THE ECOLOGY AND MANAGEMENT OF PROBLEM BLACK BEARS AT NORMAN WELLS, NWT, 1985-88

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ABSTRACT

During the Norman Wells black bear study 41 (33 male, 8 female) bears were captured and ear tagged for later identification. A minimum of 22 of the 41 marked bears died during the research period; 18 in problem bear situations, 2 of natural causes, 1 illegally shot, and 1 legally shot by a sport hunter.

Bear behaviour was observed at the Norman Wells open pit dump. When at the dump, the bears displayed a dominance hierarchy with adult males being the most dominant, followed by females with cubs, solitary females and subadults. The two grizzly bears using the dump were avoided by all black bears except two of the larger adult male black bears.

Female black bears using the dump produced cubs, however, only limited reproductive information was collected. Radio-collared bears denned in a variety of habitats at different elevations. Most of the dens were dug in sandy soil. The movements of radio-collared bears were recorded when possible. Two bears travelled as far as Fort Norman (80 km).

The bear mortality in the study shows that once bears are involved with human garbage and become problems, there is a good chance they will be killed. Problem bear management is an annual demand on personnel and resources in Norman Wells. Changing the policy on municipal dumps, may not be possible, however, some preventive management and public education would help reduce bear-people conflicts in the Norman Wells area.

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INTRODUCTION

Black bears (*Ursus americanus*) are found throughout the boreal forest in the Northwest Territories (NWT). Their distribution ranges from the forests on the southern NWT border (60 degrees latitude) to the northern limit of trees in the Mackenzie River valley (Lloyd and Miller 1979, Clarkson 1986). Although common throughout the forested areas in the NWT, black bears have received little research or management attention.

Black bears are listed as a big game animal for sport hunting, (NWT Wildlife Act, Schedule A, 1979). This gives the species some protection as sport hunting is limited to a specific season and bag limit. General Hunting License holders (indigenous people) may hunt black bears throughout the year with no limit on their take. Black bears are traditionally used by Dene and Metis as a source of food and hides. In some communities black bears are still taken for food and the hide is used for clothing and handicrafts.

The ecology, behaviour, and management of black bears has been studied in Canada (Kemp 1972, 1976, Young and Ruff 1982, Yodzis and Kolenosky 1986, Nagy et al. 1989), the lower United States (Jonkel and Cowan 1971, Amstrup and Beecham 1976, Alt 1977, Rogers 1977, 1983, 1987, Alt et al. 1980, Garshelis and Pelton 1981, LeCount 1982, 1987, Beecham 1983) and Alaska (Erickson 1965, Hatler 1967, Schwartz and Franzman 1980, Schwartz et al. 1985). Problem black bear biology and management has been studied in Alaska (Dalle-Molle and Van Horn 1989, Follmann 1989), southern Canada (Gunson 1974, 1980, Fuller and Keith 1980, Herrero 1983, 1985, Tietje and Ruff 1983), and the southern United States (Rogers et al. 1976, Flowers 1985, 1986, Decker and O'Pezio 1989, Garshelis 1989, Hastings et al. 1989, Keay and Webb 1989, Rogers 1989, Stringham 1989).

Although some of the research results and management prescriptions from other jurisdictions are transferable, research that addresses local problems in existing situations is more relevant and applicable. This research is the first study on black bears in the NWT. Problem black bear management in the NWT has

been discussed previously and problems have been identified (Bromley 1985, Clarkson et al. 1986).

Black bear management has not been a serious management concern, however, a considerable amount of time and resources are spent each year responding to problem bear incidents. Black bear problems are common around communities in the southwestern NWT and along the Mackenzie River. Most black bear problems involve damage to private property, however, the threat to human safety is always a public concern.

To address problem black bear ecology and management the Norman Wells study was initiated. Norman Wells was chosen as a study location because of the existing bear population and bear problems with the town and industry camps. Norman Wells, like other communities in the NWT has an open pit dump on the outskirts of town which is used by black bears as a food source.

Objectives

The overall objectives of this project were to study the ecology of problem bears and monitor and evaluate problem bear management in the area. Specific objectives were to:

1) Radio-collar and monitor bears captured in problem bear situations.
2) Radio-collar and monitor bears captured at the Norman Wells dump.
3) Identify the sex and age class of bears involved in bear-human conflicts.
4) Determine if bears feeding at the dump became problem bears in the townsite or at industry camps.
5) Evaluate the existing problem bear management techniques used at Norman Wells.
6) Analyze the circumstances causing problem bear situations and make recommendations to reduce bear conflicts.

STUDY AREA

Human Development and Past Bear Management

Norman Wells was first established because of oil and gas exploration and development in the area around 1919. Oil and gas development has involved seismic work, drilling and a refinery. In 1986 a pipeline was completed from Norman Wells to Zama Lake, Alberta. The population of Norman Wells is around 600.

Norman Wells was chosen as a study area because of the bear population and the frequent occurrence of bear-people conflicts. The area provided an opportunity to investigate black bear biology and bear-people conflicts in a community and nearby industrial sites and camps. Furthermore, the existing open pit dump near the town provided an opportunity to investigate the relationship between bears using the dump, and problem bears in the town and at surrounding industry camps.

Few bears are taken by GHL holders in Norman Wells as bear meat is only occasionally eaten and black bear hides have low economic value (Bullion pers. comm 1986). An average of ten black bear sport hunting licenses are sold per year in the Norman Wells area. Sport hunting results in a average harvest of four bears per year (Hagen pers. comm. 1989).

Physiography

The study area is centered around the town of Norman Wells, (65.17 N latitude, 112.65 W longitude) located on the east bank of the Mackenzie River (Figure 1). Most of the study area lies between the Mackenzie River and the Norman Range of the Franklin Mountains. The elevation in the area ranges from 60-1050 m above sea level with the highest elevation in the Norman Mountain Range. Discontinuous permafrost extends throughout the area.

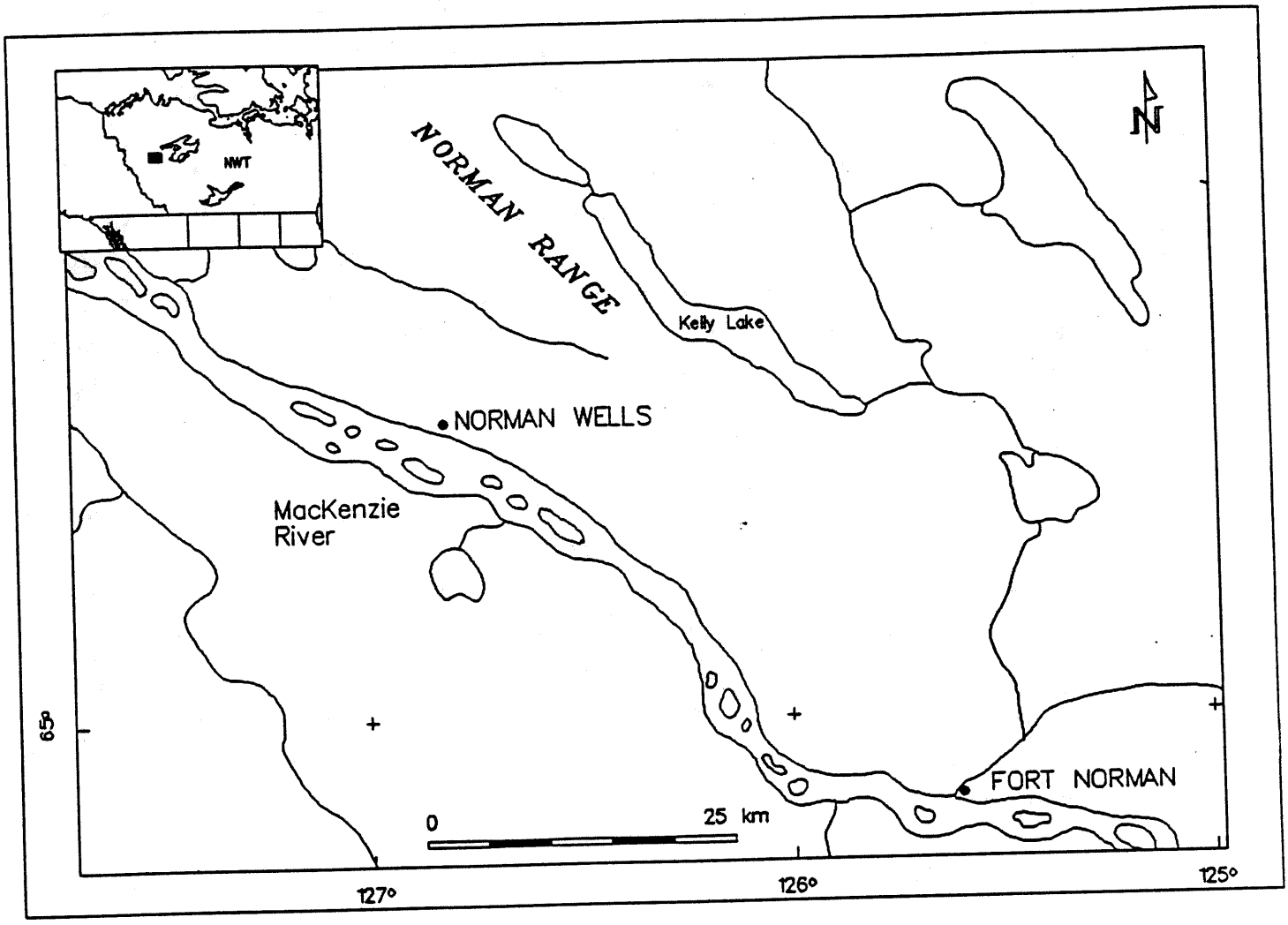

Figure 1. The Norman Wells black bear study area, Northwest Territories 1985-1988.

Climate

The Norman Wells area is situated in the subarctic climatic zone which is characterized by short cool summers and long cold winters. The mean annual temperature for Norman Wells is -5.6 C (Reid 1974). Annual precipitation is around 310 mm.

Vegetation

The boreal forest is the predominate vegetation cover type. In the non-forested areas there is a variety of bog and fen vegetation cover (Reid 1974, Reid and Janz 1974). Tree species in the area include black spruce (*Picea mariana*), white spruce (*Picea blanca*), tamarack (*Larix laricina*), balsam poplar (*Populus balsamifera*), aspen (*Populus tremuloidies*), white birch (*Betula papyrifera*), willow (*Salix* spp.) and alder (*Alnus* spp.) (Rowe 1972).

Wildlife

The study area has a rich variety of wildlife. Large mammal species include black bears, grizzly bears (*Ursus arctos*), wolves (*Canis lupus*) lynx (*Lynx lynx*), wolverine (*Gulo gulo*), red fox (*Vulpes vulpes*) moose (*Alces alces*) and woodland caribou (*Rangifer tarandus caribou*). Barren ground caribou (*Rangifer tarandus groenlandicus*) occasionally migrate into the area during the winter. Larger furbearers in the area include beaver (*Castor canadensis*), marten (*Martes americana*) and muskrat (*Ondatra zibethicus*).

METHODS

Bear Capture

Bears were located by responding to problem bear complaints or by visiting the Norman Wells dump. If a problem bear was reported at an industry camp or within the townsite the site was investigated. If the bear was still on site, it was darted with a dart gun (Palmer Chemical Co. Inc., Douglasville, Georgia) or deterred from the area with 12 gauge cracker shells or plastic slugs. If the bear had left the area a culvert trap was baited and set on site.

A culvert trap was also set at the dump, but was not successful in catching bears because of the available food supply in the dump. Bears were immobilized at the dump with a 2:1 mixture of Ketamine Hydrochloride (Parke-Davis): Xylazine (Rompun, Cutter Laboratories) at a concentration of 166 mg/ml, administered by rifle fired darts (Palmer Chemical and Equipment Co., Douglasville, Ga.).

Measurements and Marking

Once immobilized the bears were measured and weighed (Jonkel and Cowan 1971) (Appendix 1). A lower premolar was removed for later cementum aging (Stoneberg and Jonkel 1966). All of the bears were ear tagged and ear-flagged for visual identification (Lentfer 1968, Reynolds 1974). Ear-flags were 5 x 15 cm and were made from a durable 16 weight polyvinyl material. The flags were six colours (red, white, yellow, orange, green, blue) allowing 21 different colour combinations.

Telemetry and Monitoring

A sample of the bears captured were radio-collared (Telonics, Mesa Arizona) and monitored from the ground and air (fixed-wing and

helicopter). Collaring the bears allowed monitoring of their activity when they were away from the dump and identified den locations. By having radio-collared bears we were able to record movements of problem bears after they had been captured in a problem situation or at the dump. When collared bears were killed their collars were quickly put on other bears captured at the dump or in problem situations. Visual monitoring was done for ear-flagged bears in the townsite and at the dump. Dens were found by locating radio-collared bears. Trees surrounding the den were flagged in the winter and the area was investigated with a helicopter the following summer.

Problem Bear Management Techniques

After being captured and handled, problem bears were relocated as far as possible from their capture site. If available a helicopter or barge was used to transport and release the bears on the west side of the Mackenzie River. In other cases bears were released up the Jackfish Lake road, 3 to 5 km from Norman Wells.

Problem bears captured the second time were usually destroyed. In some situations bears causing damage or displaying aggressive behaviour were destroyed immediately.

RESULTS and DISCUSSION

Bears Captured

Forty-one bears were captured and marked for later identification. All of the bears were ear-tagged and if possible physical measurements were taken (Table 1). An additional 5 bears were captured and released but not ear-tagged or ear-flagged because of drug availability problems. Approximately 5 other bears were destroyed when captured or found in problem bear situations.

There were 3 capture site locations (dump, industrial and town/residence). Twenty-six of the 41 bears were captured at industrial sites (15 adult males, 2 adult females, 9 subadult males), followed by 13 at the dump (5 adult males, 7 adult females, 1 subadult male) and 2 in town (1 adult male, 1 adult female) (Table 1).

The first 17 bears captured were ear-tagged with a metal clip tag similar to those used on cattle. These tags were not as durable and may have fallen off of some bears. Because the bears were not marked in any other way it was not possible to determine if these bears were later recaptured. At least 7 of the 17 bears marked with the clip ear-tags kept their tags as later information was recorded for these bears.

The next 10 bears were ear-tagged with aluminum button ear-tags. The last 14 bears were ear-tagged with a plastic cattle ear-tag. These tags were durable, easy to read, and stayed on the bears.

Table 1. Black bears captured at Norman Wells, NWT, 1982-88.

Ear Tag	EarFlag L/R	Sex	No. Reloc	Weight (Kg)	Age[2] (Est.)	Capture Date	Capture Location
R1	-	M	2	55	Ad	8-8-82	Residence
R2	-	M	2	50	(4)	23-8-82	Rig#33
R3	-	M	2	100	(6+)	20-5-83	Dump
R4	-	M	1	140	(6-8)	13-5-83	Bear Is.
R5	-	M	1	-	(3)	16-7-83	Esso Lease
R6	-	M	1	68	(3)	16-7-83	Rig#33
R7	-	M	2	-	(8+)	10-8-83	Dump
R8	-	M	2	120	(10-11)	18-7-83	Dump
R9	-	M	1	86	(10+)	9-8-83	Goose Is.
R10	-	M	2	96	12	10-8-83	Goose Is.
R11	-	M	3	50	(3)	18-6-84	KM 78
R12	-	M	3	-	(3-4)	8-6-84	Esso #1
R13	-	M	1	45	(2-3)	15-7-84	Bear Is.
R14	-	M	2	70	(5)	8-5-85	Ranger Camp
R15	-	M	5	75	(6)	20-7-84	Industrial
R16	-	M	1	120	(10+)	10-8-84	Goose Is.
R17	-	M	2	140	(8+)	10-9-84	Esso #1
4870[1]	W/W	M	4	75	(8+)	31-5-85	Esso #1
4871[1]	W/R	F	35	68	7	23-7-85	Dump
4872[1]	Y/Y	M	8	68	(3)	20-7-85	Esso #1
4873	G/Y	F	14	63	6	25-7-85	Dump
4874[1]	W/G	F	42	91	8	24-7-85	Dump
4875[1]	B/Y	M	27	-	18	24-7-85	Dump
4876	B/B	M	12	160	(10+)	29-5-85	Dump

[1] Bears that were radio-collared

[2] Age classes (cub, subadult, adult) are given unless age has been determined by cementum analysis of premolar, or estimated in the field based on bear size, sex and tooth wear.

Table 1. (con't)

Ear Tag	EarFlag L/R	Sex	No. Reloc	Weight (Kg)	Age[2] (Est.)	Capture Date	Capture Location
4877[1]	G/G	F	21	72	5	22-7-85	Dump
4878[1]	Y/W	F	30	72	6	23-7-85	Ranger Camp
4879[1]	R/R	M	22	120	Ad	22-7-85	Dump
1-3	B/R	M	16	-	(1)	26-7-85	Dump
2-4	Y/R	F	16	105	12	26-7-85	Dump
5-6	W/B	M	5	41	3	28-7-85	Esso #1
6-5	B/W	M	3	100	Ad	29-8-85	Esso #1
7-8	R/G	M	25	70	3	29-7-85	Dump
9-10	B/G	M	1	64	20	30-7-85	Goose Is.
11-12	Y/Y	M	4	100	(10+)	8-8-85	Goose Is.
13-14[1]	O/O	F	13	95	9	11-8-85	Esso #1
15-16	Y/Y	M	2	125	(10+)	16-8-85	Goose Is.
17-18	W/O	M	7	59	(4)	24-8-85	Industry
20-21[1]	W/Y	M	2	-	(4)	5-10-86	Bear Is.
22-23	G/O	M	5	105	(10+)	18-8-85	Esso #1
24-25[1]	G/G	F	5	75	Ad	25-8-86	Town
26-27[3]	B/R	M	3	-	Ad	3-5-88	Bear Is.

[1] Bears that were radio-collared

[2] Age classes (cub, subadult, adult) are given unless age has been determined by cementum analysis of premolar, or estimated in the field based on bear size, sex and tooth wear.

[3] Bear 26-27 had been previously tagged and was thought to be bear 4876 or bear 9-10. It was not possible to determine exact identity.

Sex and Age Composition

Of the 41 bears captured, 33 (80%) were males and 8 (20%) were females (Table 1). The predominately male capture sample is probably a result of the bears being caught at a dump and also in problem bear situations. Rogers (1989) observed that black bears captured at dumps were predominately males. Young and Ruff (1982) also found that male bears selected garbage dumps. Herrero (1983) found that females with cubs visited the dump more often than any other sex and age group, however, in Herrero's study there were more adult males visiting the dump (n = 8) than females (n = 7).

Seven of the eight females captured were aged by cementum analysis and were an average of 7.6 years old (Standard Deviation (S.D.) = 2.2 years, Range = 5-12 years) (Matson's Lab, Missoula Mt.). Of the 30 males classified for age 21 were adults, 8 subadults, and 1 a yearling cub (based on size, weight, tooth wear and tooth eruption). The 3 adult males aged by cementum analysis had a mean age of 16.6 years (S.D. = 4 years, Range = 12-20 years). Two subadults were 3 years old based on cementum analysis.

Adult males were 51% (N=21) of the captured bears suggesting that the dump and associated townsite is a preferred area for bears. Bears that do not leave the dump area are able to find enough food to survive. The weight and physical stature of some bears (R16, R17, 4876) suggests that the dump is a rich food source (Table 1). Rogers (1989) found that black bears feeding at dumps grew more rapidly, matured sooner and had a higher reproductive success than bears on solely natural foods.

Behaviour

This study did not specifically investigate bear behaviour, however, throughout the capture and monitoring work bears were observed at the dump and interactions between bears were recorded. Large adult males (4876, 4879) were the most dominant black bears in the dump hierarchy. These bears were able to select the most

desirable feeding sites, often chasing off other bears. Smaller male and female bears would avoid getting close to the large males and would leave a food source when a large male approached. Occasionally a large female (4871, 4874) with cubs would stand her ground if a large male approached her food source. Large males would tolerate each other at close range. When feeding on the same food source large males would sometimes stand facing each other with their mouths open, but did not contact each other.

Black bears of all age and sex groups avoided close encounters with the two grizzly bears that came to the dump. Exceptions to this were the large adult male black bears (4876, 4879) which stood their ground when either of the two grizzlies approached. In one situation the larger of the two grizzly bears approached and came face to face with a large adult male black bear (4879) that was feeding on some garbage. After about a minute of posturing and huffing and whoofing by both bears, the grizzly bear backed down and found another food source. This was an interesting observation because the grizzly bear was noticeably larger than the black bear. However, the grizzly was thought to be younger and probably did not have the confidence to match his larger size. The grizzly was believed to be younger (5 to 6 years old) because it appeared to be the same bear that had been visiting the dump for the past 2 years and was thought to be 3 to 4 years old when it was first seen at the dump (Bullion pers. comm. 1985).

Reproduction

Reproductive information from the 8 adult female bears in the study is limited, but does provide some information on the bears of this area (Table 2). One female (4873) bred when she was four years old and had cubs when she was five. Some bears were observed for 2 and 3 years but were never seen with cubs of the year (COY's) (4877, 4878). It is possible that these bears had cubs and never brought them to the dump or townsite. Reproductive interval is impossible to determine with such a small sample. Two bears (4871,

2-4) kept their cubs until they were at least 3 years old (Table 2). Bear 4873 had a COY when she was 5 years old (1985), but was not seen with a cub in 1986. When observed in 1986, 4873 had a crippled front leg. Bear 4877 had a three-year-old male cub following her during late July 1985. She sometimes tolerated the cub and other times would chase him away. It is not known for sure if this was her cub. If it was her cub the cementum age estimate for her (5 years old) would have been wrong as it is unlikely she would have had the cub when she was 2 years old.

Mean litter sizes were calculated for COY's - 1.5 (N=6), yearlings - 1.75 (N=4), 2-year-olds - 1.5 (N=2), and 3-year-olds - 1.33 (N=3). Unfortunately, there is no litter size data available for black bears in the NWT so comparisons were not made. Comparisons with black bears feeding at dumps in Minnesota indicated that bears at Norman Wells were less productive (Rogers 1989).

Table 2. Reproduction of female black bears, Norman Wells, NWT.

Bear	Age	1984	1985	1986	1987	1988
4871	7	-	2 Coy	2 Yrlg	2 2-yr	2 3-yr
4873[1]	6	1 Coy**	0	0	-	-
4874[1]	8		0	1 Coy[3]	2 Coy	2 Yrlg
4877[1]	5	-	1 3-yr[2]	0	-	-
4878[1]	6	-	0	0	0	-
2-4[1]	12	-	1 Yrlg	1 2-yr	1 3-yr	-
13-14	9	-	0	1 Coy	-	-
24-25	-	-	-	0	2 Coy	2 Yrlg

Coy - Cub of the year.
\- - Data not taken, bear not observed.
0 - No cubs seen during observations of bear.
1 - Females killed in problem situations.
2 - 3-year-old cub may not have been 4877's cub.
3 - Cubs observed then never seen again.

Denning

Den locations and dates of entrance and emergence from dens were obtained from radio-collared bears in 1985-86 and 1986-87 (Table 3). In 1985, bears entered their den from early to mid October. Bear 4877 was located at her den site on the 26-9-85, however, it is unlikely that she remained in the den at this time. Black bears in the Norman Wells area entered their dens around the same time as bears in Alaska (Erickson 1965, Hatler 1967) and Montana (Jonkel and Cowan 1971, Mack 1990).

Bears in the Norman Wells area emerged from their den from late April to late May (Table 3). Activity was observed outside of dens as early as the 17 April 1986. Bear (4878) was still inside the den, but there were fresh tracks leading in and out of the den. All of the radio-collared bears had left their den by the last week in May.

During 1985 and 1986 10 dens were located for 7 radio-collared bears (Table 3). Dens were located each year for 3 bears (13-14, 4875, 4849). The bears denned in the same area over the 2 years, but did not use the same den (Figure 2).

Den Characteristics

Seven dens located in the winter of 1985-86, were visited by helicopter in September 1986 and den characteristics were recorded (Table 4) (Figure 2). Den locations ranged from lowlands near the Mackenzie River to rock outcrops near the top of the Norman Mountains (Figure 2, Table 3). Most dens were in sandy soil with a spruce-birch-alder vegetation cover. One den was in a natural rock cave located near the top of the Norman Range. All of the dens had vegetation bedding material in the sleeping area. Six of the 7 dens investigated were on a south facing slope with the den entrance facing south (Table 4).

Den locations and characteristics vary within the same geographical area. Black bears in the Norman Wells area had

similar den characteristics as bears in other similar geographical areas (Beecham et al. 1983, Lindzey and Maslow 1976, Mach 1990).

Mortality

During the research period a minimum of 22 of the 41 bears captured died (Table 5). Eighteen (82%) bears were killed as problem bears. Two (9%) died of natural causes (drowning and predation), 1 (4.5%) was legally shot by a sport hunter, and 1 (4.5%) was illegally shot at the dump.

Natural Mortality of Adults

Two radio-collared bears died of natural mortality. An adult female (4878) was found dead along the river shore just after break-up and is presumed to have drown. A necropsy done on the bear did not identify any external injuries or bullet wounds (Stenhouse pers. comm. 1987). An adult male (R17) was found partially consumed and covered with moss along a trail leading to the dump. The site investigation concluded there had been a confrontation and the black bear had several large bite marks on his body. Grizzly tracks and scats were found at the site (Bullion and Hickling pers. comm. 1985). It appears that the bear was in a fight with a grizzly bear and was killed. Grizzly bears have been suspected of killing black bears in other areas (Jonkel and Cowan, 1971, Murie 1981). Ross et al. (1988), reported an observation where a female grizzly bear and two yearlings killed two black bear cubs of the year. The fact that few black bears travel above the treeline into alpine or tundra areas where there are grizzly bears, suggests that black bears are vulnerable to grizzly predation, even though it is rarely observed or recorded.

Other tagged bears may have died during the study but were not located because they were not radio-collared. Cubs from radio-collared adult females that died during the study are addressed in the Reproduction Section.

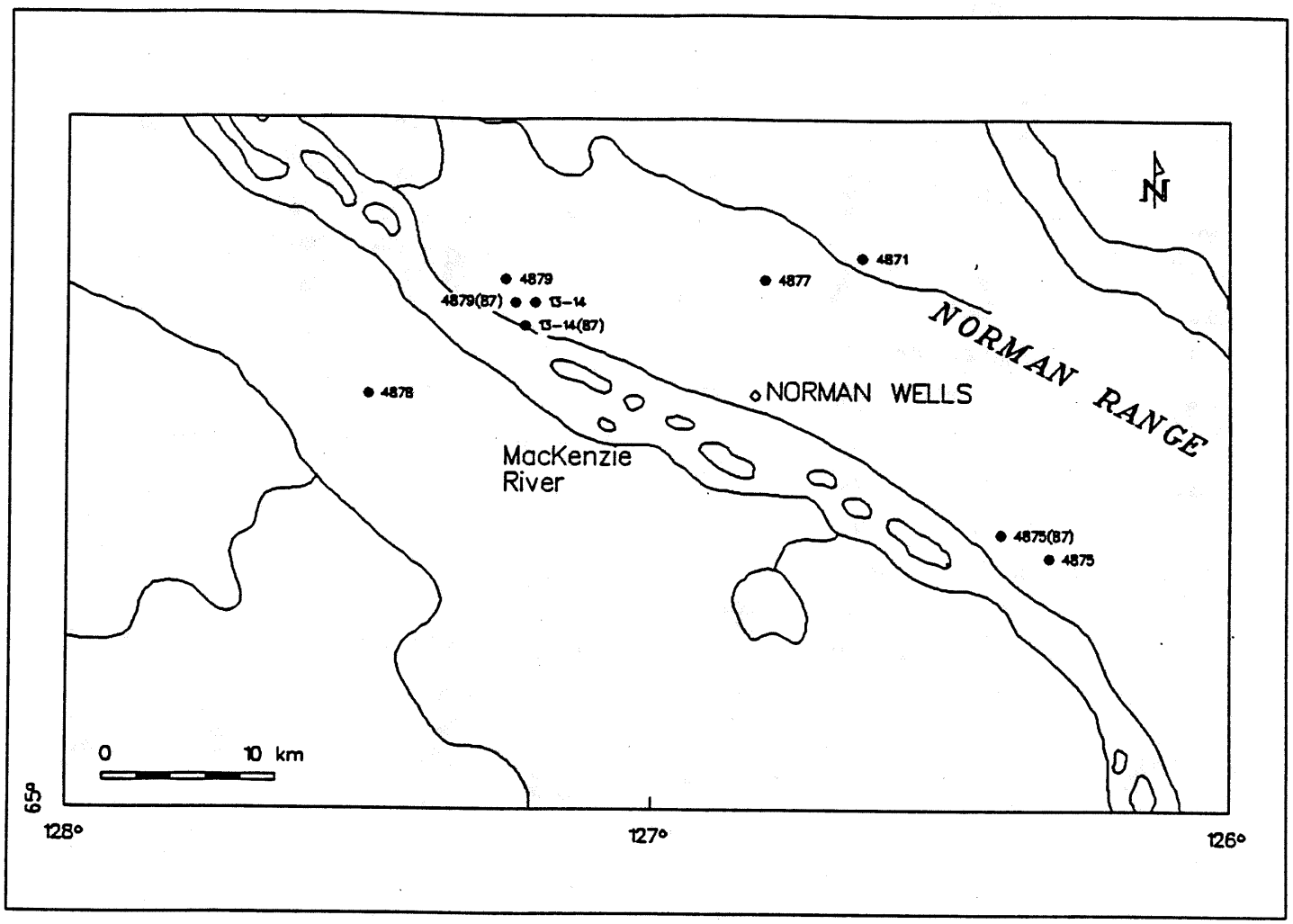

Figure 2. Black bear den locations, Norman Wells, Northwest Territories, 1985-86.

Table 3. Black bear denning information, Norman Wells, NWT, 1985-87.

Bear	Den Location	Habitat	Entrance[2]	Emergence[3]
13-14	65.22x127.12	MSF	16-10-85	23-5-85
4871	65.24x126.38	SAL	7-10-85	24-4-86
4874	68.18x126.35	MSF	7-10-85	29-4-86
4875	65.11x126.19	MSF	16-10-85	6-5-86
4877	65.23x126.48	Mtn.Slope	26-09-85	6-5-86
4878	65.18x127.29	Mtn.Slope	7-10-85	17-4-86
4879	65.23x127.15	MSF	16-10-85	6-5-86
13-14[1]	65.21x127.13	MSF	-	-
4875[1]	65.12x126.24	MSF	-	-
4879[1]	65.22x127.14	MSF	-	-

MSF - Mixed Spruce Forest.

SAL - Spruce Alder Lowland

1 - Dens located 27-3-87.

2 - Closest monitoring date.

3 - Den emergence may also include signs the bear has been in and out of den.

Table 4. Black bear den characteristics, Norman Wells, NWT, 1985-87.

Bear	Habitat	Soil	Aspect	Measurements (LxWxH) cm	
				Tunnel	Sleeping Area
13-14	MSF	Sand	South	90x60x45	112x112x52
4871[1]	SAL	Organic	Northeast	-	210x200x47
4874	MSF	Sand/loam	South	90x60x40	180x70x80
4875	MSF	Sand/loam	South	120x60x40	120x120x75
4877	Rock	Organic	South	75x43x30	100x100x70
4878	Mtn.Slope	Gravel	South	270x40x50	90x90x40
4879	MSF	Sand	South	100x95x40	150x120x80

[1] Den was in poor, wet swampy location, partially collapsed.

MSF - Mixed spruce forest.

SAL - Spruce-alder lowland.

Problem Bear Mortality

The 18 bears killed as problem bears were from the following sex and age groups: 9 adult males, 4 adult females, 4 subadult males, and 1 two-year-old male cub. The bears that were killed as problem bears were initially captured at industry sites (N=12), the dump (N=5), and in Norman Wells (N=1) (Tables 5 and 6). Four of the dump captures were adult females.

Of the 18 problem bear mortalities, 9 were killed in Norman Wells, 6 at industry sites and 3 at other locations (Ft. Norman - 2 and Brackett Lake - 1) (Table 5). Although few problem bears were initially captured in the town of Norman Wells, many of them died there.

Many bears around Norman Wells have come to depend on the dump for food and when there is a shortage of food at the dump the bears go into town searching for food. This problem may be even more serious in years when there is a berry crop failure.

The 4 females that were shot in town may have been forced to leave the dump to find food somewhere else. All 4 were captured at the dump and had not been in problem situations until shortly before their death.

Problem subadult male bears have a short life expectancy. The 4 subadult males that were captured and relocated away from industry sites all returned to the same site and could not be deterred. All 4 of these bears were destroyed (Table 5). Two of the subadults were captured twice and removed, but persisted in returning. Having found food at the site previously, there was little that could be done to deter the subadult bears. Subadults (N=4) had a short period between their initial capture and relocation and mortality (Mean = 15 days, S.D. = 4.35 days, Range = 11 to 22 days).

Bear Movements

Telemetry monitoring was limited and usually done from the ground. Most bear locations were recorded at or near the dump because this is where bears were more easily observed. Unfortunately, not enough monitoring was done away from the dump to determine bear home ranges.

Two adult male bears, (R14 and 26-27) made long distance movements to Fort Norman (80 km) where they were destroyed as problem bears (Table 5).

Problem Bear Management

The results from this study indicate that problem bears at Norman Wells are partially a result of the open pit dump and poor garbage handling facilities at industry camps, commercial businesses, and by residents. Bears are attracted to the area because of the additional food resources available to them. These additional resources have likely allowed a higher than natural bear density to exist in the Norman Wells area. Although all bears feeding at the dump are not initially problem bears, long term monitoring shows that most of these bears eventually become problems in the townsite, at industrial sites, or at cabins away from town.

Providing an additional, unnatural food source to black bears creates several problems: 1) more bears are attracted to, and remain in the area, 2) the bears become habituated to people and people odours, 3) the habituation to people results in the bears associating people with a potential food resource, 4) when there is a food shortage at the dump because of burning, burying or competition between bears, some of the bears travel to the town or industry sites, looking for food, and 5) female black bears raising cubs in the area teach their cubs to feed at the dump or other human associated areas, and the problems continue for another generation of bears. Subadult bears were a problem away from the

Table 5. Problem black bear mortality, Norman Wells, NWT, 1983-88.

Bear No.	Capture Date	Capture Location	Mortality Date	Mortality Location	Time[1] (days)	Comments
R 1	8-8-82	NW	14-8-83	NW[2]	371	
R 8	18-7-83	Dump	3-6-84	NW	695	Hunter
R10	10-8-83	Industry	30-7-85	Industry	716	Same Local[4]
R11	18-6-84	Industry	21-7-84	Industry	14	Same Local
R12	8-6-84	Industry	21-6-84	Industry	13	Same Local
R14	8-5-85	Industry	22-5-85	Ft.Norman	14	
R15	20-7-84	Industry	6-6-86	Dump	686	Shot Illegal
R17	10-9-84	Industry	6-85	JackFish	640	G. bear Pred
4870	31-5-85	Industry	9-85	Bracket Lk.	101	
4872	20-7-85	Industry	31-7-85	Industry	11	Same Local
4873	25-7-85	Dump	28-5-86	NW	307	
4874	24-7-85	Dump	27-7-88	NW	1098	
4877	22-7-85	Dump	28-5-86	NW	310	
4878	23-7-85	Industry	29-5-87	NW	675	Found Dead
1-3	26-7-85	Dump	10-6-87	NW	674	
2-4	26-7-85	Dump	10-6-87	NW	674	
5-6	28-7-85	Industry	18-8-85	Industry	21	Same Local
6-5[3]	29-8-85	Industry	11-7-88	Industry	1036	
11-12	8-8-85	Industry	10-8-85	NW	2	
17-18	24-8-85	Industry	1-9-85	NW	8	
22-23	18-8-85	Industry	4-8-86	NW	351	
26-27	3-5-88	Industry	6-88	Ft.Norman	30	

[1] Time - is time in days between first capture and mortality.

[2] NW - Norman Wells townsite or residence.

[3] 6-5 - Ear tags were reused after bear 5-6 was shot.

[4] Same local - indicates that the bears capture and mortality site were the same.

Table 6. Problem black bear, capture and mortality locations, Norman Wells, NWT.

Bears	Capture Location			Mortality Location				Mean
	NW	Dump	Ind	NW	Dump	Ind	Other[1]	Time[2]
Adult Female	0	4	0	4	0	0	0	597
Adult Males	1	0	8	4	0	2	3	292
Subadult Males	0	0	4	0	0	4	0	15
Cubs[3]	0	1	0	1	0	0	0	674
Total:	1	5	12	9	0	6	3	

[1] Other - 2 in Ft.Norman, 1 at Cabin on Brackett Lake.

[2] Mean Time in days between initial capture and mortality.

[3] Bear was captured as a cub but was a subadult when killed in a problem situation.

NW - Norman Wells

Ind - Industry Sites

dump, when they travelled to the town or industry sites looking for food. These bears may avoid the dump because of the presence of adult male black bears and grizzly bears.

Garbage dumps and poor garbage handling facilities and associated black bear problems are common throughout North America. In the 1950's and 1960's, bears at dumps were common in all of the national parks in Canada and the United States. When the parks began closing their dumps in the late 1960's and 70's, and destroying problem bears, the issue of problem bear management became controversial (Craighead and Craighead 1972, Cole 1972, Craighead 1979). Open pit dumps provide an artificial food source for bears causing a higher than normal bear density in the area (Craighead and Craighead 1972, Rogers et al. 1976, Garshelis 1989, Rogers 1989, Stringham 1989). The problem of garbage dumps and bears is not entirely a problem bear management issue. Dumps are often a financial burden to small municipal governments. Maintenance of the dump is expensive and the result is often a low maintenance program (no burying, no burning and no fences), which becomes a major food source for bears. Changing the present garbage handling policies in small communities may not be economically realistic, however, continuing with the present system of encouraging bears to become problem bears and then destroying them is not a desirable management option. The present problem bear management system is a waste of natural resources, encourages property damage, and is a threat to public safety. Present management only addresses the symptoms, and does not work towards solving the cause of the problem.

The present problem bear management strategies of capturing and relocating problem bears is not effective and only delays the bears mortality date. This was especially true for subadult male bears. Most relocated bears returned to their capture site, or were problems at other sites and were eventually killed. Relocating problem bears has never been successful as the problem is only moved and not solved (Miller and Ballard 1982, Rogers 1986). There is no logical reason why a bear habituated to human garbage and facilities will recondition to natural foods when moved to a strange environment. When a bear is moved to a new environment, it is ignorant of existing natural food

resources in the area, is not familiar with the area or other bear territories, and will likely approach other human facilities when searching for food.

Problem bear management is not addressed with much planning or preventive work. Most problem bear work is reactionary to complaints received from the public. Although there is little money allocated for problem bear management, it does consume many person hours and resources responding to complaints. It may be possible to reduce the number of problem bear incidents by doing some preventive work and to begin addressing the causes of the problem (i.e. open pit garbage dumps, poor garbage storage facilities, uninformed people).

Changing the policy on open pit garbage dumps may not be possible in small municipalities in the western NWT, however it may be possible to improve poor garbage storage and handling facilities that are making garbage accessible to bears. In some locations it may be possible to construct an electric fence around an open pit dump, industry site or camp and prevent bears from assessing garbage (Marley pers. comm. 1990). An organized public information program that addresses the problems and provides alternatives for bear proof garbage storage and handling facilities would help reduce the number of problem bears, associated complaints, and property damage.

CONCLUSIONS

1. All sex and age classes of black bears used the dump and were involved in bear-people conflicts in the area.
2. Males were the predominant sex captured during the study and involved in problem situations.
3. Large adult males were the dominant bears in the social hierarchy.
4. The Norman Wells dump was a preferred feeding site in the area.
5. Black bears feeding at the dump caused problems in the town, at industry sites and at outpost cabins.
6. Relocating problem bears did not solve the problem as the bears quickly returned to the site, caused further problems, and were usually destroyed.
7. Female bears with cubs brought the cubs to the dump, industry sites, and town, habituating them to human facilities and garbage.
8. Bears habituated to the dump returned to feed at the dump each year.
9. All black bears, except 2 large adult males, avoided the 2 grizzly bears that used the dump.
10. A public education program emphasizing preventive problem bear management would help reduce the number of bear problems encountered each year.
11. Constructing an electric fence around the dump, industry sites, or other facilities, would help reduce the number of bear problems in the area.

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Appendix 1. Black bear weights and measurements at first capture, Norman Wells, NWT, 1985-88.

Bear No.	Sex	Age[1]	Weight (kg)	Total Length (cm)	Chest Girth (cm)	Neck Girth (cm)
R1	M	Ad	55	130	75	42
R2	M	Sub	50	116	76	50
R3	M	Ad	100	174	112	70
R4	M	Ad	140	190	112	75
R5	M	Sub	-	125	67	42
R6	M	Sub	68	-	-	-
R7	M	Ad	-	160	125	70
R8	M	Ad	120	160	-	66
R9	M	Ad	86	173	96	59
R10	M	12	96	173	-	72
R11	M	Sub	50	-	-	-
R12	M	Sub	-	140	67	42
R13	M	Sub	45	83	52	-
R14	M	Ad	70	156	-	-
R15	M	Ad	75	164	95	60
R16	M	Ad	150	92	60	
R17	M	Ad	150	173	120	67
4870	M	Ad	75	177	92	56
4871	F	7	68	146	62	46
4872	M	Sub	68	140	75	47
4873	F	6	63	143	73	45
4874	F	8	91	155	99	59
4875	M	18	-	160	122	68
4876	M	Ad	160	186	-	-
4877	F	5	72	149	52	48
4878	F	6	72	147	90	53
4879	M	Ad	120	177	-	-
1-3	M	1	-	108	58	32

[1] Age classes subadult (Sub) adult (Ad) are given unless age has been determined by cementum analysis of premolar.

Appendix 1. con't

Bear No.	Sex	Age[1]	Weight (kg)	Total Length (cm)	Chest Girth (cm)	Neck Girth (cm)
4	F	12	105	151	90	56
5-6	M	5	41	147	70	40
6-5	M	3	-	176	120	63
7-8	M	3	70	144	90	50
9-10	M	20	64	174	85	55
11-12	M	Ad	100	166	103	62
13-14	F	9	95	148	89	52
15-16	M	Ad	125	175	113	69
17-18	M	Sub	59	147	-	-
20-21	M	Sub	-	-	-	-
22-23	M	Ad	105	178	93	54
24-25	F	Ad	75	160	90	54
26-27	M	Ad	-	135	104	65

[1] Age classes subadult (Sub) adult (Ad) are given unless age has been determined by cementum analysis of premolar.