2003

Compendium of Research in the Northwest Territories

Including:

- Scientific Licences
- Archaeological Permits
- Wildlife Permits and
- Fisheries Permits

Aurora Research Institute
Aurora College

ABOUT THE AURORA RESEARCH INSTITUTE

The Aurora Research Institute (ARI) was established in 1995 as a division of Aurora College when the Science Institute of the Northwest Territories (NWT) divided into eastern (Nunavut) and western (NWT) divisions.

The Aurora Research Institute's mandate is to improve the quality of life for NWT residents by applying scientific, technological and indigenous knowledge to solve northern problems and advance social and economic goals.

ARI is responsible for:

- licensing and coordinating research in accordance with the NWT *Scientists Act:* This covers all disciplines including the physical, social, biological sciences and traditional knowledge;
- promoting communication between researchers and the people of the communities in which they work;
- promoting public awareness of the importance of science, technology and indigenous knowledge;
- fostering a scientific community within the NWT which recognizes and uses the traditional knowledge of northern aboriginal people;
- making scientific and indigenous knowledge available to the people of the NWT;
- supporting or conducting research and technological developments which contribute to the social, cultural and economic prosperity of the people of the NWT

To learn more about ARI, you can contact us at:

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FOREWORD

The Aurora Research Institute is responsible for compiling this document in an effort to keep northerners informed of research activities in the Northwest Territories. The licensing requirement for researchers in the Northwest Territories is a provision of the *NWT Scientists Act*, ensuring that an annual summary of their work is accessible to all those who need to be informed and others who may be interested in these activities. The sharing of this information allows for greater involvement of northerners in the development of research programs that are pertinent to the needs of the north. This information also enables researchers to work collaboratively on related issues.

Industrial development in the NWT in recent years has highlighted the need for scientific and technological knowledge. The critical role that research plays in guiding public policy is increasingly recognized by the people, the governing agencies and the private sector of the Northwest Territories. Training in these areas is critical to allow for adaptation to the rapidly changing social and economic structure of the North. ARI actively promotes partnership with community groups, government agencies, and private sector organizations in order to identify research needs and strategies to meet those needs. Researchers are also partners in these endeavours.

Through the research licensing and permitting requirements, aboriginal organizations and community groups have input into the research that is conducted and are kept informed of current and proposed research in their region. ARI, in cooperation with researchers assists in training community members to participate in research projects within and outside their communities.

Researchers make a valuable contribution to the north as they provide information and education through schools and community presentations, and they also provide employment and training opportunities. There are an increasing number of partnerships and cooperative programs being developed with researchers and the people of the north. By sharing this information, the people of the north are able to help in sharing the future direction of research in this region.

The Aurora Research Institute works to connect scientists with the communities of the Northwest Territories by promoting and supporting studies which improve the understanding of the natural resources and indigenous knowledge and cultures of the NWT. The Compendium of Research is one means by which scientific and traditional knowledge is made available to people of the NWT.

Andrew Applejohn
Director
Aurora Research Institute

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ABOUT THIS BOOK

The Compendium of Research in the Northwest Territories is a summary of research licences/permits that were issued in the Northwest Territories during 2003. The information contained in this book is a collaboration between the Aurora Research Institute (ARI), the Prince of Wales Northern Heritage Centre (PWNHC), the Department of Resources, Wildlife, and Economic Development (RWED) and the Department of Fisheries and Oceans (DFO). The Compendium series began in 1986.

Licensing in the NWT

Under territorial legislation, all research in the NWT requires a licence/permit from one of three agencies, depending on the type of research being conducted:

- Prince of Wales Northern Heritage Centre — Archaeology
- Department of Resources, Wildlife, and Economic Development, Government of the Northwest Territories — Wildlife
- Aurora Research Institute — All other research in the NWT

Included in this Compendium are Fisheries Research projects conducted by the Department of Fisheries and Oceans staff. Other researchers conducting fisheries research are required to have a Science Licence and are included in this section of the Compendium. In addition to one of these licences/permits, there may be other permits required depending on the nature of the research work.

Through the licensing process, researchers are informed of appropriate organizations, communities and other licensing/permitting agencies that should be contacted prior to conducting studies. Licensing ensures research activities are communicated to interested parties and provides opportunities for the exchange of information.

Although the Compendium is a summary of all licences/permits issued in the NWT by all three licensing/permitting bodies, it is not a list of actual research conducted. The reader is encouraged to contact the researcher for further verification and additional information.

How to Use This Book

This book has four main sections. Each of these sections reflects a specific licensing agency and type of licence/permit issued. Within each section research descriptions have been grouped by subject, and listed alphanumerically by the principal researcher's last name. Refer to the Table of Contents for the specific page on which each section and/or subject begins.

1. Reference Number

The reference numbers shown in each of the Aurora Research Institute's subject areas refer to the file number issued to a particular researcher. It allows cross referencing with research material that may be available on file or in the ARI library. The reference numbers of the other two agencies refer directly to the permit numbers given to each researcher. When requesting information from any of these agencies on specific research outlined in this compendium, please refer to the reference number in your correspondence.

2. Regional Abbreviations

Throughout the book, reference is given to the specific land claim region(s) in which the research took place. The regions are shown in Figure 1. Some of the land claim regions are still under negotiation and boundaries shown are only approximations. The abbreviations shown for each region are as follows:

DC	Deh Cho	**SS**	South Slave
NS	North Slave	**SA**	Sahtu
IN	Inuvik (includes Gwich'in and Inuvialuit Settlement Regions)		

3. Glossary

A glossary of terms has been added to the Compendium. The intent of the glossary is to allow the reader to better appreciate the research descriptions.

4. Index

At the back of this book, you will find two indices. These have been developed to help the reader cross reference material more easily. The numbers used in the Researcher Index refer to the number listed with each research description. The numbers listed in the Subject Index refer to the page numbers.

Available in Print or CD

The Compendium is available as a printed publication or digitally on CD. The Compendium can be downloaded from the Aurora Research Institute's website (www.nwtresearch.com) or a copy can be requested by contacting the Aurora Research Institute. We encourage photocopying of the printed publication to promote its distribution.

For More Information about the Research Listed in This Book

Please contact:

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Send Us Your Comments

Whether you are a researcher or an interested member of the public, the Aurora Research Institute welcomes your comments and suggestions about the Compendium. Contact us by mail, fax, email or telephone (see address above).

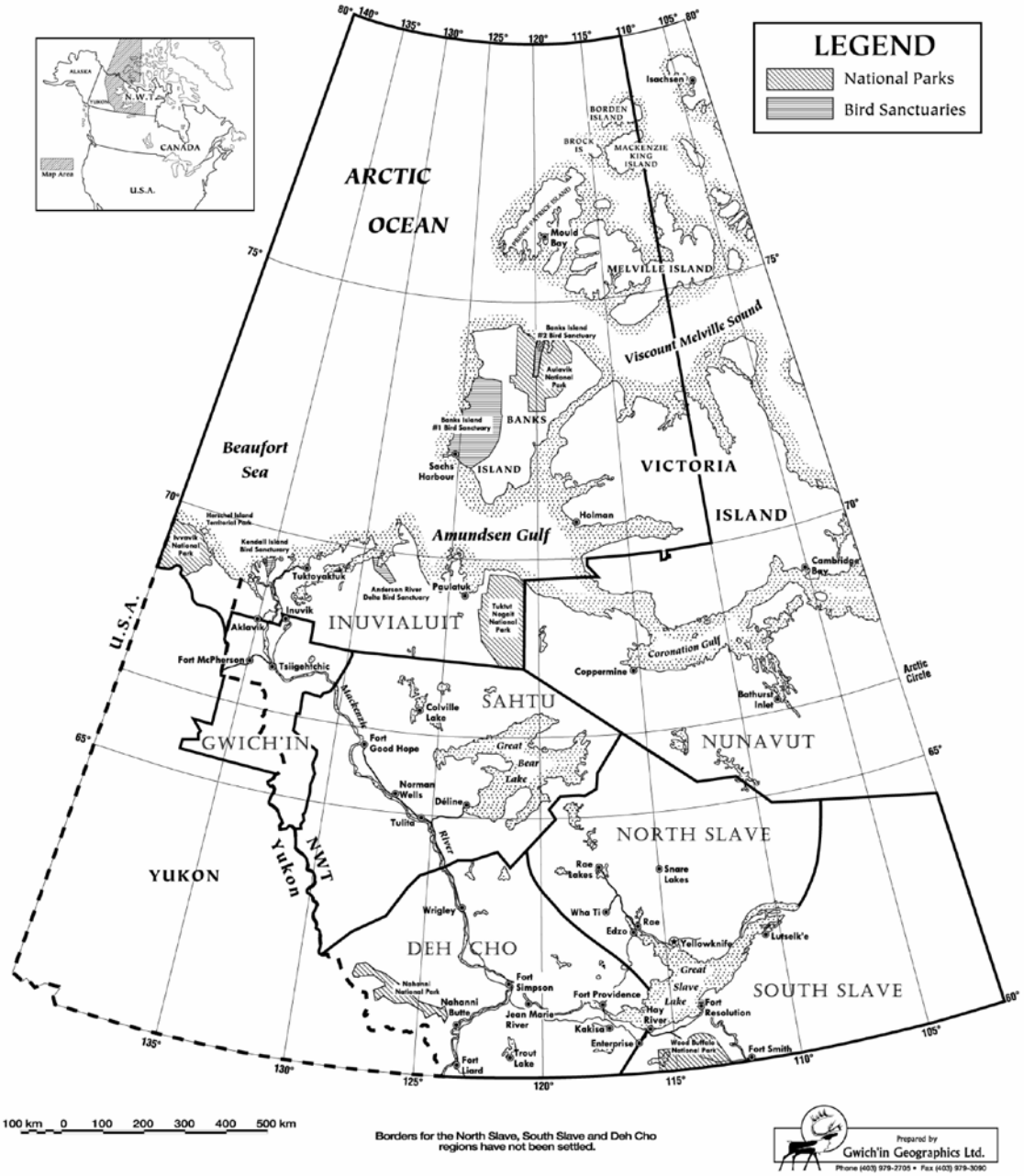

Figure 1: Land Claim Regions in the Northwest Territories

Aurora Research Institute
Science Licences

BIOLOGY

001 **Biology**

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File No: 12 402 662 **Licence No:** 13506
Region: NS **Location:** Ekati Diamond Mine

Monitoring Program for the Misery Site Surplus Water Atomization Project

The Mackenzie Valley Land and Water Board authorized the discharge of a small amount of water through an experimental water treatment system. This system sprays water into the air and onto the tundra. The monitoring of the atomization project is a requirement of the Water Licence. Specifically, the monitoring program was designed to evaluate the extent and significance of the following anticipated impacts: 1) less ammonia reaching downstream Cujo Lake; 2) accumulation of major ions (sodium, calcium, magnesium) in the main dropout zone of 60 m radius of each tower; 3) nitrates moving down gradient, and being taken up by plants and/or removed through bacterial denitrification; 4) deepening of the active layer of the tundra; and 5) an increase in vegetation biomass. It is anticipated that the water that is discharged onto the land is 'treated' by vegetation and soil bacteria. This monitoring program determines if there are any significant environmental effects from the atomization and land treatment, to determine whether this system provides a treatment option for the water. The monitoring program examined water quality, soil chemistry and soil ecosystem changes, effects on vegetation, permafrost, and small mammals in the vicinity of where the water is sprayed on the land. Results of the monitoring program are used to determine an appropriate adaptive management response.

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Region: NS **Location:** Ekati Diamond Mine (Panda Diversion Channel and inflowing tributaries of Grizzly Creek and Buster Creek)

2003 Panda Diversion Channel Monitoring Program

This project was developed to meet the requirements of the Fish Habitat Compensation Agreement between BHP Billiton Diamonds Inc. and the Department of Fisheries and Oceans. The purpose of the project was to monitor the effectiveness of created fish habitat within the Panda Diversion Channel. Assessments included an examination of fish and invertebrate utilization of the habitat structures, and the stability and function of the structures. Fish were collected and live released using two-way box traps, seining, and electrofishing techniques. Invertebrates and periphyton samples were taken using artificial substrate samplers. Data collection also included flow monitoring.

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Region: DC **Location:** North of Fort Liard

Environmental Studies for Anadarko Canada Energy Ltd.'s Proposed Liard Gas Gathering System

As part of an environmental assessment, Golder Associates conducted field surveys on a proposed 75km long gas gathering system corridor. Studies were conducted in late June through December, 2003. The study area was a 5km long corridor centered on a preferred route alignment, plus two alternate routes, north of Fort Liard, NWT. Aquatic and hydrology surveys focused on proposed water crossings and included habitat mapping, fish sampling, water quality and flow measurements, and channel characteristics. Wildlife studies included summer breeding bird and wildlife pellet/browse surveys, as well as winter track counts and a brief aerial survey to document winter wildlife. Soil pits were used to examine terrain, soil classes and permafrost presence. Main vegetation communities were identified, and rare plant surveys were conducted. Heritage resources were evaluated by examining existing surface and subsurface exposures (e.g., riverbanks), and shovel tests were conducted in areas of moderate to high archeological potential. Traditional land use sites were also documented.

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File No: 12 402 691 **Licence No:** 13497
Region: NS **Location:** Pelzer Pond, Ekati Diamond Mine

Pelzer Pond Fish Study

Pelzer Pond supports lake chub, a large member of the minnow family, and slimy sculpin. This study was designed to survey the fish community and assess the type of fish habitat in the pond. 55 lake chub were captured and measured for weight and length, marked with a clip on the left pelvic fin, and released. Juvenile slimy sculpin were observed in the shallows of the pond but were not captured. Habitat characteristics of Pelzer Pond are similar to those of other lakes within the EKATI claim block. The pond contains two central basins that are covered with sand, and pockets of sand and silt. They are surrounded by extensive shallows that are covered by boulders and isolated pockets of sand and silt. Pelzer Pond provides the required habitat for lake chubb and slimy sculpin because of its shallow depth, boulder and sand substrate, and the fringe of emergent and submergent vegetation.

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File No: 12 402 696 **Licence No:** 13518
Region: NS **Location:** Great Slave Lake, in the vicinity of effluent discharge points from Miramar's Giant Mine and Con Mine sites

Environmental Effects Monitoring for Miramar Con and Giant Mines

The objective of this study was to characterize environmental conditions and supplement existing environmental information for use in long-term Environmental Effects Monitoring (EEM) programs for the Giant and Con mines as required under recently developed federal regulations. Sampling was conducted by Golder Associates Ltd. in and around Yellowknife Bay of Great Slave Lake in August and September 2003. Two sites were sampled in areas exposed to treated mine effluent: Jackfish Bay and the mouth of Baker Creek. In addition, three sites were sampled at reference areas not exposed to mine effluent: a bay at Horseshoe Island, Burwash Point, and a bay near Kam Point. The field survey involved the sampling of fish and characterization of fish habitat at each site. Fish were sampled using a variety of gear. Field water quality was measured and sediment samples were collected for levels of total metals. Data collected for field survey were used to develop EEM study designs for Giant and Con mines. Site characterization and study design reports were prepared for both mines and submitted to Environment Canada, as required under the Metal Mining Effluent Regulations (MMER).

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Region: NS **Location:** near Daring Lake

Phenological, Growth and Reproductive Responses to Climatic Variability and Experimental Warming in Eight Arctic Plant Species

Phenology, growth and reproductive measures were taken on eight low arctic plant species; wild pea, cranberry, Labrador tea, birch, willow, prickly saxifrage, cotton grass and water sedge, over a period of six years (1997-2002) at the Tundra Ecosystem Research Station at Daring Lake. These data were related to climatic conditions and measures of the previous season's allocation. A subset of three of the species, (Labrador tea, cranberry and cotton grass) was experimentally warmed using open-topped chambers for two years (2001-2002). Phenological, growth and reproductive responses were compared to unwarmed plots. Under warmer temperatures, spring phenology was advanced such that the time from snowmelt to flowering contracted approximately five days for all species. However, timing of the end of the flowering phase remained unchanged. Growth of the two evergreen shrubs increased with warming while that of the sedge was decreased. Reproductive effort and success were essentially unchanged except for cranberry where number of flowers was reduced in the first year of warming. In general, the phenological results of the experimental manipulation confirmed those of the observational data; prefloration interval was shortened with increased temperature. The experimental and observational methods of study proved to be complementary approaches to understanding the complex responses of plants to a changing climate.

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File No: 12 402 695 **Licence No:** 13517
Region: IN **Location:** Shingle Point, Pokiak Channel, and Tuktoyaktuk Harbour

Tariuq Community-based Monitoring Program

The objective of this study was to conduct index gillnetting during the open water season in order to understand species abundance and health of fish from selected locations in the Mackenzie estuary. This study is part of the Tariuq program, which was initiated in 2000 in the communities of Tuktoyaktuk and Aklavik as a means of allowing community members to discuss concerns related to the health of the ocean and to develop their own community-based monitoring program. Species collected include Broad Whitefish, Lake Whitefish, Inconnu, Pike, Least Cisco, Arctic Cisco, Burbot, Pacific Herring, Dolly Varden, and Four Horned Sculpins. At Boogie channel, one gill net (1.5-5.5" mesh, 50 m long) was set each day. Live fish were counted and their length and weight measured, while dead fish were sampled for tissue analysis and aging structures. At Shingle Point, samples were collected for contaminant analysis. At Tuktoyaktuk, bottom-dwelling fish species were collected using either gill nets or trap nets. Bottom sediment samples were collected using a simple coring device at 4 locations ranging from near to far distances from potential sources of contaminants. Cores were frozen and shipped to Winnipeg for chemical analysis. Water temperature recorders were set out at each monitoring site to measure water temperature from June to September.

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File No: 12 402 698 **Licence No:** 13524
Region: DC **Location:** Canadian Natural Resources Ltd. well near Fort Liard

Forest Health at a Gas Well Site near Fort Liard

Golder Associates Ltd. conducted a field assessment of the effects of sulphur dioxide on the vegetation around the P-66-B gas dehydration facility. The objective of the study was to determine if any adverse effects to vegetation had occurred due to exposures to sulphur dioxide emitted from the P-66-B facility. In order to achieve this objective, the field team isolated sulphur dioxide related injury from climatic, soils, drought, and other naturally occurring forest health issues. This was accomplished by observing symptom diagnosis in combination with biochemical analysis of rose, alder, conifer, and lichen samples collected at exposed locations around the P-66-B facility. Ten permanent stations were established so that changes in the vegetation condition can be tracked over time. Results indicated that it was not feasible to distinguish the impacts of exposure to sulphur dioxide from natural climate-related effects. Sulphur absorption had occurred in tissues, but there was no definitive evidence of injury to plants from sulphur dioxide. A decline in the health of balsam poplar was evident near the P-66-B facility, but this decline is climate and age-related only and was determined to be unrelated to the facility itself. A final report was submitted to Canadian Natural Resources Ltd.

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File No: 12 404 598 **Licence No:** 13397
Region: IN **Location:** Inuvik region

Devon Canada Corporation – Environmental Studies of the Ice Environment for the Proposed Beaufort Sea Offshore Drilling Program

The purpose of this project was to document sea ice conditions at and in the vicinity of Devon's Beaufort Sea drilling prospects, and landfast ice movements at three drilling sites in Devon's Exploration Lease (EL 420) over the early winter to spring break-up in 2003. Information was gathered and used to continue and refine the planning of Devon's upcoming drilling operations in EL420. Information gathered on current ice conditions and movement data was compared with historical information obtained in the 1970s and early 1980s to assist in dealing with the potential effects of global climate change. A team consisting of two ice specialists, one locally hired wildlife monitor and one locally hired field technician was flown by helicopter from Inuvik to perform on-ice field work at Devon's offshore drilling locations. The on-ice work included the deployment of GPS-Argos buoys on the landfast ice cover to provide detailed ice movement data via satellite link until breakup. The buoys were placed in holes in the ice. In order to improve the accuracy of measurements, a local resident was trained to run a GPS computer base station located in Tuktoyaktuk from mid February to breakup. The buoys had floats on them to make recovery possible. Ice conditions were documented at Devon's 10 potential drilling sites, through the use of visual observations, photographs, and drilling for ice thickness.

010 **Biology**

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File No: 12 402 674 **Licence No:** 13526
Region: DC **Location:** within the Cameron Hills Project area

Post Construction Revegetation and Permafrost Monitoring Within Paramount's Cameron Hills Project Area

This is the second annual monitoring report of revegetation and permafrost along the Transborder Pipeline and the Cameron Hills Gathering System as required by the NEB and the MVLWB. The data from the monitoring plots for four reseeded slopes and the three unseeded slopes indicate a general trend of increased vegetation cover along the right-of-way (ROW) compared to the 2002 data. Recovery tends to be directly related to quantity of slash rolled back on the ROW. Revegetation success also appears dependent on the degree of disturbance associated with the removal of the original vegetation root layer. Slowest revegetation is occurring in the trench area, which tends to be the most disturbed area where less productive subsoil has been brought to the surface. No significant areas of permafrost degradation related to pipeline construction and operation were evident. Trench subsidence does not appear to have changed significantly since 2002 and appears spatially sporadic with obvious cause. In general, ponding along the ROW has occurred predominantly in conjunction with natural landscape depressional areas where drainage is limited.

011 **Biology**

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File No: 12 402 674 **Licence No:** 13448
Region: DC **Location:** along the Liard Pipeline south of Fort Liard

Post Construction Water Quality Monitoring and Revegetation and Soil Monitoring for the Liard Pipeline and Gathering Project

This is the fourth annual monitoring report of revegetation and soil along the 24 km raw gas-gathering pipeline and central battery at F-36 as requested by the NEB. Results indicate that natural encroachment of native vegetation along the pipeline right-of-way is occurring with the number of species and the mean percent cover higher than recorded last year. Bare areas are more obvious because of increased revegetation growth. The erosion channel between Creeks 8 and 9 continues to be monitored, as well as a large erosion channel crossing the pipeline right-of-way. One area of water channeling on the pipeline trench showed evidence of soil movement. Drainage and erosion channels have been upgraded at the F-36 Battery site. The results from the fourth year of monitoring water quality in the Shiha pipeline study area confirm that no pipeline related impacts are apparent. The majority of the measured parameters showed no deterioration between survey periods and the measured parameters were well within acceptable guidelines. On-going surveillance of stream crossings noted soil eroding around the bridges at Creeks 1 and 6; erosion channels remain on the slopes of the winter access road leading to Creek 6; and silt fences require regular maintenance at Creek 6.

012 **Biology**

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File No: 12 402 635 **Licence No:** 13446
Region: IN **Location:** Banks Island and Prince Patrick Island

Canadian Arctic Plants: Systematics, Evolution and Floristics

This research project studied variation among arctic plants (bluegrasses, alkali grasses, arctic poppies, arctic mustards) to better define species so that arctic plants may be more easily identified, and to better understand the origin and evolutionary relationships of arctic plants. The research team made short visits to many sites in order to observe how plants vary in their morphology and genetics from site to site across the arctic. The team visited sites on southern Banks Island (vicinity of De Salis Bay, Masik River and Egg River) and Mould Bay on Prince Patrick Island. At each site the researchers made observations on the morphology, ecology, reproductive biology, and distribution of each species under study. Collections were made of 1-5 plants of each species. Part of each plant was pressed, dried, and deposited as a voucher research specimen in the Canadian Museum of Nature. Another part of each plant was preserved in silica gel for DNA analysis. Plants were photographed in their natural habitat.

013 **Biology**

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File No: 12 402 635 **Licence No:** 13519
Region: NS **Location:** Fortune Minerals NICO property

Environmental Scoping of the Fortune Minerals NICO Project

Fortune Minerals is considering an expanded exploration program on the NICO property. This program required an environmental baseline survey to augment existing information on species and habitat in the area to optimize current environmental impact mitigation and to support future permit applications. The scope of environmental studies included wildlife and wildlife habitat, fish and fish habitat, aquatic biota (plankton and benthos), water and sediment quality (surface and ground), vegetation, and archaeology. The wildlife and wildlife habitat survey was conducted by foot and focused on sensitive species and habitats. Wildlife, signs of wildlife, and habitat features such as nests and dens were identified and coordinates of all observations were recorded. The objective of the aquatics survey was to assess the sensitivity of Grid Lake and adjacent unnamed lakes to proposed exploration activities. This involved capturing fish with gill nets and minnow traps. Captured fish were measured for length and weight and examined externally for sex and health condition. The vegetation survey was conducted by foot. The focus was on identifying and documenting observations of rare plants. Several visits by field staff and assistants were made during the summer of 2003.

014 **Biology**

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File No: 12 402 702 **Licence No:** 13549
Region: IN **Location:** Airport Lake

Testing Fish Deterrents for Use Under-Ice in the Mackenzie Delta

The goal of this study was to determine the effectiveness of several portable, temporary deterrents as a means of excluding fish from area of blast activities associated with seismic exploration in Mackenzie Delta lakes. In October 2003, trials were conducted at Airport Lake using lake whitefish, broad whitefish, inconnu (coney), lake trout, and northern pike. Groups of fish were equipped with orally inserted acoustic tags and placed in a 10x10x10 experimental net pen. Each fish was monitored using a fish tracking system that produced a detailed swimming pattern, revealing any behavioral responses. A multi-frequency sound projector and a strobe light were tested as deterrents. Further consideration of the strobe light as a deterrent in northern lakes is not recommended on account of low light spread observed in the lake water. The study did not identify the overall satisfactory deterrent. However, sufficient indications of response were observed in the acoustic trials to recommend future testing of a louder sound projector.

015 **Biology**

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File No: 12 402 690 **Licence No:** 13496
Region: DC **Location:** area approximately 40 km northeast of Fort Providence, off highway #13

Community Fire Project

The objective of the community fire project is to use experimental prescribed burns to evaluate the effectiveness of forest fuel treatments and sprinkler systems in protecting homes and communities from wildfires. Under a collaborative agreement between the Fort Providence Resource Management Board and the Forest Management Division, three students were hired to assist researchers make forest fuel measurements at the project site. The students and RWED staff conducted a forest fuel inventory and hazard assessment in the forest area surrounding Fort Providence. No prescribed experimental burns were conducted because of weather conditions. Researchers laid out experimental plots, established three model houses to test sprinkler systems, and collected data on tree crown fuel loading (needles, twigs, dead woody material). This information is useful for assessing crown fire development. The Deh Gah School used the project site for one week to conduct science projects.

016 **Biology**

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File No: 12 402 674 **Licence No:** 13513
Region: NS **Location:** Snap Lake

Artificial Reef Monitoring Program at Snap Lake

In 2001, De Beers Canada Mining Inc. constructed an artificial reef in Snap Lake as compensation for the loss of an inland lake (Lake IL1) and its outlet stream (Stream S30). In 2003, Golder Associates Ltd. and De Beers Canada Mining Inc. documented physical conditions, bathymetry, water temperature, sedimentation rate, and the presence of small fish, and assessed spawning use by lake trout at the artificial reef and a nearby natural reef. It has been demonstrated that the artificial reef has established itself as an integral part of the physical habitat. Lake trout eggs were observed in the interstices of the artificial reef indicating that lake trout found and utilized the artificial structure for spawning. As well, it was demonstrated that the "cleared areas" on the artificial reef contain lake trout eggs. A total of 13 lake trout eggs were clearly observed during the excavation process of these clearered areas and examination revealed that eggs were deposited on more than one occasion in 2003. The new reef and the availability of spaces increased the diversity in fish habitat in Snap Lake. The reef was colonized by algae. A biofilm developed and a community of small fish (slimy sculpin, lake chub, juvenile burbot and longnose sucker) was present. The sedimentation rate was lower at the artificial reef than at a natural reef, likely as a result of greater wind and wave action at the former location. The types of fish observed on the artificial reef were similar to those observed in the natural reefs. The configuration and features of the artificial reef are within the range of characteristics identified as preferred spawning habitat for lake trout.

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File No: 12 402 635 **Licence No:** 13489
Region: SS **Location:** Gahcho Kué (Kennady Lake)

Gahcho Kué (Kennady Lake) Baseline Limnology Program (2003)

The 2003 Baseline Limnology Program was conducted at the three main basins of Gahcho Kué (Kennady Lake) and ten smaller adjacent waterbodies. Kennady Lake and some surrounding water bodies may be subject to impacts should a mine be built on the property. Gahcho Kué waters were generally well mixed. Concentrations of nutrients, major ions, and physical parameters are similar among studied basins. None of the 17 trace metals detected exceed Canadian Council of Ministers of the Environment (CCME) criteria for the protection of aquatic life. Composition and relative densities of zooplankton are comparable to 2001 and 2002 findings. All of the smaller lakes and basin water wetlands surrounding Gahcho Kué were less than 3.8 m deep and fully mixed. Nutrient and major ion concentrations were low at time of sampling. Of the 25 trace metals detected, two, aluminum and iron, exceed CCME criteria for freshwater aquatic life. Fish were not captured in any of the smaller water bodies sampled. Based on water chemistry and the results of the fish sampling, all but Lake 21 are not fish-bearing. Although fish were not captured in Lake 21 in the sampling program, Arctic grayling and northern pike have been recorded in the lake by previous studies (pers. comm Ward Prystay, 2003).

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Region: IN **Location:** Netla and Trout Lakes

Netla and Trout Lakes Geo-Microbial Project

The objective of this surface geochemical survey was to establish the presence, distribution, and to high grade specific exploration leads and prospects based on their probable hydrocarbon charge. The method used for the recognition of light hydrocarbon microseepage is the Microbial Oil Survey Technique (MOST) and supplemented with Sorbed Soil Gas (SSG) analysis. These methods were selected because of the researcher's extensive survey experience in similar environments which document that they are a reliable method for microseepage detection. The research team hypothesized that hydrocarbon microseepage surveys offer a flexible low-risk and low-cost technology that naturally compliments geologic, seismic, aeromagnetic, and remote sensing methods. Properly integrated with geological and geophysical data, their use will contribute to the successful high-grading of exploration leases, leads and prospects, and can also aid in field development. This was confirmed with the Netla survey, with numerous well defined areas of active seepage being identified. Unfortunately, the Trout Lake portion of the program was never completed. It is expected however, based on the effectiveness of the Microbial Oil Survey Technique in the Netla area, that this method would be equally as effective at Trout Lake and/or throughout the Territory.

019 **Biology**

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File No: 12 402 693 **Licence No:** 13 511
Region: NS **Location:** Lookout Pond, Ekati Diamond MIne

Lookout Pond Fish Study

This study was conducted by BHP Billiton Diamonds Inc. at the Ekati Diamond Mine to determine the presence or absence of fish. Researchers walked the shores of Lookout Pond looking for signs of fish and fish fry. No signs were observed. The lake was monitored during calm periods over 3 days to watch for any signs of fish surfacing. No signs of fish were observed. Buster Lake, a nearby lake, which is known to have fish was also observed and showed signs of fish surfacing. Researchers proceeded to set gillnets in the lake. On the first day, a single 1" mesh size gillnet was set and checked for fish capture every hour. The net was removed at the end of the day. On the second day, a 1" and a 2" mesh size gillnet were set and checked for fish every hour. The nets were removed at the end of the day. The same procedure was followed for the third and fourth days of fishing. During this time, no fish were caught in the nets. A consultant from Rescan Environmental Services Ltd. conducted electro fishing around the edges of the lake and no fish were observed.

020 **Biology**

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Region: DC **Location:** O-35 wellsite southeast of Fort Liard

Modified Phase II Environmental Site Assessment 0-35 Wellsite

On July 15, 2003 a site reconnaissance was conducted and no apparent staining was observed in the vicinity of the wellhead, facilities, tank farm or flare stack. Ponding of water with no visible sheen occurred in one trench and subsidence occurred along several areas near tanks or pipelines. Soil samples were taken from eight different areas and the analyzed results were found to meet Canadian Council of the Ministers of the Environment (CCME) criteria. Further maintenance work will be needed to remove scrap materials and fill in the areas of subsidence.

021 **Biology**

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Region: DC **Location:** N-01 wellsite southeast of Fort Liard

Modified Phase II Environmental Site Assessment N-01 Wellsite

On July 14 & 15, 2003, a site reconnaissance of the N-01 Wellsite was conducted and a water sample was collected from a subsided area near the former sump that exhibited an oil sheen. Potential hydrocarbon contaminated soil was field screened and appropriate soil samples taken for follow-up analysis. Analysis of the surface water taken from the former sump area was characterized to be below Canadian Council of the Ministers of the Environment (CCME) guidelines for benzene, toluene, ethylbenzene, and xzylene (BTEX). The soil sample from the one probehole with the highest vapor concentration was also characterized to be less than CCME guidelines with the exception of arsenic, conductivity and pH. In the area surrounding the vent stacks, the analysis of the oil sample from the one probehole with the highest vapour concentration showed it to have exceeded CCME guidelines for BTEX, cadmium and selenium. As no visible sheen was noted, nor sidewall staining in the two artificial trenches, no samples were obtained.

022 **Biology**

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Region: DC **Location:** F-36 wellsite south of Fort Liard

Modified Phase II-III Environmental Site Assessment F-36 Wellsite

In March 2003, the hydrocarbon impacted soil from the area around the flare was excavated and placed in a lined and bermed biopile for further treatment. Field screening and soil samples were taken to delineate the extent of the contamination of the excavation and the biopile. Follow-up soil samples were taken in July 2003 from the soil remaining in the open shallow excavation, and the lined and bermed biopile. A comparison of analytical results from the March and July sampling periods indicated that the hydrocarbon concentrations in the walls of the excavation have decreased. The average hydrocarbon concentration in the biopile also decreased during the sampling periods but did not meet Canadian Council of the Ministers of the Environment (CCME) guidelines for benzene, toluene, ethylbenzene, and xzylene (BTEX). Further work will be required to remediate the biopile hydrocarbon concentrations to meet the CCME guidelines.

023 **Biology**

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Region: DC **Location:** Pointed Mountain Plant site, northwest of Fort Liard

Decommissioning of the Pointed Mountain Field, Phase II Assessment

In June through October 2003, field crews completed soil and water sampling at the seven well sites, airstrip, Fisherman Lake, and gas plant. This sampling was conducted to supplement the 2002 assessment and assess the sites for potential contamination and/or delineate known impact. The assessment will continue in the 2004 field season when additional soil, groundwater, and surface water will be sampled.

024 **Biology**

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Region: NS **Location:** Matthews Lake Area

2003 Baseline Assessments in the Matthews Lake Area

A baseline fisheries assessment in the Matthews Lake area was used to document existing fishery resources and habitat conditions. The data were used for the Mathews Lake and Area Fish and Habitat Restoration Program (MLAFHRP) to identify restoration and enhancement opportunities for aquatic habitats impacted by historical mining operations (Salmita and Tundra Mill Mines). Inventories were conducted at seven streams, six lakes, and three artificial ponds. Fish collected by backpack electrofishing in streams included: arctic grayling, round whitefish, burbot, northern pike, longnose sucker, slimy sculpin and lake chub. Fish collected from lakes using gillnets included: lake trout, arctic grayling, round whitefish and longnose suckers. Habitat surveys revealed historical mining operations had impacted aquatic habitats at sites where infilling of lake shorelines occurred; historical winter roads and berms encroached; and debris and construction materials remained. Several enhancement opportunities were also identified (e.g. providing fish access into fishless lakes and artificial ponds). The baseline report was used at a community workshop to solicit input on restoration and enhancement opportunities from regulators and community stakeholders.

025 **Biology**

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File No: 12 402 631 **Licence No:** 13444
Region: NS **Location:** Baker Creek and outflow to Back Bay, Yellowknife

2003 Baker Creek Environmental Monitoring Program

As part of the 2003 Baker Creek Environmental Monitoring Program, Dillon Consulting Limited conducted fish habitat assessments at Baker Creek, Yellowknife. Benthic invertebrates were sampled at each of 8 sampling sites using multi-plate artificial substrate samplers. Five replicate plates were installed in each location in early June and removed in late July 2003. Upon removal, the plates were sent for metals analyses and species identification. Additional benthos samples (kick samples and/or using an Eckman dredge) were collected in early June, July and August. Water and 3 sediment samples were collected monthly from each site and analysed for metals and sediment composition. Collection of monthly data allowed for a better understanding of temporal and spatial effects of mine activities on the benthic community and sediment/water quality. Fish were sampled at each site in early June 2003 using a back-pack electro-fisher or gillnet. Captured fish were identified to species, measured, weighed and sampled for various aging structures. A maximum of 10 northern pike per site were euthanized for tissue metal analysis and their biological characteristics (sex, maturity, reproductive status, stomach contents) were recorded. In addition, a shoreline vegetation assessment was carried out at each sampling location to identify the most dominant aquatic species found throughout the Baker Creek watershed. A single species found at each location was collected for tissue metal analysis.

026 **Biology**

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Region: SA **Location:** within the Tulita district, between Little Bear River and the east side of Tate and Stewart Lakes

Environmental Survey for EnCana ECA *et al* Begadeh Exploratory Wellsite Project

This survey was required to obtain specific environmental information to be used in support of land use permit and water licence applications for EnCana's proposed winter drilling program within the Tulita District of the Sahtu Settlement Area. Emphasis was on ensuring that finalized project components (winter access, well drilling, camps, water use, etc.) have minimal impact on the environment. A review of existing literature and other available information, including documented sources of traditional knowledge, was first conducted to identify gaps. This helped to focus field studies. The survey included both aerial reconnaissance flights (travel by helicopter) and ground work (travel by foot and/or boat). Field studies examined vegetation, fish habitat and lake bathymetry. Incidental observations of wildlife or their sign (e.g., dens, nests, tracks) were also recorded.

027 **Biology**

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File No: 12 402 692 **Licence No:** 13500
Region: DC **Location:** in the vicinity of the proposed bridge site in Fort Providence

Fish Habitat Assessment of the Mackenzie River Related to the Deh Cho Bridge

The Deh Cho Bridge Corporation (DCBC) of Fort Providence is proposing to construct a bridge across the Mackenzie River on the Yellowknife Highway #3. The bridge would replace the existing ferry operation, which commenced in the early 1960's, and the winter ice crossing. Golder Associates was retained by Jivko Engineering (Yellowknife), on behalf of DCBC and Andrew Gamble Associates Ltd. to undertake a fisheries assessment of the Mackenzie River in the vicinity of the crossing. The principle objectives were to determine the short term (construction related) and long term (operational) impacts of the proposed bridge on fish and habitat resources. The overall significance of these impacts was evaluated after considering any benefits that might arise from discontinuing the current ferry and ice crossing. The construction of the proposed bridge would result in the short-term disturbance and alteration of main channel and near shore habitats, primarily due to increased suspended sediment levels. However, with effective scheduling and migration, construction should not result in significant adverse effects over the long term.

028 **Biology**

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Region: SS **Location:** Wood Buffalo National Park and along Sandy Lake Road outside the northern park boundary

Carbon Dynamics in Chronosequence of Boreal Forest Ecosystems: A Production Ecological Approach

Possibility of the climate warming demands detailed analysis of carbon budget in boreal forest ecosystems as these may be the earth's major carbon sinks. This is a possible place where the CO2 gas is removed from the atmosphere and absorbed by plants. This research has been examining the carbon dynamics of jack pine forests in Wood Buffalo National Park since late spring of 2002. The data so far suggests that these forests may be losing carbon to the atmosphere, instead of accumulating, as being discussed by scientist; the results so far are opposite to what was expected. This means that what is happening in jack pine forests must be looked at in further detail, because there is the possibility that these forests are accelerating global warming instead of slowing it down. One aspect of forest carbon budget has not been examined in detail yet; the movement of carbon through the growth and death of fine roots in the soil. This amount can be substantial, and may change the way arguments have been made so far.

029 **Biology**

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File No: 12 402 670 **Licence No:** 13462
Region: DC **Location:** the proposed (and alternate) pipeline corridors, and potential infrastructure sites, access roads and borrow pits within the Deh Cho Region

2003 Spring, Summer and Fall Aquatic Studies in the Deh Cho Region

This study included fisheries, hydrology, water quality and hydrogeology investigations. Detailed aquatic surveys were conducted on 27 streams and large river crossings, eight lakes, and five barge landings. Sixteen fish species were identified. Detailed stream crossing assessments were completed on 27 sites. Potential overwintering areas were identified at eight sites. Fish catches in the streams were dominated by arctic grayling, northern pike, brook stickleback and lake chub. At the five proposed barge landing sites, northern pike were caught most frequently. Eight lakes were assessed during the summer survey: six potential water supply lakes and four lakes in close proximity to the proposed pipeline alignment. The potential water supply lakes ranged from 1.2 to 7.2 m in maximum depth. Fish captured in three of the six lakes included whitefish, longnose sucker, finescale dace, lake chub and brook stickleback. The two unnamed lakes close to the pipeline ranged from 2.4 to 6.4 m in maximum depth. Brook stickleback and lake chub were captured only in the shallower lake. The following sites were examined on the ground: two sites between Harris River and Manners Creek, five sites on route segments south of Manners Creek, and three sites on route segments between Harris River and White Sand Creek.

030 **Biology**

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File No: 12 402 670 **Licence No:** 13439
Region: IN **Location:** the proposed pipeline corridor, and potential infrastructure sites, access roads and borrow pits within the Gwich'in Settlement Area

2003 Spring, Summer and Fall Aquatic Studies in the Gwich'in Settlement Area

Detailed aquatic surveys were conducted on three streams and three lakes. Fish species identified included arctic grayling, northern pike, and broad whitefish. The aquatic habitat at stream crossing sites ranged from deep flat habitats with minimal velocity to shallow run/flat habitats that would likely freeze to the bottom during winter months. Northern pike were caught at three sites and arctic grayling at one site. The maximum depths of lakes I-03 and I-04 (Campbell Lake) were 5.2 and 15.8 m, respectively. Fish catches were dominated by northern pike in both lakes. The third unnamed lake surveyed was less than 1 m deep with silt substrate and abundant vegetation. No fish were caught in this lake, likely due to the low over-wintering potential. For the hydrogeological surveys, the 1 km width of the proposed refined pipeline route within the Gwich'in Settlement Area (GSA) between the Inuvik Area Facility and the KP 250 was surveyed by helicopter. Three sites were examined on the ground, including a striped fen (sampled); a small pool beside a stream; and a distinctive area or fen. The striped fen may indicate shallow groundwater movement.

031 **Biology**

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File No: 12 402 670 **Licence No:** 13438
Region: IN **Location:** the proposed pipeline corridor and locations for potential infrastructure sites, access roads and borrow pits within the Inuvialuit Settlement Region

2003 Spring, Summer, and Fall Aquatic Studies in the Inuvialuit Settlement Region

Spring hydrology surveys consisted of the following: aerial break-up and flood surveys and water level monitoring at Taglu, water level monitoring at the Beaufort coast and channel discharge and water levels surveys. The surveys were conducted in and around the Niglintgak and Taglu lease areas. During the aerial surveys, the progression of spring break-up was documented. Prior to high water conditions associated with the spring flood, a temporary water level monitoring station was installed on Kuluarpak Channel at Taglu. A temporary water level recorder was also installed at the Beaufort coast in order to capture the magnitude of seasonal and tidal water level variations, as well as to record any storm surge events over the summer period. The discharge measurement and water level survey was conducted at proposed pipeline watercourse crossing locations in the area of Niglintgak and Taglu. For the hydrogeological surveys, the gas field areas and the 1 km width of the proposed gathering system corridor were surveyed by helicopter. Six sites were examined on the ground. Two sites were sampled: a ponded water site below a small mudflow, and a lake reported to remain open in winter. For the summer survey, assessments were conducted at 14 proposed stream or large channel crossings, five proposed barge landing sites, and 14 lakes. Fish caught during the summer included 16 species. A late summer/fall driftwood level survey was conducted at Taglu.

032 **Biology**

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File No: 12 402 670 **Licence No:** 13440
Region: SA **Location:** the proposed (and alternate) pipeline corridors, and potential infrastructure sites, access roads and borrow pits within the Sahtu Settlement Area

2003 Spring, Summer and Fall Aquatic Studies in the Sahtu Settlement Area

This study included fisheries, hydrology, water quality and hydrogeology investigations. Detailed aquatic surveys were conducted on 28 stream and large river crossings, nine lakes, and six barge landings and included a variety of fish and fish habitat information and water and sediment quality information. Detailed stream crossing assessments were completed on 28 sites. Arctic grayling and slimy sculpin dominated the fish catches at most sites. Six potential landing sites were assessed during the summer survey. Three of the identified sites are currently active barge landings. The Norman Wells barge landing area was the only site at which the shoreline has been altered. Fish (mainly northern pike, inconnu and lake chub) were captured at five sites. No fish were caught at the Tulita West barge landing. Nine lakes were assessed during the summer survey: five potential water supply lakes and four lakes in close proximity to the proposed pipeline alignment. The potential water supply lakes ranged from 1.8 to 30.5 m in maximum depth. Northern pike and whitefish were the only species captured in these lakes. The four lakes close to the pipeline were all less than 1.5 m deep, had silt/organic substrate, and aquatic vegetation throughout. No fish were captured in these lakes, likely due to low over-wintering potential. A 1 km width of the proposed pipeline corridor within the SSA was surveyed by helicopter. Four sites between Tulita and the southern border of the Sahtu; two sites between Gibson Gap and Bear Rock; and one site at Gibson Gap were examined.

033 **Biology**

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File No: 12 402 670 **Licence No:** 13466
Region: DC **Location:** the study corridor within the Deh Cho Region, including locations for potential infrastructure sites, roads and borrow pits

2003 Terrestrial Studies in the Deh Cho Region

Terrestrial surveys were conducted in the Deh Cho Region (DCR) along the proposed Mackenzie Valley pipeline corridor and on selected infrastructure sites. Reconnaissance surveys conducted involved survey route refinements, quality control checks on vegetation and terrain mapping and select sampling sites for terrain unit, underrepresented vegetation types, and potential rare plant habitat. An ecological land classification ground truth survey was conducted. A total of 208 plots were completed during the survey including 163 visual checks, 29 ground plots and 16 detailed plots. Visual checks were conducted to confirm vegetation types assigned during aerial photo interpretation. During groundwork, plots were surveyed to quantify main tree, shrub and groundcover plant species according to percent cover and to characterize vegetation types. 65 sites were surveyed during a rare plant reconnaissance survey, which involved identifying and surveying a variety of small patch communities and uncommon terrain features to characterize areas with higher potential to support rare plants. A complete list of plant species was compiled at each site.

034 **Biology**

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Region: IN **Location:** the study corridor within the Gwich'in Settlement Area, including locations for potential infrastructure sites, roads and borrow pits

2003 Terrestrial Studies in the Gwich'in Settlement Area

Terrestrial surveys were conducted in the Gwich'in Settlement Area (GSA) along the proposed Mackenzie Valley pipeline gathering system and on selected infrastructure sites. Surveys included the collection of detailed vegetation, terrain and soils information. Reconnaissance surveys conducted involved survey route refinements, quality control checks on vegetation and terrain mapping and select sampling sites for terrain unit, underrepresented vegetation types, and potential rare plant habitat. An ecological land classification ground truth survey was conducted. A total of 163 plots were completed during the survey including 102 visual checks, 35 ground plots and 26 detailed plots. Visual checks were conducted, via helicopter, to confirm vegetation types assigned during aerial photo interpretation. During groundwork, plots were surveyed to quantify main tree, shrub and groundcover plant species according to percent cover and to characterize vegetation types. 30 sites were surveyed during a rare plant reconnaissance survey. The surveys involved identifying and surveying a variety of small patch communities and uncommon terrain features to characterize areas with higher potential to support rare plants. A complete list of plant species was compiled at each site. The vegetation community was also characterized at each site. Soil and terrain surveys collected information for underrepresented soil and terrain types and for re-routes outside of the previously mapped survey area.

035 **Biology**

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File No: 12 402 670 **Licence No:** 13463
Region: IN **Location:** the study corridor within the Inuvialuit Settlement Region

2003 Terrestrial Studies in the Inuvialuit Settlement Area

Terrestrial surveys were conducted in the Inuvialuit Settlement Region (ISR) along the proposed Mackenzie Valley pipeline gathering system and on selected infrastructure sites. Surveys included the collection of detailed vegetation, terrain and soils information. Reconnaissance surveys conducted involved survey route refinements, quality control checks on vegetation and terrain mapping and select sampling sites for terrain unit, underrepresented vegetation types, and potential rare plant habitat. An ecological land classification ground truth survey was conducted. A total of 203 plots were completed during the survey including 121 visual checks, 40 ground plots and 42 detailed plots. Visual checks were conducted to confirm vegetation types assigned during aerial photo interpretation. During groundwork, plots were surveyed to quantify main tree, shrub and groundcover plant species according to percent cover and to characterize vegetation types. 83 sites were surveyed during a rare plant reconnaissance survey. A complete list of plant species was compiled at each site. Soil and terrain surveys collected information for underrepresented soil and terrain types and for re-routes outside of the previously mapped survey area.

036 **Biology**

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File No: 12 402 670 **Licence No:** 13465
Region: SA **Location:** the study corridor within the Sahtu Settlement Area, including locations for potential infrastructure sites, roads and borrow pits

2003 Terrestrial Studies in the Sahtu Settlement Area

Terrestrial surveys were conducted in the Sahtu Settlement Area (SSA) along the proposed Mackenzie Valley pipeline corridor and on selected infrastructure sites. Surveys included the collection of detailed vegetation, terrain and soils information. Reconnaissance was conducted in the south SSA. This work involved survey route refinements, quality control checks on vegetation and terrain mapping, and select sampling sites for terrain unit, underrepresented vegetation types, and potential rare plant habitats. An ecological land classification (ELC) ground truth survey was conducted, during which data was gathered along the pipeline corridor re-route and at select infrastructure sites. A total of 310 plots were completed during the ELC survey including 256 visual checks, 37 ground plots and 17 detailed plots. Visual checks were conducted, via helicopter, to confirm vegetation types assigned during aerial photo interpretation. Additional information on dominant tree characteristics, snags and course woody debris were documented. A total of 38 sites were surveyed in the rare plant reconnaissance survey. These surveys involved identifying and surveying a variety of small patch communities and uncommon terrain features to characterize areas with higher potential to support rare plants. A complete list of plant species was compiled and the vegetation community was characterized at each site. The soils and terrain surveys collected information for underrepresented soil and terrain types, and for re-routes outside of the previously mapped survey area. Information collected and used to classify soils included soil horizon morphology and chemical characteristics. Terrain classification involved the identification of parent material, drainage, surface expression, slope and aspect.

037 **Biology**

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Region: IN **Location:** selected water courses along the proposed pipeline corridor within the Gwich'in Settlement Area

2003 Winter Aquatic Studies in the Gwich'in Settlement Area

This study included fisheries, hydrology, and water quality investigations. The purpose of the winter surveys was to assess watercourse freezing conditions and over wintering conditions of selected waterbodies (streams and lakes) along the proposed pipeline corridor and within the production area leases. Selection of sites was based on observations made during the spring, summer, and fall 2002 surveys. Information collected during this survey included the following: fish collections (setlines and under ice gill net sets); assessment of winter habitat use using remote videography; in situ water quality measurements (temperature, dissolved oxygen, conductivity and pH); discharge measurements: ice thickness and depth of water below the ice cover; and presence/absence of frazzle ice.

038 **Biology**

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File No: 12 402 670 **Licence No:** 13401
Region: IN **Location:** waterbodies within the Inuvialuit Settlement Region near Taglu, Parsons Lake and Niglintgak lease site

2003 Winter Aquatic Studies in the Inuvialuit Settlement Region

This study included fisheries, hydrology, and water quality investigations. The purpose of the winter surveys was to assess watercourse freezing conditions and over wintering conditions of selected waterbodies (streams and lakes) along the proposed pipeline corridor and within the production area leases. Selection of sites was based on observations made during the spring, summer, and fall 2002 surveys. Information collected during this survey included the following: fish collections (setlines and under ice gill net sets); assessment of winter habitat use using remote videography; in situ water quality measurements (temperature, dissolved oxygen, conductivity and pH); discharge measurements; ice thickness and depth of water below the ice cover; and presence/absence of frazzle ice.

039 **Biology**

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File No: 12 402 670 **Licence No:** 13415
Region: SA **Location:** selected streams and lakes along the proposed pipeline corridor in the Sahtu Settlement Area

2003 Winter Aquatic Studies in the Sahtu Settlement Area

This study included fisheries, hydrology, water quality and hydrogeology investigations. The purpose of the winter surveys were to assess watercourse freezing conditions and overwintering conditions of selected waterbodies (streams) along the proposed pipeline corridor. Selection of sites was based on observations made during spring, summer, and fall 2002 surveys. Information collected during the winter aquatic field survey included: fish capture data, assessment of overwintering using videography, water quality measurements, discharge measurements, snow, ice and water depths, ice thickness, presence/absence of frazzle ice, under-ice water velocities, and photographs of representative habitat conditions at each site. A reconnaissance level hydrogeology study was undertaken in conjunction with the winter fish and hydrology field program. Observations were made at each of the selected crossings and in areas of visible or reported springs or icings. Locations of icings or springs along the route were noted and investigated where possible.

040 **Biology**

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Region: NS, SS **Location:** along the proposed transmission corridor for the Taltson River hydro power supply to Snap Lake Diamond Mine

Taltson River Hydro Power Supply to Snap Lake Diamond Mine Environmental Baseline Studies

The purpose of this project was to continue the Water Effects Monitoring Program (WEMP), which was initiated in 2000. In 2003, hydrology monitoring stations were established in the watershed and river flows were measured. Historical information on weather was collected and studied for long-term trends. A detailed photographic survey of freeze-up was done from Taltson Bay to Nonacho Lake. Ice thickness was also measured. A total of 524 fish were captured from Nonacho, Taltson and Rutledge Lakes and from Taltson River. All fish were identified to species, counted, measured for length and weight, and examined for deformities and wounds. Lake whitefish and lake trout made up most of the catches. The incidence of deformities and wounds was highest in Taltson Lake. Some fish were killed and tissue samples were taken to measure the concentration of mercury and the number of parasites of the species *Triaenophorus crassus*. Average mercury concentrations in lake trout and lake whitefish were highest in Nonacho Lake. The number of parasites that were observed in a fillet ranged from 0 to 35 for lake whitefish and from 0 to 15 for lake trout. Water samples were collected from Taltson Watershed for measurement of temperature, transparency, electrical conductivity, and concentrations of oxygen and total dissolved solids. Mercury concentrations of samples of sediment and aquatic plants collected fell well below the federal guideline for the protection of aquatic life. Aerial surveys were used to measure the number and location of beaver lodges in the area. A total of 43 active lodges and 40 abandoned lodges were counted.

041 **Biology**

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Region: DC **Location:** 15 plots throughout the Deh Cho region

Establishment of Permanent Monitoring Plots for Growth and Yield National Forest Inventory and Cumulative Impact Monitoring

In 2003 a total of thirty eight Permanent Monitoring Plots (PMPs) were established in the Sahtu, Deh Cho and South Slave Regions. The Forest Management Division (FMD), Department of Resources, Wildlife and Economic Development is implementing a Permanent Monitoring Plot (PMP) Program in the NWT. PMPs are permanent monitoring sites set up in the forest to measure tree and vegetation information in the same location every five to ten years. The plots will provide baseline information on the state of the forest resource, and provide a mechanism for long term monitoring of change to forest and vegetation condition. In 2003 there were 6 PMPs established in the Sahtu Region, 9 established in the Deh Cho and 23 established in the South Slave, including two in Wood Buffalo National Park. To date there are about 100 PMPs in the NWT.

042 **Biology**

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Region: SS **Location:** approximately 9 plots within the South Slave Region

Establishment of Permanent Monitoring Plots in South Slave Region

The Forest Management Division of the Department of Resources, Wildlife and Economic Development has determined that a network of permanent monitoring plots (PMPs) is required for assessing forest growth and yield in the NWT. The objectives of the PMPs are to: 1) assess the rate of forest growth and determine current and potential yield of various forest types; 2) provide valuable biophysical information to the Western NWT Biophysical Study for use in resource planning, cumulative effects assessments and cumulative impact monitoring; and 3) contribute NWT information to the National Forest Inventory, to assess and monitor the extent, state and sustainable development of Canada's forests. In 2003, 23 PMPs were established in the South Slave Region, including two within Wood Buffalo National Park. PMPs are fixed area plots established as monitoring sites to measure tree and vegetation information in the same location every 5-10 years, providing baseline information on the state of the forest resources and providing a mechanism for long-term monitoring of change. Plots are required in certain stand types likely to be targeted for particular uses such as harvesting, firewood, building material, or habitat. For the National Forest Inventory, plot locations were selected randomly and assessed for land cover type using satellite vegetation classification or forest cover inventory.

043 **Biology**

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File No: 12 402 687 **Licence No:** 13457
Region: DC **Location:** Nahanni National Park Reserve and hotsprings

Status and Occurrence of Nahanni Aster (Symphyotrichum nahanniense) in Nahanni National Park Reserve and Vicinity

Field work for this study was carried out at nine thermal spring complexes in and near Nahanni National Park Reserve (NNPR). Populations of Nahanni Aster were found at three of the previously known sites, including Wildmint Hotsprings, Old Pots Springs, and Rabbitkettle Hotsprings. A fourth, previously unknown population was discovered at 13 Steps Springs beside the Flat River in NNPR. No Nahanni Asters were found at the five other springs. Visual assessments of the populations were made at each of the springs, including area covered and estimates of the number of stems present. Small amounts of live material were also collected for preservation, analysis and transplant experiments. Invertebrate sampling (dip nets, opportunistic collections and observations) was also successfully undertaken at 30 sites within the nine thermal spring complexes. At least 74 genera were identified from the collections, with different springs supporting from four to 35 different genera. Diversity was lower at high water temperatures and higher in cooler waters. Insects and crustaceans were the most common organisms found, and the most widespread was a small amphipod known as 'freshwater shrimp' or 'scud'. Rare finds include one snail and one damselfly species, which may represent significant range extensions for the species. Work to confirm the identification of these species is continuing.

044 **Biology**

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File No: 12 402 689 **Licence No:** 13493
Region: NS **Location:** 18 lakes and streams at Ekati Diamond Mine

2003 Aquatic Effects Monitoring Program

The Aquatic Effects Monitoring Program (AEMP) at the Ekati Diamond Mine was conducted in 2003 by Rescan Environmental Services Ltd. for BHP Billiton. The main objective of the AEMP is to identify any potential effects that the Ekati Diamond Mine is having on the surrounding bodies of water and/or aquatic life. Within the Koala watershed, some of the changes in the water quality found to be likely the result of mining activities. Most water quality changes were observed within a few lakes downstream of the Long Lake Containment Facility (LLCF). The LLCF is the area where processed kimberlite, mine water, and other substances are placed. The characteristics changed that were detectable in Slipper Lake included higher pH, sulphate, total dissolved solids, potassium, and total molybdenum. Changes in the water quality likely did not cause harm to aquatic life in 2003.
This was the third year of monitoring for the Kind-Cujo Watershed. Small changes were found in the water samples collected, but most water quality changes remained within the King-Cujo Watershed, with the possible exceptions of elevated sulphate and potassium. The main source of water quality changes came from discharge from the King Pond Settling Facility (KPSF). Water quality changes in 2003 likely did not cause harm to aquatic life. However, the introduction of phosphorus in 2002 may have resulted in some temporary changes that were still evident in 2003. Water quality levels remained below Canadian federal standards for the protection of aquatic life.

045 **Biology**

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File No: 12 402 685 **Licence No:** 13421
Region: IN **Location:** along seismic lines in the Mackenzie Delta and Uplands Lynx Creek, and trails east of Inuvik

Forest Dynamics (Dispersal and Regeneration) at Treeline

Researchers quantified the number of seeds that can be produced and dispersed by a species during the winter period, focusing on alder and black spruce. This study examined: (1) the regeneration dynamics of white spruce in the Mackenzie Delta and black spruce on seismic lines; (2) the potential for seeds to disperse on snow; (3) pollen dispersal; and (4) pollen production. Study sites in the Mackenzie Delta and along seismic lines were determined based on accessibility and species composition near the cut line. Transportation to sites was by vehicle or boat. At the sites, small patches of soil (50 cm x 50 cm) were modified; that is, soil was mixed or removed to expose mineral soil, or it was left alone to be used as a control. Seeds of white spruce (in the Delta) and black spruce (in the Uplands) were sown on these seedbeds. Mesh remained on the sites to prevent additional seeds from falling onto them. Using counts and estimates of seeds on short tarp fences, which were put in place in 2002 to accumulate wind-dispersed seeds throughout the winter, researchers estimated the capacity of seeds to disperse on snow. Pending these results, this study may be repeated.

046 **Biology**

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File No: 12 402 629 **Licence No:** 13475
Region: IN **Location:** southern end of Travaillant Lake

Travaillant Lake Fish Movement Study

Sampling was performed with assistance from Tsiigehtchic community members Dan Andre, Thomas Kendo and Barney Natsie, and Tsiigehtchic youth Brian Francis. Fish were captured using 4.5 and 5 inch gill nets set along the southwest shore of Travaillant Lake and in the Travaillant River during fall spawning. Broad whitefish (Coregonus nasus) and lake whitefish (C. clupeaformiis) caught within the nets were tagged using T-bar anchor tags, sampled for biological characteristics and released. Lake trout (Salvelinus namaycush), northern pike (Esox lucius) and inconnu (Stenodus leucichthys) that were caught in the nets were sampled for biological characteristics and released. Fish found dead in the nets were retained and sampled in greater detail for biological characteristics that could only be collected through a lethal analysis.

047 **Biology**

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Region: IN **Location:** throughout the Gwich'in Settlement Area

Seismic Line Revegetation in the Gwich'in Settlement Area

Baseline data on the rate at which trees grow (productivity) and the time required for trees to re-establish (regeneration) following fires and human disturbances are required to determine forest sustainability and to understand how habitat changes over time (succession). Seismic line cutting in the 1960s and 1970s resulted in hundreds of kilometres of cleared 9 metre lines that crisscross the Gwich'in Settlement Area (GSA). Short term projects were carried out to determine the effects of seismic line cutting on northern environments, but no long term monitoring studies were undertaken. It has now been 30 years since the lines were cut and we have the opportunity to assess how well northern forests have recovered from the disturbance. The results of this type of study are important because a second wave of oil and gas exploration is planned for much of the region and a clear understanding of past seismic cutting effects is needed to assess future work. Also, knowledge of forest regrowth in the region will help predict impacts of timber cutting and refine replanting techniques for northern forests. Numerous sites along seismic lines and old burns were sampled in the summer of 2002. More data was collected in the summer of 2003. Maps of old seismic lines cut in the (GSA) were obtained from the National Energy Board. Sites along the lines were randomly chosen and accessed by helicopter, boat and truck. Small teams completed vegetation plots, assessed species composition and percent cover, and measured active layer depth along the cutline and off the cutline.

048 **Biology**

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Region: IN **Location:** Gwich'in Settlement Area

Alternate Forest Products: Study of Driftwood Along the Lower MacKenzie River

With the expansion of the petroleum industry residents are asking if driftwood might supply wood products including woodchips for the industry. During the summer of 2003, the researcher continued to study the rates of sinking and the wood quality of driftwood. They learned that the year to year variability of driftwood movement is high and that in 2003 very little driftwood floated down the river. They learned that the sources of driftwood are in the forested upper regions of the rivers that drain from the mountains into the Mackenzie River. The driftwood sinking experiments showed us that species other than white spruce and black spruce sink the fastest. White and black spruce are the species that float the longest and are therefore the most common on the riversides. Studies on wood quality showed that most logs have sufficient rot that milling for dimensional lumber would not be justified. More driftwood could be used for blocks and other low quality products. A large proportion of the driftwood could be used for chips in preventing permafrost thaw after construction.

049 **Biology**

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Region: NS **Location:** Lac De Gras

Aquatic Effects Monitoring Program

This is the third year of post-baseline aquatic effects monitoring. Despite the very close (60m) proximity of SNP Station 19 to the effluent diffuser, open-water and ice-cover results remain below Canadian Council of the Ministers of the Environment (CCME) guidelines for the protection of aquatic life. Ice-cover concentrations at SNP Station 19 tend to be higher and more variable than open-water concentrations. This is likely a result of increased wind driven lake circulation in the open-water resulting in better initial dilution or mixing. The results of the data analysis identified locations where there were changes in the concentrations of 7 water quality parameters. Changes in total arsenic are below levels that would cause environmental effects. The results for several of the parameters indicated a possible change when the actual reason for the positive results was a low baseline statistic. There are also locations or parameters where baseline data are not available and so the data analysis is not possible. Chlorophyll a concentrations have not increased from baseline. Zooplankton biomass results at both far-field and mid-field monitoring locations remain within the baseline range. The data analysis methods do not appear to provide a meaningful interpretation of change for the benthic invertebrate results. It is recommended that every three years the full data sets be provided to a qualified invertebrate biologist to conduct a separate statistical analysis and prepare an interpretive report. Data analysis indicated changes at specific monitoring locations of 4 sediment quality parameters. Diavik activities were not likely the cause of the indicated changes primarily because the concentration gradients were the reverse of what would be expected if Diavik was the source.

050 **Biology**

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Region: NS **Location:** Lac De Gras mine site

The Effects of Blasting on Lake Trout Egg Incubation (Update After Year One Early Retrieval)

This project was designed as a two-year study to assess effects of blasting from the A154 pit on lake trout egg incubation in the surrounding area. In fall 2002, eggs were collected from 3 females and fertilized with milt from 4 males. These eggs were placed in incubators and 10 incubators were assigned to each of one of four sites and also a control group. Three sites were located within the predicted blast zone and the other was a reference site. After three weeks of blasting exposure, which is the most sensitive period for the eggs, half of the incubators have been removed to be examined for mortality. During this time period, no sites in the estimated blast zone showed higher mortality when compared to the reference site and the lab controls. However, during this time period blasts were lower than estimated and never exceeded the blasting guidelines. The next step is to see if there was increased mortality after a whole season of blasting exposure and this will be done at ice-off in the summer of 2004.

051 **Biology**

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Region: NS **Location:** approximately 200 km north of Great Slave Lake

Analysis of Caribou Herd Dynamics Using a Proxy Indicator

This study's fieldwork was targeted as a preliminary study. Helicopters were used to fly to six sites where a few tree cores or cross-sections were taken at the base of black spruce trees (approximately 3 cores or cross-sections taken from each site). The purpose of this was to assess as many sites as possible for similarities in terms of site characteristics (soil type, canopy closure, slope orientation and degree, and tree form). Later fieldwork was aimed at obtaining a minimum of 30 cross-sections or tree cores from black spruce trees at three sites. Due to limited time and resources only two sites were sampled. 43 cross-sections from black spruce trees were taken from those two sites.

CONTAMINANTS

052 Contaminants

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File No: 12 404 604 **Licence No:** 13525
Region: NS **Location:** Yellowknife Bay, Great Slave Lake

The Potential for Geochemical and Microbial Remobilization of Arsenic from Sediments in Yellowknife Bay, Great Slave Lake

The overall goal was to provide data on arsenic cycling in sediments under water to better understand the potential environmental impacts within Yellowknife Bay and the long-term fate of arsenic. Important objectives of the project were to assess the stability of arsenic-associated minerals in Yellowknife Bay sediments and to characterize the mechanisms controlling arsenic mobility in the water in the sediments' pores. In order to meet these objectives, the research team developed a sampling strategy that targets environmentally and geochemically diverse locations within the arsenic-enriched sediment footprint near the Giant Mine. Careful consideration has also been given to potential seasonal geochemical changes within Yellowknife Bay. Sediment coring and dialysis array installation occurred during the second week of August. The dialysis array, which was used to test the water in the sediment pores, was retrieved during the last week of August. One sediment core (approximate volume of 2000 cm^3) from each sampling location was retrieved. Five dialysis arrays (360 mL) were retrieved with water from the sediment pores.

053 Contaminants

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Region: NS **Location:** Back Bay, Yellowknife

Arsenic Concentration and Speciation in Fish from Back Bay, Yellowknife

The objective of this study was to determine the concentrations of total arsenic in fish tissues so that a more complete risk assessment of human exposure to arsenic through consumption of fish from Back Bay in Great Slave Lake could be performed. To this end, the concentrations of total arsenic and five arsenic species were measured in muscle (fillet), liver and gastrointestinal tract (GIT) of lake white fish, walleye, northern pike, white sucker and longnose sucker. The total concentration of arsenic in the muscle, liver and GIT was 0.84 ± 0.43, 1.24 ± 1.15, and 3.28 ± 4.24 mg/k dry weight, respectively. Among fish species, the total arsenic concentration in the muscle was very similar; however white sucker had significantly higher concentrations of total arsenic in GIT than walleye, northern pike and lake whitefish. In all fish species, only a very small portion of the total arsenic identified in the muscle was inorganic arsenic; inorganic species are the most toxic forms of arsenic and are of toxicological concern when conducting a human health risk assessment. The majority of organic arsenic in almost all of the tissues from fish caught in Back Bay was not directly identified. Evidence from the literature suggests that most of these other organic arsenic species were trimethyated arsenic compounds, however, further analytical work would need to be performed to verify this hypothesis.

054 **Contaminants**

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File No: 12 402 503 **Licence No:** 13408
Region: IN **Location:** lakes near Fort Simpson, Jean Marie River, Deline, Norman Wells, Colville Lake, Great Slave Lake, and Slave River at Fort Smith

Investigation of Factors Affecting High Mercury Levels in Fish in Lakes in the Mackenzie River Basin

This study is based on earlier research conducted by the Department of Fisheries and Oceans which found that fish in many lakes in the Mackenzie River Basin had high mercury concentrations. This study examines the environment in which the fish live, to find out why mercury in fish is high in some, but not all lakes. Measurements that were taken include lake depth, temperature, conductivity, pH, dissolved oxygen, and turbidity. Water and mud samples were analysed for certain biological (e.g., plankton) and chemical (e.g., mercury) parameters. Fish were analysed for mercury and organic contaminant concentrations and stable isotopes. The researchers used a fish depth sounder to measure lake depth, and an instrument called a Hydrolab to measure temperature, conductivity, pH, dissolved oxygen, and turbidity. Water was analysed for various chemicals such as nutrients, chlorophyll and mercury. A fine-meshed net was used to collect plankton from the water column, which were then analysed for mercury. Mud samples were collected using a bottom grab. Fish were analysed for mercury and organic contaminant concentrations and stable isotopes. The research team consisted of four scientists, a guide and a student. For the Great Slave Lake component of the study, community members at Fort Resolution, Lutsel K'e and Fort Smith, and a commercial fisherman at Hay River collected the fish and shipped them to the National Water Research Institute for processing and analysis.

055 **Contaminants**

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Region: SA **Location:** Port Radium Mine Site

2003 Port Radium: Phase 2 Environmental Studies

This 5-day sampling program involved fisheries, aquatic, and vegetation studies at/in the vicinity of the abandoned Port Radium Mine site. The studies included: 1) sediment metal concentration analysis, to determine if remediation of the sediments in Great Bear Lake is required; 2) benthic invertebrate metal tissue analysis; 3) benthic invertebrate diversity; 4) whitefish myomere and liver tissue metal concentration analysis; 5) water metal analyses; and 6) plant, lichen and mushroom metal concentration analysis. All samples were analyzed for the presence of five biologically significant metals; antimony, arsenic, lead, nickel and zinc. Samples were compared to existing metal concentrations and biotic diversity in neighboring areas to provide a better understanding of potential temporal or spatial effects of the abandoned mine site on the biotic community. Motor boats were used to transport the project team to sampling locations along 1 km of the shoreline of Great Bear Lake. Sediment and benthic samples involved the use of an Ekman Dredge and Ponar Sampler at six locations along the sampling transect. Sinking gillnets were used to sample fish communities along the same transect. Vegetation samples were collected north and roughly parallel to the shore of Great Bear Lake at contaminated and control sites using Whirl-pak and Zip Lock Bags.

ENGINEERING

056 **Engineering**

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Region: IN **Location:** within the pipeline study corridors of the Gwich'in Settlement Area

2003 Field Reconnaissance Program – Gwich'in Settlement Area

The objective of this study was to provide geographic, engineering and operational information to support the planning, permitting and cost estimating for a potential natural gas gathering system in the Mackenzie Delta and natural gas liquids and natural gas pipelines in the Mackenzie Valley. Ten technical programs were conducted and the scopes of work included: investigating possible pipeline routes and facilities locations; establishing the bathymetry of lakes for potential water usage; investigating the surficial properties of possible borrow sources, access routes and construction slopes along the proposed pipeline right-of-way; and specialized studies related to unique technical features of the proposed pipeline. The information gathered provided input into future land use and water licence applications, engineering design criteria, preliminary construction and design plans, operational criteria and cost estimates.

057 **Engineering**

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File No: 12 406 032 **Licence No:** 13468
Region: DC **Location:** within the pipeline study corridors of the Deh Cho Region

2003 Field Reconnaissance Program – Deh Cho Region

The objective of this study was to provide geographic, engineering and operational information to support the planning, permitting and cost estimating for a potential natural gas gathering system in the Mackenzie Delta and natural gas liquids and natural gas pipelines in the Mackenzie Valley. Ten technical programs were conducted and the scopes of work included: investigating possible pipeline routes and facilities locations; establishing the bathymetry of lakes for potential water usage; investigating the surficial properties of possible borrow sources, access routes and construction slopes along the proposed pipeline right-of-way; and specialized studies related to unique technical features of the proposed pipeline. The information gathered provided input into future land use and water licence applications, engineering design criteria, preliminary construction and design plans, operational criteria and cost estimates.

058 **Engineering**

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Region: DC **Location:** within the pipeline study corridors of the Sahtu Settlement Area

2003 Field Reconnaissance Program – Sahtu Settlement Area

The objective of this study was to provide geographic, engineering and operational information to support the planning, permitting and cost estimating for a potential natural gas gathering system in the Mackenzie Delta and natural gas liquids and natural gas pipelines in the Mackenzie Valley. Ten technical programs were conducted and the scopes of work included: investigating possible pipeline routes and facilities locations; establishing the bathymetry of lakes for potential water usage; investigating the surficial properties of possible borrow sources, access routes and construction slopes along the proposed pipeline right-of-way; and specialized studies related to unique technical features of the proposed pipeline. The information gathered provided input into future land use and water licence applications, engineering design criteria, preliminary construction and design plans, operational criteria and cost estimates.

059 **Engineering**

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Region: DC **Location:** within the pipeline study corridors of the Inuvialuit Settlement Region

2003 Field Reconnaissance Program – Inuvialuit Settlement Region

The objective of this study was to provide geographic, engineering and operational information to support the planning, permitting and cost estimating for a potential natural gas gathering system in the Mackenzie Delta and natural gas liquids and natural gas pipelines in the Mackenzie Valley. Ten technical programs were conducted and the scopes of work included: investigating possible pipeline routes and facilities locations; establishing the bathymetry of lakes for potential water usage; investigating the surficial properties of possible borrow sources, access routes and construction slopes along the proposed pipeline right-of-way; and specialized studies related to unique technical features of the proposed pipeline. The information gathered provided input into future land use and water licence applications, engineering design criteria, preliminary construction and design plans, operational criteria and cost estimates.

060 **Engineering**

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Region: DC **Location:** the proposed pipeline corridor within the Deh Cho Region

2003 Route and Site Selection in the Deh Cho Region

The Environmental Protection Planning (EPP)/Environment Management Program (EMP) was undertaken to provide a better understanding of the physical terrain and watercourses that would be encountered in the Deh Cho Region. This information will assist in the development of the environmental protection plans and other environmental management documents. Helicopter reconnaissance was conducted and location and developments viewed include: the pipeline route between Willowlake River and the Blackwater River; proposed infrastructure and facility sites in the Blackwater River Area; the pipeline route between the Mackenzie and Willowlake Rivers; the proposed infrastructure sites and access roads near Camsell Bend; the all-weather road alignment between the Mackenzie Highway and the ROW; the pipeline route between NWT/Alberta border and Trout River; and the proposed site for the Trout River Heater Station.

061 **Engineering**

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Region: IN **Location:** the proposed pipeline corridor within the Gwich'in Settlement Area

2003 Route and Site Selection in the Gwich'in Settlement Area

The Environmental Protection Planning (EPP)/Environment Management Program (EMP) was undertaken to provide a better understanding of the physical terrain and watercourses that would be encountered in the Gwich'in Settlement Area (GSA). This information will assist in the development of the environmental protection plans and other environmental management documents. Locations and developments viewed include: a ground reconnaissance of the proposed Campbell Lake camp site; a ground reconnaissance of existing barge landing sites in Inuvik; an aerial reconnaissance of the proposed all-weather road from the Campbell Lake camp site to the Inuvik Area Facility; a pass over a tentative site for the Inuvik Area Facility; an aerial reconnaissance of the shared gas and NGL right-of-way south to Thunder River; and then a return to Inuvik along the proposed right of way.

062 **Engineering**

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File No: 12 402 670 **Licence No:** 13441
Region: IN **Location:** The proposed pipeline corridor within the Inuvialuit Settlement Region

2003 Route and Site Selection in the Inuvialuit Settlement Region

The Environmental Protection Planning (EPP) / Environment Management Program (EMP) was undertaken to provide a better understanding of the physical terrain and watercourses that would be encountered in the Inuvialuit Settlement Region (ISR). This information will assist in the development of the environmental protection plans and other environmental management documents. During helicopter reconnaissance flights the locations and developments viewed include: the Ikhil pipeline, a pass over Tunnuk (Bar-C); Niglintgak Anchor Field; Niglintgak Lateral; Taglu Anchor Field; Taglu Lateral to Swimming Point; Swimming Point; Lucas Point; proposed access road from Lucas Point to Parsons Lake North Pad site; Parsons Lake North Pad site; Parsons Lake Lateral; Taglu Lateral from Swimming Point to Storm Hills Pigging Facility; and Storm Hills Lateral.

063 **Engineering**

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Region: SA **Location:** the proposed pipeline corridor within the Sahtu Settlement Area

2003 Route and Site Selection in the Sahtu Settlement Area

The Environmental Protection Planning (EPP)/Environment Management Program (EMP) was undertaken to provide a better understanding of the physical terrain and watercourses that would be encountered in the Sahtu Settlement Area (SSA). This information will assist in the development of the environmental protection plans and other environmental management documents. Helicopter reconnaissance was conducted and location and developments viewed include: the pipeline route between Fort Good Hope and Little Chicago; Fort Good Hope and Gibson's Gap; proposed infrastructure sites in the vicinity of Fort Good Hope; the pipeline route between Tulita and Norman Wells; Tulita and Sahtu/Deh Cho border; and the proposed infrastructure sites and access roads near Little Smith Creek.

FOSSILS

064 **Fossils**

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File No: 12 412 048 **Licence No:** 13487
Region: IN **Location:** within the boundaries of Aulavik National Park and northern Banks Island

Search for Eocene Vertebrate Fossils on Banks Island

Due to funding problems, this research was postponed until 2004.

065 **Fossils**

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Region: IN **Location:** Ballast Brook, northwestern Banks Island, and Duck Hawk Bluffs, southwestern Banks Island

Past Climate of Ancient Forests on Banks Island

The occurrence of ancient forests buried in fluvial sediments and peat lands in the Canadian Arctic presents an opportunity to understand the species composition, structure, productivity, and climate of northern forests during a period when there was not permanent ice in the Arctic. In the summer of 2003 researchers collected samples of well-preserved wood from three locations on Banks Island. Cellulose has been extracted from these well-preserved samples of spruce and pine in order to determine its oxygen isotopic composition. Using a global-scale collection of wood from modern trees, researchers have determined that the ratio of 18º to 16º is an excellent indicator of mean annual temperature. The preliminary cellulose-oxygen isotope values determined from the Banks Island conifer wood suggests that 3-12 million years ago the mean annual temperature of southern and northwestern Banks Island was similar to the mean annual temperature of Sitka, Alaska today. Researchers expect to refine the relationships between climate indicators and cellulose isotopic composition over the next few months.

GEOLOGY

066 **Geology**

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File No: 12 404 606 **Licence No:** 13542
Region: SA **Location:** Tulita, Blackwater Lake, and Mahoney Lake

Surficial Geology Mapping Fort Norman (96C), Blackwater Lake (96B), Mahoney Lake (96F)

This project aims to obtain a better understanding of the sensitivity of slopes to disturbance from development, especially in the context of progressive climate warming. It also identifies baseline levels for natural and anthropogenic contaminants, transport mechanisms and development of transport process models. Information from this study will enable predictions of the impacts of climate change on the terrain and infrastructure. The project involved surficial geology mapping of unmapped areas near Tulita, in areas to the south and east of already-mapped areas. This information is used to assess: 1) granular resources; 2) slope instability, landslide occurrence and potential due mainly to instability of the active layer, forest fires and erosion; 3) geochemical analysis on a regional basis of till and gravel samples collected during mapping; and 4) geochemistry of peat deposits to determine the input of geogenic and/or anthropogenic metal mobilization along the proposed pipeline right-of-way. Access to sites was by helicopter.

067 **Geology**

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File No: 12 404 141 **Licence No:** 13459
Region: IN **Location:** Western Melville Island and outlying islands on the western archipelago

Quaternary Glacial Geology and Sea Level Change, Western Canadian Arctic Archipelago

During July 2003, fieldwork was extended westward from Winter Harbor, Melville Island, to Cape Providence. A second field camp was established on the north side of Dundas Peninsula along the outer coast of Liddon Gulf. Shorelines related to the former passage of the Laurentide Ice Sheet were surveyed and fossil marine shells were collected for radiocarbon dating. Evidence was found for two floating ice margins of former Laurentide Ice Sheet during its retreat about 12,000 years ago. These ice margins are similar to the modern "ice shelves" that characterize much of the margin of the modern Antarctic Ice Sheet. This research will determine the history of the former Laurentide ice shelves, i.e. How rapidly they formed and how long they remained stable before they broke up. The researcher also documented the history of submerging. This will contribute to the understanding of coastline processes; specifically whether modern coastlines are emerging from the sea or submerging. This work will lead to an improved understanding of coastal processes across the western Arctic islands where modern communities would be greatly affected by sea level changes.

068 **Geology**

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File No: 12 404 593 **Licence No:** 13481
Region: SA, DC **Location:** southwestern part of Sahtu Settlement Area and northwestern Deh Cho Region

Resource Assessment of Intrusions in the Northern Cordillera: parts of NTS 1051, H, P, 95E, L

The purpose of this project was to research, develop and compile an inventory of mineral deposit related to granite intrusions in the mountains of western NWT. The majority of the study was conducted at the Tungsten Mine. Visits were also conducted to most of the granite plutons in the area, including Mactung, Lened, Hole-in-the-Wall and the Little Nahanni Pegmatite Swarm. At Tungsten Mine, researchers were able to assemble the mine data into a three-dimensional model. Rock samples of the ore at Tungsten were also collected, which were analyzed for a number of elements including gold. The results show that there is a minor amount of gold in the ore, but studies looking at the fluids that carried the metals showed that the pressures and temperatures were too high for the precious metal to accumulate. A study of small granite dykes in the mine suggests these dykes were important pathways for the mineralizing fluids. A study was also conducted to test different geophysical properties of the ore and surrounding rocks. At the other deposits, quartz vein samples were collected to compare with the Tungsten results. At Little Nahanni, the pegmatite dykes were examined. It was noted that the character and composition of the rock becomes more quartz-rich with elevation.

069 **Geology**

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Region: SA **Location:** Edacho (Scented Grass Hills)

Non-renewable Resource Assessment (Phase II Fieldwork), Edacho

This study consisted of minor bedrock mapping and geochemical sampling at Edacho (Scented Grass Hills). Forty-eight stream sediment samples, 29 water samples, 14 heavy mineral concentrate (HMC) samples, and 7 bedrock samples were collected. There was very little bedrock outcrop observed. Black shale (probable Turonian Slater River Formation) occurred in slumped outcrops along the shore south of Edacho Point. The shale is a potentially rich petroleum source rock (15-20% total organic carbon content), but is immature. No important mineralization was seen in the bedrock outcrops. Several thin coal beds outcrop along the west side of Douglas Bay (Paleocene age, Summit Creek Formation equivalent). Initial results from stream sediment samples do not indicate any strongly significant anomalies. Maximum values 94 parts per million (ppm) copper, 162 ppm zinc, and 41 ppm nickel were obtained from assays. Gold, silver, and uranium values were also low. Water samples yielded sulphate values up to 304 ppm and conductivities to 940 milliohms. The range of pH values was 7.47-8.40. Chromite was the dominant mineral, and most of these may actually be from ultramafic intrusions rather than kimberlites.

070 **Geology**

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Region: DC, NS **Location:** Edahzhie (Horn Plateau)

Non-renewable Resource Assessment (Phase II Fieldwork), Edehzhie

The objective of the fieldwork was to further assess the non-renewable resource potential of the Edehzhie area, as a follow-up to the Phase I work which was a review of existing data. Phase II work consisted of geochemical sampling at Edehzhie (Horn Plateau area). Stream sediment samples, water, and heavy mineral concentrate (HMC) samples were collected. The samples were collected with the assistance of personnel from local communities and the Geological Survey of Canada, according to National Geochemical Reconnaissance protocols. The sampling focused on the western portion of Edehzhie. Results are being compiled and will soon be released.

071 **Geology**

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File No: 12 406 032 **Licence No:** 13510
Region: SA **Location:** three frost heave sites (#FH5, FH6, FH7) located within the municipal boundaries of the Town of Norman Wells

2003 Norman Wells Summer Field Geotechnical Investigation Program

A Field Geotechnical Investigation Program was conducted in Norman Wells by ColtKBR during the summer. Three frost heave sites were examined within the town boundary. The program commenced with access from the Imperial Oil Ltd. road to the first frost heave site by Quarry Road in Norman Wells. The second frost heave site was near the Norman Wells airport and the third frost heave site was near the entrance to the Norman Wells Imperial Oil facility. Holes were drilled at the four sites to a depth of 10m. Samples were collected and sent to a Calgary lab for analysis. Thermistors were installed in one hole on each site to record ground temperatures. The sites were restored to its usual contour and the equipment demobilized. The program provided eight days of employment for five people from the Norman Wells area.

072 **Geology**

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Region: DC **Location:** frost heave site #FH19T1, within the municipal boundaries of the Village of Fort Simpson

2003 Fort Simpson Summer Field Geotechnical Investigation Program

A Field Geotechnical Investigation Program was conducted by ColtKBR in Fort Simpson during the summer. One frost heave site, located near the Northwest Tel tower, was examined within the town boundary. Holes were drilled at the site to a depth of 10m. Samples were collected and sent to a Calgary lab for analysis. Thermistors were installed in one of the holes at the site to record ground temperatures. The site was restored to its usual contour and the equipment demobilized. The program provided four days of employment for four people from the Fort Simpson area.

073 **Geology**

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Region: NS **Location:** Southern Bear Province Project area, centered approximately 300km north northwest of Yellowknife

Southern Bear Province Geological Mapping Project

During the summer, researchers conducted a field trip with the objective to assist in choosing an area suitable for a multi-year, systematic, regional bedrock-mapping project to commence in the summer of 2004. During the expedition, researchers examined the geology at and surrounding the NICO deposit at Lou Lake, part of the Sue-Dianne deposit, smaller prospects (the Mar and Nod), drill core at Lou Lake, rocks at DeVries Lake, Ray Rock mine site, and Terra mine site and some nearby mineral showings.

074 **Geology**

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Region: SA **Location:** between Macmillan Pass (Mile 231) and Plains of Abraham (Mile 104) of the Canol Heritage Trail, approximately 150km west of Tulita and Norman Wells

Long Term Ecological and Geomorphological Investigations in the Alpine Tundra of the Mackenzie Mountains

The main activities in the vicinity of Macmillan Pass and Camp 222 were to retrieve stored information from the automated microclimate stations established in 1990, check the depth of thaw on selected features, and conduct a ground penetrating radar survey on the same permafrost landforms. Based on these studies it is evident that the permafrost is warming and melting. However, analysis of the 12 years of air temperature data show a cooling trend which suggests that the permafrost thaw is due to climatic events prior to 1990. In the vicinity of Camp 108 the soil temperature data were recovered from miniloggers installed in 2002. The loggers were also retrieved. Similar loggers in the vicinity of Camp 222 were also recovered and the data archived. As expected, temperatures on the oil spills were warmer than the adjacent undisturbed areas. Lab analysis indicates that the crude oil is still degrading but that the degree of decomposition decreases with depth. Plant recovery varies considerably but cover is generally increasing although still quite low.

075 **Geology**

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Region: IN **Location:** Peel Plateau area

Peel Plateau - Fort McPherson, NWT Aeromagnetic Survey, Phase VI and VII of Mackenzie Corridor Survey

The Geological Survey of Canada (GSC) continued with the sixth and seventh phase of the multi-year airborne magnetic survey over the Mackenzie Corridor region, which commenced in the summer of 1998. The survey was carried out from March to September, 2003 over the Peel Plateau area extending as far north as Fort McPherson and west into Yukon Territory. The survey was entirely airborne with no land access. Approximately 52,000 line kilometres of data were acquired. The purpose of this survey was to improve the public knowledge and understanding of the geology of this area, as no publicly available high-resolution aeromagnetic survey coverage exists. The survey recorded the variation in the earth's magnetic field caused by magnetic minerals contained in the rocks of the earth's crust. The patterns obtained are indicative of the subsurface geological structure and will be used as an important element of geological mapping and resource exploration. The GSC and Yukon jointly funded the survey. The GSC will be the primary source for information and public distribution of the raw digital data. The final results have been compiled and presented by the GSC in the form of colour Aeromagnetic Total Field and First Vertical Derivative Magnetic maps at a scale of 1:100,000. The GSC will publish all of these maps.

076 **Geology**

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Region: IN **Location:** drilling mud sumps in the Mackenzie Delta

Ground-thermal Conditions at Abandoned Drilling Mud Sumps, Mackenzie Delta Region

Ground-temperature monitoring sites at Navy Road and between Inuvik and Reindeer Station were established to determine ground-thermal conditions in different environments in the Mackenzie Delta region. These data can be compared with measurements taken in the 1960's and 1970's to determine decadal-scale changes in ground-thermal conditions. Monitoring of these sites is ongoing. Ground-thermal conditions were investigated at several sumps in the vicinity of Taglu Island. Shallow thermistors and data loggers were deployed in late summer to determine the effects of revegetation and snow accumulation on the thermal evolution of drilling mud sumps. Data collection is ongoing. This initiative has contributed to sump-monitoring guidelines that will be developed in conjunction with the Department of Indian and Northern Affairs.

077 **Geology**

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Region: IN **Location:** Richardson Mountains

Non-renewable Resource Assessment, Gwich'in Conservation Zones

The objective of this fieldwork was to assess the non-renewable resources of the Richardson Mountains study area using geochemical sampling and analysis. This work is a requirement for the approval of the Gwich'in Land Use Plan by the federal government. Helicopter-supported geotechnical sampling was based out of Fort McPherson. Unconsolidated sand and gravel samples were collected with the use of hand shovels from stream and river bars. The sample sites were accessed by helicopter and samples were transported back to the base. Collected sample sizes vary from less than 1 kg to as much as 25 kg. Plastic bags and pails were used to hold the samples.

078 **Geology**

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Region: DC, SS **Location:** along Hay River Highway to Kakiska, near Trout River campground, and Deep Lake

Sedimentology and Stratigraphy of Upper Devonian Strata Around Hay River

In the summer researchers conducted finish-up work at 9 locations in the area between Enterprise and Heart Lake. Researchers took approximately 50 fist size samples and approximately 20 photographs of geological features. They also worked along the Hay River between Alexandra Falls and Escarpment Creek. From this work, detailed maps are currently being produced, which show the nature of limestone in the area, and fossilized reefal deposits. The collected samples are now being examined to identify the different fossils present, and the microscopic textures of the limestone.

079 **Geology**

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Region: NS **Location:** Wecho River Project Area, approximately 100 km north-north-west of Yellowknife

Wecho River Bedrock Mapping Project

The Wecho River Bedrock Mapping Project is a two year bedrock mapping assignment taking place 100 km north of the city of Yellowknife. Previous geological mapping from the 1940's indicated the area is underlain by heterogeneous Achaean granular packages, but the units were not described. This project was able to divide the Archean intrusive rocks into 4 separate phases based on physical features and crosscutting relationships. Further to this, a large, previously unrecognized package of Archean turbidites was recognized in the area. Similar turbidites south of the map area are known to host numerous gold deposits; however this study did not identify any such deposits within the map area. This study also identified a regional change in metamorphic grade. In the southern part of the area the rocks have been metamorphosed to amphibolite-grade. In the northern part of the area numerous remnants of granulite-grade rocks occur. The project is also supporting a M.Sc. thesis study, which is aimed at determining the nature of the late Archean crust and mantle of the area. This in turn may be useful in determining if the area is prospective for future diamond exploration.

080 **Geology**

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Region: SA **Location:** Selwyn Basin, Mackenzie Mountains

Collaborative Research: A Sequence, Chemo- and Biostratigraphic Study of Late Early Cambrian Rocks, Southern Selwyn Basin, Mackenzie Mountains

During summer 2003 the researchers measured and sampled three locations of the Early Cambrian Sekwi Formation along the Canol Heritage Trail. Thin sections of the rock samples were studied with a microscope to determine their composition and deduce the climate and oceanographic conditions approximately 525 million years ago. The researchers' work so far indicates: 1) the Sekwi Formation rocks record initial deeper water conditions, probably produced by faulting coincident with sea level rise, followed by shallow water deposition; 2) climate during deposition of this unit fluctuated between arid and humid (as is typical in modern low to moderate latitudes); 3) there are 6-7 long-term sea level fluctuations of approximately 1-2 million years each recorded in this unit and traceable throughout the region; and 4) Sekwi trace fossils indicate that Early Cambrian organisms were capable of burrowing at least a few tens of centimeters into wet sediment and some organisms may have walked or crawled on land. Future work will focus on identifying more trilobites, generating more stable and radiogenic isotope values and tying them into sea level fluctuations.

081 **Geology**

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Region: NS **Location:** Lac De Gras region

Teleseismic Studies in the Lac de Gras Area

At the end of 2003, the POLARIS consortium was successfully archiving seismic wave records from 22 remote sites in the Lac de Gras area. Four of these sites were installed in 2003. They are located at: Lupin Mine site, Discovery Mine site, Grizzly Bear Lake, and Indin Lake. These seismic data from distant earthquakes were analyzed in several ways to detect several layers within the Earth's mantle below this area. One clear boundary lies at 120-140 km depth, just above where most of the mined diamonds originated. The top of the lower layer is interpreted currently as ancient oceans rocks thrust downward to these depths between 2300 and 1800 million years ago, and unusually preserved since that time. The layer boundary is at about 120 km beneath Ekati and deepens to about 150 km to the south-southeast. These results were presented at the Yellowknife Geoscience Forum in November, 2003.

HEALTH

082 **Health**

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Enhanced Surveillance of Canadian Street Youth

Street youth are a priority for sexually transmitted disease (STD) prevention programs, but reliable data on STD prevalence, trends, characteristics and behaviour of high-risk youth are scarce. Through data collection and analysis, this study, which is part of a Canada-wide program, provided information on the sexual health and sexual behaviours of street youth. The objectives were: (1) to report the prevalence rates and examine trends of sexually transmitted infections (STIs) and other blood borne pathogens (BBPs) within the street youth population at a local, regional and national level; (2) to investigate the epidemiology patterns and associated risk factors; and (3) to fill in geographical gaps and increase representation in data by adding more youth in testing, treatment and the provision of information around STIs and BBPs. Information was collected from participants through two visits with a research nurse. The first visit included a questionnaire (personal life and sexual behaviour) and lab testing (urine sample for chlamydia and gonorrhea; blood sample for Hepatitis B and syphilis, and possible future testing for HIV, Hepatitis C, herpes virus or HTLV); the second visit involved a review of the participant's lab tests and, if required, follow-up treatment. Participation was completely voluntary and medical records and results from this study are kept strictly confidential.

083 **Health**

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Region: NS **Location:** no NWT locations

Determinants of Asthma and Wheezing in Aboriginal Children

The purpose of this population health study was to determine the prevalence and incidence of asthma and wheezing, and to identify factors associated with these conditions in aboriginal and non-aboriginal children living in the Northwest Territories and the Yukon. Data from the National Longitudinal Survey of Children and Youth (NLSCY) conducted in these regions by Statistics Canada from 1994-1995 to 2000-2001 were used in this study. These findings will further the understanding of asthma epidemiology in aboriginal children and will be useful to health care providers for management of asthma, to health promotion specialists to develop prevention techniques, and to parents in order to manage their child's asthma at home. This study investigates the trends in asthma and wheezing incidence and prevalence every two years over an 8-year period from 1994 to 2001. It also determines host, parental and household determinants of incidence of asthma and wheezing in aboriginal and non-aboriginal children aged 0 to 11 years living in Northwest Territories and Yukon, as well as any predictors which vary between aboriginal and non-aboriginal children. No part of the study took place in the NWT in 2003.

PHYSICAL SCIENCES

084 **Physical Sciences**

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File No: 12 404 371 **Licence No:** 13552
Region: IN **Location:** Beaufort Sea, north of the Tuktoyaktuk Peninsula and into the Amundsen Gulf, 50-400km offshore

Twin Otter Aerial Surveys of Sea Ice During Fall Freeze-up

Sea ice is decreasing at an alarming rate throughout the northern hemisphere. Dramatic reduction of sea ice in the northern hemisphere is clearly shown from satellite data. To understand what is really going on with sea ice and climate changes, researchers conducted scientific activities, including aerial surveys and ship-based measurements. They equipped a Twin Otter with radiation sensors and digital camera. From these instruments researchers understand the interaction between local thermodynamic processes and sea ice. Onboard the icebreaker passive microwave characteristics and sea ice microstructures were measured. These data are very important to refine the satellite algorithm and thus provide information from satellite data. All the information gathered from these scientific activities will contribute to improve the sea ice products from satellite data and produce an estimation of the reduction of sea ice in the Inuvialuit Settlement Region (ISR).

085 **Physical Sciences**

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File No: 12 404 576 **Licence No:**
Region: IN **Location:** Beaufort Shelf, in a survey area bounded by: 131ºW to 141ºW and 69º30'N to 71ºN

Beaufort Shelf Seabed Mapping Project

The Geological Survey of Canada in collaboration with the Canadian Hydrographic Service and the Monterey Bay Aquarium Research Institute conducted a seabed-mapping program using the Canadian Coast Guard vessel NAHIDIK. New multibeam sonar technology was utilized to investigate environmental and engineering issues related to offshore hydrocarbon exploration and transportation. Digital georeferenced maps of the seabed were acquired to study seabed scouring by pressure ridge keels, seabed ecosystems, gas seeps, mud volcanoes, abandoned artificial islands and seafloor foundation conditions. Extreme ice scours as deep as 3.8m were observed incised into the seabed. Seabed topographic and bottom classification maps were generated as baseline information for seafloor habitat delineation. Actively venting gas seeps were mapped at two separate locations on the shelf. The identified methane gas may be the product of decomposing hydrates. Features described as submarine pingos are probably mud volcanoes and were also observed venting methane. Mapped artificial islands have been eroded below sea surface and are now hazards to navigation as well as possibly unique marine habitats and future sources of sand and gravel. Seabed sediments have been significantly reworked by the action of ice keels over time. This affects their physical properties and performance as a foundation material under offshore engineering structures.

086 **Physical Sciences**

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Region: DC **Location:** Highway 1 and 3 between Fort Liard, Fort Simpson and Fort Providence

Canada Northwest Experiment (CANOE)

In June of 2003, researchers began the first stage of the CANOE project by deploying 11 earthquake recording instruments between Fort Nelson and halfway between Fort Simpson and Fort Providence on the Mackenzie-Liard Highway. The stations are sited at an average distance of approximately 100 m from the highway at intervals of 35-40 km. These instruments were serviced once in October 2003 to collect data that had been recorded over the 3 month period, identify any problems that may have occurred, and prepare the stations for the winter months. Researchers have examined the data for quality control but have yet to begin processing and interpretation.

087 **Physical Sciences**

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Region: IN **Location:** Garry Island, Illisarvik, Paulatuk, and South of Inuvik

Permafrost Investigations in Western Arctic Canada

In 2003, fieldwork research was concentrated at Illisarvik, the experimental drained lake on Richards Island, Mackenzie Delta area, on Garry Island, near Inuvik and near Paulatuk. The major result obtained was the determination of permafrost warming over the last 30 years in the outer Mackenzie Delta area. On Garry and northern Richards Islands, the permafrost was at about -8ºC in 1969/70 and now the temperature is 1º to 1.5ºC higher. This warming of permafrost is probably the result of climate warming because since 1969/70 the air temperature in the delta has risen by over 2ºC. This is the first area in the Western Arctic where a clear connection between climate change and permafrost warming has been established. At Garry Island researchers have also been studying how ice wedges crack. In the period 1967 to 1987, on average 10 out of 30 ice wedges researchers have been monitoring cracked every year. In the last 3 years, only 3 wedges have cracked each year. This is another piece of evidence that the ground behaviour is changing near the coast. At Illisarvik, data has been collected on the depth of the ground thawing for twenty years. These data show that the ground thawing does not only depend on the warmth of the summer, but also how cold the previous winter and spring have been. This is new because most people have thought that the only factor important for ground thawing is the summer warmth.

088 **Physical Sciences**

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Region: IN **Location:** Banks Island and Victoria Island

Fossil Reef Assessment for North East Banks Island

This project centered around mapping and sampling in situ, tectonically undisturbed sponge, and coral reefs of Frasnian age (ca. 378-383 million years old), the only part of the Canadian Arctic where such reefs are exposed. This consisted of: (1) mapping and measuring reef localities at the extremes of the field area around NE Banks, along the Mercy River carbonate platform. Researchers discovered new reefs in the N (Manning River Mouth) and NE fringes (M'Clure River), as well as reefs at the southern limits of the platform, upriver; (2) researchers were able to confirm four cycles of reef growth, and determined the A, B, C, and D levels. Each of these levels are distributed somewhat differently along the platform, and they show apparent back stepping of the reefs in the NE direction, as these were built on successive paleo-delta lobes; (3) researchers were able to carry out sampling of some of the main reef coral and sponge constructors. These are being prepared for detailed microscope studies; (4) measuring sections to determine thickness and spacing of the four reef levels; and (5) once we have completed maps for each reef cycle, we hope to demonstrate the total extent of these reefs in the Mercy River area and the variability in size and thickness of reefs with time (maximal development was at level C).

089 **Physical Sciences**

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Region: NS **Location:** Giant Mine

Ecological Investigations at the Giant Mine

Ecological investigations were conducted on the Giant Mine surface lease area near Yellowknife. The project involved surveying the extent of Baker Creek to document the emergent, submergent and riparian vegetation species. Other components of the project included mapping the terrestrial vegetation communities for the surface lease area and describing the muskrat utilization of the Baker Creek watershed. Products included a detailed report and an interactive GIS-based mapping database. The distribution of aquatic vegetation species along the narrow linear sections of Baker Creek was sporadic. Submergent vegetation was rare with minor amounts of sago pondweed and Richardson pondweed. Emergent vegetation was observed in varying amounts along the length of Baker Creek. In some areas, cattails lined approximately 80% of the shoreline while in other areas; only trace amounts of emergent vegetation were observed. Sections of Baker Creek that have been physically modified exhibited a lesser density of aquatic vegetation. The soils and climate of the Giant Mine Surface Lease area have limited the upland vegetation communities to three upland, one riparian type, two wetland types and three disturbed types. Based on the observations of the survey, muskrats utilize the majority of Baker Creek. Areas with the greatest utilization are those with suitable vegetation and water flow and depth under normal conditions. Muskrat utilization is influenced by water fluctuations. Reduced levels of utilization may be observed during periods of lower water levels as muskrats may seek out areas with more favourable conditions.

090 **Physical Sciences**

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Region: NS **Location:** Tundra Ecosystem Research Station, Daring Lake

Tundra Hydrology and Chemistry, Daring Lake

There were two main objectives for this field season. The first was to assess snow water equivalent to the basin prior to snow melt while the second was to quantify surface water hydrology and the chemistry in several elevated sub-basins and in the principle stream channel of Peregrine sub-basin during melt season. During the snow survey, transects were established in the study basin in areas where snow pack accumulation was representative of larger areas. At each site along these transects, snow cores were extracted and measured for length and their contents weighed to establish snow density and snow water equivalent. Additional depths were taken around the coring site to assess any spatial variability in the depth of the snow pack. Once the basin's principle stream began to flow in late May, it was regularly monitored at its outlet to quantify the discharge and surface water chemistry during the spring melt. Water level rods were used at this site and three other strategic sites in the basin to provide a continuous record of water level. This water level was later related to discharge, thereby providing a continuous record of discharge at the four locations. Additional sampling took place at several other points in the basin including upstream locations along the principle stream, major tributaries, and overland flow pathways. These data, combined with the 2002 field season data, have helped in the establishment of a comprehensive study in the hydrology surface water chemistry within Peregrine basin from the early spring through the snow melt period to the end of summer.

091 **Physical Sciences**

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File No: 12 404 399 **Licence No:** 13504
Region: IN **Location:** western Arctic coastline, including the mainland coast, and Mackenzie Delta area, Banks Island and Victoria Island

Coastal Hazards, Relative Sea-level Change, and Climate Impacts on Northern Coasts and Seaways

Climate warming in the western Arctic is associated with rising sea levels, rising ground temperatures, reduced sea ice, and increased open water and bigger waves. These changes can be expected to result in increased thaw subsidence and more rapid coastal erosion. Storm-surge flooding may increase, particularly where land subsidence enhances the apparent rate of sea-level rise. Where sea level has been falling in the past due to postglacial uplift, water levels may begin to rise if future rates of sea-level rise exceed the rate of uplift. During 2003, a new continuously operating GPS station was established at Tuktoyaktuk, adding to the existing stations at Inuvik, Sachs Harbour, and Holman. New GPS measurements were made at sites on northern Banks Island. Preliminary results indicate subsidence at all sites, implying that the area of rising sea level may extend farther east than previously thought, with implications for coastal vulnerability at Holman and Paulatuk. In 2003, the GSC coastal monitoring network was expanded to northern Banks Island and monitoring was continued on the outer Mackenzie Delta and at Tuktoyaktuk, Sachs Harbour, and Holman. High-resolution satellite imagery was obtained over southwest Banks Island and aerial oblique video was completed for 75% of the Banks Island coastline.

092 **Physical Sciences**

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File No: 12 404 586 **Licence No:** 13540
Region: IN **Location:** oceanic region of Mackenzie Shelf/Shelf Break/Amundson Gulf/Franklin Bay

Canadian Arctic Shelf Exchange Study (CASES)

The Canadian Arctic Shelf Exchange Study (CASES) aims to understand the biogeochemical and ecological consequences of sea ice variability on the Mackenzie Shelf (Beaufort Sea) and provide the knowledge needed to model the impacts of present and forecasted variation in Arctic ice cover, particularly in response to climate warming. These studies may be considered as 3 complementary subprojects: 1) atmosphere, sea-ice and coastal circulation; 2) pelagic processes; and 3) benthic processes. The 2003 field operations were conducted at sea, on the new Canadian research icebreaker. During open water months, data collection took place from the ship. A zodiac and a landing barge were deployed at some stations to sample around the icebreaker. Some ice reconnaissance sampling surveys were conducted with the onboard helicopter. The ship overwintered in the landfast ice of Franklin Bay until the ice melted. During this time, data collection took place at this single site from the ship and in small ice tents located within 5 km of the ship. Data collected include temperature, salinity, light transmittance and chlorophyll a fluorescence, dissolved organic/inorganic carbon, nutrients, total and fractionated chlorophyll a, microbial densities and picoplankton densities and suspended sediments, underwater currents and meteorological conditions, snow and sea-ice physical properties, zooplankton and larval fish areal densities and contaminant levels, vertical position and migration of plankton and fish in the water column, fish stock density and behaviour, and particle concentration and flux. The topography and character of the seabed and the distribution and characteristics of the sediment below the water-sediment interface were mapped.

093 **Physical Sciences**

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File No: 12 404 602 **Licence No:** 13505
Region: SA **Location:** 7 sites along the Great Bear River, between Bear landing and Tulita

Characterization of NTR Sites Under Institutional Controls

The objectives of the project were to obtain radiological characteristics of Northern Transportation Route (NTR) sites currently being regulated through institutional controls due to potential contamination. Since 1992, the Atomic Energy Control Board (AECB), now the Canadian Nuclear Safety Commission (CNSC) has been made aware of the existence of approximately 30 sites that were potentially contaminated during the transportation of uranium ore from the mine at Port Radium, to the railroad at Fort McMurray. The sites were located in populated areas and were, over the course of ten years, remediated under licence where required. With the coming into force of the Nuclear Safety and Control Act (NSCA), 12 sites were located along the Great Bear River, which drains Great Bear Lake to the Mackenzie River. The information available to CNSC staff indicated that some elevated gamma radiation levels had been observed on site visits to these remote areas. Based on the potential for public health risks if the sites are developed, CNSC staff put in place institutional controls requiring the cooperation of other federal government agencies and the local First Nations bands. These were reported to the Commission in CMD 01-M78 and an exemption from licensing the possession, management and storage of nuclear substances at these sites was granted. One of the conditions of granting the exemption was that CNSC staff would report on the status of the sites every five years. The field program involved: establishing a base camp at the Bennett Airstrip, recording gamma radiation readings 1 m above ground surface over a 10 m x 10 m grid at all the subject sites, locating each of the gamma radiation readings, and collecting 13 soil samples from representative site areas and four water samples. Researchers found that the gamma radiation levels are very low throughout 8 of the 10 sites. Gamma radiation levels at some locations on the Bennett Original Landing and the road between the Bennett Camp and Airstrip are elevated to levels that will likely require the maintenance of institutional controls.

094 **Physical Sciences**

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File No: 12 404 597 **Licence No:** 13477
Region: IN **Location:** northwest Victoria Island (near Armstrong Point and Dean Dundas Bay) and northeast Banks Island

Postglacial Sea Ice Conditions in Prince of Wales Strait Section of the Northwest Passage

A survey of shorelines (both modern and raised above present sea level) and of archaeological sites was carried out in July 2003 on northwest Victoria Island. Researchers traveled by ATV over 150 km of coastline around Deans Dundas Bay, Armstrong Point, and Passage Point (northeast Banks Island). This was part of a study to see if the amount of summer sea ice covering the 'Northwest Passage' has changed during the 10 000 years since glaciers of the last ice age retreated from the area. Using the fact that sea level has fallen over this period, researchers were looking at whether the raised (older) beaches formed in ice covered or in open seas. The frequency of occurrence of marine life from this period (preserved as fossil shells, whalebone etc.) and of driftwood and archaeological sites are also indicators of former marine conditions. It turned out that in this area, much of the coast is made of fine sand and silt, deposited during the last glaciation, which is too soft to preserve former shorelines or support fossils. Nevertheless, the researchers' time was usefully occupied with additional studies of natural exposures of massive ice in the ground resulting from glacial and post glacial processes.

095 **Physical Sciences**

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Region: IN **Location:** Niglintgak Gas Field, 120km northwest of Inuvik

Aerial LiDAR Survey of the Niglintgak Gas Field

In August 2003, Shell Canada Ltd. conducted an Aerial Light Detection and Ranging (LIDAR) survey of the area in which the Niglintgak Gas Field is located. The survey took approximately 8 hours to complete by helicopter from Inuvik. Reflectors and a GPS base station were placed at Camp Farewell and the Niglintgak site to calibrate the data points collected. The survey was conducted to determine the height of the land in relation to sea level. As well as collecting LIDAR data, the survey flight was also recorded using digital videography. The information from the survey was used to create maps of the Niglintgak area and to select the sites on which the proposed Niglintgak production facilities would be developed.

096 **Physical Sciences**

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File No: 12 404 603 **Licence No:** 13520
Region: NS **Location:** along the Ingraham trail, east of Yellowknife

The Effect of Great Slave Lake on Air and Surface Temperature in Peatlands near Yellowknife

This project investigates the effect of Great Slave Lake on air and surface temperatures in peatlands near Yellowknife over three years. Air and surface temperatures are used in numerical models that predict permafrost conditions. Air and surface temperatures are controlled by site characteristics such as vegetation, but are also affected by regional surroundings such as Great Slave Lake. To determine the effect of Great Slave Lake on air and surface temperatures, four peatlands were chosen at varying distances from the lake. At each site, temperature sensors were installed to measure air temperature at a height of 1.5m and ground temperature at 100cm, 50cm, and 2cm beneath the surface moss cover. Temperatures are being recorded on miniature data loggers. Detailed description of vegetation, moisture availability, and soil properties were noted at each site. Several times during winter 2003-04 snow depth measures were taken to differentiate the effects of surface characteristics from the effects of Great Slave Lake. During the upcoming summer data loggers will be downloaded and air and ground temperature data collected will be analyzed.

097 **Physical Sciences**

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Region: DC **Location:** Liard River

Liard River Water Depth Survey

In order to determine the navigational capabilities of the Liard River, WesternGeco conducted a bathymetric study to record water depths along the course of the Liard River, from the confluence at the Mackenzie River to the British Columbia / Northwest Territories border. The survey was minimal from Fort Simpson to the Beaver Dam area and more extensive in areas with rapids, shallow waters and river bends. This work involved approximately 10 people, including personnel from WesternGeco, contractors and monitors. Local people were hired as river pilots and bear monitors. Two to four small vessels were utilized, depending upon time constraints and logistics. Equipment used included a Fathometer to determine water depths, GPS and laptop computers to record data.

098 **Physical Sciences**

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Region: IN **Location:** Melville Island Ice Cap

Mass Balance of Arctic Glaciers

This program is part of a larger one that also measures 5 glaciers/ice caps in Nunavut. The mass balance of South Melville Ice Cap was measured in late April 2003. The automatic weather station was also downloaded and re-set for 2004. Although there has been a pronounced warming to the region over the past 20 years, the 2002 summer proved cold enough to cause the ice cap to gain, rather than lose. The glacier measurements suggest that 2002 was one of the coldest summers of the last 40 years. Interestingly, although the Arctic Ocean sea ice is decreasing in area and thickness, similar reports show the 2002 summer at the North Pole left snow un-melted at the end of the summer. Our 43-year record of glacier mass balance shows that the summers are becoming more variable and perhaps more unpredictable. The South Melville Ice Cap normally gains and gets slightly larger, only one year in 30. It also usually shows the western Arctic is warming more rapidly that the eastern Arctic. Thus the 2002 summer was remarkably cold in the area.

099 **Physical Sciences**

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Region: IN **Location:** Mackenzie Delta, Inuvik area and central Delta

Permafrost Conditions in the Mackenzie Delta Region

The 2003 field season was the first year of this research initiative investigating the physical and chemical characteristics of near-surface permafrost in the Makenzie Delta area and the effect of permafrost degradation on the limnology of small tundra lakes. Ground-temperature monitoring sites at Navy Road and between Inuvik and Reindeer Station were established to determine ground-thermal conditions in different environments in the Mackenzie Delta region. These data can be compared with measurements taken in the 1960s and 1970s to determine decadal-scale changes in ground-thermal conditions. Monitoring of these sites is ongoing. The geochemical effect of permafrost disturbance on the limnology of small tundra lakes was investigated between Inuvik and Richards Island. Preliminary results indicate that total dissolved solid concentrations in tundra lakes affected by permafrost degradation were an order of magnitude greater than in undisturbed lakes and pH differences were statistically significant. Data collection and analysis are ongoing.

100 **Physical Sciences**

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Region: IN **Location:** Mackenzie Delta, in the vicinity of Inuvik

Biogeochemistry of Lakes in the Mackenzie Delta

This project is on going and the long-term goal is to develop a biogeochemical model for lakes in the Mackenzie Delta, and ultimately, a more general ecosystem model for lakes in the floodplains and deltas of major world rivers that could help assess the effects of multiple stresses on rivers as a result of global change. Specific goals for the 2003 season included: (1) investigating the photochemical effects of coloured and non-coloured dissolved organic carbon (DOC); and (2) initial collection of water samples for assessing the stripping of nutrients and DOC from the Mackenzie River water during flow through the Mackenzie Delta. Samples were collected for bacterial production and water chemistry in surveys of 15 lakes. A 6-lake set was also sampled weekly for experimental measurements of bacterial production with and without UV-radiation. Bacterial production appeared to be directly affected by UV-radiation exposure. Water samples were collected weekly from the Mackenzie River at Arctic Red River and the Peel River inflow to the delta to enhance the available data for estimating nutrient inflows to the Beaufort Sea during the primary period of observation for the Canadian Arctic Shelf Exchange Study.

101 **Physical Sciences**

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Region: IN **Location:** Campbell Uplift area

Assessment of Aqueous Methanogenic Precursor Compounds in Periglacial Groundwaters

The winter 2002-2003 was drier and colder than normal, resulting in many potential groundwater monitoring sites to be dry or nearly dry when research began. The few sites that did produce enough flow tended to have high surface areas of limestone debris, such as quarry talus. Despite the researchers' success in finding sites with active methane formation, levels of dissolved organic matter (DOM) were low, and the researchers were unable to detect any fatty acids in the DOM fraction. The analyses of cations and anions on samples transported back to facilities in Ottawa revealed significant levels of sulphur. Methanogenic activity is not a viable process in the presence of potential substrates for sulphate reduction unless sulphate-reducing bacteria (SRB) are inhibited. The apparent lack of acetic acid production may explain why methane production can proceed in the area. The 13C-isotopic composition of methane was mostly in the range of -60 to -70‰ VPDB, indicating that biogenic CO2-reduction was the likely process responsible for most methane production, and thus proving that methanogenesis in the area is not dependent on acetic acid availability.

102 **Physical Sciences**

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Region: IN **Location:** Mackenzie Delta

Snow Accumulation/Runoff in High Latitude Permafrost Basins

Field studies were conducted in the Inuvik area during 2003, looking at the factors controlling the movement of energy and water between the land and surface and the atmosphere during the spring snowmelt period. These factors control both the supply of energy and water to the atmosphere, as well as snowmelt and therefore spring runoff in the streams and rivers. The long-term objective of these studies is to improve the ability to predict weather, climate, and water resources. With future uncertainties in climate, and with potential development projects, an improved predictive ability is essential in order to properly manage future environmental change and to adapt to such changes. The researchers' work in 2003 concentrated primarily on measuring total basin snowfall, as well as the usual automated measurements of solar radiation, air and ground temperatures and summer rainfall. Their ongoing work will compare results from a number of different years so they can understand the variation from year to year, and will compare results from areas on either side of the tree line. This work provides important data needed to test computer models, which are used to predict the impact of climate warming on these environments.

103 **Physical Sciences**

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Region: IN **Location:** northeast of Parsons Lake

ConocoPhillips LiDAR Helicopter Survey of August 2003

This survey was preliminary research relating to a possible development at Parsons Lake. ConocoPhillips was interested in determining the topographic features of the study area both for drainage assessment and for determining a suitable flat location for a possible future site development. LiDAR collection occurred at a height of 300m above ground level (AGL). GPS receivers were placed and retrieved the same days as the survey flights. No physical samples of any kind were taken, and there was no work on the ground at Parsons Lake, except for the placement and retrieval of the GPS receiver at the former D-20 well site. For the actual survey, LSI employed its HELIX LiDAR system utilizing a near infrared (1064nm), eye safe, Class 3B laser. The pulsating laser was directed out of the helicopter airborne platform by a multifaceted rotating mirror. Besides the scanning laser used in the HELIX LiDAR system, a NADIR high density profiling laser was also used. The LSI data processing team used the profiling laser data as a quality control (QC) tool to verify the bare earth digital terrain models derived from the scanning laser. First level data processing for QC purposes was done in Inuvik. Final processing was done in the LSI office in Calgary and results in a digital data set convertible to topographic maps in a variety of formats. LSI also collected a digital video record of the ground over flown, a copy of which ConocoPhillips provided to each of the Tuktoyaktuk and Inuvik HTC's, at their request.

104 **Physical Sciences**

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Region: DC, IN, SA **Location:** approximately 60 sites between Fort Simpson and the Beaufort Sea Coast

Active Layer Monitoring Network in the Mackenzie Valley

During summer 2003, the 13th annual survey of the active layer monitoring system in the Mackenzie Valley was completed from Fort Simpson to the Arctic coast. There are now 53 sites, about half in the Mackenzie Delta. Ten have been selected for the Circumpolar Active Layer Monitoring program of the International Permafrost Association. Along this 1400km transect, active layer thickness varies more as a result of local factors, related to situation, than to regional climate, associated with latitude. Though both air and ground thawing degree days increase from Arctic through Sub-arctic to Boreal environments, active layer development is surprisingly similar, except where local factors override regional patterns. The thaw of 1998 was the greatest yet recorded, in keeping with record warm temperatures. The thaw in 1996 north of Norman Wells and in 2000 at many sites was notably less than adjacent years and was also associated with temperature and season length that were significantly less than normal. The widespread response to these events builds confidence in the utility of the instrumentation for measuring response in the ground atmospheric change. In the longer term, measurements from this transect will be used to help model climate change impact on near surface permafrost in this fragile environment.

105 **Physical Sciences**

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Region: IN **Location:** Taglu Gas Field, 120km northwest of Inuvik

Aerial LiDAR Survey of the Taglu Gas Field

An aerial Light Detection and Ranging (LiDAR) survey of the Taglu Gas Field was undertaken to determine the topographic features for drainage assessment and to locate a suitable flat location for future site development. The area surveyed was between 69°20' and 69°24' Latitude and between 134°50' and 135°05' Longitude. The LiDAR survey used a pulsating laser directed by a multifaceted rotating mirror from a helicopter-borne platform. The laser pulse was reflected back to the platform from solid objects below (vegetation, ground surface, and roadways). The time between the pulse leaving the platform and its return was measured precisely. The time interval measurements were converted to distance and referred to the aircraft's Global Positioning System (GPS), Inertial Measurement Unit (IMU), and two ground based reference GPS stations, one at the Inuvik Airport and one at Taglu. The GPS data determined the aircraft position by Latitude, Longitude and Altitude. By combining the LiDAR, GPS, and IMU data, a 3-dimentional digital model of the terrain, accurate to 10 to 15 cm horizontal and vertical, was created.

106 **Physical Sciences**

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Region: IN **Location:** Ya Ya Lake, Parsons Lake

Massive Ice Study in Granular Deposits

The study of massive ice in granular deposits is the basis of this research. The researchers are focusing on the nature and occurrence of massive ice in sands and gravels. Many theories suggest that massive ice should not be present in these materials. However, there are several places in the NWT where there is massive ice in sand and gravels. The researchers are trying to explain the origins of the massive ice in sands and gravels. In March 2003, they visited some of the sites including Parsons Lake and Ya Ya Lake on Richards Island. Because the massive ice in coarse sediments is seldom visible at the surface, they visited Ya Ya when there was no borrow operation in progress. When they were digging in the sand and gravel they ran into massive ice. The researchers are studying the samples at laboratories to see if they can shed some light on why there is massive ice in sand and gravels.

107 **Physical Sciences**

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Region: IN **Location:** two sites near Travaillant Lake

2003 Winter Baseline Noise Monitoring Program in the Gwich'in Settlement Area

Mackenzie Project Environment Group did not conduct winter baseline noise monitoring surveys in the Gwich'in Settlement Area in 2003.

108 **Physical Sciences**

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File No: 12 402 670 **Licence No:** 13399
Region: SA **Location:** Taglu lease site, Swimming Point, Parsons Lake, and Jimmy Lake

2003 Winter Baseline Noise Monitoring Program in the Inuvialuit Settlement Region

Mackenzie Project Environment Group did not conduct winter baseline noise monitoring fieldwork in the Inuvialuit Settlement Region in 2003.

109 **Physical Sciences**

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Region: SA **Location:** near Fort Good Hope and near the Blackwater River

2003 Winter Baseline Noise Monitoring Program in the Sahtu Settlement Area

Mackenzie Project Environment Group did not conduct winter baseline noise monitoring fieldwork in 2003.

110 **Physical Sciences**

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File No: 12 402 670 **Licence No:** 13473
Region: DC **Location:** select locations for potential facilities, infrastructure and granular resources related to the development of the Mackenzie Gas Project

2003 Summer Baseline Noise Monitoring Program in the Deh Cho Region

In 2003, MPEG conducted baseline noise monitoring at Blackwater River, Trail River, and Trout River in the Deh Cho Region. The noise monitoring equipment included a microphone, a sound level meter, a digital sound recorder, and a portable weather station. At each site, the equipment was set up and left it for 24 hours or longer. The sites were accessed by helicopter. A sound survey was conducted at Blackwater River. The observed sources of noise at this site were the wind, rain, birds, aircraft, and a low frequency sound that could have been caused by the Enbridge pump station. A sound survey was conducted at Trail River. The observed sources of noise at this site were the wind, birds, and insects. A sound survey was also conducted at Trout River. The observed sources of noise at this site were the wind, wind in the trees, birds, insects, and the occasional distant aircraft.

111 **Physical Sciences**

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File No: 12 402 670 **Licence No:** 13471
Region: IN **Location:** select locations for potential facilities, infrastructure and granular resources within the project corridor in the Gwich'in Settlement Area

2003 Summer Baseline Noise Monitoring Program in the Gwich'in Settlement Area

Mackenzie Project Environment Group did not conduct any summer baseline noise monitoring surveys in the Gwich'in Settlement Area in 2003.

112 **Physical Sciences**

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File No: 12 402 670 **Licence No:** 13470
Region: IN **Location:** Niglintgak, Taglu and Parsons Lake lease sites, as well as at select potential locations for facilities, infrastructure and granular resources

2003 Summer Baseline Noise Monitoring Program in the Inuvialuit Settlement Region

In 2003, Mackenzie Project Environment Group conducted baseline noise monitoring at Niglintgak, and Parsons Lake in the Inuvialuit Settlement Region (ISR). The noise monitoring equipment included a microphone, a sound level meter, a digital sound recorder, and a portable weather station. At each site, the equipment was set up and left in place for 24 hours or longer. A sound survey was conducted at Niglintgak. The observed sources of noise at this site were the wind, birds, and insects. A sound survey was also conducted at Parsons Lake. The observed sources of noise at this site were the wind, birds, and insects. A sound survey was conducted near the Inuvik Facility. The observed sources of noise at this site were the wind, rain, distant air traffic, birds and insects.

113 **Physical Sciences**

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File No: 12 402 670 **Licence No:** 13472
Region: SA **Location:** select locations for potential facilities, infrastructure and granular resources related to the development of the Mackenzie Gas Project

2003 Summer Baseline Noise Monitoring Program in the Sahtu Settlement Area

In 2003, MPEG conducted baseline noise monitoring at Little Chicago and Norman Wells locations in the Sahtu Settlement Area. The noise monitoring equipment included a microphone, a sound level meter, a digital sound recorder, and a portable weather station. At each site, the equipment was set up and left in place for 24 hours or longer. The Little Chicago site was accessed by helicopter. The Norman Wells site was accessed by quad. A sound survey was conducted at Little Chicago. The observed sources of noise at this site were the wind, rain, birds, and insects. Additionally, the sound of one distant airplane was recorded during the survey. A sound survey was also conducted at Norman Wells. The observed sources of noise at this site were the Imperial Oil facility, wind, birds, rain, fixed wing aircraft, helicopters, thunder, and insects.

114 **Physical Sciences**

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Region: DC **Location:** Lower Liard River valley

Connectivity and Storage Functions of Channel Fens and Flat Bogs in Northern Basins

The hydrological response of low relief, wetland-dominated zones of discontinuous permafrost is poorly understood. This poses a major obstacle to the development of a physically meaningful hydrological model for the Mackenzie Basin. This study examines the runoff response of five representative study basins (Scotty Creek, and the Jean-Marie, Birch, Clackstone and Martin Rivers) in the lower Liard River valley as a function of their major biophysical characteristics. High resolution IKONOS satellite imagery was used in combination with aerial and ground verification surveys to classify the land cover and to describe the wetland area connected to the drainage system. Analysis of the annual hydrographs of each basin over a four year period demonstrated that runoff was positively correlated with the drainage density, basin slope, and the percentage of the basin covered by channel fens, and was negatively correlated with the percentage of the basin covered by flat bogs. The detailed analysis of the water-level response to summer rainstorms showed that the water was slowly routed through channel fens with an average flood speed of 0.23 km/h. The flood-wave velocity appears to be controlled by channel slope and hydraulic roughness, suggesting that a roughness-based routing algorithm might be useful in large-scale hydrological models.

115 **Physical Sciences**

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File No: 12 404 587 **Licence No:** 13425
Region: IN **Location:** near Inuvik (Campbell Creek) and Paulatuk and along the transect between Inuvik and Paulatuk

Trace Contaminant Transformation and Fate in Northern Ecosystems

The objective of this study was to determine the toxicological risks posed to arctic fauna ingesting arctic and sub-arctic plant species grown in polycyclic aromatic hydrocarbon (PAH) contaminated soil. PAHs are a group of compounds produced during the burning of organic matter such as petroleum oil and are toxic to mammals including humans. In this study, the researchers hypothesized that different plant species can take up these compounds at different rates from the environment due to structural and cellular differences between species. As a result, mammals that ingest plants as a food source could be exposed to these compounds through their diet. We found that of the six plant species tested, (black spruce, labrador tea, bog birch, green alder, water sedge, little-tree willow) green alder contained the highest bioaccessible PAH concentrations. The bioaccessible PAH concentration is the concentration of PAHs that is released from the plant upon digestion and is able to be absorbed by the mammal. Plants grown on a PAH contaminated site had on average 1.8x greater bioaccessible PAH concentration in their leaf tissue compared to plants from the reference site. Incidentally, it was also discovered in this study that black spruce had a preventative effect on the toxicity of PAH compounds, which may be the mechanism behind its therapeutic properties as reported by Native Americans.

116 **Physical Sciences**

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Region: IN **Location:** within the Town of Inuvik

Investigation of the Long Term Stability of Survey Monuments in Permafrost

In summer 2003, the Geodetic Survey of Canada's permafrost monumentation test-bed at Inuvik was measured using precise leveling and global positioning system (GPS) methods. The objectives of this campaign were to discover the long-term stability of a variety of survey monuments founded in permafrost and to ascertain the feasibility of using GPS as a measurement tool in heightening such monuments. The overall aim of the project was to find out whether or not the combination of survey and GPS measurements could be used to monitor deformation due to gas extraction when production commences in the lower Mackenzie delta. The data collection phase was accomplished successfully, and the data has allowed the investigators to make several decisions on the objectives: 1) that DGPS measurement has an accuracy of around 12mm ± 8mm in the north with current field and data processing methods; 2) that the stability of survey monuments is extremely variable depending not only on type of monument and depth of foundation, but on the material through which the monument is drilled/driven; and 3) since it is unlikely that this combination will give accuracy sufficient to enable an annual campaign, studies into the alternative method of differential interferometric synthetic aperture radar (DINSAR) would be appropriate.

117 **Physical Sciences**

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Region: IN **Location:** Banks Island (within Aulavik National Park)

Biocomplexity of Frostboil Ecosystems

The goal of this project was to understand the complex linkages between biogeochemical cycles, vegetation, disturbance and climate across the full summer temperature gradient in the Arctic in order to better predict ecosystem responses to changing climate. The focus was on frostboils. The process of frostboil formation is currently poorly understood, so full knowledge of the biogeochemical system first requires a better understanding of the process of frost heave itself and how it is modified by interactions with climate and vegetation. The focus of this study was on the interactions between soils, climate and vegetation, and the way that these interactions control the patterns of bare soil and vegetation that are found in the Arctic. Often these patterns form circular features known as frostboils or frost scars. The researchers spent a few weeks in the Green Cabin area on, Banks Island, looking at, measuring and sampling the air, soils and vegetation. Approximately three areas that represent the common vegetation communities were selected for the study. In each area, the researchers marked a 10 m x 10 m grid, described and mapped the vegetation in the grid, and dug a pit near each grid to examine the soils. A small amount of vegetation and soil was collected for analysis. Temperature sensors were put in place at each grid and left there to measure air, ground and soil temperatures for several years. These observations will be compared with results from a similar study in Alaska.

118 **Physical Sciences**

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File No: 12 404 599 **Licence No:** 13424
Region: SS **Location:** Slave River Delta, in the vicinity of Fort Resolution

Paleohydrological and Paleoecological Reconstruction of the Mackenzie Delta Basins

This research program is centred on developing high-resolution 1000-year hydro-ecological histories in the Mackenzie Basin Deltas (MBDs) from multi-proxy analyses of lake sediment cores supported by comprehensive field-based studies of modern hydrology and limnology. During summer of 2003, a multi-year study on the modern hydro-ecology of the Slave Delta was initiated. The aim of this research is to improve knowledge of changes in lake water balance and chemistry and the subsequent response of aquatic communities and habitat over seasonal and annual time-scales under varying climatic and hydrological conditions. The focus was mainly on six lakes. Water samples were collected every two weeks for analysis of oxygen and hydrogen isotope composition, major ions, dissolved organic carbon, and nutrients. Data loggers were installed to obtain continuous records of lake conductivity and water temperature. Stable isotope and water level data are being used to quantify seasonal variations in lake water balance using isotope-mass balance models which will then be related to seasonal variations in limnological parameters using statistical techniques. Aquatic macrophytes were collected along transects to assess species biomass and associated epiphytic diatoms, and to establish relationships between hydro limnological conditions and aquatic habitat. In addition, 20-30 cm-long sediment cores were obtained from these lakes for multi-proxy analysis and reconstruction of past hydro-ecological variability.

SOCIAL SCIENCES

119 **Social Sciences**

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File No: 12 404 586 **Licence No:** 13393
Region: IN, NS, SS **Location:** Inuvik, Yellowknife, and Fort Good Hope

Collaborative Approaches to Ecosystem Management in Indonesia: Learning From Experience in Canada's North

In Indonesia, indigenous groups are articulating a demand for rights to lands and resources and a greater role in processes of development and change. There is also an increasing emphasis on negotiating partnerships and collaborative management arrangements. There is much to learn from experiences with co-management in Canada's North and the objective is to better understand these experiences and explore their potential application in a place like Indonesia. This research involved semi-structured telephone or in-person interviews and focus groups with co-management board staff and officials, HTC members, and other relevant community members, government and non-government representatives. The Research Ethics Board of Wilfried Laurier University had determined that this research is ethically sound.

120 **Social Sciences**

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File No: 12 410 548 **Licence No:** 13420
Region: SA **Location:** Sahtu Settlement Communities

Sahtu Settlement Harvest Study

The Sahtu Settlement Harvest Study is an important project required under the Sahtu Land Claim Agreement (1993). The Sahtu Renewable Resources Board is responsible for conducting this project. This study counted the numbers of fish and wildlife harvested by Sahtu Dene and Métis until 2003 (5-year study). The Board will use this information to meet two specific objectives: (1) to establish the minimum needs of Sahtu Dene and Métis; and (2) to be used as a tool in natural resource management in the Sahtu region. The Harvest Study is a 5-year, 5-community study. Each month, in each community, a local interviewer collected fish and wildlife harvest information in their community using a brief face-to-face interview. All adult Sahtu Dene and Métis and a select group of adult non-beneficiaries who provide for their Dene-Métis families were interviewed every month. Numbers and general locations of all fish and wildlife species harvested were collected. Confidentiality is maintained through use of harvester ID numbers. With the increase in oil and gas development in the region and the proposed Mackenzie Valley pipeline, Sahtu communities believe that it is essential that the Harvest Study data collection continue during pipeline construction and hydrocarbon development to capture information about subsistence harvest.

121 **Social Sciences**

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Region: NS **Location:** Yellowknife

Therapists' Professional and Personal Perspectives on Professional Practice in a Small Remote Community

This research investigates three mental health therapists' perspectives on working and living in a small remote community. The particular issues studied with regard to the therapist/client relationship include: client confidentiality, lack of personal privacy and anonymity, isolation, dual relationships and a lack of professional development and resources. These results reflect the information received from the three therapists narratives in response to interviews and therapist feedback. It involved interviews with three therapists living in the same geographic area. The interview questions relate to personal experiences and perspectives on their professional practice within this remote setting. Each participant was interviewed individually. Interviews were recorded on audiotape for later transcription by the researcher, and the audiotapes were destroyed upon completion of the study. Confidentiality will be maintained.

122 **Social Sciences**

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Region: IN **Location:** Inuvik and Aklavik

Local and Regional-Scale Societal Dynamics in Grizzly Bear Conservation

Grizzly bears are strong symbols with different meanings to different people. Wildlife management programs based solely on biology and without clear understanding of the human side of grizzly bear management run the risk of creating serious conflicts - especially with people who share landscapes with bears and are affected by those decisions. These conflicts can waste much time and money, and generate mistrust and bad feelings among the people involved. The goal of this study is to better understand how such conflicts arise, in order to help people involved in wildlife management to resolve or avoid such situations. Grizzly bears are managed in different ways in northern and southern Canada, which provides opportunities to study how a range of social and cultural factors might influence grizzly bear management. This study is being conducted in: Baker Lake, Nunavut; Jasper National Park, Alberta; the Kluane region, Yukon; and the Yukon/NWT North Slope. Histories of these four grizzly bear management programs are being built by interviewing people involved in and affected by bear management, and reviewing agency and scientific documents. Forty-nine interviews have been conducted with 51 people. The researcher is examining how the different mixtures of social and cultural factors in those places have influenced how grizzlies are managed there. He is concentrating on how people in grizzly bear management systems work together, who is involved, how they learn as a group from their experiences, and how science and traditional knowledge are used in these management processes. Community members are involved in this research whenever possible.

123 **Social Sciences**

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Region: IN **Location:** Fort McPherson

Teetl'ıt Gwıch'ın Heritage Places Project

This project, which is carried out in collaboration with the Gwich'in Social and Cultural Institute (GSCI), aims at documenting places that are of heritage significance to the Teetl'ıt Gwıch'ın. Throughout their long history of habitation in the Peel River drainage, these people have developed an intimate relationship with their homeland. The landscape is dotted with hundreds of places that have been named and which have stories associated with them. These include resource harvesting areas, trails, campsites, burials, and legendary/powerful sites. Although their life has undergone many changes within the last decades, the Teetl'ıt Gwıch'ın rely greatly on the land for their subsistence, and many places still play an important role in the maintenance of their culture and traditions. The fieldwork for this study took place over three consecutive years and involved a ten-month residency in Fort McPherson. Interviews and a questionnaire have been used to learn about the places the Teetl'ıt Gwıch'ın value, define how these were traditionally kept or regarded, and determine how they should be cared for in the present context.

124 **Social Sciences**

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Region: SS, DC **Location:** Hay River, Yellowknife, Fort Providence, Fort Smith and Fort Resolution

Aboriginal Involvement in Wood Bison Projects

The goal of this study is to develop "best-practice" implementation and management guidelines for Wood Bison recovery projects involving Aboriginal communities in north-western Canada. It also has the goal of identifying how Aboriginal and Treaty rights can be integrated in collaborative natural resource management projects in Canada. Field research in the Northwest Territories in 2003 involved a field trip by road to five communities involved in Wood Bison projects (Fort Resolution, Fort Smith, Hay River, Fort Providence, and Yellowknife). A total of 15 interviews with Aboriginal people and government employees involved in Wood Bison projects were conducted, and 3 recovery projects were visited. The interviews aimed to identify criteria that would improve the likelihood of success of Wood Bison projects (including management of Wood Bison in Wood Buffalo National Park). In addition, three archives were consulted for material related to the project (RWED archive, Ft. Smith, Parks Canada library, Ft. Smith, and the Prince of Wales Museum Archives, Yellowknife).

125 **Social Sciences**

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Region: NS **Location:** Yellowknife

Non-Governmental Involvement in Policy Development in the NWT

The main objective of the project was to assess the nature and saliency of non-governmental organizations in the Northwest Territories through an analysis of non-governmental participation in policy development. Secondary data was gathered through three policy case studies: the Social Agenda Initiative; the Protected Areas Strategy; and the Legislative Review of the Official Languages Act. Primary data was gathered in Yellowknife during August 2003 through 20 personal interviews conducted with representatives of non-governmental organizations, GNWT public servants, and Members of the Legislative Assembly. Results indicate that non-governmental organizations play an important role in policy processes through their participation in a variety of partnership arrangements. Collaborative partnerships among public governments, Aboriginal governments, and non-governmental organizations are pursued based on respect for the principle of local control and a need to increase legitimacy for policy decisions. The study found that partnership networks in the NWT: are particularly useful for improving relationships among diverse stakeholders; improve decision-making processes through the inclusion of technical and/or cultural knowledge and public values; present a challenge for NGOs to participate due to low financial or human resource capacity; have a high level of legitimacy for partnership policy processes, though legitimacy is diminished when policy outcomes do not reflect non-governmental stakeholder input.

126 **Social Sciences**

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Region: DC **Location:** Sambaa K'e and Jean Marie River

Recognizing Differences: Dene woman's involvement in Traditional Dene Games

This study, conducted in Jean Marie River and Fort Simpson, was an extension of the research that was done in Trout Lake, Northwest Territories. This research examines woman's involvement in traditional Dene Games and other physical practices. The researcher conducted semi and unstructured interviews with community members. In particular, this project focused on oral traditions and community recollections concerning participation in traditional games, sport, recreation, and physical activity. Discourses concerning gender equity and notions of tradition were frequently employed by participants to explain changes to/maintenance of participation in physical practices. Other factors seen as influencing participation in physical practices included: increased access to outside communities due to the construction of roads; the influenza pandemic of the early 1900's, lack of a variety of resources (financial, structural, emotional); drugs and alcohol; television; increased mechanization of daily life; and bingo. Fieldwork in Fort Simpson continued until the end of March 2004. Presentations of the research to the three communities that participated in the research will be conducted in winter 2005.

127 **Social Sciences**

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Region: DC **Location:** Fort Simpson

Factors Influencing Physician Recruitment and Retainment in Fort Simpson

This study examined the factors influencing physician recruitment and retainment in Fort Simpson. Through a search of historical documents and word of mouth, 44 former physicians were identified and 10 were contacted. The physicians were interviewed in person, or by telephone, email or fax. Several factors influencing recruitment and retention were discovered. Among the most commonly cited reasons for venturing to Fort Simpson: a desire to work in an adventurous location; wanting to work in an under serviced area; and a wish to work with aboriginal people. There were four different groups of doctors that worked in Fort Simpson: the new medical graduates, those having a midlife crisis, those approaching retirement, and doctors from other countries who were trying to gain a Canadian medical licence. Many different reasons eventually led doctors to leave Fort Simpson. Some of the most commonly cited reasons for leaving were: a perception that the local schools were of substandard quality; a desire to escape the "politics" of the local health authority; a wish to be able to regularly attend continuing medical education events; and a need to have a less onerous on-call schedule.

128 **Social Sciences**

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Region: IN **Location:** Inuvik

Local Communities and Environmental Groups in Finland, Canada and the United States: Reducing Land Use Conflict in Arctic Wilderness Areas

This study was conducted in Inuvik to collect information for a case study of how local control affects levels of political conflict in managing Ivvavik National Park. The researcher interviewed several people, first asking them to read and sign an informed consent form. In October 2003, the researcher attended a meeting of the Inuvialuit Game Council in Whitehorse, where a brief presentation of the study was given and approval was received to conduct future interviews. In the fall interview notes were prepared and sent to interviewees to check for accuracy. Documents that were collected while doing fieldwork in Inuvik were analyzed. The Inuvialuit Joint Secretariat and Parks Canada were particularly helpful in the researcher's efforts to collect materials needed for the project. There are no research findings to report until the work on Ivvavik National Park is compared with the case studies of wilderness politics in Finnish Lapland and Gates of the Arctic National Park in Alaska.

129 **Social Sciences**

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File No: 12 410 594 **Licence No:** 13398
Region: IN **Location:** schools in the Beaufort Delta District

Administrative Changes in the Integration of Fetal Alcohol Spectrum Disorder Students into Northern Canadian Schools

This study began using action research but quickly altered course and utilized a comparative case study approach. There were three schools in the study described as large, mid-sized, and small. The schools utilized different approaches in their attempts to integrate the students with Fetal Alcohol Spectrum Disorders (FASD) into the mainstream of the student body. One of the most prominent findings from the data was that the approach utilized varied according to the size of the school and the community where it was situated. The large school and community had more resources with which they could address the problem. This was contrasted by the more personal approach in the mid-sized school whereas the small school utilized a family atmosphere and concern for the students with FASD. In each of the cases, attempts were made to adapt the school to the particular needs of the students with FASD and each school felt that they enjoyed some success with their approach. Recommendations from the study include early intervention coupled with full-time Kindergarten to give the best possible start to formal education for these children. The adaptation of the curriculum for students with FASD is seen as essential and, where possible, a more practical curriculum with an on the land component is recommended.

130 **Social Sciences**

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Region: DC **Location:** Fort Simpson

Aboriginal Housing Assessment: Community Design Needs and Preferences

This study is part of a national program to gather information on Aboriginal housing design needs and preferences and on the use of local materials for housing construction by Aboriginal communities in Canada. For the past three to four decades, most of the housing in First Nations communities across Canada has been, and continues to be, constructed based upon "urban" designs and imported materials. In remote communities material freight costs amount to approximately half the total unit cost. Overcrowding, house design limitations and low-end building materials combine to reduce the life expectancy of housing units. These factors also result in high maintenance costs and contribute to air quality problems. This research facilitates knowledge transfer from Aboriginal communities that have implemented housing programs, incorporating alternative and culturally appropriate housing designs and local building materials, to other communities that may not be aware of other housing options. This knowledge transfer was achieved by undertaking a study to assemble relevant information, including lessons learned, and compiling the information into an audience appropriate report. One staff member of the Centre for Indigenous Environmental Resources travelled to Fort Simpson by plane to visit Liidlii Kue First Nation and Forth Simpson Metis Nation, to meet with the Councillor or official most involved in housing, the Chief (if he or she choose to be involved), and one or two homeowners and Elders to determine housing needs and preferences. The information was gathered through interviews and photographs.

131 **Social Sciences**

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Region: IN **Location:** Holman, Winter Cove Area

Long-Term Copper Inuit – European Intersocietal Interaction

Sociocultural investigations were conducted in conjunction with archaeological investigations. A series of oral interviews were done with elders from Holman. All interviews were initiated and carried out according to strict professional and ethical standards and are now being analyzed according to project plans and schedule. The archeological investigations in the Walker Bay area were initiated according to plans and were successfully carried-out. After completing both the sociocultural and archeological components of the project, the principle investigator delivered presentations on project findings to date to both the Olokhaktomiut Hunters and Trappers Committee and the Holman Community Corporation. These organizations have provided outstanding support to the project and have expressed interest in further collaborative efforts. Research will continue in 2004.

132 **Social Sciences**

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Region: SS **Location:** Hay River

Hay River Youth Disposition Panel: Perceptions and Experiences of Participants

The Hay River Youth Disposition Panel started in January 1997, the first program of its kind in Canada. A panel of twelve students from Diamond Jenness Secondary School sits in youth court to hear cases such as vandalism, alcohol-related offences, violating probation, theft, etc. Once guilt has been determined, students discuss the case in private and return to present their sentencing recommendation to the judge. The judge can accept, modify or reject the recommendation. This program is based on the principle that peer pressure is a strong force in the lives of teenagers and can be used to influence behaviour in a positive way. He often accepts or makes minor modifications to the recommendations. Sixteen current and former panel members were interviewed about why they joined the panel, their experience of being on the panel and the training they received. Many had only been exposed to the justice system through television dramas. They saw the panel as a chance to see first hand how the justice system works. Participants said they learned how courts operate, as well as the challenge of choosing a sentence that combines punishment, deterrence and restitution. It also gave them a sense of responsibility and a role within a society that doesn't often give young people a voice.

133 **Social Sciences**

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Region: NS **Location:** Yellowknife

Bridging Restorative Justice and Crime Prevention through Social Development

This study investigated the opportunity to improve linkages between restorative justice and crime prevention through social development initiatives by defining them and exploring their inter-relationships. It was hoped study results might bridge information gaps between these two social development approaches, which could lead to permanent positive change and improve social cohesion within Yellowknife. Sponsorship of this study was provided by the National Crime Prevention Centre of Canada's Northern Regional Director in hopes of enabling a seamless, integrated approach to crime prevention through social development, restorative justice initiatives, and aboriginal justice strategies that arise from native self-governance. The research component of this study involved numerous individual interviews (8) and two focus group sessions. Research findings were presented to the general public at the Great Hall of the Legislative Assembly on September 8th, 2004. Research results proved that, while the public majority is unaware of the link between restorative justice and crime prevention through social development, people who participated in interviews, focus group sessions, or the research findings presentation did substantially expand their knowledge and understanding of the linkages and differences between these two concepts. This increased awareness provided some opportunity to meet social and restorative needs in the community.

134 **Social Sciences**

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Region: IN, DC, NS **Location:** Inuvik, Fort Simpson, Rae-Edzo, and Fort Smith

Self-Care and Aboriginal Social Work Managers in Rural/Remote Northern Communities

The findings suggest that for some of the participants the personal costs of working in rural/remote Northern communities have been high. Stressors identified by participants include; a lack of privacy and anonymity, ethical challenges to practice, inadequate staffing levels (leading to a change in their performance of front line and/or on call duties), and a lack of understanding by community members and/or employers of their job function. They noted the effects of job stress on their physical and mental health. Due to the relative isolation of their communities, participants are often unable to 'escape' tensions that arise as a result of the job. Co-workers and family are cited as the primary sources of support for participants. Self-care is generally limited to individual coping methods. While participants believe that finding ways to care for one's self is an individual responsibility, they did relate a desire to have more involvement with peers and colleagues at a regional and/or territorial level. However, distance and expense limit the opportunities for peer networking. The findings reveal how crucial self-care and support is to participants' well being and ultimately their relationships with clients and the community.

135 **Social Sciences**

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Region: NS **Location:** Yellowknife

Stages of Change Profiles in Adolescent Clinical Treatment

The Transtheoretical Model suggests that the stage of change should be determined for individual psychotherapy clients and therapeutic interventions should be matched to the stage of change demonstrated by each client. This study generated stage of change profiles for a sample of adolescents seeking psychotherapy in clinical settings, and compared these results with those reported from a sample of adult psychotherapy clients. Minimal differences between adult and adolescent psychotherapy clients were uncovered. On intake, the adolescent psychotherapy clients in this study did not demonstrate a pervasive resistance to addressing change through psychotherapy. A general willingness to consider identified problems and issues was evident. The literature supports the conviction that adolescents manifest resistance to psychotherapeutic intervention and restricted levels of motivation during psychotherapy. In cases where these problems arise, failure to match the client's stage of change with interventions appropriate for that stage might be a contributing factor. This mismatch might hold particular significance for adolescent clients who are developmentally sensitive to issues of autonomy and identity development. Psychotherapeutic interventions with adolescent clients that consider the stage of change demonstrated by the adolescent hold the potential for improved effectiveness in retaining adolescent clients in therapy and improving the general outcomes of psychotherapy.

136 **Social Sciences**

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Region: IN **Location:** Inuvik

Am I Sami? Identity Maintenance and Identity Change Among Sami Immigrants in North America

This study examines Sami identity among Sami descendants in North America. Sami, formerly known as Lapplanders, emigrated from Scandinavia to Canada and USA beginning in the late 1800s to teach reindeer herding and to look after the herds. Interviews were conducted with Sami descendants in the Inuvik area. The interviews were taped and later transcribed. Interviewees had the option of remaining anonymous or of using their names. Interviews focused on Sami identity and traditions. The researcher traced Sami traditions to see what has been passed down through the generations, what has been considered important to keep and what has not. This study contributes to Sami history and immigration history in Scandinavia and Canada.

137 **Social Sciences**

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Region: SS **Location:** Fort Smith

Integrating Elders Experience of Past, Present, and Future

The objective of this study was to understand the process whereby Aboriginal elders in the community of Fort Smith have engaged in exploring and responding to historical events over the past century. This study describes Aboriginal elders' experiential and culturally based perceptions of community history, as compared to western accounts, and explores whether these perspectives have influenced strategies used to relate to western institutions. At this time, the researcher conducted interviews with Metis elders only. This research may benefit the community by collecting important accounts from elders and using this material in community development and educational contexts. Information gathered was to be presented in community forums and a community summary report was written and distributed. With community support, the possibility would exist to use this material to produce a book on community history.

138 **Social Sciences**

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Region: NS **Location:** Rae-Edzo, possibly also Wha Ti and Wekwati

Dogrib Textual Studies

This research project aims to produce a book and CD of Dogrib stories and their English translations for Dogrib people and others interested in Dogrib culture and language. The research in 2003 was mostly done at the University of Victoria, preparing for working with elders and others in the Dogrib region in 2004 and 2005. Two students at the University of Victoria researched syllables and vowels in Dogrib to help in understanding Dogrib spelling and grammar. Three presentations on Dogrib grammar were given at conferences.

139 **Social Sciences**

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Region: IN **Location:** Inuvik, Aklavik, Holman, Paulatuk, Sach's Harbour, and Tuktoyaktuk.

Development of a Strategy to Engage Inuvialuit Youth in Oceans Stewardship

This research presents and supports a proposed strategy to engage Inuvialuit youth in oceans stewardship with the purpose of fostering increased Inuvialuit youth interest and participation in oceans stewardship activities. The objectives of the research were: a) to assess trends of Inuvialuit youth participation; b) to evaluate reasons for the trends; c) to identify components of a successful strategy to engage youth; d) to examine programs outside the ISR to identify principals and techniques to encourage youth involvement; and e) to make recommendations for a strategy to engage Inuvialuit youth in oceans stewardship. The research methodology included making a preliminary visit to the communities of Inuvik and Tuktoyaktuk to begin community consultations; establishing working relationships with local people by visiting with community leaders, people at their homes, and attending local resource management board and committee meetings; gathering data through focus groups with youth and interviews with Inuvialuit elders, parents, local resource managers, past and present teachers, and environmental stewardship program administrators; and verifying the research findings by preparing a summery report and then returning to the communities to present findings to the research participants, community organizations, and the public at large. Key findings of the research include: A proposed strategy was developed and attempts to address both directly and indirectly many of the issues facing youth including; a lack of support to complete their education and the lack of opportunities available to spend extended periods of time on the land and ocean; Youth share the feeling with elders, community leaders, and local resource managers that they are unprepared to take on ocean stewardship responsibilities from their elders; Youth also feel short changed in terms of the quality of formal education that they are receiving. Inuvialuit youth have expressed a desire to participate in ocean stewardship activities but to date there have been limited opportunities for their involvement. The main recommendation of the research is the adoption of the proposed strategy.

TRADITIONAL KNOWLEDGE

140 **Traditional Knowledge**

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Devon Canada Corporation – Traditional Knowledge Study for the Proposed Beaufort Sea Offshore Drilling Program

Devon Canada Corporation is proposing to commence an offshore oil and gas exploratory drilling operation in the Beaufort Sea in 2005/6. Exploratory work would take place over a three to five year period on exploration lease (EL) 420 in the Inuvialuit Settlement Region. Kavik-AXYS Inc. undertook a traditional knowledge study to; 1) collect traditional knowledge information to contribute to a community-based approach to the impact assessment for the Devon Offshore Exploratory Drilling Program; 2) facilitate meaningful participation of local communities in the impact assessment process; and 3) ensure compliance with the regulatory requirements for the collection and application of traditional knowledge in the impact assessment process. Traditional knowledge studies in the context of impact assessment have two major objectives. The first is to work with people from local communities to obtain information to assist in the assessment of potential impact to traditional activities and relationships. The second objective is to obtain traditional knowledge information that can be used to improve the biophysical and social impact assessment. This study focused on collecting information from Inuvialuit elders and harvesters. Twenty to twenty-five members from each community were interviewed. The area of concern was the lease area (EL 420) and adjacent lands. Participants were asked to discuss their perceptions of the potential impact of the project on community health and wellness, and their knowledge of traditional use in these areas. They were also asked to share their traditional knowledge regarding the various components of the impact assessment.

141 **Traditional Knowledge**

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Region: DC **Location:** Fort Simpson

Traditional Knowledge Studies for the Mackenzie Gas Project within Liidlii Kue First Nation Traditional Territory

This study involved collecting existing Traditional Knowledge information, gathering new information, and producing a Traditional Knowledge report. A cooperative approach was developed involving Mackenzie Gas Project (MGP), Mackenzie Project Environment Group (MPEG), Liidlii Ku'e First Nation and Metis Nation of Fort Simpson. Project management was provided by Nogha Geomatics Ltd. which included, in cooperation with MPEG and MGP, establishing a Traditional Knowledge Working Group, determining community participation, determining the types of information that were documented, defining the study area, collecting data through interviews, verifying the accuracy of the data, writing reports, controlling and using the data, and input in a GIS format compatible with the format used by MGP. It was anticipated that the study document information related to wildlife, birds, fisheries, vegetation, historical/cultural/spiritual sites, climate, soil conditions, hydrology and hydrogeology, human health, cumulative effects and other relevant social, economic and environmental issues. The primary area of interest for this study encompassed 10 km each side of the proposed pipeline corridor, reflecting areas likely influenced by project effects on traditional uses, environmental components (e.g., fish, vegetation, wildlife) and communities. Areas of potential granular and infrastructure sites were also included.

142 **Traditional Knowledge**

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Region:IN **Location:** Tuktoyaktuk, along the Anderson River

Tuktoyaktuk Place Names Project

During this study, time was spent in Tuktoyaktuk to get photographs of named places that had been identified by Tuktoyaktuk elders. The photographs will be used in verifying information on named places with elders, and in a publication on those places and their use. A day trip by boat was taken east towards Igluk during which locations were identified. Another day was spent going west towards Kitigaaryuit. A day trip was taken by helicopter south along the Anderson River to just past Husky Bend. Photographs were taken of places at Husky (Eskimo) Lakes on the way to and from the Anderson River. Information on named places was also sought through a review of some oral histories that were made between the 1950s and mid-1970s. Two days were spent at the Anglican Synod Archives in Toronto looking for old photographs of the named places. The project continues into 2004-2005 with work to be completed consisting of further verification of information with elders, some additional archival research, production of the final draft, and its review by Tuktoyaktuk elders.

143 **Traditional Knowledge**

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File No: 12 410 522 **Licence No:** 13394
Region: NS **Location:** Lutsel K'e

Social-Ecological Indicators for Community-Based Monitoring and Resource Management

This project involved the documentation of existing sources of traditional knowledge previously recorded with Lutsel K'e Dene First Nation through the West Kitikmeot Slave Study Society. The main focus of this project was on social and ecological health issues, indicators and monitoring. The community of Lutsel K'e and the researcher worked together according to the terms and conditions of a formal research agreement previously negotiated between the proponent and the community.

144 **Traditional Knowledge**

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Region: IN **Location:** Fort McPherson

Social-Ecological Indicators for Community-Based Monitoring and Resource Management

The goal of this project was to examine sustainable forest management through social-ecological indicators of community and ecosystem health in the Gwich'in Settlement Area. The growing body of traditional ecological knowledge (TEK) that has been documented in the last two decades has provided insights into the relationships between indigenous communities and their environment. Land-based cultures require healthy ecosystems; hence healthy communities require healthy environments. Until recently, relatively little attention has been focused on the social dimension of the human environment relationship. This gap is addressed by developing social-ecological health indicators based on local TEK, with particular attention to forest ecosystems and non-timber related resources. This study proposed to find ways to integrate social-ecological indicators into a participatory resource management framework. Contributions were made to the theories of managing multifunctional forest environments, while generating practical tools to address both community and environmental health issues. This project involved working with the Gwich'in Renewable Resources Board, the Tetlit Gwich'in Renewable Resources Committee and elders/harvesters from Fort McPherson. The main focus of the project was on berries and berry harvesting. Specific goals included: identifying signs and symbols traditionally used by the Gwich'in to recognize changes in the community and environment; understanding how the Gwich'in traditionally watched, listened, learned, understood and adapted to these changes.

145 **Traditional Knowledge**

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Region: DC **Location:** Trout Lake

2003 Socio-Economic and Traditional Knowledge Studies in the Deh Cho Region

Ten communities within the Deh Cho Region (DCR), Wrigley, Fort Simpson, Trout Lake, Jean Marie River, Fort Liard, Nahanni Butte, Fort Providence, Hay River, Enterprise and Kakisha are included in the socio-economic study area for the Mackenzie Gas Project. In 2001 and 2002, existing socio-economic baseline data for these communities was collected, verified, and reported on, including information on: the local/regional wage and subsistence economies, population, labour force, community facilities, services, accommodations, local/regional infrastructure, community health, wellness and other social and economic indicator data. In 2003, efforts were concentrated on checking, updating, and verifying the data collected previously. In some cases community officials and local service providers were asked to provide additional information or validate information. DCR communities within the Traditional Knowledge (TK) Study area for the Mackenzie Gas Project are Wrigley, Fort Simpson, Jean Marie River, Trout Lake and Kakisa. Separate TK studies will be undertaken for each community. In Wrigley, 2003 activities focused on discussing the TK study process with the Pehdzeh Ki First Nation. In Fort Simpson, the Liidlii Kue First Nation and Fort Simpson Métis negotiated a contract with the project proponents and initiated a TK study. Nogha Geomatics is participating in the study as a community contract authority (see listing #141 in this document). 2003 focused on collecting TK information and writing reports. In Jean Marie River, 2003 activities focused on discussing the TK study process and negotiating a contract with the Jean Marie River First Nation. In Trout Lake, the Sambaa K'e First Nation negotiated a contract with the project proponents and initiated a TK study. The Sambaa K'e Development Corporation participated in the study as a community contract authority. Crosscurrent Associates was retained as a subcontractor to the Sambaa K'e Development Corporation. 2003 activities focused on collecting TK information and writing reports.

146 **Traditional Knowledge**

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Region: IN **Location:** Aklavik, Fort McPherson, Inuvik, and Tsiigehtchic

2003 Socio-Economic and Traditional Knowledge Studies in the Gwich'in Settlement Area

Four communities within the Gwich'in Settlement Area (GSA), Aklavik, Fort McPherson, Inuvik and Tsiigehtchic, are included in the socio-economic study area for the Mackenzie Gas Project. In 2001 and 2002, existing socio-economic baseline data for these communities was collected, verified and reported on, including information on: the local/regional wage and subsistence economies, population, labour force, community facilities, services, accommodations, local/regional infrastructure, community health, wellness and other social and economic indicator data. Most information was collected from existing sources and verified through discussions with community officials and local service providers. In 2003, efforts were concentrated on checking, updating and verifying the data collected previously and incorporating the results in draft regulatory filings. In some instances, community officials and local service providers were asked to provide additional information or validate information. These data collection and verification sessions occurred in person or over the telephone. Gwich'in communities within the Traditional Knowledge (TK) Study area for the Mackenzie Gas Project are Aklavik, Fort McPherson, Inuvik and Tsiigehtchic. Activities were geared towards developing detailed study methods, and negotiating contractual arrangements with the Gwich'in Social and Cultural Institute, which has agreed to participate as a study contractor and complete the TK study.

147 **Traditional Knowledge**

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Region: SA **Location:** Tuktoyaktuk, Inuvik, Aklavik, Paulatuk, Holman, Sachs Harbour

2003 Socio-Economic and Traditional Knowledge Studies in the Inuvialuit Settlement Region

Six communities within the Inuvialuit Settlement Region (ISR), Aklavik, Holman, Inuvik, Paulatuk, Sachs Harbour, and Tuktoyaktuk, are included in the socio-economic study area for the Mackenzie Gas Project. In 2001 and 2002, existing socio-economic baseline data for these communities was collected, verified and reported on, including: the local/regional wage subsistence economies; population; labour force; community facilities; services; accommodations; local/regional infrastructure; community health and wellness; and other social and economic indicator data. Most information was collected from existing sources and verified through discussions with community officials and local service providers. In 2003, efforts were concentrated on checking, updating, and verifying the data collected, and incorporating the results in draft regulatory filings. Inuvialuit communities within the Traditional Knowledge (TK) Study area for the Mackenzie Gas Project are: Aklavik; Inuvik; and Tuktoyaktuk. In 2003, organizational consultations with the Hunters and Trappers Committees, the Community Corporation and the Elders Committees in each of the study area communities were held. An ISR TK Study Working Group consisting of representatives from each of these organizations has formed and developed a detailed methodology for completing the study. Also, the Working Group recommended that the Community Corporations in each study area community participate as study contractors, and contractual negotiations commenced.

148 **Traditional Knowledge**

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File No: 12 402 670 **Licence No:** 13507
Region: SA **Location:** Colville Lake, Fort Good Hope, Norman Wells, Tulita and Deline

2003 Socio-Economic and Traditional Knowledge Studies in the Sahtu Settlement Region

Five communities within the Sahtu Settlement Area (SSA), Colville Lake, Deline, Fort Good Hope, Norman Wells and Tulita are included in the socio-economic study area for the Mackenzie Gas Project. In 2001 and 2002, existing socio-economic baseline data for these communities was collected, verified and reported on, including: the local/regional wage subsistence economies; population; labour force; community facilities; services; accommodations; local/regional infrastructure; community health and wellness; and other social and economic indicator data. Most information was collected from existing sources and verified through discussions with community officials and local service providers. In 2003, efforts were concentrated on checking, updating, and verifying the data collected previously. In some instances, community officials and local service providers were asked to provide additional information or validate information. Sahtu communities within the Traditional Knowledge (TK) Study area for the Mackenzie Gas Project include: Colville Lake; Deline; Fort Good Hope; Norman Wells; and Tulita. Meetings were held with representatives from aboriginal governmental organizations in each of these communities and a regional TK Working Group was formed. The Working Group developed detailed study methods and recommended that the Ernie McDonald Land Corporation, Tulita District Land Corporation and K'ahsho Got'ine Charter Community Council participate in the TK study as community contract authorities. The Project team distributed draft contract documents to each of these organizations for review. Subsequently, these community organizations decided to conduct TK studies on the basis of district lands. Negotiations to conduct district lands based TK studies were initiated.

149 **Traditional Knowledge**

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Region: IN **Location:** Campbell Uplift (south and west of the Inuvik airport)

Inuvialuit Ethnobotany

The goal of this project was to collect and document traditional uses and knowledge of plants in the Inuvialuit Settlement Region (ISR), to store this information in a permanent form for future generations of Inuvialuit, to promote and enhance education about Inuvialuktun language and culture as related to plant use within the ISR, and to educate present generations of Inuvialuit about conservation and sustainable use of these plants. Traditional Ecological Knowledge related to the use of plants for nutritional, medicinal, and structural uses was documented and stored. A literature and archival search on traditional uses of plants in the ISR was conducted. Information sessions and consultation with community members were held to determine the traditional plant harvesting sites that were visited, a trip schedule, and translation needs. Where possible, interviews were carried out on the land. Interviews were recorded in both audio and video formats. Small quantities of plant material were collected in order to prepare the plant in the traditional way. Specimens were also collected for preservation and to verify correct identification of species. This project includes Parks Canada and Inuvialuit Cultural Resource Centre.

150 **Traditional Knowledge**

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Region: SS **Location:** Bonifaces Cabin (61°15'95"N, 104°35'25")

Food Preservation, Return Rates and Its Implications for Storage

Fieldwork was conducted at Anaunethad Lake. The researcher traveled with members of the Black Lake Band from northern Saskatchewan to hunt and trap on this lake. The goal of this research was to record data on caribou hunting, butchering, preservation, and storage. Unfortunately, the caribou did not arrive in the area while the researcher was at the camp. However, data was collected on other resources like fish and moose. Information was recorded on the types of animals hunted and fish collected, how much meat was eaten, how much meat was processed for smoking and how food was distributed to other people in the camp. These circumstances led the researcher to understand the types of resources used when the caribou are unavailable and that winter is not the lean season as was originally assumed. Instead, the researcher realized the summer months were the lean time of year, which requires the use of dried and preserved meat.

151 **Traditional Knowledge**

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File No: 12 402 682 **Licence No:** 13527
Region: NS **Location:** Lac De Gras Mine site

Fish Palatability Study

As per subsection 35(2) 9 of the Fisheries Act, Diavik Diamond Mines Inc in cooperation with Department of Foreign Affairs and Aboriginal partners, developed and conducted a fish palatability and texture study at the Diavik mine site on Lac de Gras. In conjunction with this study, scientific samples were taken and sent for analysis to monitor fish populations and indices of fish health. The study took place over two days and included participants from Dogrib Treaty 11, Lutsel K'e, North Slave Métis Alliance and Yellowknife's Dene. Fish were collected from the lake and samples were taken for metallothionein and metals analysis, aging structures (fins or otoliths) were harvested, and whole fish were sent to Winnipeg for electronic sniffing and texture testing. Observations on fish weight, length, fecundity, stomach content and general health were also recorded. Participants were given questionnaires to fill in regarding the fish sampled for tasting in comparison with fish from their own communities. Each community collaborated as a group on rating the fish that were cooked for sampling. Fish were rated on how they looked before cleaning, during cleaning and how they looked and tasted once cooked. This study is to be repeated every five years but may be done more often as requested by the Aboriginal participants, and the fish in subsequent years will be compared to those caught in 2002 for the baseline study. No concerns in fish quality or condition were noted either from the scientific samples or from the community participants.

ARCHAEOLOGY PERMITS

152 **Archaeology**

Bussey, Jean
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Langley, BC

File No: (NWT Archaeologists Permit 2003-929)
Region: NS **Location:** Tibbitt to Contwoyto Winter Road

Archaeological Investigations Conducted Along the Tibbitt to Contwoyto Winter Road

In 2003, Jean Bussey of Points West Heritage Consulting Ltd. conducted archaeological investigations for the Joint Venture that operates the Tibbitt to Contwoyto (formerly the Lupin) winter road. Investigations were limited to a single field trip for the purpose of monitoring site markers installed in 2002. This is the third year that the Joint Venture has sponsored investigations as part of their commitment to ensure that future archaeological impacts are avoided or minimized.

In 2001, an archaeological inventory was conducted and resulted in the discovery of 55 new archaeological sites and the revisit of 14 previously recorded sites. Six of these sites are situated in Nunavut and the rest are located in the NWT. Because the inventory was conducted nearly 20 years after construction of the road, there were some sites within 30 m of developed areas and some sites have been disturbed. In 2002, all sites within 30 m of the winter road or related facilities were revisited and if threatened were subjected to site assessment and/or mitigation or were protected through the erection of markers. The four sites in the NWT at which markers were erected were: KiPb-2, KjPa-1, KkNv-9 and LcNs-140. During the 2003 investigations, all sites located near areas with current winter road activity were revisited to assess their status.

The major objective of the 2003 field reconnaisance was to determine if markers had adequately protected sites. The markers erected at three sites consisted of standard four-foot (1.2 m) wooden survey stakes with tops painted fluorescent orange. On average, they were pounded approximately 30 cm (1 foot) into the ground. At KiPb-2 the stakes are at some distance from the actual site and are present only on the esker crest since they would be lost in snow cover on lower ground. At KkNv-9 and LcNs-140, it was necessary to install markers immediately adjacent to the east side of each site because of the proximity of the winter road portages. No stakes required replacement at KiPb-2, a few loose stakes were re-pounded at KkNv-9 and three were replaced at LcNs-140. At KjPa-1, because of the proximity of a winter road camp (Lockhart Lake Camp), Nuna Logistics arranged to install taller and more permanent metal markers with reflectors. No disturbance was noted within the protected areas associated with these four sites. Because the markers were successful in protecting these sites, another site (LcNs-133) threatened by road activity conducted during the winter of 2002-2003 was marked in a similar manner. Orange flagging tape was added to both the old and new markers since the paint had faded over the winter.

Some of the wooden markers are showing signs of wear although they could last another year or two. It is recommended that the status of the markers and their ability to provide site protection be reviewed annually. During this recheck it is recommended that any weakened markers be replaced, loose stakes be re-installed and the tops of all markers be sprayed with orange paint to make them more obvious. No new tools were noted at any visited sites, but additional unworked flakes are evident on the surface of LcNs-133. No artifacts were collected since the 2003 field investigations were conducted under a Class 1 NWT Archaeologists Permit.

153 **Archaeology**

Bussey, Jean
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File No: (NWT Archaeologists permit 2003-930)
Region: NS **Location:** Ekati Diamond Mine

Archaeological Investigations Conducted at the Ekati Diamond Mine

For the tenth consecutive year, Jean Bussey of Points West Heritage Consulting Ltd. conducted archaeological investigations for BHP Billiton Diamonds Inc. (BHPB) in its claim block north of Lac de Gras. Bonnie Campbell of Points West and Noel Doctor of the Yellowknives Dene First Nation assisted with field reconnaissance. The fieldwork consisted of an archaeological inventory as well as tours of archaeological sites associated with the Ekati Diamond Mine. The first tour involved elders from Lutsel K'e, Madelaine Drybones and Noel Able, along with their interpreter, Bertha Catholique. The second tour involved Mike Francis and Michel Paper of the Yellowknives Dene First Nation. Noel Doctor served as the interpreter. The third group involved Inuit elders, Tom Kokak and Walker Bolt, and their interpreter, Gerry Atatahak. A variety of archaeological sites were visited during the tours, including sites at both ends of Lac de Gras – in an area known as the narrows and at the outlet of the lake on the Coppermine River. Also visited were sites near Lac du Sauvage including one with numerous Arctic Small Tool tradition artifacts, one with four tent rings and several sites where archaeological excavation has been conducted in the past.

During the 2003 archaeological inventory, ten new archaeological sites were discovered bringing the total number of known sites in the BHPB claim block to 198. Stone tools or the fragments (flakes) removed during the manufacture of stone tools characterize the new sites. The majority of the artifacts are white or grey quartz, but some chert and siltstone specimens were also discovered. Most of the recorded sites in the claim block are associated with eskers, but sites are also found on other terrain types, usually in the vicinity of the larger lakes. Five of the sites found in 2003 were associated with an esker known locally as the Exeter esker; numerous other sites have been found on this esker. The other five sites were found near the Lac de Gras – Lac du Sauvage narrows, where 12 other sites have been recorded. No development activity has been identified in the vicinity of the ten new sites, thus, there is no potential for conflict and no artifacts were collected.

The 17 sites in the vicinity of the Lac de Gras-Lac du Sauvage narrows are likely associated with caribou hunting since the narrows represents an important caribou crossing. A number of the sites in this area have yielded small chert tools suggestive of the Arctic Small Tool tradition. The presence of these artifacts is strongly suggestive of the narrows representing a significant location through time. The archaeological investigations and tours were conducted under a Class 2 NWT Archaeologists Permit.

154 **Archaeology**

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File No: (NWT Archaeologists Permit 2003-931)
Region: NS **Location:** Snap Lake

Archaeological Investigations Conducted for the Snap Lake Project in 2003

Jean Bussey of Points West Heritage Consulting Ltd. conducted archaeological investigations for De Beers Canada Mining Inc. at their Snap Lake Project in 2003. The archaeological work was conducted under a Class 1 NWT Archaeologists Permit.

Because no new development areas have been identified, investigations were limited to site monitoring and a tour with representatives of the North Slave Metis Alliance (NSMA), Fred Turner and Len Turner. Kevin Le Drew of De Beers was also part of the tour. Past archaeological reconnaissance relating to this proposed mine has resulted in the discovery of 53 archaeological sites, most of which are sufficiently distant from proposed development that no further investigation is required. Two sites threatened by development activity were previously mitigated. One of these sites, KkNv-6, is adjacent to the Snap Lake winter access road and was revisited in 2003 in company with the NSMA representatives. At the recommendation of the NSMA representatives, De Beers has arranged for the erection of protective markers on the portage where KkNv-6 is located.

The Snap Lake winter access road was flown during the NSMA tour, which permitted aerial monitoring of archaeological sites in the immediate vicinity. There have been no revisions to the route examined previously for archaeological resources and there is no evidence of any impacts to archaeological sites along it. KkNv-6 and nearby KkNv-7 were visited on the ground. A few unworked flakes exposed since 2001 were encountered on the surface of KkNv-6; all artifacts were left in situ.

Also examined from the air were the 10 archaeological sites located on the esker south of Snap Lake. There is no evidence of any disturbance in the vicinity of these sites. Diamond development activity is restricted to a gravel borrow and the winter access road leading to it. The gravel pit was visited on the ground during the archaeological tour and the closest site, KjNu-11, was examined by Bussey. It is located approximately 300 m to the west of the gravel pit and is intact.

155 **Archaeology**

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File No: (NWT Archaeologists permit 2003-943)
Region: NS **Location:** Courageous Lake

Archaeological Investigations Conducted at the Courageous Lake Property for Seabridge Gold

Gold exploration prompted archaeological investigations in the vicinity of Courageous Lake on behalf of Seabridge Gold. Jean Bussey and Gabriella Prager of Points West Heritage Consulting Ltd conducted these investigations. Noel Doctor of the Yellowknives Dene First Nation provided assistance during the field reconnaissance. The fieldwork involved intensive helicopter reconnaissance to provide an overview assessment of archaeological potential as well as detailed ground examination of selected areas. Three historic/traditional sites were discovered during aerial reconnaissance and were recorded and 11 sites were found during ground reconnaissance, for a total of 14 new sites. The selected intensive survey areas were three locations in which more exploration and/or development might occur, as identified by EBA Engineering Consultants Ltd., the prime consultant for this multi-disciplinary environmental study. Archaeological investigations were conducted under a Class 2 NWT Archaeologists Permit. There are no previously recorded archaeological sites in the vicinity of this study area.

Two graves, each surrounded by a white picket fence, the site of a possible tent camp likely used during an early phase of mineral exploration and a traditional cabin/camp were recorded north of Courageous Lake in areas for which no specific development has been identified. One site is located on an esker, one is on the shore of Courageous Lake and the third is situated on a bedrock bench inland from the lake.

Each of the three areas in which more exploration activity might occur yielded archaeological resources. The more northerly survey area, north of Matthews Lake and south of Courageous Lake, yielded six prehistoric archaeological sites. Four are associated with esker deposits, one is on a bedrock ridge and the sixth appears to be on an old lake terrace/beach. All six contained varying quantities of primarily quartz flakes, most of them unworked; all unworked flakes were left in site. Three sites contained formed tools or fragments, which were collected because of the proximity of a recreational camp. The second survey area was located east of Matthews Lake and the abandoned Salmita mine. Two archaeological sites were recorded, one a windbreak likely relating to early mineral exploration and the other an isolated find (collected) consisting of a white chert artifact suggestive of the Arctic Small Tool tradition. Both sites are located on inland areas typified by scattered bedrock outcrops. The third survey area is south of Matthews Lake and yielded three prehistoric sites, all on elevated bedrock outcrops. One is an isolated find consisting of a formed biface fragment (collected) and the other two are lithic workshops/dense lithic scatters, with no visible formed tools.

The archaeological investigations conducted in 2003 suggest that the Courageous Lake Property is an important area archaeologically. Only a small portion of this area has been examined in any detail. If further exploration or development activities are proposed then additional archaeological research will be required. The historic Tundra Mine is located at the south end of Matthews Lake and was briefly examined in 2003. The buildings are deteriorating as a result of weather, time and vandalism.

156 **Archaeology**

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File No: (NWT Archaeologists Permit 2003-933)
Region: DC, SA, IN **Location:** Mackenzie Pipeline Route

Mackenzie Gas Project Reconnaissance and Impact Assessment

Archaeological investigations initiated in 2001 on the Mackenzie Gas Project continued for a second field season in 2003. Imperial Resources Ventures Ltd., the Aboriginal Pipeline Group, ConocoPhillips Canada Ltd., ExxonMobil Canada Properties Ltd. and Shell Canada Limited are developing the Mackenzie Gas Project.

During the 2003 field season, archaeologists with MPEG (a consortium of AMEC Earth and Environmental, Golder Associates Ltd., Kavik-AXYS Environmental Ltd. and Tera Environmental) led reconnaissance and impact assessment level investigations of selected project components. As listed below, numerous local people assisted with the fieldwork. Greenpipe Industries Ltd. assisted MPEG archaeologists with the investigations in the Tulita district.

Inuvialuit Region: Robert Albert, Abel Tingmiak.
Gwich'in Region: Rita Carpenter, Anna May MacLeod, Fred Jerome, Harry Carmichael, Allen Firth, Tom Wright, and Albert Frost.
Fort Good Hope: Marcel Grandjambe, Alfred Masazumi, and Leon Tauveau.
Tulita: Richard Andrew, Lee Anne Wrigley, and James Bavard.
Pehdzeh Ki First Nation: Justin Clilie, Ernest Moses, Darcy Moses, and Archie Horasey
Liidlii Kue First Nation: Joe Tsetso, Leo Norwegian, and Edward Cholo
Trout Lake: Arthur Jumbo, Dolphus Jumbo, Tony Jumbo, Edward Jumbo, Ruby Jumbo, Eric Kotchea, and Lucas Cli

While a definitive right-of-way has not been identified for the pipeline, which is in excess of 1400 km in length, a 1 km wide corridor has been identified. As this is too wide for a conventional heritage resources impact assessment, investigations are limited to reconnaissance techniques of selected moderate and high potential areas. A heritage resources impact assessment will be completed once the right-of-way within the corridor has been selected. For the 2002 field season, areas were selected for examination based on aerial photograph and NTS map analysis as well as helicopter over-flights. During the winter of 2003, the project team identified several reroutes. Subsequently, the archaeological team conducted reconnaissance level investigations at reroute locations thought to exhibit moderate to high potential for heritage resources.

Heritage resource impact assessments were also undertaken at a selection of the infrastructure and granular resource extraction sites. As with the pipeline corridor, moderate and high potential areas have been focused on and additional investigations can be anticipated as project plans become more finalized.

Numerous prehistoric and historic sites were recorded / revisited. These include a wide variety of site types and ages. The precontact period sites are primarily comprised of stone flakes and other debris remaining from stone tool manufacturing. No temporally diagnostic stone tools were recovered during the field investigations. Historic period sites primarily relate to traditional land use practices and include numerous trails, cabins and camps. Palaeontological materials include one location of preserved tree trunks and leaf litter identified north of the current tree line preserved in permafrost. A number of traditional land use areas such as traplines and camps were also observed / recorded.

157 **Archaeology**

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Golder Associates
Calgary, AB

File No: (NWT Archaeologists Permit 940)
Region: DC **Location:** southwest from the Netla/Arrowhead gas fields, crossing the Liard River north of Fort Liard

Heritage Resources Impact Assessment of the East Liard Gas Gathering System

In August of 2003, Golder Associates Ltd. conducted a Heritage Resources Impact Assessment (HRIA) of Anadarko's proposed East Liard Gas Gathering System located near Fort Liard. The proposed 75 kilometre gathering system extends southwestward from the Netla/Arrowhead gas fields, crossing the Liard River north of Fort Liard where it joins an existing system just west of the river. The purpose of the study was to identify, record, and evaluate heritage sites in potential conflict with proposed development activities, so that appropriate avoidance or mitigation measures could be incorporated into the plans for this project.

Procedures employed in the Anadarko East Liard Gas Gathering System Project entailed pre-field studies, on-ground reconnaissance, site documentation and assessment, reporting and recommendation formulation. A community request was made that, should archaeological materials be identified during the HRIA, no artifacts were to be collected. Therefore, a system for documenting sufficient information about artifacts was devised in consultation with the PWNHC prior to the commencement of the field program. Project planning also included provisions for a community representative to work with the archaeologists during the field inspection, to provide advice about the cultural significance of any sites and to identify areas of cultural concern or relevant land use patterns that might assist in interpretation of the physical evidence encountered. Roy Klondike of Fort Liard provided a wealth of information about the area and its people while he accompanied two Golder archaeologists during the field program.

The field component of the HRIA included the visual inspection of all areas that had been proposed for development prior to the beginning of August 2003. This included an aerial survey of the entire gathering system to confirm that our predetermined areas of moderate and high potential were valid and to modify our program to include areas that were not identified during the pre-field screening. Subsequent fieldwork consisted of helicopter assisted field surveys and sub-surface testing of areas deemed to have moderate to high potential for containing heritage resources. While no new archaeological sites were identified during the field investigations conducted for this project, a total of 19 Traditional Use locations were identified and recorded. These included cabin and tent frame locations, bark-stripped trees, trails, and various types of snares and traps.

Further archaeological work will be undertaken next year on newly proposed components of the project that include an all-weather access road, gathering system re-alignments and facilities locations. It is anticipated that additional work will also be conducted at other high potential areas along the alignment.

158 **Archaeology**

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Calgary, AB

File No: (NWT Archaeologists Permit 2002-932)
Region: IN **Location:** Mackenzie Delta

2003 Mackenzie Delta Heritage Resource Survey

In August of 2003, Bison Historical Services Ltd. and Inuvialuit Environmental and Geotechnical Inc. carried out a survey of heritage sites in the Mackenzie Delta on behalf of EnCana Corporation. Previously known sites were re-visited to ensure that they had not been damaged by last winter's seismic exploration program. Three potential well sites and related access routes were also examined to ensure that upcoming winter projects would avoid all known and newly identified heritage sites.

Fieldwork was based out of Tuktoyaktuk and carried out by helicopter and on foot. The work was concentrated around the mouth of the East Channel of the Mackenzie River, on both Richards Island and portions of the Tuktoyaktuk Peninsula. The team did not excavate any materials at any sites and no artifacts or other cultural materials were collected.

Twenty-seven known sites, including ancient graves, villages and camps, were re-visited to evaluate the success of avoidance during the 2002-2003 Kugmallit winter seismic program. All sites within 200 metres of seismic program activities were re-visited. No previously identified sites were damaged by last winter's Kugmallit seismic exploration activities. However, natural erosion at several sites remains an on-going concern.

The newly proposed EnCana Burnt Lake well site(s) and access route were also examined. This program consists of three possible well site locations and related access routes linking the wells to the Mackenzie River Ice Road. Three new sites were identified during our examination of this project. Newly identified sites are all prehistoric lithic scatters and/or campsites. Two previously identified sites were also examined in connection with this program. EnCana's planned development was modified to avoid all newly identified and previously known heritage sites. The proposed Encana Burnt Lake well site and access route will avoid all previously known and newly identified heritage sites.

159 **Archaeology**

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File No: (NWT Archaeologists Permit 2003-939)
Region: SA **Location:** Summit Creek

Summit Creek Heritage Survey

In July of 2003, Bison Historical Services Ltd. carried out an archaeological survey of heritage sites in the vicinity of Summit Creek, some 60 kilometres south of Tulita. These investigations were carried out at the request of Northern EnviroSearch Ltd. on behalf of Northrock Resources Ltd.

Northrock proposes to drill an exploratory oil well (B-44) near Summit Creek on the southwest flanks of the Flint Stone Range during the winter of 2003-2004. This well site will require an access road extending approximately 74 kilometres east to Mackenzie River before joining the Mackenzie River ice road. The access road will largely follow existing trails and cut lines. Northrock Resources Ltd. engaged Bison Historical Services Ltd. to ensure that no known or suspected heritage sites would be damaged by the proposed activities.

Six previously identified heritage sites are known to lay within one kilometre of the proposed Northrock B-44 construction program. The location of each of these sites was re-visited and the proximity of the site to the proposed development was evaluated. None of these previously identified sites will be impacted by the construction or use of the proposed Northrock Resources Ltd. B-44 Summit Creek well site, access route and staging area.

Areas with high potential for un-recorded heritage sites that might be impacted by the planned activities were also examined. No new heritage sites were identified. The proposed Northrock B-44 construction program will impact no previously unidentified or suspected heritage sites.

160 **Archaeology**

Johnson, Donald S.
University of Manitoba
Winnipeg, MB

File No: (NWT Archaeologists Permit 2003-941)
Region: IN **Location:** Winter Cove, Walker Bay, and Victoria Island

Archaeological Investigations, Winter Cove, Walker Bay, Victoria Island, NWT, July-August 2003

Archaeological investigations (in conjunction with sociocultural investigations, Hamlet of Holman, Victoria Island), were initiated between July 30th and August 15th, 2003 in the Winter Cove area, Walker Bay, Victoria Island. The archaeological investigations represent the initial field season in a proposed two-year project, and focus on an assessment of mid-19th century direct and indirect contact and intersocietal interaction between historic northern Copper Inuit groups and the Royal Navy vessels H.M.S. Enterprise and H.M.S. Investigator in northwestern Victoria Island. Specifically, the project is the first to systematically examine possible changes in northern Copper Inuit material culture, intra- and intergroup material trade systems and social relations resulting from direct and indirect contact with elements of the Royal Navy on Victoria Island. Additionally, these investigations also examined sites directly associated with the 1851-52 "wintering" of H.M.S. Enterprise at Winter Cove.

Field surveys were conducted in the immediate Winter Cove area - including Flagstaff Hill - and at several (unnamed) inland lakes south and southeast of Winter Cove. A total of approximately 30 sites, comprising historic Copper Inuit tent rings and caches, Royal Navy habitation, burial, cache and survey features and several mid-20th century habitation and survey features associated with the 1940-41 "wintering" of the R.C.M.P. Schooner St. Roch in Winter Cove, were recorded.

The nature and amount of data collected varied according to project research plans, though random sampling was conducted at each site, and all features were recorded in detail. The items recovered from sites also varied, although 19th century manufactured metals, glass, and wood predominated. In some cases, evidence of modification of manufactured materials into projectile points and uniface cutting implements was present. All recovered items are now undergoing conservation procedures.

Preliminary results of these field surveys suggest that Northern Copper Inuit groups interacting with the officers and crew of H.M.S. Enterprise in the Winter Cove, Walker Bay area ca. 1851-52 acquired significant amounts of manufactured items. Many of these items were modified into tools and introduced into the material culture of these groups. Similarly, it can also be suggested that these items were "filtered" into intra- and intergroup trade systems of the Walker Bay and Minto Inlet areas thereby contributing to changes in traditional social interaction.

The project has received the strong support of the Holman Community Corporation, and the Olokhaktomiut Hunters & Trappers Committee. Aaron Kimiksana and Tony Alanak of Holman and Ethan Applegarth of Idyllwild, California, served as Research Assistants. Donald Inuktalik, Jack Kataoyak and Helen Kimiksana provided other invaluable support in the field and in Holman. The following institutions and individuals have contributed support, expertise and guidance: Inuvialuit Land Administration; Aurora Research Institute; Prince of Wales Northern Heritage Centre; Joint-Faculty Research Ethics Board, University of Manitoba, Dr. Jill Oakes, Department of Native Studies, University of Manitoba; Dr. Rick Riewe, Dept. of Zoology, University of Manitoba; Dr. William "Skip" Koolage, Department of Anthropology, University of Manitoba; Dr. James Savelle, Department of Anthropology, McGill University; and Gerard and Nan Snyder, Montpelier Station, Virginia.

161 **Archaeology**

Pilon, Jean-Luc
Canadian Museum of Civilization
Ottawa, ON

File No: (NWT Archaeologists Permit 2003-937)
Region: DC **Location:** Fort Simpson

Fort Simpson Heritage Park Archaeology Project

During the month of August 2003, archaeological excavations were once again carried out within Fort Simpson Heritage Park. In earlier field seasons, artifacts had been found which indicated a use of the area that could bear witness to some of the earliest Euro-Canadian presence on Simpson Island. In 2002, a deep pit feature had been identified but its shape, function and age were uncertain. This summer's work hoped to recover artefacts, which might be indicative of the time period, as well as the nature of this clearly man-made feature.

While laboratory work on the collections continues, some statements can be made concerning some of the events represented in the excavated area. A first point is that while the vast majority of the artifacts gathered are of Euro-Canadian or European manufacture, objects attesting to an earlier, pre-Contact Native occupation or occupations, are present. This Native component was confirmed in 2003 with the recovery of flakes and stone tools, one manufactured from a distinctive stone found only in the Norman Wells area.

As for the age of the earliest historic period occupation, the recovery of a percussion cap near the bottom layers of the long pit feature firmly place the principal occupation in the 1830-1860 time period when this invention became widely used. It would thus appear that this pit feature somehow relates to the nearby Hudson's Bay Company (HBC) (established on Simpson Island in 1822) activities and not the earlier Northwest Company establishment that was abandoned in 1811, well before the widespread use of percussion caps.

Within a single excavation unit a very high density of artifacts were recovered from all of the buried pit layers which are clearly separated from each other by at least 2 thick distinct layers of shredded bark. Nails and "box" rivets were the most numerous object type found within the pit fill layers. The high concentration of debris in this area suggests that there was some condition that, over the course of the feature's use, naturally tended to concentrate artifacts in that region. One proposal is that the main point of access to this feature was in the area of this evacuation unit; perhaps a trap door, if this feature was found under a building, as a cellar would be.

The "box" rivets are intriguing in their own right because their function is not immediately obvious. Dr. Robert Grenier of Parks Canada, an international expert in the excavation of marine heritage and early ship building techniques, identified these as items clearly involved in "clinker-built" boat construction. Of course, York boats, those transportation workhorses of the HBC, fit this interpretation perfectly.

The next step in this research will take place, in the Archives of the Hudson's Bay Company in Winnipeg. It is anticipated that within the journals and documents kept there will be some reference to a boat house or a boat shed, where the heavy York boats were repaired and perhaps even built. Hopefully, such a passage will provide enough information to determine its approximate location in relation to the HBC compound which is, by contrast, relatively well-documented on both maps and in vivid eye-witness accounts.

This summer's crew was comprised of Stephen Rowan, John Blyth, Naomi Smethurst, Elizabeth Marsh and Douglas Kirk. Additional help was kindly offered by Tyrone Stipdonk, Scott Passmore and Sophie Borcoman.

An additional component of the work this summer was to assist Dr. Brian Moorman of the University of Calgary who conducted a ground-penetrating radar study of the Heritage Park.

162 **Archaeology**

Ronaghan, Brian
Golder Associates
Calgary, AB

File No: (NWT Archaeologist Permit 2003-942)
Region: NS **Location:** Nico Mine

Heritage Resources Impact Assessment of Fortune Minerals Nico Gold Project

Brian Ronaghan of Golder Associates completed an archaeological inventory and assessment of facility locations proposed by Fortune Minerals for a bulk-sampling program for an underground gold mine operation near Nico Lake. The property is located about 10 km east of Hislop Lake in the Marian Basin north of Great Slave Lake. John Mantla of Rae (Dogrib First Nation) assisted with the investigations.

The Nico Lake Mine is in the preliminary planning stage of development and as a result, very limited information is available regarding the eventual development of the property. Previous archaeological records and studies within the region, as well as environmental and ethnohistorical data, were consulted to aid in providing a basis for structuring field studies and context for any sites that might be found. Map and aerial photograph mosaic analysis were also undertaken to serve as an orientation to the Project area landforms and their heritage resource potential. The foot traverses and visual examinations then focused on the project specific facilities that have been defined as well as the landforms considered to exhibit high potential for heritage resources.

Due to the largely sloping nature of the terrain, there was a notable lack of organic sediments in all areas except in water-saturated locations, which were considered to have low heritage resource potential. Consequently, shovel testing to investigate for buried sites was neither feasible nor warranted. The field program resulted in the identification of five loci of historic period use. None of the locations exhibited materials and/or evidence of use that exceeded the late 1960's in age. As a result, none were considered archaeological resources under the current provisions of the Archaeological Sites Regulations (GNWT 2001) and none were formally recorded as such. The locations consist of two claim posts for prospects registered in or around 1968, two trails that represent recent use of seismic and exploration cut lines by Aboriginal hunters or trappers, and a temporary campsite by an exploration or survey crew probably in the 1970's. None of these sites are considered to be of more than limited scientific significance.

Although archaeological sites have been recorded in the region, none have been found in the area to be affected by the Nico Mine Project. While some of the locations of specific development facilities are not known, all high potential landforms within the Project area were examined. Therefore, it is recommended that development proceed without additional heritage resources investigations. However, the local area traditional users should be consulted prior to development as the area is currently utilized.

163 **Archaeology**

Ross, Julie
Department of Anthropology
University of Toronto,
Toronto, ON

File No: (NWT Archaeologist Permit 2003-936)
Region: IN **Location:** Northwest Passage

Holocene Sea Ice Conditions in the Northwest Passage

Raised marine deposits along the northern Prince of Wales Strait were surveyed for archaeological sites as part of a larger study of Holocene sea ice conditions in the Northwest Passage. Douglas Hodgson (Geological Survey of Canada) and the researcher surveyed an area north of that examined by Arthur Dyke (GSC) and James Savelle (McGill, Anthropology) in previous years. Two camps were established on Victoria Island: Deans Dundas Bay, Armstrong Point and one camp, at Wallace Point, was established on Banks Island.

While the project had several research goals, the main aim was to establish the time periods when the areas on either side of Prince of Wales Strait were occupied, which cultural groups utilized these areas, and what the nature of use of the area was by Palaeo- and Neoeskimo peoples. The researchers also wished to establish if there was a difference in Palaeo- and Neoeskimo occupation density between northwestern and western Victoria Island coasts. Dyke and Savelle had observed a decrease close to the northern limit of their study area at 72 N.

Only forty-eight sites were recorded during the 2003 field season, compared to the fifty-two sites recorded during the 2002 field survey of the Viscount Melville Sound coast of northwestern most Victoria Island. Of the forty-eight sites recorded, seventeen of these consisted of clusters of caches. Most of the caches had been opened; however a few were still closed and one contained barrel staves.

Other than one find spot, there is limited definite evidence for Palaeoeskimo use of the area; many of the features recorded were amorphous in form and thus a cultural affiliation could not be assigned. Neoeskimo, Early Historic, and Late Historic sites were evident in low-lying areas.

There were fewer habitation structures found along the examined sections of coast than to the northeast (2002) and it would seem that this area was used predominately for short term hunting and trapping ventures. It is apparent that this section of coast has been submerging during at least the latest Holocene, so it is possible that some archaeological sites have been destroyed. There is also a paucity of the well-defined raised beaches on which Arctic dwelling sites are often found. Furthermore, the predominantly fine-grained raised marine sediments are undergoing active processes of solifluction and thus any sites are likely being covered or dispersed by this slope movement.

164 **Archaeology**

Savelle, James M.
Department of Anthropology
McGill University
Montreal, PQ

File No: (NWT Archaeologist Permit 2003-938)
Region: IN **Location:** Northern Prince Albert Sound, Victoria Island

Archaeological Investigations along Northern Prince Albert Sound, Victoria Island, NWT- August 2003

Archaeological investigations along northern Prince Albert Sound were carried out in early to mid August 2003. The excavations concentrated upon Dorset, Thule and Historic Inuit sites at the Kuuk River, Thule Inuit sites at Woodward Point, Cape Ptarmigan, and the Thule Inuit Co-op site southeast of Holman. At the Co-op site and Kuuk river sites, excavations were restricted to previously disturbed or excavated sod houses and middens (garbage heaps), while at the Cape Ptarmigan and Woodward Point sites excavations were restricted to test pits in middens and sod houses. While a small number of artifacts were recovered from the excavations, the primary goal was to collect animal bones, primarily seal, caribou and musk-ox teeth, to determine changes through time in the level of various trace (potentially toxic) elements. These changes can be determined through the chemical analyses of trace elements in the teeth themselves.

165 **Archaeology**

Thomson, Callum
Thomson Heritage
Calgary, AB

File No: (NWT Archaeologist Permit 2003-927)
Region: NS **Location:** Gahcho Kué (Kennady Lake)

Gahcho Kué (Kennady Lake) and Drybones Bay Archaeological Surveys

The Gahcho Kué survey was the sixth year of field inventories, assessments and mitigation undertaken by Callum Thomson on behalf of De Beers Canada Exploration Inc. (DBCE), in advance of their proposed diamond mine development. In 2003, Callum and assistant Henry Basil from Lutsel K'e worked in three areas: the Gerle Sill, where they flagged six previously recorded sites and found three new sites in an area of expanded exploration activity; the Kelvin and Faraday Lakes area, where they revisited two known sites and ensured their continuing stability, walked the proposed 3 km winter access route to this area of intensive exploration drilling, and inspected ten drill sites; and on the East Esker, part of a prominent sand and gravel feature that runs east-west for at least 30 km, south of Gahcho Kué. Callum and Henry found an additional twelve sites on and adjacent to 5 km of the East Esker, including a major quartz quarry where material was obtained for stone tool-making, and two large workshops where the quartz was manufactured into tools. This brings to 31 the number of sites found on a 16 km section of the east-west esker, parts of which have been or are planned to be exploited for aggregate, and almost 100 in total around Gahcho Kué.

The preliminary survey of Drybones Bay and parts of the coast and near interior between Wool Bay and Matonabbee Point, southeast of Yellowknife on Great Slave Lake was conducted with leadership and local knowledge provided by elders and youth from the Yellowknife's Dene First Nation. The objective was to examine the potential for disturbance of sites during continuing mineral exploration and potential development activities, primarily at Wool Bay and Drybones Bay. Sixty-three new sites were added to the previous inventory of five, including precontact stone tool sites and quartz quarries, many sites containing boulder features such as tent rings, hide stretchers and toboggan weights, and a variety of sites from the historic period including four cemeteries, cabins and camps, and fish camps.

166 **Archaeology**

Thomson, Callum
Thomson Heritage
Calgary, AB

File No: (NWT Archaeologist Permit 2003-928)
Region: NS **Location:** Hardy Lake

Hardy Lake Archaeological Survey

The Hardy Lake survey, undertaken by Callum Thomson with the assistance of Calinda Football from Wekweti, was the first such work conducted on the DBCE claim block around Hardy Lake, northeast of Lac de Gras. As only three days were available for this initial survey, the team focused on areas of intensive exploration activity and eskers, of which there are many in the area. Forty precontact sites were found, all containing stone tools and fragments of material such as quartz, quartz crystal, shale and chert. Six of the sites date to the Palaeo-Eskimo period, which in this area, dates back to about 3500-2500 years ago. Two quartz quarries, three workshops and six sites containing habitation features such as tent rings and hearths were found, and most of the rest contained scatters or concentrations of stone artifacts ranging from less than 10 to over 200 in number. Among the Palaeo-Eskimo sites on Hardy Lake was one located in the middle of a large camp used by construction and maintenance crews on the Lupin Ice Road. All site locations are now known to the exploration crews and will be avoided, and mitigation has been proposed for the construction campsite.

Department of Resources, Wildlife & Economic Development

WILDLIFE RESEARCH PERMITS

167 **Wildlife**

Auriat, Denise
Gwich'in Renewable Resource Board
Box 2240
Inuvik, NT X0E 0T0

File No: 2808
Region: IN **Location:** Richardson and Mackenzie Mountains

Objective: To determine wolf prey selection in the Richardson and Mackenzie Mountains in the Gwich'in Settlement Area and to determine diet and fatty acid signatures of prey species of wolf.
Species studied: Wolf

168 **Wildlife**

Auriat, Denise
Gwich'in Renewable Resource Board
PO Box 2240
Inuvik, NT X0E 0T0

File No: 2839
Region: IN **Location:** Richardson Mountains

Objective: To commence research in regard to Dall's sheep habitat in the Richardson Mountains within the Gwich'in Settlement Area.
Species studied: Ovis dalli

169 **Wildlife**

Bollinger, Karen
U.S. Fish and Wildlife Service
Waterfowl Population Surveys
11500 American Holly Drive
Laurel, MD USA 20708-4002

File No: 2844
Region: DC **Location:** Mills Lake

Objective: To continue banding practices at Mills Lake Station under the Western Canada Cooperative Banding Program.
Species studied: Ducks

170 **Wildlife**

Buckland, Laurie
Golder Associates
1000, 940 - 6th ave SW
Calgary, AB

File No: 3026
Region: DC **Location:** Liard Valley

Objective: To conduct wildlife and wildlife habitat surveys for a potential pipeline corridor in the Liard Valley.
Species studied: Wildlife and vegetation

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171 **Wildlife**

Carriere, Suzanne
RWED, Wildlife and Fisheries
5th Floor - Scotia Centre
5102 – 50th Avenue
Yellowknife, NT X1A 3S8

File No: 2826
Region: All **Location:** Locations throughout the Northwest Territories

Objective: To continue with annual research on small mammals and snowshoe hare throughout various locations in the NWT.
Species studied: Small mammals and hare

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172 **Wildlife**

Cluff, Dean
RWED, Wildlife and Fisheries
PO Box 2668
Yellowknife, NT X1A 2P9

File No: 2974
Region: NS **Location:** Slave Geological Province

Objective: To collect genetic samples from wolf skins as available from hunters.
Species studied: Wolf

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173 **Wildlife**

Cluff, Dean
RWED, Wildlife and Fisheries
PO Box 2668
Yellowknife, NT X1A 2P9

File No: 2975
Region: NS **Location:** Slave Geological Province

Objective: To conduct flights to monitor movements of wolves fitted with radio collars.
Species studied: Wolf

174 **Wildlife**

Cluff, Dean
RWED
PO Box 2668
Yellowknife, NT X1A 2P9

File No: 2823
Region: NS **Location:** Lac de Gras southeast to Snap Lake

Objective: To continue to study the ecology and movements of tundra-denning wolves fitted with radio collars.
Species studied: Wolf

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175 **Wildlife**

Devink, Jean-Michel
Canadian Wildlife Service
115 Perimeter Road
Saskatoon, SK S7N 0X4

File No: 2814
Region: NS **Location:** Yellowknife - Ingraham Trail

Comparative Ecology and Reproductive Energetics of Boreal-nesting Lesser Scaup and Ring-necked Ducks

Objective: To compare the ecology and reproductive energetics of Boreal nesting lesser scaup and ring-necked ducks.
Species studied: Lesser Scaup (Aythya affinis), ring-necked ducks

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176 **Wildlife**

Elkin, Brett
RWED, Wildlife and Fisheries
5th Floor, 600 5102 - 50th Avenue
Yellowknife, NT X1A 1H1

File No: 2803
Region: All **Location:** various locations

Objective: To conduct annual wildlife health and genetic monitoring by testing samples from sick or dead animals throughout various locations of the NWT.
Species studied: Various species of wildlife

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177 **Wildlife**

Elkin, Brett
RWED, Wildlife and Fisheries
5th Floor, 600 5102 - 50th Avenue
Yellowknife, NT X1A 1H1

File No: 2851
Region: SS **Location:** Near Fort Smith

White-tailed Deer Baseline Health Survey

Objective: To conduct a baseline health survey of the white-tailed deer.
Species studied: White-tailed deer

178 **Wildlife**

Elkin, Brett
RWED, Wildlife and Fisheries
5th Floor, 600 5102 - 50th Avenue
Yellowknife, NT X1A 3S8

File No: 2853
Region: All **Location:** Various locations

Objective: To conduct wildlife health and genetic monitoring by testing samples from sick or dead animals.
Species studied: All indigenous wildlife will be surveyed

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179 **Wildlife**

Ferguson, Carl
U.S. Fish and Wildlife Service
Division of Migratory Bird Management
11500 American Holly Drive
Laurel, MD USA 20708-4002

File No: 2843
Region: NS **Location:** Stagg River Station

Objective: To continue waterfowl banding activities at the Stagg River Station under the western Cooperative Waterfowl Banding Program.
Species studied: Ducks

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180 **Wildlife**

Gunn, Dr. Anne
RWED
5th Floor 600 - 5102 50th Avenue
Yellowknife, NT X1A 3S8

File No: 2973
Region: NS, SS **Location:** Bathurst Caribou herd location.

Movement of caribou of the Bathurst Herd
Objective: To continue to monitor the movement of female caribou from the Bathurst herd fitted with satellite collars.
Species studied: Bathurst caribou

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181 **Wildlife**

Hines, Jim
Canadian Wildlife Service, Environment Canada
Suite 301, 204 - 50th Avenue
Yellowknife, NT X1A 1E2

File No: 2830
Region: NS **Location:** area 400 m on each side of Yukon highway beginning 16 km west of Yukon and continuing another 48 km

Objective: To conduct research on the abundance and productivity of waterfowl and other aquatic birds breeding in the boreal forest.
Species studied: Ducks, loons and grebes

182 **Wildlife**

Hines, Jim
Canadian Wildlife Service
Suite 301, 204 - 50th Avenue
Yellowknife, NT X1A 1E2

File No: 2840
Region: **Location:** Inuvialuit Settlement Region

Study on Goose Population in Mackenzie Delta, Tuktoyaktuk Peninsula, and Anderson River Areas
Objective: To study goose populations in the Inuvialuit Settlement Region.
Species studied: Geese

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183 **Wildlife**

Hines, Jim
Canadian Wildlife Service
Suite 301, 204 - 50th Avenue
Yellowknife, NT X1A 1E2

File No: 2841
Region: IN **Location:** Banks Island

Study on Lesser Snow Geese and Habitats on Banks Island
Objective: To study lesser snow geese and their habitats.
Species studied: Lesser snow geese

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184 **Wildlife**

Johannesen, Daryl
Golder Associates Limited
10th Floor, 940 -6th Avenue SW
Calgary, AB T2P 3T1

File No: 2967
Region: DC **Location:** Paramount's Cameron Hills Significant Discovery Area

Objective: To continue the site assessment and documentation of all wildlife and signs to help with mitigations.
Species studied: Wildlife and vegetation

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185 **Wildlife**

Johannesen, Daryl
Golder Associates Limited
10th Floor, 940 -6th Avenue SW
Calgary, AB T2P 3T1

File No: 2966
Region: DC **Location:** Shiha Energy Transmission Pipeline

Objective: To continue the monitoring program for breeding birds and large mammals on the pipeline right of way.
Species studied: Ungulates, furbearers and any other wildlife or sign

186 **Wildlife**

Johnson, Deborah
RWED South Slave
Box 390
Fort Smith, NT X0E 0P0

File No: 2970
Region: DC **Location:** Taiga plains of Mackenzie River, of Redknife River, of border and of Hay River

Boreal Caribou and Land Use Planning in the Cameron Hills

Objective: To measure baseline adult female and calf survival; determine current footprint of landscape changes; and seasonal use of caribou.
Species studied: Boreal woodland caribou

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187 **Wildlife**

Johnson, Deborah
RWED South Slave
Box 390
Fort Smith, NT X0E 0P0

File No: 2845
Region: SS, DC **Location:** Buffalo, Redknife, and Kakisa Rivers

Boreal Caribou Forage Recovery Following Fire - Pilot Study

Species studied: Woodland caribou

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188 **Wildlife**

Johnstone, Robin
Golder Associates Limited
5007 Bryson Drive
Box 255 Postal Service 9600
Yellowknife, NT X1A 2R3

File No: 2813
Region: NS **Location:** Snap Lake Diamond Project

Snap Lake Wildlife Study

Objective: To conduct wildlife research for the Snap Lake Diamond Project for DeBeers. To continue baseline environmental data collection for the Snap Lake Diamond Project and the surrounding area.
Species studied: All indigenous wildlife will be surveyed

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189 **Wildlife**

King, Rodney J
U.S. Fish and Wildlife Service
PO Box 2012
Mare Island, CA 94592

File No: 2848
Region: IN **Location:** Mackenzie River Delta

Western Canada Cooperative Waterfowl Banding Program, Mackenzie River Delta

Objective: To capture and band migratory birds in the Mackenzie River Delta under the Western Canada Cooperative Waterfowl Banding Program.
Species studied: Duck species

190 **Wildlife**

Larter, Nic
RWED Deh Cho
Box 240
Fort Simpson, NT X0E 0N0

File No: 3029
Region: DC **Location:** Along Mackenzie River, including the right-of-way of proposed pipeline

Giospatial Moose Surveys in the Deh Cho (North)
Species studied: Moose

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191 **Wildlife**

Latour, Paul
Canadian Wildlife Service
5204 – 50th Avenue
Yellowknife, NT X1A 1E2

File No: 2815
Region: SA **Location:** Edehzhie candidate protected area

Ecological Assessment of the Edehzhie Candidate Protected Area - Horn Plateau\Mills Lake Area
Objective: To conduct an ecological assessment of the Edehzhie candidate protected area.
Species studied: All mammal and bird species and their signs

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192 **Wildlife**

Latour, Paul
Canadian Wildlife Service
5204 – 50th Avenue
Yellowknife, NT X1A 1E2

File No: 2816
Region: IN **Location:** Kendall Island Bird Sanctuary

Effects of Seismic Exploration on Migratory Birds and their Habitat in Kendall Island Bird Sanctuary
Objective: To conduct research on the effects of seismic exploration on breeding migratory birds and their habitats in the Kendall Island Migratory Bird Sanctuary
Species studied: waterfowl; aquatic birds

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193 **Wildlife**

MacDonald, Bruce
Ducks Unlimited Canada
5017 – 52nd Street
Yellowknife, NT X1A 1E8

File No: 2820
Region: IN **Location:** ISR and GSA - Lower Mackenzie

Waterbird ecology of the Lower Mackenzie River within the Inuvialuit Settlement Region and Gwinch'in Settlement Areas, NT
Objective: To conduct aerial surveys of wetlands, distribution of waterbirds, and water sampling.
Species studied: All mammal and bird species and their signs

194 **Wildlife**

MacDonald, Bruce
Ducks Unlimited Canada
5017 – 52nd Street
Yellowknife, NT X1A 1E8

File No: 2828
Region: SA, IN **Location:** Middle Mackenzie River (SSA and GSA)

Waterbird ecology of the middle Mackenzie River within the Sahtu and Gwich'in Settlement Areas
Objective: To study waterbird ecology of the middle Mackenzie River.
Species studied: Ducks

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195 **Wildlife**

MacDonald, Bruce
Ducks Unlimited Canada
5017 – 52nd Street
Yellowknife, NT X1A 1E8

File No: 2836
Region: DC, NS **Location:** Lac la Martre Plain and Tathlina Lake Area

Waterbird Reconnaissance Survey of the Lac la Martre Plain and Tathlina Lake area, NWT
Objective: To conduct a waterbird reconnaissance survey in the Lac la Martre Plain and Tathlina Lake area.
Species studied: All species of birds and mammals encountered

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196 **Wildlife**

Machtans, Craig
Canadian Wildlife Service
5204-50th Avenue
Yellowknife, NT X1A 1E2

File No: 2817
Region: DC **Location:** Near Fort Liard

Effects of Seismic Exploration on Songbirds and their Habitat near Fort Liard
Objective: To conduct impact assessement of the effects of seismic lines on songbirds near Fort Liard.
Species studied: Songbirds

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197 **Wildlife**

Madsen, Eric and Cheryl Wray
Diavik Diamond Mines Inc
P O Box 2498
Suite 205 - 5007 – 50th Avenue
Yellowknife, NT X1A 2P8

File No: 2969
Region: NS **Location:** Local study area of the proposed Diavik diamond mine

Wildlife Monitoring Program
Objective: To conduct a wildlife monitoring program in the local study area of the proposed Diavik diamond mine.
Species studied: Barren-ground caribou, waterfowl, raptors, breeding birds; grizzlies, wolves, wolverine, foxes.

198 **Wildlife**

Melo, Octavio
Indian Affairs & Northern Development
P O Box 1500
Yellowknife, NT X1A 2R3

File No: 2849
Region: NS **Location:** Colomac Mine area and vicinity

Continuation of Terrestrial Monitoring Groundtruthing Exercise Program
Objective: To determine the concentration of contaminants in wildlife exposed to mine tailings. This information will help assess the impacts on wildlife and humans who depend on wildlife for food.
Species studied: Small mammals, RB vole, meadow vole, some shrew

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199 **Wildlife**

Mulders, Robert
RWED, Wildlife and Fisheries
5th Floor, 600 - 5102 50th Avenue
Yellowknife, NT X1A 3S8

File No: 2809
Region: SS **Location:** Central Barrens

Objective: To conduct non-invasive wolverine hair collection on the barrens (a pilot study); test hair sampling devices to collect hair for DNA anaylysis; and detect wolverine presence and activity based on snow tracks.
Species studied: Wolverine (Gulo gulo)

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200 **Wildlife**

Mulders, Robert
RWED, Wildlife and Fisheries
5th Floor, 600 - 5102 50th Avenue
Yellowknife, NT X1A 3S8

File No: 2829
Region: NS **Location:** Lac de Gras

Objective: To conduct research on grizzly bear habitat use in the Lac de Gras area.
Species studied: Ursus arctos

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201 **Wildlife**

Nagy, John
RWED Inuvik
Bag Service 1
Inuvik, NT X0E 0T0

File No: 2804
Region: IN **Location:** Beaufort Sea and Amundsen Gulf

Objective: To conduct survey of polar bears; to deploy additional radios; and to perform a mark-recapture study of the entire Beaufort Sea populations.
Species studied: Polar bear

202 **Wildlife**

Nagy, John
RWED Inuvik
Bag Service 1
Inuvik, NT X0E 0T0

File No: 2805
Region: IN **Location:** Gwich'in Settlement Area

Objective: To conduct a survey on the ecology of boreal woodland caribou in the Gwich'in Settlement Area.
Species studied: Boreal woodland caribou

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203 **Wildlife**

Nagy, John
RWED Inuvik
Bag Service 1
Inuvik, NT X0E 0T0

File No: 2825
Region: IN **Location:** Inuvialuit Settlement Region

Objective: To conduct a study on grizzly bear population using satellite tracking.
Species studied: Grizzly bear

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204 **Wildlife**

Nagy, John
RWED Inuvik
Bag Service 1
Inuvik, NT X0E 0T0

File No: 2827
Region: IN **Location:** Inuvialuit Settlement Region

Objective: To study the potential impacts of development on grizzly bears in the area of the Mackenzie Delta oil and gas exploration and development area.
Species studied: Grizzly bear

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205 **Wildlife**

Nishi, John
RWED South Slave
Box 390
Fort Smith, NT X0E 0P0

File No: 2850
Region: SS **Location:** Highway 3

Baseline Vegetation and Bison Distribution Studies Along Highway 3
Objective: To conduct baseline vegetation and bison distribution studies.
Species studied: Bison

206 **Wildlife**

Nishi, John
RWED South Slave
Box 390
Fort Smith, NT X0E 0P0

File No: 3027
Region: SS **Location:** Highway 3

Bison Survey in the Liard Valley to Monitor Diseases

Objective: To census the Liard bison population and bull:cow ratios.
Species studied: Bison

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207 **Wildlife**

Nishi, John
RWED South Slave
Box 390
Fort Smith, NT X0E 0P0

File No: 2852
Region: SS **Location:** Fort Resolution

Salvage and Propagation of Hook Lake Wood Bison

Objective: To study the salvage and propagation of Hook Lake wood bison.
Species studied: Bison

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208 **Wildlife**

Pederson, Simen
University of Tromso
N-9037
Tromso, Norway

File No: 2842
Region: SS **Location:** Dubawnt River

Objective: To conduct research on heavy metals in Arctic hare along a transect near the Dubawnt River.
Species studied: Lepus arcticus

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209 **Wildlife**

Poole, Kim
Aurora Wildlife Research
2305 Annable Rd.
Nelson, BC V1L 6K4

File No: 2854
Region: SS, NS **Location:** Along the proposed Taltson River Transmission Line to Snap Lake

Objective: To conduct a baseline wildlife monitoring on the proposed Taltson River Transmission Line to Snap Lake.
Species studied: Ungulates, carnivores

210 **Wildlife**

Povey, Andrew
Mackenzie Project Environment Group
TERA Environmental Consultants
Suite 1100, 815 8th Avenue S W
Calgary, AB T2P 3P2

File No: 2806
Region: IN **Location:** along the proposed pipeline route within the Inuvialuit Settlement Region

2003 Wildlife Studies in the Inuvialuit Settlement Region
Objective: To commence 2003 Wildlife Studies in the Inuvialuit Settlement Region.
Species studied: waterfowl and shorebird; ungulates

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211 **Wildlife**

Povey, Andrew
Mackenzie Project Environment Group
TERA Environmental Consultants
Suite 1100, 815 8th Avenue S W
Calgary, AB T2P 3P2

File No: 2807
Region: IN **Location:** along the proposed pipeline route in the Gwich'in Settlement Area

Wildlife Study for the Proposed Pipeline in the Gwich'in Settlement Area
Objective: To perform 2003 wildlife studies of the proposed Mackenzie Valley pipeline in the Gwich'in Settlement Area.
Species studied: Ungulates, furbearers and any other wildlife or sign

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212 **Wildlife**

Povey, Andrew
Mackenzie Project Environment Group
TERA Environmental Consultants
Suite 1100, 815 8th Avenue S W
Calgary, AB T2P 3P2

File No: 2810
Region: DC **Location:** along the proposed pipeline route within the Deh Cho Region

2003 Winter Wildlife Studies within the Deh Cho Region
Objective: To commence the 2003 winter wildlife study in the Deh Cho region.
Species studied: Various wildlife

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213 **Wildlife**

Povey, Andrew
Mackenzie Project Environment Group
TERA Environmental Consultants
Suite 1100, 815 8th Avenue S W
Calgary, AB T2P 3P2

File No: 2833
Region: IN **Location:** along the proposed pipeline route within the Inuvialuit Settlement Region

2003 Summer Wildlife Studies in the ISR
Objective: To commence the 2003 summer wildlife studies of the proposed Mackenzie Valley pipeline route in the ISR.
Species studied: Various bird, terrestrial mammal, and aquatic species

214 **Wildlife**

Povey, Andrew
Mackenzie Project Environment Group
Suite 1100, 815 8th Avenue S W
Calgary, AB T2P 3P2

File No: 2834
Region: IN **Location:** along the proposed pipeline route within the Gwich'in Settlement Area

2003 Wildlife Studies within the Gwich'in Settlement Area
Objective: To commence the 2003 wildlife studies within the Gwich'in Settlement Area.
Species studied: Various bird, terrestrial mammal, and aquatic species

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215 **Wildlife**

Scheer, Aedes
Yukon College
P O Box 1230
Dawson City, YT Y0B 1G0

File No: 2811
Region: IN **Location:** near Fort McPherson

Objective: To study the impact of Oestridae fly parasites on the body condition of the Porcupine caribou herd.
Species studied: Caribou

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216 **Wildlife**

Sharpe, Sean
Rescan Environmental Services
908-5201 50th Ave
Yellowknife, NT X1A 3S9

File No: 2846
Region: SS, NS **Location:** Taltson River Hydro Plant to Snap Lake Diamond Mine

Objective: To conduct a baseline study of aquatic, terrestrial and hydrology data for Taltson River Hydro Power Supply with a potential corridor to Snap Lake.
Species studied: Waterfowl, songbirds, shorebirds, raptors, caribou, bison, etc.

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217 **Wildlife**

Shier, Catherine J.
University of Alberta
CW-40, Biological Sciences Bld.
Edmonton, AB T6G 2E9

File No: 2855
Region: All **Location:** various locations throughout the Northwest Territories

Objective: To study the synchrony between mink and muskrat populations in Canada.
Species studied: Mink, muskrat

218 **Wildlife**

Slattery, Stuart
Ducks Unlimited Canada
P O Box 1160
Stonewall, MB R0C 2Z0

File No: 2821
Region: IN **Location:** Tundra-Cardinal-Clearwater Lakes about 90 km south of Inuvik and 18 km northeast of Tsiigehtchic

Demographic Rates and Factors Limiting Breeding Duck Populations in the Mackenzie Valley
Objective: To study breeding ecology and habitat requirements of waterfowl to develop a population model.
Species studied: Waterfowl, with a special emphasis on scoters and scaups

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219 **Wildlife**

Slattery, Stuart
Ducks Unlimited Canada
P O Box 1160
Stonewall MB R0C 2Z0

File No: 2847
Region: IN **Location:** Lower Mackenzie Valley

Small Mammal Survey
Objective: To conduct a small mammal survey (in addition to waterfowl studies as described in permit 2821).
Species studied: Small mammals

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220 **Wildlife**

Swystun, Heather
University of British Columbia
Box 1864
Inuvik, NT X0E 0T0

File No: 2824
Region: IN **Location:** Inuvik Region

Tundra Swans in the Mackenzie Delta Region
Objective: To study the reproductive ecology of tundra swans in the Mackenzie Delta Region; to monitor potential impacts of oil and gas development and climate change.
Species studied: Tundra swans

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221 **Wildlife**

Tate, Douglas
Nahanni National Park Reserve
Box 348
Fort Simpson, NT X0E 0N0

File No: 2832
Region: DC **Location:** Nahanni National Park Region

Objective: To conduct grizzly bear research in areas adjacent to Nahanni National Park Reserve.
Species studied: Grizzly bears

222 **Wildlife**

Veitch, Alasdair
RWED
P.O. Box 130
Norman Wells, NT X0E 0V0

File No: 2968
Region: SA **Location:** Willow Lake (Brackett Lake) in the Loche River watershed north of Tulita

Objective: To continue the duck banding program at Willow Lake in conjunction with the Western Canada Cooperative Duck Banding Program.
Species studied: Mallards, Northern Pintail, Green-winged Teal

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223 **Wildlife**

Veitch, Alasdair and Arianna Zimmer
RWED
P O Box 130
Norman Wells, NT X0E 0V0

File No: 2972
Region: SA **Location:** Mackenzie Valley

Current Movements, Distribution and Habitat Use of Boreal Woodland Caribou in Sahtu Settlement Area

Objective: To study the movements, distribution, and habitat use of boreal woodland caribou to document the concern that their number is declining in the NWT.
Species studied: Boreal woodland caribou

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224 **Wildlife**

Voelzer, James F.
US Fish and Wildlife
911 N.E. 11th Avenue
Portland, OR
USA 97232-4181

File No: 2812
Region: IN **Location:** Mackenzie Valley basin

The Annual Cooperative US/Canada Waterfowl Population Surveys

Species studied: waterfowl

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225 **Wildlife**

Wainwright-De La Cruz, Susan
U.S. Geological Survey
Western Ecological Research Center, San Francisco
BLDG. 505, Azuar Drive and I Street
Vallejo, CA
USA 94592

File No: 2822
Region: All **Location:** various locations locations throughout the Northwest Territories

Objective: To conduct a study into the cross-seasonal effects of contaminants on Surf Scoter wintering in San Francisco Bay, CA and breeding near the Mackenzie River.
Species studied: Melanitta perspicillata

226 **Wildlife**

Wilson, Anne
Environmental Protection Branch
Suite, 5204 - 50th Ave
Yellowknife, NT X1A 1E2

File No: 3176
Region: NS **Location:** Misery Pit at Ekati Mine

Small Mammal Study

Objective: To study small mammals near the misery pit of Ekati Mine.
Species studied: Small mammals

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227 **Wildlife**

Witteman, John
BHP Diamonds Inc.
1102 4920 – 52nd Street
Yellowknife, NT X1A 3T1

File No: 2971
Region: NS **Location:** BHP Diamonds Inc. property surrounding the Ekati Diamond Mine

Wildlife Effects Monitoring Program

Objective: To test impact predictions and effectiveness of mitigation measures for the following species.
Species studied: Caribou, grizzly bears, wolves, wolverines; Upland breeding birds, loons, raptors.

Department of Fisheries and Oceans

FISHERIES SCIENTIFIC LICENCES

228 **Fisheries**

Cott, Pete
DFO
Box 1871
Inuvik, NWT X0E 0T0

File No: SLE-03/04-227
Location: Lakes off the Ingraham Trail, Pontoon to Tibbitt Lake. Study area bounded by coordinates: 62°40'00" 113°10'00", 62°30'00" 113°10'00", 62°40'00" 114°20'00", 62°30'00" 114°20'00"

Pike Spawning Habitat
Objective: To study the effects of forest fire on pike spawning habitat.

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229 **Fisheries**

Harwood, Lois
DFO
Suite 101 Diamond Plaza
5204-50th Avenue
Yellowknife, NT X1A 1E2

File No: SLE-03/04-203 (DFO)
Location: sea Ice on the Beaufort Sea at 69°39'00", 136°27'37".

Study on Bearded Seals – Beaufort Sea
Objective: The researcher collected information on the distribution, densities, behavioral patterns, body and reproductive conditions of ringed and bearded seals in habitats that may be subject to winter seismic and/or winter exploration drilling activities.

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230 **Fisheries**

Harwood, Lois
DFO
Suite 101 Diamond Plaza
5204-50th Avenue
Yellowknife, NT X1A 1E2

File No: SLE-03/04-216
Location: Eskimo Lakes and Liverpool Bay. 69°15'00" to 69°40'00" and 130°30'00" to 132°00'00"

Study of Different Species of Fish in Eskimo Lakes and Liverpool Bay
Objective: To obtain baseline information on fish (including size, sex and collect ageing structures) from fish caught in the subsistence fisheries; to obtain information on trophic levels within the lakes; and to estimate the abundance of fish through a small-mesh gillnetting program. Lake trout will also be floy tagged to determine the present rate of exploitation.

231 **Fisheries**

Harwood, Lois
Department of Fisheries and Oceans
Suite 101 Diamond Plaza
5204-50th Avenue
Yellowknife, NT X1A 1E2

File No: SLE-03/04-223
Location: Sitidgi Lake 68°32'00" 132°40'00"

Characteristics of Fish in Sitidgi Lake

Objective: To collect information on the fish and lower trophic levels at different sampling locations; document size, sex and age from lake trout that are caught in the subsistence fisheries and determine the present rate of exploitation of the species through a tagging program; to estimate the abundance of fish through a small-mesh gillnetting program.

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232 **Fisheries**

Low, George
Department of Fisheries and Oceans
42043 Mackenzie Highway
Hay River, NT X0E 0R9

File No: SLE-03/04-207
Location: Kakisa River where it flows into Kakisa Lake at 60°52'00" 117°38'00"

Study of Spawning Walleye

Objective: The study collected specimens to determine fecundity, size and age of spawning walleye.

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233 **Fisheries**

Low, George
Department of Fisheries and Oceans
42043 Mackenzie Highway
Hay River, NT X0E 0R9

File No: SLE-03/04-208
Location: Kakisa River where it flows into Tathlina Lake at 60°28'00" 118°03'00"

Study of Spawning Walleye

Objective: The study collected specimens to determine fecundity, size and age of spawning walleye.

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234 **Fisheries**

Low, George
Department of Fisheries and Oceans
42043 Mackenzie Highway
Hay River, NT X0E 0R9

File No: SLE-03/04-209
Location: Island River where it flows into Trout Lake at 60°25'00, 121°17'00"

Study of Spawning Walleye

Objective: The study collected specimens to determine fecundity, size and age of spawning walleye.

235 **Fisheries**

Low, George
Department of Fisheries and Oceans
42043 Mackenzie Highway
Hay River, NT X0E 0R9

File No: SLE-03/04-210
Location: The mouth of the Buffalo River where it flows into Great Slave Lake at 60°53'00" 115°02'30"

Inconnu Survey - Buffalo River

Objective: The study surveyed fish stocks in the Buffalo River closed area. Data was collected on species composition, size and age, to monitor on-going efforts to rebuild the stock of inconnu in an area that was previously over-fished.

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236 **Fisheries**

Low, George
Department of Fisheries and Oceans
42043 Mackenzie Highway
Hay River, NT X0E 0R9

File No: SLE-03/04-211
Location: The Mackenzie River and tributaries between Fort Simpson (61°51'00" 121°23'00") and Gossage River (66°59'00" 130°17'00").

Bull Trout Survey – Mackenzie River

Objective: To determine the northern limit of bull trout in the Mackenzie River drainage system

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237 **Fisheries**

Papst, Mike
Department of Fisheries and Oceans
501 University Crescent
Winnipeg, MB R3T 2N6

File No: SLE-03/04-218
Location: Chitty Lake 62°42'50" 114°07'55"

Fish Assessment – Chitty Lake

Objective: This survey assessed the fish population structure – growth rates, reproductive status, habitat use and food consumed. Trophic status will be determined using food types, parasites and stable isotopes.

238 **Fisheries**

Stephenson, Sam
Department of Fisheries and Oceans
Box 1871
Inuvik, NT X0E 0T0

File No: SLE-03/04-213
Location: Mackenzie River and tributaries and Beaufort Sea

Study on Different Species of Fish

Objective: To collect or purchase samples of various species for scientific, contaminant and disease/parasite analysis. Studies included age and growth rates, fecundity and sex ratios. Samples of vagrant species were also collected for positive identification and range distribution.

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239 **Fisheries**

Tallmann, Ross
Department of Fisheries and Oceans
501 University Crescent
Winnipeg, MB R3T 2N6

File No: SLE-03/04-228
Location: Keith Arm (Southern portion near Deline) ; 65°10'00" 123°00'00" on Great Bear Lake

Gathering Data on Stocks in Great Bear Lake

The objective of this study was to gather baseline data on size, age, fecundity, growth and mortality and to compare productivity of stocks in different parts of Great Bear Lake. These data were used to assess the lake trout stocks. Tissue samples were collected and analyzed to determine fish movements.

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240 **Fisheries**

Tallmann, Ross
Department of Fisheries and Oceans
501 University Crescent
Winnipeg, MB R3T 2N6

File No: SLE-03/04-229
Location: Keith Arm (Deerpass Bay) ; 66°00'00" 122°00'00" on Great Bear Lake

Lake Trout in Great Bear Lake

Objective: To gather baseline data on size, age, fecundity, growth and mortality and to compare productivity of stocks in different parts of Great Bear Lake. These data were used to assess the lake trout stocks. Tissue samples were collected and analyzed to determine fish movements.

GLOSSARY OF SCIENTIFIC TERMS

Active layer	the area where the soil freezes and thaws above the permafrost
Aeration	pumping air into a medium
Aeromagnetic survey	surveys from aircraft that make use of the magnetic field caused by magnetized rocks in the Earth's crust to make estimates about underlying geology of a given area such as distribution of potential resources
Algae	simple living things that are composed of one or more cells. Most algae are similar to plants that do not have roots or flowers
Algorithm	a procedure or formula for solving a problem
Alkali	a soluble salt obtained from the ashes of plants and consisting largely of potassium or sodium carbonate
Amphibolite	a medium-grained dark coloured metamorphic rock, characterized by large dark coloured crystals
Analytical	a detailed examination of the structure or some other parameter of a substance or thing
Anatomy	the science that deals with body structures of animals or plants
Anoxic	a situation where oxygen is present in very low amounts or not at all
Anthropogenic	of, relating to, or resulting from the influence of human beings on nature (ie: source of pollution)
Anthropometric	measurements of the body
Anticline	a folded upward rock that has a center that contains stratigraphically older rocks
Aquatic Biota	all living organisms in the aquatic environment
Archean	a period of geologic time from about 3.9 billion years to 2.5 billion years ago
Archival	pertaining to a collection of documents
Arsenic	a chemical element that is gray in colour and that is highly poisonous with no taste
Artifacts	an old tool, weapon or other human-made thing from the past
Asexual	an organism that reproduces without the aid of a partner and who passes on all of its genetic information
Asphodel	a herb like plant
Assessed	from observations, estimated result(s) of the outcome are made
Attributed	giving a cause to affect or outcome
Aufies	ever-thickening sheets of ice formed by springs that freeze in layers 2 - 5 meters thick over existing river ice, often breaking away to become navigational hazards

Autoecology	the branch of ecology that deals with the biological relationship between an individual organism or an individual species and its environment
Awl	a tool that is pointed for poking holes in leather or wood
Bacteria	tiny living single cells that can only be seen through a microscope
Baseline	the standard
Benthic	organisms that live at the bottom of a body of water
Benthos	the bottom of the ocean or body of water
Bentonite	a rock composed of clay-like material formed by volcanic ash or tuff. Bentonite beds are common in shale or limestone from the Paleozoic time
Biochemistry	study of chemical processes in living organisms
Biodiversity	pertaining to the variety of species in an area
Biogenic	produced by living organisms or biological processes
Biogenic emission rates	the speed that volatile organic compounds are released into the surrounding environment
Biogeography	the science that deals with distribution of all living organisms
Biomass	the total amount of all living material within a specific volume of the environment
Biomes	distinct areas of the Earth that are common in climate conditions, life forms and physical features like the tundra or woodland
Biostratigraphy	identification and differentiation of rocks based on the types of fossils they contain
Bituminous	a term used to describe many forms of solid/semi-solid hydrocarbons that are either synthetic or found in nature
Brachiopods	marine invertebrates characterized by their filamentous feeding organs and two bilaterally symmetrical valves that make up its shell
Brittle stars	a marine organism belonging to the same family as sea stars and sea urchins that is commonly found in Arctic regions in shallow waters
Calcrete	a mix of gravel and sand cemented by calcium carbonate
Carnivore	a flesh eating animal
Characterized	to describe something
Chlorophyll a	a pigment in plants that give them their green colour and which absorb energy from the sun. Plants use Chlorophyll to change carbon dioxide and water into food and oxygen
Classification	organize into groups or categories
Cockles	a sea clam used for food with a shell that looks like a heart
Compliance	an agreement with something
Comprehend	being able to understand

Comprehensive	conveying or including everything or almost everything
Coniferous woodland	a wooded area that is dominated by evergreen trees
Conifers	a group of woody plants commonly known as evergreen trees such as pine, spruce or fir that bears cones
Connectivity	how well something is able to connect or relate with another thing
Convection	a transfer of heat through a gas or liquid by currents
Coral	a hard substance like stone found in tropical seas. Coral is made from the skeletons of tiny marine organisms
Core	a part removed from the interior of a mass especially to determine the interior composition
Correlated	a mutual relation between two comparable things
Cosmopolitan	consisting of a group of individuals from around the world
Crinoids	a sea urchin that has feathery arms
Cumulative	things that add together
Dark septate endophytes	tiny fungi that grows underground into tree roots
Deducing	draw a conclusion
Deformation	a measurable change in structure
Degradation	to reduce something or to place something at a lower level
Denitrification	a bacterial process in which nitrate is used to metabolize organic molecules when atmospheric oxygen is not available
Density	a quantity of mass per unit volume
Devonian	a period between 410 and 370 million years ago when terrestrial plants began to spread across the land as well as much development in aquatic animals such as fish and other shell fish
Diamiction	glacial soils with clay, sand, gravel and boulders mixed together
Diatom	microscopic one-celled marine or fresh water alga having cell walls that contain silica (a white colorless glass-like solid that doesn't dissolve)
Disjunct	refers to separate societies
Diversion	a changing of the direction in which something is going
Dorsal fin	the fin on an aquatic animal that is located on its back
Ecology	the science that deals with how living organisms live in relation to each other and their environment
Ecological integrity	ensuring the relationship in plant and animal communities remains healthy
Ecophysiological	pertaining to an individual organism's response to the factors in the environment such as temperature
Ecosystem	living organisms and non-living structures that work together to form a system

Effluent	something that flows out from a main source, such as sewage or waste matter
Electro-fishing	using electricity to stun and kill fish, usually used during scientific scenarios
Electromagnetic	magnetism that is caused by electricity
Emissions	something that is radiated outward or discharged from a source
Endophytes	a plant that grows underground or under a tree
Eocene	a time when small mammals began to develop on Earth between 54 and 38 million years ago
Epoch	a period of time during which something important developed or happened
Erosion	group of natural processes (weathering, disintegration, abrasion, corrosion, transportation) where the Earth's surface is worn away and removed
Eskers	a long, narrow ridge of coarse gravel deposited by a stream flowing under a decaying glacial sheet of ice
Estuary	a place where coastal seawater comes into contact with the current of a freshwater stream
Evolution	a process where different species come into existence by differentiation and genetic mutations from common ancestors over a long period of time.
Excavated	extracting or revealing something by removal of the surrounding earth
Extant	organisms that are still present on the Earth today
Fauna	animal life of a particular region, environment, or geological period
Fibril	a smaller unit of an individual fibre
Flora	the plants of a particular region, environment or geological region
Fluvial	pertaining to something's existence or growth around a stream or river
Fossil	trace of an organism of a past age, embedded and preserved in the Earth's crust
Fungi	a kingdom of heterotrophic organisms that produce spores
Gastropod	an organism that characteristically has a single, usually coiled shell or no shell at all, a ventral muscular foot for locomotion, and eyes and feelers located on a distinct head
Gender	one's characteristics or traits determined socially as a result of one's sex
Genetic	pertaining to an organism's traits or characters being linked to genes
Genera	a group of organisms that share common characteristics
Geochemistry	a science that deals with the chemical composition of and chemical changes in the solid matter of the Earth
Geochronological	the chronology of the earth's history as determined by geologic events and not by human history
Geomorphologic	pertaining to the physical features of the Earth's surface
Glacial refugia	an area isolated by glaciers where little environmental change took place

Glyptostrobus pensilis	a species of conifer that has the common name of water pine
Gneisses	a banded or foliated metamorphic rock, usually of the same composition as granite
Grams	a unit of measurement for mass
Granitic rock	light colored coarse-grained rock that was formed at great depths such as quartz
Granulite	a metamorphic rock, commonly granular in texture
Habitat	a place where organisms can live
Heterogeneous	a situation where something is in a mixed composition
Holocene	the most recent 11,000 years of the Earth's history starting at the end of the last major ice age, which has been relatively warm
Host specificity	how selective a parasite is when looking for a host to live on as a source of food
Hydraulic	pertaining to movement caused by water
Hydrograph	a graph showing the water level, discharge, or other property of river volume with respect to time
Hydrology	science dealing with the properties, distribution and circulation of water
Igneous	a rock or mineral that solidified from molten or partly molten material, i.e. from magma; one of three rock types with metamorphic and sedimentary
Implemented	to put into effect
Inoculated	to introduce to an organism
Iron	a metallic element used for making tools and essential for all living organisms' survival
Kitigaaryumiut	the traditional gathering place where the Kitigaaryumiut people would hunt beluga and hold celebrations
Larix	a genus of boreal trees commonly known as Larch, the range of which includes the circumpolar region and some mid-high altitudes in the south
Larvae	a premature stage for an insect where it feeds a lot before it becomes a pupa
Latitude	a measurement of the angular distance from the equator to a given point on the Earth's surface
Lenticular	resembling the shape of a cross section of a lens
Liliaceae	a family of mostly perennial herb-like plants with about 280 genera and 4,000 species
Limestone	a sedimentary rock that contains mostly calcium carbonate and can be formed by either inorganic or organic processes
Limnology	the scientific study of the life and phenomena of fresh water, especially lakes and ponds
Manganese	a metallic element that is used to make alloys

Metamorphic rock	any rock derived from pre-existing rocks by changes in response to environmental factors such as temperature and pressure over a long period of time; one of three types of rocks with igneous and sedimentary
Metasquoia	a Dawn Redwood that belongs to the conifers
Methane	the simplest hydrocarbon that is the main ingredient in natural gas (CH_4)
Methanogenic	microorganisms that produce methane (CH_4) by the fermentation of simple organic carbon compounds with the production of carbon dioxide (CO_2)
Microbes	bacteria that can cause disease
Microclimate	the climate close to Earth's surface or the climate of a small area
Microfossils	a very small fossil that needs the aid of a microscope to view it
Microorganisms	organisms that must be viewed under a microscope, such as bacteria or a virus
Migration	the long range movement of a group of animals based on the seasons
Molecular analysis	a detailed look at the chemical structure and properties of a molecule
Moraine	a mound of rock debris carried and deposited by a glacier
Morphometric	measurements taken at designated places to compare individuals of a species
N-butanol	an isomer of the alcohol butanol - C_4H_9OH
Nested plots	in an experiment, designated areas are placed out along a transect line to gather data
Oligotrophic	a pond or lake lacking in plant nutrients and having a large amount of dissolved oxygen throughout
Organic	material pertaining to plants or animals
Outcrop	a portion of bedrock or other stratum protruding through the soil level
Overlie	sedimentary or volcanic rock that lays on top of older rock
Paleo-Eskimo	the people who migrated across the north around 2000 years ago. It is not known if they are the ancestors of the modern Inuit.
Paleoecological	a relationship or study of ancient organisms and how they related to their ancient environment
Paleoenvironmental	an environment that existed in the past
Paleohydrological	a study regarding the ancient water features preserved in rocks
Paleolimnological	a study regarding the ancient lake conditions by looking at its sediment
Parameter	one set of measurable factors, such as the temperature and pressure, that define a system and determine its behavior and are varied in an experiment
Parameterized	expressing something in terms of a parameter
Pertinent	something is relevant to the topic
Physiological	pertaining to the physical structures and functions of living organisms

Phytoplankton	a group of plant-like plankton that all sea animals depend on either directly or indirectly
Pixel	a single unit of a television or computer screen that is responsible for the picture
Pleistocene	an age of notable ice ages and development of humans between 2,000,000 and 10,000 years ago
Polycycle thaw slump	a depression with underground drainage that reflects many base-leveling for more than one sea-level
Postglacial	relating to or occurring during the time following a glacial period
Putative	to assume something
Qualitative	complete detailed descriptions usually taken from a small sample that allows for distinctions to be drawn from the data
Quantitative	use of large amounts of data where statistics can be applied to interpret the data
Radiocarbon dating	the determination of the approximate age of an ancient object, such as an archaeological specimen, by measuring the amount of carbon 14 it contains
Raptor	a bird of prey such as an eagle, falcon or osprey
Reef	a structure formed by coral and its remains that lie above the bottom sediment
Reticular	a system that adopts a network design
Revitalization	to give new life or vitality to something
Sandstone	sedimentary rock that contains fine-grained fragments that are firmly cemented together
Satellite imagery	computer images generated by a satellite which allow researchers to look at a specific area and monitor surface features such as vegetation
Sediment	solid fragment material that occurs from the weathering of rocks. In water it is material that has settled from a state of suspension
Sedimentary rock	rock derived from loose particles that have accumulated over time; one of three rock types with igneous and sedimentary
Sedimentation	the process where small particles are moved and deposited to accumulate into layers
Seiche events	an environmental event such as pressure or especially high winds that generate a change in a lakes water level or wave level
Seismic	pertaining to vibrations in the Earth, both natural and induced
Shovel testing	a crude test where a sample of ground is taken by use of a shovel
Siltstone	silt having the texture of shale
Skeptical	to have doubt
Solutes	a substance that has dissolved
Species	a group of organisms that share common characteristics that group them together and also distinguish them from others

Sponges	aquatic organisms that characteristically have a porous skeleton composed of fibrous material and often form colonies attached to an underwater surface
Stone flakes	debris left over from a rock while making tools
Stratified	a system that is set up in layers or strata
Stratigraphic	formation of rock where different layers can be picked out based on type and age of the rock
Subsidence	to flatten out so as to form a depression; to sink or fall to the bottom
Succession	a progressive change in the biological community as a result of a response from species to the changing environment
Surficial	pertaining to something that is on the surface
Suspension	a situation where the medium is able to support the weight of the particles trapped inside it
Systematic	done according to a plan
Thermatic	pertaining to a cause of heat
Thermokarst	sinking holes, caves and underground drainage that are produced in regions with permafrost from melting of ground ice and settling of the remaining ground
Thermokarst lakes	lakes where water is trapped in a cut off karst region
Topography	a description of the surface of a given area
Trace metals	a metal that is not essential in the sample but is found in small quantities
Tracheid	a pitted long cylindrical tube in the xylem of a plant used for water conduction
Transect	an imaginary line across a surface where observations are made
Tributary	a place where a stream feeds into a larger stream or lake
Trilobite	an ancient group of marine organisms that represents some of the oldest arthropods known and whose fossils are often found in rock
Turbid	stirred up material suspended in a medium leaving it unclear and opaque
Turbidites	sea-bottem deposits formed by massive slope failures, caused by earth quake shaking or excessive sedimentation load, where rivers have deposited large deltas
Unconformity	a large break in the chronological sequence layers of rock
Vascular plants	a group of plants that have developed a good conductive system and that have structural differentiation
Velocity	rate of occurrence or action; quickness of motion
Volatile	an easily vaporized compound
Watershed	the region draining into a river, river system, or other body of water
Younger Dryas	the most significant rapid climate change event that occurred during the last deglaciation of the North Atlantic region

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