



IDENTIFICATION

Department	Position Title	
Industry, Tourism and Investment	Permafrost Geohazard Scientist	
Position Number	Community	Division/Region
63-16303	Yellowknife	NWT Geological Survey

PURPOSE OF THE POSITION

The Permafrost Geohazard Scientist undertakes scientific studies to increase the knowledge of thaw-sensitive terrain and permafrost geohazards that have impacted or may impact communities, infrastructure corridors, development projects, and areas of cultural and environmental significance.

SCOPE

The Permafrost Geohazard Scientist (Scientist) is located in Yellowknife and reports to the Senior Permafrost Scientist. The Scientist works with other permafrost researchers and geoscientists at the Northwest Territories Geological Survey (NTGS). The incumbent conducts research, analyzes data, prepares and disseminates reports, and provides advice to other researchers and NTGS clients.

All governments in the Northwest Territories (NWT) have recognized the need for permafrost and environmental geoscience knowledge in order to better understand and adapt to the effects of climate change on infrastructure and the environment. An ability to predict the environmental impacts of climate change represents a distinct advantage in planning and maintaining infrastructure and preparing for changes to the natural environment such as changes in water quality due to permafrost thaw. This knowledge is now a key factor in supporting sustainable economic development and in maintaining positive socio-economic conditions for NWT residents.

Permafrost research supports decision making related to the development and maintenance of transportation infrastructure. The NTGS contributes to these goals through environmental geoscience research, compiling relevant datasets, and disseminating information to stakeholders. The NTGS works closely with the Government of Northwest Territories (GNWT)



Department of Infrastructure in contributing permafrost knowledge to inform construction, maintenance, and regulatory decisions for existing and new road corridors.

Permafrost thaw is increasing the frequency and magnitude of geohazards, affecting the cultural, environmental, and socio-economic health of the NWT. The NWT Climate Change Strategic Framework (NWT CCSF) has identified that understanding permafrost conditions and the effects of climate change on terrain stability is necessary to develop informed mitigation and adaptation strategies that minimize impacts on society and supports responsible infrastructure development. Scientific knowledge of permafrost conditions provides the necessary foundation for predicting the impacts of climate change in the north, making the discipline relevant across scientific disciplines and government and industry sectors. The NWT CCSF 2019-2023 Action Plan acknowledges that developing a modern and comprehensive permafrost knowledge base is a significant need.

The Scientist works with legislative, regulatory, and policy frameworks that include the NWT CCSF and its Action Plan, the NWT Transportation Strategy, the GNWT Knowledge Agenda and its Action Plan, the *NWT Scientist Act*, Aurora College research policies, and the *Mackenzie Valley Resource Management Act*.

The Scientist develops, plans, and implements permafrost research projects. Projects vary from regional, multi-disciplinary collaborative studies to smaller targeted studies that may be conducted independently. A key research focus is characterizing sensitive permafrost terrain and its associated geohazards and monitoring thaw-induced landscape change. In implementing this work, the Scientist may be required to recruit and supervise field staff, ensuring that occupational health and safety procedures are developed and complied with.

A key NTGS mandate is to publicly disseminate research data and interpretations in a timely manner. The Scientist is responsible for authoring papers and developing publications of high technical quality that are suitable for publication by the NTGS or in refereed scientific journals. The Scientist also disseminates information by delivering presentations at community meetings, professional conferences, and to interested NTGS clients. In addition, the incumbent contributes to NTGS outreach activities by giving public presentations, producing plain-language science communication products, and engaging with students.

The Scientist provides information, evidence, and advice to NWT regulatory boards to inform their decision-making processes. This information may be used to establish terms and conditions for Land Use Permits, Water Licenses, and Environmental Impact Assessments that are issued or ordered by regulatory agencies.

The Scientist collaborates with other NTGS colleagues, the NWT Centre for Geomatics, the GNWT departments of Infrastructure, Lands, and Environment and Natural Resources, federal departments (especially Natural Resources Canada), and Indigenous governments (especially



their land management agencies). The incumbent also regularly collaborates with academic partners, engineering and environmental consultants, and non-profit organizations.

The Scientist has significant latitude provided that best practices in scientific data collection, research, and methodology are followed. The position's work must be impactful in achieving the goals of the NTGS Strategic Plan and in meeting the needs of the GNWT and NWT residents.

RESPONSIBILITIES

1. Leads geohazard mapping and terrain modeling research projects.

- Develops, implements, and leads research utilizing a range of mapping, remote sensing, modeling, and field-based data collection methods.
- Develops and implements research projects that map and model sensitive permafrost terrain and permafrost geohazards.
- Manages administrative aspects of projects including recruitment and supervision of field staff, financial reporting, the acquisition of permits and licenses, and preparation of service contracts.
- Collaborates with local, national, and international partners to develop and implement research projects.
- Assembles existing data to serve as a framework for interpreting new field, laboratory, and remotely-sensed information.
- Contributes to strategic decisions on the permafrost and environmental geoscience needs and priorities of the NTGS.

2. Manages, interprets, and maintains NTGS scientific data holdings.

- Supports the development of a permafrost data management system so that spatial data on permafrost conditions and geohazard information can be accessed by GNWT and external clients.
- Investigates past permafrost mapping and geohazard inventories and related projects conducted in the NWT.
- Compiles, organizes, and archives permafrost mapping and geohazard data collected by the GNWT, partner organizations, researchers, and industry.
- Plans and implements data compilation and synthesis projects.
- Compiles permafrost data and models terrain hazards.
- Promotes the utility and value of permafrost spatial datasets to government, industry, regulatory boards, academic partners, and the public.

3. Disseminates research findings and provides information and advice to partners and stakeholders.

- Authors or co-authors reports, maps, web pages, books, digital atlases, and other materials.



- Develops proposals, including budgets and schedules, for research syntheses and compilations.
- Contributes as an author and reviewer to the NTGS publication process and to peer-reviewed scientific journals.
- Assembles and presents research results at professional scientific meetings and industry and environmental management conferences.
- Organizes and conducts project workshops, technical sessions, and training exercises as required.
- Maintains regular contact with colleagues and clients to ensure constant critical feedback of work underway and a high technical quality of completed work.
- Prepares non-technical promotional and educational materials about permafrost terrain conditions and geohazards in northern Canada.
- Responds to client requests for assistance in accessing and interpreting permafrost terrain sensitivity and geohazard information.
- Conducts or contributes to community information sessions and outreach activities.
- Collaborates with the Canadian Standards Association to revise and develop permafrost-related standards.

WORKING CONDITIONS

Physical Demands

The incumbent works in a normal office environment from September to April and up to three weeks of winter field work. From May to August this is a field-based position. In the summer field season, the incumbent will be hiking over rough terrain with a backpack and collected samples (up to 50 pounds) for 8 hours per day, up to 3 weeks per year; will be travelling in small aircraft and helicopters for up to 4 hours per day, up to 3 weeks per year; will be travelling in small water craft for up to 1 hour per day, up to 3 weeks per year. In the winter field season, work involves travelling by snowmobile, work at extreme cold temperatures, operation of two-person drills and working alongside industrial diamond/sonic geotechnical drills for up to 8 hours per day, up to 3 weeks per year.

Environmental Conditions

The incumbent work in a normal office environment from September to April. From May to August this is a field-based position. While in the field, the incumbent can be exposed to: rapidly changing weather and to conditions such as cold (hypothermia), intense sun (burn), wind, rain; helicopters, airplanes, ATV's, road vehicles (physical injury, hearing loss, gas/fumes); insects and insect bites; dangerous, unforeseen, uncontrolled field situations such as vehicular accidents, attack by wild animals, falls and other accidents while on traverse (broken bones, cuts, etc.). The incumbent will be exposed to these environment conditions every day up to three weeks per year every day.



Sensory Demands

The incumbent work in a normal office environment from September to April. From May to August this is a field-based position. While in the field, the incumbent is subject to impacts associated with long hours of field work (e.g., fatigue). The incumbent will be exposed to these environment conditions every day up to three weeks per year every day.

Mental Demands

The incumbent work in a normal office environment from September to April. From May to August this is a field-based position. While in the field, the incumbent is subject to substantial disruption of family life due for field work in distant locations. The incumbent is also responsible for the continuous management of scientific and logistical activities and safe work practices while in the field, including the prediction and mitigation of potentially hazardous situations and managing personality conflicts amongst field staff. The incumbent will be exposed to these demands every day up to three weeks per year.

The incumbent is also required to present research or work plans to scientific peers, collaborators, community groups, etc.; attend research meetings in Southern Canada two to four times per year and give presentations at international conferences.

KNOWLEDGE, SKILLS AND ABILITIES

- Knowledge of scientific principles and techniques pertaining to permafrost and geohazard research and monitoring, and/or engineering, including slope stability analysis, field-based and remote sensing data acquisition, terrain mapping, management, and analysis.
- Knowledge of permafrost, climate, and ecological conditions that influence the distribution of sensitive permafrost terrain across the NWT.
- Knowledge of the primary indicators of thaw-sensitive permafrost terrain.
- Knowledge of slope and terrain stability factors in permafrost terrain, including specific knowledge pertaining to slope failure.
- Knowledge of remote sensing methods including Landsat image analysis, interferometric synthetic aperture radar (InSAR), light detection and ranging (LiDAR), and other image acquisition techniques.
- Knowledge of spatial modeling for geohazard susceptibility, terrain assessment, and landscape change, including machine learning methods.
- Knowledge of the methods, techniques, and practices of spatial information management, including manipulation, interpretation, digitization, retrieval, and storage of data.
- Knowledge of data management principles and appropriate data structures for spatial information.



- Knowledge of government strategic priorities and the role of permafrost terrain and geohazard information in contributing to infrastructure planning, design, and maintenance.
- Knowledge of the relevance of permafrost thaw with respect to environmental effects, including hydrological, water quality, and ecosystem impacts.
- Knowledge of the roles and permafrost geoscience needs of other government departments, agencies, and industry.
- Knowledge of databases and basic computer coding to upload, search, evaluate, manipulate, and analyze spatial datasets.
- Knowledge of the legal and ethical obligations of the geoscience or geotechnical engineering professions (e.g., Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists).
- Project management, organizational, and logistical skills to effectively manage and participate in independent and collaborative research projects.
- Data management skills to organize, archive, and manage large volumes of permafrost mapping, geotechnical, and spatial information.
- Analytical skills to describe and synthesize permafrost terrain and geohazard information, and skills in statistical modeling.
- Skills in scientific report writing, critical peer review, and editing of scientific reports and interpretations.
- Supervisory skills to oversee contractors, other staff, and field assistants.
- Field skills that are grounded in best practices in safety management and permafrost and environmental geoscience research and monitoring.
- Presentation skills that result in effective communication with scientific and engineering peers and laypersons.
- Ability to interpret permafrost and periglacial landforms.
- Ability to obtain remote sensing data and manipulate it to create derivative products that portray permafrost geohazards, or to monitor terrain stability at local to regional scales.
- Ability to work effectively, both independently and in collaboration with other professionals.
- Ability to conceptualize, design, and implement permafrost geohazard and environmental geoscience research projects.
- Ability to manage diverse project teams comprised of researchers, government staff, industry, and community members.
- Ability to complete projects on time and within budget, often in conjunction with the performance of other duties.
- Ability to produce scientific reports of high technical quality suitable for publishing in external scientific journals or through the NTGS.



- Ability to efficiently use computer hardware and software for data collection, data management, synthesis and modeling, and presentations (e.g. MS Office; ArcGIS; R; specialized graphic design, statistics, and modelling software; database software).
- Abilities in computer coding to organize, analyze, and model permafrost geoscience data.
- Ability to clearly and effectively communicate scientific information in visual, oral, and written formats and at an appropriate level.
- Ability to commit to actively upholding and consistently practicing personal diversity, inclusion and cultural awareness, as well as safety and sensitivity approaches in the workplace.

Typically, the above qualifications would be attained by:

A minimum of a Master of Science (M.Sc.) degree in Geology, Geography, or related field, or a M.Sc. in Engineering with a specialization in geotechnical or geological sub-disciplines, with expertise in permafrost environments and at least 5 years of work experience in industry, academia, or a government agency in a related capacity.

Assets include:

- A proven track record of conducting field work, establishing scientific collaborations, managing scientific teams and projects, authoring peer-reviewed scientific publications, and presenting the results of original scientific work to colleagues, decision makers, and Northerners.
- Eligibility for registration in Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists (NAPEG).

Equivalent combinations of education and experience will be considered.

ADDITIONAL REQUIREMENTS

Position Security (check one)

- ☐ No criminal records check required
- ☒ Position of Trust – criminal records check required
- ☐ Highly sensitive position – requires verification of identity and a criminal records check

French language (check one if applicable)

- ☐ French required (must identify required level below)

Level required for this Designated Position is:

ORAL EXPRESSION AND COMPREHENSION

Basic (B) ☐ Intermediate (I) ☐ Advanced (A) ☐

READING COMPREHENSION:

Basic (B) ☐ Intermediate (I) ☐ Advanced (A) ☐

WRITING SKILLS:

- Basic (B) ☐ Intermediate (I) ☐ Advanced (A) ☐
☐ French preferred

Indigenous language: Select language

- ☐ Required
☐ Preferred