows	*Notropis heterolepis*	Blacknose Shiner	X	X	X
Minnows	*Notropis hudsonius*	Spottail Shiner		X	X
Minnows	*Notropis texanus**	Weed Shiner		X	
Minnows	*Notropis volucellus*	Mimic Shiner		X	X
Minnows	*Phoxinus eos*	Northern Redbelly Dace	X	X	
Minnows	*Pimephales notatus*	Bluntnose Minnow	X	X	X
Minnows	*Pimephales promelas*	Fathead Minnow	X	X	X
Minnows	*Semotilus atromaculatus*	Creek Chub		X	
Killifishes	*Fundulus diaphanus*	Banded Killifish	X	X	X
Pikes	*Esox lucius*	Northern Pike	X	X	X
Sticklebacks	*Culaea inconstans*	Brook Stickleback		X	X
Bullhead Catfishes	*Ameiurus melas*	Black Bullhead		X	X
Bullhead Catfishes	*Ameiurus natalis*	Yellow Bullhead		X	
Bullhead Catfishes	*Noturus gyrinus*	Tadpole Madtom		X	X

Table 6. Continued.

Family	Species	Common Name	Counties Todd	Otter Tail	Douglas
Perches	*Etheostoma caeruleum**	Rainbow Darter		X	
Perches	*Etheostoma exile*	Iowa Darter	X	X	X
Perches	***Etheostoma microperca***	**Least Darter**	X	X	X
Perches	*Etheostoma nigrum*	Johnny Darter	X	X	X
Perches	*Perca flavescens*	Yellow Perch	X	X	X
Perches	*Percina caprodes*	Logperch		X	
Mudminnows	*Umbra limi*	Central Mudminnow	X	X	
		Total species documented:	21	35	26

X = Present in county
Listed species appear in bold
* = species of regional interest

Table 7. Number of records of listed species of fish documented during the 2004-2005 County Biological Survey of Todd, Otter Tail and Douglas Counties.

Family	Species	Common Name	Counties Todd	Otter Tail	Douglas	All Counties
Minnows	***Notropis anogenus***	**Pugnose Shiner**	3	16	13	32
Minnows	*Notropis texanus**	Weed Shiner		6		6
Perches	*Etheostoma caeruleum**	Rainbow Darter		5		5
Perches	***Etheostoma microperca***	**Least Darter**	10	22	14	46
		Total records:	13	49	27	89

Listed species appear in bold

* = species of regional interest

Table 8. Tiger beetles documented during the 2004 County Biological Survey of Todd County.

Family	Species	Common Name	Counties		
			Todd	Otter Tail	Douglas
Cicindelidae	*Cicindela formosa*	A Species of Tiger Beetle	X		
Cicindelidae	*Cicindela scutellaris*	A Species of Tiger Beetle	X		
		Total species documented:	2	0	0

X = Present in county

Table 9. Jumping spiders documented during the 2004 County Biological Survey of Todd, Otter Tail and Douglas Counties.

Family	Species	Common Name	Counties		
			Todd	Otter Tail	Douglas
Jumping Spiders	*Eris militaris*	Bronze Jumper		**X**	
Jumping Spiders	*Evarcha hoyi*	A Species of Jumping Spider	x	**X**	x
Jumping Spiders	*Ghelna canadensis*	A Species of Jumping Spider		x	
Jumping Spiders	*Habronattus cognatus*	A Species of Jumping Spider		**X**	
Jumping Spiders	*Habronattus sp.*	A Species of Jumping Spider		x	x
Jumping Spiders	*Habronattus viridipes*	A Species of Jumping Spider		x	
Jumping Spiders	*Marpissa formosa*	A Species of Jumping Spider			x
Jumping Spiders	***Marpissa grata***	**A Species of Jumping Spider**		**X**	
Jumping Spiders	*Neon nellii*	A Species of Jumping Spider		**X**	
Jumping Spiders	*Pelegrina insignis*	A Species of Jumping Spider	x	x	**X**
Jumping Spiders	*Pelegrina proterva*	A Species of Jumping Spider	**X**	**X**	
Jumping Spiders	*Pelegrina sp.*	A Species of Jumping Spider		x	
Jumping Spiders	*Phidippus clarus*	A Species of Jumping Spider	**X**	**X**	**X**
Jumping Spiders	*Synageles occidentalis*	A Species of Jumping Spider		x	x
Jumping Spiders	*Tutelina similis*	A Species of Jumping Spider	x	**X**	**X**
		Total species documented:	5	14	7
x = Present in county		New county records:	2	8	3

X = County record (new county records as compared to Ehmann and Boyd's 1996 records, Ehmann's 1999 & 2001 records, literature reviews, and correspondence with Bruce Cutler, University of Kansas.)
Listed species appear in bold

Appendix 1

Final Report

"Initial Jumping Spider Surveys for Otter Tail, Douglas, and Todd Counties, MN (with several additional records)"

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1. Summary

As part of an effort to learn more about the status and distribution of invertebrate fauna of Minnesota, I traveled to 19 field locations and collected 201 jumping spiders (Araneae: Salticidae) from 42 prairie, old field, and forest sites (primarily within Otter Tail, Douglas, and Todd counties), between 13-JUL and 23-AUG-2004 . An additional 18 sites were sampled with no spiders found. While in summer transit, limited sampling was also done in Aitkin, Cass, Koochiching, Pine, and Sherburne counties. Previous to this work, only the relatively common Pelegrina insignis was known with certainty from Otter Tail Co., and no reliable specimens of jumping spiders were known from either Douglas or Todd counties.

Using sweep nets, limb-beating, and hand-searches, I found 13 species of salticids, including 16 new county records. Five specimens of the state-listed special concern (SC) species, Marpissa grata (Gertsch, 1936), were taken from two sites near water at Agassiz Waterfowl Production Area (WPA) and from a drier site dominated by big bluestem at One Mile Lake Nature Area (Fergus Falls), both in Otter Tail Co. These records establish the tenth county of historical occurrence for M. grata, which is endemic to IA, MI, and MN, and suggest that other populations will be found. No other SC species was collected, despite increased use of hand-searches. The heavily disturbed character of west-central MN may partly explain these results.

Phidippus clarus (Keyserling, 1885) dominated the overall catch, representing 58% of all spiders collected, an abundance consistent with previous work in MN. Pelegrina insignis (Banks, 1892), which has represented almost 20% of previous catches from other counties, totaled only 8 specimens (4%). Pelegrina proterva (Walckenaer, 1837), a species associated with northern forests, was collected by limb-beating planted Colorado blue spruce trees at Pine Grove Park (Todd Co.) and from sweeping oak savanna at Glendalough SP (Otter Tail Co.). A new northern range record for Neon nellii Peckham

& Peckham 1888 within MN was established from a female taken at the One Mile Lake Nature Area. Specimens of the ant-mimic, Tutelina similis (Banks, 1895), from Otter Tail and Douglas counties brought the total number of MN counties with historic populations to ten.

Note: The contract work was done in Otter Tail, Douglas, and Todd counties, and other sites were sampled in transit or on the contractor's own time, and are voluntarily included.

Table 1. Historic and new areas in Minnesota sampled for jumping spiders by W.J. Ehmann during 2004.

Area	County
Historic (2)	
Solana SF	Aitkin
Uncas Dunes SF	Sherburne
New (17)	
Agassiz WPA	Otter Tail
One Mile Lake Nature Area (Fergus Falls)	Otter Tail
Maplewood SP	Otter Tail
Glendalough SP	Otter Tail
Seven Sisters TNC	Otter Tail
Lake Carlos SP	Douglas
Runestone County Park	Douglas
Staffanson Prairie	Douglas
WMA near Coon Point	Todd
WMA near Clotho	Todd
Pine Grove Park (Staples)	Todd
Pillsbury SF	Cass
Howard's Island	Koochiching
WMA near New York Mills	Otter Tail
WMA near Rush Lake	Otter Tail
Wilmer Lake WPA	Otter Tail
Issacson Property (private)	Pine

Sampling locations were recorded by hand-held GPS with approximately 15 m accuracy. Specimens were preserved in glass vials containing 70% ethanol, identified using published authorities (89% to species level, 93% to genus level; sexed when possible), and linked both to archival vial tags and a digital database. The entire collection will be deposited with the Department of Entomology, University of Minnesota, building the permanent research collection of MN salticids. Complete listings of spiders collected with geographic coordinates, age and sex information, and notes on site characteristics are presented as an appendix.

Table 2. Numbers of jumping spiders collected during this study.

Species	Count
Eris militaris (Walckenaer, 1837)	15
Evarcha hoyi (Peckham & Peckham, 1883)	9
Ghelna canadensis (C.L. Koch, 1848)	1
Habronattus cognatus (Peckham & Peckham, 1901)	3
Habronattus viridipes (Hentz, 1846)	2
Habronattus sp.	6
Marpissa formosa (Banks, 1892)	1
Marpissa grata (Gertsch, 1936)	5
Neon nellii Peckham & Peckham 1888	2
Pelegrina insignis (Banks, 1892)	8
Pelegrina proterva (Walckenaer, 1837)	11
Pelegrina sp.	1
Phidippus clarus Keyserling, 1884	117
Synageles occidentalis Cutler, 1987	3
Tutelina similis (Banks, 1895)	2
Unidentified, damaged, or lost	15
Total	**201**

2. Notes on Project Objectives

The following notes report on the proposed objectives from the work contract and the results that were obtained.

- Access to adult specimens from species that mature at different dates, by using two sampling periods (mid-July and mid-August) in one season (instead of one)

  Result: The mid-July sampling period worked especially well, with 60% of individuals collected in adult stage. This aided identifications.

- Increased opportunities for finding P. apacheanus, by scheduling a collection period later in the season than any previous work by this contractor

  Result: This species was not found.

- Good likelihood of M. grata (a MN and MI endemic of high conservation interest), P. fontana, and P. arizonensis from Todd Co., based on existing range maps

  Result: M. grata was found but not in Todd Co.

- Very good likelihood of M. grata from wet to wet mesic habitats at 320-acre Ottertail Prairie and from mostly undeveloped shoreline at Glendalough State Park, both in Otter Tail Co.

  Result: Five specimens of this SC species, including adults, were found in Otter Tail Co.

- Additionally, new records will be obtained for sites identified and prioritized by Gerda Nordquist, Animal Survey Coordinator.

  Result: As described in summary, 16 new county records and one state range record were obtained (see Table 3. and Table 4.).

Table 3. New county records of jumping spider species from this study, compared to Ehmann and Boyd's 1996 records, Ehmann's 1999 & 2001 records, literature reviews, and correspondence with Bruce Cutler, University of Kansas.

Species	Status	New County Localities Found
Eris militaris		Koochiching, Otter Tail
Evarcha hoyi		Otter Tail
Habronattus cognatus		Otter Tail
Marpissa grata	SC	Otter Tail
Neon nellii		Otter Tail (northernmost record in MN)
Pelegrina insignis		Douglas
Pelegrina proterva		Koochiching, Otter Tail, Todd
Phidippus clarus		Douglas, Otter Tail, Sherburne, Todd
Tutelina similis		Douglas, Otter Tail

Table 4. Reconfirmed (persisting) jumping spider populations at protected, historically-known locations, with distributional records.

Species	Reconfirmed Localities	Range Records
Evarcha hoyi	Solana SF, Uncas Dunes	MT to ME, IA to VA
Phidippus clarus	Solana SF, Uncas Dunes	US & Canada except SW

3. Conservation Perspectives

Although two new locations for M. grata have been found, this species has never been taken in large numbers, and the SC designation is still quite justified. While the Agassiz WPA collection locality is state-managed, the One Mile Lake Nature Area appears to be managed by the City of Fergus Falls and may not add much to DNR conservation planning.

The 16 new county records reported here are significant to the extent they provide potential management options, when jumping spiders are explicitly considered. Salticid and other invertebrate biodiversity may help managers gauge the relative importance of certain similar parcels to conservation or may add a distinctive character to protected locations.

As my field work has progressed, I am developing some expectations for salticid associations with vegetation. Spiders, including salticids, are known to be influenced by floristics, but salticids also have strong associations with certain plant architectures (e.g., "grass", "trees") that would decouple them from specific plant species. An example of an architectural association from this season is P. proterva for trees, whether spruce or oak.

My experience suggests that Otter Tail Co. does have some habitat variety and supports jumping spider populations to a moderate degree. Based just on this one, limited expedition, it is not a "hotspot" but it was much more interesting than Douglas and Todd counties. Pressed, I would note Agassiz WPA, Seven Sisters TNC, and Wimer Lake WPA as supporting good spider diversity.

I have yet to find three state-listed SC species, and will be considering specialized training in spider collection at Highlands Biological Station in July 2006 to give me more search options. To some degree, the lack of encounters with other SC species, in this study and previous ones, argues for their continued or elevated conservation status.

4. Recommendations for Future Work

At Staffanson Prairie TNC (Douglas Co.), I detected a stocky, iridescent salticid inside the visitor mailbox adjacent to the preserve information sign. Gusty NW winds interfered with its capture (it blew away going into the vial), but my immediate impression was that it was Sassacus papenhoei (Peckham & Peckham, 1888). I am quite familiar with this species from my dissertation work, when I collected hundreds of specimens from shrubs. S. papenhoei has only been collected from the Whitewater Bluffs area of southeastern MN, and makes Staffanson Prairie a site I would like to try again.

Immature spiders tentatively identified as Eris militaris (Hentz, 1845), Evarcha hoyi Peckham & Peckham 1883, Ghelna canadensis (C.L. Koch, 1848), and Habronattus virdipes Hentz 1846 cannot act as vouchers, but do suggest locations for further sampling for adults that would constitute new county records.
The most significant factor, after weather, affecting the results of these searches is probably search effort. The reconnaissance level work that I am doing (mostly solo) should eventually be followed by field crews, perhaps a team of 6-8 workers, visiting a specific site several times over the season. It is a well-known phenomenon that more search objects are found as party size increases.

While DNR funding levels may preclude this approach in the near future, I suggest that after the county surveys are completed, we might sit down to select a handful of sites for intensive study, by the same field crew, for a complete June-September season. This would be costly (estimate of $1600/day for 5 days/site and 3 visits/season would be $24K for one site), but we would then have a way to estimate how much data we are getting from reconnaissance work. Perhaps a matching grant opportunity could be explored. My impression to date is that reconnaissance is very cost effective for species diversity (county-wide surveys), but to get the pulse of rarer species (approaching an inventory)

we would benefit from more effort. Certainly, this is a familiar argument to field workers and resource managers.

Nonetheless, it is my continued impression that Minnesota is ahead of the game in looking at invertebrates and spiders in particular, compared to other states.

5. Acknowledgements

I appreciate the support from Gerda Nordquist, Animal Survey Coordinator, MN-DNR for this season, the cooperation of the Conservation Division in helping me to obtain and use collection permits, and site selection advice from numerous people familiar with Minnesota natural areas. Rich Baker helped nurture my interest in this project and I am very happy to continue adding to our knowledge of an under-studied component of Midwestern biodiversity. Finally, I appreciate the efforts of Vicki Plaistow and Cindy Wiebe at Northland College with budget coordination, and encouragement from my staff and faculty colleagues.