

Data Summary and Scent Post
Survey for Swift Fox in the West
Block, Grasslands National Park
1995

Cochrane Ecological Institute
P.O. Box 484
Cochrane, AB
T0L 0W0

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The final and most important acknowledgment is to the land owners who allowed the project team access to their lands for the survey. Private land owners who provided access were the Grant family (Val Marie), John Chandler, and Joe Latunas. Access to the PFRA community pastures were arranged through Trevor Dyck and Stan Day for the Masefield Community Pasture and Dave MacElwain for the Val Marie Community Pasture; and Howard Hansen for the Dixon Community pasture. We would also like to express our appreciation to Mrs. Hansen for her hospitality throughout the study.

Chapter 1 - Introduction

1.2 - BACKGROUND

The Swift fox reintroduction program, in Canada, began in 1971 and 1972 when Beryl Smeeton of the Wildlife Reserve of Western Canada, Cochrane, Alberta (now Cochrane Ecological Institute) imported two pair of Swift fox from Colorado. Mrs. Smeeton's intention was to start a program that would see the Swift fox once again living on the Canadian Prairie. In 1977 a cooperative agreement was signed between the Wildlife Reserve of Western Canada and the University of Calgary (Dr. Steven Herrero) to start the field work involved with reintroduction of the Swift fox. The agreement outlined a series of research projects to be conducted as M.Sc. thesis. The Canadian Wildlife Service became involved with the project in 1978 after the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated the Swift fox as an 'extirpated' species¹ in Canada. Alberta Fish and Wildlife division were invited to join the project in 1978 but they declined. Saskatchewan joined the project in 1983 when they signed a cooperative agreement with the Canadian Wildlife Service.

The research conducted by the University of Calgary involved three projects as follows:

- Carlington, B.G. 1980 Re-introduction of the swift fox (*Vulpes velox*) to the Canadian prairies. Master's Degree Project, Faculty of Environmental Design, University of Calgary, Calgary, Alberta, Canada.
- Reynolds, J. 1983. A plan for the reintroduction of the swift fox to the Canadian Prairies. Master's Degree Project, Faculty of Environmental Design, University of Calgary, Calgary, Alberta, Canada.

¹ 'extirpated' applies to any species of fauna or flora no longer existing in the wild in Canada, but existing elsewhere (COSEWIC, 1978)

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- Schroeder, C. 1985. A preliminary management plan for securing swift fox reintroduction into Canada. Master's Degree Project, Faculty of Environmental Design, University of Calgary, Calgary, Alberta, Canada

Two other projects that were initiated under the University of Calgary reintroduction project, one by M. Scot-Brown and one by C. Mamo, were not completed.

The combined effort of the University of Calgary and the Smeeton's breeding program at the Wildlife Reserve of Western Canada resulted in the first release of Swift fox on September 13, 1983. Since that time there have been a total of 749 animals have been reintroduced as outlined in Table 1.

In 1984 the management of the project was taken over by a 'Technical Committee'. Under this committee additional releases were conducted, and a feasibility study began in 1989. The results of the feasibility study were presented in Brechtel et al (1993). The feasibility study concentrated on the calculation of survival rates using radio collared animals. A total of 155 Swift fox were radio collared in the experiment, 33 were translocated animals from the USA, 41 were captive raised and released in the spring and 81 were captive raised and released in the fall.

In 1991 the Cochrane Ecological Institute (CEI) was involved in the releases for the first time. It was apparent from this involvement that improvement was needed in the release procedures and the monitoring of released animals. In 1992 CEI working in cooperation with Grasslands National Park, began research on release procedures and began post release monitoring in Grasslands National Park. The increased involvement of CEI sparked renewed interest on the part of government in research on the project and by 1995 the Canadian Wildlife Service, government of Alberta, and the government of Saskatchewan all had research or monitoring projects on the Swift fox.

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A critical examination of the existing data and data gaps in 1994/95 clearly indicated that there was very limited information on the actual numbers and distribution of Swift fox in the wild, and especially in Saskatchewan. This led to the priority for study in 1995 being put on attempts to define the range and population of the Swift fox in Saskatchewan. The government of Saskatchewan developed a survey project in the eastern release areas (Grasslands National Park East Block and Wood Mountain area); and Grasslands National Park sponsored a similar study in the West Block area, Masefield PFRA Pasture, Val Marie PFRA Pasture and the Grant lands.

CEI was contracted by GNP to conduct the West Block study. At the same time CEI was conducting a review of the data available on Swift fox in Saskatchewan, and a Swift fox den site survey in Saskatchewan. This report presents the data from all three studies.

1.2 - 1995 WORK EFFORT

Although data had been collected on the Swift fox populations in Saskatchewan no concerted effort had been made to document their distribution or estimate their populations. The April 1995 meeting of the Swift Fox Recovery Team placed a high priority on this work. Subsequent discussions between the government of Saskatchewan and Grasslands National Park resulted in a two agency approach to trying to gain more information on the Swift fox population in Saskatchewan. The government of Saskatchewan would conduct a scent post survey of the East Block area and Grasslands National Park would conduct a scent post survey of the West Block area. CEI had already started a data summary for Saskatchewan and were planning a den site survey for the summer of 1995.

Grasslands National Park subsequently contracted CEI to conduct the scent post survey in the West Block area under the following objectives:

1. To use a combination of night-lighting and/or scent stations along trails and fireguards to determine whether Swift fox are present in the study area.

2. To use systematically spaced scent posts in the Masefield PFRA Community Pasture in order to assess whether the technique can be used to estimate the absolute abundance of Swift foxes.

In addition to the work funded by Grasslands National Park, CEI undertook a Swift fox data summary for Saskatchewan with the objectives:

1. To summarize all available data collected on the Swift fox in south central Saskatchewan prior to 1995.
2. To present the data in a graphical form and in data bases that can be used with GIS systems.

1.3 - REPORT ORGANIZATION

This report is divided into four chapters:

1. Introduction
2. Data prior to 1995: Summary
3. Scent Post Survey and Night-lighting
4. Swift Fox Population Status in West Block Area

Table 1: Swift fox production from captive breeding and wild caught translocated animals which have been reintroduced to the Canadian prairie from 1983 to 1994.

RELEASE AREAS	CEI CAPTIVE BRED SWIFT FOX	OTHER FACILITY* CAPTIVE BRED SWIFT FOX	WILD CAUGHT SWIFT FOX	% TOTAL RELEASED SWIFT FOX FROM CWR
Alberta				
Lostriver	100	17	27	69%
Foremost	31	20	7	53%
McIntyre	46	17		73%
Jumping Pound	2			100%
Southern Alberta	38	12	11	62%
Total in Alberta	217	66	45	66%
Saskatchewan				
Cyprus Hills	9	19	2	30%
Wood Mountain	61	50	15	48%
Nashlyn	41	56	1	42%
Grasslands National Park	94	9	1	90%
South Saskatchewan		11		0%
Total in Saskatchewan	205	145	19	56%
To Breeding Colony at Calgary Zoo	6			100
To Breeding Colony at Edmonton Valley Zoo	2			100
To Breeding Colony at Moose Jaw Wild Animal Park	5			100
Total Swift Fox	435	211	64	61

- This includes the Edmonton Valley Zoo (18), Moose Jaw Wild Animal Park (125), and Calgary Zoo (68). Calgary Zoo, as of 1994, no longer have a captive breeding programme.

Chapter 2 - Data Summary

2.1 - DATA SOURCES

The Swift fox reintroduction project has attempted to establish a minimum of two physically separated populations of animals on the Canadian prairies. One of the locations is in Alberta and what is referred to as the border area (Figure 1). This area is situated in the south east corner of Alberta and straddles the Alberta/Saskatchewan provincial border. The second area is in south central Saskatchewan and can be defined as the area occupied by the East and West Block of Grasslands National Park, including the Wood Mountains in the East and bounded on the south by the Canada/USA border. This data summary will be limited to the latter area that for convenience will be referred to as Grasslands National Park (GNP).

The information available on the Swift fox populations in GNP was found in the following documents:

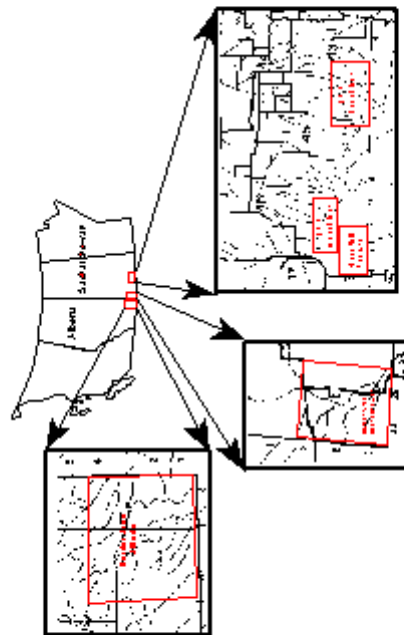
Hjertaas, D., B. Wait, and K. Rusk. 1992. Reintroduction of the Swift fox on the Wood Mountain plateau. Progress Report 1992. Saskatchewan Parks, Recreation and Culture, Regina. Unpublished Report.

Summarizes the data collected and presents preliminary analysis for survival of Swift fox released in the Wood Mountain area. Unpublished Report.

Cochrane Wildlife Reserve. 1993. The use of "A" frame Portable Protective Structures (PPS) in the 1993 Swift fox release program in Grasslands National Park, Val Marie, Saskatchewan Canada. Unpublished Report.

Observations are provided on the use of the PPS to reduce stress and increase Swift fox survival during the releases program in 1993.

Figure 1: The main release areas for the Canadian Swift fox reintroduction program.



Brechtel, et al. 1993. Canadian Swift Fox Reintroduction Feasibility Study: 1989 to 1992. Unpublished Report to the Swift Fox Recovery Team.

This report provides an analysis of the radio tracking data from 60 collared Swift fox. Fourteen of the collared animals were translocated animals from Wyoming and 46 were captive breed animals.

Harris, W.C. and S. M. McAdam. 1994. Assessment of Swift fox populations in Saskatchewan- Winter/Spring 1994. Prepared for Swift Fox Conservation Society, Calgary and Saskatchewan Environment and Resource Management, Regina. April 1994, Unpublished Report.

Data were reported on winter track surveys, from the Wood Mountain and Frenchman River areas and on a spring playback/response survey in the Wood Mountain and Governlock-Counsel area.

Moehrenschlager, A. 1994. Population monitoring of swift foxes (Vulpes velox) by means of scent-posting and spotlighting in Wood Mountain Saskatchewan. Report to Saskatchewan Environment and Resource Management, Regina and the Swift Fox Conservation Society, Calgary. Unpublished Report

Scent posts put out in the Wood Mountain area produced 13 visitations in late June and July, and three Swift fox were observed night lighting in the same area.

Longmuir, R. 1994. Live trapping Swift fox (Vulpes velox) in the Wood Mountain area March 1 - 7, 1994. Wildlife Population Management Information Base 94-WP-. Saskatchewan Environment and Resource Management, Regina.

Data were reported on 108 live trap nights in the Wood Mountain area. Four swift fox were trapped, including one retrapped individual.

Hjertaas, D. 1994. Reintroduction of the Swift fox on the Wood Mountain Plateau. Unpublished Report. Saskatchewan Environment and Resource Management, Regina. Unpublished Report.

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The report analyses the radio tracking data collected from 1990 to 1993 and concludes that there may be a negligible differences between the survival of captive raised and wild translocated Swift fox in the Wood Mountain area. It also recommended that a small number of animals (20) should be in the area in 1994.

Dennington, M. 1994. Swift fox reconnaissance survey Grasslands National Park, March 1994. Prepared for Cochrane Ecological Institute by Redwing Naturalists, Creston, B.C. April 1994. Unpublished Report.

Observations were reported on the utilization of Swift fox habitat in the West Block of Grasslands National Park from March 8 to 17, 1994.

Cochrane Ecological Institute. 1994,a. Survey of Swift fox activity and possible release sites in Grasslands National Park (15 August to 6 September, 1994). Unpublished Report.

Report on habitat survey and night-lighting to select the Swift fox release sites in Grasslands National Park and area for 1994.

Michie, J. 1994,a. Monitoring of Swift fox in Grasslands National Park, November 1994. Prepared for Cochrane Ecological Institute, Cochrane, AB. Unpublished Report.

Scent stations, night lighting and snow tracking were used in both the East and West Block of GNP and Masefield and Val Marie PFRA Pastures to monitoring the movements and survival of the 1994 captive bred releases.

Michie, J. 1994,b. Swift fox update in Grasslands National Park, West Block. July 18 - 26, 1994. Prepared for Cochrane ecological Institute. Unpublished Report.

Summarized field observation from GNP West Block in July 1994. Observed natal den and a possibly four kits.

Michie, J. 1994,c. Swift fox monitoring in Masefield and Val Marie PFRA

Community Pastures and their suitability as future release sites. Prepared for Saskatchewan Environment and Resource Management. Unpublished Report.

Presents data collected during a scent post survey and night lighting in November 1995.

Cochrane Ecological Institute. 1994,b. Observations of Captive Raised Swift foxes on release into Grasslands National Park, September 12th - 22nd, 1994.

Unpublished Report.

Observations on the post - release monitoring of the Captive Bred Swift fox released using the PPS in 1994.

Stephens, P. 1995. Monitoring of Swift fox by breeding call playback and other techniques in Grasslands National Park Saskatchewan 23.4.95 - 7.4.95. Prepared for Cochrane Ecological Institute. May 1995. Unpublished Report.

Data present on the development of a playback response method of population estimation of Swift fox, as well as night lighting and ground search data for both the East and West Block of GNP.

Stephens, P. and H. Etemadi. 1994. Investigation into habitat and diet of Captive Swift fox, June to October, 1994. Prepared for Cochrane Ecological Institute.

Unpublished Report.

Data reported on the analysis of scat contents of 21 Swift fox scat collected during the 1994 releases in Grasslands national Park.

Smeeton, C. 1994. Reintroducing the Swift Fox. Canid News. 2:13-16.

Presents the concept and data on the use of the PPS in GNP.

The reports outlined above are all unpublished and come from three organizations.

In addition to these documents information on Swift fox den sites was obtained from radio tracking files (Hjertaas, et al, 1992) held by GNP in Val Marie Saskatchewan.

2.2 - DATA SUMMARY

The data contained in above documents is summarized in Figure 2 (West Block) and Figure 3 (East Block). The detailed data can be found in Appendix 1.

Figures 2 and 3 showed that there were substantial signs that the Swift fox population in south central Saskatchewan had a wide distribution prior to 1995. The following sections examine each data type.

2.2.1 - Den sites

Figure 4 shows the locations of all known Swift fox den sites in south central Saskatchewan.

2.2.2 - Scat, Tracks and Swift Fox Sighting Pre-1995

The location of Swift fox scat, tracks and actual sightings were considered to be the only definite indication of the presence of Swift fox. Figure 5 reveals that distribution of the positive location of sign and actual sightings. Of the 43 occurrences of sign, 22 have been located in the West Block and 21 have been found in the East Block. When examining the Swift fox sightings, five have been from the East Block and three from the West Block. In addition, four Swift fox have been live trapped in the East Block, while no live trapping has occurred in the West Block.

2.2.3 - Scent Posts Pre-1995

A summary of the positive scent post visitations found in the above reports are shown in Figure 6. There were a total of 127 scent post nights reported for the West Block area with a total of 14 confirmed visitations or 0.011 visitations per scent post night. In the

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East block there were a total of 180 scent post nights reported with a total number of confirmed visitations of 16 or 0.089 visitations per scent post night.

2.2.4 - Swift Fox Release Sites

Figure 7 presents the locations and numbers of Swift fox released in GNP area since the beginning of the reintroduction program. It should be noted that releases in the GNP area began in 1990 with all the releases in 1990 and 1991 being in the Wood Mountain and East Block Area. Releases in the West Block area began in 1992. The data for the releases are contained in Appendix 2.

Table 2 summarizes the total numbers of Swift fox released in the East and West Block areas from 1990 to 1994, inclusive.

Table 2: Summary of the Swift fox released into GNP from 1990 to 1994, inclusive.

Year	East Block/Wood Mountain		West Block	
	Captive Raised	Translocated	Captive Raised	Translocated
1990	51			
1991	61	14		
1992	16		38	
1993	11		17	
1994	9		10	
Total	148	14	65	0

Figure 2: Summary of all data collected prior to 1995 for the West Block area .

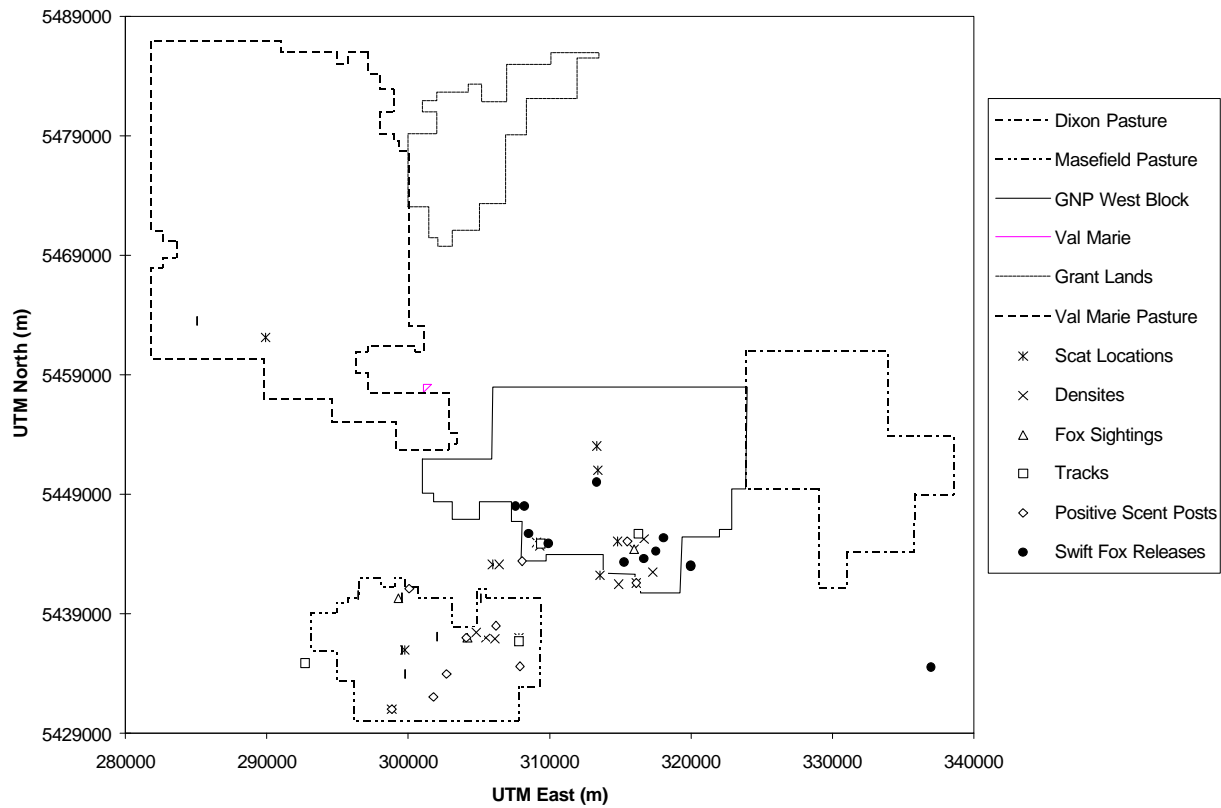


Figure 3: Summary of all data collected prior to the 1995 for the East Block Area.

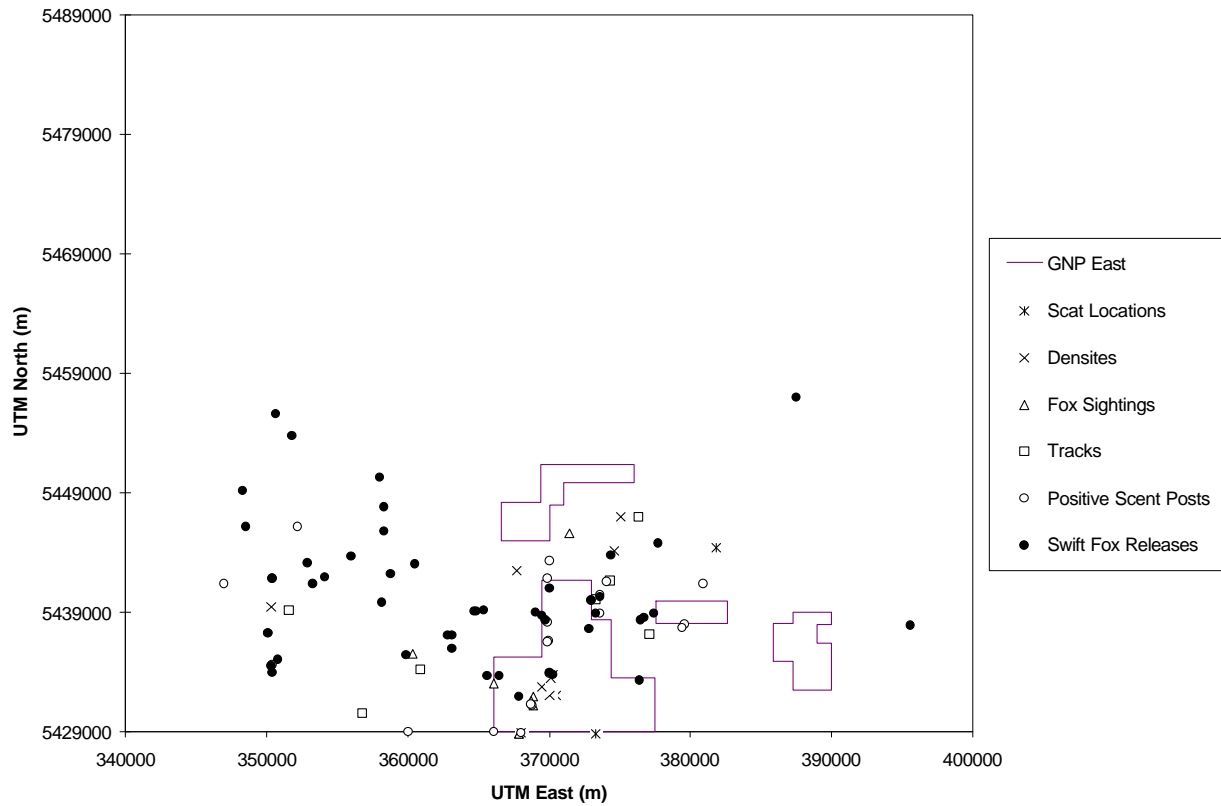


Figure 4: Summary of the den sites found in the East and West block areas prior to 1995.

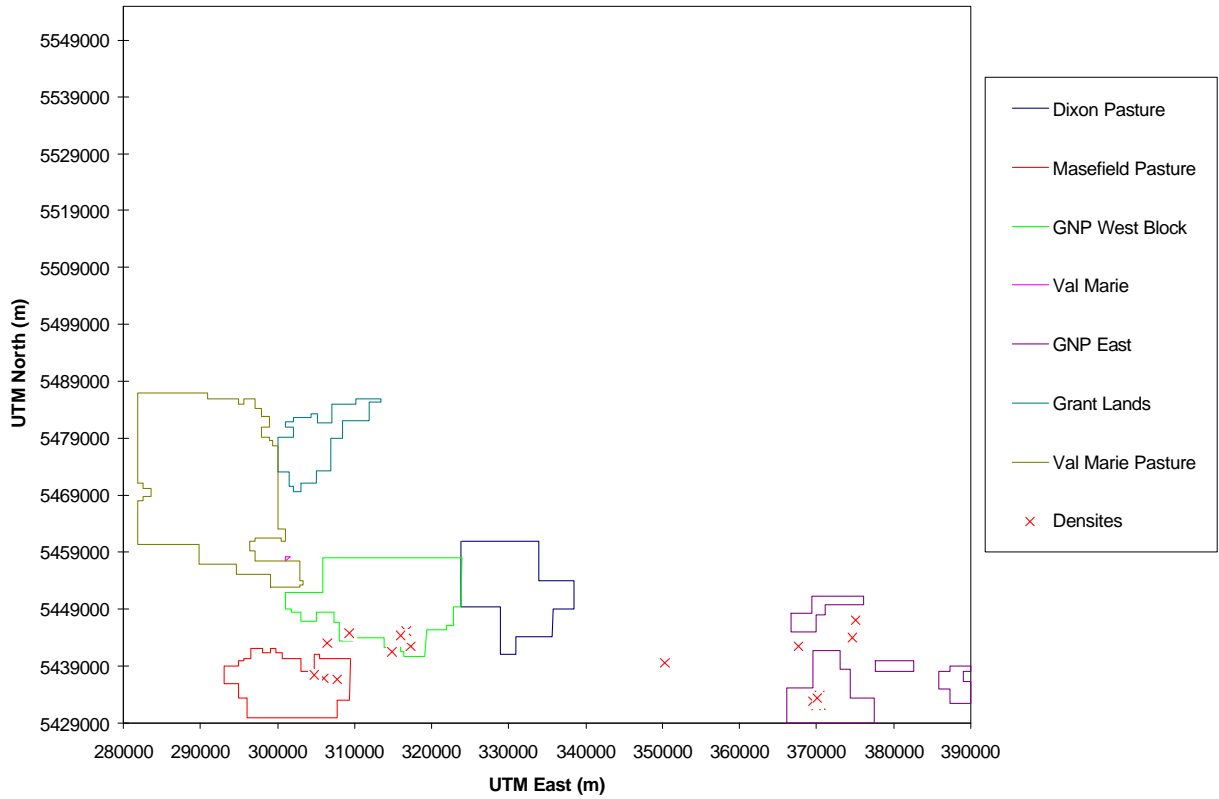


Figure 5: Summary of all Swift fox sightings, scat and track found in the East and west Block areas prior to 1995.

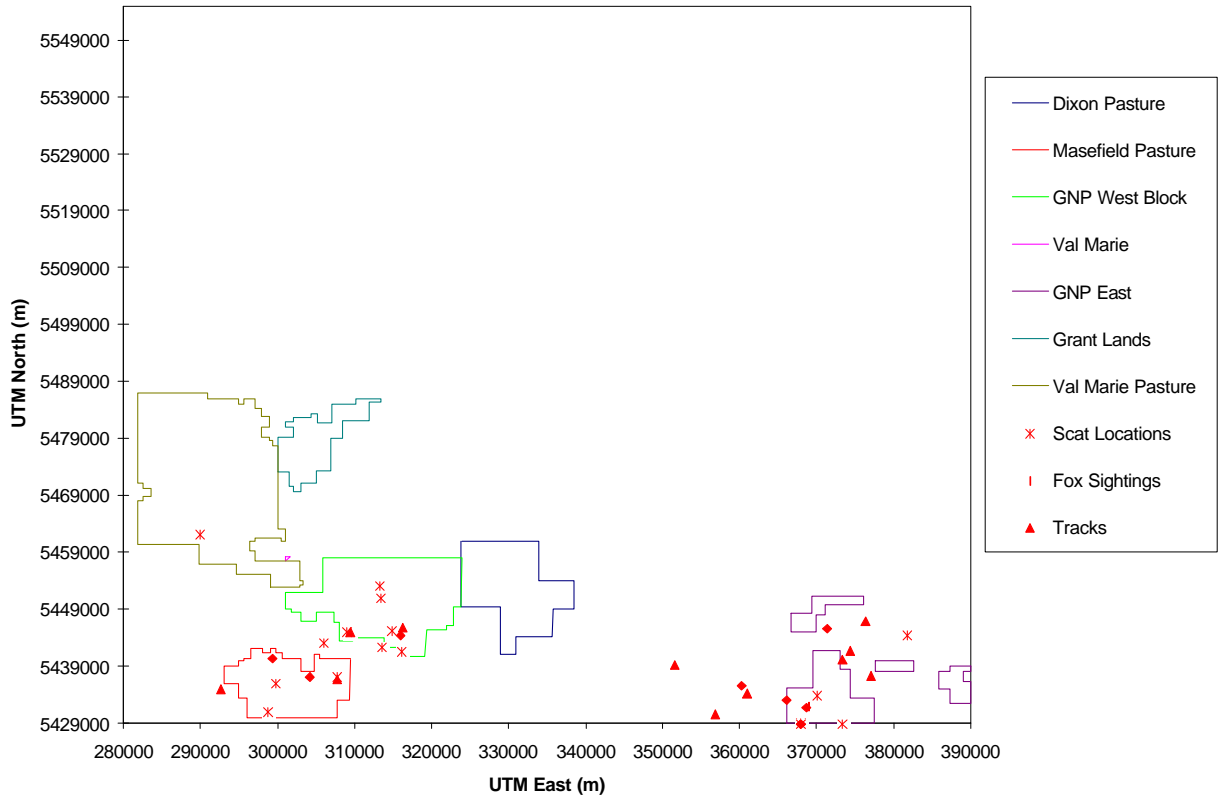


Figure 6: Summary of all positive scent posts for Swift fox in the East and West Block areas prior to 1995.

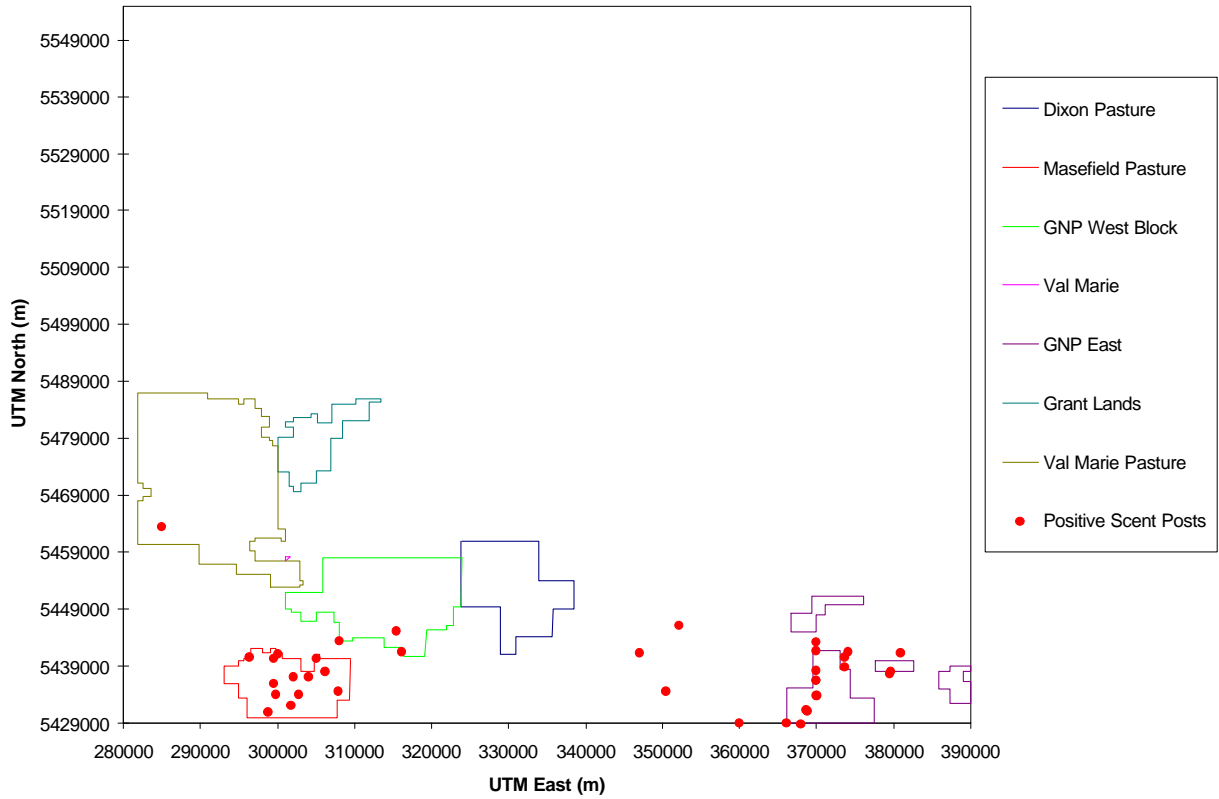
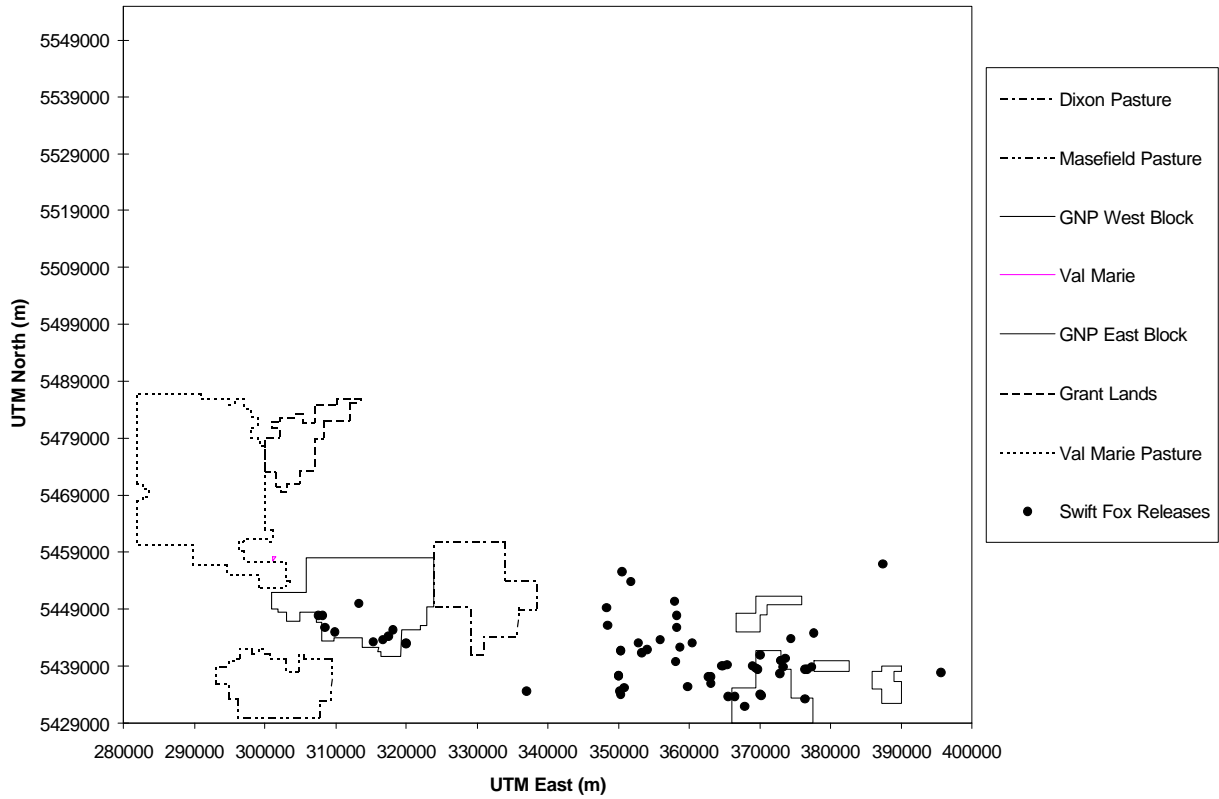


Figure 7: Summary of all Swift fox release sites for the East and West Block prior to 1995.



2.3 - DISCUSSION

An examination of Figure 2 and 3 indicated that there were substantial sign of Swift fox found in both the East and West blocks prior to 1995. The data used to compile the above figures came from seven distinct sources (Table 3). The monitoring effort in these sources however was relatively similar with the major difference being that no live trapping was conducted in the West Block. The similarity in population indicators resulting from relatively similar monitoring efforts supports the conclusion that similar populations levels of Swift fox have developed from the release program in the East and West Blocks.

Table 3: Summary of the monitoring efforts prior to 1995 in the East and West Block.

Data Source	Location		Night lighting Hr.	Scent Post Nights	Days in Field	Trap Nights
	West	East				
Stephens (1995)	X	X	18		13	
CEI (1994,a)	X				23	
Michie (1994,a &c)	X		26	127	14	
Michie (1994,b)	X				8	
Harris and McAdam (1994)		X	18		12	
Moehrensclager (1994)		X	23.5	180	14	
Longmuir (1994)		X			7	108
Effort Summary						
East Block			45.5	180	39	108
West Block			40	127	52	

One hundred and sixty-two (162) Swift fox have been released into the East Block area over a five year period. These animals were released into an area of approximately 1187 km² giving a release density of 0.136 fox /km².

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In comparison the population in the West Block has developed from 65 swift fox released over a three year period into a 89 km² area. This resulted in a release density of 0.733 fox/km². Figure 2 showed that the West Block population has spread from the GNP West Block proper into the Masefield PFRA Pasture. Where as in the East Block (Figure 3) the population has not occupied the full release area, but has contracted into a smaller area.

The analysis of the existing release data and the presence of Swift fox prior to 1995 provide valuable insight into the relative effectiveness of release strategies. In the East Block the releases appeared to be done with a shot-gun approach on the hypothesis that covering more area would result in larger potential population. In reality, instead of the animals expanding into areas of new habitat or at least maintaining the initial areas covered by the releases, the population has appeared to have contracted into a smaller area.

The strategy for the releases into the West Block was to release only into areas selected on habitat characteristics that matched known Swift fox habitat in South Dakota (Smeeton, 1994). Releases were monitored to document success and add to the knowledge base for subsequent release site selection. This concentrated the releases into what was considered the optimum habitat. The Swift fox sign noted in the West block showed that the population appeared to have expanded into the Masefield PFRA pasture. This expansion indicated the natural habitat selection of this population.

If the success of the release program was release density dependent, there may be a behavioral cause and effect relationship between survival and density. Weagle and Smeeton (1995) presented the idea that Swift fox may live in loosely formed communities, which enhanced their chances of survival. They cited several behavioral traits that led to the conclusion:

1. Swift fox are a gregarious, highly social species (J. Sharpes, personal

- communication, 1992, Rongstad et al, 1989, U.S. Fish & Wildlife Service, 1995).
2. Swift fox vocalisations link individual animals; calls will be repeated by all Swift fox within earshot and the response to those calls will be the same. The ripple effect of repeated warning barks reduces the chances of success for predators on this small, vulnerable canid. The repetition of the lubricious bay increases the likelihood of matching unpaired Swift fox, a particularly important point as they are very fastidious in mate selection, thus Swift fox living within hearing of each other have a greater protection from predators and a greater chance of pairing.
 3. Historically Swift fox were reported to be found within close proximity of each other. Wright (1913) reflecting on his pioneer days said that there were "millions of Prairie dogs" and "next in numbers was the little Swift fox". At this time of writing, remnant populations of Swift fox were found only in pockets, or "hotspots" over what appeared to be a much larger range of similar habitat in the U.S. (Dr. L. Carbyn, Canadian Wildlife Service, Edmonton, personal communication).
 4. When Swift fox were introduced to large enclosures, of either 9 hectare or 0.7 hectare enclosures, with a number of animals per enclosure, association patterns between individuals included sharing of artificial dens, and a reduction in aggressive behaviour. In the larger enclosure the Swift fox appeared to share a multiplicity of different dens, unless the den is occupied by a vixen with unweaned kits.

Unreported data from research in the "Border Area" also suggests that where established Swift fox populations exist, the concentration of animals was relatively dense (greater than 0.75 fox/km² (16 animals/township)). Preliminary analysis of the radio

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collar data from the area has also showed showed that hunting areas overlap (Axel Moehrenschrager, personal communication, August 1995).

The above analysis of existing data in the two release areas in south central Saskatchewan indicate that release methods developed by CEI and used in the West Block of GNP may result in the quicker establishment of a Swift fox population, and the more efficient use of Swift fox for reintroduction. It also indicated that a population of Swift fox can be established in the wild using captive bred animals (only 0.6% (14/227) of the Swift fox released in both the East and West Block were wild translocated animals).

The relative success of the CEI release method indicates that continued effort should be put into the refinement of release methods and in the pre-selection of release sites.

Chapter 3 - Scent Post Survey and Night-Lighting

3.1 - INTRODUCTION

Three methods of population estimation has been used in the Swift fox reintroduction program, radio collars, scent posts, and night-lighting. Radio collars were used in the Feasibility study conducted by the recovery team (Brechtel et al, 1993) and in the initial introductions in the East Block (Hjertaas, 1992 and 1994). Scent posting has been used in the East and West Blocks on several occasions as has night-lighting (Chapter 2). The latter two methods were popular because they were non-intrusive, they were however labour intensive.

When working with endangered species and fragile populations, such as the Swift fox in Canada, the prime consideration must be placed on the welfare of the individual animals. In established populations the injury of an individual animal must also be avoided but if it inadvertently happens it would not necessarily jeopardise the population as a whole. The loss of one Swift fox from the wild population can have serious consequences on the population. One animal in a population of 100 representes one percent, the loss may break up a breeding pair, or it may jeopardise the care of a litter. For these reasons non-intrusive methods have been preferred by the CEI in studying the Swift fox populations and new non-intrusive methods are presently being research.

Scent stations have been used since the 1950's to examine changes in animal populations. Uses of the method have been outlined in Table 4. At least two of the studies have used scent stations to evaluate Swift (Kit) fox populations.

Considerable variation is found in the tracking medium at scent stations and in the scents used. No specific research on the scent preferences for Swift fox could be found, but Clark and Campbell (1983) evaluated the ability to identify tracks on a smoked kymograph paper and sand. The research was conducted in prairie dog towns

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which produced a wide variety of animal tracks to evaluate. Their conclusion was that sifted dirt was more time effective to use but positive identification of tracks was better from the kymograph paper. Barrett (1982) also presented results on smoked aluminium sheets used for pine marten. His tracking results were very clear for many species but it was noted that results would be eliminated by rain.

Table 4: Literature on Scent post methods.

Author	Species	Tracking Medium
Linhart and Knolton (1975)	Coyote	sifted earth or sand
Turkowski, Popelka and Bullard (1982)	Coyote	Sifted or raked soil
Roughton and Sweeny (1982)	Coyote	??
Drew, Fagre and Martin (1988)	Cottontail Rabbits	Sifted Soil
Diefenbach et al (1993)	Bob Cats	Sifted lime
Conner, Labinsky and Progulske (1982)	Bob cats, Raccoons, Grey Fox and Opossums	Sifted Sand
Barrett (1982)	Pine Marten	Smoked Aluminium
Clark and Campbell (1983)	Swift fox, coyotes, badgers, mice, ground squirrels and prairie dogs.	Smoked kymograph paper
Marten (1972)	mice	Sand
EG&G(1989)	Kit fox	??

Some of the uses of night-lighting in population investigations were outlined in Table 5. No references to using night-lighting to monitor carnivores was found in the literature.

As outlined in Chapter 2 both scent posts and night-lighting have been used extensively in the Swift fox reintroduction program. The work planned for 1995 was designed to use

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both methods. The concept was to use scent posting to find areas of Swift fox occurrence and then attempt to locate the animals with night-lighting.

Table 5: Summary of the literature on night lighting.

Author	Species
Cypher (1991)	Deer
Fafarmann and DeYoung (1986)	Deer
Clark and Andrews (1982)	Raccoon
Drew, Fagre and Martin (1988)	Cottontail Rabbits
Wakkinen (1992)	Sage Grouse

The study area to be covered over the summer of 1995 was to include both the East and West Blocks. By prior agreement the Government of

Saskatchewan was responsible for the work in the East Block and Grasslands National Park was responsible for the work in the West Block. This report provides the findings for the work conducted by Cochrane Ecological Institute, under contract to GNP for the West Block area.

The problems of definite track identification noted in the literature and in the data review (Chapter 2) suggested that some preliminary work was necessary before the summer's field work. Several problems needed examination and a series of experiments were designed and conducted at CEI to examine the response of the Swift fox to several different baits and the efficacy of several tracking media for track identification.

The summer of 1995 was an exceptionally wet period in south central Saskatchewan. After two weeks of the survey over 60% of the nights had been lost due to rain. This prompted an attempt to develop a water proof covering for the scent posts. This work was also carried out at CEI.

3.2 - METHODS

3.2.1 - Preliminary Work at CEI

During the month of June 1995 a series of experiments were carried out in the 9 hectare enclosure at CEI to evaluate the effectiveness of anchovy paste, vanilla extract, and sardines as a scent, and to test sand, wood smoked aluminium, kerosene smoked aluminium and charcoal as tracking medium. The enclosure is comprised of 50% mixed grass prairie, 40% mixed woodland and 10% wetland and was home to five adult Swift fox and four cubs born in April 1995.

The experiment was designed using three scent posts, each monitored for a five day period. On the first two days the scent employed was anchovy paste, the second two days the scent was vanilla extract, and the final day was sardines. One of the three scent stations was chosen for a control with no scent. The control site was changed each night. This same series of scents was repeated with each tracking medium.

The locations were chosen on elevated ground, away from dense vegetation. The scent posts were placed as follows. A 30 cm long wooden stake (2.5 cm X 1.25 cm) was driven into the ground approximately 5 cm. The scent (anchovy paste, vanilla extract, or sardines) was smeared onto the stake. The stake was surrounded by the tracking medium. Sand was placed in a 1m X1m frame around the base of the stake and lightly compacted and smoothed. The aluminium sheets were purchased with a 5 cm hole drilled into the centre. The sheets were smoked (either with wood or kerosene) outside the enclosure and then placed with the stake in the centre. The charcoal was sprinkled on an unsmoked aluminium sheet placed over the stake, this was then covered with unbleached paper to prevent the charcoal from blowing away.

The wood smoke was applied to the aluminium by placing the sheet over a 45 gallon drum that contained a wood fire. The kerosene smoke was applied in the same manner replacing the wood fire with a kerosene lamp made from a "Mason jar " and lamp wick.

The week of July 17 to 23, 1995 several strategies for the protection of the scent posts from rain were examined at CEI. The method chosen was the use of a 1.25m X 1.5 m “Tough Tarp” mounted over the scent post on a wooden frame and forming an open ended tent. This configuration was tested in the 9 hectare enclosure at CEI for four nights using anchovy paste as a scent.

3.2.2 - Scent Post Survey West Block

The scent post survey in the West Block and surrounding area was conducted from July 11 to September 4, 1995. The survey was conducted by two crews and covered an area of approximately 1400 km². The land covered were loosely described as GNP West Block, Masefield PFRA Community Pasture, Dixon Community Pasture, the south half of Val Marie PFRA Community Pasture, and lands owned by the Grant family.

The survey was divided into two components a detailed study of Masefield Pasture and a less intensive sampling of the other areas. In Masefield Pasture scent posts were placed on a 3.2 km (2 mile) grid. This grid spacing was possible because of the extensive road and fireguard network in the pasture. When a positive Swift fox hit was recorded, more scent posts were placed in the area on a 1.6 km grid around the positive site.

In the other areas scent post locations were limited to the roads and fireguards. Spacing of scent posts along the access routes were at approximately 3.2 km, except for the GNP West Block where the spacing on the main north/south road was at approximately 1.6 km. (The closer spacing at this location was because of an active natal den in this area.)

Table 6 outlined the number of scent posts from all the areas sampled.

Table 6: Summary of the number of scent posts by area and the total scent post nights.

Area	Number of Scent Posts	Scent Post Nights
Masefield Pasture	31	175
GNP West Block	15	74
Dixon Pasture	11	52
Val Marie Pasture	17	51
Grant Lands	10	38
Total	84	390

The scent posts were a 30 cm long wooden stake (2.5 cm X 1.25 cm) driven into the ground approximately 5 cm. The stake was smeared

with a scent after it was driven into the ground. The tracking medium placed around the stake was a 1m X1m sheet of kerosene smoked 22 gauge sheet metal. The sheet metal had a 5 cm hole in the centre to accommodate the stake and 1.25 cm holes in each corner to provide for nailing the sheet to the ground to prevent wind damage (Plate 1). The metal sheets were smoked by placing them over a '45 gallon' metal drum which contained a kerosene lamp made from a '500 ml Mason Jar' with a lamp wick passed through its cover. The drum had a hole cut at the bottom (15cm X 15 cm) through which air reached the lamp. The complete sheet could not be smoked at one time and after approximately three minutes exposure to the smoke, the sheet was moved to smoke a different area. To fully smoke a sheet took approximately 15 minutes.

The primary scent used during the survey was anchovy. From July 26 to August 1 the liver pate was used as a scent in Masefield Pasture, the supply of anchovy paste had been used and was not restored until August 1.

Once in place the scent post were checked daily. If at the time of checking the smoked surface had been disturbed to the point of hindering track identification the sheet was re-smoked. The initial experimental design was to leave the scent posts at each station for

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five operable nights. The persistent rain over the summer made this impracticable and in mid August the number of operable nights was reduced to four per scent post. Several of the scent posts in Val Marie Pasture had less than four operable nights because of the conflicts with the Swift fox release program for 1995.

To compare the success of the sheet metal tracking medium with sand, five of the locations were operated with sand and sheet metal scent posts at the same site. The sand was obtained from the Saskatchewan Highways gravel pit in Val Marie and transported to the site. Vegetation was cleared from a 1m X 1m area and sand, contained within a 1m X1m wooden frame, was placed on the site. The central post and scent used was the same as for the sheet metal sites. After August 1 all scent posts were installed with a rain protective covering as described above (Plate 2).

3.3 - RESULTS and DISCUSSION

3.3.1 - Preliminary Work at CEI

The results of the experimental work conducted on “scents” and tracking media at Cochrane Ecological Institute are summarised in Table 7. The data showed few differences between the treatments and controls. All of the 18 treatment nights with three scents had visitations; while 10 of the 13 controls had visitation. The indication from this is that there was little difference between scents, the high visitation rate for the controls may indicate that visitations were random rather than related to the scent. The apparent random nature of the visitations may be related to the small size of the enclosure and the higher density of Swift fox where the tests were performed.

Clark and Campbell (1983) reported the visitation of Swift fox to scent stations using a mixture of liver and sardines for both a bait and scent. Conner et al (1983) used bobcat urine to attract grey fox. Turkowski et al (1983) tested a selection of 58 commercial, synthetic, and US Fish and Wildlife formulated lures on coyote. This was the only study

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found where actual lures were tested. Over a 28 month period it was concluded that there were significant differences between lures and recommended 12 lures for use. It also recommended synthetic lures because they could be more consistently formulated.

In the present work it was concluded that there was little difference between the baits tested and the most convenient bait for field work would be used. Anchovy paste was available in a tube and semi-liquid formulation. This made it easier to carry in the field and apply to the posts.

In testing the tracking medium emphasis was put on the clarity of the tracks left on the medium, and the reluctance of the Swift fox to walk on the medium. Eight scent post nights were tested using various aluminium based substrates and 10 scent post nights were tested using sand. When the aluminium was associated with a scent eight out of eight scent posts were visited; six out of eight controls were also visited. Using sand, 10 out of 10 scent posts associated with scents were visited ; four out of five of the controls were visited. The conclusion from this data was that the Swift fox in the 9 hectare enclosure were not hesitant to visit a scent post with an aluminium substrate.

No studies could be found that experimentally compared types of tracking medium had been tested but Clark and Campbell (1983) did note Swift fox visitations to an plywood substrate covered with smoked kymograph paper and Barrett (1982) used smoked aluminium to record pine marten tracks. These authors noted the clarity of the tracks on the smoked kymograph paper compared to sand.

The clearest tracks in the present experiments were on the smoked aluminium. The nature of the smoke (wood or Kerosene) did not affect the clarity of tracks. The process of smoking the aluminium sheets with kerosene was considered to be safer and more field applicable than smoking with wood, and therefore was chosen for the survey. The aluminium tested at CEI was replaced by 22 gauge sheet metal in the field study because of cost.

Table 7: Summary of the testing of scents and tracking medium tested at CEI [3(4) - 3 is the number of scent post visitations, (4) is the number of operable nights of testing]

		Charcoal on Paper	Wood Smoker Aluminum	Kerosene Smoked Aluminum	Sand	Total Hits
Anchovy Paste	Treatment	1(1)	2(2)	1(1)	4(4)	8/(8)
	Control	1(1)	2(2)	0(1)	2(2)	5(6)
Vanilla Extract	Treatment	1(1)	0(0)	1(1)	4(4)	6(6)
	Control	0(1)	0(0)	1(1)	1(2)	2(4)
Sardines	Treatment	0(0)	1(1)	1(1)	2(2)	4(4)
	Control	0(0)	1(1)	1(1)	1(1)	3(3)
Totals	Treatment	2(2)	3(3)	3(3)	10(10)	
	Control	1(2)	3(3)	2(3)	4(5)	

The experimentation with rain protection for the scent post (Plate 2) was checked for four nights in the 9 hectare enclosure. All nights were positive for visitations.

3.3.2 - Scent Post Survey West Block

The locations of the scent posts used during the survey can be found in Figure 8. The detailed summary of the scent post survey and copies of the field sheets can be found in Appendix 3. There were a total of 1033 scent post nights during the survey. Of these only 390 were operable (Table 5). Six hundred and forth-three (643) scent posts were lost as follows:

- 356 - weather
- 199 - vehicle breakdown

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- 33 - holiday
- 24 - cattle damage
- 11 - medical leave
- 20 - logistical problems

The major cause for the loss of scent post nights was rain. The smoked sheet metal tracking medium is very sensitive to rain, with even a minor shower washing off the smoke. Figure 9 shows the daily rain fall from a weather station 3.2 km east of the Masefield Pasture. For the period from July 10 to September 5, 1995 there were a total of 23 days with recorded rainfall and only four (4) periods when there were four consecutive days with out rain.

Table 8 summarises the number of visitations that were recorded at the scent posts.

There were a total of 33 scent posts were visited during the 390 scent post nights of the survey. Four of these visitations were confirmed to be Swift fox. The number of confirmed Swift fox visitations appeared to be much lower than recorded by Michie (1994) in November 1995. Michie recorded 19 Swift fox visitations from 159 scent post nights in the GNP West Block, Masefield pasture and Val Marie Pasture.

Using the Scent Station Index (SSI) described by Linhart and Knowlton (1975) the present study (for the comparable area to Michie) SSI = 13.3, Michie (1994) SSI=119. EG&G (1989) reported on San Joaquin kit Fox (*Vulpes macrotis mutica*) scent post visitations over spring, summer and fall. They found that fall visitations were generally higher than summer visitations by as much as 84%. Conner et al (1983) recorded similar differences in the Grey fox visitation to scent stations with the summer visitations being as high as 75% lower than the fall visitations.

The SSI for the 1994 survey which occurred in November was 90% higher than the SSI for the 1995 survey which was conducted in July and August. If the differences

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observed for the San Joaquin kit fox in California, and the Grey fox observations apply to the Swift fox in south central Saskatchewan the differences observed in the scent post survey would be reasonable and caused by different visitation rates in different seasons.

Table 8: Summary of the positive ‘visitations’ in the 1995 scent post survey.

	Swift Fox	Striped Skunk	Ground Squirrel	Raccoon	Coyote	Mice/ Vole	Other	Total Visitations
GNP West Block	2	0	1	1	0	3	0	7
Dixon Pasture	0	0	0	0	0	0	0	0
Masefield Pasture	2	8	3	3	1	7	1	25
Val Marie Pasture	0	0	0	0	0	0	1	1
Grant Lands	0	0	0	0	0	0	0	0
Total Hits	4	8	4	4	1	10	2	
Figure for Data	Figure 11	Figure 10	Figure 13	Figure 12	Figure 13	Figure 14	Figure 13	
Plates of Tracks	Plate 3,4 & 5	Plate 6	Plate 7	Plate 8	Plate 9	Plate 10		

Figure 8: Location of the scent posts for the 1995 survey in the West Block area.

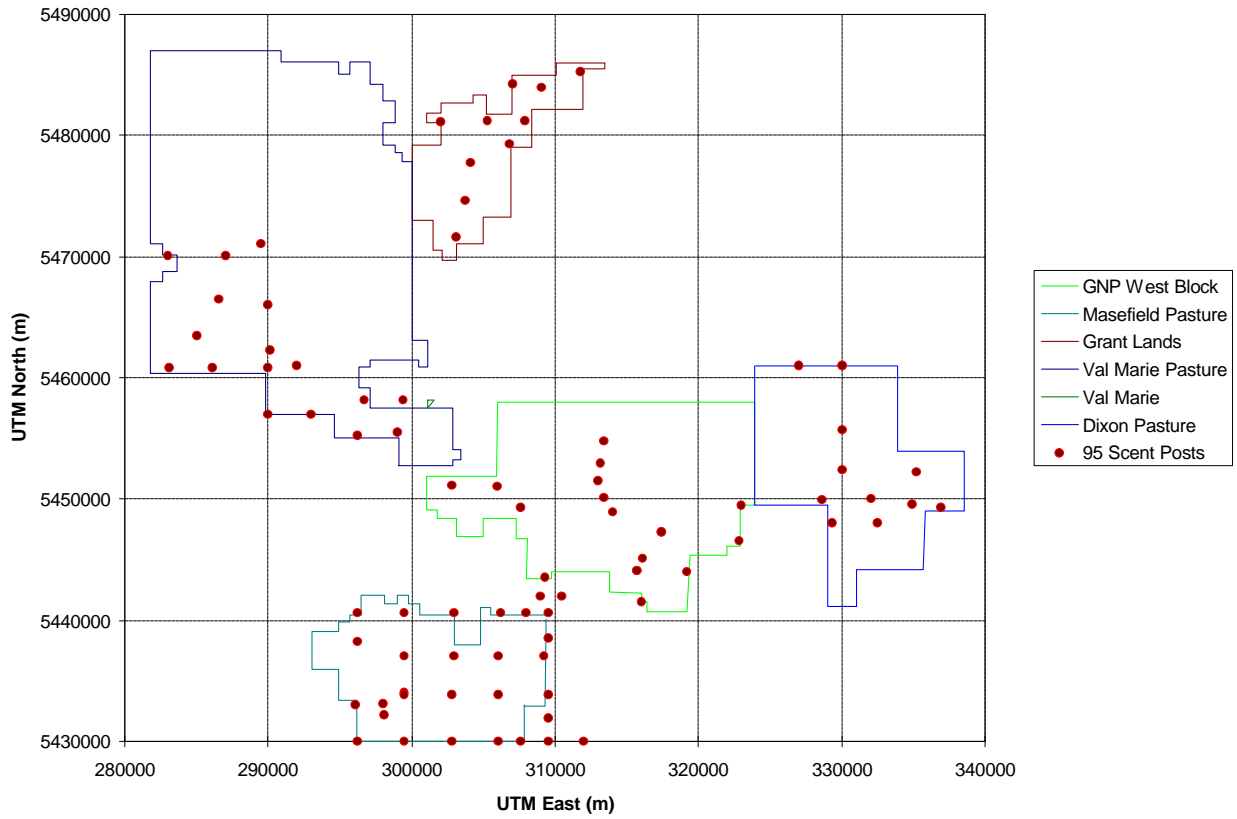


Figure 9: Daily Rainfall for the Environment Canada weather station 3.2 km east of Masefield PFRA pasture.

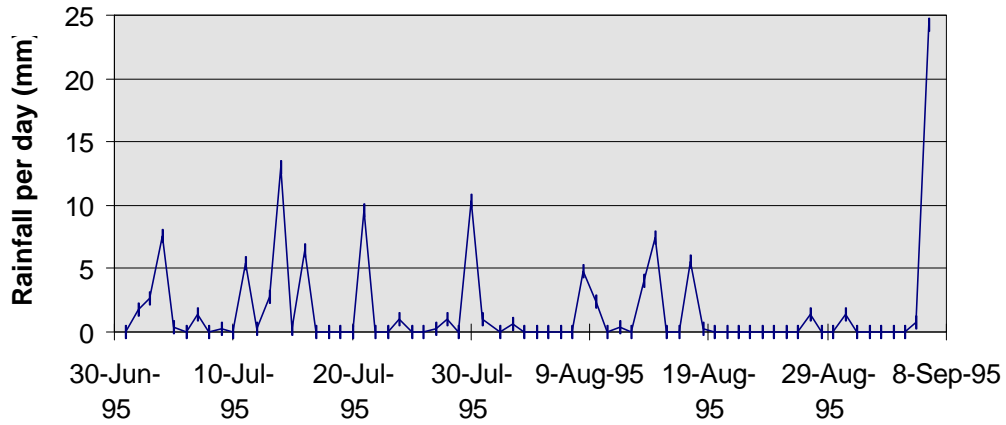


Figure 10: Summary of the Striped skunk visitations for the 1995 scent post survey.

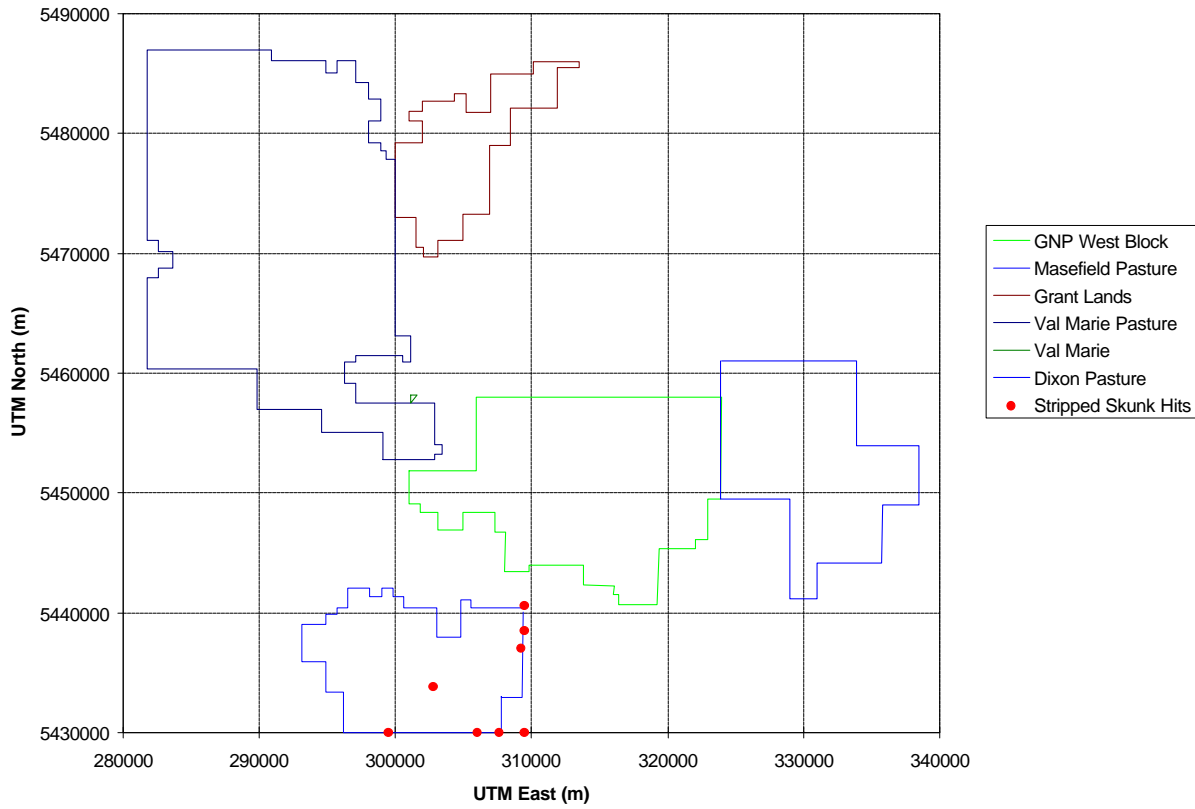


Figure 11: Summary of the Swift fox visitations for the scent post survey, 1995.

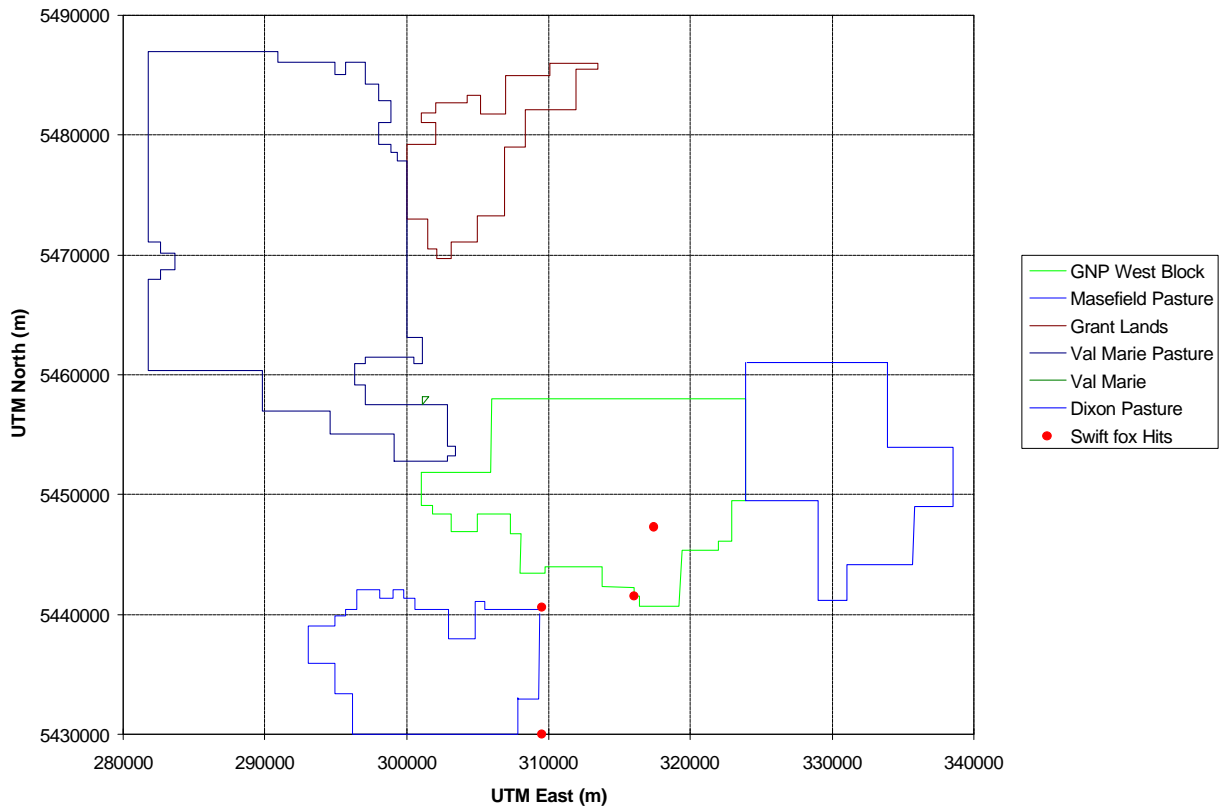


Figure 12: Summary of the Raccoon visitations for the scent post survey, 1995.

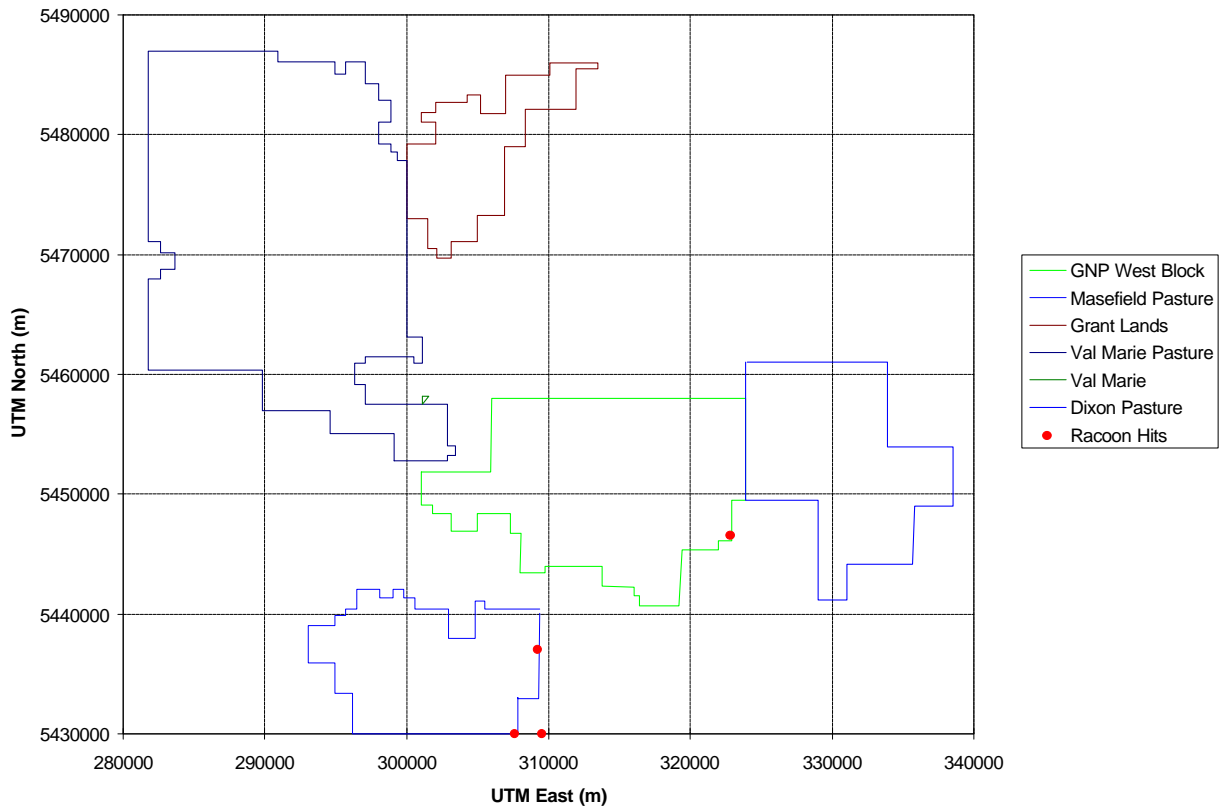


Figure 13: Summary of the Ground squirrel, coyote and 'other' visitations for the scent post survey 1995.

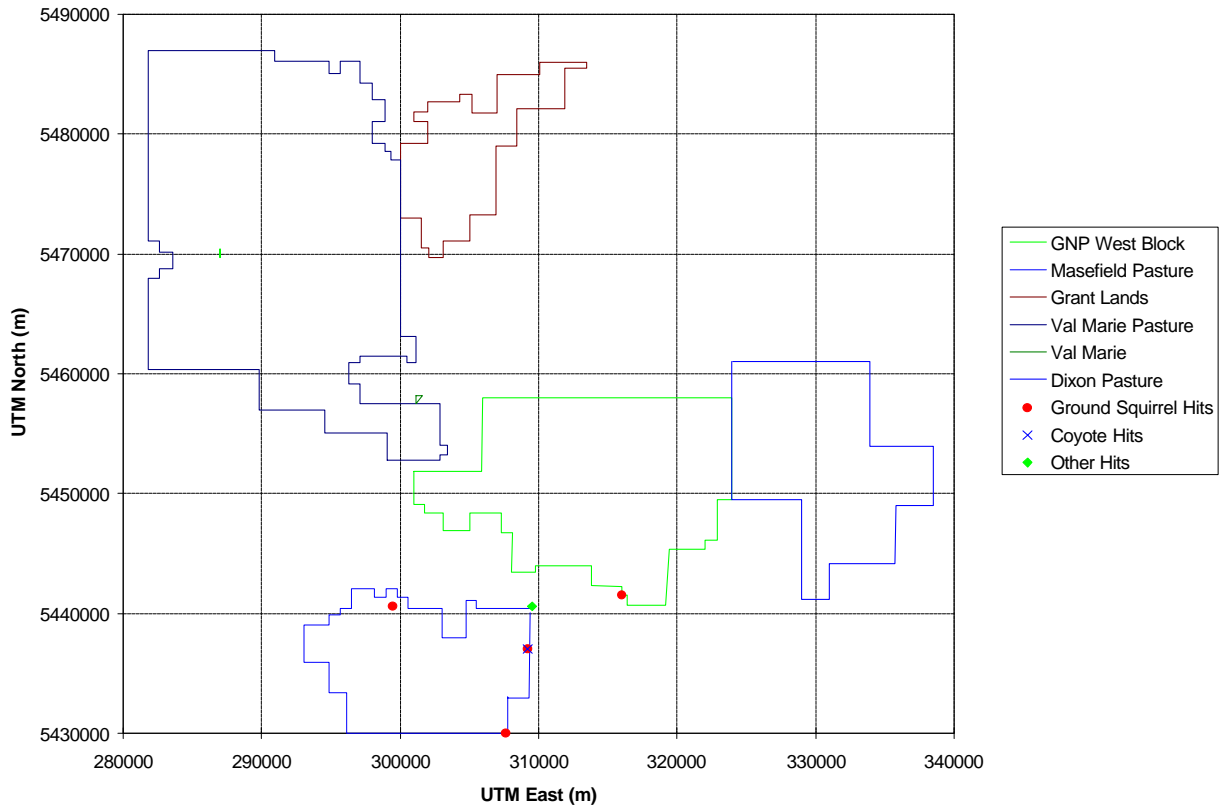
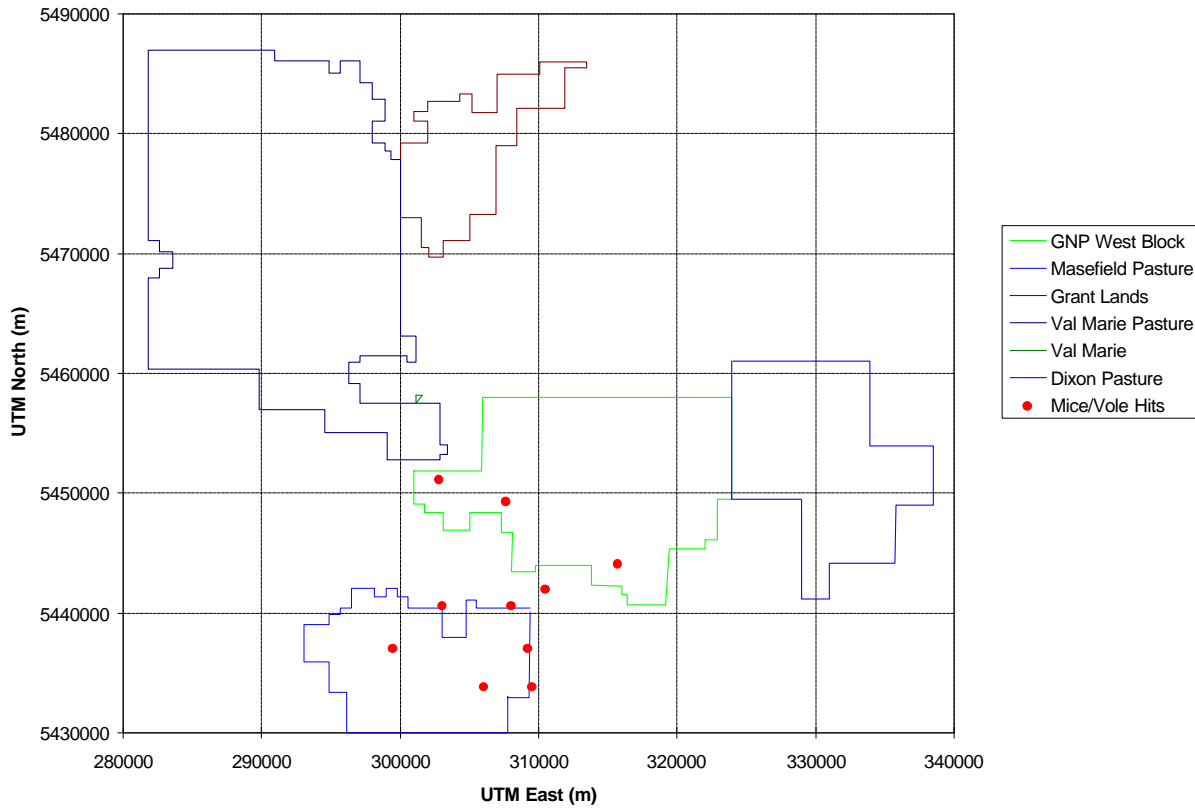


Figure 14: Summary for the mice/vole visitations for the scent post survey, 1995.



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The field comparison of tracking methods (sand vs. smoked aluminium) was inconclusive because of the lack of data. Our scent post locations were operated with sand and smoked aluminium side by side (Plate 3). Only one sand scent post had tracks. It was determined that this visitation was a Swift fox (Site K 12 - UTM 317400E, 5447300N). Of the 12 tracks recorded in this visitation only one was identifiable as Swift fox.

Clark and Campbell (1983) have commented on the difficulty in identifying tracks in sand and soil. Moehernshlager (personal communication, 1995) and Michie (personal communication, 1995) both indicated that some of the tracks recorded in sand and soil were difficult to identify with certainty. Table 9 provides the dimensions of tracks from three sources. This comparison of dimensions showed that the size of the tracks of Striped skunk, Swift fox and possibly ground squirrel were similar. Considering the similarity in size and shape it is hypothesised that if the tracking medium did not provide a perfect track, tracks could be incorrectly identified. Confusion between the Swift fox and striped skunk may be common if the toe pattern was not apparent. Seeing that the striped skunk was the second most common species found visiting the scent post, misidentification of its tracks for a Swift fox, could significantly bias the results of the survey. The use of smoked aluminium reduced the possibility of biasing the results as all tracks recorded were sharp enough to allow positive identification.

The large differences in the 1994 November survey visitations (19 Swift fox in 159 scent post nights) and the 1995 July/August survey (4 Swift fox visitations in 390 scent post nights) could be attributed to the two factors:

1. differences in the seasonal behaviour of Swift fox in relation to scent post visitations
2. misidentification of tracks on tracking mediums in past studies.

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If the factors affecting the seasonal variations in visitations of scent posts by San Joaquin Kit fox and the Grey fox apply to the Swift fox in the study area (fall visitation rate 84% higher than summer visitation rate for the San Joaquin Kit fox and 75% higher for the Grey fox), the conclusion drawn from the data collected in November 1994 by Michie (1994 a, c) and the present data would be that the population during the two periods was similar. If the possibility of misidentification of the tracks recorded on sand and sifted soil as compared to smoked sheet metal was considered the number of Swift fox visitations during the November 1994 survey may be lower than recorded, making the estimates of relative population size closer.

Table 9: Comparison of the track dimensions for the species found in the scent post survey.

Species	Source	Front		Rear	
		Length	Width	Length	Width
Ground Squirrel	Murie (1974)			2.8 cm	
Striped Skunk	Murie (1974)	2.5 cm		3.75 cm	
	Halfpenny (1986)	3.0 cm			
Swift fox	Murie (1974)	3.75	4.38 cm	4.38 cm	3.13 cm
	Halfpenny (1986)	2.5 cm			
Raccoon	Murie (1974)	5.6 cm		7.8 cm	
	Bang (1974)	7 cm		9 cm	
	Halfpenny (1986)	6.4 cm	6.4 cm	10 cm	6 cm
Coyote	Murie (1974)	6.25		5.6 cm	
	Halfpenny (1986)	5 cm			

A point of concern with the present study was the impact of the rain protection structure on the visitation to the scent posts. All scent posts monitored after August 2, 1995 had rain protection. The structure was tested at CEI and did not inhibit visitation by the Swift fox in the 9 hectare enclosure. To determine the impact of these structures in the field the number of visitations before and after August 2, 1995 were compared. Before that

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date there were 19 scent post visitations, by all species, to 27 scent posts for an average of 0.7 visitations/scent post. Once the rain protection structures were added there were 26 visitations, by all species, to a total of 52 scent posts for an average of 0.5 visitations/scent post. The relative closeness of the average visitations pre- and post-August 2, 1995 indicated the addition of the rain protective structures did not affected the visitation of the scent posts.

3.3.3 - Night Lighting

The dates and duration of night lighting are summarised in Table 10. The areas chosen to night light were in the proximity of the scent post visitations and known den sites. A summary of the Swift fox seen during the night lighting follows:

August 11, 1995	Family Group of 5	South of Belza's	UTM 316100E 5443400N
August 28, 1995	1 Swift fox	South of Belza's	UTM 315800E 5444500N
August 30, 1995	Possible Swift Fox	West of Dog town	UTM 305800E 5440050N

Table 11 summarises the sightings of animals other than Swift fox in the night lighting survey. These do not include the numerous sightings of deer, antelope or porcupines.

During the 1994 surveys Michie (1994,a and ,c) conducted a total of 28 hours of night lighting in Masefield Pasture and GNP West Block. During the present study 31.75 hours of night lighting were conducted in the same area. Michie sighted two Swift fox and in the present study a total of six Swift fox were spotted (and one possible sighting). Five of the Swift fox spotted in 1995 were in one area and were thought to be a family group. Although night lighting added to the general knowledge of the distribution of the Swift fox in the study area, it was labour intensive for the information gained.

Table 10: Summary of the night lighting in the West Block during the summer survey 1995.

Location	Route	Start Time	Finish Time	Total Hours
West Block	Belza to South	11-Aug-95 21:30	12-Aug-95 0:45	3:15
West Block	Belza to South	12-Aug-95 21:50	13-Aug-95 1:00	3:10
West Block	Belza to South	14-Aug-95 21:30	15-Aug-95 23:10	1:40
West Block	Belza to South	28-Aug-95 22:20	29-Aug-95 0:15	1:55
Masefield	Dog town and North	13-Aug-95 23:40	14-Aug-95 2:10	2:30
Masefield	Dog town and North	15-Aug-95 21:40	16-Aug-95 0:50	3:10
Masefield	Dog town and North	17-Aug-95 22:00	18-Aug-95 1:35	3:35
Masefield	Dog town and South	30-Aug-95 21:20	31-Aug-95 0:30	3:10
Masefield	Border & Central	31-Aug-95 21:30	01-Sep-95 0:45	3:15
Masefield	Dog town and North	01-Sep-95 21:30	02-Sep-95 0:20	2:50
Masefield	Dog town and North	03-Sep-95 21:30	04-Sep-95 0:45	3:15
Total Hours West Block				10:00
Total Hours Masefield				21:45

3.3.4. - Other Swift Fox Sign

One of the benefits of conducting an intensive scent post survey was that areas of Swift fox habitat are visited on a regular basis. During the visits a close watch was kept for other sign (tracks and fresh scat). During the field work fresh Swift scat was found near Scent post PC10 (UTM 309500E, 5440600N) at the north east corner of Masefield pasture and between scent posts PC 15 and PC 20 (UTM 297900E, 5434000N) in the west central area of Masefield Pasture.

Table 11: Summary of the animals seen during night lighting in the 1995 summer survey.

Area	Animals Observed
GNP West Block	6 coyotes
	14 white-tailed jack rabbits
	2 great horned owls
	7 porcupine
	2 raccoons
	3 short eared owl
	2 white-tailed jack rabbits
Masefield Pasture	3 coyotes
	1 burrowing owl
	2 golden eagle
	2 white-tailed jack rabbits

3.4 - Conclusions

Smoked sheet metal was found to be a suitable tracking medium for scent post surveys. It allowed for the positive identification of animal tracks but was high susceptible to rain damage.

The scent post surveys proved to be a labour intensive method of evaluating the Swift population in the West Block

area. Using scent posting to determine the absolute population numbers was inappropriate because of the low number of visitations recorded.

Comparison of the visitation data from the present study with data from other studies was questionable because of the differences in time of year and tracking medium. If the influence of these two factors on Swift fox visitation were considered the population level noted during July and August 1995 may be similar to that noted in November 1994.

Night lighting provided little additional information on which to evaluate the Swift fox population in the west block area of GNP.

Chapter 4 - Swift Fox Population Status West Block Area

Based on the data and analysis presented in this report it can be stated that there is a

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population of Swift fox in GNP West Block and Masefield PFRA Community Pasture.

The most compelling evidence of the population is the known location of a natal den site where a litter has been produced in both 1994 and 1995. Other known den sites have yet to be confirmed as natal dens.

Known Swift fox sightings are another positive sign of an establishing population. These sightings have occurred over a wide area including both GNP West Block and Masefield PFRA Community Pasture. Swift fox scat have also been found over a similar wide area indicating an expansion of the population from the relatively concentrated release area into surrounding suitable habitat.

At this point an estimate of the Swift fox numbers in this area can not be made. Considering the time of year scent post surveys were conducted in 1994 (November) and in 1995 (July/August) the data indicated the population levels may not have changed over substantially over the time period. Estimating the number of individuals in the population will require different survey methods than those presently available.

The comparison of the Swift fox data prior to 1995 from the East and West Block areas (Chapter 2) showed that release strategy developed and used in the West Block was more successful than that used in the East Block. The release methods should be further examined and developed to increase the success Swift fox releases.

With the lack of suitable method to determine the absolute population numbers, it is recommended that monitoring continue during two periods of the year. A winter survey (December to March period) should be planned on a yearly basis to do track counts, and possibly scent posting. A spring (May/ Early June) natal den survey should also be done on a yearly basis.

The winter survey is suggested because of the ability to track the animals when there is snow. This adds to the efficiency of the work and will return better results for the effort

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compared to surveys in the summer. The natal den survey is suggested to attempt to estimate breeding success in the wild. The data base on den site locations is growing year by year as new locations are added. A spring survey should occur before the litters leave the natal den so kit numbers can be estimated. The combination of the winter and spring survey will be particularly effective because if Swift fox are located in the February/March (breeding season) period they are most likely at the natal den site , these sites can be followed up in the spring survey.

Research is also needed on non-intrusive methods to census small populations of carnivores. A high priority should be put on methods that consider the welfare of the individual animal, as well as the population as a whole.

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Communications

Ludwig Carbyn, Research Scientist, Canadian Wildlife Service, Edmonton, AB

Jasper Michie, Wildlife Technician Volunteer, Canadian Wildlife Service, Edmonton, AB

Axel Moehrenschrager, Ph.D. Student, Oxford University, Oxford, England.

Jon Sharps, Wildlife Consultant, Box Elder, South Dakota.

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