

Northern Alberta Institute of Technology

**The Northern Landscapes
Sensitivity Atlas and Net
Environmental Benefit Analysis
(NEBA) Tool**

**Preliminary Project Discovery
Report**

*Prepared for Government of the Northwest
Territories*

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1. Executive Summary

This Northern Landscapes Sensitivity Atlas (NLSA) project is funded by the Government of Northwest Territories Environmental Studies Research Fund (ESRF) and the Natural Sciences and Engineering Research Council of Canada (NSERC) College and Community Social Innovation Fund (CCSIF). This report presents the preliminary findings of the project's discovery phase (July 1, 2022 - June 30, 2023), including a summary of the project team's initial scan of the Sahtú Region's legacy geographic information system (GIS) data and mapping project archive.

NAIT's Northern Landscapes Sensitivity Atlas presents an immersive and integrated viewer of data from the natural, social, and built environments. The platform and tool are a computer-based GIS that combines maps and related map data and information into one place. Initial research is focused on the Sahtú Settlement Area of the Northwest Territories, and uses authoritative published data from local, regional, national, and international sources to visualize intersections and overlaps in mapped information. Observations made with this tool can help communities and stakeholders make better and more inclusive decisions by taking information out of institutional silos and presenting them in a unified platform: an efficient single-point-of-truth for planning that is comprehensive, transparent, and evidence-based.

Throughout the discovery phase, engagement with the Sahtú Renewable Resources Board (SRRB) and Sahtú community members have been instrumental in providing guidance, knowledge, and critical insights into the community's areas of interest, priorities, and challenges. The collaboration and co-creation of knowledge with the SRRB, Sahtú community, industry and other research partners were realized via community meetings (in-person and virtual), and fieldwork in the Sahtú region in August 2022 and February 2023.

As part of the fieldwork excursions to the Sahtú region, the NAIT team was able to leverage the opportunity to also conduct research into the SRRB library and archives in search of data from previous research initiatives. Over a terabyte of data, across varying formats and types (e.g., water, land, ecological, community, cultural), were retrieved, leading to a preliminary data scan and review. Additional work during the data management phase of this project is required to clean, ingest, and present the data within the NLSA in a user-friendly way.

In the final months of the discovery phase and into the next phase of the project, the NAIT team will be focusing on two priority areas that have been identified: 1) data sovereignty and data sharing, and 2) storytelling. Indigenous data sovereignty and data sharing is a key consideration for the Sahtú communities; therefore, the project team will be ensuring that the NLSA methodology is rooted in respect for the communities' rights to provide informed consent before new data is collected and before current or legacy data is disseminated. Digital storytelling has been used throughout this project and has been positively received by community and research partners, leading to plans to incorporate it into the future iterations of the NLSA.

2. Introduction to the Sahtú

The Sahtú Settlement Area encompasses 283,000 km² of the central Northwest Territories. Delineated in the Sahtú Dene and Metis Comprehensive Land Claim Agreement of 1993, the region is home to a rich diversity of renewable and non-renewable resources, as well as a variety of wildlife habitats. Barren-ground caribou, muskoxen, and grizzly bears inhabit the barren lands north of Great Bear Lake. The mixed boreal forest of the Mackenzie River Valley is home to moose, black bears, and boreal woodland caribou. Mackenzie Mountains' rich variety of habitats – from thickly forested river valleys to the high alpine meadows – support mountain woodland caribou, Dall's sheep, and mountain goats.

The peoples of the Sahtú depend on its rich ecological diversity for subsistence harvest activities: hunting, fishing, and trapping, as well as the additional revenue streams offered by tourism, recreation, and outfitted sport hunting and fishing. Underlying these habitats are plentiful deposits of oil, natural gas, and minerals, all of which have played a significant role in the developing economy of the Sahtú and the Northwest Territories.

The past, ongoing, and potential future development in oil and gas, mining, tourism, and transportation stands to greatly affect vegetation, wildlife, and their habitats as well as people's activities on the land, and the integrity of their cultural landscapes. It is therefore critical to collect and store information that can be used for decision-making about proposed development opportunities, wildlife management, industrial activities, clean-up, remediation, and community planning.

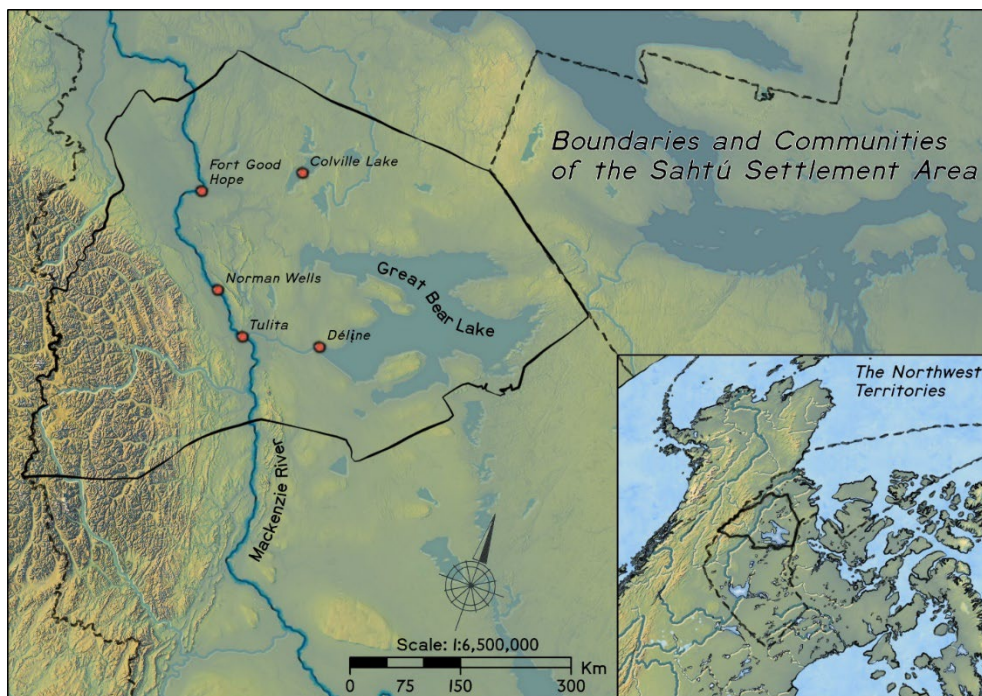


Figure 1: The Sahtú Settlement Area. Map by D. Blaine

3. Project Description and Methodology

Discovery is the process of data collection, including information exchange between project collaborators and stakeholders, archival and collections research, geospatial data gathering, and cooperative discussion with communities to better understand the landscape and its challenges. To date, the discovery phase has been conducted through the following activities:

- Environmental Studies Research Fund (ESRF) Proof-of-Concept, 2022
- Community Engagement
- Collaborative Fieldwork
- Archives and Collections Research

i. ESRF Proof-of-Concept, 2022

NAIT effectively began its process of discovery in January 2022, when it was decided to reorient an existing emergency management focused hazard and risk mapping project towards an environmental and cultural sustainability project in Canada's north.

With support from the Government of Northwest Territories' ESRF, our report on Cartographic Approaches to Net Environmental Benefit Analysis (NEBA) evaluated the extent and quality of published, authoritative geospatial datasets from territorial and federal government ministries, non-governmental organizations, data warehouses, and post-secondary institutions.

Together these datasets cover a swath of topics about the Northwest Territories, including land use planning, cultural and heritage resource management, treaties, community development, current and legacy industrial infrastructure, climate change, environmental and wildlife monitoring, etc.

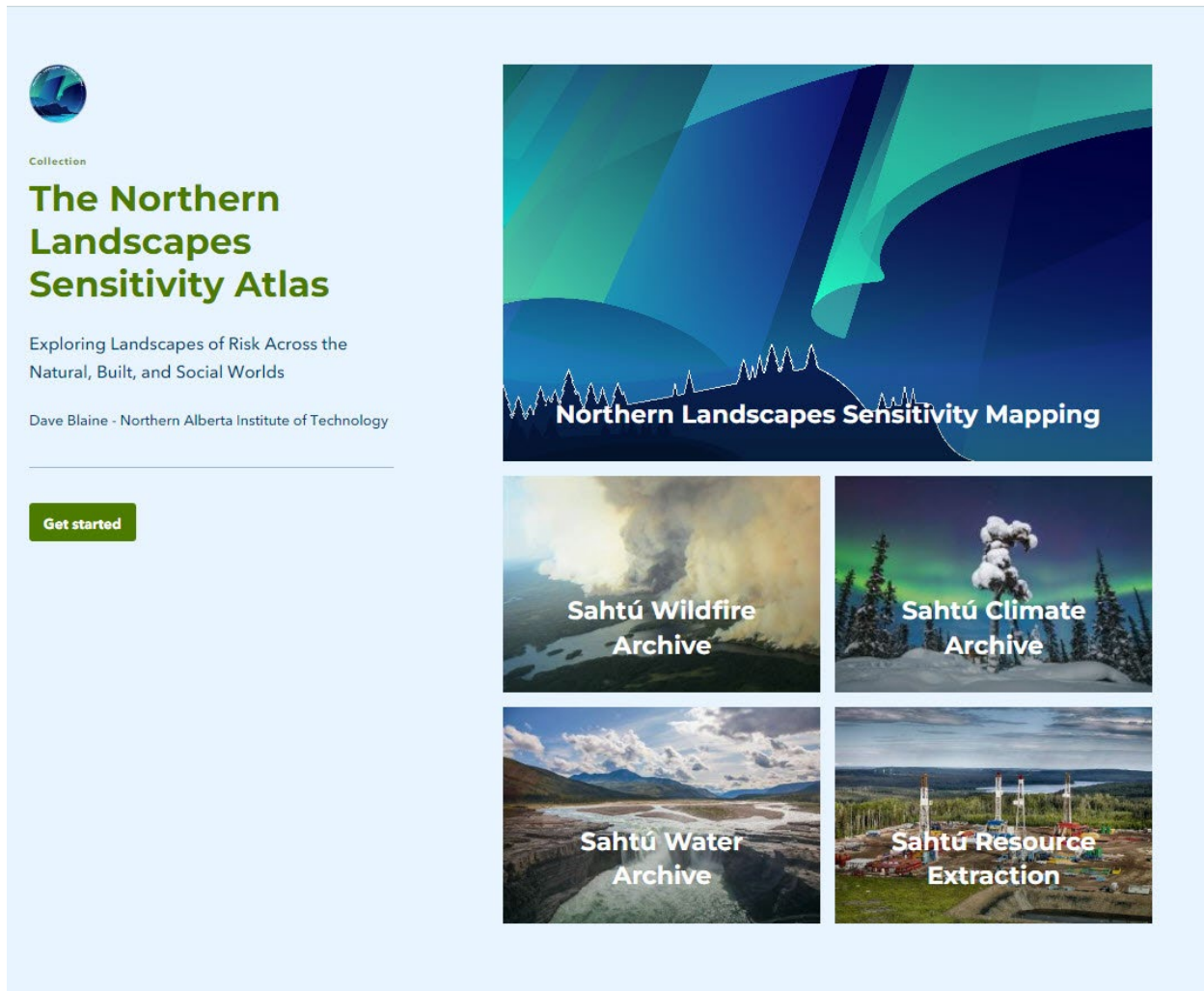


Figure 2: Landing Page for the NLSA Application Demonstration Site

This proof-of-concept report served as a prelude to the discovery phase of the Northern Landscapes Sensitivity Atlas (NLSA) project, which formally began in July 2022. From then to the time of this writing, the project team has engaged in data collection, community engagement, knowledge holder interviews, and collaborative fieldwork in the Sahtú with our research partner, the Sahtú Renewable Resources Board (SRRB).

ii. Community Engagement

Following the demonstration of the ESRF proof-of-concept, NAIT and the SRRB worked towards formalizing a research partnership to develop the NLSA, beginning in the Sahtú Settlement Area. Within the Sahtú, a carefully developed methodology exists for the co-production of knowledge, especially knowledge that arises from communities and may be considered their intellectual property. As such, the SRRB has taken every opportunity to include the NAIT team in its community engagement discussions.

Through these interactions – which have included discussions relating to economic and infrastructure developments, environmental remediation, research initiatives, and cultural sustainability – we have gained critical insights into the interests and challenges that are of greatest concern to the communities of the Sahtú.

Community Meetings (remote and in-person), January 2022 – March 2023

- Norman Wells Proven Area - Reclamation and Remediation Forum (January 2022)
- Nę K'ə Dene Ts'ı̄l̄ Forum Meeting - Reclamation Mapping (February 2022)
- Petroleum Histories Project - Study Circles (February 2022 through February 2023)
- Nę K'ə Dene Ts'ı̄l̄ Forum Meeting - Petroleum Histories Project Update (November 2022)
 - Petroleum Histories Project - GIS and Story Mapping Demonstration (November 2022)
- Nę K'ə Dene Ts'ı̄l̄ Forum Meeting – Geology and Permafrost Research (December 2022)
- Petroleum Histories Project – In-Person Study Circle, Norman Wells, NWT (March 2023)

The value in relationship-building and contributing to a deeper understanding of community priorities that have been gained through these engagements cannot be overstated. They have been critical to the success of the project thus far.

iii. Collaborative Fieldwork: August 2022, February 2023

Following several demonstrations of the ESRF proof-of-concept in the spring of 2022, the NAIT team were invited to attend a fieldwork planning meeting for the SRRB's Petroleum Histories Project (PHP) – chronicling the last century of oil and gas exploration in and around the Norman Wells Proven Area – to help identify field sites of legacy petroleum operations that would be visited and described by local knowledge keepers.

The PHP summer fieldwork presented a valuable opportunity for NAIT to collaborate on a SRRB project, which could also contribute knowledge to the NLSA, as well as an opportunity to meet and work with our collaborators in person. Furthermore, NAIT's project lead's background in digital media, GIS, and archaeological fieldwork could add value to the excursion through audio/visual content creation, field mapping and data capture, and conducting ethnographic interviews.



Figure 3: Arrival in Norman Wells, NWT. Petroleum Histories Project Summer Fieldwork, August 2022. Photo by D. Blaine.

The results of this collaborative fieldwork, which visited several sites in the vicinity of Norman Wells and Tulit'a, were presented at the Ne K'ə Dene Ts'ı̨ Community Forum Meeting in November 2022 and resulted in an opportunity to return to the Sahtú in early 2023.

Winter fieldwork associated with the PHP planned for January and February 2023 involved a community-led project to set up remote wildlife cameras at several stream crossings adjacent to the pipeline right-of-way extending north from Tulit'a to Norman Wells, to track and monitor wildlife behaviour where traditional areas of hunting and trapping intersect with oil and gas infrastructure.

The excursion coincided with a planned multi-day visit to the headquarters of the SRRB to complete an inventory of the archives and collections of their reference library, and an invitation was extended through the SRRB to join the excursion, in order to document the field research for outreach and training purposes.



Figure 4: Winter fieldwork, vicinity of Tulít'a, NWT. Community-led wildlife monitoring program, January 2023. Photo by D. Blaine.

The fieldwork was both delayed and cut short due to extreme cold weather conditions, but one short excursion, accompanied by SRRB staff and community elders, was completed in which the NAIT project lead was familiarized with the SRRB's method for documenting wildlife trails with photography and GPS, as well as traditional methods for identifying and tracking wildlife trail marks.

iv. Archives and Collections Research

The PHP summer fieldwork introduced NAIT to many of the SRRB's current and past research initiatives. Although the excursion included a brief visit to SRRB headquarters in Tulít'a, it became apparent that a dedicated visit to explore the SRRB library collection and take an inventory of its legacy projects and data would be essential to the discovery process. This was confirmed with the SRRB's gift of a copy of the Sahtú Atlas, published in 2005, which presents the results of several extensive mapping projects in the Sahtú.

Tentatively planned to take place in the winter, the visit was scheduled as described above, and resulted in four days of research and documentation of the SRRB's printed and digital archives. As instructive as a familiarization with the SRRB's legacy research projects was, the real value of

the exercise was the retrieval of over a terabyte of past project data, reports, and publications. This extensive archive of quantitative data presents a rich resource from which to establish a detailed and comprehensive baseline of pre and turn-of-the-millennium data, against which to conduct comparative analyses with the findings of current and future research projects.

Also present were many hours-worth of audio/visual recordings and transcripts of community forums, roundtable discussions, and interviews from across the Sahtú, many dating back decades, and presenting a priceless record of individual and community insights into the history, challenges, and future of the Sahtú.

Some challenges of this data research and recovery exercise resulted from the age of the records involved and required grappling with both outmoded data storage formats and outdated software file types. In the SRRB's collection were 3.5-inch floppy disks, CD-ROMs, several iOmega Rev 70gb zip disks, several more audio cassettes, one Sony minidisc, and a dozen HP DDS-3 25gb digital tapes. Data recovery might best be described as salvage, and while drives and readers for much of the data on these storage media were brought to Tulít'a for this purpose, the surprise discovery of the digital tapes and minidisc mean that at the time of this writing, the contents of that storage media have yet to be explored. Additionally, a portion of the data is stored on outdated software files that have yet to be recovered; these are mainly system backup images made with now-retired operating systems, but also include files from software packages that are no longer in circulation, or versions of software that are no longer maintained or supported by the manufacturer.

Discussions are underway to lever some of NAIT's IT personnel to aid in finding legacy media format readers that may still be in storage on our various campuses, or to support software solutions in reading and possibly converting these legacy files into modern formats. These activities are scheduled to begin in the data management phase of the project.

As discussed above, this data recovery project was primarily concerned with retrieving as much of the SRRB's digital legacy data as possible, and the majority has yet to be explored and reviewed. At the time of this writing, project data, records, and media materials that have been specifically identified are as follows:

- Dene Mapping Project, multiple years, 1974-2014
- Sahtú GIS Project, 1996-2007
- Sahtú Harvest Study, multiple years, 1998-2012
- Sahtú Settlement Area Vegetation Classification Project, 1999
- Sahtú Atlas Project, 2003-2005
- Délįnę Uranium Committee Oral History Project, 2004
- Canada - Délįnę Uranium Table, 2005
- Délįnę Remediation Zone Mapping Project, 2010

Undoubtedly, this list represents but a fraction of the legacy project data in the archive, and it will be a task in the data management phase to identify these legacy projects, their contents, and more importantly the communities to which they pertain, in order to discuss how these data can or should be presented in a modern web-based GIS, and the extent to which they should be either publicly shared, or secured according to the involved community's discretion.

v. Legacy GIS Archive – Initial Data Scan and Review

A preliminary analysis and exploration of the data from the SRRB archive found GIS data from a variety of sources and scales.

At a territorial scale, GIS data from the Northwest Territories (NWT) depicts information such as major borders between the NWT and other Canadian provinces and territories, the settlement regions in the NWT, and electoral districts. There are also shapefiles (points, lines, and polygons) representing lakes, rivers, ocean, the treeline, ecozones, watersheds, and permafrost at this territory-level view.

Additionally, detailed information about the Sahtú settlement region is present in the archive. This data includes important watershed boundaries, elevational contours, outlines of water bodies, shapefiles for towns and roads, ecozone delineations, etc. It should be noted that a portion of the Sahtú region data are excerpts from the NWT data folder, from which larger datasets were narrowed down to focus on the Sahtú region.

Other data includes information about the Canol Heritage Trail, land parcels and surface rights, and community data. Community data in the archive consists of important cultural, economic, and ecological data. These layers are present for a wider view of the entire settlement region, as well as for each community in the Sahtú.

This data is presented as shapefiles that can be drawn in GIS software such as ArcGIS Pro. However, many shapefiles are missing metadata, and/or information about what project they have come from. Some layers, such as ecozone layers, have detailed attributes that provide information to each object within the dataset, but there is no additional information that could be used to interpret the attributes. For other datasets, there is no attribute information about the layers or object, so one can only assume what the layers represent based on the dataset name. Further exploration of the archive to discover the metadata for these datasets would be required if this data was going to be implemented into the NLSA. Furthermore, it may be necessary to edit the datasets to include more attribute and metadata information, so that they can be easily understood in the future.

Although only a preliminary scan has been done of the data archive at this point, it is clear there is a lot of important data for the Sahtú Settlement Region within this archive. While some of this data can be found in the Government of Canada or Northwest Territories archives, much of it is not available to the wider public. Once this data from the SRRB archives has been cleaned and

presented in a user-friendly way, it would be a valuable resource for the communities in the Sahtú.

4. Next Steps

The discovery phase of the NLSA project has provided the project team with the opportunity to identify and scope several project priorities that were not immediately apparent at the time of the proof-of-concept. Two priorities that have emerged as being of great concern to indigenous collaborators are the issues of data sovereignty, specifically relating to traditional knowledge; and how, and in what ways the data will be communicated. Each of these priorities will inform our approach in future project years.

i. Data Sovereignty and Data Sharing

Data sovereignty is a critical discussion in this project. The discovery process has brought us into contact with traditional indigenous knowledge and its keepers and has sensitized us to historical appropriations and misuses of that knowledge. The project team are therefore committed to take direction from the communities of the Sahtú as to which elements of their knowledge they see fit to share, and what they wish to retain as their own intellectual property, for their own internal capacity building and decision-making.

While the concept of indigenous data sovereignty is not new: the United Nations Declaration on the Rights of Indigenous Peoples¹ (UNDRIP) (UN General Assembly, 2007) affirms Indigenous Peoples' rights to self-determination as political entities and the concept of indigenous control over indigenous data. However, this declaration does not specifically codify the complex issues of data consent, ownership, security, storage, use, and continuity into a concrete methodology for dealing with past, current, and new data about, relating to, and/or belonging to Indigenous Peoples.

By no means have these complex issues been remotely settled during this project's discovery process, but it is clear that the way forward is through consistent communication and discussion with partners and stakeholders.

Whatever form that the NLSA's data sovereignty methodology may take, it will necessarily be rooted in a respect for the communities' right to have their free, prior – and in the case of legacy data, renewed – informed consent obtained before new data are collected, and/or current and legacy data are disseminated.

As such, an ongoing series of community discussion forums, and study circles – similar to those initiated to inform the PHP – has been proposed and are tentatively scheduled to coincide with the beginning of the data management phase in June 2023. Through these discussions, the

¹ UN General Assembly, United Nations Declaration on the Rights of Indigenous Peoples : resolution / adopted by the General Assembly, 2 October 2007, A/RES/61/295, available at: <https://www.refworld.org/docid/471355a82.html> [accessed 20 March 2023]

findings of the discovery phase will be presented, focussing on a specific legacy project, the contents of its data, and how it might be used as part of the NLSA.

Further to these discussions will be the formalization of a data sharing agreement with the SRRB, and any other collaborators who are involved.

ii. Storytelling

On several occasions, both remotely and in-person, the NAIT team has reported on the progress of both the NLSA and the results of its collaborative field excursions using ESRI's ArcGIS StoryMaps application, an example of which can be found [here](#).

Leveraging the digital multimedia-sharing and distribution capabilities of web-based GIS, this engaging and interactive storytelling platform has been positively received by community and research collaborators.

These stories, though experimental and best considered drafts at this point, will require some considerable community insight and feedback before they are ready for wider circulation. But these tentative first steps recognize the cultural importance of storytelling to the communities of the Sahtú, and storytelling is a functionality that should be incorporated into the structure of the NLSA.

In practical terms, storytelling can be incorporated into the NLSA in several ways. Media content, including audio recordings, videos, and/or photos, can be linked to specific locations identified within the Atlas wherever places and experiences intersect. At the discretion of the communities involved, these intersections may present the stories of different place names; the history of a culturally important landscape; the recollections of a knowledge keeper. They can also present the images and sounds of local wildlife; or the impressions of researchers studying habitat, or ecology.

Certainly, and where appropriate to do so, digital storytelling can be used as a modern approach to traditional methods of saving and sharing traditional cultural knowledge and memory. It also serves our collaborators in providing a platform for public outreach – within the Sahtú, and further afield – by showcasing engaging stories of research, fieldwork, discovery, and advocacy. As such, the NLSA strives to present a more nuanced, inclusive, and perhaps in some minimal way, a truer reflection of the landscape than a mere graphic representation of a territory on a map.

The discovery phase of the NLSA project will be complete as of June 30, 2023. The data management phase will continue from June 1, 2023, until May 31, 2024. The app development phase will run from June 1, 2024, until May 31, 2025.