



**East Kootenay Badger Project
2003-2004 Update:
Population Ecology, Translocation,
Sightings and Communications**

June 15, 2004

**Columbia Basin Fish & Wildlife
Compensation Program
Nelson, British Columbia**

**Parks Canada
Radium Hot Springs, BC**

**Prepared by:
Nancy J. Newhouse, R.P.Bio. and Trevor A. Kinley, R.P.Bio.
Sylvan Consulting Ltd.
RR5, 3519 Toby Creek Road
Invermere, BC V0A 1K5
(250) 342-3205
sylvan@rockies.net**

Photo: Tim McAllister

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Chapter 1. Population Ecology of Resident Badgers

This chapter is an update of a similar analysis conducted in 2003 (Newhouse and Kinley 2003).

1.1 Abstract

American badgers (*Taxidea taxus*) are federally endangered and provincially red-listed in British Columbia (*jeffersonii* subspecies), where they occur near their range limit. From 1996 through 2004, we radiotagged and monitored 31 badgers in southeast BC to determine local ecological characteristics in relation to potential management actions to improve their status. The East Kootenay study area included the southerly Kootenay River zone and the northerly Upper Columbia zone. The median age at capture was 3 years in the Kootenay and 3.5 years in the Upper Columbia. Mortality causes among residents included: unknown (4), roadkill (4), probable or possible predation (3), train kill (1), probable starvation (1; a kit), and probable old age (1). For the Kootenay River and Upper Columbia zones combined, annual home ranges of resident adults averaged 3 to 150 times larger than reported from previous studies conducted in the USA, with means of 17, 24 or 34 km² for females, and 67, 110 or 315 km² for males, based on the 95% fixed kernel, 95% adaptive kernel, and 100% minimum convex polygon methods respectively. Minimum juvenile dispersals were up to 41 km. Space-use and demography varied along a north-south gradient (measured either on a continuous scale from south to north or in comparing the Kootenay River zone to the Upper Columbia zone), with southern animals having higher reproductive output, lower mortality, and apparently smaller home ranges. In fact, population projections from the Kootenay River zone suggested population growth of 20% annually and female home ranges were smaller than recorded in several studies conducted in the USA. In contrast, projections from the Columbia River zone indicated rapid population decline (annual adult survivorship of about 72%, no recruitment), and with the exception of translocated animals there appear to be essentially no badgers remaining there. However, this spatial comparison was also a temporal comparison, as monitoring gradually shifted southward over the course of the study. In reality, it appears that changes in ecological conditions corresponding roughly to the period of this study may have played at least as strong a role as intrinsic differences from north to south in determining observed patterns. That is, it appears that the Upper Columbia had experienced events at the beginning of the study that pushed the population down to a point from which it could not recover, rather than currently being unable to support badgers. Continued monitoring of residents in the south and translocated animals in the north should indicate which of the space-difference versus time-difference scenarios is more likely.

1.2 Introduction

In British Columbia, American badgers are limited to the south-central and southeast portions of the province (Rahme et al. 1995) and this represents the northwestern limit of total species distribution. The subspecies present there (*Taxidea taxus jeffersonii*) has recently been listed as endangered in Canada (COSEWIC 2003). It is also provincially red-listed due to large home ranges, declining populations, loss of habitat and prey, and potential for high mortality from roadkills and shooting (Cannings et al. 1999). Despite this status, radiotelemetry-based badger research in British Columbia began only in 1996. Current objectives of the East Kootenay Badger Project (EKBP) are to determine home range sizes, dispersal trends, habitat use patterns, and reproductive and mortality trends of badgers at this range limit in relation to potential management actions to improve their status. A two-scale habitat model has been developed for this study area (Apps et al. 2002), based on the same radiolocation data, and habitat/prey availability issues have been discussed previously (Newhouse and Kinley 2001). This report provides updated demographic and space-use analyses for resident badgers to February 2004. Information relating to animals translocated into the East Kootenay is provided in Chapter 2.

Badgers are adapted to capturing fossorial prey, which is their primary diet in most locations (Salt 1976, Lampe 1982). However, badgers are opportunistic feeders and supplement their diet with a wide variety of mammals, birds, eggs, reptiles, amphibians, invertebrates, and plants (Messick 1987). Data from Idaho suggests that conception generally occurs in late July and August, with litters of 1 to 4 born from mid-March to mid-April (Messick and Hornocker 1981). There has been little research done to define badger habitat requirements. Generally, they have been studied in open, often agricultural landscapes (Todd 1980, Warner and Ver Steeg 1995) and shrub-steppe habitats (Messick and Hornocker 1981), although they are known to occur from below sea level to elevations over 3,600 m (Lindzey 1982). There is considerable regional variation in home range size, but all studies have found males to have larger home ranges than females (Messick and Hornocker 1981, Minta 1990, Goodrich 1994, Warner and Ver Steeg 1995, Hoff 1998).

1.3 Study Area

The “East Kootenay” region of southeast British Columbia includes the portion of the Rocky Mountains west of the continental divide and south of about 52°N, the Purcell Mountains east of their height-of-land, and the Rocky Mountain Trench, a major northwest-southeast – trending valley between the 2 mountain ranges. Within this region, the Columbia River originates at Columbia Lake in the Trench and flows northward, while the Kootenay River originates in the Rockies before flowing into the Trench immediately south of Columbia Lake, and then travels southward. Thus, the study area includes parts of the Upper Columbia and the Kootenay River drainages (Figure 1-1), which are the basis for designating 2 zones

between which comparisons are drawn in this paper. The Rocky Mountain Trench is narrower in the Upper Columbia portion (3-16 km) than in the Kootenay River portion (4-30 km) of the study area.

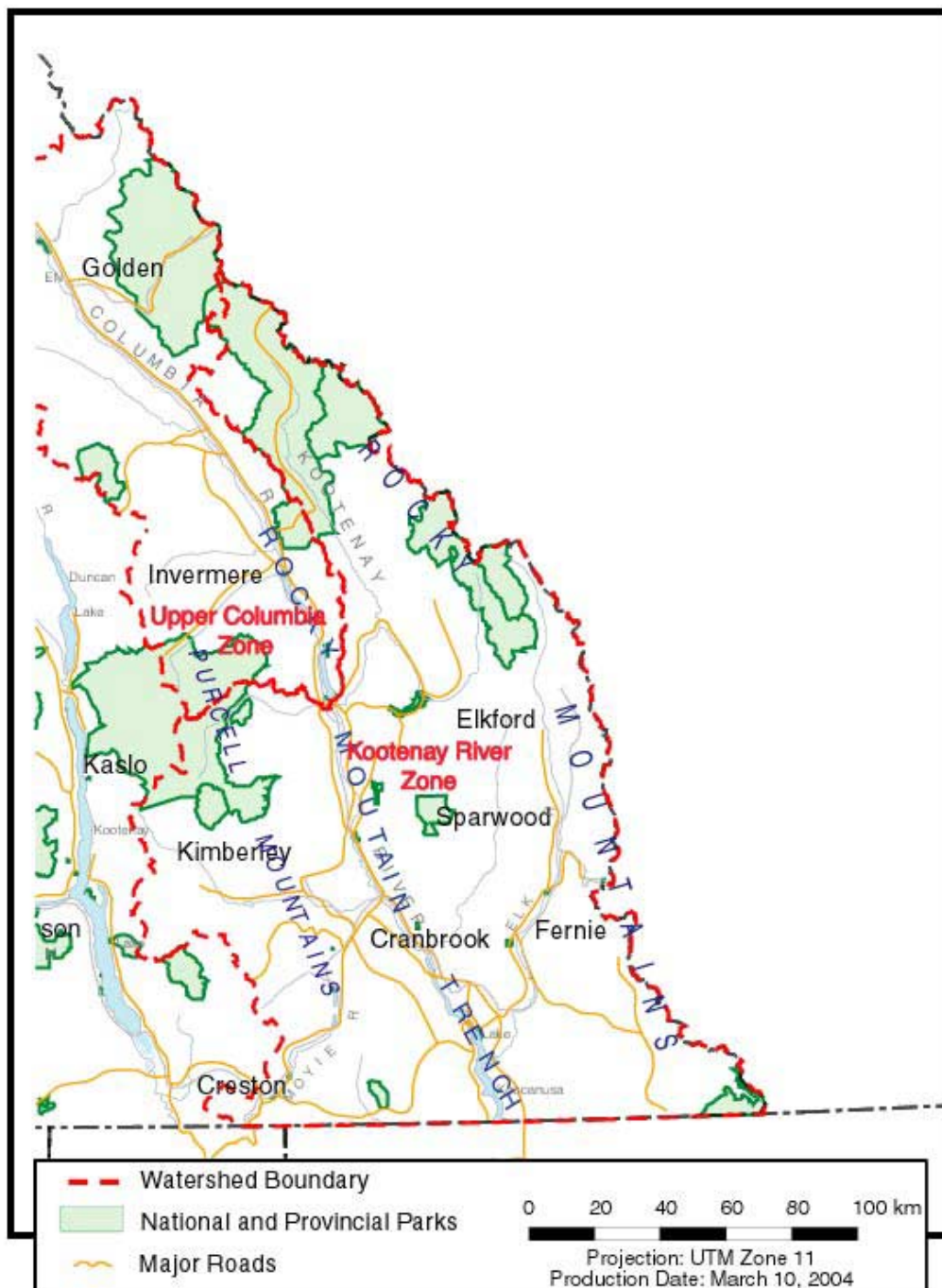


Figure 1-1. Upper Columbia and Kootenay River zones within the East Kootenay Badger Project study area, southeastern British Columbia.

Within the East Kootenay, biogeoclimatic zones generally follow an elevational sequence from the Ponderosa Pine (PP) at the lowest elevations in the warmest, driest areas, through the Interior Douglas-fir (IDF) above the PP and elsewhere on valley bottoms, followed by the Montane Spruce (MS), Engelmann Spruce – Subalpine Fir (ESSF) and Alpine Tundra (AT) zones. In some tributaries of the Trench receiving higher precipitation, the Interior Cedar – Hemlock (ICH) zone occurs in place of the MS (Braumandl and Curran 1992). The PP and IDF were historically dominated by open forests of ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) respectively on zonal sites, grasslands or grass-shrublands on more xeric sites, and extensive marsh and forested riparian habitat along rivers. However, human settlement within the IDF and PP has resulted in residential, recreational, road, and agricultural development along the valley bottoms, along with tree ingrowth and encroachment into former open forest and grassland due to fire suppression (Gayton 1996). Climax forests in the MS are closed-canopy stands of hybrid white spruce (*Picea glauca* x *engelmannii*), in the Interior Cedar Hemlock are western redcedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*) and in the ESSF are Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*), but the MS, ICH and ESSF in the study area have had an extensive history of fire and timber harvesting, so also include roads, cutblocks, burns, and forest stands of varying ages with a high proportion of lodgepole pine (*Pinus contorta*) and other tree species. The AT is non-forested.

Resident badgers radiotagged for the EKBP have been trapped in the PP, IDF and MS zones, but radiotagged badgers and untagged animals reported by the public (Newhouse 2003) have also used the ICH, ESSF and AT, covered elevations of 800 to 2700 m, and extended from the Montana boundary at 49° N to about 51° N. Translocated badgers were trapped at the southern end of the Salish Mountains, 30-50 km west of Kalispell, Montana, or in one case within Kalispell. Kalispell is the approximate southern limit of the Rocky Mountain Trench. The trapping area is classified as IDF (Demarchi et al. 2000), although vegetation there appeared more typical of the PP zone in the East Kootenay.

Potential fossorial prey includes Columbian ground squirrels (*Spermophilus columbianus*), which occur in natural or human-caused openings in all biogeoclimatic zones, northern pocket gophers (*Thomomys talpoides*), which are restricted to the lowest elevations in the PP and IDF at the southernmost end of the study area, and hoary marmots (*Marmota caligata*) which occur sporadically in the AT.

1.4 Methods

1.4.1 Trapping and Monitoring

We identified trap sites by field-checking locations of previous sightings or known colonies of Columbian ground squirrels. We trapped badgers at burrow entrances, generally using unbaited #1¹/₂ soft-catch leghold traps, and checked traps at least daily. We noosed and hand-injected trapped badgers with

either 10 mg/kg of tiletamine hydrochloride/zolazepam hydrochloride mixed at 100 mg/ml, or a combination of 0.3 mg/kg of midazolam mixed at 1.0 mg/ml and 9 mg/kg of ketamine hydrochloride mixed at 100 mg/ml. Surgical implantation of intraperitoneal transmitters (Advanced Telemetry Systems, Isanti, Minnesota) was conducted either in a veterinary clinic or in the field following Hoff (1988). While badgers were immobilized, we took samples of blood, feces and hair, and an upper premolar tooth. When badgers were alert, we released them either at the original trap sites if the burrow was still intact, or at nearby burrows. Teeth of adult study animals were sent to Matson's Lab (Milltown, Montana) for aging.

Generally, we located animals weekly from April through September and twice-monthly to monthly from October through March, although the schedule varied with budget and weather. We located animals from the air using a telemetry-equipped Cessna 172 aircraft. For approximately half of locations used in this analysis, we then employed ground-based telemetry to locate badgers in their burrows. Locations were marked on 1:20,000 air photos and transferred to 1:20,000 provincial forest inventory planning maps, from which Universal Transverse Mercator (UTM) grid coordinates were determined. With the possible exception of some air-only locations, all data points were of badgers in burrows rather than above ground. When the mortality sensor on a radioimplant was motionless for 4 hours, it caused a doubling of the implant's pulse frequency. When detected, the site was visited and carcass or implant recovered to confirm that a mortality had occurred. Data reported here were collected from June 1996 to August 1999 for the Upper Columbia zone, and February 1997 to February 2004 for the Kootenay River zone.

1.4.2 Litter Size Determination

We determined litter sizes from direct observations of burrows. Females with litters tended to have large natal burrows (evident from large mounds of recently excavated soil), use a single burrow over several months, be active throughout the day, and bring prey back to the burrow. The most obvious indications of kit presence and numbers were that the kits typically spent considerable time playing aboveground at the burrow site. At the time of capture, we checked all females for signs of lactation (swollen nipples with hair wear around them). The methods we used to determine minimum initial litter sizes were conservatively biased, as additional kits likely died at birth or before coming aboveground, so females may not have shown signs of tending young or the number visible at the time of observation may have been reduced from initial litter size.

1.4.3 Survivorship Calculations

Survivorship of juvenile badgers was calculated as the proportion of tagged juveniles surviving to the date of their assumed first birthday (15 April). The modified Kaplan-Meier method was employed to determine resident adult survivorship, following the staggered-entry technique described by Pollock et al. (1989). The survivorship function for each week was calculated and plotted using the formula:

$$S(t) = \prod (1-d_j/r_j)$$

where: **S(t)** = survivorship at time t

\prod = product

d_j = deaths in the week

r_j = number of animals at risk in the week (i.e. total number tagged minus number having previously died or for which telemetry contact was lost)

Confidence intervals (CI) for weekly Kaplan-Meier survivorship estimates were also plotted following Pollock et al. (1989):

$$95\% \text{ CI} = S(t) \pm 1.96\{[S(t)]^2[1-S(t)]/r(t)\}^{1/2}$$

Following this, **S_{annual}** was extrapolated by taking the n^{th} root of the cumulative survivorship, where n is the number of years. This was determined for (1) all animals in the Kootenay River and Upper Columbia zones combined; (2) males only (both areas combined); (3) females only (both areas combined); and (4) Kootenay River zone only (both sexes combined). All study animals from the Upper Columbia zone died prior to the analysis completion date, so an extrapolation of annual rates using Kaplan-Meier methods would have either yielded a result of 0 (if done after the final mortality) or would have been unrealistically high (if calculated immediately prior to the final mortality). Thus, **S_{annual}** for the Upper Columbia zone was calculated using the the Mayfield method (Winterstein et al. 2001), in which the total number of mortalities was divided by the total the number of animal-days of monitoring (the number of days from tagging until death or until assumed transmitter failure or emigration for each animal), then subtracted from 1. This was converted to an annual rate by raising the result to the power of 365. Thus, the formula was:

$$S_{\text{annual}} = (1 - d_t/t_t)^{365}$$

where: **S_{annual}** = annual survivorship,

d_{tot} = total number of deaths, and

t_{tot} = total monitoring time (in days).

The date of death was assumed to be the midway point between the last live telemetry date and the date on which the animal was found dead, unless there was evidence of the exact time of death (i.e. report of the animal being hit by a train or car). For data censored due to telemetry contact being lost, the censure date was assumed to be the midway point between the last successful telemetry location and the first failed attempt at telemetry thereafter. One tagged female hit by a vehicle was treated and successfully released, but would otherwise have died, so was considered a mortality for the purposes of survivorship calculations and mortality-cause determination. She was re-entered into the survivorship database on the date she was released after recovery. We excluded from analysis a female that died from surgery complications immediately after tagging.

1.4.4 Population Projection Calculations

We projected population trends using the following formula:

$$r = S_{\text{annual}} + (0.5 \times b \times S_j)$$

where: **r** = instantaneous (exponential) rate of population increase

S_{annual} = annual survivorship of adults

0.5 = proportion of adult population that is female

b = kits observed per adult female

S_j = survivorship to 1 year of radiotagged juveniles.

We then extrapolating these values to the time required to reach a given relative population level by the formula:

$$N = r^j$$

where: **N** = relative population (1 = stable, 2 = doubled, etc.)

r = instantaneous (exponential) rate of population increase, calculated above

j = number of years.

1.4.5 Home Range Determination

We used the program *Calhome* (Kie et al. 1994) to calculate adult home ranges using the minimum convex polygon (MCP) method, and *The Home Ranger* (Hovey 1999) to calculate adaptive kernel (ADK) and fixed kernel (FK) home range estimates. Fixed kernel has been found to have the lowest bias and lowest surface fit error (Seaman et al. 1999). We used the 95% FK estimate to minimize the effects of extraterritorial forays on home range size (Knick 1990). To facilitate comparisons with other studies that used other methods, we also calculated 100% MCP and 95% ADK home range estimates. Animals with fewer than 25 locations or less than 1 year of monitoring (after their assumed first birthday on 15 April) were not included in calculations of mean home range (Seaman et al. 1999). We compared home ranges among sexes for all animals and for each zone separately using the program JMP IN (SAS Institute, Inc., Cary, North Carolina). We excluded from our calculations one male living entirely within the Rocky Mountains (all other males and females were primarily within the Trench).

1.4.6 Juvenile Dispersal Measurement

Dispersal distance of animals tagged as juveniles was considered to be the maximum distance from the point of capture (generally the natal burrow) recorded for the animal, regardless of the age at which this occurred. We used a 2-tailed t-test assuming equal variance to test the hypothesis that males and females made their initial dispersal (i.e. ≥ 1 km from the point of capture) at the same age.

1.5 Results

1.5.1 Capture and Age Summary

To date, 31 resident badgers have been radiotagged and 2 more (juveniles) have been eartagged (Table 1-1). Only 4 were from the Upper Columbia zone of the study area, all in 1996 and 1997, because we did not detect the burrows of any additional badgers in that zone. One additional female (Kootenay River zone) died shortly after implantation as a result of surgery complications. Including the surgery mortality, 17 of each sex were captured. No significant trap-related injuries were detected among resident or translocated animals.

Table 1-1. Age-class and sex summary of tagged resident badgers in the East Kootenay Badger Project, southeastern British Columbia, 1996 through 2002. Juveniles are those < 1 year old on the date of capture.

Category	Adult M	Adult F	Juvenile M	Juvenile F	Total
Upper Columbia radiotagged	1	3	0	0	4
Kootenay River radiotagged	10	6	4	7	27
Total monitored	11	9	4	7	31
Kootenay River handling death ^a	0	1	0	0	1
Kootenay River eartagged only	0	0	2	0	2
TOTAL	11	10	6	7	34

^a post-surgery mortality from peritonitis

Ages of adults at the time of capture varied from 1 to 12 years (Figure 1-2). A representative comparison of the Columbia to Kootenay samples is not possible because of the small sample in the Columbia, but no gross differences in the age classes at time of capture were evident. Adult badgers in the Columbia had a median age of 4.5 years, and those in the Kootenay had a median of 3. The age was not available for 1 Kootenay resident.

1.5.2 Mortality Causes and Survivorship

Of the 11 juveniles radiotagged, 5 died in their first year of life, so survivorship of tagged juveniles to age 1 was 55%. Mortality causes included 1 known train kill, 1 probable starvation, 1 possible cougar or bobcat predation, and 2 unknown. Badgers tagged as juveniles but surviving to April 15 were included in the adult sample thereafter. One adult resident hit by a vehicle would have died but was treated by a veterinarian. Adding her to the 8 that died of non-handling-related deaths, adult mortality causes included known roadkill (4), probable cougar predation (1), probable bobcat predation (1), probable old age (1), and unknown (2). The oldest animal at the time of death was a female from the Upper Columbia zone, at 13.6 years. Annual survivorship values are indicated in Table 1-2. Cumulative survivorship curves for all

resident adults are shown in Figure 1-3, generally indicating a less rapid decline in cumulative survivorship (i.e. lower mortality rate) over roughly the last half of the study.

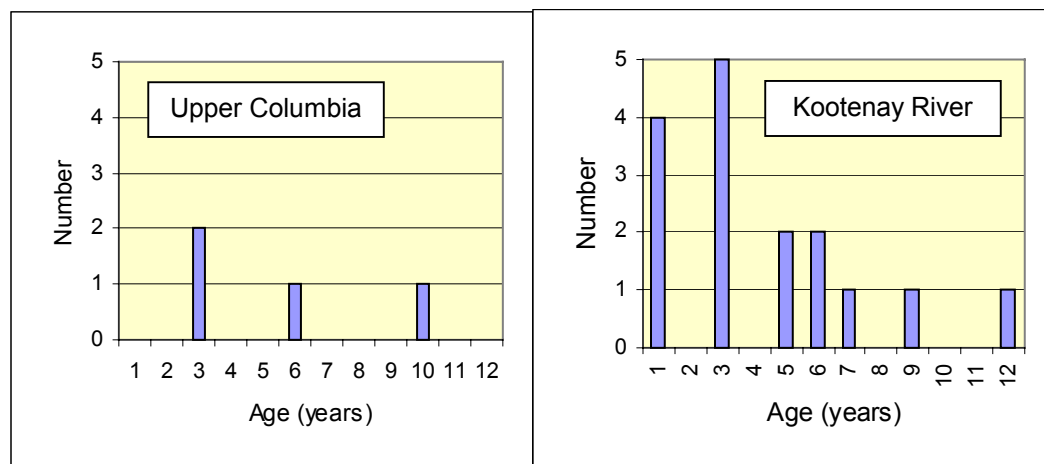


Figure 1-2. Age at capture of adult badgers from the Upper Columbia (n = 4) and Kootenay River (n = 16) zones of the East Kootenay Badger Project study area, southeastern British Columbia. Captures in the Upper Columbia were from 1996 and 1997, while those in the Kootenay River were from 1997 through 2002.

Table 1-2. Extrapolated annual survivorship of radiotagged resident adult badgers in two zones of the East Kootenay Badger Project study area, southeastern British Columbia, June 1996 – January 2003.

Zone/Sex	Annual Survivorship (%)
Upper Columbia (both sexes)	71.7 ^a
Kootenay River (both sexes)	87.4
Males (both zones)	82.8
Females (both zones)	76.2
All Animals Combined	80.9

^a based on Mayfield method; all others based on Kaplan-Meier method

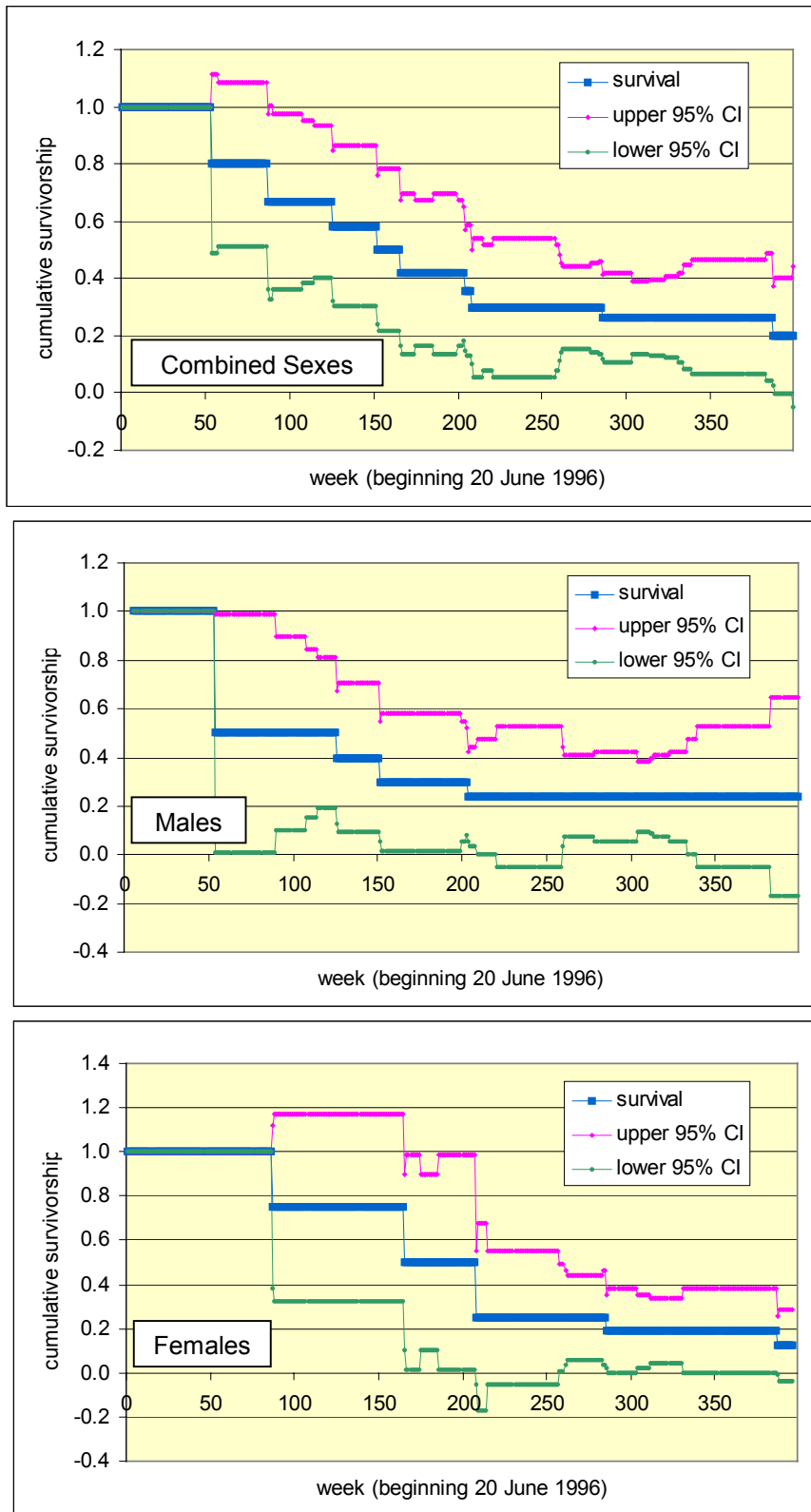


Figure 1-3. Kaplan-Meier survivorship (based on weekly intervals) for adult badgers from both zones combined of the East Kootenay Badger Project study area, southeastern British Columbia, June 1996 – February 2004.

1.5.3 Reproductive Success

Among the 11 tagged adult females observed for 1 or more kit-rearing periods, there were 25 opportunities for litters. No litters were observed in the Upper Columbia but most opportunities resulted in successful litters in the Kootenay River zone (Table 1-3). There was a general tendency for litters to be larger farther south ($R^2 = 0.57$) and later in the study ($R^2 = 0.39$; Figure 1-4). Four of the females, all from the Kootenay River zone, were observed when 1 year old, and 2 of them had successful litters. It is probable that initial litter sizes were larger than reported, as some kits likely died before they emerged from natal burrows or shortly thereafter, or were otherwise not observed.

Table 1-3. Minimum kit production to above-ground stage among radiotagged resident badgers in two zones of the East Kootenay Badger Project study area, southeastern British Columbia, 1996 – 2003. Successful litters are those with ≥ 1 kit observed aboveground.

Zone	Females Observed	Potential Litters ^a	Successful Litters	Kits	Proportion of Litters Successful	Kits/Potential Litter ^b	Kits/Successful Litter
Upper Columbia	3	9	0	0	0.00	0.00	N/A
Kootenay River	8	16	12	19	0.75	1.19	1.58
Combined	11	25	12	19	0.48	0.76	1.58

^a number of female badgers multiplied by number of breeding seasons in which they were observed

^b i.e. kits per adult female per year observed

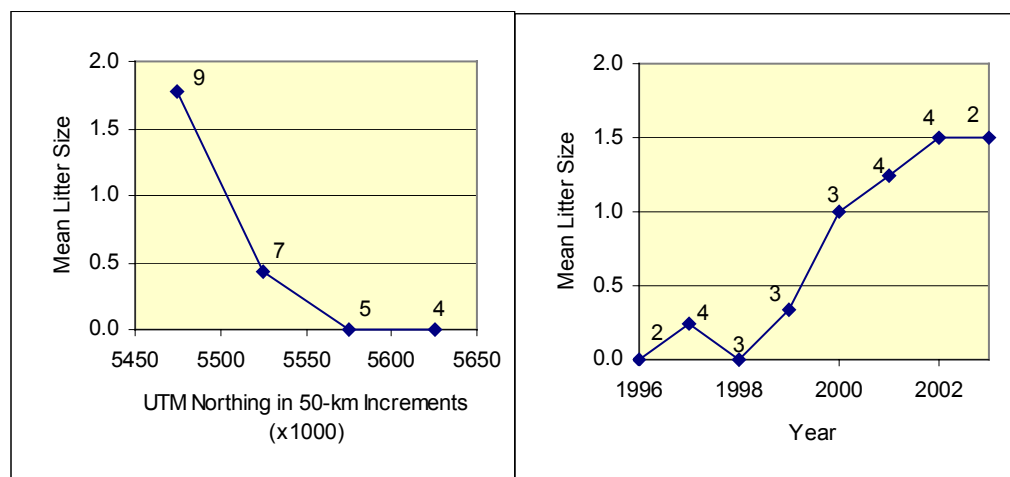


Figure 1-4. Mean litter size as a function of northing and year for female badgers ≥ 1 year old in the East Kootenay Badger Project study area, southeastern British Columbia, 1996 – 2003. Values beside data points are samples for individual geographic units or years.

1.5.4 Population Projection

Projecting the population at an exponential (density independent) rate using the survivorship estimates calculated above ($S = 0.874$ for the Kootenay River zone, 0.717 for the Upper Columbia zone and 0.809 combined), the observed rates of kits/adult female/year (1.19 for Kootenay, 0.00 for Columbia and 0.76 combined), the survivorship of kits to age 1 (55%), and assuming a $50:50$ sex ratio yields the following results:

Kootenay River zone: $r = 1.201$; population doubles in < 4 years

Upper Columbia zone: $r = 0.717$; population halves in < 3 years

Combined zones: $r = 1.018$; population approximately stable.

1.5.5 Home Ranges

Home ranges were generally larger for males and for animals in the more northerly Upper Columbia zone (Table 1-4; Figure 1-5). However, there was very high variability in the data, as is evident in comparing values within each sex by zone or within each zone by sex, and in the high standard deviations within sex-zone classes. Animals farther south (i.e. within the Kootenay River zone, and particularly the southern part of it) were radiotagged and monitored later in the study than those farther north (Figure 1-6). Home range size (particularly MCP) was positively correlated to median UTM northing values (Figure 1-7) and negatively correlated to the median date at which data were collected (Figure 1-8).

Despite the high variability and potentially changing home range sizes over time, home ranges of males were larger than those of females, whether considered for animals of both zones combined (100% MCP: $P = 0.01$; 95% ADK: $P = 0.03$; 95% FK: $P = 0.04$), or for animals within the Kootenay River zone only (100% MCP: $P = 0.02$; 95% ADK: $P = 0.01$; 95% FK: $P = 0.01$).

Table 1-4. Home ranges among radiotagged resident badgers in two zones in the East Kootenay Badger Project study area, southeastern British Columbia, June 1996 – February 2004. Sample includes only animals with ≥ 25 locations across ≥ 1 year after an assumed first birthday of 15 April, and animals living primarily within the Rocky Mountain Trench. P -values refer to t-test.

Zone/Sex	n	100% Minimum Convex Polygon			95% Adaptive Kernel			95% Fixed Kernel		
		km ²	SE	P	km ²	SE	P	km ²	SE	P
Upper Columbia Male	1	513.0	-	<0.01	50.7	-	0.09	14.2	-	0.01
Upper Columbia Female	2	85.7	1.3		74.1	1.9		52.8	0.3	
Kootenay River Male	8	290.3	89.0	0.08	117.1	32.0	0.05	73.7	20.2	0.05
Kootenay River Female	5	13.6	112.6		4.6	40.5		3.2	25.6	
Combined Zones Male	9	315.0	77.1	0.03	109.7	28.3	0.07	67.1	18.4	0.10
Combined Zones Female	7	34.2	87.4		24.4	32.1		17.4	20.9	

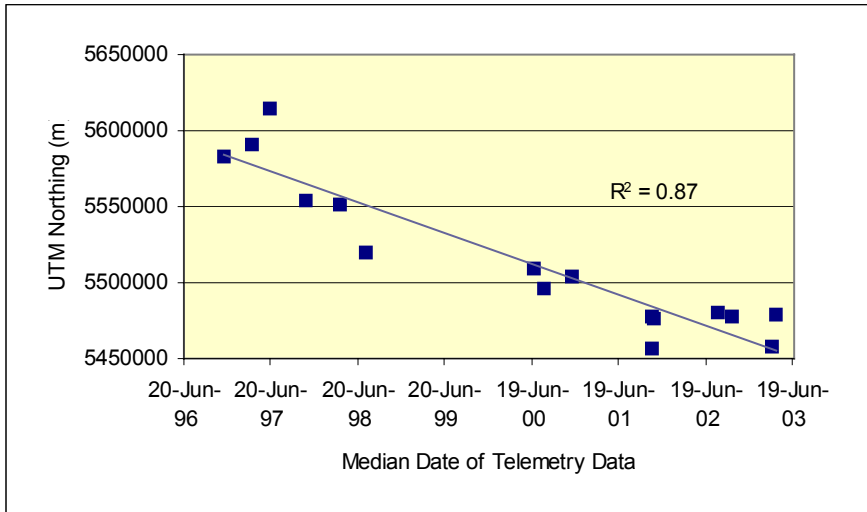


Figure 1-6. Median UTM northing in relation to median date of telemetry locations for badgers (sexes combined) in the East Kootenay Badger Project study area, southeastern British Columbia, June 1996 – February 2004.

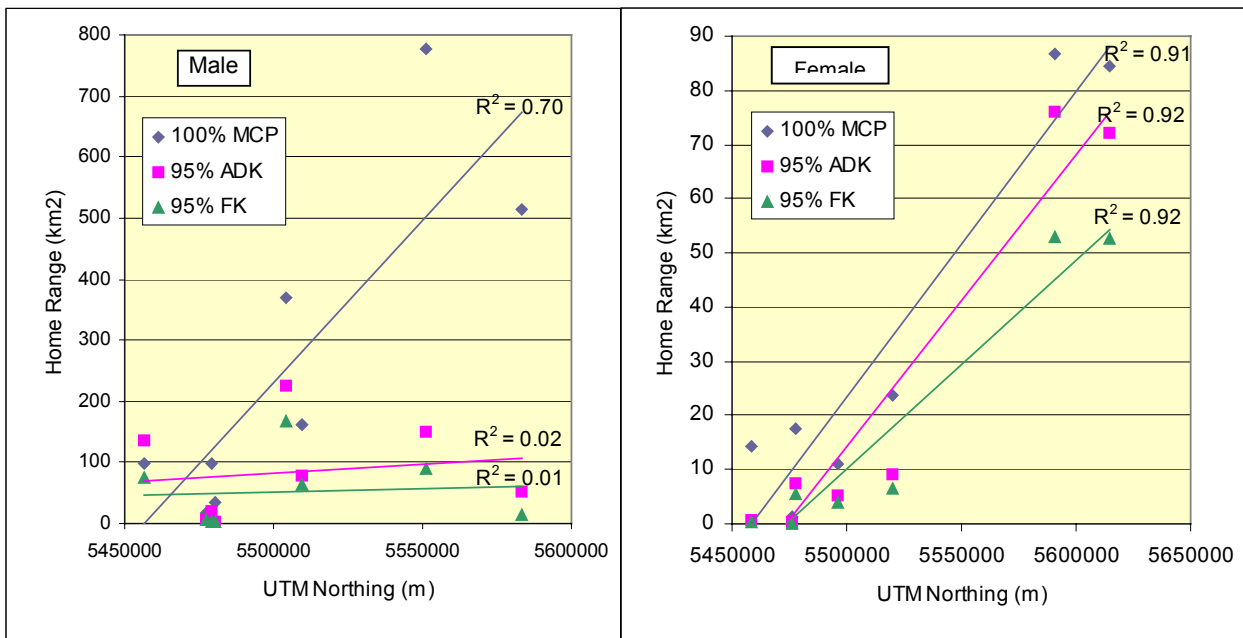


Figure 1-7. Home range size in relation to median UTM northing for badgers in the East Kootenay Badger Project study area, southeastern British Columbia, June 1996 – February 2004. Measures based on minimum convex polygon (MCP), adaptive-kernel (ADK) and fixed-kernel (FK) estimators. Sample includes only animals with ≥ 25 locations across ≥ 1 year of monitoring after an assumed first birthday of 15 April, and animals living primarily within the Rocky Mountain Trench.

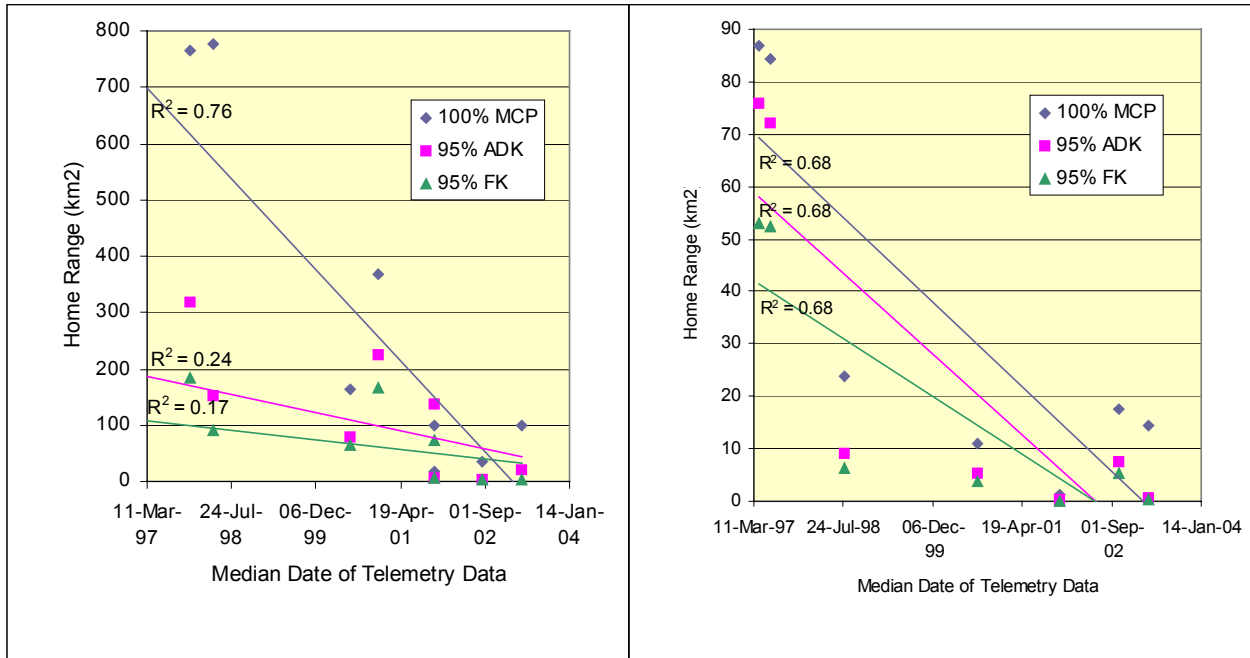


Figure 1-8. Home range size in relation to median date of telemetry locations for badgers in the East Kootenay Badger Project study area, southeastern British Columbia, June 1996 – February 2004. Measures based on minimum convex polygon (MCP), adaptive-kernel (ADK) and fixed-kernel (FK) estimators. Some data excluded (see Figure 1-7 caption).

1.5.6 Juvenile Dispersal

Dispersal distances and dates were highly variable (Table 1-5). Male kits appeared to make initial dispersal movements (i.e. ≥ 1 km from capture site) somewhat later than female kits ($P = 0.07$), and to have greater maximum dispersal distances.

Table 1-5. Dispersal from point of capture for badgers radiotagged as juveniles in the East Kootenay Badger Project study area, southeastern British Columbia, 1997 – 2002. Ages listed in final 2 columns calculated as midpoint between telemetry date at which the dispersal was first detected and the previous telemetry date.

ID No.	Sex	Monitoring Days ^a	Maximum Dispersal (km)	Age (days) at Max. Dispersal ^b	Age When Dispersal \geq 1.0 km
15 ^c	M	398	21.2	397	386
30 ^d	M	614	41.3	601	388
31 ^d	M	549	27.2	440	440
32 ^e	M	587	14.6	543	86
8 ^f	F	212	21.0	136	102
10	F	131	4.9	121	99
13 ^f	F	112	0.4	N/A	N/A
18 ^f	F	350	2.1	86	86
19	F	143	9.2	118	110
20	F	181	19.4	172	154
33 ^e	F	537	9.2	421	86

^a time from assumed date of birth (April 15) to death or last location

^b determined only if the maximum dispersal distance recorded \geq 1 km

^c was radiotagged 30 October, 198 days after assumed birth date, so may have already dispersed some distance from natal den

^d males 30 and 31 were littermates

^e female 33 and male 32 were littermates, and were with or near their mother for part of their dispersals

^f females 8, 13 and 18 had the same mother but were born in different years

1.6 Discussion

Our research focused almost entirely in the Rocky Mountain Trench. With the exception of one male who was radiotagged and appeared to remain entirely in the Rockies, all animals were tagged in the Trench and were located there either entirely or the majority of the time. While the primary badger habitat in the East Kootenay appears to be in the Trench (Apps et al. 2002), the adjacent Rocky and Purcell mountains do support badgers based on the presence of 1 radiotagged animal (Figure 1-5) and numerous sightings (Chapter 3). It is also possible that some animals with which we temporarily or permanently lost radio contact emigrated from the Trench. Thus, our results should be considered representative of the Rocky Mountain Trench, and potentially representative of the East Kootenay as a whole.

Mean home range sizes documented in this study were 3 to 150 times larger than any reported in the literature (Table 1-6). However, the dramatic differences in home range size from north to south and over time within this study make straightforward comparisons to other regions difficult. For example, ranges of females in the Kootenay River zone, which were monitored in recent years, were similar to or slightly smaller than those reported for Colorado and Illinois (Table 1-4, Table 1-6). At least part of the reason for smaller female home range sizes over time and in the south probably relates to the increasing incidence of females tending kits.

Table 1-6. Mean home ranges (km²) of adult American badgers, southeastern British Columbia, 1996 – 2003, in relation to those reported in other studies, based on 100% minimum convex polygon (MCP) and 95% adaptive kernel (ADK) methods^a.

Study Location	Source	Sample Size		100% MCP		95% ADK	
		F	M	F	M	F	M
Idaho	Messick and Hornocker (1981)	7	3	2	2		
Wyoming	Goodrich (1994)	6	9			3	12
Wyoming	Minta (1990)	15	18	3	8		
Colorado	Hoff (1998)	9	5			8	25
Illinois	Warner and Ver Steeg (1995)	7	5	13	44		
SE British Columbia	this study	7	9	34	315	24	110

^a for British Columbia, MCP calculated using *Calhome* (Kie et al. 1994) and ADK calculated using *The Home Ranger* (Hovey 1999)

Research efforts gradually shifted south over the course of the study, so it is not clear whether the north-south differences in home range sizes reflect spatial or temporal variation in badger ecology within the East Kootenay. This is a critical question for local badger conservation, because home range differences appear to mirror differing population trends between older data from the more northerly Upper Columbia zone and recent data from the southern Kootenay River zone. If the population trend found within the Upper Columbia were even roughly representative of the area's long-term ability to support badgers, then there would be essentially no possibility of badger persistence there. Conversely, if the population trend observed in the Kootenay River zone were typical over extended time periods, then rapid population growth would be underway in that area. In reality, there are undoubtedly some persisting ecological differences from north to south within the East Kootenay (including the greater amount of valley-bottom habitat on the floor of the Rocky Mountain Trench in the Kootenay River zone), but these do not appear to be sufficiently large to cause the differences in badger space use and population trends observed in the study. Furthermore, correlation coefficients of space-use and demographic parameters in relation to northing were similar to those for year. Clearly, the negative trends observed in the upper Columbia could not have been in place for long, or no badgers would have been present even at the beginning of

this study. Similarly, if the apparent 20% annual growth rate observed in the Kootenay River zone had been long-established, there would have been an extremely large population of badgers in that area (increasing 17-fold in 20 years), and we would have observed a low median age. Our observed median adult age in the Kootenay River (3 years) and Upper Columbia zones (4.5 years) compares to adult medians of 3 years in Illinois (Warner and Ver Steeg 1995), about 4.5 years in Wyoming (Goodrich 1994), and 2 years in Idaho (Messick and Hornocker 1981). Further evidence for the possibility that there has been a recent shift in demographics within the Kootenay River zone comes from the fact that, despite recent female home ranges there being similar to those reported for Colorado and Illinois as noted above, male home ranges were still 4-7x larger than reported in those studies. On the assumption that female home ranges are dictated mainly by food resources and males dictated mainly by the number of females, this might suggest that there is now a reasonable food supply, yet that female numbers are low, possibly due to events or circumstances that existed recently but not over the past few years. The very late dates of dispersal for some badgers (some at ages > 1 year) are suggestive of habitat that is currently capable of providing adequate food for a mother and adult kits within a small area over an extended period, something that would tend to have resulted in a very large badger population had it been the norm over many years or decades. Thus, it is likely that a great deal of the north-south variation observed actually reflected changes over time, not over space, in ecological or anthropogenic factors critical to badgers.

An alternative hypothesis is that north to south differences reflect a population structure having a source at carrying capacity (Kootenay River zone) and a sink (Upper Columbia zone). This would potentially explain the unsustainably high and unsustainably low population projections for the south and north respectively, while initial movements of some dispersing juveniles suggest the possibility of emigration occurring over relatively long distances. However, a source-sink situation would not explain the relatively high median ages; the very high ratio of male:female home range sizes in the Kootenay River zone; the sightings of family groups in the Upper Columbia from 1992 to 1995 (Chapter 3); the initial indications of successful translocations to the Upper Columbia (Chapter 2); or the fact that we did not record shifts of tagged animals northward in recent years. Thus, the existing evidence is more supportive of us having detected an improvement in demographic parameters over time rather than, or in addition to, an improvement over space (farther south).

If it is the case that time was as or more important as space in explaining the variability in home range size and population trends, it is not clear what factor or factors may have changed over the course of the study, and whether these affected recruitment, adult mortality, or both. Newhouse and Kinley (2001) found badgers to use a wide variety of foods in this study area, but Columbian ground squirrels were the primary item (as are ground squirrels in general throughout badger range). Informal observations by the authors suggest that ground squirrel colonies within the study area may have expanded somewhat in both extent and population over roughly the past 5 to 10 years, but this has not been quantified.

Replicating earlier broad-scale surveys for Columbia ground squirrels that were conducted within the northern portion of the study area (Newhouse and Kinley 2001) would potentially provide some information on whether the extent of colonies has recently increased, although information for comparisons prior to the late 1990's is lacking. Another variable that may have changed over time is predation. Little reliable information is available on recent population trends of most potential predators, but cougars have declined significantly across the Kootenays in recent years (Kinley 2002), and they were considered a probable or possible cause in 2 of the 9 badger deaths for which some information on cause of death was available. The incidence of vehicle or train collisions is unlikely to have declined enough to have had any effect, as levels of traffic on both highways and rails appear to be stable to increasing. Recent ecosystem restoration efforts in former grasslands and open forests, while undoubtedly beneficial, have been localized and do not appear to have even kept pace with ongoing losses of open habitat to forest ingrowth. It is likely that the extensive public outreach and publicity accompanying this research have resulted in fewer intentional killings of badgers by landowners, but there are no data to support this possibility.

There are several other possible explanations for changes over time. One is that chance played a major role in our results. The portion of the Upper Columbia suitable for badgers forms a relatively small part of the East Kootenay, and a tiny portion of total badger range. Its small population may simply be unstable and more subject to the effects of random events. More broadly, small populations often experience the Allee Effect, in which reproductive success declines as populations drop. In the case of badgers, the possibility that badgers are induced ovulators (Messick and Hornocker 1981) provides a potential mechanism for expressing the Allee Effect. Both chance events and the Allee Effect would be more strongly felt and more prone to push the local (Upper Columbia zone) population to extirpation if there had been a more deterministic factor pushing the population down prior to this study occurring, such as a high level of predation or control of perceived problem badgers. On a more general level, badgers in the East Kootenay, particularly in the Upper Columbia zone, occur near the northern range limit of the species. It would be expected along such a range limit that not every year or every decade would have conditions suitable for population stability or growth. Temporal variation in any one or combination of the factors listed above may cause a temporally variable range limit to fall somewhere in the East Kootenay.

Regardless of the factors responsible for differences observed to date along a north-south gradient, future monitoring will determine whether conditions are now and remain favorable for the persistence or growth of badger populations. The translocation of animals into the Upper Columbia in 2002 and 2003 will provide a basis to test current conditions there. If those badgers and their offspring thrive, then it can be assumed that the Upper Columbia zone does generally retain the capability of supporting badger populations, and that temporal variation explains much of the variability in badger population trends. On the other hand, if sufficient badgers of suitable age and sex classes are translocated but populations do

not persist, this may suggest that the Upper Columbia either no longer or only occasionally has conditions conducive to supporting them (see Chapter 2). Similarly, continued monitoring of residents within the Kootenay River zone will indicate whether recent population trends continue. It would be expected that control measures by landowners and other density-dependent limiting factors would increase with a growing badger population. Ultimately, the most important conclusion evident from our results to date may be that there are at least some areas or times within the East Kootenay capable of supporting growing populations of badgers. Ongoing research will show whether earlier indications of a rapidly declining population were due to more-or-less permanent conditions typifying the Upper Columbia, a result of specific events in the recent past within both zones, or simply reflect occasional and unpredictable oscillations along the species' range limit.

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Chapter 2. Translocation as a Promising Tool to Aid Recovery

This chapter was presented as a paper at the Species at Risk 2004 conference in Victoria, March, 2004.

2.1 Abstract

The subspecies of American badger present in British Columbia (*Taxidea taxus jeffersonii*) is listed by COSEWIC as endangered and is on the provincial red list. Within the East Kootenay Trench, the badger population in the Kootenay River valley appears to be stable to possibly increasing slightly, but that of the upper Columbia River valley has approached extirpation. It is not clear whether trends in the upper Columbia were a product of a long-term loss in the area's ability to support badgers, suggesting recovery would be unlikely, or simply the result of random events in a low-density population, indicating recovery is possible under appropriate conditions. As a means of fast-tracking population recovery while testing the area's ability to support a recovering population, we translocated badgers into the upper Columbia valley. In the summers of 2002 and 2003, we radiotagged and translocated 15 badgers that were of the same subspecies and genetically similar to those in the East Kootenay from the Kalispell, Montana area. These included 7 adult males, 4 adult females, 2 juvenile males, and 2 juvenile females. As of December 2003, at least 3 of the 7 badgers released in 2002 were alive, 1 was dead of unknown causes, and 3 could no longer be radiolocated. One of the live animals was a female, and she weaned 1 kit in 2003. Of the 8 badgers released in 2003, 3 were known to be alive and 5 (4 juveniles) were at least temporarily lost from radiotelemetry contact. Early indications are that (1) survivorship among known-fate translocated adults is as at least as high as for East Kootenay resident badgers; (2) 7 of 11 adults and 0 of 4 juveniles remained in radiotelemetry contact; (3) all released adults known to be alive remained entirely or partially within the release area; and (4) kit production has occurred. Thus, preliminary indications are that the upper Columbia River valley remains capable of supporting a badger population, and translocation has so far been an effective means of enabling or speeding recovery.

2.2 Introduction

American badgers (*Taxidea taxus*) occur throughout much of the conterminous United States and south-central to southwestern Canada (Newhouse and Kinley 2000). Of the four subspecies (Long 1972, Newhouse and Kinley 2000), those in the western mountains are classified as *T. t. jeffersonii*. In Canada, this subspecies occurs only within British Columbia, where it is considered nationally endangered (COSEWIC 2003) and is on the provincial "red list" (Cannings et al. 1999). Ecological research on badgers in British Columbia began with the East Kootenay Badger Project (EKBP) in 1996. Within the East Kootenay study area, the northern portion (upper Columbia River drainage) represents a northern range limit for the species. In the upper Columbia, the badger population declined from an already low

level (likely <5 animals) at the onset of research to as little as 1 animal by 2000. Historically, it appears that badgers were relatively common at low elevations within the upper Columbia. Reasons for the decline are not clear, but possibilities include shooting of perceived problem animals, control of badger prey (primarily Columbian ground squirrels; *Spermophilus columbianus*), habitat alteration through fire suppression and real estate development, increasing roadkills as road density and traffic volume have risen, increasing barriers to movement caused by rapid development, or simply the effect of random events on a small population. In contrast, within the southern portion of the East Kootenay study area (the Kootenay River drainage upstream of the British Columbia-Montana boundary), the badger population appears to be small but recently stable, and possibly increasing over the short term (Newhouse and Kinley 2003). Despite the apparent potential for the Kootenay River drainage to act as a source population, the chances of rapid natural re-colonization of the upper Columbia drainage appear slight, given the relatively small source population in the Kootenay drainage (probably <60 breeding adults; N. Newhouse, unpubl. data); the potentially ephemeral nature of conditions supporting increases within the Kootenay; the degradation of burrows over time (with reference to the importance of existing burrows to badgers; Newhouse and Kinley 2001); the partial barriers (primarily human developments) in moving northward from the Kootenay to the Columbia; and the lack of connections to potential source populations in Alberta, as implied by subspecific differences.

The draft national recovery strategy for badgers (The *jeffersonii* Badger Recovery Team 2003), identified translocation as a possible method of augmenting populations and initiating recovery. Subpopulation delimitations (Newhouse and Kinley 2000) suggest that the part of Montana west of the Continental Divide supports the same subspecies of badgers as British Columbia. The results of genetic research are consistent with this, as similarities between badgers in western Montana and those of the East Kootenay are greater than similarities between either of those two populations and badgers in eastern Montana or Alberta (Kyle et al. 2004). Thus, we began discussions with representatives of Montana Fish, Wildlife and Parks (FWP) in 2001 regarding possibilities for obtaining source animals for a translocation from the northwestern portion of that state. In Montana, badgers are classified as non-game wildlife with commercial value (Montana Fish, Wildlife and Parks 2002), so are subject to trapping and shooting without bag limits or seasons and (on private land) can be legally poisoned. The population status of *T. t. jeffersonii* in Montana has not been determined, although anecdotal observations suggest that badgers are considerably more abundant in northwestern Montana than in the East Kootenay. Thus, Montana officials were willing to permit the removal of badgers for translocation. We developed a plan to move 15 animals from Montana to the upper Columbia based on the following rationale:

- the population status within the upper Columbia River portion of the East Kootenay was extremely poor;
- natural re-colonization was likely to be slow to nonexistent;
- a suitable source population for translocations was available;

- there was an opportunity to gain experience with translocation techniques;
- results of translocation might indicate whether the previous population decline was the result of ephemeral versus permanent factors; and
- translocation was included as an option within the national recovery strategy.

One initial concern of using translocation as a recovery tool might be the apparent poor prognosis for badgers released into an area where the original population had become extirpated or nearly so. However, we felt that several factors had recently changed in the upper Columbia valley. These included a general increase in public awareness and interest in badgers (Newhouse 2003) and the assumed reduction in intentional killing of badgers, the protection of Columbian ground squirrels on Crown land since 1992, anecdotal evidence of increases in the ground squirrel population, and ongoing efforts to address the growth of trees into former open forests and grasslands (Machmer et al. 2001). These changes suggested an increased likelihood of translocations being successful. In addition, population fluctuations can be due to random or other non-mechanistic factors. If this were the case for badgers in the upper Columbia, then there would be further reason to expect that translocations could be successful. Ultimately, there appeared to be little chance of local recovery without translocations but some chance with them, so translocation appeared warranted.

2.3 Study Area

The East Kootenay region of southeastern British Columbia includes the portion of the Rocky Mountains west of the continental divide and south of about 52°N, the Purcell Mountains east of their height-of-land, and the Rocky Mountain Trench, a major northwest-southeast – trending valley between the 2 mountain ranges. Within this region, the Columbia River originates at Columbia Lake in the Trench and flows northward, while the Kootenay River originates in the Rockies before flowing into the Trench immediately south of Columbia Lake, and then travels southward. The Rocky Mountain Trench is narrower within the upper Columbia River drainage (3-16 km) than in the Kootenay River drainage (4-30 km).

Within the East Kootenay, biogeoclimatic zones generally follow an elevational sequence from the Ponderosa Pine (PP) at the lowest elevations in the warmest, driest areas, through the Interior Douglas-fir (IDF) above the PP and elsewhere on valley bottoms, followed by the Montane Spruce (MS), Engelmann Spruce – Subalpine Fir (ESSF) and Alpine Tundra (AT) zones. In some tributaries of the Trench receiving higher precipitation, the Interior Cedar – Hemlock (ICH) zone occurs in place of the MS (Braumandl and Curran 1992). The PP and IDF were historically dominated by open forests of ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) respectively on zonal sites, grasslands or grass-shrublands on more xeric sites, and extensive marsh and forested riparian habitat along rivers. However, human settlement within the IDF and PP has resulted in residential, recreational,

road, and agricultural development along the valley bottoms, along with tree ingrowth and encroachment into former open forest and grassland due to fire suppression (Gayton 1996). Climax forests in the MS are closed-canopy stands of hybrid white spruce (*Picea glauca* x *engelmannii*), in the Interior Cedar Hemlock are western redcedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*) and in the ESSF are Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*), but the MS, ICH and ESSF in the study area have had an extensive history of fire and timber harvesting, so also include roads, cutblocks, burns, and forest stands of varying ages with a high proportion of lodgepole pine (*Pinus contorta*) and other tree species. The AT is non-forested.

Resident badgers radiotagged for the EKBP have been trapped in the PP, IDF and MS zones, but radiotagged badgers and untagged animals reported by the public (Newhouse 2003) have also used the ICH, ESSF and AT, covered elevations of 800 to 2700 m, and extended from the Montana boundary at 49° N to about 51° N. Translocated badgers were trapped at the southern end of the Salish Mountains, 30-50 km west of Kalispell, Montana, or in one case within Kalispell. Kalispell is the approximate southern limit of the Rocky Mountain Trench. The trapping area is classified as IDF (Demarchi et al. 2000), although vegetation there appeared more typical of the PP zone in the East Kootenay.

2.4 Methods

2.4.1 Translocation and Monitoring

The general location for trapping source animals was selected by FWP biologists based on high-density badger populations. The animal captured within Kalispell was targeted due to complaints arising from it digging burrows under a helipad. We set and checked traps in cooperation with a contract trapper from Montana and a FWP biologist, following methods outlined in Apps et al. (2002). There were 935 trap-nights on 65 days between May and August 2002 and in July 2003 in the regular trapping area, plus 2 nights at the Kalispell helipad in August 2002. After capture, we transported badgers to Kalispell for veterinary examination and implantation of radiotransmitters. In 2002, a variety of brands, models and specifications of transmitters that were surplus from other research projects were implanted due to a temporary inability to license new radiotransmitters. Transmitters used in 2003 were manufactured by Advanced Telemetry Systems (Isanti, MN) and were rated at >3 years battery life. All badgers were dewormed and had topical flea ointment applied. We then transported them to the border for Canadian Food Inspection Agency (CFIA) veterinarian examination. Seven of the translocated badgers were released the day after capture, while 6 were released after 2 days and 2 after 3 days due to the temporary unavailability of veterinarian services or inspection personnel.

We selected release sites based on the following criteria:

- within or immediately adjacent to the upper Columbia River drainage;

- high habitat quality extending over a large area, as indicated by recent habitat suitability modeling (Apps et al. 2002) and subjective assessments incorporating recent or imminent changes to habitat conditions;
- evidence of abundant ground squirrel populations;
- evidence of recent use by badgers;
- low risk of vehicle collisions (few roads and/or roads with little traffic); and
- relatively low levels of human settlement.

We released badgers at existing but currently unoccupied badger burrows within active Columbian ground squirrel colonies. Several frozen ground squirrels were provided to each released badger to ensure it had food immediately and an opportunity to develop familiarity with the release site. We monitored badgers aerially using standard radiotelemetry techniques (Samuel and Fuller 1996). The monitoring schedule varied by season, weather, aircraft availability and budget. Flights occurred approximately three times monthly through October 2002, then monthly through March 2003, twice monthly through June 2003, and weekly through 13 August 2003. Flights were interrupted from 14 August (19 days after the release of the last badger) through 10 September 2003 due to the telemetry aircraft being used for spotting wildfires. Flights occurred about three times monthly in September and October 2003, then monthly through December 2003. In searching for badgers that were not readily located, we periodically extended monitoring flights in the Rocky Mountain Trench from 80 km northwest of the northernmost release site southward to the trapping locations, and up to 15 km into both the Purcell and Rocky mountains, an area of about 10,000 km². This report summarizes results through December, 2003.

We used the following procedures and obtained the following permits to conduct the augmentation:

- The British Columbia Ministry of Water, Land and Air Protection (WLAP) provincially approved an "Application for Permit to Conduct Badger Translocation" by The *jeffersonii* Badger Recovery Team.
- WLAP provincially issued a permit to import, transport and release badgers.
- WLAP regionally issued a scientific permit for collecting samples, radiotagging and tracking.
- A scientific collecting permit was issued by FWP.
- For each badger, a United States Fish and Wildlife Service (USFWS) "Declaration for Importation of Exportation of Fish or Wildlife (Form 3-177) was completed.
- Each badger was inspected by a veterinarian in Montana and issued a Health Certificate titled "Official Certificate of Interstate Movement".
- Each badger was checked at the border by a CFIA veterinarian.

2.4.2 Analyses

We employed the modified Kaplan-Meier method to chart survivorship, following the staggered-entry technique described by Pollock et al. (1989). The survivorship function for each week was calculated using the formula:

$$S(t) = \prod (1-d_j/r_j)$$

where: $S(t)$ = survivorship at time t

\prod = product

d_j = deaths in the week

r_j = number of animals at risk in the week (i.e. total number tagged minus number having previously died or for which telemetry contact was lost)

This provided weekly cumulative survivorship data for plotting. Confidence intervals (CI) for weekly Kaplan-Meier survivorship estimates were determined following Pollock et al. (1989):

$$95\% \text{ CI} = S(t) \pm 1.96\{[S(t)]^2[1-S(t)]/r(t)\}^{1/2}$$

Following this, S_{annual} was extrapolated by taking the n^{th} root of the cumulative survivorship, where n is the number of years. The date of death or censoring (due to telemetry contact being lost) was assumed to be the midway point between the last live telemetry date and either the date on which the animal was found dead or the first date on which it could no longer be located.

We compared the proportion of animals lost from radio contact between juveniles and adults with a chi-square test using *Statistix 8* (Analytical Software, Tallahassee, FL). We calculated 100% minimum convex polygons (MCP) enclosing post-release radiolocations of translocated badgers using *Calhome* (Kie et al. 1994), to provide preliminary indications of movement. Kernel estimators of home range were not calculated due to currently low relocation samples. We assumed the center of MCPs to be the midpoint of each badger's extreme post-release east and west coordinates and north and south coordinates.

2.5 Results

Fifteen badgers were translocated, almost half of which were adult males (Table 2-1). In addition, 3 juvenile females were released immediately after capture due to their small size, and 2 adult males were also immediately released due to the preponderance of males captured (Table 2-1). There were 7 release sites (<0.5 km² each) across 75 lineal km of the upper Columbia portion of the Trench, or immediately adjacent to it (Figure 2-1). We used 4 of the sites for releases of 1 adult male each, 1 site for an adult female and adult male in 2002 and adult male in 2003, 1 site for an adult female and adult male in 2002 and adult female with a kit of each sex in 2003, and 1 site for an adult female with female kit and an unrelated male kit in 2003.

Table 2-1. Badgers translocated from the Kalispell, Montana area to the upper Columbia River portion of the East Kootenay region, British Columbia, 2002 and 2003.

Year	Badgers Translocated				Total
	Adult Male	Adult Female	Juvenile Male	Juvenile Female	
2002	5 ^a	2	0	0 ^b	7
2003	2	2	2	2	8
Total	7 ^a	4	2	2 ^b	15

^a 2 more were released upon capture due to preponderance of adult males trapped in 2002

^b 3 more were released upon capture due to small size and young age

Known movements of translocated badgers were within both the upper Columbia drainage and the adjacent Kootenay River drainage (Figure 2-1). While most activity was in the Rocky Mountain Trench within areas predicted to have medium to high habitat quality, several animals made use of sites farther into the Rocky or Purcell mountains, including at high elevations. The sizes of minimum convex polygons enclosing known badger locations for badgers translocated in 2002 were highly variable but, within the limitations of the preliminary data, appeared similar between residents and translocated animals for males, but smaller for translocated animals among females (Table 2-2).

As of December 2003, 6 of the translocated badgers were known to be alive, 1 (adult female) had died, and the fates of the remaining 8 were unknown, but they were presumed to either have experienced radiotransmitter failure or to have dispersed beyond the range of monitoring (Table 2-3, Figure 2-1). This represents annual survivorship among known-fate adults of 88.9%. Because all translocated juveniles were lost from radio contact within a month of release, we could not calculate survivorship for them. For animals translocated in 2003, a comparison among age groups was possible because identical radiotransmitters were used in each animal. The proportion of badgers lost from radiotelemetry contact was higher among juveniles than adults (4/4 vs. 2/6; $\chi^2 = 4.44$, 1 df, $P = 0.035$) in that year.

Of the 2 adult females present in the spring of 2003, 1 is known to have raised 1 kit to the above-ground stage (first observed 12 June 2003). The fate of this kit is unknown, as trapping attempts were not successful. We could not determine whether there were littermates that did not survive to the age at which they emerged from the natal burrow. The other adult female died between 10 May and 30 May 2003. Although the 2 last radiolocations prior to death (15 April and 10 May) had been estimated to be within 10 m of each other, suggestive of a there being a maternal den, we had no direct evidence of the presence of kits.

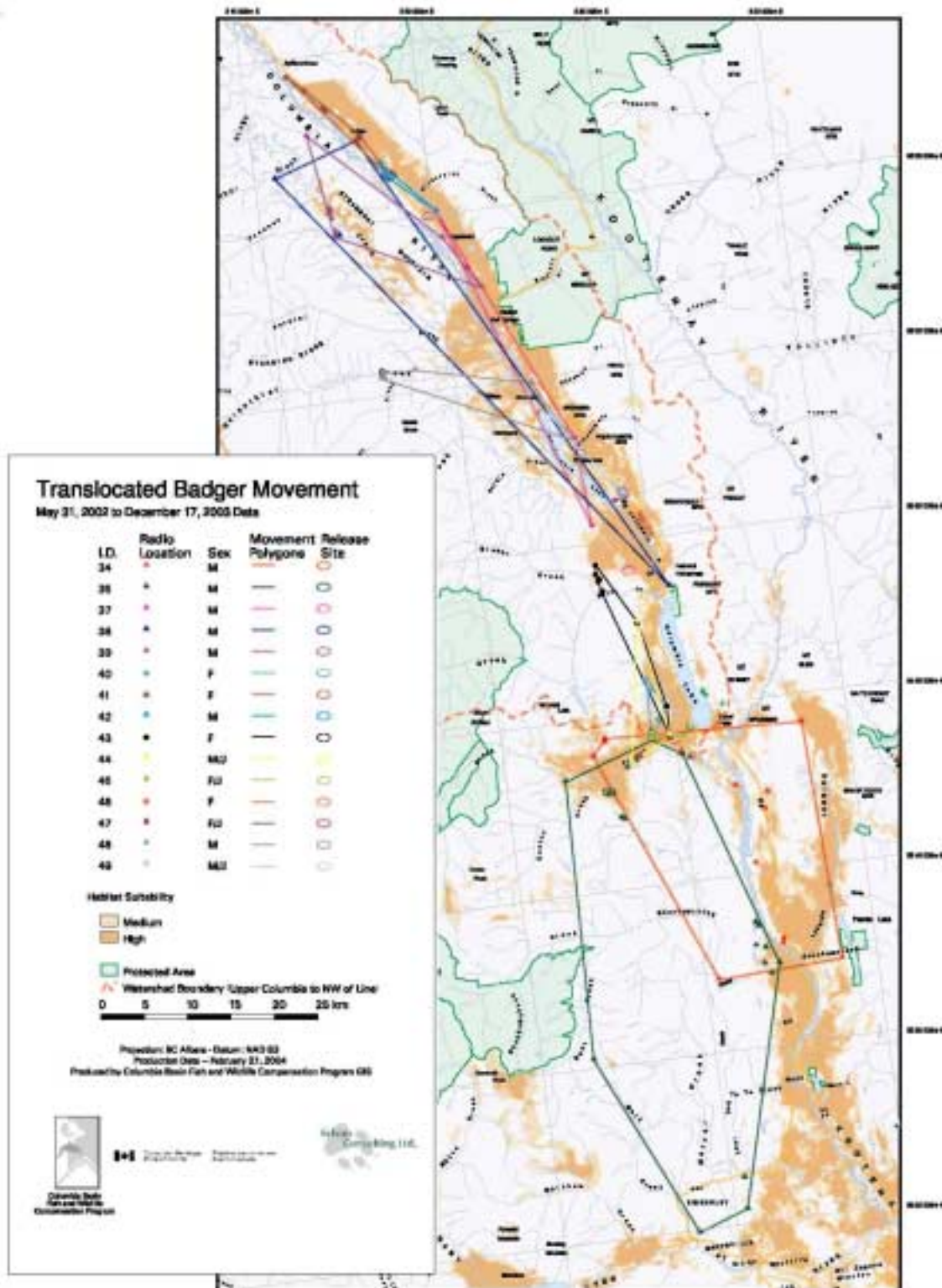


Figure 2-1. Release sites, radiolocations and minimum convex polygons enclosing radiolocations for badgers translocated to the upper Columbia River portion of the East Kootenay region, British Columbia, in 2002 and 2003.

Table 2-2. Area of minimum convex polygons^a enclosing movements of adult badgers translocated to the upper Columbia River portion of the East Kootenay region, British Columbia, 2002, in comparison to those resident^b in the upper Columbia, 1996-1999.

Badger	Sex	Status	Months of Data	n ^c	Rate ^d (%)	Area (km ²)
2	M	resident	23	57	87	513.0
4	M	resident	30	81	75	764.8
6	M	resident	17	39	75	776.4
1	F	resident	38	163	88	86.9
3	F	resident	36	142	83	84.4
5	F	resident	8	27	93	52.3
34	M	translocated 2002	19	36	92	560.7
35	M	translocated 2002	19	26	65	913.9
37	M	translocated 2002	13	14	54	55.3
38	M	translocated 2002	13	4	17	320.9
39	M	translocated 2002	12	11	100	107.6
40	F	translocated 2002	10	14	100	7.3
41	F	translocated 2002	16	28	88	9.6

^a Due to small samples and high proportion of unsuccessful relocations, these should be considered to be only preliminary indicators of areas used. No calculations were done for animals released in 2003.

^b Calculated using N. Newhouse, unpubl. data.

^c Number of radiolocations; excludes release locations for translocated badgers.

^d Percentage of attempted radiolocations that were successful, including last successful radiolocation.

Table 2-3. Status and locations relative to release sites of badgers translocated to the upper Columbia River portion of the East Kootenay region, British Columbia, 2002 and 2003.

No.	Sex	Age	Year	Status and Latest Radiotelemetry Contact Date	MCP ^a in Upper Columbia?	Release Site in MCP?	Maximum Dispersal Dist. (km)	Distance from Release Site to Center of MCP (km)
34	M	adult	2002	alive Dec/03	part	yes	33.7	15.3
35	M	adult	2002	alive Dec/03	part	yes	51.7	23.7
37	M	adult	2002	unknown Aug/03	yes	no	47.1	26.9
38	M	adult	2002	unknown Sep/03 ^b	yes	yes	57.2	24.0
39	M	adult	2002	unknown Feb/03	yes	no	16.9	4.0
40	F	adult	2002	dead Jun/03	yes	yes	7.0	3.7
41	F	adult	2002	alive Dec/03	yes	yes	16.6	8.4
42	M	adult	2003	unknown Sep/03	yes	yes	6.9	2.7
43	F	adult	2003	alive Dec/03	yes	yes	20.9	10.2
44	M	juv.	2003	unknown Jul/03	yes	yes	13.4	5.4
45	F	juv.	2003	unknown Jul/03	yes	yes	3.7	1.9
46	F	adult	2003	alive Dec/03	yes	no	5.6	4.3
47	F	juv.	2003	unknown Jul/03	yes	no	1.2	0.6
48	M	adult	2003	alive Dec/03	yes	no	24.5	13.1
49	M	juv.	2003	unknown Aug/03	yes	no	6.7	6.2

^a 100% minimum convex polygon enclosing post-release radiotelemetry locations

^b transmitter replaced July 2003

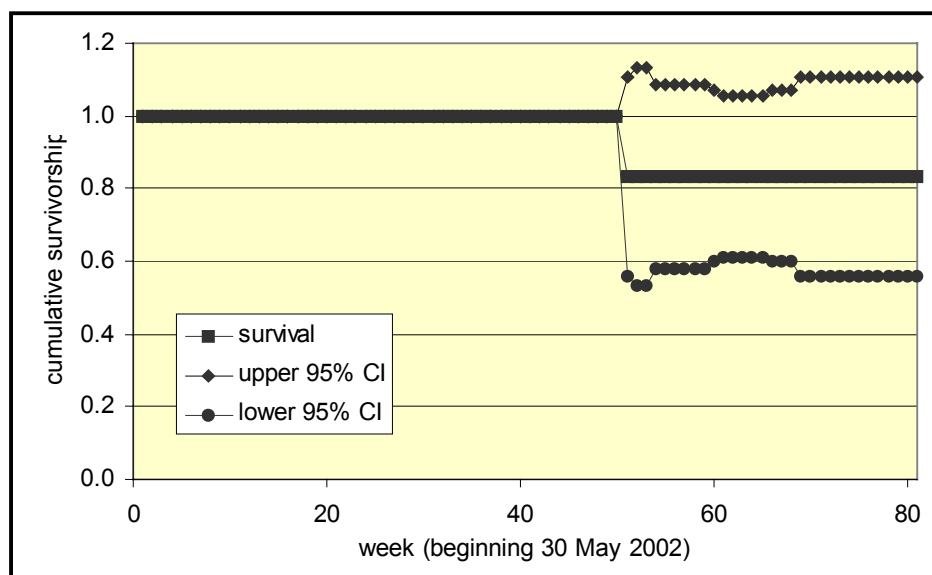


Figure 2-2. Kaplan-Meier survivorship curve for adult badgers with known fates translocated to the upper Columbia River portion of the East Kootenay region, British Columbia, May 2002 - December 2003.

2.6 Discussion

One difficulty in assessing the success of the translocation program is that 8 of 15 animals had unknown fates. It is likely that few if any of these animals died within the normal monitoring area, as transmitters continue to function regardless of an animal's death. In the past, dead resident animals with implanted transmitters have been readily detected from the air and ground when up to several metres underground, following a train collision, and after being struck by vehicles (N. Newhouse unpubl. data). Thus, even if translocated animals had died, repeated attempts to locate them should have eventually been successful had they remained within the roughly 10,000-km² monitoring area. Several observations suggest that transmitter failure may have occurred in at least some of the animals. Failures have occurred for both resident and translocated animals in the past (N. Newhouse, unpubl. data). This was particularly true for animals implanted in 2002, when surplus transmitters that were several years old were implanted. Thus, it is conceivable that the unknown status of badgers trapped in 2002 is partly or entirely the result of transmitter failures. In fact, 1 of the badgers translocated in 2002 were subsequently re-trapped with a failed transmitter in 2003, and had its transmitter replaced. However, there are also factors suggesting that dispersal was likely responsible for the unknown status of some animals. All transmitters implanted in 2003 were freshly purchased with an expected life >3 years, so having failures from 6 of the 10 transmitters in newly captured or recaptured animals would be surprising. The proportion of animals lost from radiotelemetry contact was higher among juveniles than adults, which is consistent with the expectation that juvenile badgers normally disperse (Messick and Hornocker 1981), so may suggest that at least part of the observation relates to long-distance dispersal by translocated badgers. Furthermore, several of the animals are known to have made movements well away from the release area, including some that were at high elevations and/or near the edge of the monitoring area, and each of the translocated animals went undetected on at least 1 monitoring flight. These observations are consistent with some of the "lost" animals having simply dispersed farther than those that remained in contact. The unavailability of the telemetry aircraft for much of the period shortly after release may have contributed to us losing contact with some animals before their general direction of travel could be established. Thus, while the fate of 8 of the badgers will not be known unless they are fortuitously found as dead animals, are re-trapped, or return to the monitoring area, our best estimation is that (a) some portion, possibly the majority, of unknown fates represent animals that made long-distance dispersals, and (b) most of the remainder probably had transmitter failures. Permits are required for possession of badger carcasses in British Columbia, providing an opportunity to inspect badgers picked up as roadkills or shot as nuisance animals. Full necropsies should be performed on all animals for which permits are requested until at least 2010, to maximize the opportunity to learn the fate of translocated animals.

Despite the apparent dispersal of some or all of the translocated juveniles and the preliminary nature of our data, initial indications are that translocation has been relatively successful. Roughly half (likely

more) of those translocated remained entirely or largely within the upper Columbia valley, with most continuing to make periodic to regular use of their release areas. There have been no other American badger translocation programs with which to compare results, but in 2 fisher (*Martes pennanti*) translocation programs in British Columbia, Weir (1995) found that 9 to 14 of the 15 collared animals established home ranges in the target area (mean < 42 km from release site) and Fontana et al. (1999) reported that 56% remained within the study area (mean < 26 km from release site) until losing radiocollars an average of 5 months post-release. Among grassland-dependent carnivores, dispersal data are available from the release of captive-reared and translocated wild-caught swift foxes (*Vulpes velox*) in Alberta and Saskatchewan, and captive-reared black-footed ferrets (*Mustela nigripes*) in Wyoming. In a year of apparent prey abundance, captive-reared foxes that survived from fall through spring had mean maximum dispersal distances of 9.3 km, with den sites averaging 4.5 km from release sites. In contrast, in a year of low food availability, 9 of 12 collared captive-reared foxes appeared to have dispersed beyond radiotelemetry contact within 2 weeks of release, while the remainder averaged 8 km dispersals in the same period (Herrero et al. 1991). Wild swift foxes captured in Wyoming and released in Alberta or Saskatchewan moved an average of 7.2 km from the release site within 2 days, 17.3 km after 4 days, and 27.2 km (adults) or 19.3 km (pups) during the multi-year monitoring period. In addition, daily movements were over twice as large for translocated than resident foxes during the first 50 days after release. Of the 29 foxes translocated in the fall, 11 survived within the target area to the following June (Moehrensclager and Macdonald 2003). Many released ferrets were lost from radiotelemetry contact, but the locations of known-fate animals were within a rectangle of 1200 km² around the release site 2 months after release, with a maximum known dispersal distance of 26.5 km (Biggins et al. 2004). Within the constraints of having many animals of unknown fate, our results appear to be within the range of these 5 studies.

Additional evidence of success is that annual adult survivorship has been at least as good as that previously recorded for resident badgers (88.9% for translocated animals vs. 80.2% for residents of the East Kootenay as a whole; Newhouse and Kinley 2003). Reproductive data are extremely limited, but the 1 female for which observation were possible had at least 1 kit that reached the above-ground stage, in contrast to the previous complete absence of reproduction among tagged resident females in the upper Columbia (Newhouse and Kinley 2003). Thus, translocation appears to be a promising tool to “kick-start” the recovery of extirpated or nearly extirpated badger populations. Our positive results also suggest that the original loss of the badger population in the upper Columbia valley may have been due to factors that were not permanent, i.e. the decline prior to translocations does not necessarily indicate that the area has permanently lost its capability to support badgers.

Conducting translocations as soon as possible after population declines is important, for several reasons. Burrows in which badgers are found are more often re-used than freshly dug (Newhouse and Kinley

2001). From a social perspective, having a collective public memory and recognition of badgers as part of the ecosystem probably improves the likelihood of support for both translocation and the necessary management actions (such as habitat restoration, protection of prey, and improving the public's perception of the value of badgers). In fact, rather than viewing translocation as being appropriate only when land and resource management actions have already been taken to maximize the likelihood of success, we argue that the presence of badgers through translocation in itself acts as a catalyst for appropriate management activities. With no badgers present, it would probably be more difficult to convince government agencies and the public of the need to take other steps needed for the conservation of badgers. Thus, translocation of badgers into historic range from which they have been lost likely contributes to a positive feedback cycle leading to further badger conservation actions. This may be appropriate where badgers occur at low and potentially reduced densities elsewhere in British Columbia, such as parts of the Thompson-Okanagan region (Weir et al. 2003), or for badgers of the endangered *T. t. jacksoni* subspecies in southern Ontario (Newhouse and Kinley 2000).

Interpretation of translocated badger movements must be tempered by the fact that most were lost from radio contact, and some of the movement may have represented exploration, so might not ultimately be included within a normal home range. Those 2 factors have opposing implications for whether the MCP polygons portrayed represent the true extent of home ranges. However, preliminary indications are that space use among males was similar to residents. Adult female polygons appeared to be much smaller for translocated than resident animals, with translocated animals having polygons similar to the mean value of 12.0 km² reported for resident adult females in the more southerly Kootenay River portion of the East Kootenay (Newhouse and Kinley 2003) and 10.5 km² for an adult female in the North Thompson River valley (Weir et al. 2003). More refined analyses of home ranges will be possible in future years as additional telemetry data from animals released in 2003 becomes available.

Two recommendations for future translocations relate to sex ratio and the use of juveniles. Even with the rejection of 2 males at the point of trapping, 64% of adults released in the upper Columbia were male. This sex ratio was skewed relative to the balanced population reported in other badger capture samples (Messick and Hornocker 1981, Newhouse and Kinley 2003). This imbalance will presumably help ensure pregnancy among translocated females, given the polygamous mating pattern, but is obviously problematic from the perspective of maximizing the number of litters. For those planning translocations in the future, the possibility of requiring additional effort and funding to acquire a more balanced sex ratio should be factored into planning and budgets. Unless our conclusions about juveniles having dispersed well out of the upper Columbia valley are wrong, preliminary indications are that the use of kits (family groups) had no significant benefit. We had initially expected that juveniles might be less attached than adults to their point of origin, potentially making them less likely to "go home" and therefore perhaps more likely to remain in the vicinity of release sites. Among fishers translocated to the East Kootenay, family

groups were found to be more likely than individuals to remain near the release site (Fontana et al. 1999). From our limited data, we cannot determine whether the presence of kits improved fidelity to release sites among adult females, but preliminary indications are that the kits did not remain nearby. Site fidelity and family group cohesiveness among translocated kits and their mothers might be improved by forcing all members of family groups into the same burrow upon release. We released groups together but animals sometimes entering separate burrows, and we observed kits and mothers diverging from each other soon afterward. Using boards to funnel each member of a family group from the transport barrel into a single burrow would ensure that they did not immediately become separated. If translocations continue in future years or at other locations, monitoring the success of forcing family groups into a common burrow would be worthwhile. However, if future results indicate that translocated juveniles are not typically successful in establishing home ranges within target areas and their presence does not improve site fidelity among their mothers, then conservation goals might ultimately be best served by leaving juveniles in the source area (assuming adult females were only removed late enough in the season that the kits would be independent or nearly so). This would facilitate juveniles establishing home ranges in areas vacated by captured animals, thus presumably increasing survivorship of the source population and allowing a higher future removal of animals for translocation.

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Chapter 3. Badger Sightings Update

Sightings were collected through the toll-free line for reporting badger sightings (1-866-EK-BADGER) and through informal communications. The hotline served both as a tool to receive information about badger locations and as a valuable opportunity for researchers to convey ecological and conservation messages to callers.

About 60 additional sightings were recorded from April 2003 to February 2004, bringing the total number of sightings to nearly 700 (Figure 3-1). Eleven family groups were recorded in the East Kootenay in the summer of 2003. Of these, 3 were known through radiotelemetry and the remaining 8 were documented as a result of reports from the public. There were also 7 records of non-tagged roadkilled badgers during 2003-2004 (all in 2003), in addition to the 20 non-tagged badgers reported as roadkills from 1996-1997 through 2002-2003.

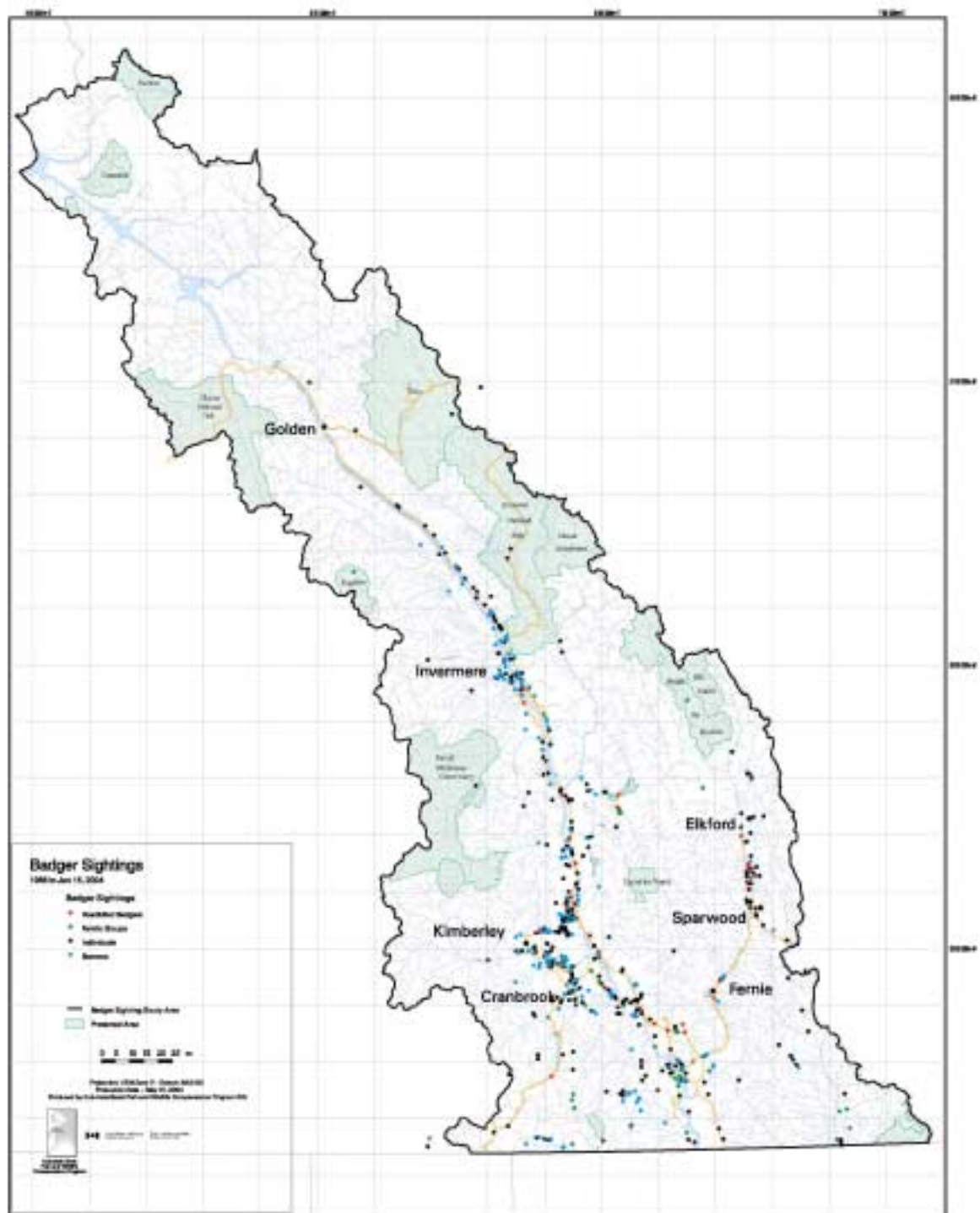


Figure 3-1. Badger sightings reported in the East Kootenay region, British Columbia to February, 2004.

Chapter 4. Communications Update

4.1 Introduction

Badgers are red-listed in British Columbia, and BC's subspecies (*Taxidea taxus jeffersonii*) is listed as endangered by COSEWIC. An intensive research and conservation project, the East Kootenay Badger Project (EKBP) has been underway in the East Kootenay since 1996. During this time, 31 badgers have been radiotagged and monitored and a habitat suitability model has been published. Under the guidance of the recovery team, conservation messages have been delivered through a multi-media approach ranging from one-on-one meetings with landowners to international television coverage to scientific publications.

4.2 Websites

There are several active websites that provide information about the EKBP, including:

- Columbia Basin Fish and Wildlife Compensation Program (www.cbfishwildlife.org)
- Parks Canada: (www.pc.gc.ca/pn-np/bc/kootenay/natcul/natcul30a_e.asp)
- East Kootenay Environmental Society: (www.ekes.org)
- jeffersonii Badger Recovery Team: (www.badgers.bc.ca)

4.3 Portable Display

The portable display developed with funding from Parks Canada in 2002-2003 has been set up at the Radium Hot Springs Visitor Centre since May, 2003. The centre received about 24,000 visitors in 2003.

4.4 Presentations

During the 2003-2004 year, presentations on the research results and conservation implications of the EKBP were made at the:

- Science and Management of Protected Areas Association (SAMPAA) annual conference, Victoria, BC
- Parks Canada Research Speakers Series, Banff, Alberta
- Rotary Club meeting, Invermere, BC
- Species at Risk 2004 conference, Victoria, BC.

4.5 Television, Radio, Magazine, Brochure and Newspaper Coverage

Extensive education efforts continued in 2003 through television, radio, magazine, brochures, and newspapers. Highlights included continued broadcasting of the *Champions of the Wild* documentary on the Knowledge Network, and newspaper articles in the *Calgary Herald* and Canmore's *Rocky Mountain Outlook* (Figure 4-1). We cooperated with the Land Conservancy of BC's "Adopt a Badger" program, a fund-raising program to purchase properties in the Wycliffe area, by supplying project brochures for mail-outs to 35 donors. We also provided photos and information for an article in the *Columbia Valley Map Book* (Figure 4-2). In addition, we twice provided input for press coverage for the *Cranbrook Daily Townsman* relating to a "problem badger" in Cranbrook (Figure 4-3). Badgers were one of the species featured in a newspaper article highlighting the purchase of conservation lands in the East Kootenay (Figure 4-4).

CALGARY HERALD Sunday, May 4, 2003

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American badgers are considered endangered in B.C., but conservationists are working to protect the animal. Photos, Tim McAllister, Rocky Mountain Outlook

Badgers moved north to boost species

CATHY ELLIS
FOR THE CALGARY HERALD
RADIUM HOT SPRINGS, B.C.

Strained Canada-U.S. relations are about to take a turn for the better under a plan to boost an endangered badger population in the Upper Columbia Valley this summer.

Researchers with the East Kootenay Badger Project plan to relocate up to 10 more American badgers from Montana this summer to help bring the endangered badger back from its precarious state in B.C.

"Our goal is to recover self-sustaining populations of the badger in British Columbia," said Nancy Newhouse, an independent biologist with Sylvan Consulting Ltd. "I think we can do it, but it's not going to be easy because there are so many challenges facing this population.

Badgers were always the forgotten carnivore, but not anymore."

Jim Williams, regional wildlife manager with Montana's fish, wildlife and parks department, said a permit allows for up to 15 badgers to be translocated from an area west of Kalispell.

"Canada has sent us so many species over the years, whether it's grizzly bears or wolves sent to Yellowstone, and so this is something we can reciprocate," said Williams. "This is the first international badger relocation project and it paves the way for other international wildlife projects. Last year's translocation was a success and hopefully we'll see the same success again this year."

FROM CI BADGERS: Adjusting well to their new homes

Last summer, five male and two female badgers were relocated from near Kalispell to the Upper Columbia Valley to boost dwindling badger numbers between Radium Hot Springs and Canal Flats.

Newhouse said the translocated badgers appear to be adjusting well to their new homes, although it is possible that one of the males has died because his transmitter signal is off the air.

She said the two females appear to have settled close to where they were released, while the males continue to cover fairly extensive areas, often travelling as far as 50 kilometres.

"In general terms, this behaviour mirrors what has been observed in resident badgers," said Newhouse.

Badgers, which belong to the weasel family and are related to mink, marten and wolverine, are nocturnal and secretive, making it difficult for researchers to study them.

Six years of study indicates badger numbers in the East Kootenay region are quite low, and although there appears to be small, healthy pockets, there are thought to be fewer than 60 breeding adults.

About one-third of the 32 radio-tagged animals have died since the study began, mainly mowed down on the roads and railway line, although natural predators killed some.

During the same time, only five of



A population decline in the B.C. subspecies of the American badger has spawned the Kootenay Badger Project, which is translocating some of the animals from Montana.

the 11 radio-tagged adult females have given birth.

A population decline of the B.C. subspecies of the American badger in the past few decades has prompted the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to list the species as endangered.

Three sub-species of the American badger exist in Canada.

The Ontario sub-species is also listed as endangered, although the prairie badgers are not considered at risk.

Researchers suspect many reasons for the population decline, although it is believed the biggest threat to the badger is loss of habitat due to human activities.

There has been no legal trapping allowed since 1967, but researchers say highway and railway mortality plays a role in the badgers' endangered status.

Newhouse said one of the most interesting discoveries in the six-year study is just how huge the home ranges of badgers are. The ranges were found to be substantially larger than in areas studied in the U.S.

Female badgers have been tracked to cover an average area of 37 square kilometres, while the home ranges of male badgers are about 308 square kilometres on average, she said.

"Some of the animals we tagged in the northern part of the study area have home ranges the same size of grizzly bears," said Newhouse.

"Badgers are remarkable creatures."

CATIE ELLIS IS A REPORTER FOR THE ROCKY MOUNTAIN OUTLOOK

Figure 4-1. Badger translocation article from *Calgary Herald* and *Rocky Mountain Outlook* (Canmore).

Species at Risk

Badgers belong to the weasel family and are related to mink, marten and wolverine. The species that occurs in Canada is the American badger (*Taxidea taxus*). Badgers spend much of their time underground. The badger is one of the few carnivores that burrows after and eats other burrowing animals. It has many interesting features that adapt it to life as nature's digging machine. In the East Kootenays, the badger's favourite food is the Columbian ground squirrel, but they also eat voles, sparrows, loons, fish and even beetles.

Unfortunately, badgers are endangered in B.C. Although they were likely widespread up to the late 1800's, recent studies show that the British Columbia badger population has dropped to fewer than 200 adults. The *jeffersonii* subspecies of American badger was listed as endangered in 2000.

Badgers like to live in open valley bottoms – the same places humans like to establish cities, roads, and farms. Suitable badger habitat is being lost as a result, along with prey species like ground squirrels. Many badgers die from vehicle collisions and even deliberate persecution as "nuisance" animals.

The East Kootenay Badger Project,

with Parks Canada as one of the partners, aims to find the answers of how best to restore populations. Initiated in 1995, this long term study of badger ecology and distribution in the East Kootenays, including Kootenay National Park, is Canada's first intensive radio telemetry-based study of badgers.

Badgers are hard to study as they are nocturnal, secretive animals and are seldom seen. This research uses a technique called radio-telemetry to follow the badgers' movements. Badgers are fitted with a transmitter that emits a radio signal and tracked both by plane and on the ground.

The results from six years of telemetry studies indicate that:

- Reproductive success is low, especially in the upper Columbia Valley.
- Annual home ranges of resident adults averaged 3 to 150 times larger than reported studies conducted in the USA.
- Average annual survivorship of adults was 80%.

The badger study is an all important component of the strategy to restore British Columbia's American Badger populations.

Photos: Sam MacMillan

If you do see a badger, please call the Badger Hot Line 1-866-352-2343 (EK BADGE)

60 2004 Columbia Valley Map Book

Figure 4-2. Article from 2004 *Columbia Valley Map Book* based on information provided by East Kootenay Badger Project biologist.

Cranbrook Daily Townsmen

Tuesday, May 13, 2003

Varmint Report



Lowell Threinen photo
The itinerant badger goes to ground in Lowell Threinen's backyard.

Badger sets up shop: Now how to roust him out

By GERRY WARNER
Staff Writer

CRANBROOK — Local musician Lowell Threinen has an unwelcome "guest" in his yard that he doesn't quite know how to deal with — a full-grown badger.

The gray-coated, furry mammal took up residence in Threinen's back yard Saturday afternoon and he even came face-to-face with the nocturnal creature when he looked into its burrow.

"When I went to investigate what I thought to be something my son had dug, I noticed a large animal looking at me from the hole. It didn't become aggressive, but I didn't stick around very long."

Threinen said he's familiar with badgers from his days on the farm and believes they should be given a wide berth. "They're extremely aggressive, anti-social

and very dangerous. They're sort of like a cross between a weasel and a tank but you can't do anything to them because they're an endangered species.

"They've got big claws and they're something you just leave alone."

Threinen, who lives on the south side of town on 7th Avenue, said he contacted the city's animal control department, the conservation office and the fire department but didn't get the kind of help he was looking for.

Animal control put skunk traps at the badger's two entrances, but they didn't look big enough to handle the animal which he estimated to be 24 to 30 inches long and 12 to 18 inches wide. The person at the other end of the 1-800 conservation officer line in Victoria said badgers were considered "nuisance animals" and CO's don't deal with nuisance animals.

He was given the numbers of two local trappers, but told he'd have to pay for the trappers to remove his unwanted guest. But the fire department put him into contact with wildlife biologist Nancy Newhouse, coordinator of the East Kootenay Badger Project.

"She called back and was astonished to hear the story," he said. "She had never heard of a badger in town before. Her thoughts are that the badger is probably using our yard as a 'hotel,' but it might be a den."

Threinen said he's not keen about the badger using his yard for a "hotel" even though he hasn't seen the critter since 3 a.m. Sunday.

"At the moment it appears he's gone for a walk. But our fear is when is it going to come back. All I can say is we have a large and quite dangerous animal roaming up and down 7th Avenue and living at least part time in my yard."

But Threinen said he wouldn't want to see the foot-loose badger killed. "Absolutely not. It's an endangered animal. It's not his fault. I think a live trap would be best, but he should be dealt with carefully because he's endangered."

In a phone interview from Invermere, Newhouse said she will do all in her power to see that the errant badger isn't harmed. But live trapping would only be a last resort, she said.

"I'm not convinced he (the badger) has taken up residence permanently. He was certainly there the day they took the picture but I don't know if he's still there now."

Newhouse, who's been studying badgers in the East Kootenay for nine years, said the best thing anybody could do for the urban badger is to leave it alone and it will probably wander away on its own. Ensuring there's no food, especially meat of any kind, will also help, she said. Keeping dogs away will also help because they will just cause the badger to stay in its burrow, she said.

Badger enjoys new locale

From Page 1.

"If it doesn't leave or if it leaves and comes back we'll certainly try to live trap it and move it out of there," she said.

Badgers exist primarily on Colombian ground squirrels but they will also eat birds, bird eggs, large insects and other forms of protein, she said. They can be aggressive towards creatures their own size and most dogs will avoid them but there are no known cases of them attacking humans.

Badgers do have long claws, but the claws are used primarily for digging and not for attacking other animals, Newhouse said.

"It's a very unusual situation to have a badger in a back yard like that. They're not dangerous but I wouldn't want to see anyone sticking their hand down their burrow or poking at them with a stick," she said.

Newhouse said there are 200 to 250 known breeding adult badgers in B.C. and about 60 breeding pairs in the East Kootenay. Several have been radio tagged and their wanderings mapped in ranges as large as 500 sq. km, she said.

About the only enemies badgers have in the wild are cougars, bob cats and coyotes, but many become road-kill trying to cross busy highways, she said. Legal trapping of badgers ended in B.C. in 1967 and the creature's fur is no longer used for shaving brushes and angler's flies as was the case in the past, she said.

Newhouse said her hope as a biologist is that the badger will leave town. "I would love to see it leave on its own and go back into the surrounding area and become part of the local ecosystem."

Cranbrook Daily Townsmen

Tuesday, May 20, 2003

Varmint Report



File photo

Comforts of home

*Itinerant badger finds urban
backyard living much to his taste*

By GERRY WARNER
Staff Writer

CRANBROOK — Cranbrook's wandering badger may not have left town yet as another local resident said she has a suspicious looking hole in her yard that could be a badger burrow.

Jody Lamb said she was told something was up when she purchased her house on Eighth Avenue earlier this spring about two blocks from where the badger was sighted last week.

"The realtor said I really should mention to you that you have something living underneath the sun porch on the side of the house," she said.

Lamb said she examined the hole and it was big enough for a badger although she caught no sight of the rare critter which is on the endangered species list.

At one point, Lamb tried blocking the hole with a big planter but to no avail. "I went away for a few days and then there was a new hole beside it."

Lamb said she has a large house cat for a pet, but that didn't seem to bother the badger either. Nor did an underwater sprinkler system in the yard.

"I thought he might have decided to move on and it would deter him from sticking around," she said.

Lamb said she hasn't actually seen the nocturnal creature, but can't help but wonder if the guest in her yard is a badger now that one has been sighted in her neighborhood.

Meanwhile Lowell Threinen, who took a picture of a badger in his yard last week, said he hasn't sighted the wayward creature since then, but is still concerned because his four-year-old boy likes to play in the back yard.

"He likes to push dirt around and my big concern is that he might find a nice soft pole and it belongs to the badger."

Threinen said he's convinced the badger is active in the area and is not leaving, because his neighbor also has some tell-tale badger holes along his fence.

"The badger biologist (Nancy Newhouse) told me they don't have single homes. They have multiple dens. That's how they live."

Newhouse couldn't be reached for comment. Last week she said she was hoping that the badger would get tired of living in a busy urban neighborhood and leave town for the wide-open country.

But until this point at least, the badger doesn't seem to be following the script. Newhouse said this is a concern because many badgers end up as road kill when they try to cross busy highways at night.

If the errant badger doesn't leave town on its own, Newhouse said she would consider live trapping, if for relocation.

There are 200 to 250 known breeding adult badgers in B.C. and about 60 breeding pairs in the East Kootenay. Several have been radio tagged and their wanderings mapped in ranges as large as 500 sq. km.

Badgers exist primarily on Colombian ground squirrels but they will also eat birds, bird eggs, large insects and other forms of protein, she said. They can be aggressive towards creatures their own size and most dogs will avoid them but there are no known cases of them attacking humans.

Cougars, bob cats and coyotes sometimes kill badgers, but most domestic dogs and cats are no match for the wily creatures, Newhouse said.

Figure 4-3. Two articles from *Cranbrook Daily Townsman* based partially on information provided by East Kootenay Badger Project biologist

Community *Golden Star* Wednesday, March 26, 2003



Badgers are among the many species found in the Hofert/Hoodoos area south of Invermere. The area was purchased by the Nature Trust and other conservation groups in order to protect sensitive species in the area.

SUBMITTED PHOTO

Hope for Hoodoo wildlife

By Michelle Johnson
SPECIAL TO THE STAR

An ecologically diverse piece of property in the East Kootenay Trench was recently purchased for critical wildlife habitat.

A group of B.C. land conservation groups pulled together \$3.5 million to purchase 4,037 hectares of private land between Invermere and Fairmont Hot Springs known as the Hofert/Hoodoos. The land provides vital winter range, migration corridors and a staging ground for numerous endangered and threatened species.

The land neighbours and builds upon land set aside for conservation by the Nature Trust of British Columbia.

"The Hofert/Hoodoos property ranges from wetlands along the Columbia River, to grasslands to mid-elevation forests inhabited by migratory waterfowl and land birds as well as deer, elk, badgers and other mammals," explained Mzureen DeHaan, program manager for the Columbia Basin Fish & Wildlife Compensation Program (CBFWCP). "The property supports at least five red and blue-listed animals and provides opportunities to enhance the habitat for ungulates and to become a recovery area for Sharp-tailed Grouse, a blue-listed species recently extirpated from the East Kootenay."

Besides the Nature Trust and CBFWCP, the Habitat Conservation Trust Fund, Ducks Unlimited, BC Conservation Foundation and Kootenay Wildlife Heritage Fund all contributed dollars towards this purchase.

Figure 4-4. Newspaper article from *Golden Star* featuring badger photo.

4.6 Private Stewardship

Parks Canada loaned the project a digital video camera and Richard Klafki was successful in 2002 in collecting extensive video footage of badgers and habitat. Omni Film also allowed the project to use footage shot in the East Kootenay for the *Champions of the Wild* documentary. In 2003, interviews were conducted with local residents who were involved in positive stewardship projects. Interviews included:

- Dan Foraie, a forestry consultant who recommended a realignment of a logging road to avoid badger burrows.
- Jack Boon, a landowner near Fort Steele, who is pursuing a conservation covenant with the Land Conservancy of British Columbia and has posted a sign indicating his support for badger conservation.
- Joe Nicholas, a member of the Columbia Lake band who has been involved in badger translocation to the Upper Columbia valley.
- Gordon Burns, a rancher from the Wardner area who is interested in ways to maintain large ranches and consider wildlife in planning. In the footage, he discusses the possibility of pre-purchase of development rights (conservation covenants).
- Tim Foley, the superintendent at the Kimberley Golf Course who worked with the EKBP to develop strategies for maintaining ground squirrels on the golf course by only moving those animals that burrowed in the fairway, and leaving those that burrowed in the rough. An interpretive sign was developed that described the benefit of this management strategy to ground squirrels and their predators, including red-tailed hawks and badgers.

This footage was used to prepare the video *Conserving Badgers in the East Kootenay*, providing examples of stewardship that East Kootenay residents are undertaking. The video will be distributed to local residents and interested schools.

4.7 Publications

Two publications involving data from the East Kootenay Badger Project were accepted for publication in 2003-2004. Together with C. Kyle, H. Davis, R. Weir and C. Stobek, Nancy Newhouse co-authored the paper Genetic Structure of Sensitive and Endangered Northwestern Badger Populations (*Taxidea taxus taxus* and *T. t. jeffersonii*) which has been accepted for publication in the Journal of Mammalogy. In addition, we provided blood samples that were used in research on carnivore antibodies. The resulting paper, Survey for Antibodies to Selected Pathogens in Free-ranging Terrestrial Carnivores and Marine Mammals in Canada by J. D. W. Phillips, F. A. Leighton, P. Y. Daoust, O. Nielsen, M. Pagliarulo, H. Schwantje, T. Shury, R. van Herwijen, B. E. E. Martina, T. Kuiken, M. W. G Van de Bildt and A. D. M. E. Osterhaus, has been accepted for publication in Veterinary Record.