

# **Blackfoot Swift Fox (*Vulpes velox*) Reintroduction & Monitoring Programme**

## **Fieldwork Report for May-October 2002**

**By**

**Siân S. Waters & David Ausband**

### **Introduction**

This project, which began in 1998, has released 123 captive bred swift fox up to and including the fifth release in 2002 (for information on all individuals released by CEI during the project see Appendix I). The population has been monitored but information is sparse. This report draws together the information available from previous fieldwork reports in order to facilitate information transfer for planners and funders and to aid future project fieldworkers. The fieldwork for 2002 attempted to estimate the productivity of the swift fox population by locating signs of swift fox and the distribution of active natal dens. Radio telemetry was used to track swift fox radio-collared since 1999. In August, live trapping was undertaken to trap and collar adult foxes in order to ascertain survivorship and movement and to aid in the locating of natal dens in the future.

In total 10 active swift fox natal dens were located. Data was also collected on the occurrence of red fox (*Vulpes vulpes*) natal dens on an opportunistic basis. The locations of red fox natal dens were documented as potentially useful for future research into canid ecology on Blackfoot Tribal Lands. Red fox are known to kill arctic fox (*Alopex lagopus*) juveniles in Sweden (Tannerfeldt *et al.*, 2002) but their effect on swift fox is not well known. Radio telemetry was undertaken from the ground and aurally. A number of collars were located from those individuals released in 2001. Radio collars from 1999 were still active until July but collars from 2000 had apparently ceased to function. Trapping was rather unsuccessful due to the time of year and abundant food supply including an epidemic year for grasshopper abundance. Recommendations for future fieldwork and improvements in project management are made.

### **Previous Fieldwork**

The first releases in 1998 were of thirty juvenile, un-collared foxes. These animals were followed up by a sign survey which ascertained in the spring of 1999 that animals had already begun to breed (Carpenter & Crawford, 1999).

In 1999, the University of Montana donated eight collars to the project and these were fitted to adult animals being released that year. Of the eight animals radio collared, two were killed within the first 14 days of the release (Bremner, 1999). Signals from the radio collars of the remaining six animals were all located in June 2002 and were last located in July 2002.

Sixteen foxes were radio collared in 2001 out of 31 who were released. These animals were part of a study on survivorship being undertaken by PhD

student, Samantha Bremner. The collars used were of British manufacture and were probably developed for the European red fox as they were heavier and larger than those manufactured by ATS. Ms Bremner followed these animals until late September of 2001 and again in February/March 2002. They were also followed throughout the year by Brian Crawford and Roian Matt. Data collected during this period were sparse and poorly reported. However, the monitoring was not facilitated by the fact that the collars used did not have mortality sensors fitted making it almost impossible for fieldworkers to ascertain if an animal was dead or denned. Dates for those foxes found dead do not appear to have been reported. SW last heard a signal from one of these collars (150.396) on 29<sup>th</sup> August 2001. Since that date, none of the collars have been heard transmitting, leading us to assume that they are now defunct. Apparently, these are breakaway collars and the collar itself, which is made of leather, wears out and drops off after a period of two years (S. Bremner, pers. comm.).

Twenty-five swift fox were released in 2001 of which eleven animals were radio-collared. These individuals were monitored for a week post-release. Twenty-two juvenile swift fox were released in September 2002. Six of these animals were radio collared. These animals were monitored during September and for two days in October 2002. Identification information on all these individuals is included in Appendix I.

Fieldwork was due to continue as part of a PhD project by the first author in 2001. A car accident prevented this and fieldwork did not resume on the project until 31<sup>st</sup> May 2002 when the authors were employed by Defenders of Wildlife to monitor the swift fox population on the Blackfeet Tribal Lands from June to September 2002. SW undertook a further two days of fieldwork in October 2002. The Cochrane Ecological Institute (CEI) provided an SUV without which it would have been impossible to cover so much ground. The CEI also provided a number of volunteer biologists to work with SW in the field.

## **Results**

### **Natal Den Survey**

When the field team arrived on May 30<sup>th</sup> 2002, the foxes had already denned and given birth but the cubs were still underground. The first task was to locate past natal dens reported by Bremner (2000) and Matt and Crawford (2001) and observe whether they were still active. Of six dens reported in 2000 and 6 reported in 2001, three were still in use. The location data for some natal dens reported in 2001 were muddled. Surveys were then undertaken of areas where living or dead swift fox had been previously reported – these were Mission Lake and the surrounding area, the area around the Teton (Molly Nipple) Road and areas of suitable habitat near the den at E. Glacier. Other areas of apparently suitable habitat were also surveyed and included many areas north of Browning and north west of Cut Bank, areas around Hwy 444 to Del Bonita and areas around hwy 89 south just beyond Dupuyer. Radio telemetry was also undertaken during these surveys.

Swift fox natal dens are difficult to locate because of the large areas to be covered. Once located, however, they are distinctive in the first few weeks because of the presence of swift fox hair or fluff caught around vegetation near the hole. The female plucks this fluff from her abdomen in preparation for the birth (Clio Smeeton, pers. comm.). This fluff attaches to vegetation above the entrance hole and, along with sign of scat, is a relatively easy method of ascertaining that it is indeed a natal den and not just a den (these dens are those holes which are used by swift fox throughout the year). The fluff is also very resilient to high winds and will remain in some instances for up to 4 weeks. Samples of this hair were taken in case it might be possible to ascertain the identity of the individual from DNA analysis. During July, the cubs were very often above ground, which meant they were easier to spot from a vehicle (fieldworkers on foot tended to scare the cubs who would then go underground). In August, dens with cubs were more obvious from the ground due to a heavy trampling of earth around the den area; large amounts of scat and, in one case, uneaten prey items. When a natal den was located, a GPS location was taken and if easily observed from a vehicle, the den was frequently checked during the season to ascertain whether it was still in use (See Appendix II for detailed information). Red fox dens were also located on an opportunistic basis. We attempted to identify natal dens from the air in August using the method described by Marsha Sovada (the appearance from the air of a "wagon wheel" due to trails radiating from the den site but the grass was too short and this method may not be suitable in this type of pasture due to xeric conditions).

Ten natal dens were located by the field team (see Table I). This gives a minimum of ten breeding pairs or twenty individuals. A total of 31 cubs were observed thus giving a minimum of 51 animals. There was an average of 3.1 cubs per den if all dens are included and 4.4 per den if only those dens where cubs were observed were included. Data from these natal dens is presented in Table I.

**Table I**  
**Swift Fox Natal Den Locations**

| Den Site | Date Located | Description                     | UTM                  | Adults Observed | No of Cubs | Moved Dens               | Evidence                          |
|----------|--------------|---------------------------------|----------------------|-----------------|------------|--------------------------|-----------------------------------|
| 1*       | 30/5/02      | Off Hwy 2 E Glacier             | 0340563E<br>5370315N | 2               | 6          | Yes - 1 other den in use | Scat, belly fluff                 |
| 2**      | 3/6/02       | Off track to AMS                | 0383374E<br>5375252N | 2               | 3          | Yes- 1 other den in use  | Scat, belly fluff                 |
| 3***     | 27/6/02      | Off Hwy 89                      | 0372228E<br>5367436N | 2               | 6          | Yes 2 other dens in use  | Cubs seen                         |
| 4        | 4/6/02       | Off Lenoir Rd                   | 0387619E<br>5370863N | 1               | ?          | Unknown                  | Swift fox seen, scat, belly fluff |
| 5        | 5/4/02       | East side of Fenners' ranch     | 0384908E<br>5376601N | 1               | ?          | Unknown                  | Scat, belly fluff                 |
| 6        | 6/6/02       | Entrance of Gustafson's ranch   | 0373983E<br>5371775N | 1               | 5          | Unknown                  | Cubs                              |
| 7        | 26/6/02      | Junct. 89/Teton Rd              | 0384708E<br>5358099N | 0               | 4          | Unknown                  | Cubs                              |
| 8        | 26/6/02      | Teton Rd/irrigation canal track | 0388578E<br>5358154N | 0               | 6          | Unknown                  | Cubs                              |
| 9        | 8/8/02       | Johnson's Ranch                 | 0377743E<br>5369751N | 0               | ?          | Unknown                  | Scat (cubs)                       |
| 10       | 9/8/02       | Field opp junct. 89/Teton Rd    | 0083458E<br>5358192N | 1               | 1          | Unknown                  | Swift fox seen and cub trapped    |

\*Previously reported as having denned there from 2000

\*\* Previously reported as having denned there from 2001

\*\*\* Previously reported as having denned on opposite side of road in 2001

Swift fox cubs and adults were still present in some dens in September. Four cubs and both adults were seen at Den Site 1 near E. Glacier on 10<sup>th</sup> September and four animals were seen at Den Site 2 (AMS ranch) on 9<sup>th</sup> September. These individuals were all adult sized but only three cubs had been reported from this den site so at least two of them could have been cubs. No activity was observed at den site 3 and there was fresh coyote scat around the holes. At den site 10, two carcasses were located and no other activity was observed. In October, no sign of activity was observed at Den Site 2 but Site 1 had plentiful fresh scat around the main holes.

Four red fox dens were located and these data are presented in Table II below. The sample size for red fox dens is smaller but nevertheless these data give an average of 2.5 cubs per den if all dens are counted and 3.33 cubs per den if only those dens where cubs were observed are included.

**Table II**  
**Red Fox Natal Den Locations**

| Den Site | Date    | Location                          | UTM                  | Adults | No. of Cubs | Sign      |
|----------|---------|-----------------------------------|----------------------|--------|-------------|-----------|
| 1        | 28/6/02 | Off Hwy 444                       | 0370852E<br>5400390N | 1      | 5           | Cubs Seen |
| 2        | 30/6/02 | Cultivated land near Mission Lake | 0383394E<br>5385114N | 0      | 2           | Cubs Seen |
| 3        | 9/7/02  | Off Mission Rd                    | 376253E<br>537320N   | 2      | 3           | Cubs seen |
| 4        | 11/8/02 | Junct 89/Joe Show East            | 0366933E<br>5370286N | 2      | 0           | Den Found |

### Non-Natal Dens

Whilst searching for natal dens all signs of swift fox dens were noted. Those dens were mainly near natal dens and most had not been used for some time. Five of these dens were found and the details are documented in Table III below.

**Table III**  
**Swift Fox Non-Natal Dens**

| Date   | Location                              | UTM                  | Signs         |
|--------|---------------------------------------|----------------------|---------------|
| 5/6/02 | Lenoir Rd                             | 0387736E<br>5370752N | Hair          |
| 5/6/02 | East of Den site 5                    | 0385111E<br>5376291N | Hair and Scat |
| 6/6/02 | NW of Johnson's Ranch                 | 0379686E<br>5370317N | Hair          |
| 7/6/02 | AMS Ranch (top cattle grid)           | 0383629E<br>5375455N | Fresh Scat    |
| 7/6/02 | AMS Ranch                             | 0381898E<br>5374704N | Old Scat      |
| 7/6/02 | High up on SE side of AMS             | 0384478E<br>5372791N | Old Scat      |
| 8/8/02 | Track from 89 towards Johnson's Ranch | 0377743E<br>5369751N | Old Scat      |

## Sightings

Only three sightings of un-collared swift fox aside from adults at natal dens were made. One individual seen at night at the AMS cattle grid appeared very similar to the male Jinx released last year (2001). This animal had uncharacteristically short legs. However, without trapping and checking the animal for a tattoo this observation could not be verified. The sighting of the adult on Teton Road was uncharacteristic as this animal was actively hunting and marking territory early on a very hot afternoon. Interestingly this individual was lame on the foreleg. This injury is characteristic of adults with cubs (SW pers. obs.). A natal den was later found quite close to the spot where we had seen this animal (Den Site 8). Sightings of un-collared individuals are presented in Table IV below.

**Table IV**  
**Sightings of Un-collared Swift Fox (Not at Natal Den Sites) in 2002**

| Date    | Time  | Location                       | UTM                  | Adult? | Behaviour                 |
|---------|-------|--------------------------------|----------------------|--------|---------------------------|
| 6/6/02  | 23.45 | AMS Cattle grid                | 0381898E<br>5374704N | Yes    | Fled                      |
| 26/6/02 | 14.10 | Teton Road                     | 0389443E<br>5357641N | Yes    | Did not flee<br>- hunting |
| 26/6/02 | 19.10 | Near Junct<br>Teton Rd &<br>89 | 0386098E<br>5357848N | Yes    | Fled                      |

## Radio Telemetry

Exhaustive attempts were made by the field team to locate radio-collared animals in vehicles and on foot. DA travelled over 2,000 miles during July when SW was not present. Before the 2002 release, the team was trying to locate those animals released in 2000 and 2001. Radio collars and some carcasses were recovered from releases in 2001 but no signals from 2000 collars were ever heard. Results from radio collars recovered immediately after the release in 2001 are also included in Table V below. Many of the carcasses recovered were too decomposed to give much information regarding the cause of death. A high number of discarded collars were also located with no evidence of a carcass at the location of the collar. Carcasses recovered in 2001 were placed in the freezer at the Blackfeet Fish & Wildlife office for future autopsies. However, directly after the 2002 releases we had the services of a qualified veterinary technician, Maria Elisa Hobbelink. Ms Hobbelink performed field autopsies on both the carcasses located during the 10 days after release. A canid had killed one animal and the other had died of injuries received after a collision with a vehicle.

Aerial telemetry was undertaken twice. The first attempt in August was also a trial run to ascertain if collars hidden underground could be located. This proved to be the case with collars hidden less than a foot below the surface but collars hidden 2-3 feet underground proved impossible to locate.

However, collars lying on the surface were located easily and accurately from the air. The collar of 150.805 was located in this way. However, the collar of 150.686, which was easily heard from the air, was not heard even faintly when in the area and surrounds of the GPS location obtained aurally. This may be because the collar is underground. A second flight took place on 14th October after 1800 hours in the hope of locating more collars. Three collars were heard from living animals (150.625, 150.853 and 150.883) whilst a fourth collar (150.723) was heard emitting a mortality signal. The GPS location for this collar was slightly misleading on the ground but the signal can clearly be heard farther to the south east of the area. SW did not have time to locate this collar but it should not be difficult to find. The data for radio-collared swift fox located in 2002 is presented in Table V below. There are now only two collars from 2001 which have not been located and whose fate is unknown. Another two of those collars are emitting mortality signals. A total of five carcasses have been recovered.

**Table V**  
**Radio Collared Swift Fox Located in 2002**

| Year of Release | Frequency | When Last Located Alive | Where Last Located Alive                    | When Mortality Signal Heard | Situation       | UTM of Collar or Carcass                | Cause of Death? |
|-----------------|-----------|-------------------------|---|-----------------------------|-----------------|---|-----------------|
| 1999            | 150.073   | 10/7/02                 | S Mission Rd, 1m W of AMS *                 | N/A                         | N/A             | N/A                                     | N/A             |
| 1999            | 150.147   | 10/7/02                 | Due N of Mission Rd – .5 m east Monroe Den* | N/A                         | N/A             | N/A                                     | N/A             |
| 1999            | 150.155   | 9/7/02                  | NW of 89, mile marker 98*                   | N/A                         | N/A             | N/A                                     | N/A             |
| 1999            | 150.163   | 9/7/02                  | S of 89, mile marker 98*                    | N/A                         | N/A             | N/A                                     | N/A             |
| 1999            | 150.173   | 10/7/02                 | Due N of Mission Rd – .5 m east Monroe Den* | N/A                         | N/A             | N/A                                     | N/A             |
| 1999            | 150.184   | 19/6/02                 | S. of Mission Rd.*                          | N/A                         | N/A             | N/A                                     | N/A             |
| 2001            | 150.686   | 25/9/01                 | Release Site                                | Not located Since           | N/A             | N/A                                     | N/A             |
| 2001            | 150.704   | 30/8/01                 | 0380295E 5374338N                           | 30/8/01                     | Collar only     | 0380295E 5374338N                       | N/A             |
| 2001            | 150.723   | 28/8/01                 | Release Site                                | 14/10/02                    | Not yet located | 0385841E 5388314N - SW of this location | ?               |

| Year of Release | Frequency | When Last Located Alive | Where Last Located Alive                                | When Mortality Signal Heard | Situation                | UTM of Collar or Carcass            | Cause of Death?       |
|-----------------|-----------|-------------------------|---|-----------------------------|--------------------------|-------------------------------------|-----------------------|
| 2001            | 150.765   | 28/8/01                 | 0380888E<br>5373731N<br>(AMS .25 mile south of bridge)  | 28/08/01                    | Carcass                  | 0380888E<br>5373731N                | Predator - Raptor     |
| 2001            | 150.793   | 27/8/01                 | Release Site  | 1/8/02                      | Badly chewed collar      | 0384707E<br>5357092N                | ?                     |
| 2001            | 150.805   | 29/8/01                 | Release site  | 8/8/02                      | Collar and spinal column | 0377962E<br>5369603N<br>(Johnson's) | Possibly bird of prey |
| 2001            | 150.814   | 25/8/01                 | Release Site  | 3/6/02                      | Decomposed carcass found | 0377642E<br>5375224N                | Unknown               |
| 2001            | 150.824   | 29/8/01                 | Release Site  | Not Located Since           | N/A                      | N/A                                 | N/A                   |
| 2001            | 150.833   | 28/8/01                 | 0381041E<br>5373726N<br>East of track over bridge – AMS | 28/8/01                     | Carcass                  | 0381041E<br>5373726N                | Predator - Canid      |
| 2001            | 150.845   | 28/8/01                 | Release Site  | 21/6/02                     | Chewed Collar Only       | 0376418E<br>5373326N                | ?                     |
| 2001            | 150.863   | 27/8/01                 | Release Site  | 8/8/02                      | Not Located              |                                     | ?                     |
| 2002            | 150.625   | 14/10/02                | 0379086E<br>5372739N                                    | N/A                         | N/A                      | N/A                                 | N/A                   |
| 2002            | 150.644   | 13/9/02                 | AMS ranch   | 13/9/02                     | Carcass                  | 0380167E<br>5373852N                | Predator - Canid      |
| 2002            | 150.744   | 11/9/02                 | Release site towards Johnsons                           | N/A                         | N/A                      | N/A                                 | N/A                   |
| 2002            | 150.784   | 16/9/02                 | Release Site  | N/A                         | N/A                      | N/A                                 | N/A                   |
| 2002            | 150.853   | 14/10/02                | 0366941E<br>5388843N<br>(Hwy 2 – W of granary)          | N/A                         | N/A                      | N/A                                 | N/A                   |
| 2002            | 150.874   | 16/9/02                 | W AMS   | N/A                         | N/A                      | N/A                                 | N/A                   |
| 2002            | 150.883   | 14/10/02                | 0371461E<br>5368546N                                    | N/A                         | N/A                      | N/A                                 | N/A                   |

\* Dave Ausband did not have access to a GPS when SW was not in the field



## Deaths of Un-collared Foxes

Six un-collared foxes were found dead (see Table VI below). Many of these were in an extremely decomposed state such that it was impossible to even tell the sex of the dead individual. The animals from Den Site 10 were found dead in unusual circumstances. Both carcasses were very decomposed. The animals had died after 17<sup>th</sup> August as both authors had visited the den site on that day. The animals were very close to the den entrance and about 18" apart. No skulls could be located in the area for either of these animals and so it was impossible to estimate their age.

The un-collared animal whose body was recovered by a water analysis consultancy team had been released a few days earlier and so its tattoo was clearly readable. The animal had an old bite wound on its inner thigh. A recently released individual had been observed heading up the hill from the AMS ranch house area the previous night. This individual was limping on the back leg. An accurate location is not available for this carcass, but the people who brought the body to us reported that they had found it on the Lenoir Road close to the junction with the Hugo Aronson Road. (See Appendix III for details of autopsy).

**Table VI**  
**Deaths of Un-collared Foxes**

| <b>Date Found</b> | <b>Approx Age</b> | <b>Sex</b>     | <b>Tattoo?</b>   | <b>Location</b>   | <b>Cause of Death?</b> |
|-------------------|-------------------|----------------|------------------|---|------------------------|
| 31/5/02           | Juvenile?         | Too decomposed | No               | Hwy 1.5 m east of E. Glacier den site N98 29' 29.5 W113 07'38.1 | Road traffic accident  |
| 5/8/02            | Cub               | Too damaged    | No               | 0372107E<br>5367363N<br>(den site off 89)                       | Road traffic accident  |
| 9/9/02            | No skull present  | Too decomposed | No skull present | 0083458E<br>5358192N<br>(Den Site 10)                           | ?                      |
| 9/9/02            | No skull present  | Too decomposed | No skull present | 0083458E<br>5358192N<br>(Den Site 10)                           | ?                      |
| 14/9/02           | Cub               | Too decomposed | Too decomposed   | 0340594E<br>5370359N<br>(E. Glacier den site)                   | Road traffic accident  |
| 13/9/02           | Released Juvenile | Male           | Yes - 13S - Melo | Lenoir Rd but exact location unknown as body was brought to us  | Road traffic accident  |

### Hair Trapping

Some hair trapping was undertaken and samples were taken from den sites 1 and 3. The DNA analysis for hair and scat will only be available until April 2003 after which a fee will have to be paid for each sample. Hair samples from trapped individuals and from natal den fluff were sent to Trent University in Ontario in October. Results are awaited.

### Live Trapping

Trapping was carried out from 31<sup>st</sup> July to 17<sup>th</sup> August. Except for one adult female, all other individuals trapped were cubs. Traps were set at known natal dens from 1800 and were checked at hourly intervals. The traps were then retrieved at approximately 00.30. The traps were coyote traps and very large. As well as being difficult to transport they also caused the handling process to be more stressful for the foxes than should have been the case. The animals trapped are detailed in Table VII. The first cub trapped at a natal den was weighed and hair samples were taken. Cubs were not collared at the time, as they were too small. After one cub had already been trapped and handled at a natal den, any others trapped were released immediately without handling in order to alleviate as much stress as possible on the animals. The adult female trapped at den site 3 was weighed, ears checked for a tattoo and then a radio collar was fitted. The frequency of this collar is 150.883. This female was last located near den site 3 on 14<sup>th</sup> October 2002.

**Table VII – Results of Live Trapping Efforts in August 2002**

| Date     | Den Site No. | Age   | Released Before Handling? | Sex    | Weight (lbs) | Tattoo | Hair Taken | Collared?     |
|----------|--------------|-------|---------------------------|--------|--------------|--------|------------|---------------|
| 7/8/02   | 3            | Cub   | No                        | Female | 5.4          | No     | Yes        | No            |
| 8/8/02   | 3            | Cub   | Yes                       | ?      | ?            | No     | No         | No            |
| 48/8/02  | 3            | Adult | No                        | Female | 5.8          | No     | Yes        | Yes – 150.883 |
| 9/8/02   | 1            | Cub   | No                        | Female | 4.4          | No     | Yes        | No            |
| 11/8/02  | 1            | Cub   | Yes                       | ?      | ?            | No     | No         | No            |
| 11/8/02  | 1            | Cub   | Yes                       | ?      | ?            | No     | No         | No            |
| 11/8/02  | 1            | Cub   | Yes                       | ?      | ?            | No     | No         | No            |
| 12/8/02  | 1            | Cub   | Yes                       | ?      | ?            | No     | No         | No            |
| 13/12/02 | 10           | Cub   | Yes - escaped             | ?      | ?            | No     | No         | No            |

### Unscheduled Releasing of Swift Fox

It came to our attention that two swift fox bred at a zoo in the US were released on Blackfeet Tribal Lands in June or July 2002. These animals were released by Craig Knowles who has since stated that he had permission from Blackfeet Fish & Wildlife. The animals concerned were apparently trained to use a portable protection shelter (PPS) at the zoo where they were born. This

may have been the case but is immaterial as no PPS was used for these releases. The animals were “surplus” zoo stock. They were not marked in any way that they could be identifiable if found in the field because they were transponded and a transponder reader is not part of this project’s equipment. The field team was not informed in any way about this release. Another individual from the Pueblo Zoo was then scheduled for release on 8<sup>th</sup> September 2002. After consultation between SW and Pueblo Zoo staff, it was agreed that this animal was completely unprepared for life in the wild. The release was cancelled and the animal offered to CEI for inclusion into the breeding colony. These unplanned releases bring the project into disrepute. They also contravene the IUCN Reintroduction Guidelines (IUCN, 1995) that state the possession of surplus stock is not a reason to release captive bred animals. The animals were not marked so could not be monitored in any way and the established best practice of releasing captive bred foxes into the wild was not followed. It would have been much more honest for the zoo in question to have euthanased these animals or to have sent them to CEI where their progeny would have received appropriate pre-release training and then been released. This practice of releasing poorly prepared foxes is inhumane and should be actively discouraged in the future.

### **Conclusion**

Swift fox are undoubtedly surviving and breeding on Blackfeet Tribal Lands. Six of the captive bred released animals from 1999 were still alive in June/July of 2002. Results from 2000 were incomplete. An increase in the number of natal dens located means that there are at least 10 breeding pairs of swift fox and at least six other adults of potential breeding age surviving making a minimum population total of 57 animals without the 2002 releases. In depth research on wild born cub mortality did not form a part of this study, but human-induced mortality in the form of road traffic accidents were a factor for juveniles whose natal dens were located beside major highways. Swift fox are a difficult species to monitor and a combination of methods should be used for monitoring this population. These should include hair trapping, continuation of radio telemetry monitoring (that was quite effective aurally) of those individuals already collared, monitoring of natal den sites described in this report and the location of future natal dens.

### **Recommendations**

- Future fieldwork should consider looking at rates of wild born cub mortality, as this will be an important factor in estimating the long-term sustainability of the population.
- A suitably qualified individual needs to be identified to carry out autopsies on dead animals so that they are carried out with the minimum of delay. This is an important information resource and a longstanding issue that needs to be addressed.
- The team leader in the field should be given more autonomy regarding fieldwork and more responsibility for decisions regarding the ordering of project equipment. The team leader should be informed as to the amount of funding available and should then organise the fieldwork

accordingly in consultation with the biologist responsible from Blackfoot Fish & Wildlife.

- Field crew should be outfitted with hand-held GPS units.
- Should more animals be released on this site, they should continue to be radio collared in order to ascertain survivorship and dispersal distances in compliance with IUCN guidelines.
- Make a GIS map of the reservation and surrounding lands available so that fieldworkers can identify potentially suitable habitat for surveys.
- Make available a map of land tenure to facilitate relationships with landowners.
- The potential for competition between swift and red fox for den sites and resources in general could be a focus for research.

### References

Bremner, S. 1999. *Report on the 1999 Swift Fox Releases onto the Blackfoot Tribal Lands, Montana*. Unpub. Report for CEI, DOW, BF&W and Montana State Fish, Wildlife & Parks Service.

Carpenter, M. & Crawford, B. 1999. *Sign Survey of the AMS Ranch for Swift Fox and Other Species*. Unpub. Report for CEI and Defenders of Wildlife.

CEI. 2000. *Report on the 1999/2000 Survival, Reproduction and Reintroduction of Swift Foxes Released onto the Blackfoot Tribal Lands, Montana*. Unpub. Report.

IUCN. 1995. *Guidelines for Reintroduction*. IUCN, Gland, Switzerland.

Matt, R. & Crawford, B. 2001. Unpub. Report to Defenders of Wildlife.

Tannerfeldt, M., Elmhagen, B. & Angerborn, A. 2002. Exclusion by interference competition? The relationship between red and arctic foxes. *Oecologia* 132:213-220.

### Acknowledgements

We are indebted to Clio Smeeton of the CEI for the use of a vehicle throughout the fieldwork season. We are grateful to Dan Carney of Blackfoot Fish & Wildlife for help with malfunctioning radio telemetry equipment. CEI volunteer field assistants whose help was invaluable were Claudia Alonso, Maria Elisa Hobbelink, Colette Holden and Nisha Owen. We thank Bill and Lara of the AMS Ranch for their hospitality whilst camping on the ranch. We are indebted to Sean and his colleague of the water analysis consultancy team for finding and bringing us an un-collared dead fox that would otherwise have gone undetected.

## Appendix I

### Swift Fox from Cochrane Ecological Institute Released on Blackfeet Tribal Lands 1998-2002

| Year Released | Age      | Sex    | Tattoo | Name          | Collar  | Dead?   |
|---------------|----------|--------|--------|---------------|---------|---------|
| 1998          | Juvenile | Female | S932   | Ingenué       | No      |         |
| 1998          | Juvenile | Female | S910   | Icicle        | No      |         |
| 1998          | Juvenile | Male   | S929   | Ignite        | No      |         |
| 1998          | Juvenile | Male   | S933   | Idle          | No      |         |
| 1998          | Juvenile | Male   | S934   | Imbroglío     | No      |         |
| 1998          | Juvenile | Female | S931   | Illyria       | No      |         |
| 1998          | Juvenile | Male   | S927   | Illiad        | No      |         |
| 1998          | Juvenile | Male   | S900   | Icon          | No      |         |
| 1998          | Juvenile | Male   | S901   | Inubis        | No      |         |
| 1998          | Juvenile | Male   | S902   | Impi          | No      |         |
| 1998          | Juvenile | Male   | S919   | Ingot         | No      |         |
| 1998          | Juvenile | Male   | S920   | Impervious    | No      |         |
| 1998          | Juvenile | Male   | S921   | Indulgence    | No      |         |
| 1998          | Juvenile | Male   | S922   | Isaac         | No      |         |
| 1998          | Juvenile | Female | S903   | Inga          | No      |         |
| 1998          | Juvenile | Female | S904   | Iris          | No      |         |
| 1998          | Juvenile | Female | S905   | Iridescence   | No      |         |
| 1998          | Juvenile | Female | S906   | Ingrid        | No      |         |
| 1998          | Juvenile | Female | S909   | Ibiza         | No      |         |
| 1998          | Juvenile | Male   | S907   | Ibinbatuta    | No      |         |
| 1998          | Juvenile | Male   | S908   | IbrahimPasha  | No      |         |
| 1998          | Juvenile | Female | S911   | Isadora       | No      |         |
| 1998          | Juvenile | Female | S912   | Isolde        | No      |         |
| 1998          | Juvenile | Female | S914   | Ivory         | No      |         |
| 1998          | Juvenile | Male   | S913   | Isiah         | No      |         |
| 1998          | Juvenile | Male   | S915   | Ivanhoe       | No      |         |
| 1998          | Juvenile | Male   | S916   | Ivan          | No      |         |
| 1998          | Juvenile | Male   | S926   | Ivor          | No      |         |
| 1998          | Juvenile | Female | S917   | Isabel        | No      |         |
| 1998          | Juvenile | Female | S918   | Iona          | No      |         |
| 1999          | 1 year   | Male   | S937   | Inquiry       | 150.173 | No      |
| 1999          | 1 year   | Female | S923   | India         | 150.193 | 1/9/999 |
| 1999          | 1 year   | Male   | S928   | Ira           | 150.163 | No      |
| 1999          | 1 year   | Female | S936   | Inamorata     | 150.155 | No      |
| 1999          | 1 year   | Male   | S925   | Indiana Jones | 150.147 | No      |
| 1999          | 2 years  | Female | S578   | Hedwig        | 150.184 | No      |
| 1999          | 5 years  | Male   | S448   | Epharisto     | 150.093 | 7/9/99  |
| 1999          | 3 years  | Female | S553   | Georgina      | 150.073 | No      |
| 1999          | 1 year   | Male   | S919   | Ingot         | No      |         |
| 1999          | 2 years  | Female | S599   | Halma         | No      |         |
| 1999          | 1 year   | Male   | None   | Hellfire      | No      |         |
| 1999          | 4 years  | Female | S486/7 | Farrah        | No      |         |
| 1999          | Juvenile | Male   | S939   | Jaspar        | No      |         |
| 1999          | Juvenile | Female | S943   | Jessica       | No      |         |

| <b>Year Released</b> | <b>Age</b> | <b>Sex</b> | <b>Tattoo</b> | <b>Name</b>  | <b>Collar</b> | <b>Dead?</b> |
|----------------------|------------|------------|---------------|--------------|---------------|--------------|
| 1999                 | Juvenile   | Male       | S945          | Julian       | No            |              |
| 2000                 | Juvenile   | Female     | S952          | Konsko       | 150.574       | ?            |
| 2000                 | Juvenile   | Female     | S953          | Kaksimi      | No            |              |
| 2000                 | Juvenile   | Female     | S954          | Kakoo        | 150.496       | Yes          |
| 2000                 | Juvenile   | Male       | S974          | Kaiyo        | No            |              |
| 2000                 | Juvenile   | Male       | S975          | Koko         | 150.375       | ?            |
| 2000                 | Juvenile   | Female     | S976          | Kine         | No            |              |
| 2000                 | Juvenile   | Female     | S977          | Kitsaka      | 150.254       | Yes          |
| 2000                 | Juvenile   | Male       | S955          | Kinnekinick  | 150.596       | Yes          |
| 2000                 | Juvenile   | Male       | S956          | Kokos        | 150.476       | Yes          |
| 2000                 | Juvenile   | Female     | S957          | Katoyosis    | 150.215       | Yes          |
| 2000                 | Juvenile   | Male       | S978          | Ketapis      | 150.536**     | ?            |
| 2000                 | Juvenile   | Male       | S979          | Kattana      | No            |              |
| 2000                 | Juvenile   | Male       | S980          | Kisapa       | 150.234       | Yes          |
| 2000                 | Juvenile   | Male       | S981          | Katoyisix    | 150.435       | ?            |
| 2000                 | Juvenile   | Female     | S969          | Kipitaki     | No            |              |
| 2000                 | Juvenile   | Female     | S970          | Ksaakum      | No            |              |
| 2000                 | Juvenile   | Male       | S971          | Kokota       | 150.536**     | ?            |
| 2000                 | Juvenile   | Female     | S972          | Kachatan     | 150.396       | ?            |
| 2000                 | Juvenile   | Female     | S958          | Kylie        | 150.456       | ?            |
| 2000                 | Juvenile   | Female     | S959          | Kenna        | 150.315       | ?            |
| 2000                 | Juvenile   | Female     | S961          | Kody         | No            |              |
| 2000                 | Juvenile   | Female     | S962          | Kowboy       | No            |              |
| 2000                 | Juvenile   | Female     | S963          | Kip          | No            |              |
| 2000                 | Juvenile   | Female*    | Unk           | Khalsa*      | No            |              |
| 2000                 | Juvenile   | Male       | S965          | Kakatosi     | 150.416       |              |
| 2000                 | Juvenile   | Female     | S966          | Kisomm       | No            |              |
| 2000                 | Juvenile   | Female     | S967          | Kokona       | 150.296       | Collar only  |
| 2000                 | Juvenile   | Female     | S968          | Kipitaki     | No            |              |
| 2000                 | Juvenile   | Female     | S982          | Kitakopsim   | No            |              |
| 2000                 | Juvenile   | Male       | S983          | Kaatsi       | No            |              |
| 2000                 | Juvenile   | Female     | S985          | Kakasin      | No            |              |
| 2001                 | Juvenile   | Male       | S02           | Llywelyn     | No            |              |
| 2001                 | Juvenile   | Female     | S01           | Llinos       | No            |              |
| 2001                 | Juvenile   | Female     | S03           | Lluan        | 150.765       | 28/8/01      |
| 2001                 | Juvenile   | Female     | S04           | Lowri        | 150.686       | ?            |
| 2001                 | Juvenile   | Female     | S05           | Lynwen       | 150.793       | Collar only  |
| 2001                 | Juvenile   | Female     | S06           | Luned        | 150.824       | ?            |
| 2001                 | Juvenile   | Female     | S07           | Leri         | 150.833       | 28/08/02     |
| 2001                 | Juvenile   | Female     | S08           | Llangynidr   | No            |              |
| 2001                 | Juvenile   | Male       | S09           | Llion        | No            |              |
| 2001                 | Juvenile   | Female     | S10           | Lilwen       | 150.704       | Collar only  |
| 2001                 | Juvenile   | Female     | S11           | Laura        | 150.814       | Yes          |
| 2001                 | Juvenile   | Female     | S12           | Llywela      | 150.863       | ?#           |
| 2001                 | Juvenile   | Female     | S13           | Llio         | No            |              |
| 2001                 | Juvenile   | Female     | S14           | Llan y Bytha | No            |              |
| 2001                 | Juvenile   | Male       | S15           | Llynfi       | No            |              |

| Year Released | Age      | Sex    | Tattoo | Name           | Collar  | Dead?       |
|---------------|----------|--------|--------|----------------|---------|-------------|
| 2001          | Juvenile | Male   | S16    | Llawen         | No      |             |
| 2001          | Juvenile | Female | S17    | Lleuce         | No      |             |
| 2001          | Juvenile | Female | S18    | Languareth     | 150.805 | Yes         |
| 2001          | Juvenile | Female | S19    | Lili           | 150.723 | ?#          |
| 2001          | Juvenile | Male   | S20    | Llangors       | No      |             |
| 2001          | Juvenile | Female | S21    | Llywelydd      | No      |             |
| 2001          | Juvenile | Male   | S22    | Llyr           | No      |             |
| 2001          | Juvenile | Male   | S24    | Lloyd          | No      |             |
| 2001          | 4 years  | Male   | S951   | Hosis          | 150.845 | Collar Only |
| 2001          | 2 years  | Male   | S947   | Jinx           | No      |             |
| 2002          | Juvenile | Male   | 93S    | Marco          | 150.874 |             |
| 2002          | Juvenile | Male   | 04S    | Morfeo         | No      |             |
| 2002          | Juvenile | Female | 14S    | Molly          | No      |             |
| 2002          | Juvenile | Male   | S28    | Mephistopheles | No      |             |
| 2002          | Juvenile | Male   | S29    | Machiavelli    | No      |             |
| 2002          | Juvenile | Male   | S30    | Maverick       | No      |             |
| 2002          | Juvenile | Male   | S38    | Max            | 150.625 |             |
| 2002          | Juvenile | Male   | S43    | Mellifluous    | No      |             |
| 2002          | Juvenile | Male   | S42    | Murdock        | No      |             |
| 2002          | Juvenile | Female | 73S    | Monica         | 150.744 |             |
| 2002          | Juvenile | Female | 83S    | Maureen        | No      |             |
| 2002          | Juvenile | Female | 23S    | Mata Hari      | 150.853 |             |
| 2002          | Juvenile | Male   | 13S    | Melo           | No      | 13/9/02     |
| 2002          | Juvenile | Male   | S34    | Megalomaniac   | 150.644 | 13/9/02     |
| 2002          | Juvenile | Male   | S35    | Meriadoc       | No      |             |
| 2002          | Juvenile | Male   | S36    | Montana        | No      |             |
| 2002          | Juvenile | Female | S37    | Maria Elisa    | No      |             |
| 2002          | Juvenile | Female | 53S    | Minette        | 150.874 |             |
| 2002          | Juvenile | Female | 63S    | Morwenna       | No      |             |
| 2002          | Juvenile | Female | S39    | Misogynist     | No      |             |
| 2002          | Juvenile | Female | S40    | Mayhem         | No      |             |
| 2002          | Juvenile | Female | S41    | Meanie         | No      |             |

- \* This animal was incorrectly identified as the male Kootenay in previous reports. This male is still present at CEI.
- \*\* Both of these animals were fitted with collars of the same frequency.
- # Collars not yet located.

**Total Swift Fox Released = 123 (57 males, 66 females)**

## Appendix II

### Den Site Observations during the Field Season June – October 2002

#### Den Site 1

This den site is situated on highway 89 leading to the village of E. Glacier. This den site was first reported by Maja Pepion in 2000 and was in use in 2001. This pair keeps another den for their litters in the bison pasture, which is visible from the roadside den site. This year the parents produced six cubs, which were markedly smaller in appearance than those at den site 3 were and in fact, there was a pound in weight difference between the two cubs from each den that we handled (see Table VII).

- 31/5/02 - The den was first identified as active when belly fluff and scat were seen at the den site by the side of the road
- 1/6/02 - Three cubs and one adult were seen.
- 1/7/02 - Both adult and three cubs seen.
- 2/7/02 - Six cubs and both adults seen.
- 11/7/02 - Two adults and six cubs seen. One adult brought ground squirrel to the den.
- 16/7/02 - Two adults and six cubs seen. Male returned with ground squirrel, which was taken by female. Male tried to run away. Cubs hanging on to male's tail giving it a very bedraggled appearance.
- 23/7/02 - Two adults and three cubs seen. Male crossed highway and travelled north.
- 12/8/02 - Six cubs and both adults seen.
- 10/9/02 - Four cubs and both adults seen at bison pasture den. One carcass of a cub found at side of road.
- 14/10/02 - No animals seen but fresh scat found at entrances to holes at side of road.

#### Den Site 2

The natal den for this fox group was on the southern side of the road to the AMS after the cattle grid. This den site had been reported as in use in 2001 (Matt & Crawford, 2001).

- 3/6/02 - Natal den (Den Site A) identified as active after finding belly fluff, scat and bird feathers around the den hole.
- 19/6/02 – An adult and 2 kits seen outside Den site B in Fenners' field on left from road to AMS. These animals moved frequently between Dens A and B. Domestic dogs investigating den area.
- 9/7/02 - One adult seen at den B bringing gopher. Three cubs seen eating a ground squirrel.
- 10/7/02 - Three cubs and one adult at den B. In evening two adults seen at den A
- 11/7/02 - Two adults seen at den A at 14.35. At 17.44 three cubs observed at den site B.
- 16/7/02 - Three cubs at den B. These cubs are now substantially larger than those at den site 1.
- 9/9/02 Four swift fox seen at den site B.



### Den Site 3

The 2001 location for this den site checked – inactive.

27/6/02 - Six cubs seen on opposite side of the 89 to where the above den had been situated. Den site located near fence line. Adult seen crossing road.

28/6/02 - Three cubs and one adult seen at another den site across the road from that seen on 27/6/02.

1/7/02 - One adult and six cubs seen at fence line den.

17/7/02 - Two cubs and two adults seen at fence line den. One adult brought ground squirrel. Both adults then left den site together.

23/7/02 - Three cubs seen.

29/8/02 - Five cubs and one adult seen. Cubs hunting grasshoppers.

1/8/02 - Cub killed on road.

5/8/02 - Two cubs seen at fence line den. Tossing something in the air.

7/8/02 - Fence line den site inspected – heavily trampled, abundant scat and half eaten prey remains

9/9/02 - Coyote scat at mouths of den holes. No swift fox seen.

### Den Site 4

This den site is to the west of the Lenoir Road on the higher land overlooking the Two Medicine River. This den was located by the sighting of an adult swift fox. Scat and belly fluff were also present. Due to this den being located so far from a road it was not possible to keep under observation from a vehicle.

11/7/02 - Checked by DA – no animals seen.

### Den Site 5

To the east of Fenners' ranch

11/7/02 - Checked by DA – no animals seen.

9/7/02 One un-collared adult observed near den site.

### Den Site 6

Entrance to the Gustafson Ranch on Mission Road (LHS).

6/6/02 - Five cubs and one adult spotted at den site at 21.10 hours whilst stationary in vehicle and scanning for telemetry.

7/6/02 - GPS location taken. Two main holes with scarce scat and belly fluff. NB This den was frequently checked for presence or absence thereafter but no animals were observed there again. They may have moved elsewhere after the extreme weather, which occurred soon after the den, was located.

### Den Site 7

This den site was found under a telegraph road on the Teton road about .25 of a mile from the junction with highway 89. The four cubs were spotted from the road. This den showed no sign of being a natal den. The swift fox litters had moved from the natal den at den site 2 and 3 by this time and so the location of den site 6 may well have been an auxiliary den. These cubs were never observed again at this location.

#### Den Site 8

This den site was situated on the side of a small hill overlooking the irrigation canal, which leads off the Teton Road. Six cubs were seen out of the den. Due to the difficulty of access to this den – it was only seen once more in the daytime on 3/7/02 and no animals were visible.

#### Den site 9

Found on 7/8/02. No animals observed but ground heavily used, abundant scat a lot of which was small enough to be from cubs. Many small bones evident.

#### Den Site 10

Located in field off highway 89 east of Teton Road. Not visible from main road. Swift fox seen here and one cub trapped. Den heavily trampled – there were two uncharacteristically large den holes that were big enough for a coyote to enter. However, it was impossible to tell if these holes became narrower deeper underground.

9/9/02 - Two swift fox carcasses found near den holes. The bodies were very decomposed and both skulls were missing (see deaths of un-collared foxes above).

### **Appendix III**

#### **Autopsy Results for Individuals Recovered After 2002 Release**

Autopsy reports for 13S (Melo and Megalomaniac (150.644) juveniles released on 8<sup>th</sup> September 2002.

13/9/02

Male Melo – tattoo 13S

Gross autopsy revealed an old bite wound to inner right thigh – 2.2 cm across. The right foreleg was dislocated at the elbow.

Had sustained a blow to the skull.

Internally the liver was ruptured.

Conclusion – killed by vehicle.

For interest, the stomach contents were checked and were found to consist of invertebrates (grasshoppers, crickets) and grass. The intestine was almost empty.

13/9/02

Male Megalomaniac – tattoo S34 – radio collar frequency 150.644. Located when mortality signal heard in pm. Found between release site and river.

Body already decomposed due to high temperatures during the day. A gross autopsy was carried out.

Lower jaw badly broken

Broken ribs

Bite marks all over the body

Conclusion – killed by injuries inflicted by a canid.