Conservation Biology Research Grants Program
Nongame Wildlife Program
Division of Ecological Services
Minnesota Department of Natural Resources

REINTRODUCTION OF BULLSNAKES INTO THE CROW-HASSAN PRAIRIE RESTORATION

FINAL REPORT

submitted to

NONGAME WILDLIFE PROGRAM
Box 7, DNR Building
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Submitted by:

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ABSTRACT: Ten Bullsnakes, a species of special concern in Minnesota, were released into a 300 ha recreated prairie system within a 1000 ha park reserve in Northwestern Hennepin County, Minnesota. The snakes were collected from a population 30 km north of the release site to insure similar genetic traits and because it was the closest known population. Six of the Bullsnakes were equipped with radio transmitters and were monitored twice a week from their 18 June 1991 release through hibernation . Home ranges of the Bullsnakes averaged 6 ha with two day movements of up to 700 m. Male Bullsnakes wandered further than females. Gopher mounds were the preferred habitats with some snakes remaining in the same mound for over two weeks. All of the hibernation sites are in gopher mounds. Three of the snakes hibernated within 20 m of the release site after having wandered up to 1 km away during the summer.

The Bullsnake (*Pituophis catenifer sayi*) is the largest Minnesota snake. It is also a species in decline in Minnesota (Lang, et al. 1988) The sandy prairie and savannah habitats preferred by this species (Vogt 1981, Breckenridge 1944) have been greatly reduced (Coffin and Pfannmuller 1988). Bullsnake declines have also been attributed to over collection and general persecution of snakes (Lang et al.1988) The decline in the Bullsnake population led to its listing as a special concern species (Lang et al. 1988).

The decline of the Bullsnake can be stopped by protecting and restoring its natural habitat (Dodd 1987, Lang et al. 1988). Protecting the Bullsnakes from human predation, either unwarranted killings or collecting will help maintain existing populations (Dodd 1987, Johnson 1987). The use of reintroductions if carefully planned, can be a helpful tool in preserving a species (Dodd 1987). The reintroductions should be in habitats that provide for the needs of all aspects of the snake's biology and should use animals from a local gene pool (Dodd 1987, Moriarty 1985).

The reintroduction of snakes is relatively new (Collins, pers. comm., Speake, pers. comm.). The few published studies are mainly release and forget reintroductions (Cook 1989). Follow up on monitoring the mortality of released animals has not been published (Speake, pers. comm.) This study will document the reintroduction of Bullsnakes into a restored habitat from release through establishment.

OBJECTIVES

The objectives of the study were:

1. to verify the absence of Bullsnakes from the Crow-Hassan Prairie. There are no modern records from the area around the park, but we need to be sure there are no snakes before proceeding with reintroduction.
2. to reintroduce Bullsnakes from Sherburne Co. to the Crow-Hassan Prairie. The Bullsnakes will be caught at Sherburne NWR, processed, and released in the prairie to help improve the diversity of the prairie system.
3. to monitor the habitat use of the reintroduced snakes. Habitat use needs to be determined for future management considerations.
4. to monitor the mortality and reproduction of the snakes. The success of the reintroduction will depend on favorable recruitment. Long-term monitoring of the population is the only way to determine recruitment.

STUDY AREA

The study area is located in Hennepin Parks, Crow-Hassan Park Reserve in north west Hennepin County (Figure 1 and 2.). Crow-Hassan Park Reserve encompasses 2580 acres of woodland, wetland, oldfield, and restored prairie. The restored prairie totals 490 acres, with a 9 acre prairie remnant, in the northern third of the park. The area planted to prairie had been in row crops prior to restoration. The 1873 Hennepin County plat book shows original prairie within the current restored prairie.

The prairie was planted between 1969 and 1978, with continued planting of various forb species to increase the diversity. The prairie is on sandy soils. Within the borders of the prairie plantings are several wetlands, ranging from permanent water in Prairie and North Twin Lakes to numerous temporary potholes. There are also several oak woodlands scattered within the same area.

The small mammal community of the prairie area includes deer mice (*Peromyscus* spp.), meadow voles (*Microtus pennsylvanicus*), thirteen-lined ground squirrels (*Spermophilus tridecemlineatus*), and plains pocket gophers (*Geomys bursarius*). Ground squirrels and pocket gophers are both common and will provide a good prey base. The tunnels and burrows will also provide habitat for escape, resting and hibernating.

METHODS
1990 Bullsnake Search

The first phase of the Bullsnake Reintroduction Study has been completed. The area at and around the release site has been searched for Bullsnakes. Between 9 May and 30 June 1990, over 60 hours were spent by Madeleine Linck and John Moriarty searching for Bullsnakes. The majority of efforts were spent in Prairie Units R, 9, 14, 15, and 16. Units 5, 11, 12, 17, and 19 were also searched (Figure 3).

Searching involved looking for snakes or their signs (crawl tracts, shed skins, or eggs). All available cover was checked. No signs of Bullsnakes were found.

Funnel traps along natural drift fences (logs) were used between 30 May and 22 June 1990. Drift fences with funnel traps were strategically placed on the prairie(Karns 1986. Vogt and Hines 1982). Visual searching and flipping of debri was extensively used. A total of 261 trap nights was accumulated from 12 traps. A total of 41 captures of six species was made in the traps (Table 1). The only species of snake captured was the common garter snake (*Thamnophis sirtalis*).

Park staff was also requested to keep an eye out for Bullsnakes during this period. At least six other park personnel spent over 100 accumulative hours in the park during June. No reports were received from park staff concerning Bullsnakes.

No Bullsnakes were found in 1990, so reintroductions began in the Spring of 1991. Bullsnakes were caught at Sherburne NWR, located 20 miles north of Crow-Hassan, where they are common. Sherburne NWR was also used because it provided a local gene pool. The snakes were collected using search and flip techniques (Karns 1986) and road driving. Snakes were at least 1 m in length. At this length all snakes should be of breeding size (Vogt 1981).

A Bullsnake collecting trip to Sherburne National Wildlife Refuge took place on 11 May 1991. The trip involved 18 volunteers from the Minnesota Herpetological Society and 2 Hennepin Parks employees. The collecting trip lasted 6 hours for a total of 120 person hours of searching. The weather was sunny and warm, 70 to 80 F, which was ideal for Bullsnake movements. Numerous sites were checked throughout the refuge, including those recommended by the Sherburne NWR staff. Only 3 snakes were caught. All of these snakes were found on or along the road. Two roadkilled snakes were also observed.

Several additional trips were made to Sherburne by Hennepin Parks staff and volunteers in search of Bullsnakes. Searching was confined to road driving. An additional 7 snakes were collected in this manner. All future collecting efforts will be limited to road driving. Once caught the snakes were measured, weighed, sexed, and marked using scale clipping (Brown and Parker 1976). The reproductive status of the female snakes was also checked.

A total of 10 Bullsnakes were collected for release. Six of these snakes, 3 males and 3 females (1 gravid), were equipped with internal radio transmitters at the Wildlife

Rehabilitation Clinic (WRC) at the University of Minnesota. The radios were implanted on 14 June 1991 by Linda Wolfe, DVM and Mark Zens, DVM. The transmitters were Advanced Telemetry Systems (ATS) Model 12 implantable with a life expectancy of 1 year. The implant surgery was covered by the newspapers and television stations (Figures 4 and 5). The delay in implantation of transmitters was due to scheduling problems with the WRC.

The Bullsnakes were released in the center of the prairie (Unit 16). Artificial cover, in the form of logs was placed in the vicinity of the release to provide additional cover for the snakes. Radio-tagged snakes were located every other day for the first month, then twice a week afterwards for a total of 41 possible relocations. The dates and times of relocation attempts are in Table 2. The location of the snake, the habitat, time, weather conditions, and behavior were recorded at each relocation point.

The seasonal movements of tagged snakes were mapped so habitat use could be determined. The maps were used to determine the dispersal rate and direction from the release point.

Intensive surveys will be conducted in the spring of 1992 to relocate radio tagged snakes and to capture as many Bullsnakes as possible. Survival will be determined at that time. The reproductive condition of mature females will be checked.

RESULTS

Bullsnake Release

Nine Bullsnakes were released on 18 June 1991. One snake (#2) was held for several days for additional observation. The Bullsnakes were all released on Unit 16 of the Crow-Hassan Prairie. One snake (#1) was released down a gopher hole, while all the others were let go on the surface. The release was covered by the newspapers and television stations (Figure 6). The weather on the day of the release was warm (mid-70's F) and a thunderstorm passed through the area within one hour after release dropping approximately 1 inch of rain in 2 hours.

The released snakes were first relocated the following day. Snake #1 was not relocated, but the other 5 snakes were still in the vicinity of Unit 16. The non-radioed snakes were not seen again.

All of the relocations were made with the assistance of the receiver and antenna. Snakes were not seen during relocation attempts until they were within several meters. On several occasions, snakes were not seen until they were stepped on. There were only 2 incidental sightings of Bullsnakes outside of relocation attempts. One by J. Moriarty and one by a qualified park user. Proper assessment of habitat use and movements could not be made without telemetry equipment.

Habitat Use

The habitat use of the 5 radioed Bullsnakes was mainly in open areas. The two females spent all of their time on the prairie. They did not use any of the woodlots or wetlands. The 3 males spent most of their time in open habitats, but did travel through woodlots. Snake # 4 did spend several week in a dry woods and sumac brush habitat, but returned to

the prairie to hibernate. The 3 males were relocated on several locations along the edge of Prairie Lake on the southside of the remnant. They were never found near the lake on consecutive locations.

When underground, the snakes were found in gopher mounds (87 relocations), except for several relocations in a woodchuck burrow (3 relocations, 2 snakes) and a stump hole (2 relocations, 1 snake). This is the first time that this extensive use of gopher mounds has been reported (Parker and Brown 1980, Vogt 1980).

General Movements

The Bullsnake movements were not what we expected at the beginning of the study. The gravid female left the study area and park very rapidly (Figure 7). This behavior was not expected of a gravid snake, which normally move very little before egg deposition (Parker and Brown 1980). The two remaining females stayed in the release area (Figures 8) with no sign of migration. Their home ranges were large at 8.4 and 12.8 ha as compared to Parker and Brown's(1980) study which had an average home range of 2.1 ha for females. The three males snakes (Figures 9, 10, and 11) had smaller home ranges with an average of 1.5 ha, but they did cover more territory. They all showed a delayed summer migration averaging 2.4 km. but up to 4 km (Snake #6) before settling into a summer range with an average of 1.5 ha. Parker and Brown (1980) reported an average migration of 508 m with a maximum of 875 m. This is considerably less than this study, but these snakes were probably investigating new territories. The 1992 field season will help define a more normal migration and home range pattern. Snakes #5 and #6 hibernated at their summer range (Figure 10 and 11), while Snake #4 returned to the release site (Figure 9).

Snake Summaries

Snake #1: Snake 1 was a large gravid female released on 18 June 1991. She was released on Unit 16 by placing her at the entrance of a gopher hole in hopes that she would stay in the area. She was lost immediately after release, in that her signal could not be picked up the day after release.

Numerous attempts to locate Snake 1 from all corners of Crow-Hassan Park were fruitless. There was heavy interference on channel 2 (150.02mh). This was due to a local company with the same frequency. On several occasions a faint signal was picked up from the west side of the Crow River, but the interference would swamp out the signal after a few minutes.

On 23 September, Madeleine Linck picked up a good signal from across the Crow River. This was after the receiver was rebuilt on 18 September. Moriarty tracked the signal to a road shoulder on Lander Ave. NE in Wright County (Figure 7). The site was dug up on 26 September to locate the snake. After very little digging snake ribs and vertebrae were found. At approximately 18 inches down remnants of snake eggs and the transmitter were found.

It is hypothesized that Snake 1 moved rapidly to the west and probably crossed the Crow River within several days of release. She then tried to cross Lander Ave. NE, but was hit by a car and was able to crawl down a ground squirrel hole before she died. The position of the bones, eggs, and transmitter appear to have been head down and stretched out in the hole.

Snake #2: Snake 2 was the smallest snake released. She was not gravid in 1991. Snake 2 was held for several days longer before release for additional time to observe the recovery from implant surgery. She was released on 21 June 1991. A total of 28 relocations were made on the snake prior to her going into hibernation on 15 September 1991 (Table 2) in a gopher mound. This was the earliest hibernation date of the five radioed snakes.

During the summer Snake 2 spent her time on Units 16 and 14 (Figure 8). She was found on the surface 53 percent of the time. The longest she spent underground without moving before hibernation was thirteen days between 28 July and 9 August 1991.

Snake 2 appeared healthy when periodically recaptured during the summer. Visual observations were few since most of the surface movements were in mouse runs through the thatch.

Snake #3: Snake 3 was the third female released. She was not gravid in 1991. She was released on 18 June 1991 on the surface of the ground at Unit 16. She was relocated 32 times before entering hibernation on 26 September 1991 (Table 3). She entered hibernation in a gopher mound within 20 m of where she had released. Snake 3 had the smallest home range at 8.4 ha (Figure 9). There were no movements outside this home range. Snake 3 was the only snake actually encountered actively hunting. She had her head in a mouse nest when located on 9 September.

Snake 3 spent most of the time underground (62%). The longest recorded move she made between relocations was 425 m between 3 and 6 September.

Snake #4: Snake #4 was a medium sized male that was released on 18 June 1991. He was released at the surface on Unit 16. Snake 4 was relocated 40 times before entering hibernation on 11 October 1991 (Table 4). He was the last snake to enter hibernation.

Snake 4 spent most of his time underground with only 13 relocations (33%) above ground. He spent most of his time on Units 16 and 14 until 6 September when he moved 1 km to the southwest side of Prairie Lake. He stayed in a 2.8 ha area for a month, then moved back to Unit 16 on 8 October and hibernated within 25 m of his release site in a gopher mound. The movements between the two activity areas (Figure 10) are tentative, but it is suspected that Snake 4 traveled around the south side of Prairie Lake through the woods.

Snake #5: Snake #5 was a large male released on 18 June 1991. He was released at the surface on Unit 16. He was relocated 28 times (Table 5). There were three relocations during which Snake 5 was removed for observation due to air under the skin and three relocations during which he was not found because of receiver problems. The last movement was recorded on 2 October 1991.

Snake 5 stayed in the area of Unit 16 and the remnant until 28 August when it moved south (Figure 10).. The largest recorded move by Snake 5 between relocations was 900 m on 12 September. Snake 5 settled into an extensive gopher mound system 1.3 km south of the release site. Upon reaching the gopher mounds on 18 September he did not move more than a few meters in any one direction.

Snake #6: Snake #6 was the largest snake released. Snake 6 was a male and was released at unit 16 on 18 June 1991. He was relocated 34 times before hibernating on 26 September 1991 (Table 6). He hibernated 1.3 km south of the release site (Figure 11) in a gopher mound area on the north west side of Davis Pond.

Snake 6 moved more than any of the other radioed snakes (Figure 11). He stayed in the area of the remnant and Unit 16 until 28 July when it started to move. Between 20 August and 3 September it moved over 4 km, but not in a straight line (Figure 11). The two home ranges were both less than 2 ha, but the total area covered was almost 200 ha.

DOR Snake: A DOR Bullsnake was recovered from Hwy 116 on the north side of Crow Hassan Park on 21 September 1991. The snake was reported to M. Linck during the Prairie Fest at Crow-Hassan. The snake appeared to have been dead for several weeks. Upon closer inspection it could not be decided if the snake was one of the non-radioed males or a wild snake. If the snake was wild, it proves that there are native Bullsnakes in the park, but at low numbers. The roadkilled snake was found 1.5 km northeast of the 1990 search area and 2 km northeast of the release site.

Management Implications and Future Research

Surveying for the absence of snakes can be difficult (Karns 1988, Moriarty 1989). Negative surveys are not always correct since low numbers may still exist within a relatively short distance of the search area. This was found to be true in this study with the finding of the DOR Bullsnake north of Crow-Hassan. Additional information on snake movements and behaviors would improve searching success. This is especially important when dealing with rare species.

Relocation with the use of radio telemetry of Bullsnakes appears to be successful. The final judgement cannot be made until their emergence from hibernation. Telemetry equipment developed problems twice during the summer. The receiver transistors failed causing weakened and loss signals. Repairs were made quickly by ATS of Princeton, MN. We found a good working relationship with our radio telemetry manufacturer helped reduce loss field time.

The Bullsnakes need to be collected from an area with a good population and later in the year than was done in this study. The collected snakes were biased towards males (7:3). Imler (1945) found that males were more active in the early spring, but females increase in activity into June. Time of day and ambient temperature are also major factors when planning a collecting trip.

The release site has to be large enough to allow for dispersals to remain within a protected area. The five snakes in this study covered over 300 ha. There will be additional movements in following years. I would not recommend a release in an area less then 500 ha.

The release site also has to have appropriate habitat. In central Minnesota this appears to be sites with sandy soils and abundant gopher mounds. The gopher burrows were used almost exclusively by snakes in this study for cover. If a restored site is intended for a Bullsnake release and there is little or no gopher activity, then the reintroduction should be postponed until gophers are established.

The frequency of relocations also needs to be reconsidered. Multiple relocations should be made in the first 48 hours to maintain close contact of snake making immediate migrations, as in the case of Snake #1. More frequent relocations are also warranted if long movements are recorded, as in Snakes #5 and #6. If detailed habitat use and movement profiles are to be developed then hourly monitoring would be needed for an extended period of time.

LITERATURE CITED

Breckenridge, W.J. 1944. Reptiles and amphibians of Minnesota. Univ Minnesota Press, Minneapolis. 202 p.

Brown, W.S. and W.S. Parker. 1976. A ventral scale clipping system for permanently marking snakes. J. Herp. 10:247-249.

Coffin, B. and L. Pfannmuller (eds.) 1988. Minnesota's endangered flora and fauna. Univ. Minnesota Press, Minneapolis. 473 p.

Cook, R.P. 1989. And the voice of the grey treefrog was heard again in the land. Park Science 9:6-7.

Dodd, C.K. 1987. Status, conservation, and management. pp. 478-513 in Seigel, Collins, Novak (eds.) Snakes ecology and evolutionary biology. MacMillan, New York. 529 p

Imler, R.H. 1945. Bullsnakes and their control on a Nebraska Wildlife Refuge. J. Wildl. Manage. 9:265-273.

Johnson,T. 1987. Amphibians and reptiles of Missouri. Missouri Dept. Conservation, Jefferson City 356 p.

Karns, D.R. 1986. Field Herpetology. Bell Museum Occ. Pap. No. 18. 88 p.

Lang, J.W., D.R. Karns, D. Wells, M. Nehls, M. Pappas. 1988. Final report of the amphibian and reptiles group committee. pp 325-349 in Coffin, B. and L. Pfannmuller (eds.) 1988. Minnesota's endangered flora and fauna. Univ. Minnesota Press, Minneapolis. 473 p.

Moriarty, J.J. 1985. General recommendations for the rehabilitation of reptiles. pp 63-72. in Beaver, P. (ed.) Wildlife Rehabilitation Vol. 4: Proc. Nat. Wildl. Rehab. Assoc. Symp. 156 p.

Moriarty, J.J. 1989. Minnesota County Biological Survey: 1988 Herpetological Surveys. Biol. Rep. Ser. No. 9 .

Parker, W.S. and W.S. Brown. 1980. Comparative Ecology of two colubrid snakes in northern Utah. Milw. Public Mus. Pub. Biol. Geol. No. 7. 104 pp.

Vogt, R.C. 1981. Natural history of amphibians and reptiles of Wisconsin. Milwaukee Public Museum, Milwaukee. 205 p.

Vogt, R.C. and R. Hines. 1982. Evaluation of techniques for assessment of amphibian and reptile populations in Wisconsin. pp. 201-217. in Scott, N. (ed.) Herpetological Communities. U.S.F.W.S. Wildl. Res. Rep. 13.-

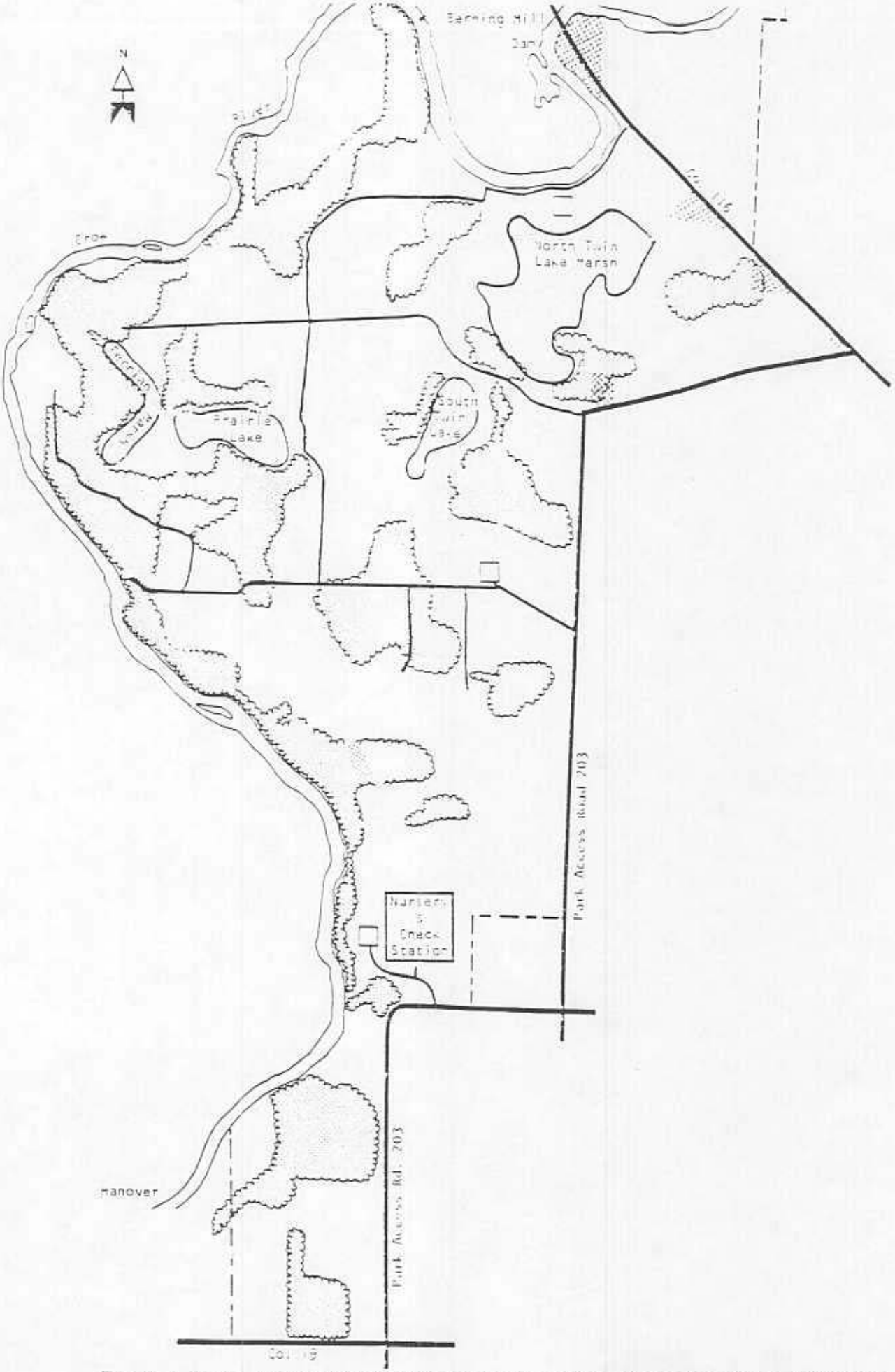

Figure 1. Crow- Hassan Park Reserve, Hassan Township, Hennepin County, Minnesota.

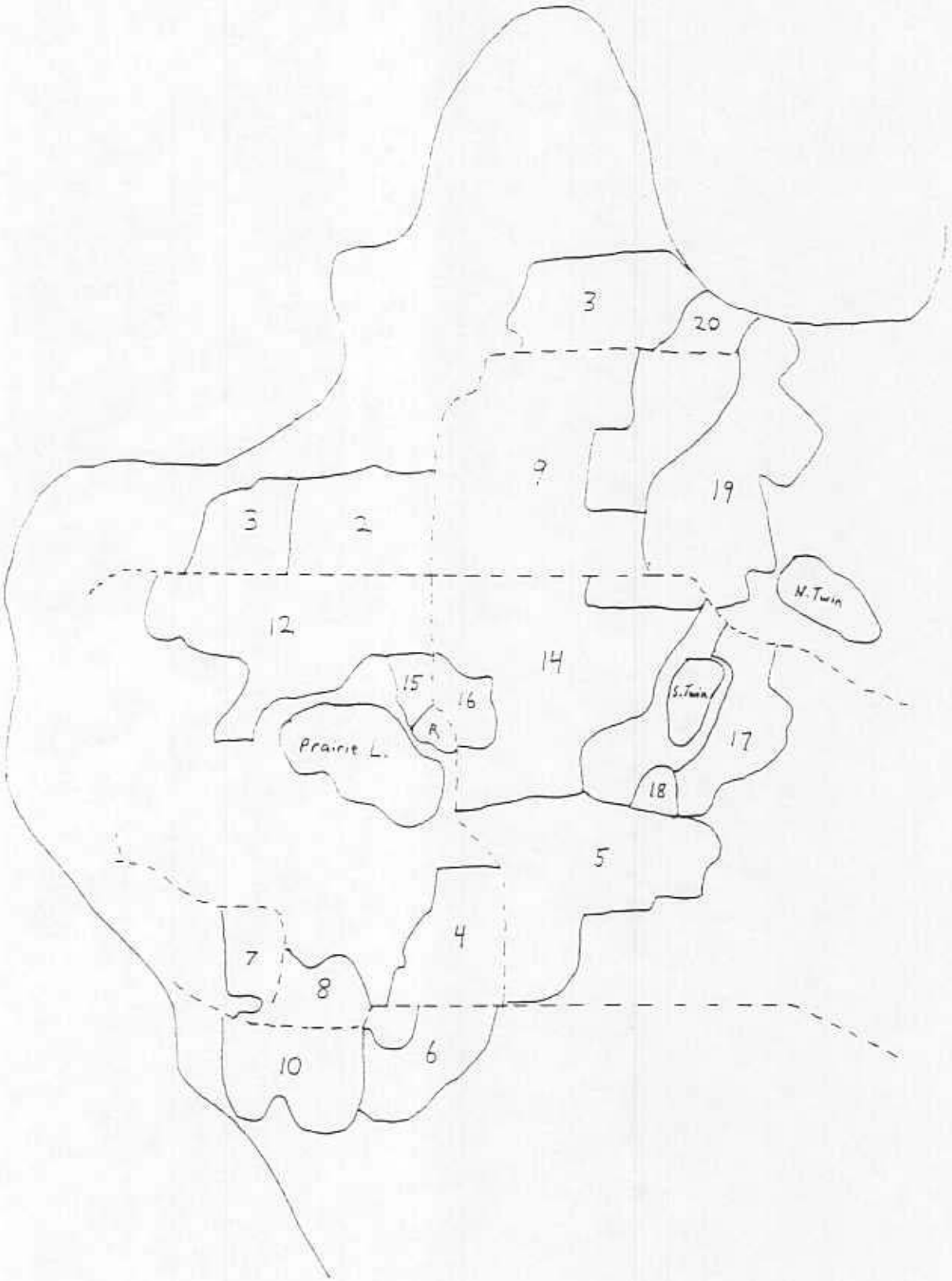

Figure 2. Location of prairie units within Crow-Hassan Park Reserve.

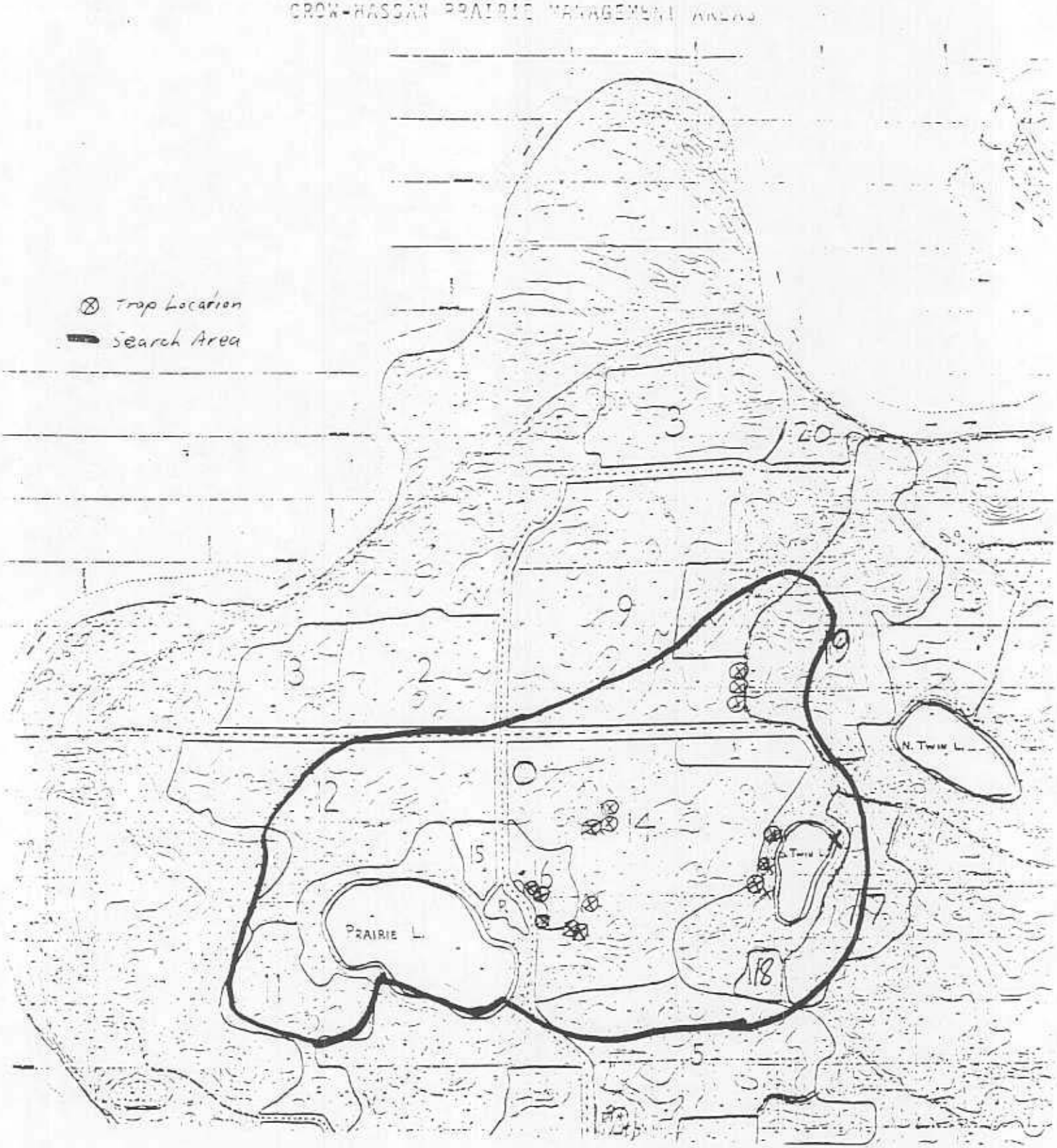

Figure 3. Bullsnake search area and funnel trap locations within Crow-Hassan Park Reserve prairie units.

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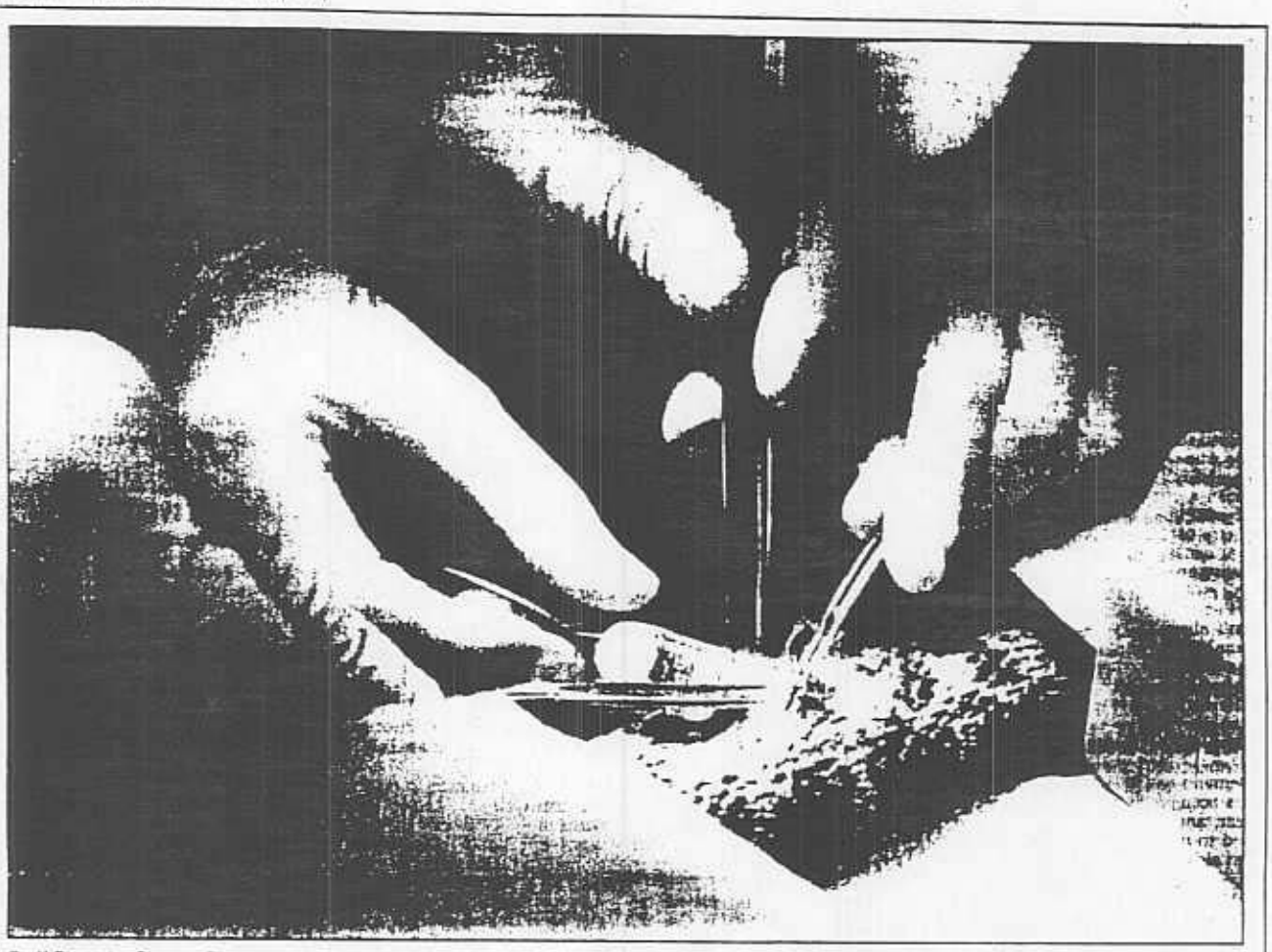

Staff Photo by Charles Bjorgen

Veterinarians inserted a transmitter Friday under the skin of a snake that will be released in Hennepin County's Crow Hassan Park Reserve.

Park gives its snakes transmitter implants

By Marcus Session
Staff Writer

The restored prairie in the Crow Hassan Park Reserve will become home Tuesday to six bull snakes that carry implanted radio transmitters for tracking their movements.

These snakes, as well as four without transmitters, were caught in the Sherburne National Wildlife Refuge north of Elk River and will be released and monitored by the Hennepin Parks staff as part of a continuing effort to restore the prairie to its natural state.

The park is in Hassan Township on the northwest edge of Hennepin County, west of Rogers.

"Normally, for 500 acres you would expect to have five or six snakes per acre," wildlife specialist John Moriarty said at the implantation surgery Friday. However, since the transmitters cost between $160 and $180 each, he said, the park district couldn't afford to implant any more.

The 10-inch-long transmitters consist of a thin wire antenna and a more bulky power unit, which is encased in hard plastic and is about the width of an adult's middle finger but half the length. They have to be inserted under the snake's skin.

Dr. Linda Wolf, who helped perform the 20-minute surgery, called it "very minor." She is the director of the University of Minnesota's Wildlife Rehabilitation Clinic and is one of its staff veterinarians.

It takes much longer, however, to anesthetize the snake using Halothane, an anesthetic also used on humans.

"Their respiratory rate is much slower than other animals, so it takes up to 45 minutes to put them under," Wolf said.

Even though the transmitter creates a noticeable bulge under the snake's skin, Dr. Mark Zens, another veterinarian who helped with the surgery, said he didn't think it would pose a problem for the snakes in their natural habitat.

"It's a possibility, if the animal has gotten themselves wedged into something pretty tight," he said.

Bull snakes are the largest species found in Minnesota and are not poisonous, according to Moriarty. They feed on ground squirrels, mice and pocket gophers, whose tunnel systems are used by the snakes for foraging, escape and hibernation.

The transmitters' lithium batteries last about a year, after which the researchers will track down the snakes and remove the transmitters.

This is done primarily because the transmitters are too expensive to leave in the snake, according to Moriarty.

Figure 5. Minneapolis Star Tribune story on Bullsnake surgery.

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North Crow River News

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Bullsnakes make Crow-Hassan Park new home

by
Lauri Winters

Crow-Hassan Park Reserve gained 10 new residents last week, but visitors will probably never see the most recent inhabitants.

Hennepin Parks naturalists releases 10 bullsnakes in the park Tuesday, June 18. What makes six of these snakes special is they have been surgically fitted with radio transmitters so allow naturalists to monitor their movements for the coming year. All of the snakes were captured at the Sherburne National Wildlife Refuge. They have been added to the environment at Crow-Hassan as part of the continuing effort to restore the prairie to its natural state. The reason visitors to the park will probably never see the snakes is the snakes usually stay underground during the day.

Seven males and three female snakes were released at Crow-Hassan Park Reserve. One of the females was gravid -- with fertilized eggs, and park naturalists will be especially interested in following her activities during the coming month. Each of the snakes transmitters was given a separate frequency so those tracking them can tell which of the snakes are being followed.

SURGERY

Surgery on the six snakes was performed at the University of Minnesota Wildlife Rehabilitation Clinic at the school of veterinary medicine in St. Paul Friday, June 14. It took about five hours to implant the 10-inch-long transmitters in a procedure veterinarian Dr. Linda Wolf termed very minor. Dr. Mark Zens also assisted with the surgery.

The transmitters are encased in hard plastic and were placed within the snakes' abdominal cavities. The power units will last about one year. Park naturalists plan to retrieve the snakes and have the transmitters removed at that time.

The Department of Natural Resources Non-Game program provided a $1,200 grant to aid with the expenses for implanting the transmitters in the snakes. The transmitting units cost between $160 and $180 each are are powered by lithium batteries. The veterinary services for the project were donated.

ABOUT SNAKES

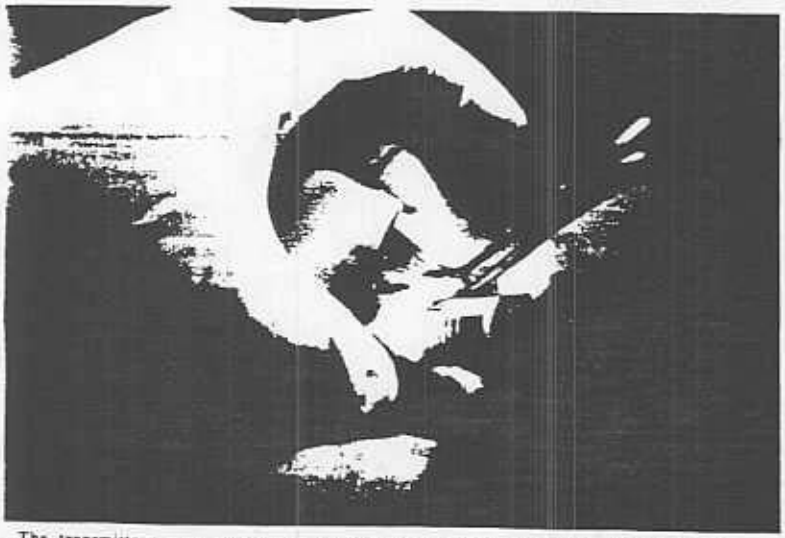
The 500-acre habitat at Crow-Hassan Park Reserve in Hassan Township west of Rogers will be an appropriate habitat for the bullsnakes, naturally prairie natives. They feed on pocket gophers, ground squirrels and mice.

Bullsnakes use the gopher tunnels for foraging, escape and hibernation. They are the largest snakes found in Minnesota and can reach lengths in excess of six feet. Bullsnakes are constrictors and are considered harmless to humans. They are not poisonous. Although not endangered or threatened, the snakes are on the state's special concerns list. That means they are becoming rarer, and officials want to keep a close eye on the species.

Bullsnakes are large yellowish snakes marked with a series of black, brown or reddish-brown blotches, which are darkest and in strongest contrast with the main color of the snake near the head and near and on the tail. There is usually a dark band extending from the eye to the angle of the jaw, with a parallel yellow band above it. The snakes are also capable of making a loud hissing noise.

The snakes usually lay 7 to 24 soft-flexible shelled eggs in holes dug in sandy soil from May to July. The eggs hatch from August to September, after about 30 days of gestation. Average life expectancy for adults is 15 to 16 years.

There are capive bullsnakes on display at Eastman and Richardson Nature Centers for those who would like to see one close up.



The transmitters were surgically implanted in six bullsnakes Friday, June 14 at the University of Minnesota.

Madeliene Linck, Hennepin Parks wildlife technician, shows off the pointed snout bullsnakes have. This was one of the largest of the 10 snakes that were released Tuesday at Crow-Hassan Park Reserve.

Hennepin Parks wildlife specialist John Moriarty points out where the incision was made in this bullsnake before it was released at Crow-Hassan Park Reserve Tuesday, June 18.

Figure 6. Crow River News story on Bullsnake release.

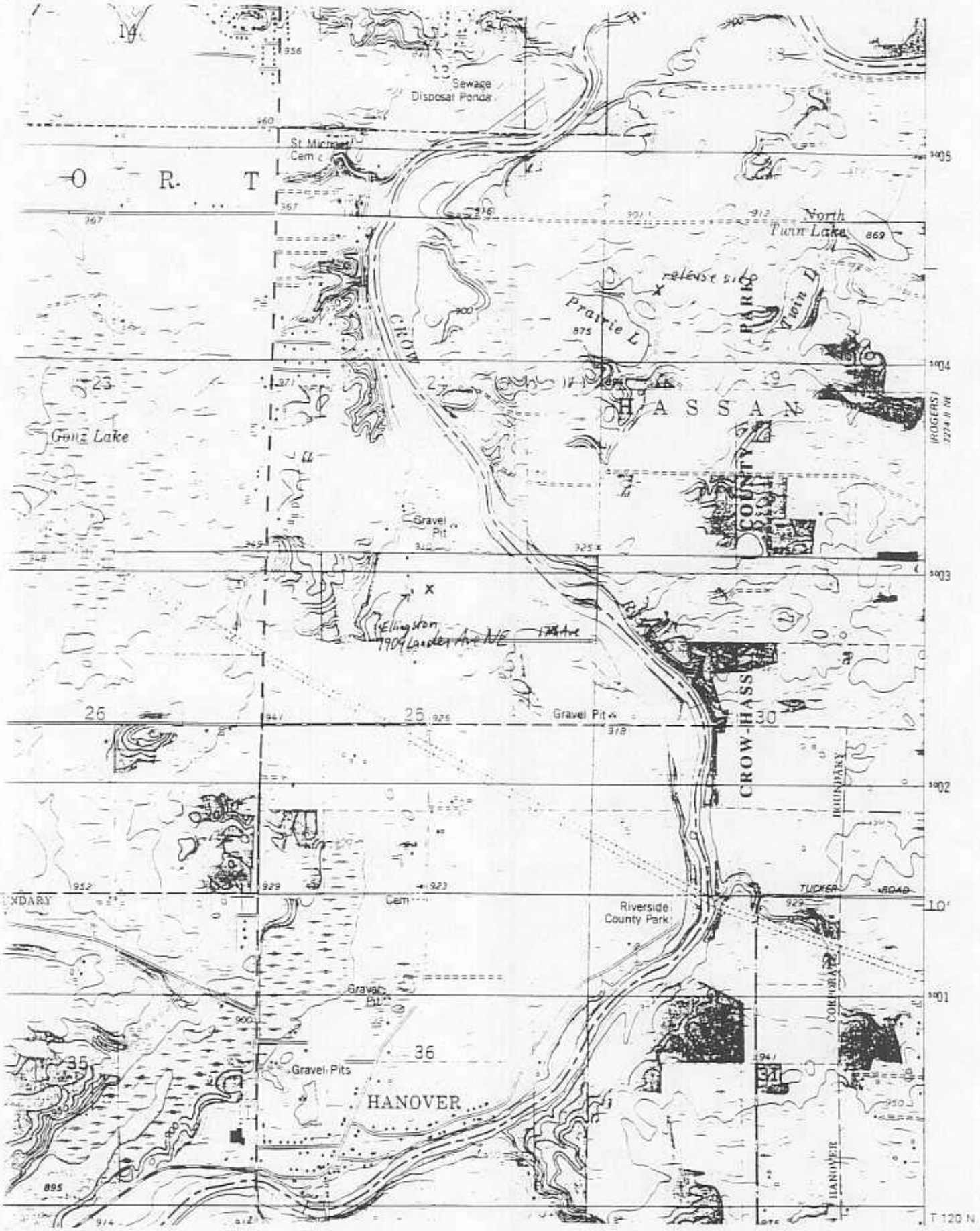
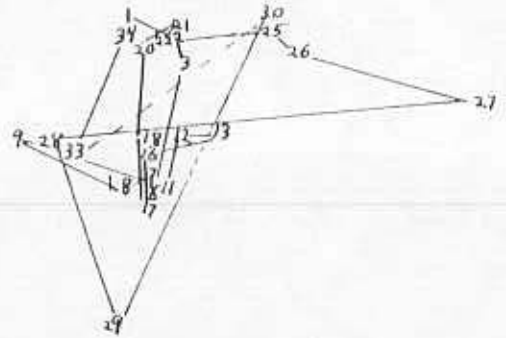


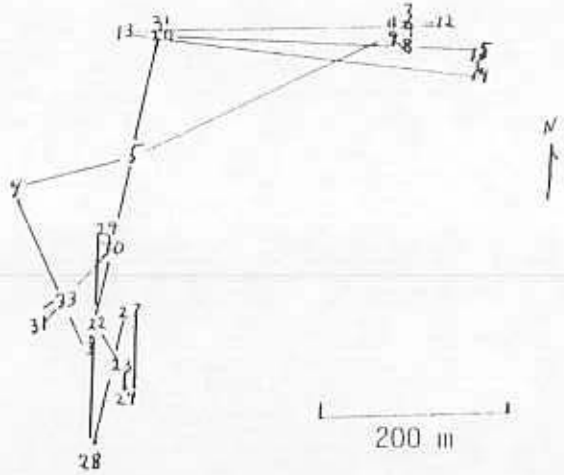
Figure 7. Location of Snake #1's remains and transmitter.

Figure 8. Relocation map for Snake #2 and Snake #3.



Snake #3

Relocations - 32
On surface - 12 (38%)
Home Range - 8.4ha



Snake #2

Relocations - 28
On surface - 15 (53%)
Home Range - 12.8ha

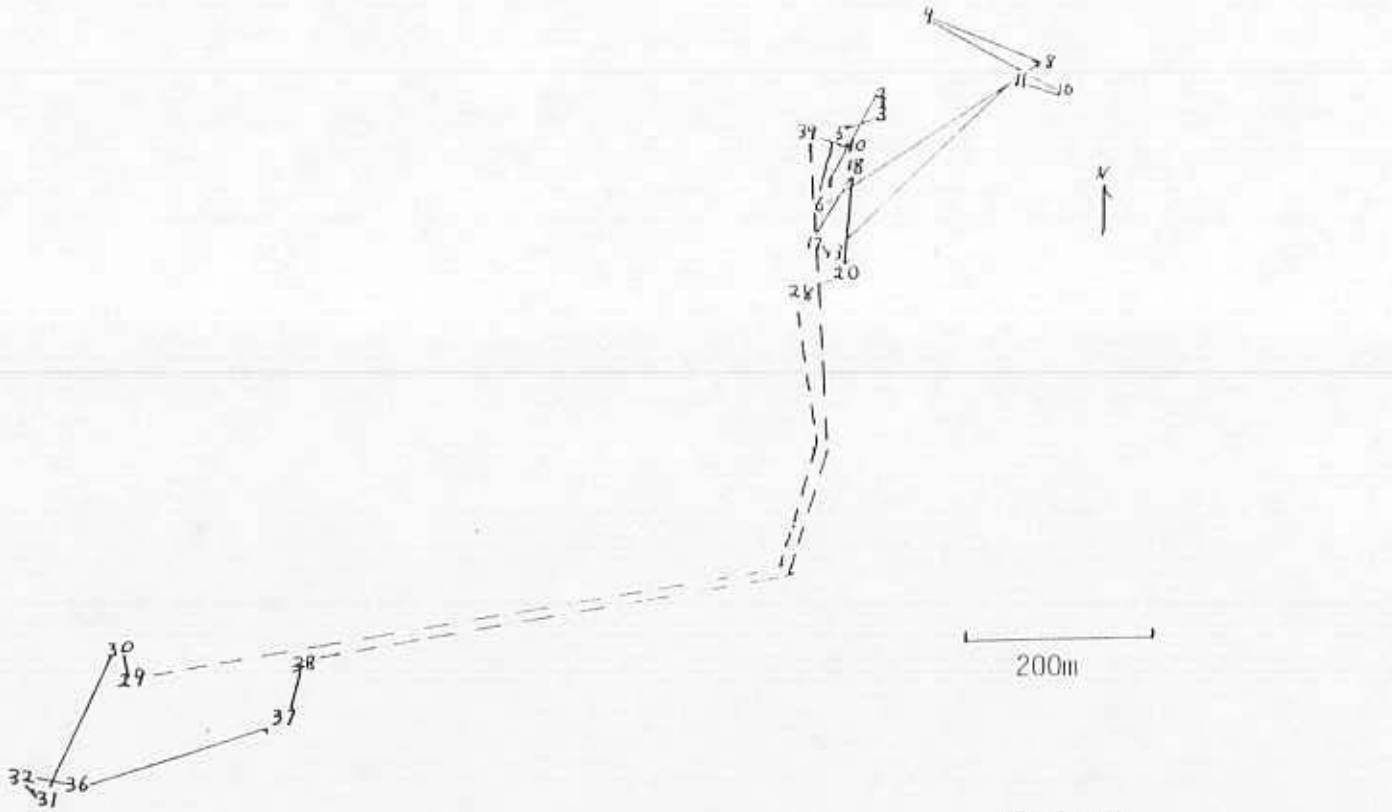


Figure 9. Relocation map for Snake #4.

Snake #4

Relocations - 40
On surface- 13 (33%)
Home Ranges - 4.4/2.8ha

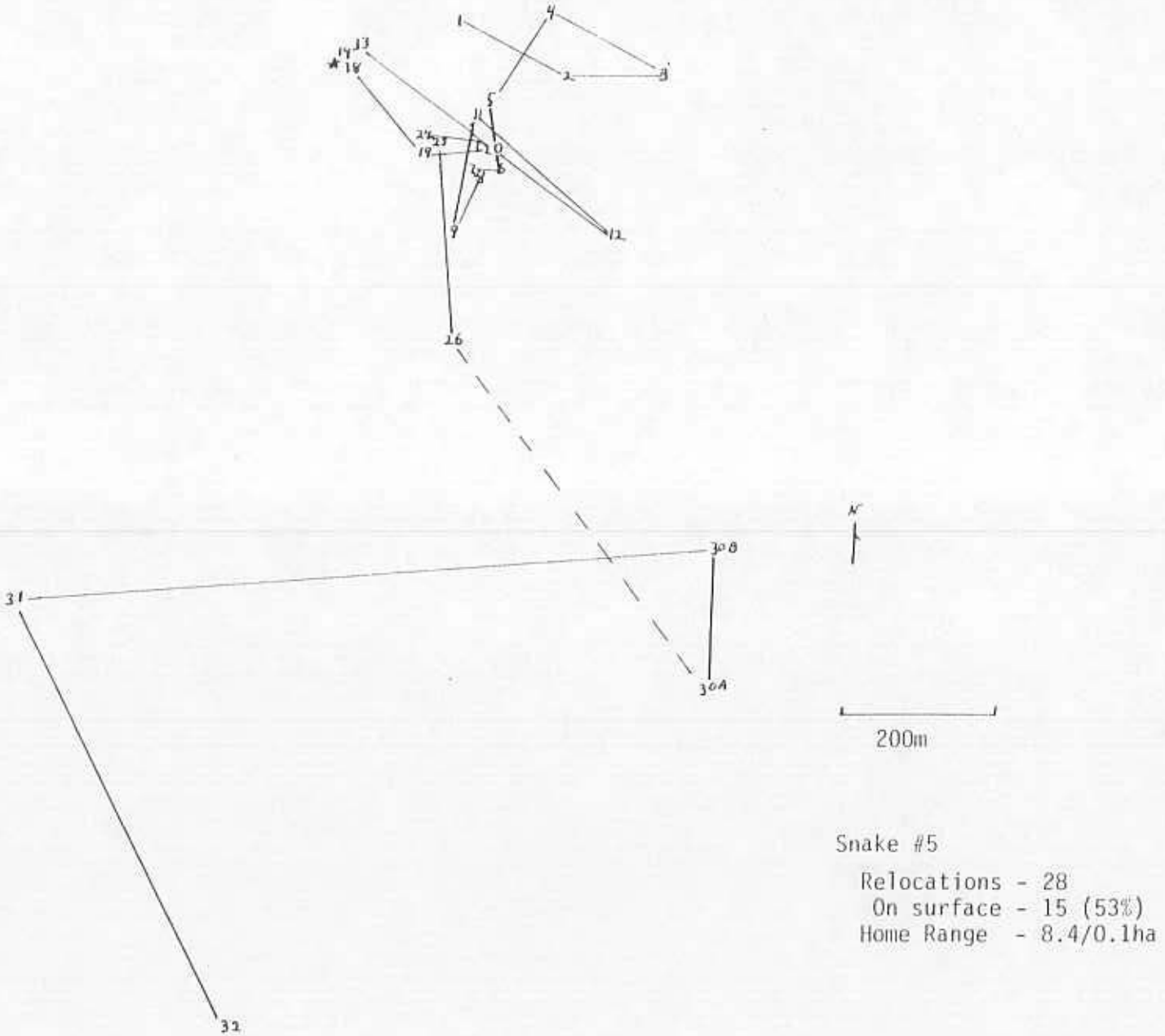


Figure 10. Relocation map for Snake #5.

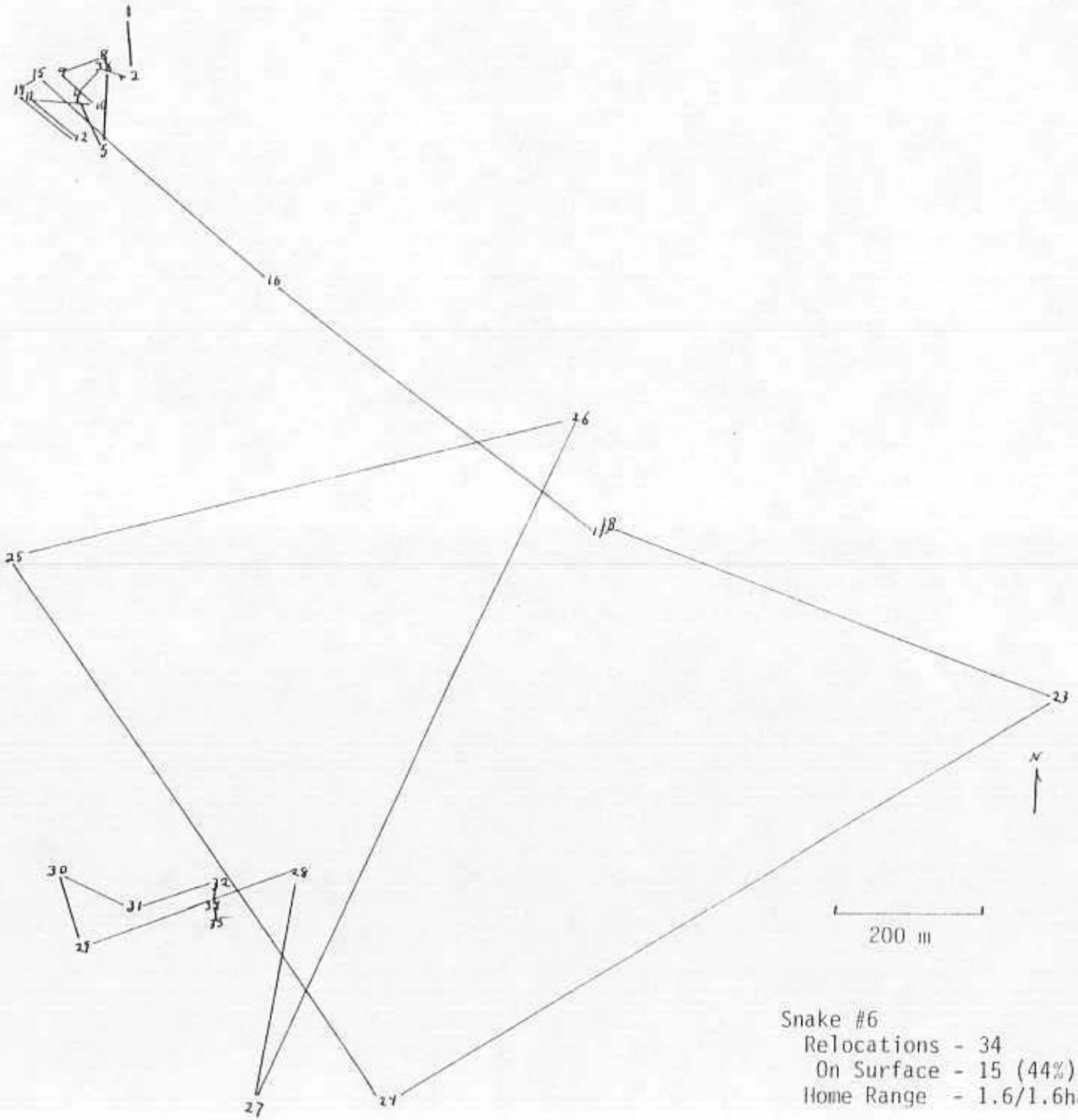


Figure 11. Relocation map for Snake #6.

Table 1. Captures in funnel traps in Crow-Hassan Park Reserve between 30 May and 22 June 1990 (261 trap nights).

Species	Captures
American Toad	1
Northern Leopard Frog	1
Northern Prairie Skink	30
Common Garter Snake	5
Longtailed Shrew	1
Meadow Jumping Mouse	3

* Includes possible recaptures.

Table 2. Bullsnake Relocation Dates for 1991
Snake # 2

Number	Date	Time		Location	General Comments
1	18 June	09-11	MN		
2	19 June	13-14	N		
3	21 June	14-16	A		released
4	23 June	10-12	N	surface	
5	25 June	12-14	N	surface	
6	2 July	18-21	A	underground	
7	5 July	08-10	M	surface	moving
8	7 July	14-16	A	surface	moving
9	10 July	13-16	NA	surface	moving
10	12 July	13-15	NA	underground	
11	14 July	09-11	MN	underground	
12	17 July	10-12	N	surface	moving
13	21 July	13-16	NA	surface	went underground
14	24 July	10-13	N	surface	
15	28 July	14-16	A	underground	
16	31 JulY	10-11	N	underground	
17	5 August	07-09	M	underground	
18	6 August	12-13	N	underground	
19	9 August	13-16	NA	underground	
20	14 August	10-12	N	surface	moving
21	16 August	10-12	N	surface	moving
22	20 August	09-10	M	surface	
23	23 August	13-15	NA	surface	moving
24	26 August	09-11	MN	underground	
25	28 August	09-11	MN	underground	
26	30 August	12-14	N	underground	
27	3 September	13-15	NA	surface	moving
28	6 September	10-14	N	surface	
29	9 September	12-15	NA	underground	
30	12 September	13-15	NA	surface	
31	15 September	15-18	A	underground	last movement- start hibernation
32	18 September	14-17	A		
33	21 September	10-12	N		
34	23 September	11-12	N		
35	26 September	09-10	M		
36	29 September	11-12	N		
37	2 October	14-16	A		
38	6 October	17-18	A		
39	8 October	14-16	A		
40	11 October	16-17	A		
41	12 October	14-15	A		

Table 3. Bullsnake Relocation Dates for 1991
Snake # 3

Number	Date	Time		Location	General Comments
1	18 June	09-11	MN		released
2	19 June	13-14	N	surface	
3	21 June	14-16	A	underground	
4	23 June	10-12	N	underground	
5	25 June	12-14	N	underground	
6	2 July	18-21	A	underground	
7	5 July	08-10	M	underground	
8	7 July	14-16	A	surface	moving
9	10 July	13-16	NA	surface	entered gopher mound
10	12 July	13-15	NA	surface	moving
11	14 July	09-11	MN	surface	
12	17 July	10-12	N	underground	
13	21 July	13-16	NA	underground	
14	24 July	10-13	N	surface	basking at entrance
15	28 July	14-16	A	underground	
16	31 JulY	10-11	N	surface	moving
17	5 August	07-09	M	underground	
18	6 August	12-13	N	underground	
19	9 August	13-16	NA	underground	
20	14 August	10-12	N	underground	
21	16 August	10-12	N	underground	
22	20 August	09-10	M	underground	
23	23 August	13-15	NA	underground	
24	26 August	09-11	MN	underground	
25	28 August	09-11	MN	underground	
26	30 August	12-14	N	surface	moving
27	3 September	13-15	NA	surface	moving
28	6 September	10-14	N	surface	basking
29	9 September	12-15	NA	surface	head in nest
30	12 September	13-15	NA	surface	basking-coiled
31	15 September	15-18	A	not located	
32	18 September	14-17	A	not located	
33	21 September	10-12	N	underground	woodchuck burrow
34	23 September	11-12	N	underground	
35	26 September	09-10	M	underground	last movement - start hibernation
36	29 September	11-12	N		
37	2 October	14-16	A		
38	6 October	17-18	A		
39	8 October	14-16	A		
40	11 October	16-17	A		
41	12 October	14-15	A		

Table 4. Bullsnake Relocation Dates for 1991
Snake # 4

Number	Date	Time		Location	General Comments
1	18 June	09-11	MN		released
2	19 June	13-14	N	surface	
3	21 June	14-16	A	underground	
4	23 June	10-12	N	underground	
5	25 June	12-14	N	surface	
6	2 July	18-21	A	underground	
7	5 July	08-10	M	underground	
8	7 July	14-16	A	surface	moving
9	10 July	13-16	NA	surface	moving
10	12 July	13-15	NA	surface	basking-coiled
11	14 July	09-11	MN	underground	
12	17 July	10-12	N	underground	
13	21 July	13-16	NA	surface	moving
14	24 July	10-13	N	underground	
15	28 July	14-16	A	surface	basking
16	31 JulY	10-11	N	surface	basking
17	5 August	07-09	M	underground	
18	6 August	12-13	N	underground	
19	9 August	13-16	NA	underground	
20	14 August	10-12	N	surface	half under stump
21	16 August	10-12	N	underground	
22	20 August	09-10	M	underground	
23	23 August	13-15	NA	underground	
24	26 August	09-11	MN	underground	
25	28 August	09-11	MN	underground	
26	30 August	12-14	N	underground	
27	3 September	13-15	NA	underground	
28	6 September	10-14	N	surface	basking
29	9 September	12-15	NA	surface	basking
30	12 September	13-15	NA	underground	
31	15 September	15-18	A	underground	
32	18 September	14-17	A	underground	
33	21 September	10-12	N	underground	
34	23 September	11-12	N	underground	
35	26 September	09-10	M	underground	
36	29 September	11-12	N	surface	moving
37	2 October	14-16	A	underground	
38	6 October	17-18	A	underground	
39	8 October	14-16	A	surface	moving
40	11 October	16-17	A	underground	last movement - start hibernation
41	12 October	14-15	A		

Table 5. Bullsnake Relocation Dates for 1991
Snake # 5

Number	Date	Time		Location	General Comments
1	18 June	09-11	MN		released
2	19 June	13-14	N	surface	
3	21 June	14-16	A	surface	
4	23 June	10-12	N	underground	
5	25 June	12-14	N	surface	
6	2 July	18-21	A	underground	
7	5 July	08-10	M	underground	
8	7 July	14-16	A	underground	
9	10 July	13-16	NA	surface	
10	12 July	13-15	NA	surface	under sumacs
11	14 July	09-11	MN	surface	moving
12	17 July	10-12	N	surface	moving
13	21 July	13-16	NA	surface	moving
14	24 July	10-13	N	removed	health observation
15	28 July	14-16	A	---	
16	31 JulY	10-11	N	---	
17	5 August	07-09	M	---	
18	6 August	12-13	N	---	released at sighting 14
19	9 August	13-16	NA	surface	basking
20	14 August	10-12	N	underground	
21	16 August	10-12	N	underground	
22	20 August	09-10	M	underground	
23	23 August	13-15	NA	surface	entered hole
24	26 August	09-11	MN	surface	woodchuck hole entrance
25	28 August	09-11	MN	surface	
26	30 August	12-14	N	surface	
27	3 September	13-15	NA	---	reciever problems
28	6 September	10-14	N	---	reciever problems
29	9 September	12-15	NA	---	reciever problems
30	12 September	13-15	NA	surface	moving
31	15 September	15-18	A	surface	moving
32	18 September	14-17	A	underground	
33	21 September	10-12	N	underground	
34	23 September	11-12	N	underground	
35	26 September	09-10	M	underground	
36	29 September	11-12	N	underground	
37	2 October	14-16	A	underground	last movement - start hibernation
38	6 October	17-18	A		
39	8 October	14-16	A		
40	11 October	16-17	A		
41	12 October	14-15	A		

Table 6. Bullsnake Relocation Dates for 1991
Snake # 6

Number	Date	Time		Location	General Comments
1	18 June	09-11	MN		released
2	19 June	13-14	N	surface	
3	21 June	14-16	A	underground	
4	23 June	10-12	N	surface	
5	25 June	12-14	N	surface	
6	2 July	18-21	A	underground	
7	5 July	08-10	M	underground	
8	7 July	14-16	A	underground	
9	10 July	13-16	NA	surface	coiled in shade
10	12 July	13-15	NA	underground	
11	14 July	09-11	MN	underground	
12	17 July	10-12	N	underground	
13	21 July	13-16	NA	surface	
14	24 July	10-13	N	surface	
15	28 July	14-16	A	underground	
16	31 JulY	10-11	N	surface	moving
17	5 August	07-09	M	underground	
18	6 August	12-13	N	underground	
19	9 August	13-16	NA	underground	
20	14 August	10-12	N	underground	
21	16 August	10-12	N	underground	
22	20 August	09-10	M	underground	
23	23 August	13-15	NA	surface	moving
24	26 August	09-11	MN	surface	moving
25	28 August	09-11	MN	surface	moving
26	30 August	12-14	N	surface	basking
27	3 September	13-15	NA	surface	moving
28	6 September	10-14	N	surface	
29	9 September	12-15	NA	surface	moving
30	12 September	13-15	NA	underground	
31	15 September	15-18	A	surface	basking
32	18 September	14-17	A	underground	
33	21 September	10-12	N	underground	
34	23 September	11-12	N	underground	
35	26 September	09-10	M	underground	last movement - start hibernation
36	29 September	11-12	N		
37	2 October	14-16	A		
38	6 October	17-18	A		
39	8 October	14-16	A		
40	11 October	16-17	A		
41	12 October	14-15	A		