WINTER STUDY OF TEN PORCUPINES

IN ITASCA STATE PARK

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ABSTRACT

Ten porcupines were observed within the park over a period of two weeks. Generalizations and correlations were difficult to make since behavior varied greatly among individuals. Damage to trees in the area was noted. There was no visible evidence of harm done by porcupines to red pines which had been a problem in the late 1960's.

INTRODUCTION

Few recorded studies have been done on the porcupine (Erithizon dorsatum) in Itasca State Park. The last study on record was done by Judy McIntyre and Herbert Archibald in the summer of 1968. It was prompted by the unusual damage being done by porcupines to the 300 year old red pines in the wilderness area of the park. At this time, instead of the usual damage done to the tops of trees, the porcupines moved to the lower portions of the trunks and girdled the entire bases of the trees. Although James D. Curtis and Edward L. Kozicky estimated in their article "Observations on the Eastern Porcupine" published in the 1944 Journal of Mammalogy that porcupines are the cause of only an infinitesimal amount of the total timber damage, the local residents have given porcupines a bad reputation. There seems to be an unwritten law that all porcupines should be shot on sight. This probably stems from all the visible damage they have been known to do to timber and more directly from the extensive damage done to red pines in the winters of 1965-1968. In January and Feburary of 1968, nine fishers were released in the area hoping that they would survive and act as a control for the porcupine population. Their effect was questionable, as few, if any, have been sited since their release in 1968. Shortly after the release of the fishers, wildlife managers went so far as to authorize park employees to go out into the area where the damage was occuring and shoot porcupines. This proved to be effective, as damage to the lower trunks of red pines has not been reported since.

This study was done in an effort to observe the behavior of porcupines and compare these observations to those made in previous studies. Of primary importance in this study was the kind of tree the porcupines inhabited and the amount of damage done to these trees. Other factors recorded were height of porcupines in the trees, their distance out from the trunk, direction the porcupines were facing as compared to the direction of the wind, whether or not the sun was readily reaching the porcupines, the lenghth of time they spent in the same tree, and possible factors affecting their movements in and out of trees. Dave Bosanke, the station's resident biologist, was extremely interested in live-trapping, weighing, sexing, and tagging the porcupines for further study. This would allow for observations to be made on such things as movements throughout the seasons, amount of time spent in dens, number of dens per porcupine, the distance of the damaged trees from the dens, and tree preference throughout the year. At the time of this writing, no porcupines have been tagged, but two have been trapped, weighed, and spray painted for easier siting and temporary identification.

MATERIALS AND METHODS

The first few days of our study were spent trying to locate porcupines. We stuck mainly to trails and looked for clippings on the ground as evidence. Everyone in the class was asked to keep their eyes open for signs; the people counting beaver lodges were particularly helpful. We chose ten to check on that could be easily observed every day and watched them for fourteen consecutive days.

We recorded sky cover by inspection (cloudy, overcast, clear,etc.) and wind velocity with a Dwyer wind meter, taking readings daily on Lake Itasca and Myrtle Lake on the Red Pine Trail. Temperature and precipitation figures were obtained from the weather station here at the Itasca Field Station. Each day we noted trees occupied by porcupines, their height in the trees, how far out on the limbs they were and which side they were on. Heights were estimated by comparing a person approximately five feet tall with the trunk of the tree, doubling their height and visually measuring the tree in ten foot intervals. Distance out from the trunk was calculated in the same way.

In addition to that data, we recorded the DBH (diameter breast height) and damage to trees occupied by porcupines and also those that had porcupine damage that appeared very light and was likely done this season. These were easily found by following old porcupine trails. Damage to these trees was catagorized as severe trunk girdling, minor trunk girdling, girdling of major branches and clippings. Trees were also tagged so we could keep track of porcupine activity and to aid us in mapping and keeping records of their movements.

The locations we observed each day were the north side of Deer Park Lake (one porcupine), the east side of Myrtle Lake (two porcupines), Professor Chaney Trail near the station (one porcupine), and Nicollet cabin (six porcupines).In Nicollet cabin we looked under the floor with a flashlight and also inspected the surrounding trees, paying particular attention to tracks and trees that had recent damage.

Nicollet cabin was the only place we had trouble distinguishing between porcupines, so after the first week we began live-trapping and marking animals. There are two holes in the foundation of the cabin, on the east and west sides. We blocked one and set a trap with apples and a slice of bacon for bait at the other. Later we blocked the door, when porcupine tracks pointed to the fact that they were using it to re-enter the cabin. When caught, we marked them with fluorescent spray paint and weighed them with a spring scale.In each case we attempted to sex the animals, unsucess-fully , since they were still in the trap and difficult to observe. After they were released we watched their movements.

In addition, an attempt was made to study porcupine eating habits.

We collected all the clippings from under the nearby animal on Professor Chaney Trail at the same time for several days, hoping to see a pattern.

RESULTS

The following lines contain the observations and measurements made on 10 porcupines from January 14th to January 27th.

1. Porcupine on Professor Chaney Trail - Located in a white pine with a dbh of 22.8 inches, this porcupine was seen in the same fork of a branch approximately 40 feet up and 6 feet from the trunk January 14th to January 16th. The sun could easily reach him as he was on the west side of the tree with few branches covering him from above. On January 17th he moved to another fork on the northeast side of the tree. Here he was 50 feet up and 10 feet from the trunk. He stayed in this location until January 23rd when he moved to a poplar about 20 feet from the white pine. The poplar's dbh was 13.3 inches. The next day, January 24th, he was back on the southeast side of the original white pine about 60 feet up and 10 feet from the trunk. Once again he was in a forked branch. There is no severe damage to the white pine that this porcupine was in. We could not see any girdling of the trunk or branches, but there was a great amount of clippings on the ground. Most of the branches had the needles chewed off. At one point, we cleared all the clippings from under the tree and then collected the clippings every 24 hours. On the first day there was quite a bit, but then the amount tappered off to almost nothing right before he moved into the deciduous tree. We didn't know when he moved, so it seemed useless to collect on either the day of his absence or return.
2. Porcupine on the east side of Myrtle Lake - Located on the south side of a white pine with a dbh of 28.0 inches, this porcupine "lived" 50 feet up and

15 feet out from the trunk. We found him on January 17th and he has been in the same position since. He is easily reached by the sun, but due to his position so near the lake, no other trees offer him protection from the wind and snow. One of the mornings after it had snowed heavily, he had moved so little that there was a layer of snow on his back. Throughout our observations, we did not see many clippings on the ground nor damage to the bark on his branch.

3. Porcupine on east side of Myrtle Lake just south of the above porcupine - This porcupine was found on January 16th in a white pine with a dbh of 22.0 inches. We immediately saw the clippings on the ground, but we couldn't find the porcupine quite so quickly, as he was 60 feet up and hugging the trunk. On January 17th he had moved out on a limb (50 feet up and 8 feet out) which is on the southeast side of the tree. The porcupine seemed to be recieving quite a bit of sunlight in this position. There was no movement until January 19th when he moved to the northeast side to a height of 40 feet and a distance of 12 feet from the trunk. This position was held until January 22nd when we saw him 50 feet up and only a foot from the trunk. On that day, there was also a fresh trail leading to some birch trees on the other side of red pine trail. The next day (January 23rd) , we found the porcupine at the end of this trail in a birch tree about 200 feet from the white pine that he had usually been in. The birch had extensive damage done to several of the large branches. On January 24th the porcupine was back in the white pine. He was right against the trunk on the west side of the tree and about 40 feet up. After January 24th there were no fresh tracks around the tree, however, we couldn't find him in the tree. There is the possibility that he was right against the trunk and we couldn't see him.

4. Porcupine on Deer Park Trail - We first sited this porcupine on January 15th on the east side of the trail. It was 50 feet up in the forked branch of an aspen. Upon further inspection of the area, we found a fallen log with two well worn porcupine paths leading to it. We decided that this was a possible den. When we came back on January 16th, it was on the west side of the trail in a white pine with a dbh of 31.0 inches. At this time, it was 45 feet high and 12 feet from the trunk on the east side of the tree. After going to check on the porcupines by Myrtle Lake, we came back by Deer Park Lake. In that span of time (1 hour), the porcupine had moved to the east side of the trail and back into a deciduous tree. It was in the same aspen (DBH - 13.2) as the day before. We could hear him chomping from the trail. On January 17, it was back on the west side of the trail but in a different white pine (DBH - 24.3). Once again it was on the east side of the trunk and about 45 feet up and 12 feet out. When we checked on the porcupine January 18 it was back in the aspen as we went by the first time,but when we came back it was down and there were tracks leading to the den. The next day (January 19) it was back in the original white pine. At 1:30 it was 30 feet up and 6 feet out. In another hour, as the sun was starting to come out, it climbed to a height of 60 feet. Both positions were on the northeast side of the tree. We could not find the porcupine on January 20. January21 it was back in the original white pine, 40 feet up and 2 feet out. This day there was also a fresh track coming from a white pine just to the east of the trail (DBH - 30.7). There seemed to be no evident damage to the tree, not even clippings on the ground. We noticed a distinct odor around the tree. The porcupine stayed in the tree until January 23 when it was once again in the aspen at a height of 55 feet. January 24 it was back in the white pine. It had snowed the night before but

there were no fresh tracks so evidently it had moved before the snow. The next day, January 25, the porcupine was in a new white pine (DBH - 30.7) close to its den. It stayed there through the following day. We were unable to find it on January 27.

5. Nicollet Cabin Area

January 15 was the first day we went to the cabin. Using a flashlight, we looked under the floorboards. There were three porcupines under the the floor. Trails led to a white pine (DBH- 25.5) southwest of the cabin but we couldn't see an animal in the tree. When we first looked under the cabin on January 16 there was only one visible porcupine, but after about half an hour there were three. We don't know if they had just moved from behind a beam or had just come in. On this day we followed a fresh trail to a tree about 700 feet from the cabin (see map). The tree was a white pine(DBH- 12.5) and was severely girdled at the top. The tree next to it (a balsam, DBH - 7.0) was also damaged. There was fresh urine and pellets at the base of this tree. On January 17 there were 5 porcupines under the cabin, but we could not find any in the trees. January 18 there were only 3 under the cabin. Once again we followed all the fresh trails but could not locate any more porcupines. January 19 was the first day that we saw a head under the cabin. The porcupine quickly corrected this and turned around! There were four under the cabin with no fresh tracks. We followed a trail from the gully (see map) . One way it led to a water hole and the other way it meandered around, over an active beaver lodge and eventually ending by a fallen log and more open water. On this day, we also set a live-trap, baiting it with some apple and bacon. At the same time we blocked the hole on the other side of the foundation. There was a porcupine in the trap on January 20. It weighed 12 pounds. We noticed there was little hair on his lower back , but many quills.

Amazingly enough it lost almost no hair and not a whole lot of quills in the trap. While we were around , it was very active inside the trap and objected strongly to being spray painted. It was painted fluorescent green on its lower back, where it is said there is said there is little shedding. After painting, it was released,and it scurried to the nearest tree and went up it. Our attention then turned to finding the others. One was in the cabin and one in the far white pine about 700 feet from the cabin. By the time we got back from searching, the green-painted porcupine was in another tree on the regular porcupine trail. We caught our second porcupine on the 21st. This one weighed 12.5 pounds. We noticed when we were working with it that it wasn't nearly as hyper as the last one. It did not even move when being painted nor would it leave the trap when the door was opened. After much prodding it finally left the trap but made no attempt to hurry away. It ambled to a regular porcupine path and followed it to a balsam (DBH - 8.5). Under the cabin that day there were three. One was clawing at the blocked hole in the foundation. This was also the first day we found a porcupine in the big white pine southwest of the cabin. Previously, we had seen clippings but no porcupine. It was 80 feet up on this day, very near the top oof the tree. We located another one back in the far white pine, about 50 feet up and 6 feet out. This accounted for six porcupines, the most we had seen. As far as we could see, none of them were painted green. The orange -painted porcupine was still in the same tree on January 22. On this day there were 4 under the cabin but none in the white pine southwest of the cabin or in the far white pine. Fresh tracks were leading from the latter tree to the cabin. Before we left we shut the door of the cabin and sprinkled snow on the steps. The next day, January 23, the trap was sprung. There were prints and claw marks in front of the door as if a porcupine had tried to get in. Two animals were visible under the cabin and the orange-painted one was still in the same tree.

On January 24, 25 and26 the trap was sprung again, perhaps by the same porcupine that pushed the logs away from the side of it. Two were under the cabin and one was in the far white pine. The orange-painted porcupine had moved to a new white pine (DBH- 28.0) to the northest of the cabin approximately 600 feet away.

DISCUSSION

From our study, we found it hard to draw any concrete correlations betweeen porcupine behavior and other factors. Eating habits varied greatly among animals and these actions did not seem to be directly affected by daily weather conditions. Mannerisms of individual animals observed were also very diverse.

Porcupines have earned a bad reputation among local people, especially foresters, because of their destructive eating habits. They are herbivores and their main source of food is the bark and young branches, leaves or buds of trees. It is possible for them to destroy trees if they have severely girdled the trunk, plus the fact that the stripped area of the tree is more open to disease and insect infection. Although the amount of damage they do is not great, porcupines are stilll considered the enemies of trees.

One of the objectives of our study was to see what kinds of trees the porcupines damaged and to what extent. All damaged trees in the vicinity of the ten animals were recorded. All in all, there were ten white pine, ten balsam, five birch, three poplar and two spruce that had apparently been used for food. Simply counting the number of trees can be misleading, though. The actual amount of damage done to trees must be taken into account, too(see "Trees Damaged by Porcupines" table). Although as many balsams as white pines were damaged, all the balsams were in the Nicollet Cabin area. We seldom saw a porcupine occupying a balsam (see results) and balsam clippings were almost never apparent. Damage to these trees was usually girdling.

Porcupines seemed to be fond of spending time in white pines. All non-Nicollet animals spent much of their time in them, although three of the four wandered to poplar or birch trees for a short stay sometime within our observation period. Nicollet animals also spent their share of time in white pines, and two of the most severely damaged trees that we saw were white pines near the cabin. Clippings were very often a sign of destruction in the white pines, unlike most other trees. This may be because they prefer different sections of different trees, for taste or other reasons. A more indepth study would have to be done in this area to draw any conclusions.

We often wondered what made porcupines choose the trees they did. Their paths would meander through the woods, often passing many trees before reaching a destination. Some trees along the way would have a few bites taken and that would be all . There is also a question as to how often porcupines eat. From evidance gained by collecting clippings from under the porcupine of Professor Chaney Trail and observing the animals at Nicollet cabin, it appears that they may eat for a few days and stop and rest or den up for a few days. This idea cannot be verified from our data, since we did not take into account bark and other things the Professor Chaney Trail porcupine ate. In respect to the porcupines at the cabin, we could not possibly identify allanimals but from observations they did appear to follow this pattern.

In the winters of the late 1960's , porcupines did a great deal of damage to very old red pines in the Wilderness Area of the park by girdling the trunks near the base.

Fishers were brought in as predators and many animals were simply shot to alleviate the problem. We saw no damage to red pines at all and no girdling of any kinds of trees at the base. We did see many porcupine paths that went past red pines without a trace of damage to the trees (see map of Nicollet cabin area). The reasons for the unusual destructions of red pines could be severe winters, overpopulation of porcupines, or size of the trees. These are all simply speculations.

A small point of interest concerning porcupine feeding habits is the fact that two porcupine trails led to open water near Nicollet cabin. Other animal tracks were evident, too, and it is not known if porcupines regularly frequented the hole or not. It was stated in the literature that porcupines have been known to drink from open holes similar to these.

Although weather conditions varied greatly throughout the two weeks we observed the animals, it would seem that these changes had little, if any, effect on the porcupines. The graphs dealing with the Nicollet Cabin area illustrate this point well. The total number of porcupines at the cabin was six. Those porcupines not daily accounted for under the cabin were assumed to be hidden behind floor beams or out feeding in the surrounding trees. On January 17th, when the minimum daily temperature was at a low, the number of porcupines under the cabin was at a maximum, 5. Yet, on January 20th, when the minimum temperature hit the same low, there was the minimum number of porcupines under the cabin, 1.(graphII). Wind correlations (graphIV) were also difficult to make. There were three porcupines under the cabin when winds were at their low of 1mph, and also at their high of 7.5mph. At first glance windchill (graph V) appears to offer some correlation, but this isn't the case. On one of the coldest days, January 20th, there was only one porcupine under the cabin, and on the warmest day there were only two under it. Finally, graph VI shows the porcupine's movements as compared to sky cover. By inspection of the graph, it can be seen that their movements do not seem to be affected by snowy, cloudy, or clear skies.

There is, however, one interesting observation that should be made concerning the weather and pocupine movements. On January 23rd three porcupines moved out of coniferous trees and into deciduous trees. Two of these porcupines had not moved for eight days. On the 23rd, the minimum temperature was almost at its high, and the wind velocity was only 2mph. The average daily temperature was also near its peak. On the following day, all three porcupines moved back to coniferous trees. On this day, the temperature was slightly warmer, but the wind velocity had increased from 2 to 4mph. This, in itself, is not enough evidence to make any conclusions, but it is possible that wind bothers porcupines more than cold temperatures.

There is one more bit of information that suggests the wind is an aspect of the weather that does indeed bother porcupines. On several occassions when we observed porcupine movements within a tree, the movements followed a change in the wind direction or velocity. At these times the porcupines moved from the windward to the leeward side of the tree.

As did the literature we read on porcupines the behavior of different porcupines contradicted. There were few similar behavior patterns that we were able to observe. Of these one of the most common occurrences dealt with their trails. The trails were like a meandering stream, certainly not the shortest distance between two points. It could be thought that their route was simply the easiest to navigate. This possibility was ruled out after we had made our own trails near and sometimes intersecting theirs. Even if our harder packed trail was of shorter distance, the porcupine, in each case, would still follow the original trail. Another interesting thing about their method of travel was that they would tunnel into the snow rather than go over or around a fallen log. We also followed a trail that went directly over an active beaver lodge. One weekend we moved the trap from the cabin and set it on their trail. The next day there was a fresh trail veering around the trap and back onto the trail. All evidence points to the fact that they are a creature of habit so far as travel is concerned. Their trails are well used with usually only one leading to an area and they do not like to leave them.

The same technique was universally used for climbing. The tails seemed to lend both support and balance. Their course is not usually straight up, but rather around in a spiral avoiding major branches. The porcupine is not a fast climber, always feeling its way carefully. Once up in the tree they usually place themselves in a fork in a small branch. The ones we saw used their "hands" quite a bit to pull in branches, bringing the needles closer to munch on. In coming down out of the tree they will go forward until they come to a steep part, then they turn and continue backwards.

Sitting in a tree they all look the same with their hair fluffed out making them resemble a headless hair ball. Looking at their movement they are all quite unique. One of the porcupines on Myrtle Lake was on the same limb in the same spot in the same position for the duration of our observation. Compare this with the porcupine by Deer Park Lake and you will see two extremes. This porcupine moved at least once a day going from a white pine to a poplar and sometimes visited his den on the way. At one time it was climbing a poplar when we went past the first time, an hour later it was down, had traveled about 400 feet and was in a white pine. For an in between version one could look at the other porcupine on Myrtle Lake. This one moved up and down the tree to various positions yet left the tree only twice during our observation. Around the Nicollet cabin area there were some that stayed in one tree for a number of days before moving and others that must have come in and gone out of the den almost every day. There were always fresh tracks going to the big white pine to the southwest of the cabin. We can't be sure it was always the same porcupine, but regardless it never stayed in the tree for more than one day at a time.

The two porcupines we caught in the live trap were also very different. One was very active, always turning about in the trap and trying continually to keep his head away from us. When released it went to the nearest tree. The other porcupine caught was lethargic to the point that on first glance we thought it was dead. It made no attempt whatsoever to keep its head away from us, in fact it seemed curious about our actions. when released it was completely oblivious to our following it. It slowly wandered to a distant tree.

In the articles we read it was stated that most dens were not shared unless they were unusually desirable. This must be the case for Nicollet cabin. The other den we found was only a fallen log and singly inhabited. The use of the den varied from an extended stay in it to use every day to, in some cases, no den at all.

It would be interesting to know the sexes of the porcupines in the cabin to find out whether there are a lot of females living together, more males of an even number of both. The sexes may also have something to do with whether the porcupines move continually or stay put.

Itasca State Park is a good place to study porcupines. They are in their natural environment but are also protected from their two major enemies, man and fire. Although conditions were favorable, our time was short and our study was in no way complete. Further studies could focus on sex in relation to porcupine behavior, choice of trees, and seasonal changes in activity.

TREES DAMAGED BY PORCUPINES

Type	Dbh	Damage
spruce	6.0	clippings;minor trunk girdling
spruce	2.9	minor trunk girdling
balsam	9.3	minor trunk girdling
balsam	7.0	minor trunk girdling
balsam	10.1	minor trunk girdling
balsam	8.5	clippings
balsam	8.5	minor trunk girdling
balsam	13.3	severe trunk girdling
balsam	5.3	minor trunk girdling
balsam	3.0	severe trunk girdling
balsam	2.0	minor trunk girdling
balsam	5.3	minor trunk girdling
white pine	25.5	clippings; girdling of major branches
white pine	22.0	clippings
white pine	24.5	clippings
white pine	25.7	clippings
white pine	30.7	clippings
white pine	28.0	clippings
white pine	12.5	clippings; severe trunk girdling
white pine	10.6	clippings; severe trunk girdling
white pine	34.7	clippings
white pine	22.1	severe girdling of major branches
birch	5.7	minor trunk girdling
birch	6.3	severe trunk girdling

Type	Dbh	Damage
birch	4.4	minor trunk girdling
birch	8.0	severe trunk girdling
birch	8.2	severe trunk girdling
poplar	17.8	minor girdling of branches
*poplar	9.9	no visible damage
poplar	13.2	clippings; minor branch girdling

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*There were fresh tracks ending at this tree; perhaps the porcupine just suns himself here or simply decided he didn't like this tree.

KEY

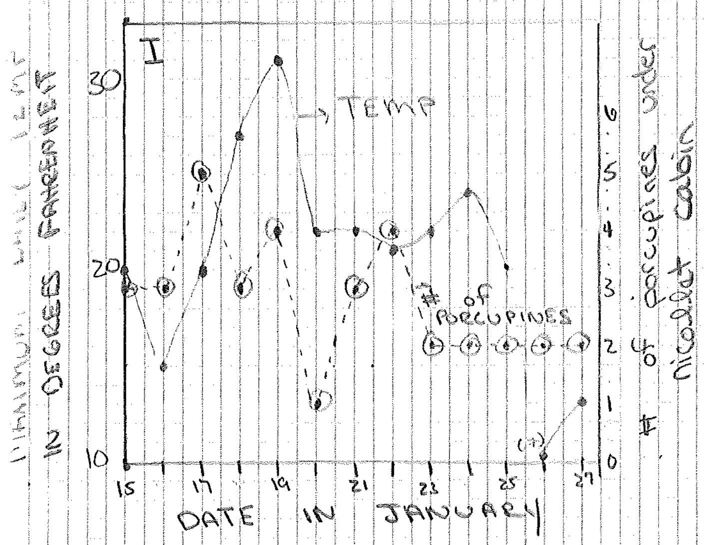
1. severe trunk girdling-girdling of the entire circumference of the trunk for a length of six inches or more

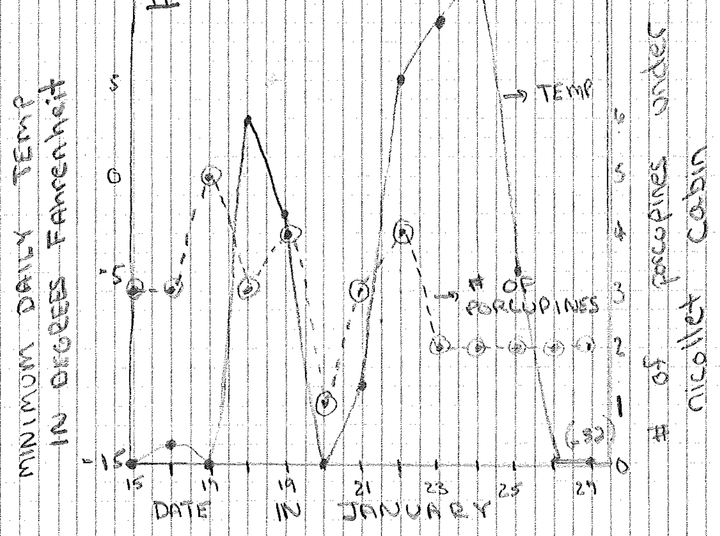
2. minor trunk girdling-girdling of the entire circumference of the trunk extending not more than six inches; may include lengthy (more than six inches) striping as long as it did not girdle the entire trunk's circumference

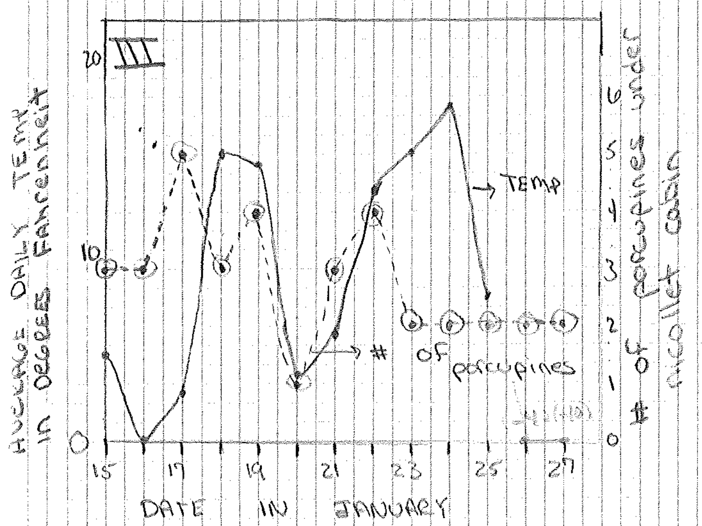
3. major branches-those branches connected directly to the trunk of the tree

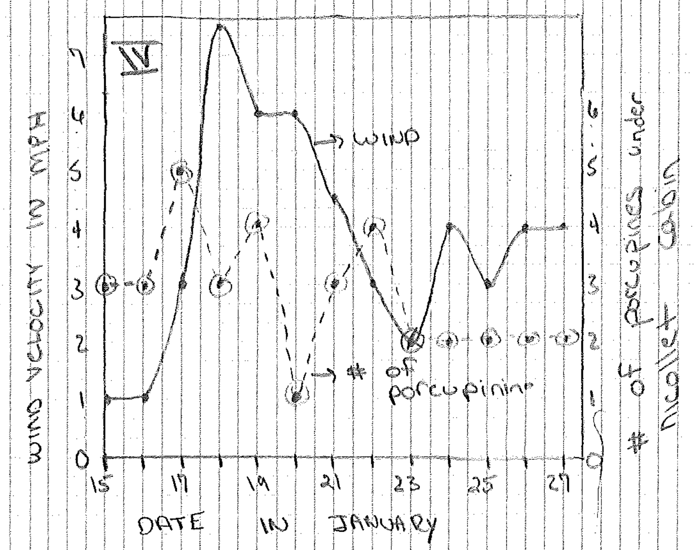
4. clippings-twigs, small branches and needles found on the ground surrounding the tree

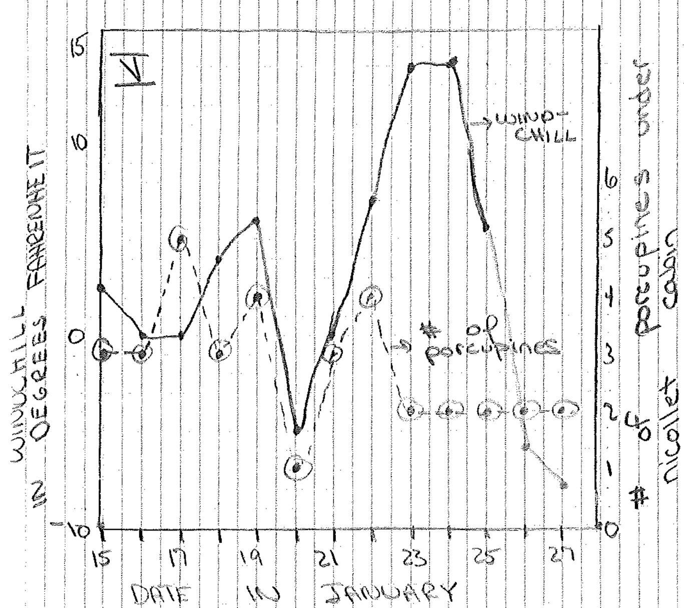
Nicollet Cabin Porcupines

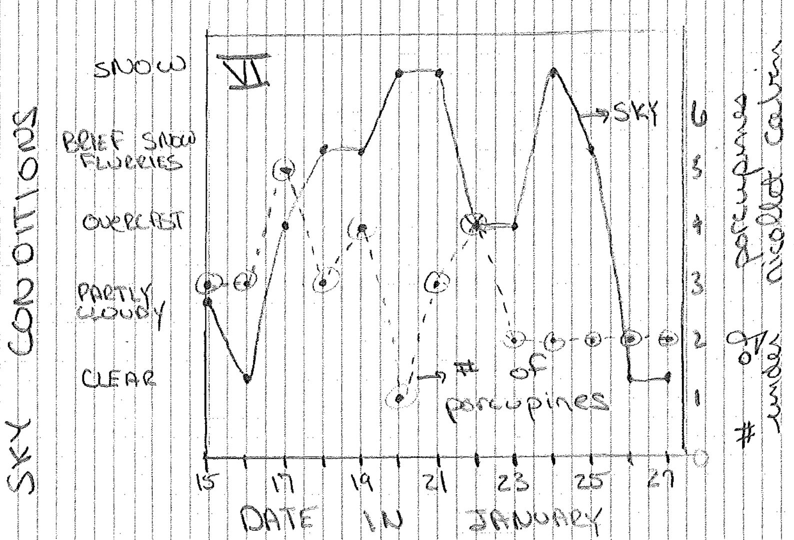




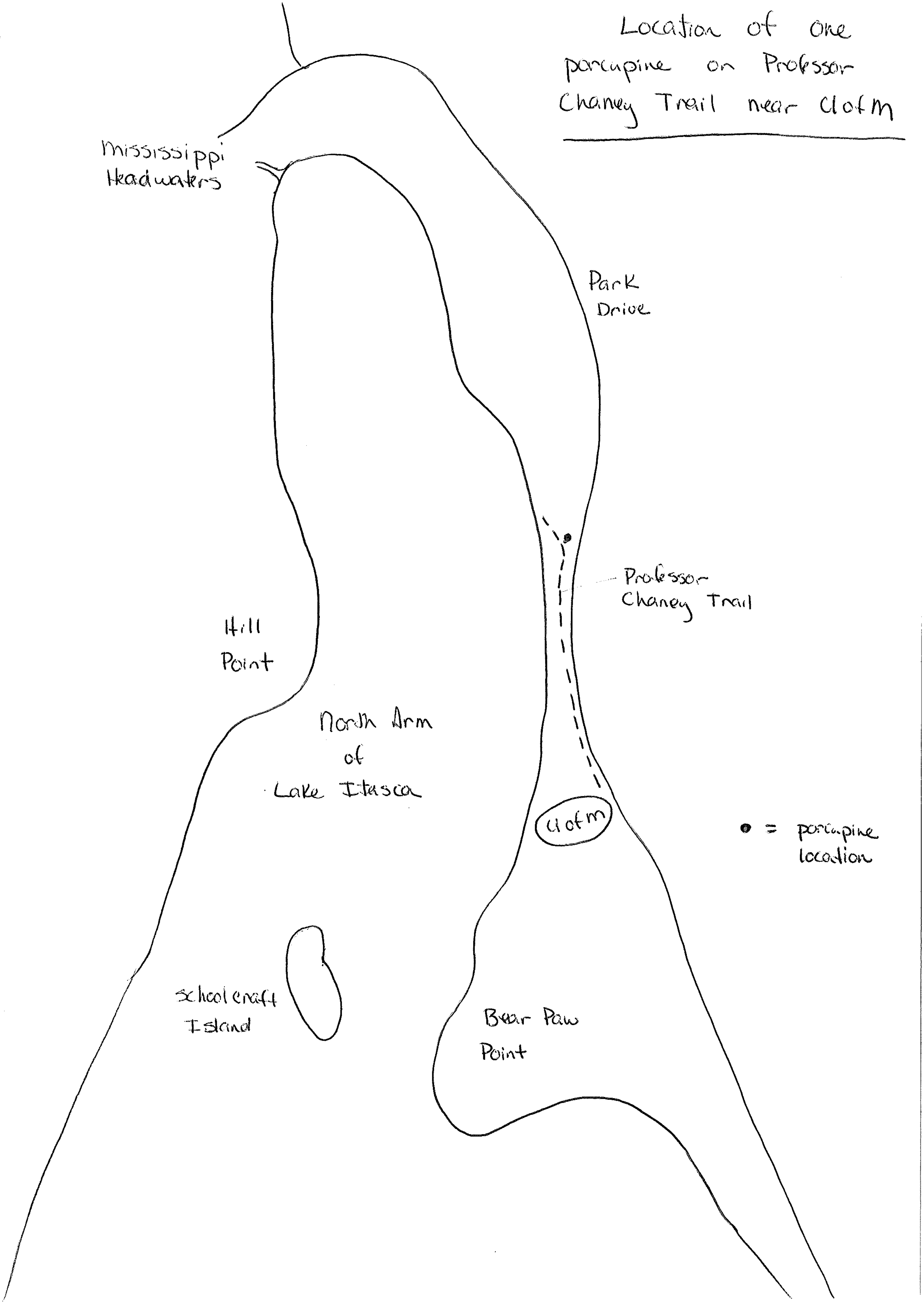




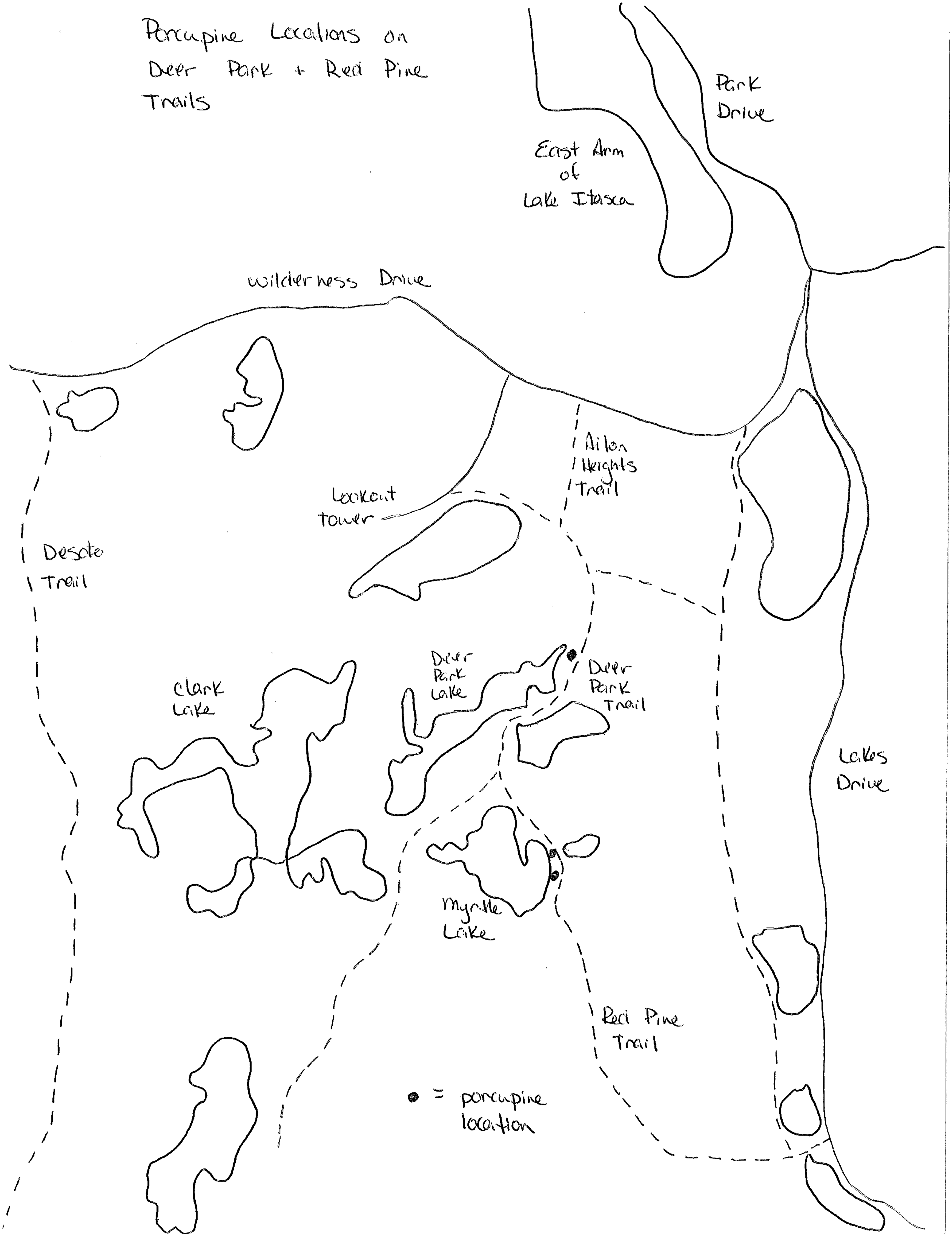




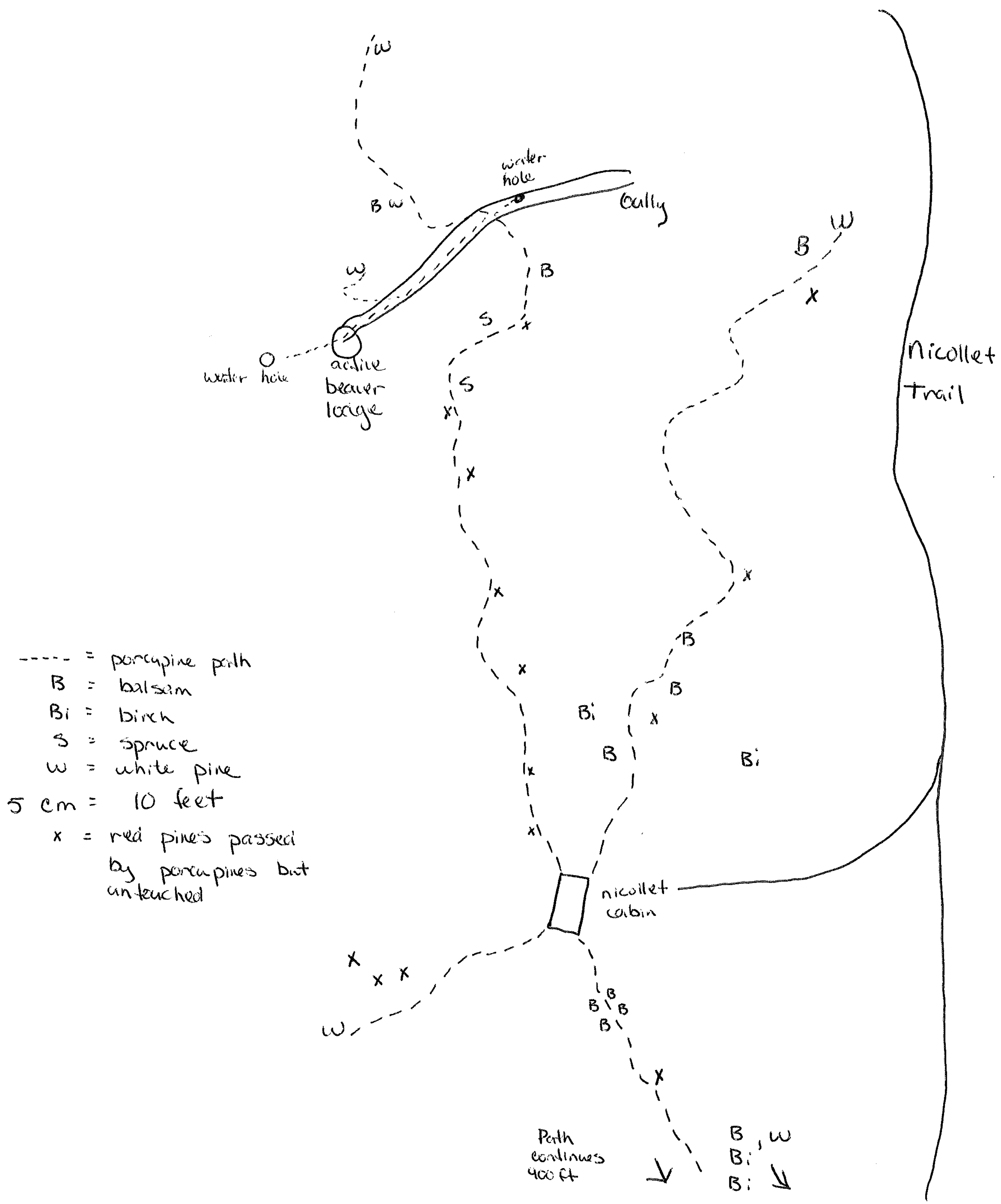
Location of one porcupine on Professor Chaney Trail near U of M

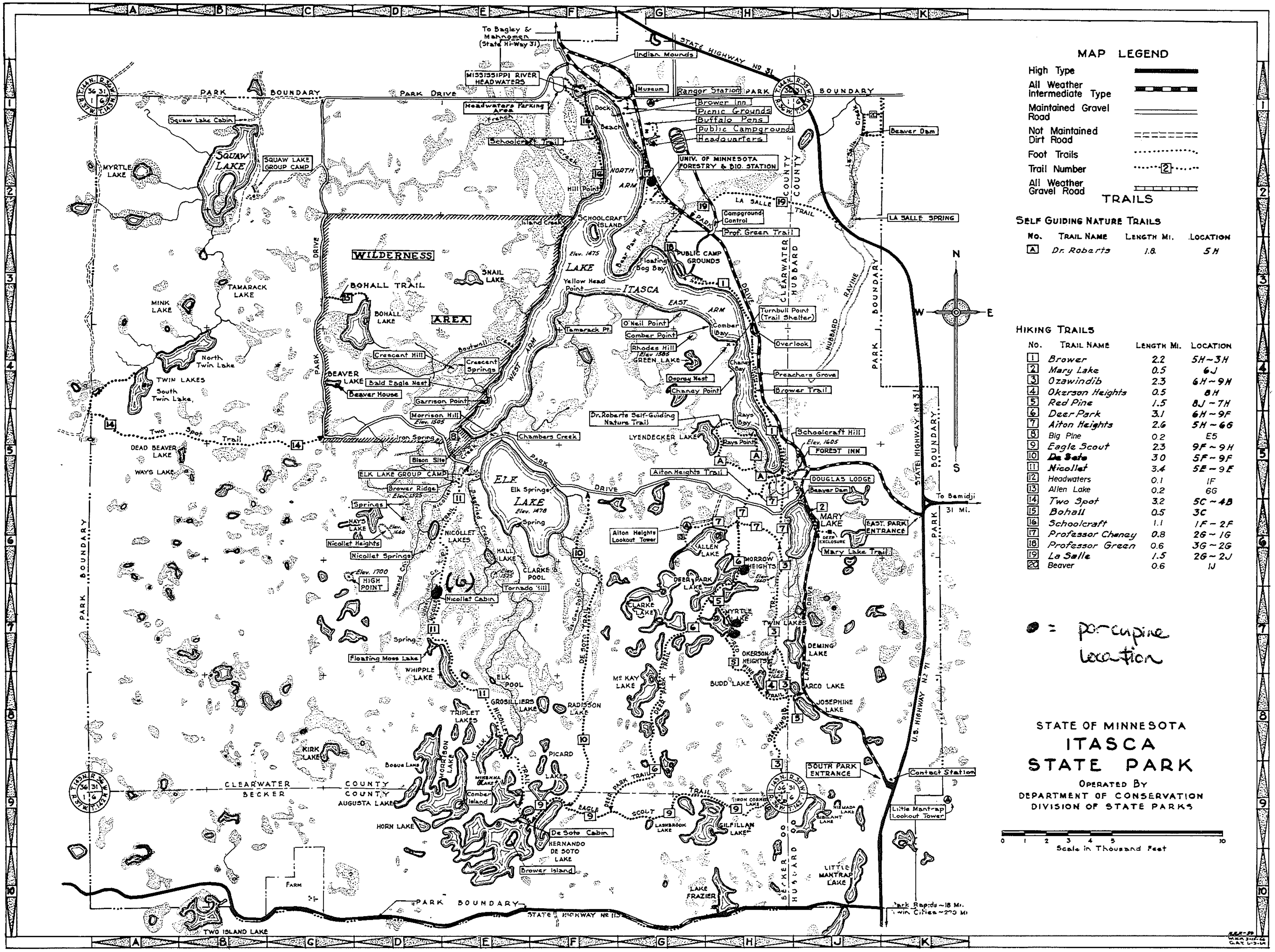


Porcupine Locations on Deer Park + Red Pine Trails



Trees Damaged by Porcupines in the Nicollet Cabin Area




MAP LEGEND
High Type
All Weather Intermediate Type
Maintained Gravel Road
Not Maintained Dirt Road
Foot Trails
Trail Number
All Weather Gravel Road
TRAILS
SELF GUIDING NATURE TRAILS
No. TRAIL NAME LENGTH MI. LOCATION
A Dr. Roberts 1.8 5H
HIKING TRAILS
No. TRAIL NAME LENGTH MI. LOCATION
1 Brower 2.2 5H~3H
2 Mary Lake 0.5 6J
3 Ozawindib 2.3 6H~9H
4 Okerson Heights 0.5 8H
5 Red Pine 1.5 8J~7H
6 Deer Park 3.1 6H~9F
7 Aiton Heights 2.6 5H~6G
8 Big Pine 0.2 E5
9 Eagle Scout 2.3 9F~9H
10 De Soto 3.0 5F~9F
11 Nicollet 3.4 5E~9E
12 Headwaters 0.1 1F
13 Allen Lake 0.2 6G
14 Two Spot 3.2 5C~4B
15 Bohall 0.5 3C
16 Schoolcraft 1.1 1F~2F
17 Professor Chaney 0.8 2G~1G
18 Professor Green 0.6 3G~2G
19 La Salle 1.5 2G~2J
20 Beaver 0.6 1J
● = porcupine location
STATE OF MINNESOTA
ITASCA
STATE PARK
OPERATED BY
DEPARTMENT OF CONSERVATION
DIVISION OF STATE PARKS
Scale in Thousand Feet
PARK BOUNDARY
PARK DRIVE
WILDERNESS AREA
ITASCA LAKE
ELK LAKE
MISSISSIPPI RIVER HEADWATERS
DOUGLAS LODGE
FOREST INN
EAST PARK ENTRANCE
SOUTH PARK ENTRANCE
STATE HIGHWAY No 31
U.S. HIGHWAY No 71
CLEARWATER COUNTY
HUBBARD COUNTY
BECKER COUNTY
To Bagley & Mahnomen (State Hi-Way 31)
To Bemidji 31 Mi.
Park Rapids ~18 Mi. Twin Cities ~270 Mi.

SHEET 16

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