

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Great Plains Research: A Journal of Natural and
Social Sciences

Great Plains Studies, Center for

Fall 2005

Nebraska's Tiger Beetle, *Cincindela nebraskana* Casey

Mathew L. Brust

University of Nebraska at Kearney, mbrust@csc.edu

W. W. Hoback

Univeresity of Nebraska-Lincoln, whoback@okstate.edu

Follow this and additional works at: <https://digitalcommons.unl.edu/greatplainsresearch>



Part of the [Other International and Area Studies Commons](#)

Brust, Mathew L. and Hoback, W. W., "Nebraska's Tiger Beetle, *Cincindela nebraskana* Casey" (2005).
Great Plains Research: A Journal of Natural and Social Sciences. 782.
<https://digitalcommons.unl.edu/greatplainsresearch/782>

This Article is brought to you for free and open access by the Great Plains Studies, Center for at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Great Plains Research: A Journal of Natural and Social Sciences by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

**NEBRASKA'S TIGER BEETLE,
Cicindela nebraskana Casey**

Mathew L. Brust and W. W. Hoback

*Department of Biology
Bruner Hall of Science
University of Nebraska at Kearney
Kearney, NE 68849
hobackww@unk.edu*

ABSTRACT—Named for the state where it was discovered, *Cicindela nebraskana* Casey is among the rarest insects in Nebraska. Although this beetle was described in 1909, only nine specimens had been collected in Nebraska in the 95 years before we conducted surveys in 2003 and 2004 in the extreme western portion of the state. Because of scant records, little was known about the Nebraska populations relative to populations of the species in the remainder of the western United States. We discovered two populations in Sioux and Scotts Bluff counties. We review the taxonomy of this species and document its habitat and adult seasonality. This information is vital to conserving this extremely rare species in the Great Plains.

Key Words: Great Plains, Nebraska, rare, shortgrass prairie, tiger beetle

Introduction

Despite its name, *Cicindela nebraskana* Casey is an enigmatic tiger beetle species in Nebraska. Although common in states west of Nebraska, only nine specimens were collected in the state as of 2003. R.H. Wolcott collected four specimens from 1901 to 1911 at War Bonnet Canyon in Sioux County (Carter 1989). Thomas Casey described the subspecies in 1909 from specimens collected from “Sioux County, Nebraska” (R.L. Huber, pers. comm. 2005). Two more specimens were collected by Art Hagen of Chadron, NE, in 1973 near Fort Robinson State Park in Sioux County (Carter 1989) and an additional specimen was collected by Randy Lawson of Chadron State College in 1987 on a roadside sandy bank along Highway 20 west of Harrison, in Sioux County (Carter 1989; R. Lawson, pers. comm.). Two additional specimens were recorded from the Wildcat Hills of Scotts Bluff County during the 1990s (S.M. Spomer, pers. comm.).

Because the species is known from fewer than 10 sites in Nebraska, it is listed by the National Heritage Inventory ranking system as S1, or critically

imperiled at the subnational level (Nebraska National Heritage Inventory List 1996). Because the distribution of *C. nebraskana* in Nebraska was poorly known, we conducted surveys for two years to document the species' occurrence, establish its phenology, and determine if its populations in Nebraska had the same morphology and habits as populations throughout the remainder of its range.

Biogeography and Taxonomy

Cicindela nebraskana is a western North American species (Spanton 1988) (Fig. 1). It is recorded from North Dakota, South Dakota, Nebraska, Montana, Wyoming, Colorado, Idaho, Utah, Nevada, Arizona, Washington, Oregon, and California (Spanton 1988; Backlund et al. 2000). It is also recorded from British Columbia, Alberta, Saskatchewan, and Manitoba in Canada (Spanton 1988).

Adults of *C. nebraskana* are most often completely black, both dorsally and ventrally, with no maculation in Nebraska specimens (Casey 1909) (Fig. 2). There is some variation in color in other geographic areas. Although most Wyoming and Montana individuals are black dorsally, some individuals are dark brown to bronze (Spanton 1988). Among Utah populations, there appears to be a relatively even mix of black, dark brown, and olive green individuals (Spanton 1988).

Life History

Tiger beetles belonging to the genus *Cicindela* are active, searching predators as adults. Among their distinguishing features are their excellent vision, rapid running ability, and flight in response to perceived danger. Tiger beetle larvae are also unusual in that they form permanent burrows at the top of which they wait for prey to pass. Both adults and larvae usually occur in open habitats. Depending on climate and food availability, tiger beetle species differ in the amount of time it takes to complete a generation. Very little has been published on the life history of *C. nebraskana*. Morphologically, it is closely related to *C. longilabris* Say (Spanton 1988) and shares with it a high-latitude, high-altitude distribution. *Cicindela longilabris* has at least a three-year life cycle throughout its range (Spanton 1988), and it is likely that *C. nebraskana* also requires three years to complete a generation. Spanton (1988) suggests that the distribution of *C. nebraskana* has a strong association with the distribution of chernozemic soils (soils that have developed under arid-adapted grasses and forbs and are found in cool, subarid to subhumid climates of the prairie region). Although the larval stages are undescribed (Valenti 1996), the larval burrows are reportedly short and have a funnel-like opening (Larochelle and Lariviere 2001).

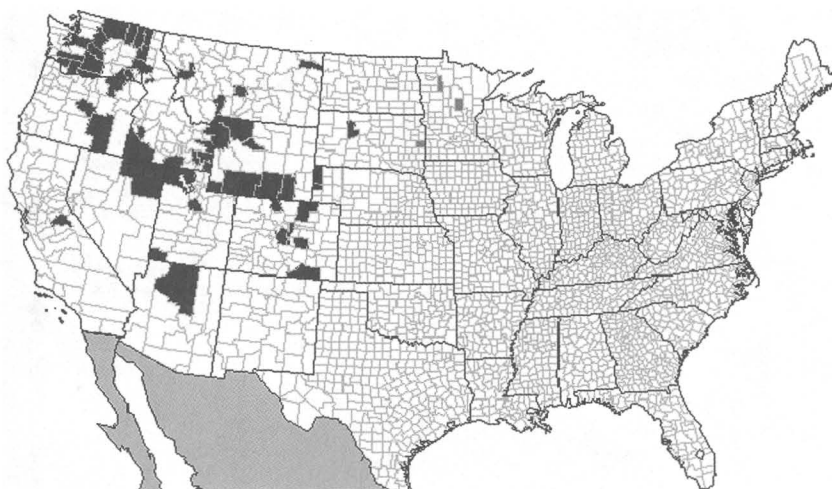


Figure 1. Recorded distribution of *Cicindela nebraskana* in the United States (modified from Hoback and Riggins 2001). Blackened counties are those with species records and gray-shaded counties represent records that are likely erroneous. Adapted from Hoback and Riggins (2001).

Habitat Preference

Comparatively little has been published on the preferred habitats of this species, and most accounts are somewhat generalized. Criddle (1907) reported it from “bare spots in dark and dryish land, with roadways seemingly preferred” in Manitoba. He also reported it from plowed fields. Ferris (1969) reported collecting it in desert grassland at 2,042 m elevation; from a vehicle’s dirt track among grasses, Rocky Mountain juniper (*Juniperus scopulorum* Sargent), and sagebrush at 2,286 m; and on east-facing hillsides with grasses, spruce, juniper, and sagebrush at 2,499 m in Wyoming. Kirk and Balsbaugh (1975) and Backlund et al. (2000) report *C. nebraskana* from the shortgrass prairie habitat in South Dakota, particularly in and near the Black Hills. Leffler and Pearson (1976) report that it has been collected in small numbers in open areas in forests in Washington. The authors also stated that the ponderosa pine—bunchgrass parkland community is its ideal habitat. Maser (1984) reported that *C. nebraskana chamberlaini* Knaus can be found on the slopes of Steens Mountain in Oregon, above 2,134 m on the east face and above 2,743 m on the west face. He also reported that it can be found along the edge of melting snow. Nordin (1985) reported it as common along a stream near a melting snowfield above Sonora Pass at 3,078 m in California. Kippenhan (1994) reported it from open ground and trails in woodland areas

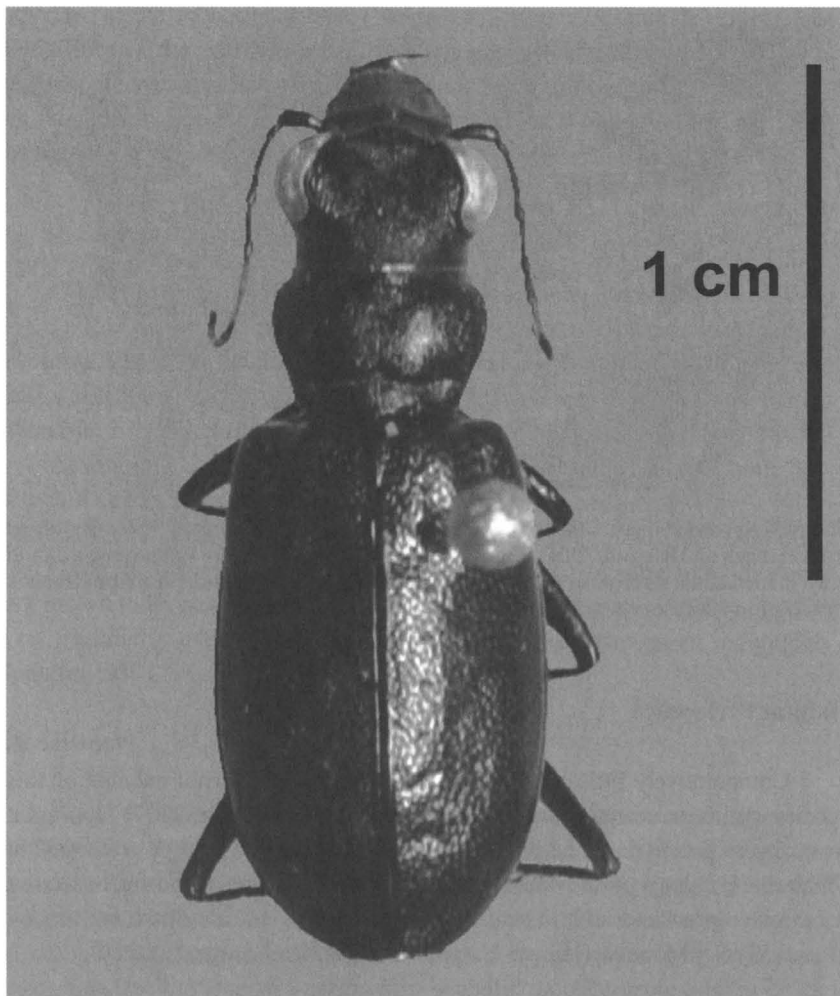


Figure 2. Adult male *Cicindela nebraskana* collected in Sioux County, NE. This species is easily distinguishable by its shiny blackish color and relatively large size (1.3 to 1.7 mm). Photo taken by Mathew L. Brust.

in Colorado and from areas with ponderosa pine (*Pinus ponderosa* P. & C. Lawson) and Gambel oak (*Quercus gambelii* Nutt) near the New Mexico state line (Kippenhan 1996).

Literature suggests that *C. nebraskana* is generally associated with relatively high altitude and forest openings and other open areas. It also appears to have at least a loose association with areas that contain ponderosa pine. Its occurrence

near the edge of melting snow and at elevations above 3,000 m suggests that it is a cold-tolerant species that may prefer upper montane and subalpine climates.

Seasonality

The seasonal activity of adults of *C. nebraskana* has been reported in some collection accounts. Collection dates in the literature include July 12 and August 1 in California (Nordin 1985), May 2-4 and May 19 in Wyoming (Ferris 1969), and September 9 in South Dakota (Backlund et al. 2000). Leffler and Pearson (1976) reported its occurrence from March 5 to September 15 in Washington, with most records from May through August. Kippenhan (1994, 1996) reports that it is a spring-fall species that quickly disappears during the warmer summer months in Colorado. Criddle (1907) reported the new brood of adults as appearing in late July and early August but makes no mention of spring activity. In Nebraska, *C. nebraskana* was collected on April 22, May 13, June 19, and June 28, suggesting that it is only spring-active in Nebraska (Carter 1989).

The wide distributional and phenological variation in *C. nebraskana* is likely related to the species' broad distribution across latitude and altitude. The occurrence of this insect in midsummer at high-altitude sites in California (above 2,700 m) is due to the fact that higher elevation shortens the duration of the growing season. The records from Nebraska in June are puzzling, especially considering the relatively low elevation and low latitude. The June records and the absence of records for fall in Nebraska may be a result of sampling bias, although a survey in August 2004 did not detect this species (Spomer et al. 2004).

Adult Behavior

There is relatively little literature on the behavior of *C. nebraskana*. Criddle (1907) reported that this species usually flies into grass when disturbed, and that it is then easily captured. Ferris (1969) reported that it is moderately wary and takes flight when startled. The flight pattern is low and relatively straight, usually for 3 to 9 m (Ferris 1969). Nordin (1985) reported interspecific copulation with *C. longilabris* in California.

Objectives

The objectives of this study were to determine whether *C. nebraskana* still occurs in Nebraska, to determine its conservation status within the state (size of populations, number of populations), and to identify habitats used by the species in Nebraska. These data will facilitate further conservation research on the species

and provide natural history information about this poorly known and rarely encountered species.

Materials and Methods

Survey areas were selected on the basis of literature and past location records of *C. nebraskana* in Sioux, Dawes, and Scotts Bluff counties in Nebraska. Surveys were limited to areas with public access (state wildlife areas, state recreation areas, national grasslands, national monuments, roadside right-of-ways) or private ranches to which access was granted by permission. In addition, a permit was obtained to survey Agate Fossil Beds National Monument.

One voucher specimen was collected per site following National Heritage Inventory (NHI) protocol, and sites were considered separate if they were more than 150 m apart. All specimens were collected with an aerial net or by hand. Surveys were conducted under sunny to partly cloudy weather conditions with a minimum air temperature of 18.3°C (65°F). Surveys were limited to the hours of 0900 to 1800. Surveys were conducted from May 9 to June 8, 2003, and from April 27 to May 7, 2004.

Study Area

The majority of the survey was conducted in Sioux and Scotts Bluff counties; relatively little surveying was done in Dawes County. In Sioux County, most surveys were conducted along the Pine Ridge formation and on roadside sandy banks off Highway 20 west of Harrison. A lesser amount of survey work was conducted in the Ogallala National Grassland, Agate Fossil Beds National Monument, and along roadsides near the Wyoming border. In Scotts Bluff County, most of the survey work focused on the Wildcat Hills formation. In Dawes County, all surveys were conducted in the Pine Ridge formation and the Ogallala National Grassland. Approximately 16 days were spent surveying in Sioux County, seven days in Scotts Bluff County, and five days in Dawes County.

Results

Of a total of 146 sites surveyed, *C. nebraskana* was found at three sites. Because two of these sites were separated by slightly more than 1 km, it is suspected that they represent part of the same population (Fig. 3, Table 1). The two clearly distinct populations of *C. nebraskana* were associated with the highest parts of the Pine Ridge in Sioux County and the Wildcat Hills of Scotts Bluff

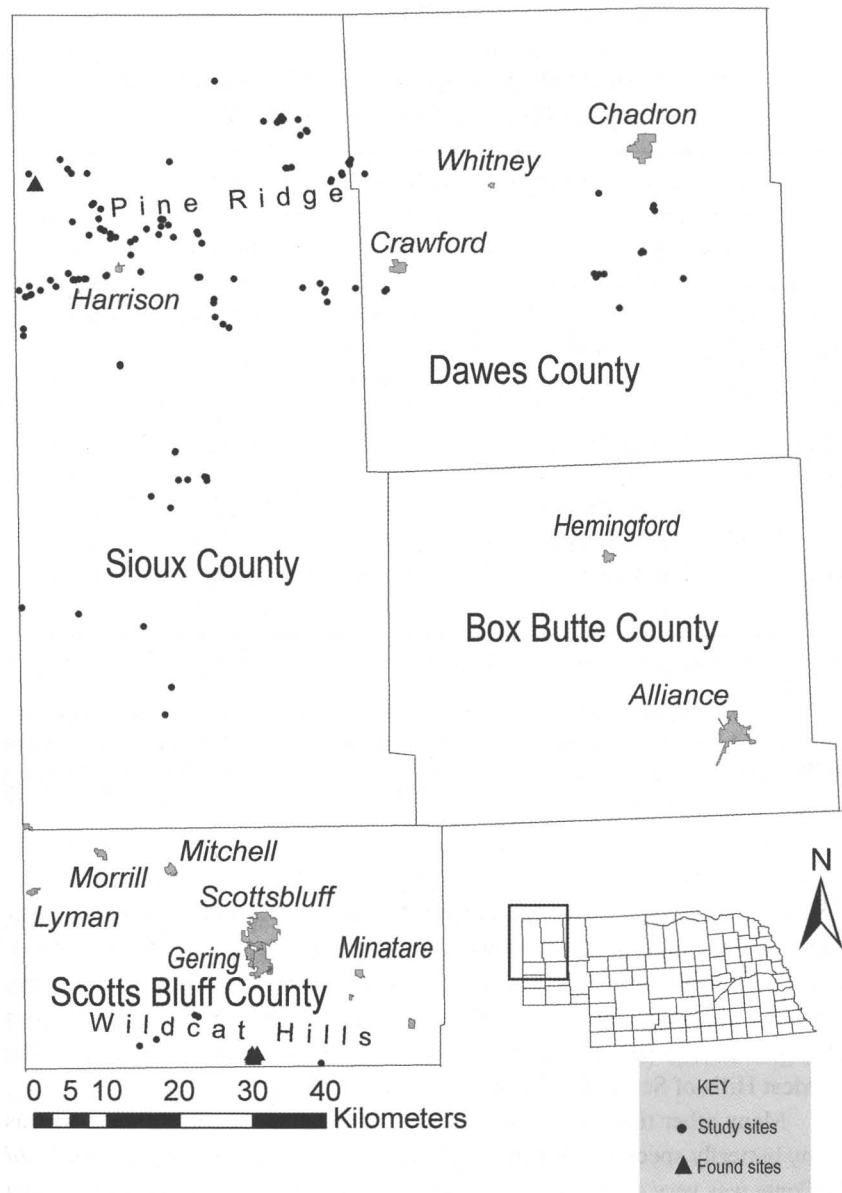


Figure 3. Map of survey sites in western Nebraska in 2003 and 2004. Dots indicate surveyed sites lacking *C. nebraskana* and triangles represent sites at which *C. nebraskana* was found. Gray-shaded areas are cities and towns.

TABLE 1

RECORDED LOCATIONS FOR *Cicindela nebraskana*
OCCURRENCES IN 2004 SURVEY

County	General location	Northing	Easting	Date
Scotts Bluff	Wildcat Hills SRA	4618901	610429	May 4
Scotts Bluff	Wildcat Hills SRA	4618308	609906	May 4
Scotts Bluff	Wildcat Hills SRA	4618919	609700	May 6
Scotts Bluff	Wildcat Hills SRA	4618608	609871	May 6
Scotts Bluff	Wildcat Hills SRA	4618631	609856	May 6
Sioux	Wilson Ranch	4738491	580046	May 7
Sioux	Wilson Ranch	4738563	580059	May 7
Sioux	Wilson Ranch	4738454	580098	May 7
Sioux	Wilson Ranch	4738370	580012	May 7
Sioux	Wilson Ranch	4738488	580018	May 7
Sioux	Wilson Ranch	4738456	580101	May 7
Sioux	Wilson Ranch	4738440	580141	May 7

Notes: GPS unit type: Lowrance, Globalmap 100, UTM: NAD 83, Zone 13. SRA = State Recreation Area.

UTM (Universal Transverse Mercator) differs from degree-based geographic systems and is based on metric locations. Northing refers to the distance in meters north of the equator and easting refers to the distance in meters east based on the longitudinal division of the earth into 6-degree zones. NAD 83 (North American Datum 1983) refers to the geographic survey on which the system is based.

County, respectively. Both populations occurred in areas of hard-packed loamy soils with sparse to moderate growth of threadleaf sedge (*Carex filifolia* Nutt.). Eight individuals were identified (two collected) at one extensive Pine Ridge site, and many other tiger beetles that were likely this species were also observed on May 7, 2004. Six individuals (two collected) were identified at two sites in the Wildcat Hills of Scotts Bluff County on May 4 and May 6, 2004.

Many other tiger beetle species were noted at the survey sites, as well as many butterfly species, a few of which are rare. *Cicindela purpurea audubonii* LeConte was very common at most sites surveyed and was found mostly along grassland trails. *Cicindela denverensis* Casey was common at many sites with steep, sparsely vegetated slopes, and *C. splendida* Hentz was found at one Pine Ridge site, as well as at Agate Fossil Beds National Monument. *Cicindela formosa formosa* Say and *C. scutellaris scutellaris* Say were common at most sites

with loose sandy soil. *Cicindela tranquebarica* Herbst (ssp. undetermined) was found in two different types of habitat. In the Pine Ridge, adults were found near streams along the bottoms of canyons, but in the Wildcat Hills they occurred along gravel roads and dirt trails at the top of the formation.

Cicindela nebraskana appears to be confined to relatively high elevation areas in the westernmost counties of Nebraska and was not encountered below 1,463 meters (4,800 feet). It also seems to prefer areas of low and somewhat sparse vegetation, especially areas dominated by threadleaf sedge that have bare spots between clumps. The adults appeared to occur on trails, but this may have been incidental. In two cases when beetles were flushed from the trail on the narrow ridge tops in the Wildcat Hills, the trail was walked for over 20 minutes, but the beetles did not return to the trail within that time. Thus, it is suspected that the adults spend more time foraging among the sedges and are on the trail either to bask or because their foraging path intercepted the trail.

All Nebraska individuals encountered were entirely black both dorsally and ventrally and had no maculation. This conforms to the original description in Casey (1909), which was derived from Nebraska specimens. No dark brown individuals were encountered.

Butterfly species *Pyrgus communis* (Grote) and *Eutoieta claudia* (Cramer) were found commonly at most sites. *Speyeria edwardsii* (Reakirt) was found at a few shortgrass prairie sites and among badlands in Sioux and Dawes counties. *Euphydryas anicia* (Luessler) was extremely abundant in open areas along the highest parts of the Pine Ridge formation, especially alongside *C. nebraskana*. *Oeneis uhleri* (W.H. Edwards) and *Plebejus icarioides* (W.H. Edwards) were relatively common in many of the same areas, though at slightly different times of the year. Small populations of *Euchloe olympia* (W.H. Edwards) were encountered along and just to the north of the Pine Ridge, and single specimens of *Hesperia uncas* W.H. Edwards, *Euphilotes ancilla* (Barnes & McDunnough), *Mituora grynea siva* (W.H. Edwards), *Coenonympha tullia* (W.H. Edwards), *Papilio zelicaon* (Lucas), and *Papilio indra* (Reakirt) were also found at one or more sites. The occurrence of one or more of these butterfly species might be useful as an indicator of habitat suitable for *C. nebraskana*.

Discussion

In the Wildcat Hills, *C. nebraskana* was confined to exposed narrow ridge tops (Fig. 4), while in the Pine Ridge it was found on a much broader ridge formation (Fig. 5). The minimum elevation for the occurrence of this species in Nebraska is unknown, but it is likely that single individuals may occasionally disperse to



Figure 4. *Cicindela nebraskana* habitat at the Wildcat Hills State Recreation Area in Scotts Bluff County, NE. Photograph by Mathew L. Brust.

lower areas. In Nebraska, it is probably restricted to the lightly forested ridge tops of the Wildcat Hills and the northern parts of the Pine Ridge. In the Pine Ridge it was found to co-occur with large numbers of the butterfly *Euphydryas anicia*. On the basis of topography, habitat, and the occurrence of this butterfly, *C. nebraskana* could be expected to occur as far east as the western end of Smiley Canyon Road near Fort Robinson State Park in the Pine Ridge area. Because of this area's accessibility and habitat, we suspect that it is the location of Hagen's 1973 specimens.

We surveyed six times at the site of Lawson's 1987 collection, but no individuals were found. Thus, we suspect that Lawson's specimen represents a dispersing individual. There may be populations on the private lands nearby, and adults may come to the road banks along Highway 20 from time to time to bask or forage, but it is unlikely that any reproduction occurs on these road banks. The majority of road banks along Highway 20 are rocky and unsuitable for most tiger beetle larvae; however, some areas contain loose, fine sandy soil containing scattered rocks and smaller stones. Numerous larval burrows were



Figure 5. *Cicindela nebraskana* habitat at the Wilson Ranch in Sioux County, NE. Photograph by Mathew L. Brust.

noted on these banks, but all appeared to be those of *C. lengi lengi* Horn. For confirmation, three larvae were dug up from 50 to 60 cm in depth and all were identified as *C. lengi*.

Because all collections of *C. nebraskana* adults occurred on hard-packed soils, we think that larvae prefer this soil type. Larval burrows were sought at the Wilson Ranch site, where there appears to be a sizeable population of adults, but none were found.

The exact location of the historic War Bonnet Canyon site in Sioux County where R.H. Wolcott collected a series of *C. nebraskana* in the early 1900s has long been a mystery (S.M. Spomer, pers. comm.). Discussion with local ranchers in Harrison, NE, suggested that War Bonnet Canyon lies within the confines of the War Bonnet Ranch and is apparently the small canyon where War Bonnet Creek descends from the steep north slope of the Pine Ridge. We were unable to gain permission to survey the site. Because there were likely very few roads in Sioux County prior to 1920 it is difficult to determine Wolcott's exact collection site. Perhaps as a result of few roads or landmarks, the site was named

after the nearest significant geographic feature. If so, it is possible that Wolcott's collection site is above the canyon rather than in it. As previously mentioned, the only specimens known from Nebraska by the time of Casey's description of *Cicindela nebraskana* in 1909 were from War Bonnet Canyon. Because the type location for the species is Sioux County, NE, War Bonnet Canyon almost certainly is the type location. The relatively large population that was found in the Pine Ridge during 2004 surveys was located no more than 15 km from the likely type location.

Numerous canyons along the north slope of the Pine Ridge were surveyed in both 2003 and 2004, but no *C. nebraskana* were found. On the basis of the species' recorded habitat preferences, we think that it prefers the upper parts of the ridge formation. Because many tiger beetle species are known to disperse for at least short distances (ca. 1 to 5 km) (Knisley and Schultz 1997), it would not be surprising if individual adults of this species might be encountered in any one of these canyons from time to time.

The color of the adults found in Nebraska is typical of other populations of *C. nebraskana* in the Great Plains. Unlike some populations in the western states, populations in Nebraska appear to be consistent in adult coloration.

Both sites at which *C. nebraskana* was found were disturbed by grazing and human activity. Association with disturbance is consistent with observations of other North American tiger beetle species, which often depend on disturbance to maintain suitable habitat (Knisley and Schultz 1997). In the Wildcat Hills, adults were found on narrow foot trails. At the Pine Ridge site, they were found on a gravel drive and on cow paths. Both the adults and larvae probably occur near these paths and in the bare patches among the sedges. Without additional information, it is reasonable to assume that *C. nebraskana* populations are stable at these locations, and thus, current land practices are conducive to its survival.

Future surveys for this species should focus on ridge-top formations such as the higher reaches of the Pine Ridge and the Wildcat Hills. There are probably other populations in these areas. The primary difficulty encountered in surveying these areas was obtaining landowners' permission, as there is very little public land in the high parts of the Pine Ridge.

Cicindela nebraskana is apparently limited to Sioux, Scotts Bluff, and potentially Dawes counties near the western edge of Nebraska. Though high elevations occur in Banner and Kimball counties to the south of the study area, surveys were not conducted there. Our reviews of maps and our drives through these counties found a region heavily irrigated and largely converted to row crops. It is unlikely that suitable habitat currently exists in Banner and Kimball counties except for two limited ridge formations.

Cicindela nebraskana, first described in Nebraska and named for the state, is a very rare species there. In fact, Nebraska represents the easternmost edge of its distribution in the United States. Our surveys reveal that it almost certainly reproduces within the state. Protection of this species and the habitat that supports it should be continued.

Acknowledgments

We extend special thanks to Anne and Bill Wilson of Harrison, NE, for allowing access to their property. At the time of this study, the largest known population of *Cicindela nebraskana* in the state resides on their property. The beetle's presence there despite the land being grazed suggests that current land management practices are maintaining the species. We would also like to thank Ron Huber at the University of Minnesota for sharing his experience with this species, Steve Spomer at the University of Nebraska–Lincoln for sharing his knowledge of Nebraska's geography and tiger beetle fauna, and Randy Lawson at Chadron State College for sharing his experience with *C. nebraskana*. We would especially like to thank the Nebraska Game and Parks Commission and the National Heritage Inventory, especially NHI specialist Mike Fritz, as well as the Center for Great Plains Studies, for funding this study.

References

- Backlund, D.C., N. Backlund, G.L. Marrone, and S. Weins. 2000. New distribution records of tiger beetles (Coleoptera: Cicindelidae) from South Dakota, U.S.A. *Cicindela* 32:9-12.
- Carter, M.R. 1989. The biology and ecology of the tiger beetles (Coleoptera: Cicindelidae) of Nebraska. *Transactions of the Nebraska Academy of Sciences* 17:1-18.
- Casey, T.L. 1909. Studies in *Omus* and *Cicindela*. *Memoirs on the Coleoptera* 5:1-24.
- Criddle, N. 1907. Habits of some Manitoba "tiger beetles" (*Cicindela*). *Canadian Entomologist* 4:105-14.
- Ferris, C. 1969. Notes on collecting early *Cicindela* in eastern Wyoming. *Cicindela* 1:9-13.
- Hoback, W.W., and J.J. Riggins. 2001. Tiger beetles of the United States. Jamestown, ND: Northern Prairie Wildlife Research Center Online. <http://www.npwrc.usgs.gov/resource/distr/insects/tigb/tigbusa.htm> (version 12DEC2003).

- Kippenhan, M.G. 1994. The tiger beetles (Coleoptera: Cicindelidae) of Colorado. *Transactions of the American Entomological Society* 120:1-86.
- Kippenhan, M.G. 1996. Distributional records of *Cicindela nebraskana* Casey (Coleoptera: Cicindelidae) from south-central Colorado. *Cicindela* 28:30-31.
- Kirk, V.M., and E.U. Balsbaugh, Jr. 1975. *A List of the Beetles of South Dakota*. Technical Bulletin 42. Brookings, SD: Agricultural Experiment Station, South Dakota State University.
- Knisley, C.B., and T.D. Schultz, 1997. *The Biology of Tiger Beetles and a Guide to the Species of the South Atlantic States*. Special Publication no. 5. Martinsville, VA: Virginia Museum of Natural History.
- Larochelle, A., and M.C. Lariviere. 2001. Natural history of the tiger beetles of North America north of Mexico. *Cicindela* 33:41-162.
- Leffler, S.R., and D.L. Pearson. 1976. Tiger beetles of Washington. *Cicindela* 8:21-60.
- Maser, C. 1984. Notes on cicindelid habitats in Oregon. *Cicindela* 16:39-59.
- Nebraska National Heritage Inventory Working List. 1996. <http://www.ngpc.state.us/wildlife/programs/grants/list.asp>.
- Nordin, P.D. 1985. Interspecific mating of two alpine California cicindelids. *Cicindela* 17:13-15.
- Spanton, T.G. 1988. The *Cicindela sylvatica* group: Geographical variation and classification of the Nearctic taxa, and reconstructed phylogeny and geographical history of the species (Coleoptera: Cicindelidae). *Quaestiones Entomologicae* 24:51-161.
- Spomer, S.M., W.J. Allgeier, and P.D. Nabity. 2004. A fall collecting trip to southwestern and western Nebraska and a new state record for *Cicindela decemnotata*. *Cicindela* 36:57-60.
- Valenti, M.A. 1996. Synopsis of reported larval descriptions of tiger beetles (Coleoptera: Cicindelidae). *Cicindela* 28:45-52.