ECOLOGY OF GRIZZLY BEARS (Ursus arctos) IN THE MACKENZIE DELTA OIL AND GAS DEVELOPMENT AREA

2004 Annual Report

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4.0 EXCUTIVE SUMMARY

THE MACKENZIE DELTA GRIZZLY BEAR RESEARCH PROGRAM (2004 – 2005)

The Mackenzie Delta Grizzly Bear Research Program is a partnership between the Government of Northwest Territories, Department of Resources, Wildlife, and Economic Development (RWED) (Inuvik Region) and the University of Alberta (UA) that focuses on management issues and questions related to grizzly bears and the development of a pipeline to export oil and gas resources from the arctic to southern markets. Research activities within the study entitled "*Ecology of grizzly bears (Ursus arctos) in the Mackenzie Delta oil and gas development area*" include the collection of baseline ecological information and fine-scale habitat use and movement patterns, the delineation of annual and seasonal grizzly bear distributions, and the identification of key habitats and resources. The collection and analysis of this data in a scientifically rigorous format is required in order to provide tools for land managers to integrate grizzly bear conservation into land management at the pre-development stages.

The Mackenzie Delta study area is approximately 20,000 km^2 and is bisected by the proposed pipeline route. This area includes the Mackenzie Delta watershed, Richards Island, the lower Tuktoyaktuk Peninsula, and the habitats between the Caribou Hills and Husky Lakes. Over the past 3 years hydrocarbon-exploration and -extraction activities have been increasing. RWED in the Inuvik Region, with support from the Inuvialuit Game Council, the Wildlife Advisory Council (Northwest Territories), and Hunters and Trappers Committees from Aklavik, Inuvik, Paulatuk, and Tuktoyaktuk, initiated a study in fall 2001 to look at the influence of seismic activity on denning bears and a subsequent study was started in 2003 to obtain current information on the numbers, distribution, and general movements of grizzly bears in the Mackenzie Delta and east to the Nunavut border. In spring 2003 the UA began working with the RWED. To date, 24 grizzly bears have been fitted with GPS radiocollars that record location information at 4-hour intervals over a 24 hour period. In July 2004, 6 of the 10 collars deployed in 2003 were removed using the attached remote collar release mechanism. Of the 15 collars deployed in 2004, two malfunctioned at the end of August resulting in only a partial sample for these research bears. In 2005, the remaining 4 collars deployed in 2003 will be removed and an additional 16 grizzly bears will be GPS radiocollared. In total, it is anticipated that 29 to 39 bear-years of information will be available for analysis. Fine-scale distribution and movement patterns of research bears within the development area were delineated for the 2004 active period (April to November); the process of developing a grizzly bear habitat selection model was initiated; vegetation characteristics at the microsite scale were recorder for a subsample of research bears; the additional sampling of training sites to construct a vegetation classification model was conducted and marks the

completion of this part of the analysis; grizzly bear food samples were collected to develop a geographically distinct stable isotope index for the region; and a program was initiated with the University of Saskatchewan to begin analysis of stable carbon and nitrogen isotope for the Mackenzie Delta grizzly bear population. In addition, the numerous granting agencies were approached to help support the project. This progress report details the actions taken, methods, and preliminary results for the 2004-2005 fiscal year and discusses plans for the upcoming 2005-2006 fiscal.

5.0 INTRODUCTION

The project entitled "*Ecology of grizzly bears (Ursus arctos) in the Mackenzie Delta in the oil and gas development area*" is a 4 year research program initiated in December 2002 between the University of Alberta (UA) and the Government of the Northwest Territories, Department of Resources, Wildlife, and Economic Development (RWED), Inuvik region to develop tools for predicting the potential effects of the proposed Mackenzie Delta pipeline on the grizzly bears within the development area and surrounding region. This project is part of the greater study being conducted by RWED in the greater Inuvialuit Settlement Region (ISR). Historically, past extirpations of grizzly bears in other jurisdictions have been characterised by a lack of planning in the preliminary stages of development (Banci *et al.* 1994) and grizzly bears inhabiting the Mackenzie Delta region may experience increasing pressure from anthropogenic activities in the coming years (Servheen *et al.* 1999). Within the development area there is a need to assess the potential impacts on local and regional grizzly bears resulting from increasing hydrocarbon-extraction activities.

The Mackenzie River drains into the Beaufort Sea through the watershed known as the Mackenzie Delta. This Delta and the surrounding region form the northernmost edge of the grizzly bear's geographical range (Banfield 1974, Black and Fehr 2002). Grizzly bears in this region undergo 6 to 7 months of winter dormancy (Nagy *et al.* 1983). This combined with a delayed and rapid phenological chronology of the region makes it difficult for grizzly bears to meet their requisite resource needs. Depressed recruitment and low resiliency of the species means that they are also especially vulnerable to anthropogenic disturbance at the population level (Weaver *et al.* 1996). At present, there is a lack of information available on this north-coastal population to enable us to predict how these grizzly bears will respond to hydrocarbon-exploration and -extraction and the associated increase in anthropogenic activity to follow.

6.0 PROJECT GOALS AND OBJECTIVES

The primary goals of this project are to describe annual and seasonal home range size and distribution, to examine fine-scale movement patterns, and to identify key habitats. This information will form the foundation for models to assess the potential impact of development activities and to assess the potential for anthropogenic disturbance and the increased risk of grizzly bear mortality. To increase our understanding of the ecology of this population I am examining the carbon and nitrogen stable isotopes from hair and claw samples collected from research and harvested bears. This will enable us to determine the marine contribution to diet and the trophic position of these bears. The following are the major project objectives:

1. To develop mechanistic models of habitat selection for grizzly bears in the Mackenzie Delta and to assess the influence of possible scenarios of increased development;
2. To describe the spatial-temporal movement patterns of grizzly bears in the Mackenzie Delta and develop mechanistic models to assess the cumulative influences of human activities;
3. To assess how oil and gas exploration, development, and production activities will affect movements of grizzly bears and to assess risk of mortality for different sex, age and reproductive classes; and
4. To determine the relative contribution of the marine system to grizzly bear diet and to assess of the trophic position of grizzly bears in the sub-artic ecosystem.

7.0 THE STUDY AREA

Although the results of this study and the information gained will have implications for the greater regional north-coastal barren-ground grizzly bear population, research activities are focused primarily in the oil and gas development area of the Mackenzie Delta, NWT. This area includes Mackenzie Delta watershed, Richards Island, the lower Tuktoyaktuk Peninsula, and the habitats between the Caribou Hills and Eskimo Lakes (approximately 20,000 km^2: Figure 1). The Mackenzie Delta is in the Southern Arctic Region of Canada's Northwest Territories where the climate and biota are influenced by the Mackenzie River (Black and Fehr 2002). This area is characterised by long, cold winters and short, cool summers. Temperatures range from -32^oC to 10^oC and the area can remain snow-covered from mid-October to mid-May with snowfall occurring at anytime during the year (Nagy *et al.* 1983, Black and Fehr 2002). The Delta itself empties into the Beaufort Sea and is the largest arctic delta in North America (Mackay 1963, Black and Fehr 2002). The study area features landscapes that range from flat alluvial plains in the west to rolling tundra in the east (Nagy *et al.* 1983, Black and Fehr 2002). Numerous lakes permeate the region and pingos are conspicuous features throughout. Broad habitat characterizations for the area include boreal forest, forest-tundra transition, and tundra ecosystems (Mackay 1963).

In addition to grizzly bears and polar bears (*U. maritimus*) along the coast, mammalian species of significance include semi-domesticated reindeer (*Rangifer tarandus tarandus*), caribou (*R. t. groenlandicus*), brown lemmings (*Lemmus sibiricus*), collared lemmings (*Dicrostonys hudsonicus*), arctic ground squirrels ((*Spermophilus parryii*), muskrat (*Ondatra zibethicus*), bearded seals (*Erignatuhus barbatus*), ringed seals (*Phoca hispida*), and belugas (*Delphinapterus leucus*). Snow geese (*Chen caerulescens*), tundra swans (*Olor columbianus*), willow ptarmigan (*Lagopus lagopus*) and small passerines are also present (Nagy *et al.* 1983). Human populations are centered in the villages of

Tuktoyaktuk and Aklavik and the town of Inuvik with numerous camps scattered across the region. In summer, access is limited to float plane, helicopter, and boat or barge travel and in winter by snow machine or by the winter ice road to Tuktoyaktuk.

8.0 CAPTURE AND COLLARING

The 2004 grizzly bear capture program was conducted from May 10th to May 24th. Searching was stratified so that equal effort was applied to the whole study area. However, poor weather during the 2003 capture program had hampered our ability to find grizzly bears on Richards Island so increased efforts were allocated to improve the sample of research bears from this area. In addition, the capture area was increased to include the areas north of Sitidji Lake and west of Old Man Lake to sample bears in the surrounding regions adjacent to the core development area. Grizzly bears were immobilized by aerial darting from a Bell 206 Jet Ranger II. Once located, the capture team assessed the bear's sex and age, and calculated the volume of immobilizing agent needed. Telezol® or tiletamine hydrochloride and zolazapan hydrochloride (8 mg/kg) was used to immobilize the bears (Woodbury 1996). Prior to initiating a capture event the ability to immobilize the bear safely and rapidly was assessed. Grizzly bears were fitted with either GEN II (1) or GEN III: TGW-3680 (14) Global Positioning System (GPS) /Argos-linked satellite radio-collars (Telonics Inc., 932 E. Impala Ave., Mesa, AZ, 85204-6699, Service Argos, Inc., P. O. Box 6756, Lynnwood, WA 98036-0756). GPS collars were programmed to acquire location information 6 times per day or 1 location every 4 hours. This relocation frequency resulted in an estimated lifespan for the GEN II collar of 14 months and an estimated lifespan for GEN III collars of 25 months. Therefore, the GEN II collar will be removed by the pre-programmed CR-2A collar release mechanism in summer 2005 and the GEN III collars will be removed in summer 2006. Relocation information was imported into a Geographic Information System (GIS) software application (ArcGIS 9.0) for home range size delineation and distribution using 100 % minimum convex polygons (MCP) and fixed kernel estimation (95%, 75%, and 50%) (Seaman *et al.* 1999, Kernohan *et al.* 2001).

A premolar tooth was extracted for ageing using cementum annuli and bears were classified as belonging to one of the following age and sex classes:

- adult male and solitary adult female (≥ 5 years old);
- sub-adult (subad) male or female (3-4 years old); or
- adult female with cubs (family) (Sauer and Free 1965).

Hair, tissue, blood, fat, milk, and a fecal sample were also collected for genealogical, dietary, and health analysis. Morphological and demographic information were recorded for all captured bears and body condition was assessed.

During the 15-day capture program 39 grizzly bears were handled, of which 15 were fitted with GPS radio-collars increasing. A total of 19 grizzly bears were monitored during the active period between April and November (Table 1). Of the 15 radio-collars deployed in 2004, 1 was a GEN II: GPS/Argos-linked satellite collars and 14 were Gen III: TGW-3680 GPS/Argos-linked satellite collars. A total of 9152 locations were recorded for all GPS-collared grizzly bears during the 2004 active period. Although collars were programmed to record 6 locations per day the mean number of daily locations was 3.81. Seventeen of the grizzly bears collared in 2004 were female (90%) and 2 were male (10%). Seven of the 17 female grizzly bears had young with them, one of which had a cub-of-the-year, another had a single yearling, 4 females had 2 yearlings, and 1 female had 2 two-year-olds. All bears with cubs were categorized as family groups (FAM) (Table 1). Morphological measurements recorded for the 15 new research bears are listed in Table 2.

9.0 HOME RANGE DELINEATION

All grizzly bears monitored in 2004 were included in the home range analysis. This includes bears collared in 2003 that were fitted with GEN III collars that had 2 year lifespans and all grizzly bears collared during the 2004 capture program. PTT IDs 47492 and 47503 may have malfunctioned or may have dropped late in the summer since there was no change in locations following August 16th and 25th, respectfully. Therefore, annual home range analysis for these bears only includes a domain from capture date to late summer or the last change in location. Only annual home range delineation is reported here so as not to make assumptions on the plant phenology and seasonality of the area without further investigation. When completed, changes in abundance of vegetation types in relation to habitat use by grizzly bears will be used to define seasonal changes in selection patterns (*John Nagy, personal communication*). ESRI's Arcview GIS 3.1 and ArcGIS 9.0 GIS software was used with the Animal Movement Analysis extension to determine home range estimates from GPS telemetry locations for the 2004 active season (Hooge and Eichenlaub 1997). One-hundred percent minimum convex polygons (MCP) were created to delineate the general home range distribution for grizzly bears inhabiting the development area (Figure 2). Ninety five, 75%, and 50% fixed kernel home range estimates allowed for core areas of activity to be determined (Figure 3-6). The average home range size for male and female grizzly bears, based on 100% MCP calculations was 3,824.93 km^2 and 1505.18 km^2, respectively (Table 3). The mean core area of use based on 95% fixed kernel home range estimation was 972.98 km^2 for male grizzly bears and 866.81 km^2 for female grizzly bears. The mean core area of use based on 75% fixed kernel home range estimations was 279.72 km^2 for male grizzly bears and 280.82 km^2 for female grizzly bears; and the 50% fixed kernel home range estimation for male grizzly bears was 114.20 km^2

and for female grizzly bears was 83.34 km^2 (Table 3). Movement patterns were plotted using ESRI Arcview GIS 3.1 and ArcGIS 9.0 GIS software with the Animal Movement Analysis extension (Figure 7-10) (Hooge and Eichenlaub 1997). The mean distance moved between consecutive locations was shorter for male grizzly bears (1.72 km) than for female grizzly bears (1.89 km).

10.0 DESCRIBING GRIZZLY BEAR HABITS

The Resource Selection Function (RSF) is a function that is proportional to the probability of a resource being used by an organism (Manly *et al.* 1993, Boyce *et al.* 2002). Unlike other methods that may include more qualitative information to describe habitat use by animals, the RSF uses empirical data to estimate model responses (Manly *et al.* 1993, Nielsen *et al.* 2002). In addition, RSF models are more objective, probabilistic, and offer more exploratory ability than other methods. RSF models will be developed to describe grizzly bear habitat selection in the development area and to identify important habitats (Manly *et al.* 1993). Resource use sites will be determined from telemetry locations and available sites will be randomly generated (Manly *et al.* 1993).

To create a representative model of grizzly bear habitat selection accurate environmental and anthropogenic information about the landscape is required. Such information may be obtained from various sources including the federal and provincial governments, non-government agencies, and private industry. Through the UA's agreement with Natural Resources Canada, coarse-scale information from the National Topographical Database was obtained. RWED has provided more anthropogenic-based information on the locations of human settlement and infrastructure, permanent industrial camps, historic seismic exploration, and oil drilling sites.

A vegetation classification model for the Mackenzie Delta region is required to build the RSF models for this grizzly bear population. To construct a vegetation classification model it is necessary to conduct air calls at a random set of training sites across the area of interest. Ducks Unlimited has been working in the lower Mackenzie Delta to build a vegetation classification model for the area. Some of these training sites (N=90) sampled in this area overlap our study area and we were able use these sites in the preliminary stages of model development. A stratified random sampling design was used to add to the initial Ducks Unlimited sites. In 2003, using the same methods as Ducks Unlimited, 155 training sites were sampled within the development area. In July 2004, this sample was further increased by 185 training sites. Presently, the overall model classification accuracy is approximately 72% and we are working with Cindy Taylor at the Government of Northwest Territories, Yellowknife office, to increase this to around 85%.

11.0 MARINE CONTRIBUTION TO GRIZZLY BEAR DIET

Unlike other grizzly bear populations, the northern boundary for Mackenzie Delta grizzly bears is the Beaufort Sea. This geographical feature offers a marine component to supplement their diet. To develop a better understanding of the ecology of these north-coastal bears I am analysing the proportional composition of stable carbon and nitrogen isotopes from hair and claw samples collected from research and harvested grizzly bears from the upper peninsula of the Inuvialuit Settlement Region. To develop a geographically distinct isotopic baseline for grizzly bears in the Mackenzie Delta region potential food sources were collected during the 2004 summer field season. Collected vegetative food samples included: red bearberry (*Arctostaphylos rubra*); crowberry (*Empetrum nigrum*); Currant (*Ribes* spp.); Cloudberry (*Rubus chamemorous*); Blueberry (*Vaccinium uliginodum*); Lingonberry/ mountain cranberry (*Vaccinium vitis-idaea*); milk-vetch (*Astragalus* spp.); bearflower (*Boykinia richardsonii*); sedges (*Carex* spp.); fireweed (*Epilobium angustifolium*); common horsetail (*Equisetum arvense*); Alpine hedysarum (*Hedysarum alpinnum*); Artic Lupine (*Lupinus arc*ticus); Coltsfoot (*Petasites palmatus*); Prickly rose (*Rosa acicularis*); Willow Catkins (*Salix* spp.); and grass. The following potential sources of terrestrial protein were also collected: Muskrat (*Ondatra zibethicus*); Beaver (*Caster canadensis*); and Caribou (*Rangifer tarandus*). Samples of arctic char (*Salvelinus alpinus*), ringed seal (*Phoca hispida*), and beluga (*Delphinapterus leucas*) were also collected to represent the potential marine contribution to grizzly bear diet.

Stable isotope analysis can increase our understanding of the proportional contribution of different dietary groups and the relative nutritional value of each (Jacoby *et al.* 1999, Herrero *et al.* 2001). This technique can reveal important information on ingested food and provides a method of inferring the use of terrestrial plant and animal matter as well as the proportional use of marine food types (Hobson *et al.* 2000, Herrero *et al.* 2001).

Hair and nails are metabolically inert and are not reabsorbed or turned-over so the stable-isotope signature represents the diet of an individual during the associated growth period (Jacoby *et al.* 1999, Roth 2002). Since the isotopic signature found in the sampled tissue represents not only what the animal has ingested but also what the animal has assimilated, I will be able to estimate the proportional contribution and nutritional importance of plant, and terrestrial and marine meats (Herrero *et al.* 2001).

The procedure requires that hair and claws be cleaned with warm distilled water to remove debris, freeze-dried for 24 hours, washed 3 more times in 2:1 chloroform: methanol solution to remove all oils before being allowed to dry an additional 24 hours (Hilderbrand 1996, Jacoby *et al.* 1999, Hobson *et al.* 2000). After being cleaned the hair and claw samples are cut to < 1 mm lengths and

ground to a fine powder in liquid nitrogen (Hobson *et al.* 2000). All plant, insect, and meat samples are cleaned with distilled water and freeze-dried for 24 hours before being ground to a fine powder in liquid nitrogen. Samples are sub-sampled (1.0 + 0.1 mg) after liquid nitrogen has evaporated and loaded into tin cups for isotopic measurement. The samples are then sent to the mass spectrometry lab at the Department of Soil Sciences, University of Saskatchewan, to be combusted and analysed for isotopic content. The results will be reported as ratios in parts per thousand (‰) relative to the PeeDee limestone ($\delta^{13}C$) standard or atmospheric nitrogen ($\delta^{15}N$) as follows:

$$\delta X = \left[\left(R_{sample} / R_{standard}\right) - 1\right] * 10^3$$

where X is $\delta^{13}C$ or $\delta^{15}N$ and R is the ^{13}C:^{12}C or ^{15}N:^{14}N ratio (Peterson and Fry 1987, Jacoby *et al.* 1999, Hobson *et al.* 2000).

12.0 PARTNERS AND GRANT APPLICATIONS

To meet the goals and objectives of the project more financial and in-kind support is required. In addition to the support provided by RWED and the UA, numerous granting agencies and potential industrial partners were approached during the 2004 season (Table 5). These included:

- Alberta Cooperative Conservation Research Unit (ACCRU)
- Department of Indian and Northern Affairs/Canadian Circumpolar Institute (NSTP/ C/BAR)
- Habitat Stewardship Program for Species at Risk
- Polar Continental Shelf Project
- World Wildlife Fund/Endangered Species Recovery Fund
- Western Northwest Territories Biophysical Study (RWED)

To date ca. $48,000 has been approved as in-kind support from Polar Continental Shelf and ca. $6,800 from the Alberta Cooperative Research Unit (Table 4).

13.0 PLANS FOR 2005 – 2006

The upcoming 2005 – 2006 season will include the following:

- Capture efforts in spring 2005 will be focused in areas of the development area where there are few representative research bears collared including the Mackenzie Delta proper and the area 40 km northeast of the town of Inuvik below and around Parsons Lake.
- 4 GEN III collars deployed in 2003 and scheduled for release on July 1st will be recovered for refurbishment.
- 1 GEN II collar deployed in 2004 with a 1 year lifespan and scheduled for release on July 1st will be recovered for refurbishment.

- An additional 16 GEN III GPS radio collars will be deployed in the development area with an emphasis on adult male grizzly bears to increase the representation of this cohort in the analysis.
- Remaining potential food sources (i.e. moose (*Alces alces*), snowshoe hare (*Lepus americanus*), ground-squirrel (*Spermophilus parryii*), and lemming species (*Dicrostonyx torquatus*) and *Lemmus sibiricus*) will be collected for development of a baseline isotopic signature for the study area.
- Carbon and nitrogen stable isotope analysis will be conducted on baseline isotope samples collected in 2004 and 2005
- Carbon and nitrogen stable isotope analysis will be conducted on hair and claw samples from bears captured or harvested between 2003-2005.

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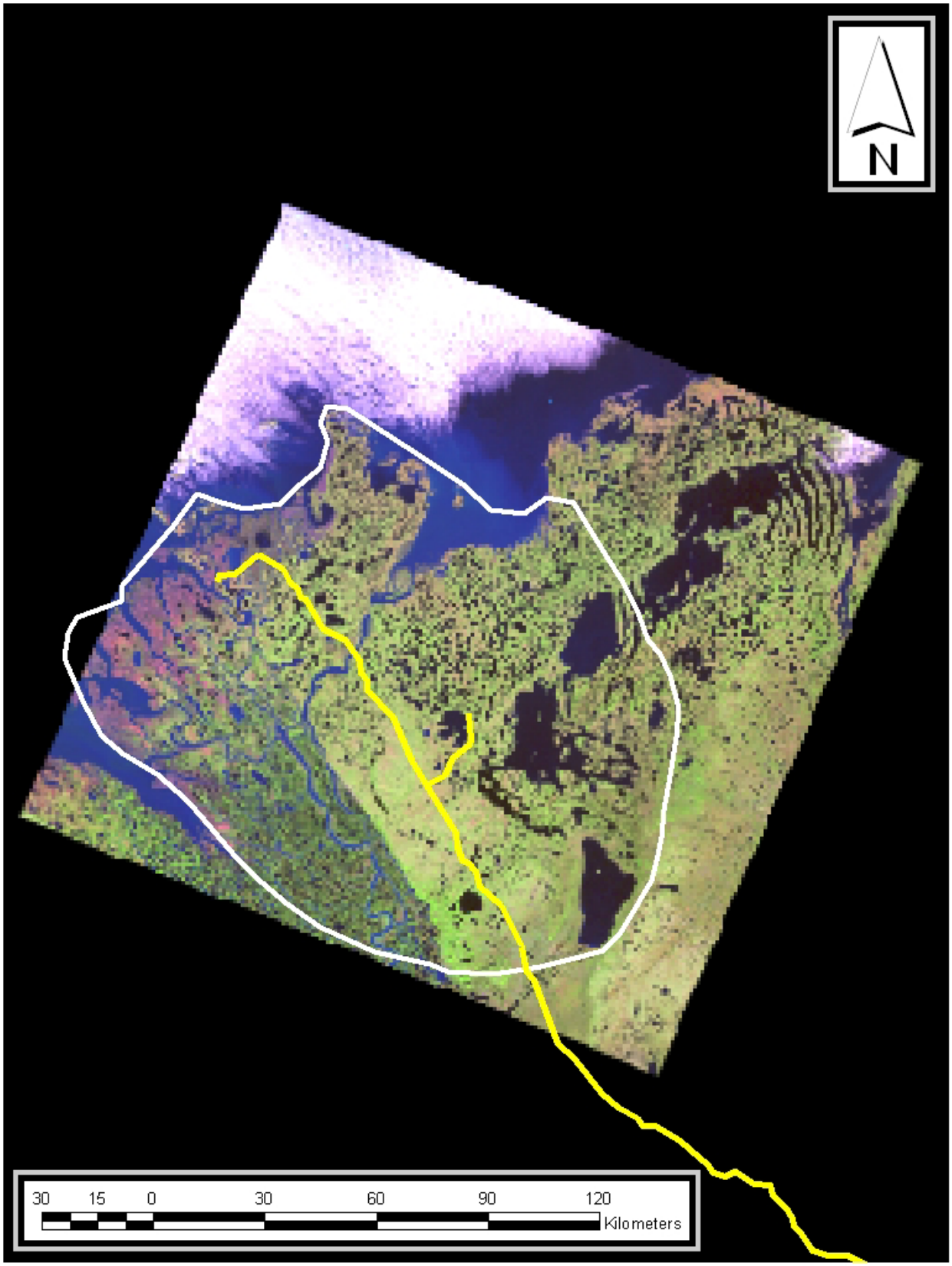

Figure 1: The Mackenzie Delta study area showing the proposed pipeline corridor.

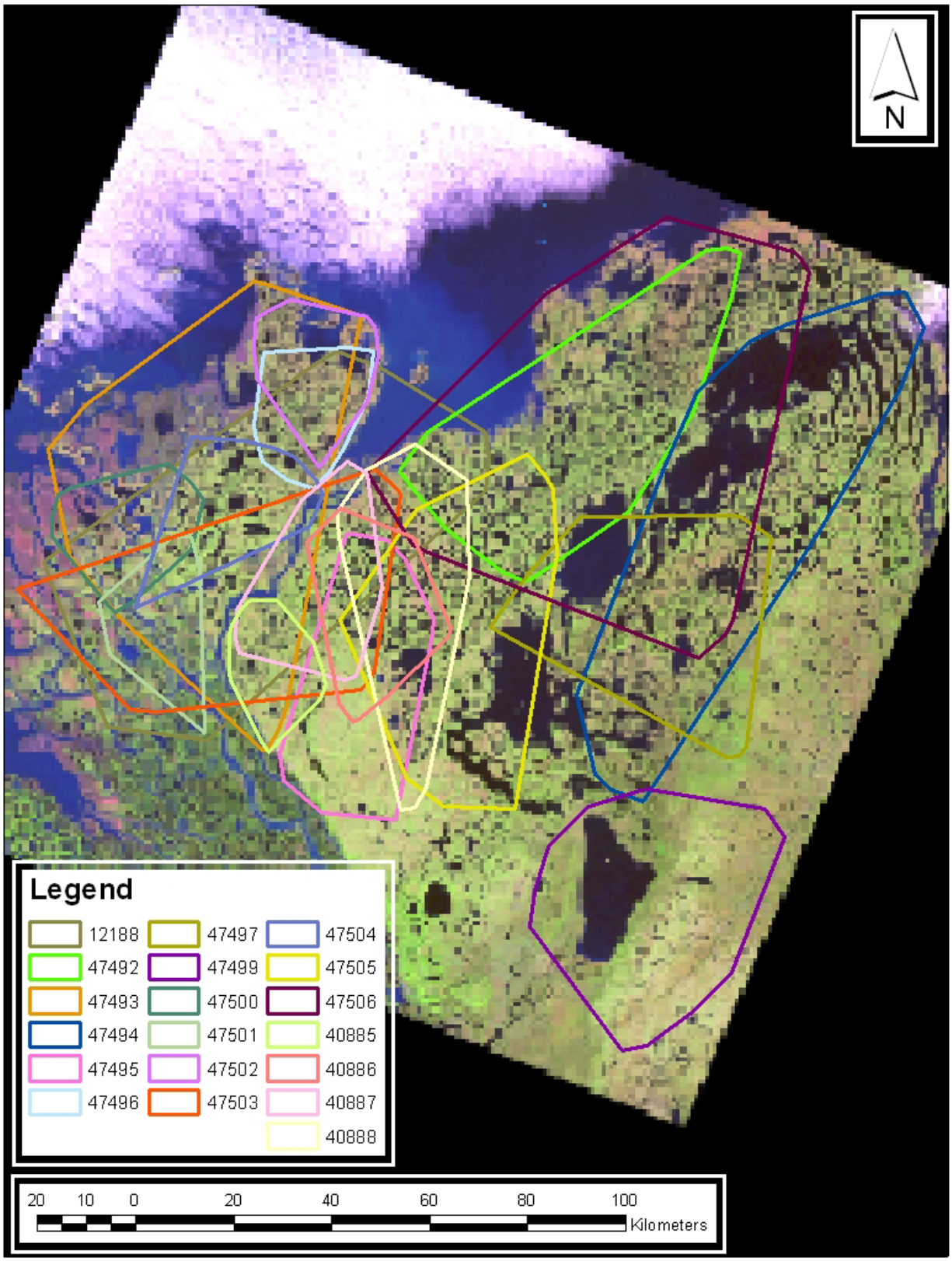

Figure 2: Home ranges (100% Minimum Convex Polygon) for all GPS collared grizzly bears monitored in development area during the 2004 active period.

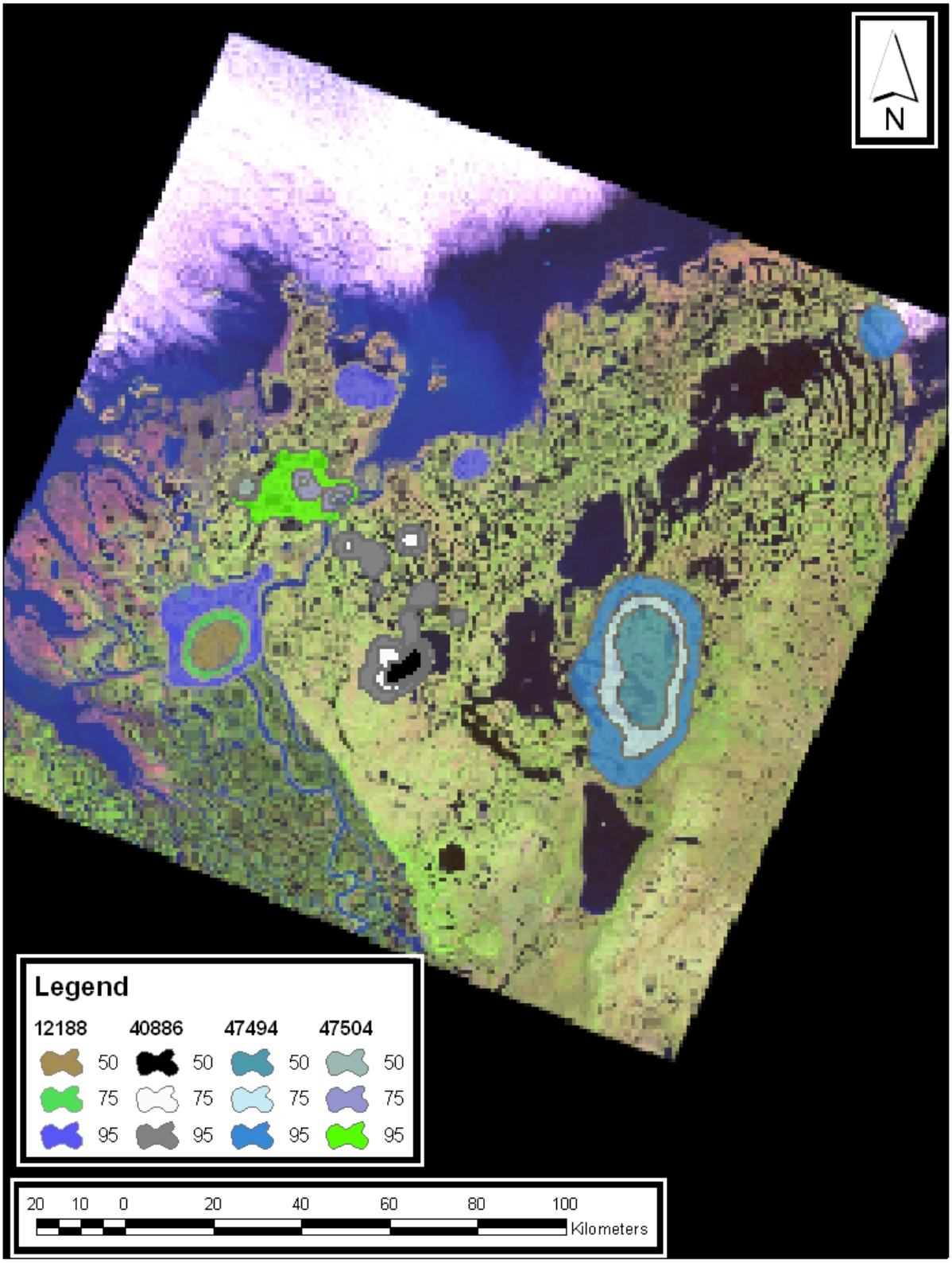

Figure 3: Fixed kernel home range estimates (95%, 75%, and 50%) for grizzly bears 12188, 40886, 47494, and 47504 for the 2004 active period.

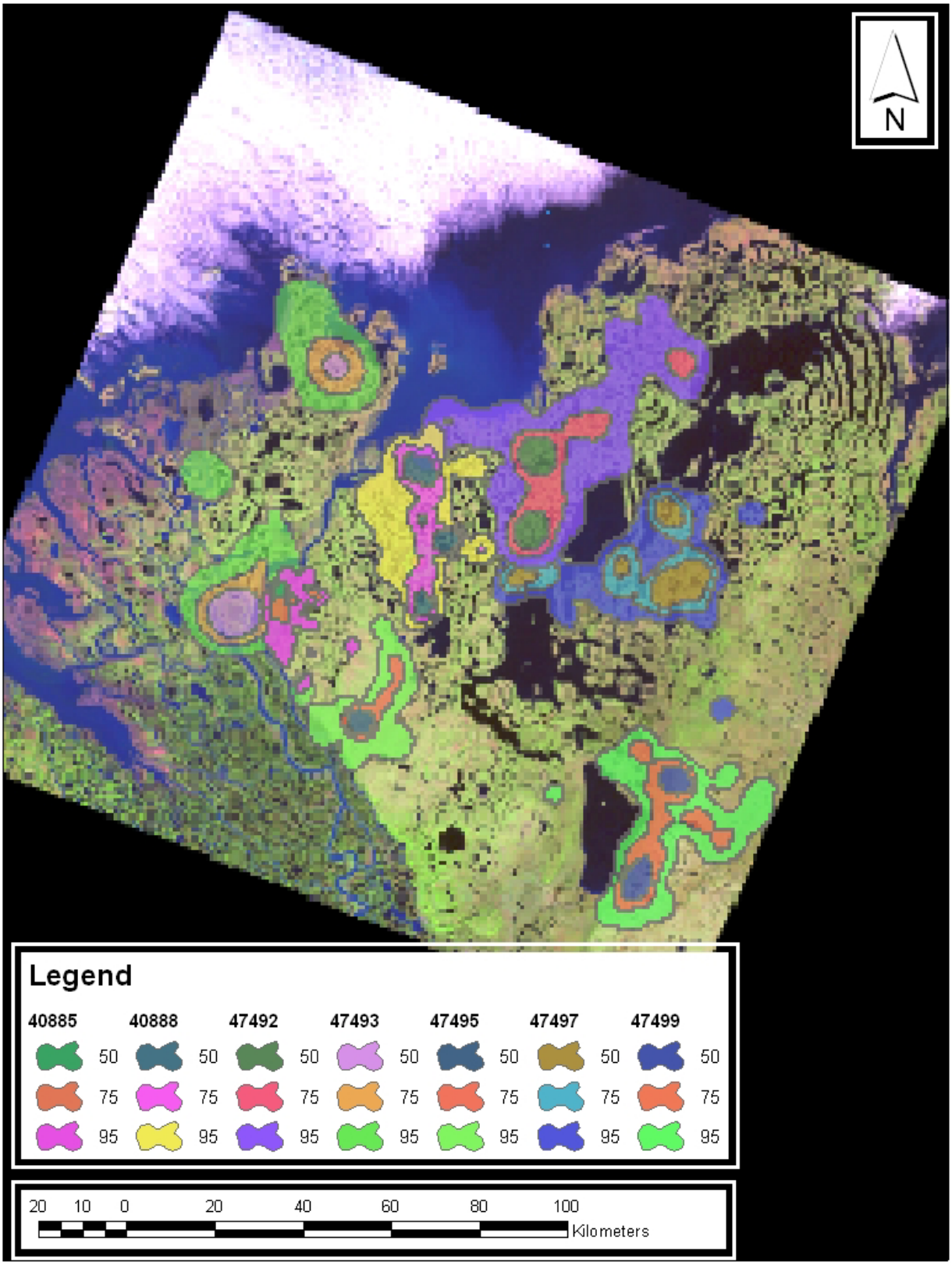

Figure 4: Fixed kernel home range estimates (95%, 75%, and 50%) for grizzly bears 40885, 40888, 47492, 47293, 47495, 47497, and 47499 for the 2004 active period.

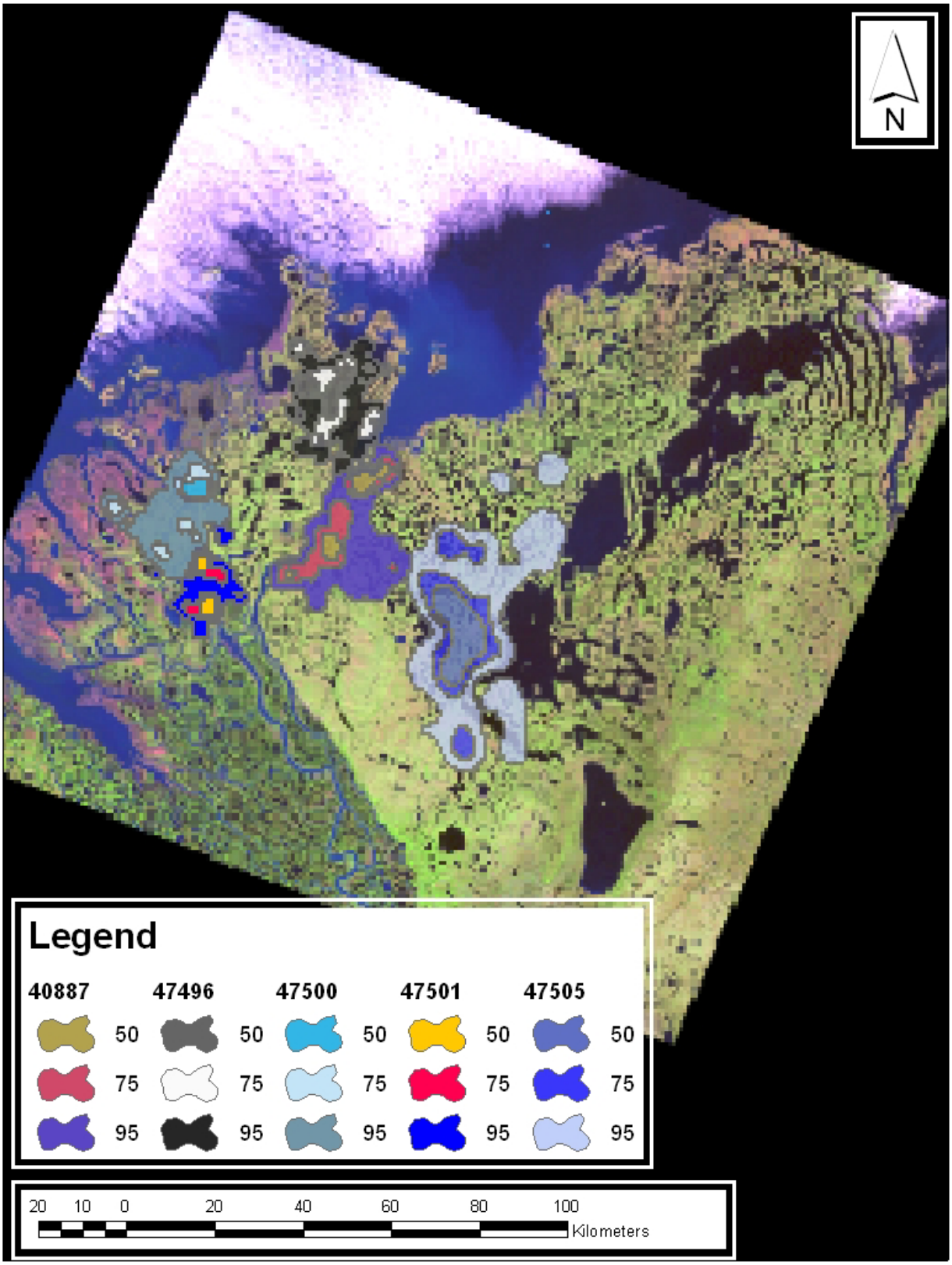

Figure 5: Fixed kernel home range estimates (95%, 75% and 50%) for grizzly bears 40887, 47496, 47500, 47501, 47505 for the 2004 active period.

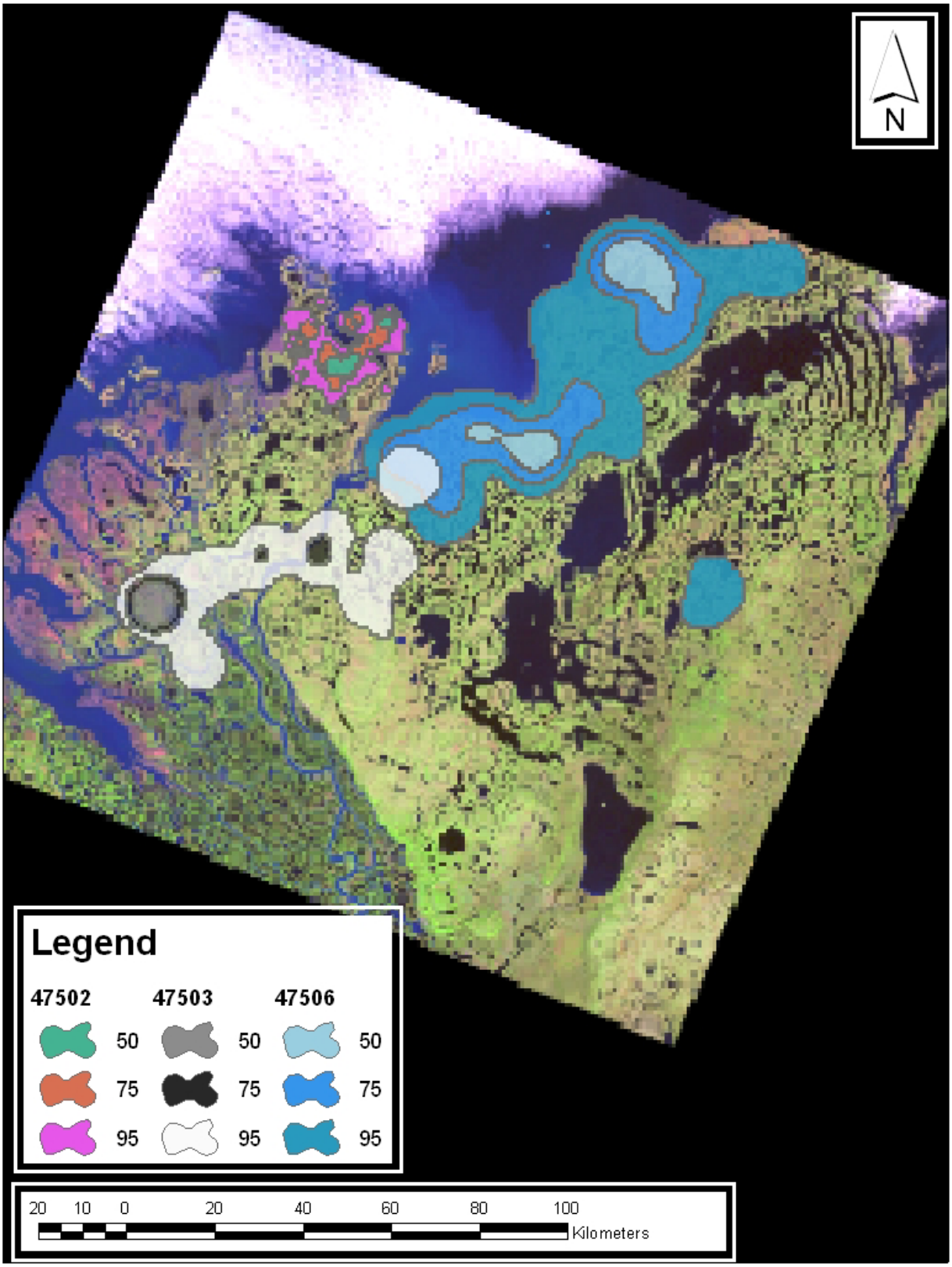

Figure 6: Fixed kernel home range estimates (95%, 75%, and 50%) for grizzly bears 47502, 47503, and 47506 for the 2004 active season.

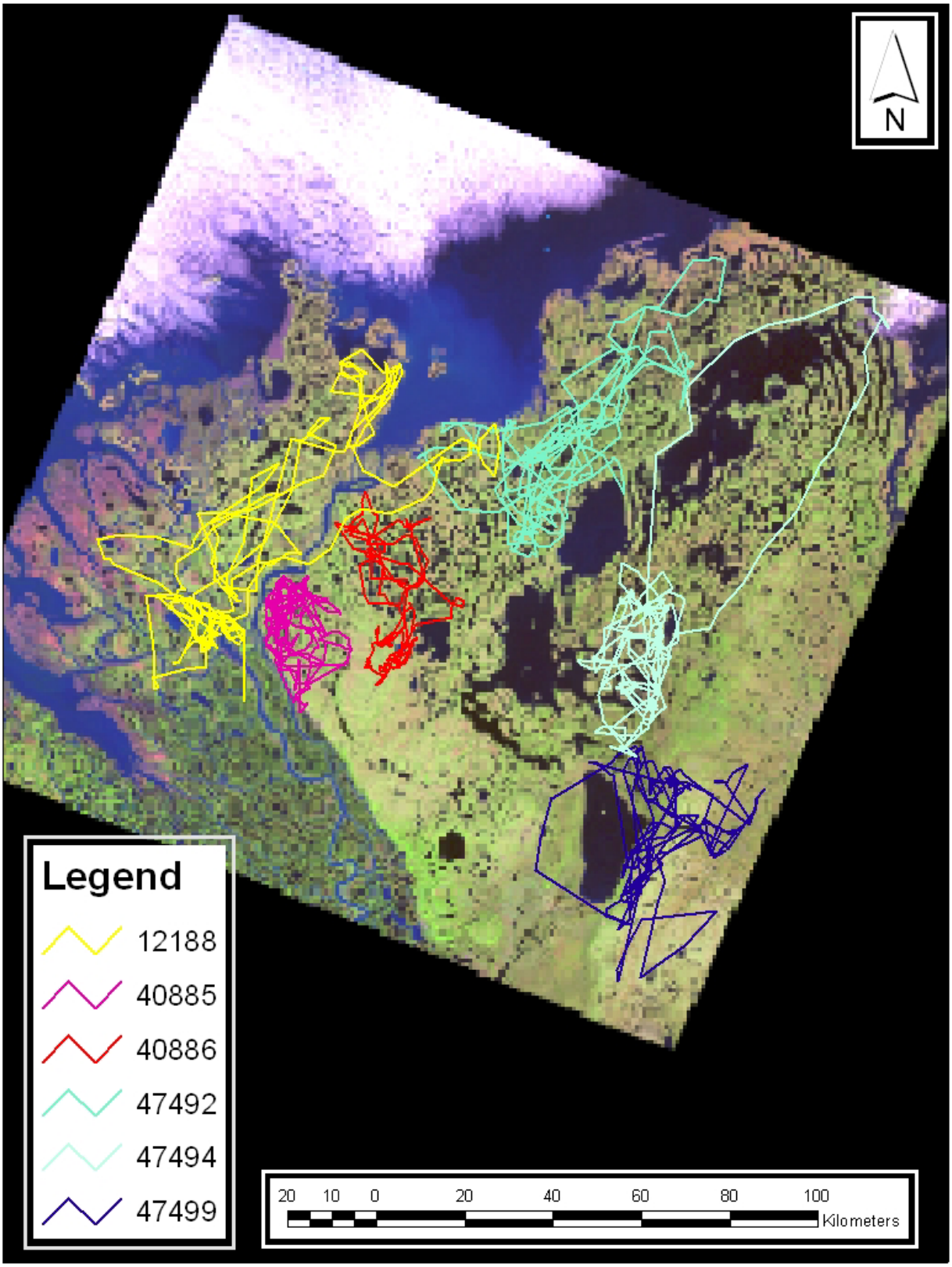

Figure 7: Movement patterns for grizzly bears 12188, 40885, 40886, 47492, 47494, and 47499 for the 2004 active period.

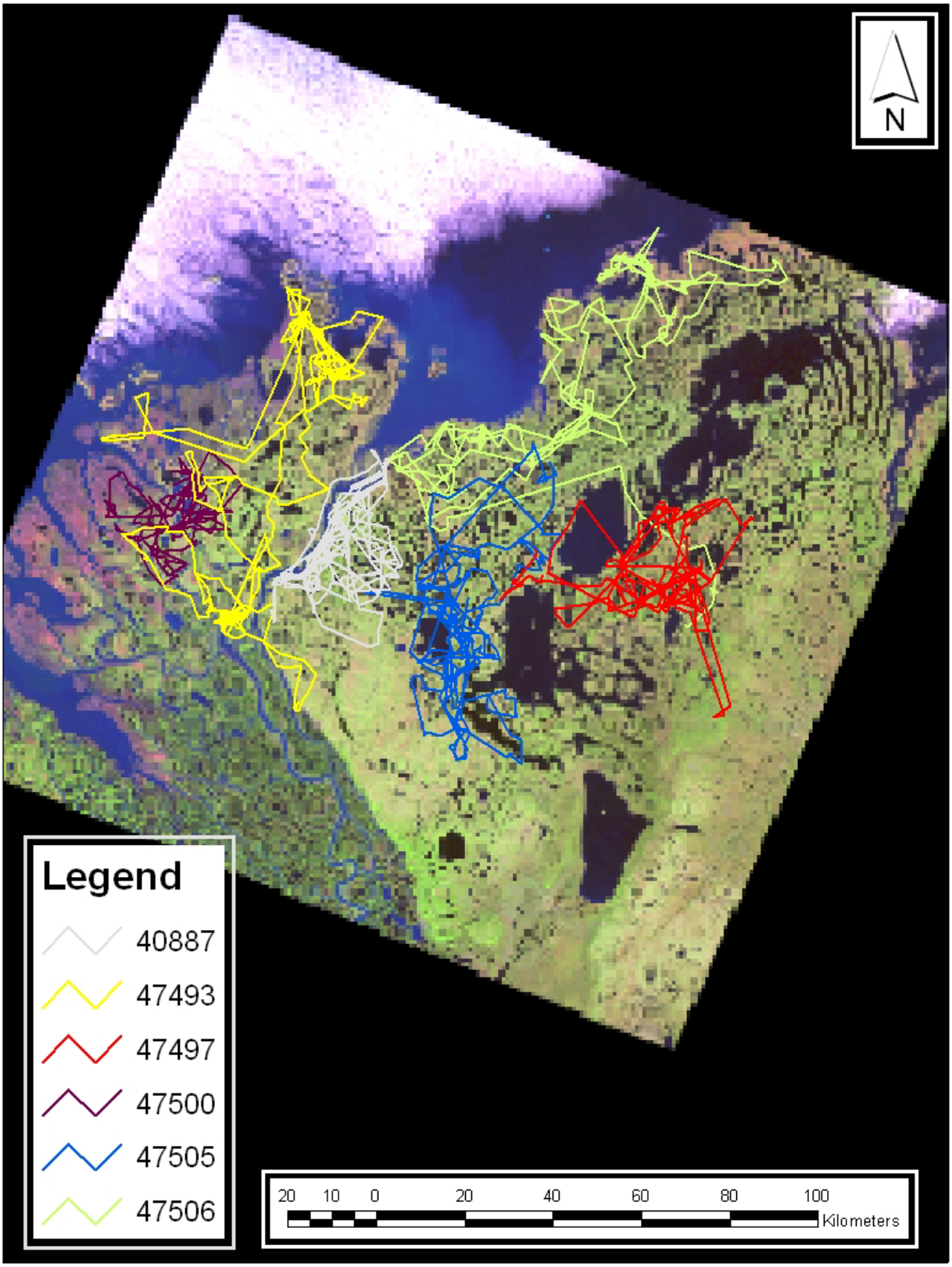

Figure 8: Movement patterns for grizzly bears 40887, 47493, 47497, 47500, 47505, and 47506 for the 2004 active period.

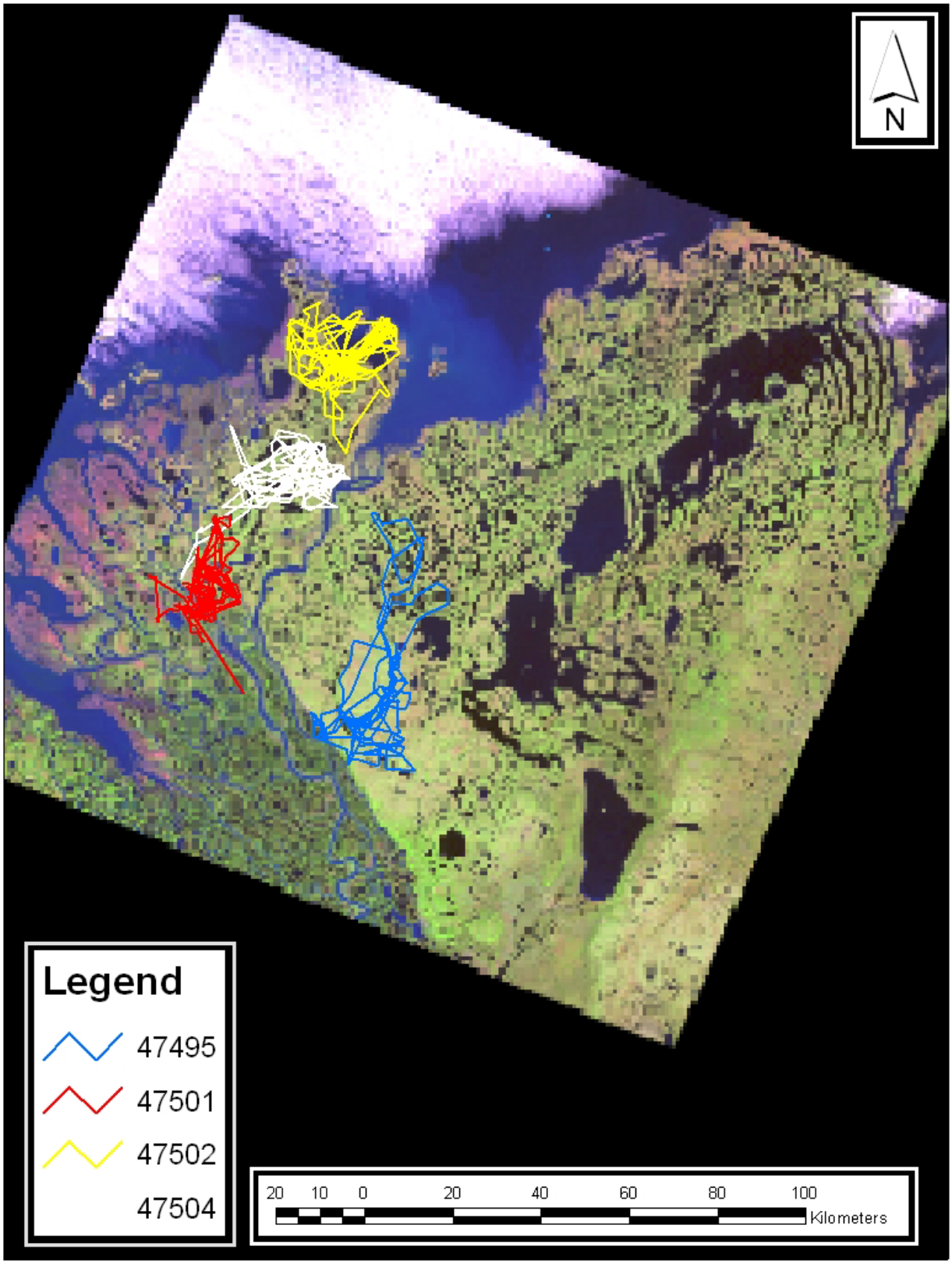

Figure 9: Movement patterns for grizzly bears 47495, 47501, 47502, and 47504 for the 2004 active season.

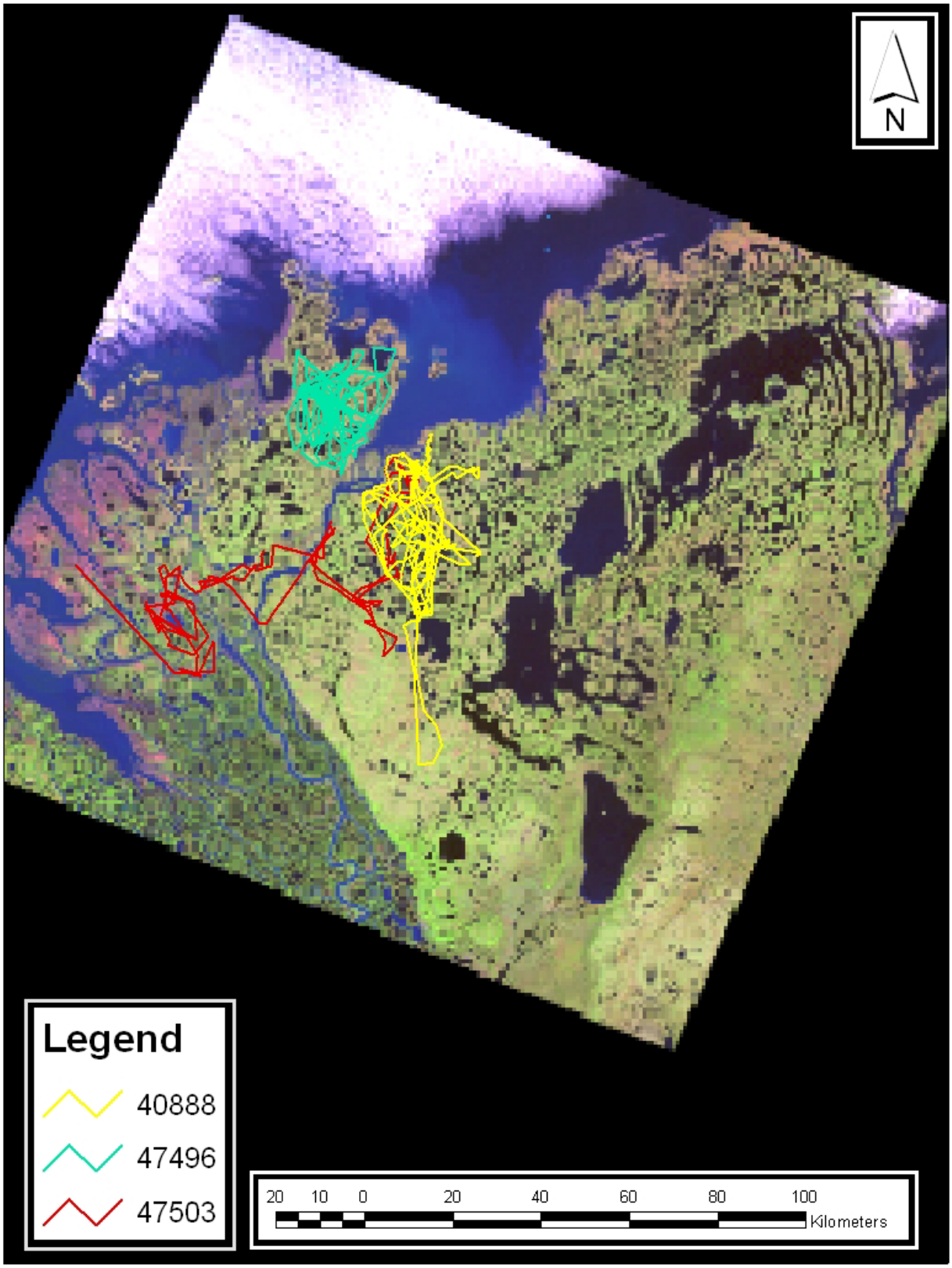

Figure 10: Movement patterns for grizzly bears 40888, 47496, and 47503 for the 2004 active season.

Table 1: Capture information for grizzly bears monitored during the 2004 active season.

Capture Year	PTTID	Bear ID	Sex	Collar Type	Age	Class[1]	Locations	Locs/day
2004	12188	1085	M	II	10	AM	773	5.42
2003	40885	1004	F	III	9	AF	547	3.83
2003	40886	1008	F	III	9	AF	664	4.61
2003	40887	1016	F	III	8	AF	551	3.57
2003	40888	1041	F	III	30	AF	630	4.36
2004	47492	1108	F	III	12	FAM	450	3.41
2003	47493	1046	M	III	5	AM	615	4.27
2004	47494	1048	F	III	n/a	AF	324	4.10
2004	47495	1099	F	III	21	AF	544	4.18
2004	47496	1107	F	III	11	AF	301	3.63
2004	47497	1106	F	III	5	AF	309	2.41
2004	47499	1084	F	III	5	AF	312	2.40
2004	47500	1086	F	III	13	FAM	389	3.41
2004	47501	1089	F	III	6	FAM	519	3.66
2004	47502	1092	F	III	10	FAM	408	3.96
2004	47503	1098	F	III	4	SF	348	3.66
2004	47504	1096	F	III	15	FAM	443	3.89
2004	47505	1079	F	III	22	FAM	520	3.89
2004	47506	1005	F	III	n/a	FAM	506	3.80

[1] Class refers to the age and sex class: adult male (AM) and solitary adult female (AF) (≥ 5 years old); sub-adult (subad) male (SM) or female (SF) (3-4 years old); and adult female with cubs (FAM)

Table 2: Morphological measurements for a GPS collared grizzly bears in the development area for the 2004 capture season.

PTT ID	Heart Girth	Neck Girth	Skull	Skull Length	Total Length	Contour Length	Tail Length	Hind Foot	Hind Pad[1]		Front Pad[1]		Zygo Width	Weight (kg)
									L	W	L	W		
12188	114.0			36.0	161.0	186.0	10.0		17.0	16.0			22.7	
47492	93.0			33.4	151.0	172.0	10.0						20.2	
47493	97.0			33.8	155.0	173.0							19.9	
47494	99.0			32.8	154.0	172.0							19.2	
47495	102.0			31.0	143.0								18.8	
47496	94.0			31.9	154.0	175.0							20.7	
47497	90.0			31.3	154.0								17.5	
47499	90.0	59.0	60.0	31.1	143.0	170.0	9.0	29.0	15.0	12.0	7.0	13.0	18.9	
47500	90.0			31.1	154.0	165.0	6.0						20.1	82.0
47501	88.0	52.0	56.0	29.7	135.0	162.0	10.0	27.0	14.0	12.0	7.0	13.0	18.6	67.0
47502	112.0			33.7	156.0	163.0	10.0	28.0	15.0	13.0	6.0	12.0	20.7	
47503	82.0	49.0	52.0	27.3	132.0	152.0	9.0						16.2	54.0
47504	99.0	55.0	60.0	31.5	149.0	167.0	8.0						19.4	
47505	88.0	61.0		32.3	148.0	160.0	10.0						20.7	82.0
47506	115.0			33.0			158.0						21.1	

All measurements are in centimetres unless otherwise indicated.
1 Pad measurements (L - length, W - width) were taken from the left hind and front paws.

Table 3: Home range estimates (100% Minimum Convex Polygon and 95 % and 50 % Fixed Kernel Home Range) for all GPS collared grizzly bears monitored in the development area during the 2004 active period.

PTT ID	Minimum Convex Polygon (km^2)	Fixed Kernel Home Range (km^2)		
		95%	75%	50%
12188	3973.04	693.34	190.33	94.22
40885	407.41	216.47	45.54	7.58
40886	79.80	362.79	110.31	43.18
40887	873.16	615.54	193.68	55.90
40888	1287.93	791.06	306.21	90.67
47492	2250.40	1557.51	392.94	114.78
47493	3676.81	1252.62	369.11	134.18
47494	3194.01	1163.31	567.37	294.86
47495	1244.58	481.86	104.73	28.68
47496	523.13	460.93	163.15	45.81
47497	1861.14	1044.77	452.34	17.60
47499	1850.33	950.79	335.72	89.61
47500	611.15	408.70	84.17	22.26
47501	533.18	220.63	72.44	20.86
47502	582.13	400.22	149.31	39.97
47503	2449.28	1369.43	181.71	78.13
47504	723.21	367.95	88.57	23.41
47505	2151.81	1259.72	385.27	153.86
47506	4965.39	3064.06	1140.51	289.65

Table 4: Request for funding.

Partners	In-Kind or Cash	Amount	Status
Alberta Cooperative Conservation Research Unit (ACCRU)	In-Kind	$6,800	Approved
Department of Indian and Northern Affairs/ Canadian Circumpolar Institute (NSTP/C/BAR)	Cash	$3,900	Pending
Habitat Stewardship Program for Species at Risk	Cash	$33,330	Denied
Polar Continental Shelf Project	In-Kind	80 hours of Helicopter time	40 hours Approved
World Wildlife Fund/ Endangered Species Recovery Fund	Cash	$15,000	Denied
Western Northwest Territories Biophysical Study (RWED)	Cash	$75,000	Pending
Total		**$182,030**	