Resources, Wildlife and Economic Development

Bear Tracks

No. 8

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A Newsletter on Grizzly Bear Studies in the Central Arctic, NWT, Canada

Assessing Cumulative Effects Impact on Wildlife

Industrial developments on the tundra may negatively affect wildlife populations in a number of ways. Human facilities, such as camps and roads necessary for the exploration, extraction, and processing of resources, directly reduce available wildlife habitat. Further reduction in habitat availability results indirectly from roads and traffic by isolating portions of an animal's range. Motor vehicles and people disrupt the normal feeding and movement activities of wildlife, which may reduce the health of these animals. An increasing number of people on the tundra will likely lead to an increase in conflicts between people and wildlife. Ultimately, this can result in the death of some wildlife and may have implications on the local population.

Individual effects of development are relatively easy to predict, but difficult to measure. The problem becomes complex when we try to determine the incremental, cumulative effects of all human activities over long time periods and large areas. For example, how will existing and planned exploration, mine development, and associated infrastructure influence the geographic distribution and size of the Bathurst caribou herd over the next 100 years? When we begin to measure the cumulative effects of development on a number of species simultaneously the problem becomes even more complex.

We have initiated a multi-year research project with the University of Alberta to address such questions. Specifically, we are interested in quantifying direct and interactive hypothetical cumulative effects of development for several wildlife species found in the Slave Geological Province (SGP).

The project uses telemetry information from previous or existing studies of **grizzly bear, wolf, wolverine, and caribou** and does not require any additional animal capture or collaring activities.

Cumulative Effects Analysis - strategy

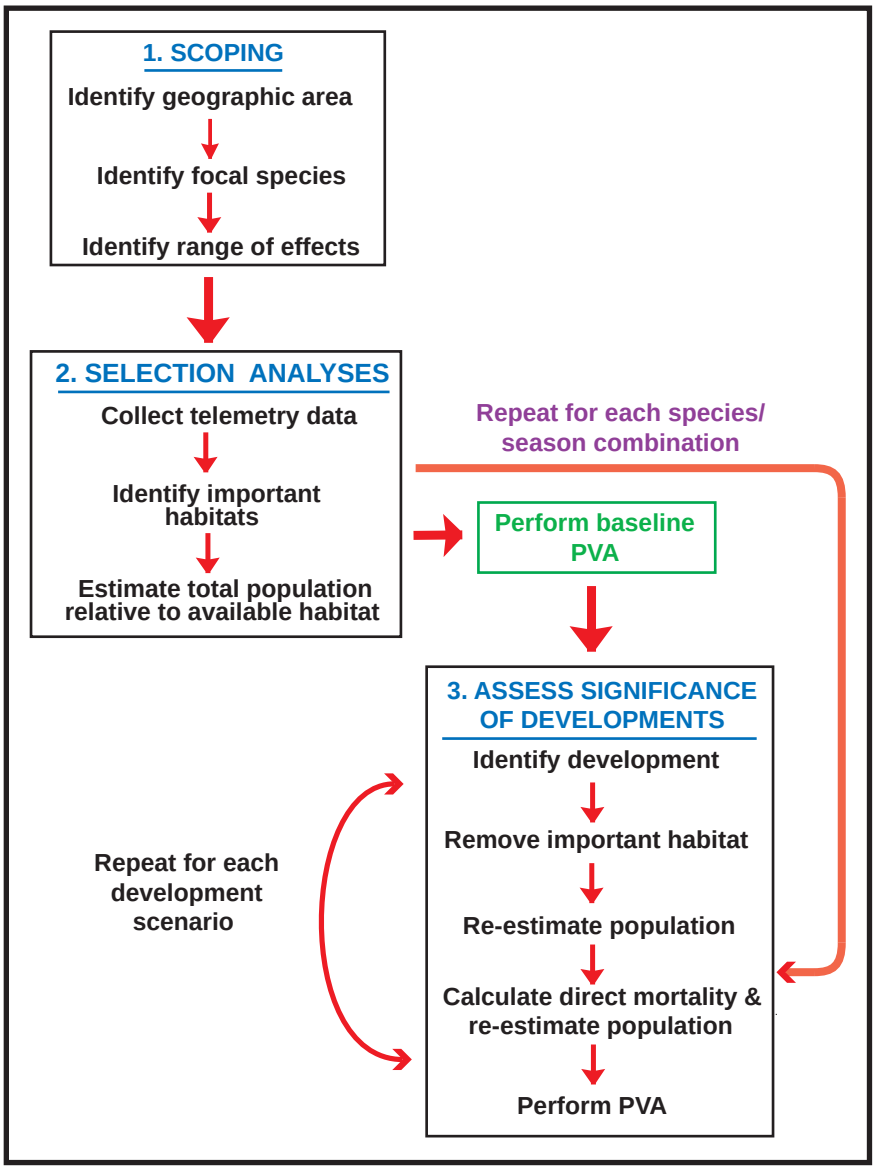
We will use habitat-based population viability analysis to examine cumulative effects. This technique allows us to statistically model the behavioral responses of animals to their environment and then determine how long these populations could exist should behaviors change as a result of development. Typically, this is a 3-step process:

Step 1 - Scoping Exercise:

This step involves identifying existing and hypothetical (future) developments, the focal species to include (in this case, grizzly bear, wolf, wolverine, and caribou), and the potential effects of development relative to the distribution, abundance, and long-term viability of each focal species.

Step 2 - Estimate the Distribution and Size of Focal Species Populations:

We will use telemetry locations to predict the distribution and abundance of each focal species according to selection or avoidance of environmental resources (for example, feeding areas) and the influences of other species (for example, wolf-caribou-wolverine interactions). We expect that cumulative effects impacts would affect those interactions or the availability of environmental resources, resulting in a reduction in population numbers or distribution.



Above - *Flow diagram of the 3 steps we will use to assess cumulative effects of development on caribou, grizzly bear, wolf, and wolverine in the Slave Geological Province. Population Viability Analysis (PVA) is the numerical technique which will allow us to assess the ability of each of the four animal populations to persist over the long term.*

Step 3 - Calculate Long-term Forecasts of Population Persistence:

Predicting decreases in the size and distribution of our focal populations is important, but the main question still remains, "How do cumulative effects of development influence the long-term persistence of affected populations?" In Step 3, we use population viability analyses to estimate the influence of the various development scenarios on the probability of persistence of each focal population 100 years into the future. Viability is influenced by decreases in population size calculated in Step 2 and natural variability in population processes that can influence the likelihood of extinction for small populations.

We will repeat Steps 2 and 3 for a baseline case and scenarios that represent progressively greater levels of development. By assessing successive increases in cumulative effects we can predict thresholds at which population persistence may be threatened.

Anticipated Study Results

We anticipate a number of results with immediate and long-term strategic application to the assessment of cumulative effects for large mammals across the SGP and other jurisdictions. Products with immediate use to habitat biologists, land-use managers, and planners working within the SGP include:

- identification of limiting resources for each focal species;
- greater understanding of interactions among focal species;
- digital maps of the probabilistic distribution of each focal species across the SGP;
- population estimates for each focal species;
- synthesis of effects that may arise from various developments; and
- baseline viability analyses for each focal species and assessment of significance for future development scenarios relative to changes in population viability.

Cumulative effects analyses in the past have been burdened by high costs, lengthy implementation periods, difficulties in assessing significance, little or no statistical and quantitative rigour, poor exportability to other jurisdictions, and designs that limit repeat analyses relative to changing ecological or development conditions. Our approach avoids or improves upon those shortcomings and will advance currently available methods for assessing the significance of cumulative effects. Successful application of a habitat-based population viability analysis to cumulative effects assessment in the SGP will have broad implications to similar efforts in other jurisdictions.

Spring 2001 Bear Captures

This past May, of six bears captured, two females (G769 and G777) were new, two were recaptures from last summer (G592 and G608), and two were recaptured from our previous study (G601 and G614). Bear G769 was aged at three years and bear G777 at 13 years old based on tooth cementum annuli, a technique similar to counting growth rings in a tree.

Throughout the summer we intensively searched broad areas inside and outside our study area (searching at times more than 40,000 km^2) to find some of these collared bears and download the stored locatons. Unfortunately, we did not relocate grizzly bear G777 and her cub since their initial capture. We are uncertain if the VHF signal has malfunctioned, or like what was observed with bear G608 last year, simply wandered out of the study area. Nevertheless, we remain optimistic that we will eventually find her.

Grizzly bear G601

Following the Bears

In October 2000, we retrieved the three GPS (Global Positioning System) satellite radio-collars deployed on grizzly bears the previous spring. These collars were an improvement from our previous Argos-type satellite collars where 2 to 5 locations were received every 48 hours with an error of 500 meters or more. GPS collars give us more locations per day than Argos collars over the same time period and are much more accurate.

Since May 2000, the United States government has turned off Selective Availability, the intentional timing error introduced to the civilian GPS system. With Selective Availability off, GPS locations are now accurate to about 10 m.

In May 2001, six GPS collars were successfully deployed on adult female bears within a 40 km radius of the Ekati™ diamond mine. However, this time the programming was changed on the GPS collar to take full advantage of the collar's large memory capacity (about 9,600 locations). Once deployed, we were unable to locate one of the bears afterward, so we only have movement maps for five bears at this time.

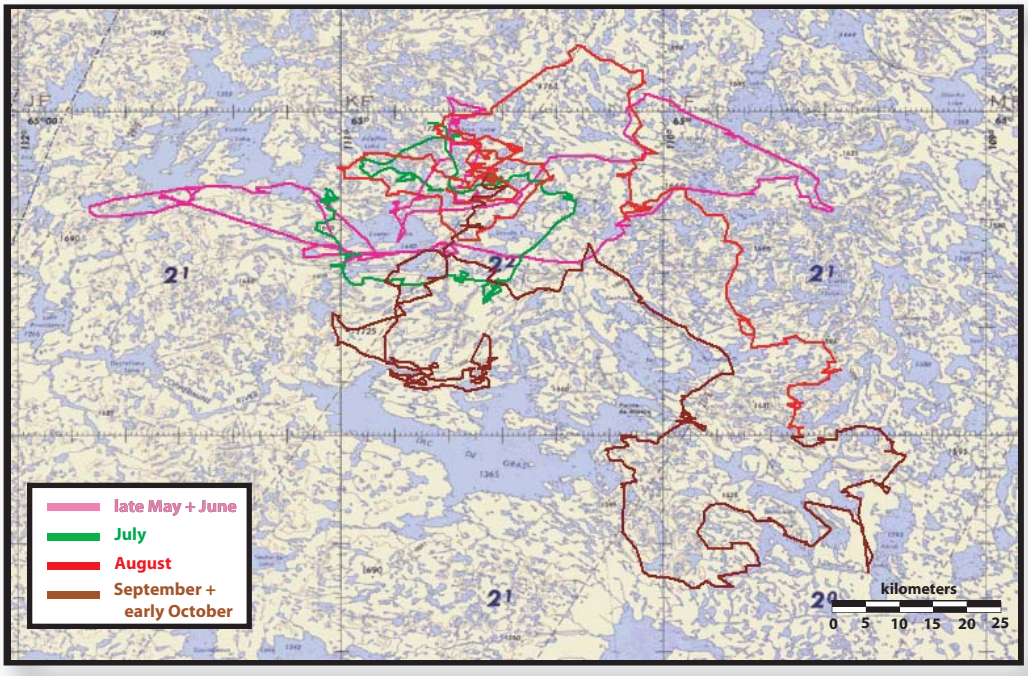
The collars will now remain on the bears through 2002 while still obtaining 24 locations per day. A pre-set release mechanism on the collar will activate in October 2002 and the collar will drop-off from the bear. We can then locate and pick up the collar with its VHF beacon to retrieve the data.

This procedure is risky because we have to wait until next October to physically extract the stored locations from the collars. If we cannot find the bears, or the dropped collars next fall, we will likely lose the data. Therefore, some of this risk was reduced by using a programming feature to remotely retrieve the stored locations each month. By flying within several kilometers from the collared bear at a pre-set time, we can download the GPS locations since our last contact.

However, even under the best field conditions, the entire dataset cannot be recovered until we have the collars in-hand. Remote downloads are adversely influenced by weather, poor signal strengths, and aircraft interference that consequently reduce the number of locations we receive.

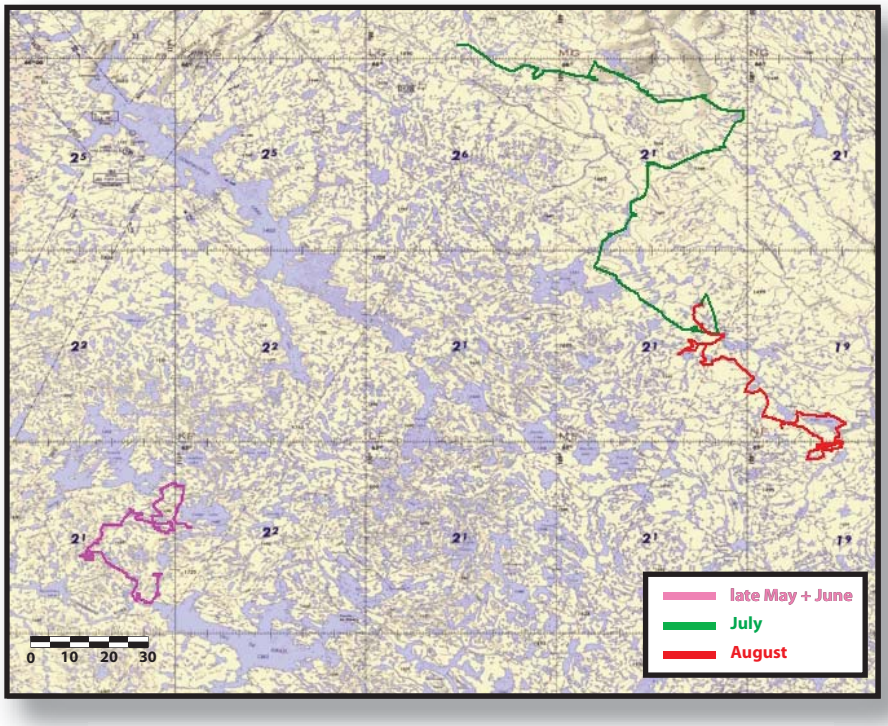
Grizzly Bear G601

On May 23rd, adult female grizzly bear G601 was captured with two yearling cubs. She was first captured in 1995 with three cubs-of-the-year. Her tooth age indicated she was 19 years old then, so now she is 25 years old. This bear heavily used the area surrounding the Ekati™ mine site. In August 2001, we watched her drag a dead female caribou carcass from the water and feed on its remains with her cubs. We obtained 2,327 locations from G601's collar between May 23nd and October 8th, for a success rate of 71%.



Grizzly Bear G608

Bear G608 was first captured as a cub-of-the-year in 1995. We re-captured this female bear last year and again this year, so she has now reached 6 years of age. This year, as in 2000, bear G608 was with an adult male grizzly when captured in late May, about 20 km southwest of Ekati™. We located bear G608 in June and August, but not in July or the fall. From the August downloads (July 16th to August 13th) we saw that her mid-July movements occurred north of 66 degrees latitude, about 150 km northeast of her previous location in June, which explains why we would have missed her signal.



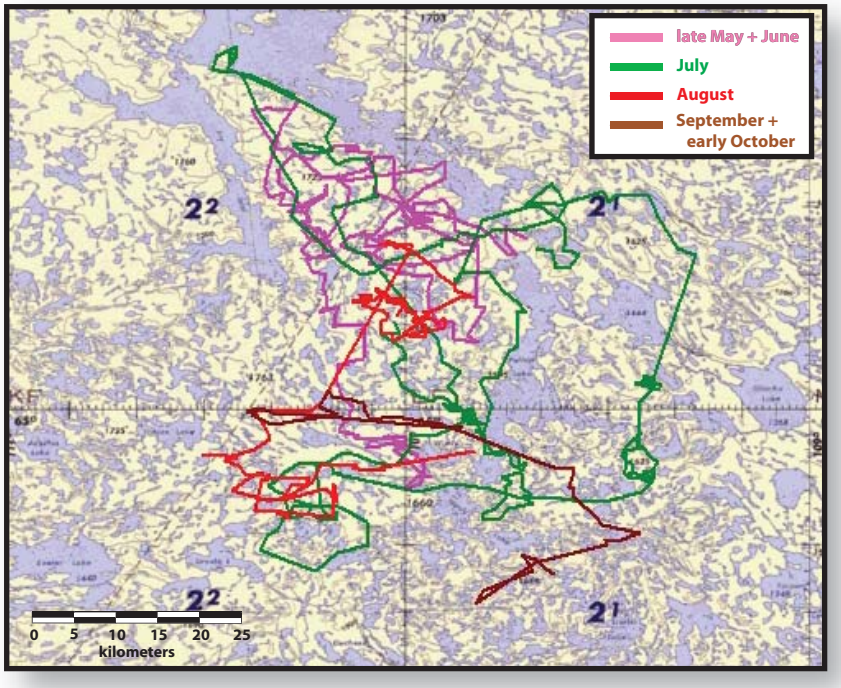
Bear G608 then travelled 450 km south to where she was found with another adult male. Last year we had tracked G608 with a GPS collar and she also showed extensive movements during the summer. We can still recover this year's July locations that we missed from the aerial download when we physically retrieve the collar next October.

Left - Bear G608 locations.
We received movement data only twice for this 6-year female bear between May and October 2001. However, from the 989 locations we obtained, we detected some extensive movements during this time.

Grizzly Bear G614

On May 22nd we captured grizzly bear G614 with one yearling cub about 40 km northwest of Ekati™. This bear was first captured in 1995. At that time, her tooth age was 4 years old so now she is 10 years of age.

We were only able to obtain 55% of a possible 2,796 GPS locations for this bear because aircraft interference encountered in September hindered data downloads. Poor weather again in October also resulted in no data collection then. However, the data show that although this bear heavily used the area west of Pellatt Lake, the southern portion of her movements brought her closer to the Ekati™ area.



Grizzly Bear G592

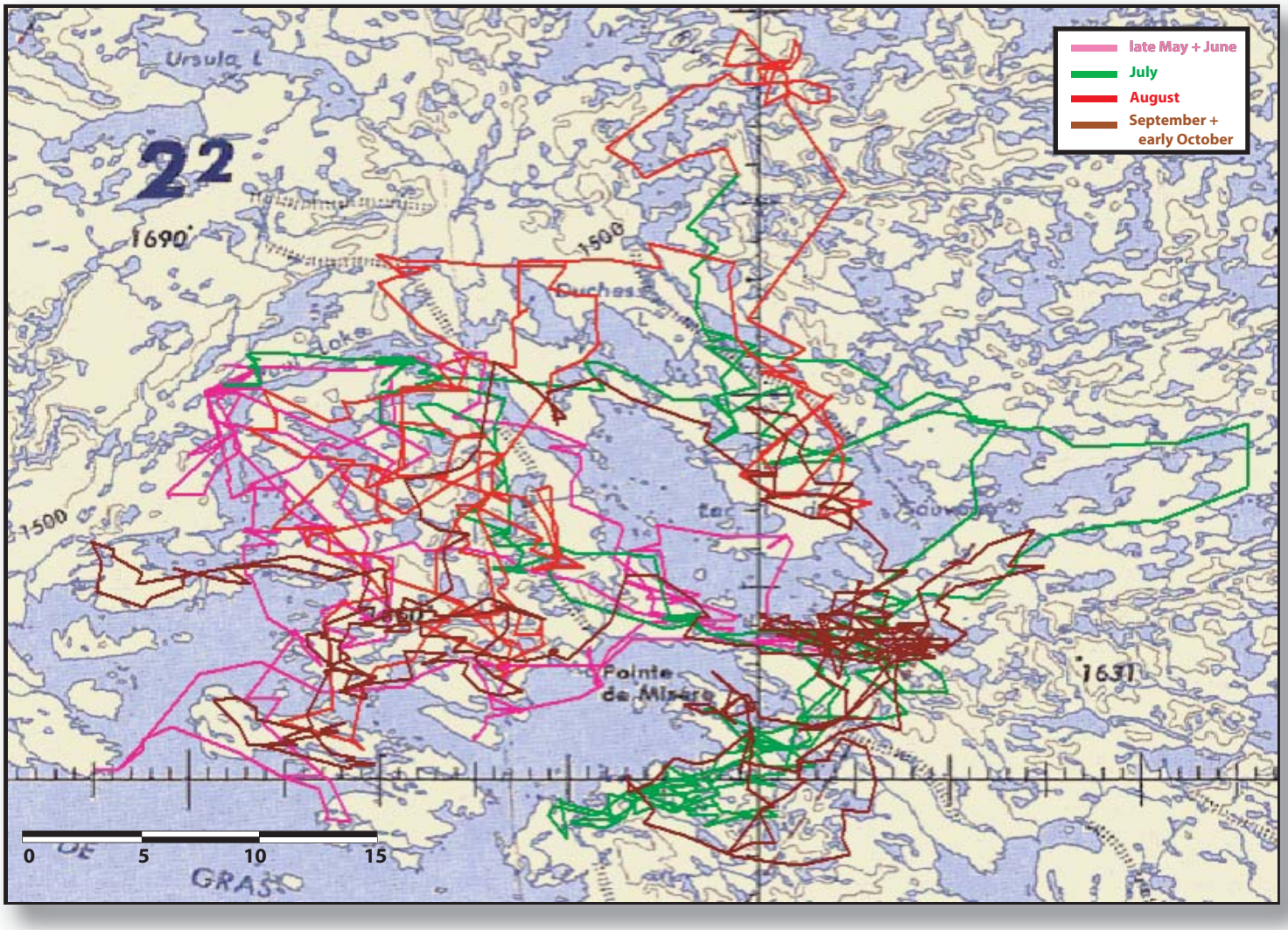
We re-captured G592 about 3 km northeast of the Diavik airstrip. She was 14 years old this year and was accompanied with three cubs-of-the-year.

This bear should provide valuable data on how she interacts with human activity because she frequents the area along the Misery road route and the Diavik area. This year, 2,541 locations were received from the GPS collar out of a possible 3,288, for a 77% success rate.

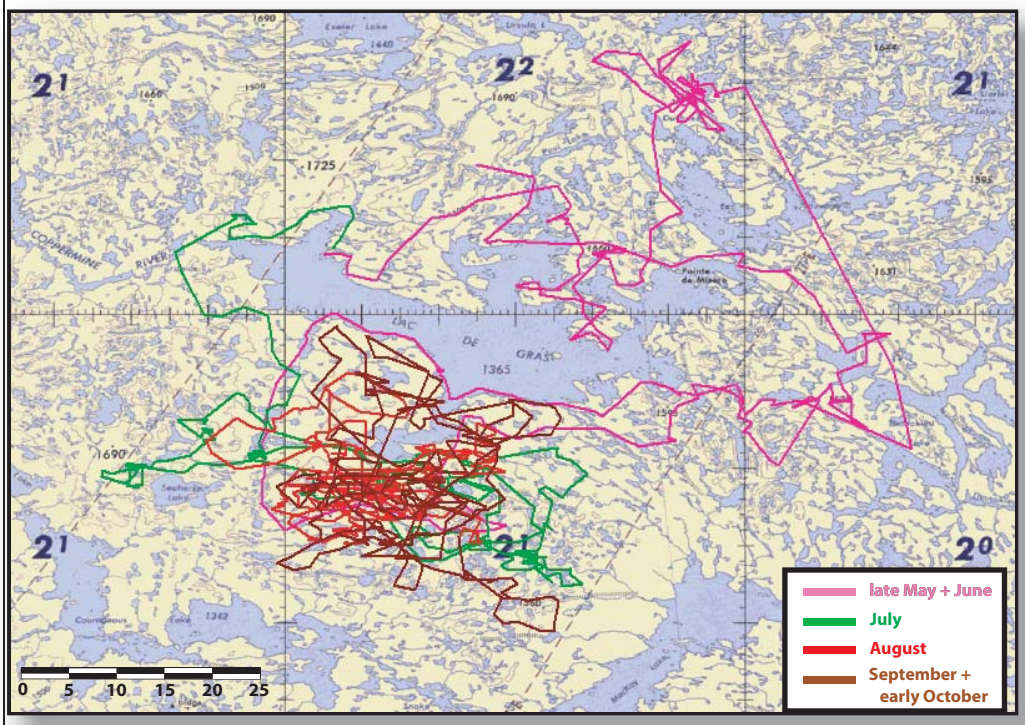
In July while tracking bear G592 from the air, we observed her crossing the Misery road. In this case, G592 stopped after walking halfway across the road, waited for her cubs to start to cross, and then all three bears ran across to the other side. About 30 seconds later, a pick-up truck drove by and at that time the bears were approximately 20 m from the road.

Bear G592 GPS locations

This bear appeared to use the area surrounding the Misery road more intensively than the other collared females.



Grizzly Bear G769



A new 3-year-old female grizzly bear was captured on May 23rd about 5 km south of Ekati™. She was found with an adult male. Most of the time bear G769 was south of Lac de Gras although at times she ventured north of there to the Diavik and Ekati™ areas. In October, we watched this bear dig into a small hillside and about 25 minutes later, saw her leave with a ground squirrel in her mouth. We obtained 1,869 locations from this GPS collar from a possible 3,260 attempts, for a 57% success rate.

Safety in Bear Country videos

Two videos on safety in bear country were released this spring that seek to reduce the risk of an adverse encounter with bears. The videos are unique because they are the result of consensus opinion of many specialists with thousands of hours of behavioral observation of bears and extensive experience with bear and human interactions and conflicts. Although these videos provide another tool to learn about bears, we encourage people to attend bear safety workshops by local wildlife authorities.

A 48-minute main video, *Staying Safe in Bear Country*, outlines black and grizzly bear identification and behavior to help the viewer better understand these bears and how this knowledge can help minimize the chance of bear encounters and attacks. This video sets the stage for shorter, more specific modules that build on the information contained in the main video. The first such module, called *Working in Bear Country*, is a 20-minute video that provides additional detailed information on working safely in bear country. The module is intended for industry managers and supervisors responsible for the safety of workers in bear country. Two additional modules are planned, one on hunting in bear country and another one on polar bears.

The videos are the result of a project by the Safety in Bear Country Society in cooperation with the International Association of Bear Research and Management. The videos themselves, produced by Wild Eye Productions in association with AV Action Yukon Ltd., are available from book stores or Magic Lantern Communications Ltd., Toronto, Ontario, Canada. Visit their website for specific ordering details and pricing.

www.magiclantern.ca

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Future Plans

Our remote data downloads will continue through the summer of 2002 until the GPS collars drop-off in October. At that time we will physically extract the stored locations from the collars. This spring, search efforts will be expanded for bears G608 and G777. The potential loss of data from the collars on these two bears is significant. As well, G601 will be 26-years-old in 2002 and may soon die of old-age. Of 300 bears captured in the central Arctic since 1988, only one other female has had cubs at 26 years of age. Because we have had difficulty acquiring data from G608 and G777, and bear G601 is very old (her potential death would cause a loss of more data), we will acquire two new GPS collars to either deploy this spring or have as back-ups for possible later deployment.

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The NWT Barren-Ground Grizzly Bear Project

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