

The South Nahanni River

**Canadian Heritage River Systems ten-year
monitoring report**

2011-2021



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Dene Place Names

Chitú	Yohin Lake
Dahtaethth'j	Deadmen Valley
Echaot'je Kúé	Fort Liard
Gahnjthah	Rabbitkettle
Gahnjthah Mje	Rabbitkettle Lake
Łíídlíj Kúé	Fort Simpson
Nahʔa Dehé	South Nahanni River
Nahʔa Dehé Ts'ç Tu Zháníłi	Greater Nahanni Ecosystem; South Nahanni River Watershed
Nájljcho	Virginia Falls
Tí'o Dehé	Prairie Creek
Tuletseę	Kraus Hotsprings
Tu Kádeegai	White Spray Springs
Tu Naka Dé	Flat River



Introduction

Originally designated as a Canadian Heritage River (CHR) in 1987, Nah?ą Dehé (the South Nahanni River) has now been a part of the Canadian Heritage River System (CHRS) for over three decades. In accordance with the Canadian Heritage Rivers System Principles, Procedures and Operational Guidelines (CHRS 2016), on an annual and decadal basis, managing bodies are required to assess and report to the Canadian Heritage Rivers Board on whether the rivers continue to possess the heritage and integrity values for which they were originally designated. As per the guidelines, the objectives of this 10-year report are as follows:

- provide a chronology of significant events and research that have occurred over the past decade;
- describe changes and threats to Nah?ą Dehé's natural, cultural and recreational values and CHRS integrity values;
- provide an update on the status of management objectives pertaining to the CHRS designated section of Nah?ą Dehé, as well as management directions for the next decade;
- list benefits that have resulted from designation;
- assess Nah?ą Dehé's ability to meet the criteria outlined in the designation document for continued designation as a CHR; and
- provide a recommendation as to whether or not Nah?ą Dehé should maintain its CHR designation.



Background

With its stunning canyons and cave systems, towering falls, glacier-carved valleys, tufa mounds, and some of the tallest granite spires in the Northwest Territories, Nahʔa Dehé is considered to be one of the most spectacular wilderness rivers in North America. Due to these features and its exceptional representation of ongoing geological processes (e.g., karst and pseudo-karst landforms, fluvial erosion, glacial and peri-glacial activity, etc.), Nahanni National Park Reserve (NNPR) was among the first sites in the world to be designated as a UNESCO World Heritage Site in 1978. CHR designation followed just over a decade later for the 322 km segment of Nahʔa Dehé located within the original boundaries of NNPR (Figure 1). Along with its outstanding examples of geological features and processes, the natural and recreational values for which Nahʔa Dehé received its CHR designation include: diversity of plants and wildlife, scenic landscapes, and outstanding wilderness river touring (canoeing, kayaking and rafting) opportunities.

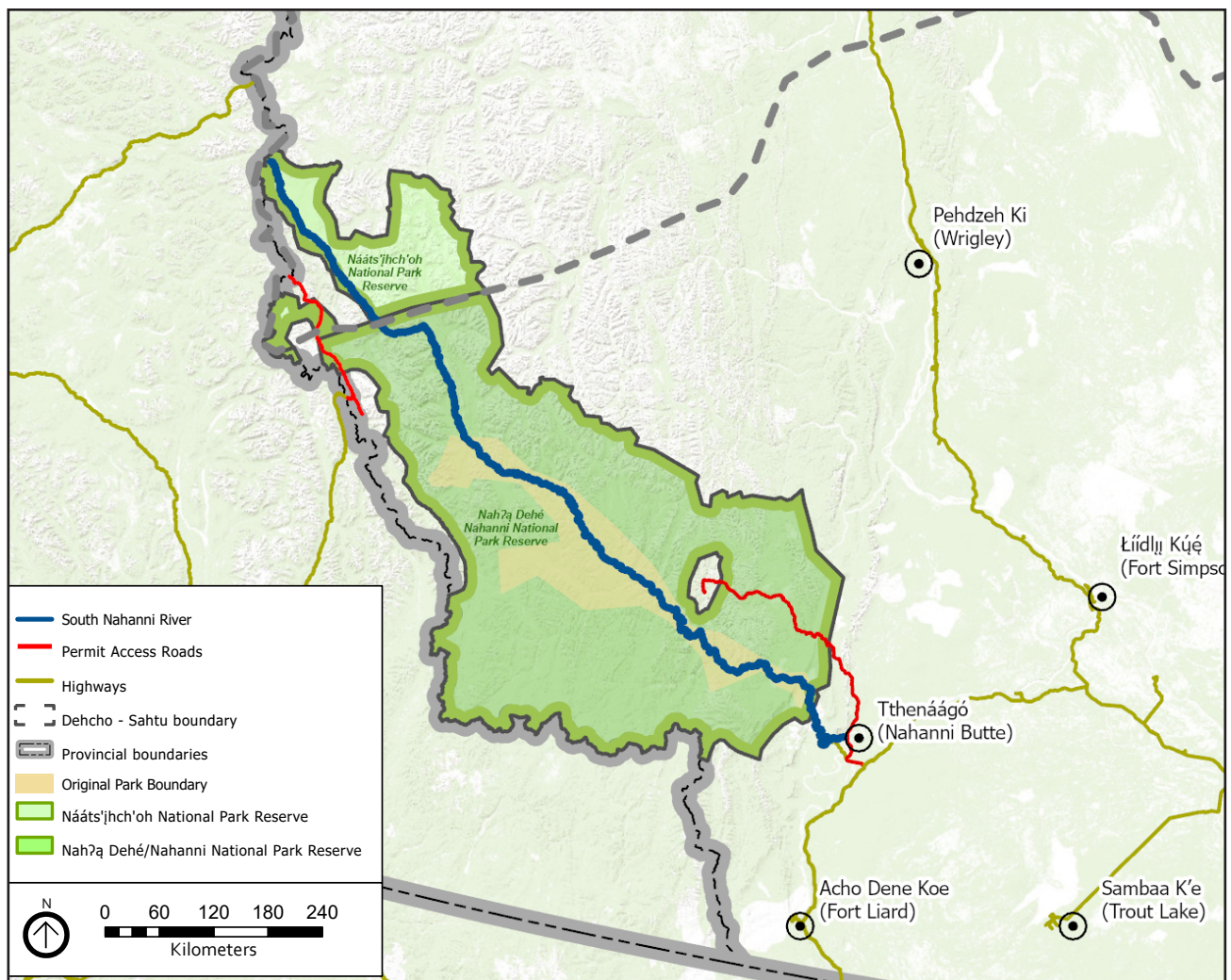


Figure 1 – Geographic Setting of Nahʔa Dehé (Note: only that section of Nahʔa Dehé within the original boundaries of Nahanni National Park Reserve is designated a Canadian Heritage River.)

Although cultural heritage values were not assessed when Nahʔą Dehé received its CHR designation, they are an integral component of Nahʔą Dehé. For countless generations, the Nahʔą Dehé drainage has been the home of Dene people living in the Mackenzie Mountains region. Landmarks in the area tell of the life of Yamba Déja, the “Great Traveller,” who fought against the giant beavers and created the laws governing how people and animals are to live together.

Until the late 1800s, Dene people lived a mobile existence following well-travelled trails through the mountains and valleys moving across a vast area linking the modern day Yukon with the Mackenzie and Liard Rivers. The upper areas of the river were occupied historically by a people known as the Naha. Very little is known about them except that they spoke a rough language different from groups living in the lower areas of the river and that they were adversaries of the southern Dene. The Naha lived within the mountainous upper regions of the Nahʔą Dehé drainage until the early twentieth century, at which point they seem to have disappeared.

The fur trade had little immediate impact on the lives of people in the Nahʔą Dehé area except that the river itself became more important as a transportation route out of the mountains to trading posts near the river’s mouth or further away at Łíídlíí Kúé or Echaot’je Kúé. It is believed that the mooseskin boat was an adaptation to travel on the rougher water of Nahʔą Dehé. Starting in the

late 1800s, the Canadian Government’s exploration of the natural resource potential in the north led to increased interest by southerners who travelled to the Mackenzie Mountains region to prospect and trade in furs. Rumours of gold brought prospectors to Nahʔą Dehé, but stories of their deaths rejuvenated tales of a mysterious people living in the upper regions of the river.

Legends of mysterious deaths and unfulfilled dreams of gold, along with the challenges of accessing Nahʔą Dehé Ts’ç Tu Zhánîlî, deterred the majority of southerners, leaving the area mostly unoccupied except for the Indigenous people that have always called it home.

The Dene continue to practice traditional hunting, harvesting and gathering activities to this day, with Nahʔą Dehé acting as a highway to access traditional territories. The cultural heritage values of Nahʔą Dehé are based in the cultural connection that the Dene of the Mackenzie Mountains region have to the waters and lands within the greater watershed. Cultural value is also derived from the unimpeded natural flow of the river and the overall lack of human impediments that detract from an appreciation of the traditional relationship that has persisted in this area between the original Indigenous peoples and the natural landscape. Natural environments continue to support a diversity of wildlife (e.g., moose, sheep, caribou) which is the basis of the Dene connection to the landscape and Dene cultural identity.

In 2000, as part of the Dehcho Process, Parks Canada and Dehcho First Nations formed the Nahʔą Dehé Consensus Team (NDCT). This team is comprised of four members appointed by Dehcho First Nations (two of which are selected by the Nahʔą Dehé Dene Band) and three members appointed by Parks Canada. They are involved in all aspects of park management and help ensure that Dene Principles and knowledge are incorporated into park operations. An essence statement for Nahanni, which reflects the Dene's strong cultural connection with Nahʔą Dehé as well as the rivers' natural and recreational values, was developed with the NDCT:

Nahanni National Park Reserve (Nahʔą Dehé) is a UNESCO world heritage site globally renowned for its geologic landforms. An incomparable northern wilderness, Nahʔą Dehé harbours sheer granite spires, vast alpine plateaux and at its heart the South Nahanni, a Canadian Heritage River. This great-spirit water thunders at Náíłıcho (Virginia Falls) and meanders through the deepest canyons in Canada. Natural labyrinths of Nahanni Karst are among the most spectacular examples of this landform type known to humankind. Mineral spring cauldrons of Gahnı̨thah form the largest tufa mounds in Canada. Gahnı̨thah is a sacred site - home to the horizon walker Yamba Déja, who created Dene law. Far greater than the sum of its landforms, Nahanni is a cultural landscape. It is a place of deep and timeless significance. Visitors are welcomed to the land by the Dehcho First Nations, whose ancestors have called Nahʔą Dehé home for untold centuries. Climbers, hikers, paddlers and visitors of all kinds find personal inspiration and connection to this rugged land and its people. Nahanni is a Dehcho First Nations gift to be shared with Canada, and Canada's gift to the world.



Chronology of Significant Events

The following table, and accompanying appendix (Appendix A), provide an overview of significant events pertaining to the natural, cultural and recreational heritage of Nahʔa Dehé, which occurred between 2008 and 2021.

YEAR	EVENTS
2008 - 2021	Research and Monitoring: Numerous cultural and ecological research studies and monitoring programs have been conducted in the Nahʔa Dehé Ts'ç Tu Zhánîlî over the last decade (Appendix A).
2008	Announcement of Nááts'ihch'oh Feasibility Study and Interim Land Withdrawal: Environment Minister John Baird signed a Memorandum of Understanding with designated Sahtú organisations in Tulita to study the feasibility of creating Nááts'ihch'oh National Park Reserve (NaNPR). The accompanying land withdrawal provided interim protection for 7,600 km ² of land including the headwaters of the Nahʔa Dehé at the Moose Ponds.
2009	Expansion of NNPR: On June 18, NNPR was officially expanded to more than six times its original size. The new boundary totals 30,055 km ² .
2010	Fourth Park Management Plan for NNPR: The fourth Park Management Plan for NNPR (Nahʔa Dehé), developed with the Nahʔa Dehé Consensus Team, was approved by Parliament.
2010	Cantung Mine Restarts Production: The Cantung mine site restarted production in October 2010 following a suspension of operations in October 2009.
2012	Establishment of NaNPR: Prime Minister Stephen Harper announced the establishment and boundaries, totalling 4,895 km ² , of NaNPR.
2014	Designation of NaNPR: On December 18th, NaNPR was officially designated under the National Parks Act. The combined boundaries of Nahanni and Nááts'ihch'oh National Park Reserves protect approximately 86% of the Nahʔa Dehé watershed.
2014-2019	Canada's Northernmost Bat Hibernacula Discovered along the Nahʔa Dehé Corridor: Analysis of data from acoustic bat detectors deployed in First Canyon provided evidence of overwintering activity by bats – confirming this group of caves as the northernmost known bat hibernacula in Canada (see Appendix A for further details).

YEAR	EVENTS
2015	Cantung Mine Suspends Operations: Late in 2015, the mine owner went into receivership and responsibility for the mine was transferred to the Government of Canada.
2017	New River Experience “Triple Header” Piloted: A new visitor experience called the Triple Header was piloted in 2017 in partnership with Nahanni River Outfitters Association members. For the first time, visitors were able to experience a guided excursion on all three Nahʔa Dehé headwaters: Moose Ponds, Little Nahanni, and Broken Skull.
2017	Canada 150 Festival: CHRS provided Łíídlı́ Kúé First Nation (LKFN) with funding for Canada 150 events. Funding was used towards 11 days of events, beginning with Canada Day festivities and ending with the unveiling of the Ehdaa Plaque at the Ehdaa National Historic Site in Fort Simpson.
2017	Mackenzie Valley Environmental Impact Review Board (MVEIRB) Approves Prairie Creek All Season Road Project: Following the completion of the environmental assessment process, the MVEIRB approved the Prairie Creek All Season Road project to proceed to the regulatory phase, subject to several conditions aimed at mitigating adverse impacts of project activities on the environment.
2017	First Park Management Plan for NaNPR: The first Park Management Plan for NaNPR was approved by Parliament.
2017-2019	Cultural Artifacts Dating Back 1200-1300 Years Discovered at Gahnı̄hthah Mje: Archaeological digs were conducted at Gahnı̄hthah Mje in 2018 and 2019 following the discovery of a dart point near park infrastructure by Nahʔa Dehé Consensus Team member George Tsetso in 2017. Charcoal from a hearth found during the digs dated back to approximately 1200-1300 years ago (see Appendix A for further details).
2018	Opening and Closing Ceremony: For the first time, an opening and closing ceremony were held to welcome visitors to Nahʔa Dehé. The opening ceremony involved fire feeding and drumming at Gahnı̄hthah Mje and Náı̄lı̄cho; while the closing ceremony had a fire feeding and feast in the community of Nahanni Butte.
2018	Nahanni: River of Forgiveness: The Nahanni: River of Forgiveness documentary film project ran in 2018. The film featured a group of Dehcho Dene who constructed a mooseskin boat at Bunny Bar, under guidance from Sahtu boatbuilders, and paddled it down the Nahʔa Dehé to Łíídlı́ Kúé.
2018	State of the Park Assessment: An assessment, which included a status review of various natural, cultural, and recreational indicators, was completed for NNPR.

YEAR	EVENTS
2018-2019	Náíłı̨cho Infrastructure Renewal Project: Major improvements were made to infrastructure at Náíłı̨cho including: installation of new float plane and canoe docks, construction of an harbour to host interpretive programming, installation of new bear-proof food caches, and renovations, stabilization, and rerouting of the landing area, falls viewing, and portage boardwalks.
2019	New Guidelines Developed for Licensing of Guided River Outfitting in NNPR and NaNPR: Following detailed public consultations and stakeholder engagement, Guidelines for Licensing of Guided River Outfitting in Nahanni and Nááts'ı̨hch'oh National Park Reserves were developed in cooperation with the NDCT and the Nááts'ı̨hch'oh Park Management Committee.
2019	In-Park Drumming Workshop: A drumming workshop co-led by Angus Ekenele, a Dene elder from Łı́ı̨dlı́ı̨ Kúę, and Olinto Beaulieu, a NDCT member and NNPR's Assets Manager, was held in August 2019 out of Gahnı̨thah Mje and Náíłı̨cho. Local Dene participants were taught traditional drum songs and learnt about the cultural significance of the drum.
2020	Screenings of Nahanni: River of Forgiveness in Nahanni Butte and Fort Simpson: Screenings of 'Nahanni: River of Forgiveness' were held in Nahanni Butte and at the first annual Łı́ı̨dlı́ı̨ Kúę Film Festival in Fort Simpson in February 2020. The director of the film, Geoff Bowie, was in attendance for post-screening Q & A sessions.
2020	Moosehide Tanning Workshop in Nahanni Butte: In September 2020, NNPR held a moosehide tanning workshop facilitated by local Indigenous women of Nahanni Butte, NT. This is the first time NNPR has hosted a workshop like this in the community; supporting the revitalization of the culture, connecting elders with youth and bringing awareness to this traditional skill.
2020-2021	NNPR Operations Impacted by COVID-19: Due to COVID-19, the start of NNPR's 2020 operational season was delayed and the scale of in-park operations was greatly reduced. Limited ecological monitoring and a reduced visitor services offer resumed in June and July of 2020 respectively, returning to near-normal levels in the 2021 operational season. However, in both 2020 and 2021, visitation remained significantly lower than in previous years due to a territory-wide public health order which limited travel within the territory by non-residents.
2021	Fifth Park Management Plan for NNPR: The fifth Park Management Plan for NNPR, developed with the Nah?ą Dehé Consensus Team, was approved by Parliament.

Changes and Threats to Natural Heritage, Cultural and Recreational Values

This section provides a summary of major changes affecting, and threats to, the natural, cultural and recreational values of Nahʔa Dehé.

Change or Threat	Affected CHRS Framework Value(s)	Explanation of Change or Threat	Actions Taken in Response to Threats
Connecting Communities with Nahʔa Dehé	• Aquatic Ecosystems • Terrestrial Ecosystems • Spiritual Associations • Cultural Expression	Dene peoples' long-standing relationship with the land has led to the development of the Nahʔa Dehé Consensus team and to adopting a cooperative management style. Parks Canada will continue to nurture the traditional Dene connection to the park and ensure the practices and knowledge can occur without interruption.	

Change or Threat	Affected CHRS Framework Value(s)	Explanation of Change or Threat	Actions Taken in Response to Threats
Upstream Mining Operations and Mineral Exploration Activities	• Water Content • Aquatic Ecosystems • Terrestrial Ecosystems • Significant Plant Communities • Rare Plant Communities • Significant Animal Populations • Rare Animal Species • Spiritual Associations • Cultural Expression	A primary threat to the Nahʔa Dehé is the presence of upstream industrial activities, located on significant tributaries of Nahʔa Dehé, as well as existing and proposed industrial roads passing through the park reserve.	• Continued ecological monitoring, including downstream water quality and benthic invertebrate monitoring. • Continued work with other government agencies, third-party boards and communities to harmonize environmental assessments, permitting, monitoring and enforcement of activities on resource development projects.
Improved Infrastructure and Visitor Programming	• Aquatic Ecosystems • Terrestrial Ecosystems • White-water Canoe, Kayak & Raft • Trail Use • Camping • Natural Heritage Appreciation • Human Heritage Appreciation		• New infrastructure (i.e., privies at Lafferty Creek and Fairy Meadows, Gahnjthah ferry, and boardwalk and docks at Nájlcho) and hiking routes (from Nahʔa Dehé to Glacier Lake and from Glacier Lake to Fairy Meadows) are reducing impacts on sensitive areas, including riparian vegetation, and improving the experience of visitors to NNPR. • Interpretive programming has evolved over the past two decades to better incorporate Dene perspectives and culture.

Change or Threat	Affected CHRS Framework Value(s)	Explanation of Change or Threat	Actions Taken in Response to Threats
Nahanni Boundary Expansion and the Establishment of Nááts'ihch'oh	• Drainage Basin • Water Content • Physiographic Regions • Topography • Aquatic Ecosystems • Terrestrial Ecosystems • Significant Plant Communities • Rare Plant Communities • Significant Animal Populations • Rare Animal Species • Spiritual Associations • Cultural Expression • White-water Canoe, Kayak & Raft • Angling • Trail Use • Camping • Natural Heritage Appreciation • Historic Sites • Cultural Landscapes • Cultural Events/Activities	The combined boundaries of Nahanni and Nááts'ihch'oh National Park Reserves protect approximately 86% of Nahʔa Dehé Ts'ç Tu Zhánîî, including the Nahʔa Dehé headwaters at the Moose Ponds. This increase in the protection of Nahʔa Dehé Ts'ç Tu Zhánîî provides numerous ecological benefits for aquatic and terrestrial ecosystems and presents opportunities for new recreational experiences for visitors to the two park reserves and continued Indigenous connection with ancestral lands.	

Change or Threat	Affected CHRS Framework Value(s)	Explanation of Change or Threat	Actions Taken in Response to Threats
Climate Change	• Aquatic Ecosystems • Terrestrial Ecosystems • Significant Plant Communities • Rare Plant Communities • Significant Animal Populations • Rare Animal Species • White-water Canoe, Kayak & Raft • Camping • Cultural Landscapes • Cultural Events/Activities	Climate change is a growing threat to the Nahʔa Dehé. Warming temperatures and changing precipitation trends are resulting in loss of glaciers, melting permafrost and are expected to increase the frequency and severity of forest fires in the coming decades.	Continued research and monitoring to better understand the impacts of climate change on terrestrial and aquatic ecosystems and park users.

Nahanni Expansion & Establishment of NaNPR

The original NNPR boundaries encompassed a narrow strip of land, centered along the Nahʔa Dehé corridor, which offered limited ecological protection. The boundaries included roughly half of the area recommended by the Canadian Wildlife Service, based on ecological features (e.g., trumpeter swan breeding grounds, key habitat for Dall's sheep, watersheds, etc.) and excluded some of the most significant geological features of the Nahanni Karst Belt, which were later shown to have drainage into Nahʔa Dehé (Tate 2003, Ford 2011). Multiple decades of research, collaboration between Parks Canada and the Dehcho First Nations and the Sahtu Dene and Métis, as well as support from the public and various stakeholders (e.g., CPAWS, Tourism Industry Association of the Yukon, Yellowstone to Yukon Conservation Initiative, etc.) resulted in the expansion of Nahʔa Dehé in 2009 and establishment of NaNPR in 2014 (Tate 2003, Banks et al. 2009, Becklumb and Williams 2014). This increased the protected proportion of Nahʔa Dehé Ts'ç Tu Zhánîlî from about 14% (Weaver 2006) to 86% (Canada 2012).

The more than 30,000 km² increase in protected area within Nahʔa Dehé Ts'ç Tu Zhánîlî has resulted in numerous ecological benefits. Some of the most notable features within the expanded boundaries and new park reserve include globally significant karst features (i.e., caves, sinkholes, canyons, poljes, cenotes, towers and labyrinths) of the Nahʔa Dehé and Ram River basins, Canada's northernmost populations of mountain goat and hoary marmot, and a large proportion of the Nahʔa Dehé headwaters, including the largest icefields and glaciers in the Northwest Territories (Banks et al. 2009, Ford 2011, Becklumb and Williams 2014). Furthermore, the approximate 7 times increase in the area protected greatly enhances the ability of the Nahʔa Dehé Ts'ç Tu Zhánîlî to sustain viable populations of wide-ranging, large mammal species (Weaver 2006). Specifically, the new boundaries include the densest grizzly bear habitat, and the majority of the Dall's sheep and South Nahanni caribou herd's ranges within Nahʔa Dehé Ts'ç Tu Zhánîlî, as well as important seasonal habitat for the Redstone, Coal River, and LaBiche caribou herds (Weaver 2006).

In addition to ecological benefits, the NNPR expansion and NaNPR establishment have also provided opportunities for new recreational activities and experiences. River

trippers now have the option to start their Nahʔą Dehé trip upstream of Gahnįhthah, as far north as the Nahʔą Dehé headwaters at Moose Ponds, in the Sahtu region on the Northwest Territories. Alternatively, river trippers now have the option to start their Nahʔą Dehé trip upstream of Gahnįhthah, as far north as the Nahʔą Dehé headwaters at Moose Ponds, in the Sahtu region on the Northwest Territories. Alternatively, river trippers can opt to start their trip at one of the headwater tributaries of the Nahʔą Dehé – the Flat, Little Nahanni, or Broken Skull Rivers – before continuing on to the Nahʔą Dehé. The Nahʔą Dehé expansion boundaries also include the Cirque of the Unclimbables, the Vampire Peaks, and several alpine plateaus; offering world class climbing and alpine hiking experiences.



Connecting Communities with Nahʔa Dehé

Parks Canada's understanding of the Dene peoples' long-standing relationship with the land has led to the development of the Nahʔa Dehé Consensus team and to adopting a cooperative management style that helps guide the management decisions of NNPR. Numerous management actions have been implemented to integrate the Dehcho Dene perspective, traditional ecological knowledge, and way of life into everyday operations of the park, interpretation plans and this guidance is helping to transform the parks monitoring programs.

It is not just recreational values that are important, but also the natural and cultural values associated with Indigenous people continuing to practice their subsistence-harvest lifestyle and cultural connections to the land.

In 2010, the national park reserve expanded two-fold, creating one of Canada's largest national parks. This wouldn't have happened without the local communities' passion and support for the protection of the land and water within Nahʔa Dehé.

Nahanni NPR attracts over 800 visitors per year, and 70% of those visitors travel down the South Nahanni River ending their river trip in the Dene community of Nahanni Butte. Parks Canada invites visitors to the local Parks Canada office to de-register, purchase merchandise, and to participate in a guided hike around the community. This guided hike, which includes touring the community's historical buildings and landmarks and highlights the connection the Dene have to the area, was developed by local heritage interpreters in consultation with the Nahʔa Dehé consensus team.

Other ways in which the park reserve has contributed to connecting and collaborating with the communities of Nahʔa Dehé include:

- Inviting local leaders from municipal governments and Indigenous groups to participate in traditional opening and closing ceremonies.
- Developing partnerships with regional tourism offices which advanced the installation of interactive displays at the Blackstone Territorial Park and Fort

Simpson Visitor Centres

- Engaging and consulting with local communities to improve the layout of the Náìlìcho campground and to add a traditional arbour at Náìlìcho where stories, tea and bannock are shared with visitors.
- Collaborating with the local community and film and photography makers to capture the process of building and travelling in a mooseskin boat. The resulting film is an award winning and internationally renowned project for its authenticity and commitment to the storyline.
- Hosting a moosehide tanning workshop led by Dene women from Nahanni Butte. This workshop connected youth with elders and traditional knowledge. At the end of the workshop, the women completed two beautiful, tanned hides completed by traditional ways.
- Supporting the development of a drumming workshop for the men of the Dehcho region. Collaborating with Łíídlíí Kúé First Nation, Parks Canada helped to promote a “Learn to Drum” program. For several weeks, men from the Dehcho region met to learn about the drum, and the language and meaning behind three main songs. An elder and local drummers shared their knowledge and voice with others. At the end of the program, the park hosted the last half of the drumming workshop at Gahnìthah Mìe and Náìlìcho to encourage a more land-based (connected to the land) experience for those learning. The workshop concluded at the top of Náìlìcho with a Dene prayer for the seasonal opening ceremony of the park.
- Partnering with the local tourism non-profit organization to market and showcase Nahanni’s beauty through photoshoots, advertisements, and familiarization tours.

Parks Canada will continue to nurture the traditional Dene connection to the park and ensure the practices and knowledge can occur without interruption.



Upstream Mining Operations & Mineral Exploration

Upstream mining operations and mineral exploration projects have the potential to affect the health of Nahʔą Dehé Ts'ę Tu Zhánîlî. Three such projects are located in the vicinity of Nahʔą Dehé: Cantung mine, Prairie Creek mine, and the Selwyn Project mine.

Cantung Mine

The Cantung mine is a tungsten mine located in the Tu Naka Dé Valley, within the Selwyn Mountain Range, near the Yukon-NWT border. Cantung operations ceased in fall 2015 and, at the time of the writing of this report, the mine is in a state of Care and Maintenance (Northwest Territories 2015).

Prairie Creek Mine

The Prairie Creek mine is located on Tl'ó Dehé, approximately 52 km upstream of the Tl'ó Dehé and Nahʔą Dehé confluence (Scrimgeour et al. 2013). Infrastructure for the zinc-lead-silver mine was built in the 1980s however, the mine has yet to enter production (MVEIRB 2017). The mine site and surrounding area do not fall within Nahʔą Dehé's boundaries, but approximately 85 km of an all season mine access road alignment (along with a similar proportion of the previous winter road footprint last used in 1982) are within the park reserve boundaries (MVEIRB 2017). Following MVEIRB approval to proceed to the regulatory phase in September 2017, Parks Canada issued a Land Use Permit and Water Licence for the Prairie Creek All Season Road project in November 2019. Construction of a Pioneer Winter Road to support one season of geotechnical and geophysical investigations along the proposed All Season Road alignment is scheduled for winter 2023.

Selwyn Project Mine

Once constructed, the Selwyn Project mine, a prospective open pit zinc-lead mine currently in the advanced exploration phase (SCML 2015), will be located in the eastern Yukon, near the Yukon-NWT border. The majority of exploration activities

have occurred within the Yukon, but the project also includes mineral claims and mining leases within the Sahtu region of the NWT (MVEIRB 2009). Selwyn Chihong Mining Ltd. (SCML) reconstructed the Howard's Pass Access Road (HPAR) in 2014 (MVEIRB 2016) in order to conduct mineral exploration activities. Approximately two 20 km sections of the road were grandfathered into the expansion of NNPR and the establishment of NaNPR respectively (MVEIRB 2016). In 2015, SCML submitted a project proposal to upgrade the HPAR to increase its capacity to support future mining operations, including the hauling of zinc and lead concentrates. The MVEIRB is currently conducting an environmental assessment on this project (MVEIRB 2016), however, SCML indicated in a March 2021 letter to the MVEIRB that they have paused work on the Developer's Assessment Report, which is required before proceeding onto subsequent phases of the environmental assessment.

Environmental Assessments and Freshwater Monitoring Programs

Parks Canada participates in regional environmental assessments (which include a review of potential cultural and socioeconomic impacts) of all industrial activities with the potential to adversely impact Nahʔą Dehé Ts'ę Tu Zhánîlî. Furthermore, NNPR has comprehensive monitoring programs in place to assess potential downstream impacts of mining and mineral exploration activities on the aquatic health of the Nahʔą Dehé Ts'ę Tu Zhánîlî. These include water quality, benthic invertebrate and bull trout occupancy monitoring programs.

In partnership with Environment and Climate Change Canada, NNPR has been monitoring the water quality of the Nahʔą Dehé corridor and two of its major tributaries, Tu Naka Dé and Tł'ó Dehé, since 1988 (Parker et al. 2010). Water samples are collected three times annually from nine sites, including: two sites on the Nahʔą Dehé, two sites on Tu Naka Dé (both downstream of Cantung mine), and five sites on Tł'ó Dehé (above and below the Prairie Creek mine). Canadian Council of Ministers of the Environment (CCME) water quality index ratings, calculated using site-specific guidelines for 11 representative parameters (see Parker et al. 2010 for further details), have indicated that water quality is consistently higher at the sites located at the mouth of Tu Naka Dé and Tł'ó Dehé (i.e., just upstream of their confluence with the South Nahanni River) than the Nahʔą Dehé site above Náìlįcho, which is located upstream of the Nahʔą Dehé's confluence with both tributaries. These results, along with the low discharge of Tł'ó Dehé and Tu Naka Dé relative to the Nahʔą Dehé (Parker et al. 2010), suggest that upstream mining operations have not significantly affected the water quality of the Nahʔą Dehé over the past decade.

A benthic invertebrate monitoring program, following Canadian Aquatic

Biomonitoring Network methods, was initiated in 2008. To assess the health of benthic invertebrates, invertebrate diversity and proportion of invertebrates from groups that are sensitive to changes in water quality are compared in samples collected from sites downstream from mining activities and roads and samples taken from upstream reference sites with similar habitat characteristics. The analysis over the years shows that Nahʔa Dehé's benthic invertebrate communities appear to be healthy and stable, as evidenced by a comparison of benthic invertebrate community data from 2008 and 2016 (Parks Canada 2018).

Bull trout found within NNPR are part of the Western Arctic populations. They are listed as a species of 'Special Concern' under the federal Species at Risk Act largely due to their sensitivity to environmental disturbance; and thus are an indicator of watershed health (COSEWIC 2012). Fisheries and Oceans Canada, in partnership with NNPR, conducted electrofishing surveys from 2013-2015 to determine the occupancy of bull trout for the Tl'ó Dehé watershed. The 2016 survey results for this watershed indicate bull trout occupancy is stable (Mochnacz et al. 2018). Changes to this monitoring program are underway, including a shift from electrofishing to non-invasive eDNA-based occupancy survey methods and expansion of the survey area to include the Wrigley Creek watershed, which will serve as a reference watershed without upstream development.



Improved Infrastructure & Visitor Programming

Náìlìcho is a bottleneck location on the Nahʔą Dehé for visitors coming to see the waterfall for the day or to stay a few nights while paddling the Nahʔą Dehé. A ~1.5 km boardwalk system supports visitor access to Náìlìcho viewpoints, the campground, and a portage trail. Permafrost upheaval causes twisting, sloping and collapse of boardwalk segments; posing a hazard for all park users. To address these issues and improve the experience, a federal infrastructure project was completed between 2018-19. Along with major boardwalk renovations and rerouting, the project included the replacement of two floating docks and installation of a third to meet capacity requirements of float planes, canoeists, and rafters during the peak visitor season. Other enhancements to the facilities at Náìlìcho achieved through the project include new bear-proof food caches and an harbour for hosting interpretive programming.

Náìlìcho is a primary visitor node for the visitor experience team of NNPR. Interpreters lead guided hikes to the waterfall that includes Dene cultural information and facilitate learning opportunities for visitors about the natural history of the park. In the evenings, the interpreters host a campfire program serving tea and bannock and sharing stories, demonstrating traditional Dene hunting techniques, or playing traditional hand games. These interpretive programs and the overall visitor experience program has evolved over the past 20 years. Programs which once focused heavily on the landscape and creation of the park now also include the Dene and their connections to the land, the animals and the water.

Náìlìcho isn't the only visitor node in NNPR where interpretive programs are available for visitors. Gahnìhthah Mìe is a popular destination for visitors and a key cultural resource for the Dene. Visitor Experience staff are on site during the peak visitor times in the summer to guide them to a Zone 1 Preservation area, the Gahnìhthah Tufa Mounds. This program has been developed over the past decade and now includes messaging from the Sahtu people who have traditional lands overlapping the Dehcho region in the park. This messaging adds an alternative perspective to the cultural identity and Parks Canada interpreters from the Sahtu will occasionally be stationed at Gahnìhthah Mìe to offer interpretive programs focused around the Sahtu Dene stories and traditions connected to the area.

There are only a few other infrastructure assets, in addition to those at Náìlìcho that the park maintains along the Nahʔą Dehé. Although some of these assets, such as

cabins at Gahnįhthah Mje and Dahtaehth’į, are primarily used by park staff to support park operations, significant enhancements have also been made to visitor facilities over the past decade. Replacing the cable ferry used to access the Gahnįhthah Tufa Mounds and building an emergency cabin at Glacier Lake has increased safety for all park users. Within the expansion area of NNPR, trail work completed on hiking routes from Nah?ą Dehé to Glacier Lake and Glacier Lake to Fairy Meadows reduced trail braiding and rerouted trail segments away from sensitive riparian habitat and hazardous talus terrain. In response to waste management concerns, new privies were installed at popular camping locations including Lafferty Creek, Glacier Lake and Fairy Meadows. These projects, along with ongoing maintenance work in the park, continue to improve the experience and safety of park users while minimizing impacts on the environment.



Climate Change

Long-term, regional warming trends have continued over the last decade. Between 1950 and 2017, mean annual temperature and mean winter temperature increased by 3.0°C and 5.7°C respectively at the Łíídlíí Kúę meteorological station, located ~140 km NE of the Nahʔa Dehé confluence with the Liard River (Parker 2018). A 59% increase in annual precipitation was observed over the same time period (Parker 2018). The effects of warming temperatures and altered precipitation patterns on Nahʔa Dehé Ts'ç Tu Zhánîlî's freshwater and terrestrial ecosystems have been observed over the past decade and are expected to continue, and intensify, over the coming decades.

Impacts

Glaciers:

The impacts of climate change on the Nahʔa Dehé Ts'ç Tu Zhánîlî are particularly evident through multi-decadal changes to glaciers of the Ragged Range. Glacier extent in this region decreased by 110 km² (39%) between 1982 and 2017 (Ednie and Demuth 2018). Furthermore, the rate of glacier surface area loss appears to be increasing, as the overall rate of glacier surface area contraction increased by ~1 km²/year over the last decade compared to the previous 2.5 decades (Ednie and Demuth 2018). Another metric used to assess glacial change is the firn limit – the lowest elevation on a glacier at which firn (an intermediate between snow and glacial ice) is still present at the end of the summer melt period. Between 1984 and 2014, the firn limit elevation increased and firn percent cover decreased by 204 m and 42% respectively on the Bologna Glacier, and was lost completely in 2015 (Anderson 2017). It is thought that the glacier is currently in a state of increasing discharge but may reverse states in the coming decades as discharge becomes increasingly limited by glacier shrinkage (Anderson 2017). As the Bologna Glacier is a significant contributor to Nahʔa Dehé streamflow (Anderson 2017), changes in glacier discharge have implications for the hydrology, temperature, and water quality of the Nahʔa Dehé; with potential for cascading impacts on aquatic life.

Permafrost

Permafrost is not monitored within the Nahʔa Dehé Ts'ç Tu Zhánîlî however; Natural Resources Canada maintains a network of permafrost monitoring sites parallel to the park reserve along the Mackenzie Valley Corridor. Nahʔa Dehé lies almost entirely within the discontinuous permafrost zone (O'Neil et al. 2020). There has been a slight increase in permafrost temperature at Mackenzie Valley monitoring sites within this zone over the last decade (Smith et al. 2018). Additionally, though not directly

monitored, permafrost thaw is evident within Nahʔa Dehé through the development of thermokarst features, such as thaw-slumps and landslides, which form on the landscape as ice-rich permafrost below the land surface thaws (Ford 2011, Northwest Territories 2016, Jermyn and Geertsma 2015). These features have the potential to impact water quality within the Nahʔa Dehé Ts'ç Tu Zhánîlî through increased input of sediments and solutes into creek and river systems (Kokelj et al. 2013, Chin et al. 2016).

Terrestrial Ecosystems and Wildlife

Nahʔa Dehé's boreal forests are likely to experience increased forest fire frequency, severity, and season length, as well as more extensive insect and disease outbreaks (Parker 2017). Upslope movement of the treeline and increasing tree density have already been detected within the Mackenzie Mountains (Kennedy et al. 2020). Similarly, shrubification of tundra ecosystems has been observed in multiple alpine locations (Myers-Smith et al. 2011, Formica et al. 2014). These changes, as well as many others resulting from a shifting climate (e.g., increasing frequency of icing events, changes to snowpack, etc.), are considered a threat to at-risk species that rely on alpine habitat for key stages of their annual cycles, such as the Northern Mountain Population of Woodland Caribou and Collared Pika (COSEWIC 2011, Environment Canada 2012, Kennedy et al. 2020). While some species ranges within the Nahʔa Dehé Ts'ç Tu Zhánîlî may decline over the coming decades, colonization of new species and range expansions of current species are also anticipated as conditions become more favourable for species whose ranges are currently limited to the south, or to southern portions, of the Nahʔa Dehé Ts'ç Tu Zhánîlî. If current climatic trends continue, Nahʔa Dehé could see a 34% increase in plant species richness over the next three decades (Parker 2018) and will likely experience a much higher rate of bird colonization than extirpation (Parker et al. 2019).

Park Users

Potential impacts of climate change on park users, including visitors and traditional users, are wide ranging. Warmer springs and falls may increase the length of the visitor season but, as noted above, are also likely to result in more frequent and severe forest fires that could necessitate area closures and evacuations (Staple and Wall 1996). Additionally, changing snow and ice conditions may make it more difficult for traditional park users to access camps and engage in harvesting practices (Northwest Territories 2018). Potential changes to whitewater conditions, and associated river-based recreation and travel, may be largely positive, if expected increases in precipitation are offset by increasing evaporation (as a result of rising summer temperature) and warmer Septembers improve river-tripping conditions during the fall shoulder season (Staple and Wall 1996).

Integrity Guidelines

The Nahʔa Dehé Ts'ç Tu Zhánîlî continues to meet the CHRS natural and recreational integrity guidelines for which it was originally designated, as well as the cultural integrity guidelines (Appendix B). Although not included in the original designation, cultural values are an integral component of the Nahʔa Dehé's heritage.

Upstream development remains a threat to the integrity of the Nahʔa Dehé Ts'ç Tu Zhánîlî. However, no significant impacts of mining operations on the CHRS designated section of the Nahʔa Dehé were detected over the last decade. Development pressures are expected to increase over the next decade with the construction of the Prairie Creek All Season Road and potential advancement of both the Prairie Creek and Selwyn Project mines into the production phase. As such, environmental assessment and review processes, as well as continued ecological monitoring, will be essential for ensuring the Nahʔa Dehé Ts'ç Tu Zhánîlî's continued protection from upstream development.

Effects of climate change on the Nahʔa Dehé Ts'ç Tu Zhánîlî have been observed but are not thought to be impacting the integrity of the watershed at the present time. Both negative and positive changes to the Nahʔa Dehé's integrity values are anticipated in future decades if current climatic trends continue.

Finally, the expansion of NNPR and establishment of NaNPR are two major accomplishments that will help protect the integrity values of Nahʔa Dehé Ts'ç Tu Zhánîlî for generations to come. These accomplishments have resulted in: increased protection of habitat for aquatic and terrestrial species, protection of additional sites of cultural importance, and new recreational opportunities.



Status of Management Objectives

In 2010, Parliament approved a new Park Management Plan for Nahʔa Dehé, the boundaries of which include the CHRS designated section of Nahʔa Dehé in its entirety. The following table outlines the status of several strategic objectives and actions identified in the 2010 Park Management Plan. The focus of these objectives and actions are centred around protecting and maintaining the wilderness character of Nahʔa Dehé while improving recreational opportunities for park visitors, and increasing local community involvement in management of, and connection with, the park.

Objectives	Key Actions	Current Status
A cooperative management approach is used to guide decision-making, and protect the ecological integrity of the entire Nahʔa Dehé watershed.	- Meetings of Nahʔa Dehé Consensus Team are held regularly. - Work with Dehcho resource management authorities. - Ensure Parks Canada's goal of maintaining or restoring ecological integrity is met through active participation in the environmental assessment and review process for development and operational activities associated with Prairie Creek, Tungsten and any other mining or industrial proposals in the watershed.	Implementation of key actions is ongoing.

Objectives	Key Actions	Current Status
Natural ecological processes remain the primary forces shaping the ecosystem.	Maintain a network of climate stations to establish weather norms, aiding the understanding of climate change and local impacts in relation to fire and other ecosystem processes.	Environment and Climate Change Canada maintains three climate stations within Nahʔa Dehé.
The high level of biodiversity in Nahʔa Dehé is retained, including naturally occurring plant and animal species. Unique and sensitive landscape features are protected.	- Improve understanding and documentation of rare and endemic species and habitats. - Assess and identify any unique and sensitive features in the park for consideration as Zone I – Special Preservation, or other appropriate management strategies.	- Numerous studies of rare species were conducted in Nahʔa Dehé between 2008-2021 (see Appendix A for study details). - The Poljes, located within the expansion area of the park, were designated as a Zone I – Special Preservation area in the 2021 Park Management Plan.
The cultural heritage and values of Nahʔa Dehé are protected and management respects traditional users and interests.	Park staff and the Nahʔa Dehé Consensus Team will collaborate with other partners on the documentation, protection and presentation of cultural resources in Nahʔa Dehé.	Reports, research and studies conducted in the park have included the assistance of local community members from the Dehcho to ensure authenticity and accuracy in information.
New, inspiring opportunities for visitors throughout the park result in enhanced experiences for visitors and increased visitation.	- Develop a Visitor Experience Plan, including an interpretation strategy and means to expand and augment the visitor offer. - A thorough assessment of potential impacts of new visitor opportunities is conducted during product development, considering: public safety, visitor experience, ecological integrity and cultural resources.	In 2017, a Visitor Experience Site Strategy was completed. Existing products and new products were identified at a workshop. This strategy is used annually to assess the parks offers to the public and the communities.

Objectives	Key Actions	Current Status
The waters of Nahʔa Dehé are high quality and unimpaired by activities inside and outside park boundaries.	• Continue baseline water quality monitoring, in cooperation with Environment Canada, other agencies and local communities as appropriate. • Actively monitor water quality of potentially impacted watercourses (e.g. Flat River and Prairie Creek).	• Water quality monitoring is ongoing (and was conducted throughout the last decade), in cooperation with Environment and Climate Change Canada.
• Authentic opportunities provided by Parks Canada and its partners create meaningful connections with Nahʔa Dehé.	• Develop guidelines and reference materials to incorporate traditional Dene place names in all public materials and programs. • Increase First Nations and Metis participation in commercial tourism business opportunities. • Develop a Partnering Strategy with commercial operators, community organizations, non-profit organizations and other government agencies to achieve efficient, effective and mutually beneficial visitor services.	• All non-personal media from brochures to interpretive signage inside and outside of the park are translated into Dene Zhatie by local translators. • The park holds an open business licence for an indigenous company. There have been no applicants during this period. • At Gahnjthah Mje and Nájljcho the Visitor Experience staff lead in-person interpretive programming from guided hikes to campfire programs for all visitors to these sites. Working with all groups to ensure authentic and accurate information and a one-of-a-kind experience.
The Nahʔa Dehé offers an exceptional wilderness experience, and continues to be the primary multi-day recreational activity for park visitors.	Continue the campsite monitoring program, and take action when necessary to ensure minimal impact to the environment and experience of visitors.	Campsite impact monitoring was conducted at multiple popular camp locations along Nahʔa Dehé from 2008-2011 and in 2013. Big Bend Creek, Tu Kádeegai, and Tuleetsee were closed to overnight camping for vegetation recovery and human and wildlife conflict prevention purposes.

Objectives	Key Actions	Current Status
Local communities are involved in water quality issues and management.	Opportunities for training in water quality monitoring are provided, to enable local communities to participate in monitoring programs.	Local communities are involved in water quality issues and management through participation in environmental assessment and review processes for development and operational activities associated with Prairie Creek Mine and Selwyn Projects. Although the listed action item has not been fully implemented, a workshop has been proposed to discuss ecological monitoring programs with local communities, including opportunities for training and partnership.



Summary of Benefits since Designation

The following table outlines recreational, educational, monetary and community engagement benefits of Nahʔa Dehé's designation to the CHRS. Although a summary of environmental, cultural, knowledge and stewardship benefits are typically included for other Canadian Heritage Rivers, they are not included here as the CHR designated portion of Nahʔa Dehé receives these benefits primarily through its inclusion in the Canadian National Park System.

Type of Benefit	Description
Recreational benefits:	Nahʔa Dehé receives greater awareness, additional interest by canoeing and rafting groups, and increased recreational use overall, because of its status as a CHR.
Educational benefits:	The CHR commemorative plaque and promotion of Nahʔa Dehé on the CHRS website help to increase public awareness and understanding of the Nahʔa Dehé and the CHR program.
Monetary benefits:	- CHRS provides funding for the installation and maintenance of the Nahʔa Dehé CHR commemorative plaque located on the overlook above Náijicho. - CHRS provided Łíídlíí Kúé First Nation (LKFN) with funding for Canada 150 events in 2017. The funding was used towards 11 days of events, beginning with Canada Day festivities and ending with the unveiling of the Ehdaa Plaque at the Ehdaa National Historic Site in Łíídlíí Kúé.
Community engagement:	Funding provided to LKFN by CHRS was used towards 11 days of Canada 150 events, beginning with Canada Day festivities and ending with the unveiling of the Ehdaa Plaque at the Ehdaa National Historic Site in Łíídlíí Kúé.

Overall Assessment & Future Directions

Although upstream development and climate change continue to present significant threats, Nahʔa Dehé's heritage and integrity values are better protected now than they were when it was first designated as a CHR over 30 years ago. The expansion of NNPR and establishment of NaNPR have resulted in diversified opportunities for river touring and better protection of wildlife and wildlife habitat. Recreation on Nahʔa Dehé continues to be a driver of tourism in the Dehcho Region, as visitors are drawn to the history, lore, and unforgettable wilderness river paddling experiences that Nahʔa Dehé has to offer. A cooperative management approach was successfully implemented throughout the last decade. Thanks to the work of the NDCT, numerous management actions have been implemented to integrate the Dehcho Dene perspective, traditional ecological knowledge, and way of life into everyday operations of the park, interpretation plans and this guidance is helping to transform the parks monitoring programs. Given the successes of the past decade, this report concludes that Nahʔa Dehé remains worthy of continued designation as a Canadian Heritage River.

In 2018, scoping discussions were undertaken with park staff and the NDCT to inform the development of the next NNPR management plan. Outcomes of these discussions included a revised vision and outline of desired management results for Nahʔa Dehé (Parks Canada 2019):

In fifteen years, NNPR will continue to:

- Connect community and visitors to this spectacular wilderness.
- Represent a place of spirituality and self-reflection.
- Represent LIFE and maintain all of its natural forms with minimal impacts to water quality and wildlife.
- Be a cultural landscape.
- Be a home to Dene cultural revitalization.
- Use technology to communicate the traditional way of life.
- Strengthen relationships between Parks Canada, the Dehcho First Nations and the local community.

- Reach the hearts and minds of Dehcho youth for generations to come.

The desired management results that are envisioned for NNPR are:

- Development and use of mining roads are achieved with minimal impact to the environment.
- Traditional and contemporary Indigenous knowledge is incorporated with science based results to better understand long-term impacts on the park (i.e. caribou movement patterns/protection and water quality).
- Commercial Indigenous eco-tourism opportunities are available and will be supported.
- A Parks Canada office is to be established in Nahanni Butte.
- Connections between Dehcho youth and elders will occur in the park.
- Parks Canada will consult with local communities toward developing youth stewardship programs in the park.
- Elders are to be consulted for guidance.
- Raise awareness and understanding of park management and operations among community members.
- Management of assets is strategic and sustainable. Policies will be in place to outline expectations for commercial operations in the park.
- Parks Canada will continue its successful work with the NDCT to implement hiring commitments made in the Interim Park Management Agreement.
- The Dene Zhatie (the Dene language) is interwoven in all park operations and management.

In 2021, a new Park Management Plan for Nahʔą Dehé, based on the results of the scoping discussions as well as public and stakeholder input on the draft plan, was tabled in Parliament. The table below contains the plan's key strategies and objectives, which will guide the management of Nahʔą Dehé for the ensuing decade.



Key Strategies	Objectives
Key Strategy 1: Nahᑭᐱ Kué/Our Home – Sharing the Heart of the Dehcho	Objective 1.1: Nahanni continues to target and attract visitors seeking high-quality wilderness experiences, while balancing protection and presentation.
	Objective 1.2: Management of park infrastructure takes into account impacts from climate change, carbon footprint reduction and the interests and views of the Nahᑭᐱ Dehé Consensus Team, Indigenous rights holders and stakeholders.
	Objective 1.3: Visitors continue to report high-quality wilderness recreation and cultural experiences.
	Objective 1.4: Local Indigenous eco-tourism partnerships are enhanced.
	Objective 1.5: Nahᑭᐱ Dehé remains internationally renowned as a premier wilderness destination.
Key Strategy 2: Dene Náothę - The Dene Worldview	Objective 2.1: Dene Zhatie, the Dene language and culture of Nahᑭᐱ Dehé, is promoted, celebrated, and integrated into visitor experiences.
	Objective 2.2: The Dene have a stronger connection to Nahᑭᐱ Dehé.
Key Strategy 3: Nahᑭᐱ Dehé K'eodhi – Taking Care of Nahᑭᐱ Dehé	Objective 3.1: Ecological integrity of Nahᑭᐱ Dehé is maintained without significant impact from resource development projects.
	Objective 3.2: Information and prevention strategies related to unauthorized activities in Nahᑭᐱ Dehé are improved.
	Objective 3.3: The sustainability of the ecological integrity monitoring program is improved.
	Objective 3.4: Condition ratings for the cultural resources in the park are established.
Key Strategy 4: Yundáa Gogha Tu K'ehodí - Waters for Life	Objective 4.1: Human waste management is improved to reflect best practices.
	Objective 4.2: The water quality of Nahᑭᐱ Dehé is maintained.
Key Strategy 5: Reconciling with Indigenous Rights Holders	Objective 5.1: The relationship between Parks Canada and the Acho Dene Koe First Nation is improved over the next ten years.
	Objective 5.2: The relationship between Parks Canada and the Kaska Dena is improved over the next ten years.

References

- Anderson, E.R. 2017. Modelling changes in multi-decadal streamflow contributions – Bologna Glacier, Selwyn Mountains, NWT, Canada. MSc thesis, University of Saskatchewan, Saskatoon.
- Associated Environmental Consultants Inc. 2020. Howard’s Pass Access Road: Stream Crossing Fluvial Geomorphological Assessment. Prepared for Selwyn Chihong Mining Ltd., April 2020.
- Banks, S.N.K., and M. Barbuto. 2009. Legislative Summary of Bill C-38: An Act to amend the Canada National Parks Act to enlarge Nahanni National Park Reserve of Canada. Library of Parliament, Ottawa, Canada. 10 pp.
- Becklumb, P., and T. Williams. 2014. Legislative Summary of Bill S-5: An Act to amend the Canada National Parks Act (Nááts’ihch’oh National Park Reserve of Canada). Library of Parliament, Ottawa, Canada. 10 pp.
- Biller-Celander, N., J.D. Shakun, D. McGee, C.I. Wong, A.V. Reyes, B. Hardt, I. Tal, D.C. Ford, and B. Lauriol. 2021. Increasing Pleistocene permafrost persistence and carbon cycle conundrums inferred from Canadian speleothems. *Science Advances*, 7: eabe5799.
- Bio-Inventory and Collections Unit. 2015. DNA Barcode-based assessment of arthropod diversity in Canada’s National Parks: Progress report for Nahanni National Park. Bio-Inventory and Collections Unit, Biodiversity Institute of Ontario, University of Guelph. Report. 20 pp.
- Brett, R. 2008. Wood Buffalo National Park and Nahanni National Park Reserve 2008 forest health conditions. Northern Forestry Centre, Canadian Forest Service, Natural Resources Canada, Edmonton, Alberta, Canada. 4 pp.
- Brett, R. 2009. The summary of historic spruce budworm outbreaks in Nahanni National Park Reserve and vicinity. Northern Forestry Centre, Canadian Forest Service, Natural Resources Canada, Edmonton, Alberta, Canada. 9 pp.
- Brett, R. 2013. Wood Buffalo National Park and Nahanni National Park Reserve 2013 forest health conditions. Northern Forestry Centre, Canadian Forest Service, Natural Resources Canada, Edmonton, Alberta, Canada. 4 pp.
- Brett, R. 2016. 2016 forest health conditions in Wood Buffalo, Nahanni, and Nááts’ihch’oh. Northern Forestry Centre, Canadian Forest Service, Natural Resources Canada, Edmonton, Alberta, Canada. 9 pp.

- Brett, R. 2018. 2017 forest health conditions in Wood Buffalo, Nahanni, Nááts'ihch'oh, and Kluane National Parks and Reserves. Northern Forestry Centre, Canadian Forest Service, Natural Resources Canada, Edmonton, Alberta, Canada. 30 pp.
- Canada. 2009. Government of Canada Announces the Expanded Boundary for Nahanni National Park Reserve of Canada [News release]. Retrieved from <https://www.canada.ca/en/news/archive/2009/06/government-canada-announces-expanded-boundary-nahanni-national-park-reserve-canada.html>.
- Canada. 2012. Nááts'ihch'oh National Park Reserve [News release]. Retrieved from <https://www.canada.ca/en/news/archive/2012/08/naats-ihch-oh-national-park-reserve.html>.
- Canadian Heritage Rivers System (CHRS). 2016. Canadian Heritage Rivers System Principles, Procedures and Operational Guidelines 2016. 74 pp.
- Chin, K.S., J. Lento., J.M. Culp, D. Lacelle, and S.V. Kokelj. 2016. Permafrost thaw and intense thermokarst activity decreases abundance of stream benthic macroinvertebrates. *Glob Change Biol*, 22: 2715-2728. <https://doi.org/10.1111/gcb.13225>.
- COSEWIC. 2011. COSEWIC assessment and status report on the Collared Pika *Ochotona collaris* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 50 pp. (www.registrelep-sararegistry.gc.ca/default_e.cfm).
- COSEWIC. 2012. COSEWIC assessment and status report on the Bull Trout *Salvelinus confluentus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxii + 103 pp.
- DeMars, C., T. Hegel, and D.P. Tate. 2016. Spatiotemporal interactions of the South Nahanni Caribou herd with the proposed all-season Howard's Pass Road. Dept. of Environment, Yukon.
- Dubé, M., and G. Scrimgeour. 2008. Development and application of methods to monitor the ecological health of the South Nahanni Watershed. NWT Cumulative Impact Monitoring Program: Capacity Building & Monitoring Projects 2007-2008. Report. 8 pp.
- EBA Engineering Consultants Ltd. 2011. Reclamation assessment, invasive and rare plant survey 2010, Prairie Creek Mine Access Road, NT. Report. 42 pp.
- EDI Environmental Dynamics Inc. 2020. Howard's Pass Access Road Baseline Wildlife Studies: 2019-2020 Annual Report. Prepared for Chinalco - Selwyn Chihong Mining Ltd. 91 pp.

- Ednie, M., and M.N. Demuth. 2018. Contemporary glacier area change in the Ragged Range, Northwest Territory, including Nahanni National Park Reserve of Canada. Geological Survey of Canada, Open File 8401, nn p. doi: 10.4095/nnnnnn.
- Environment Canada. 2012 Management Plan for the Northern Mountain Population of Woodland Caribou (*Rangifer tarandus caribou*) in Canada. Species at Risk Act Management Plan Series. Environment Canada, Ottawa. vii + 79 pp.
- Ford, D. 2011. Expanding South Nahanni National Park, Northwest Territories, Canada, to include and manage some remarkable sub-arctic karst terrains. In *Karst Management.*, Philip E. van Beynen, eds. New York: Springer, 415–37.
- Fornica, A., E.C. Farrer, I.W. Ashton, and K.N. Suding. 2014. Shrub Expansion Over the Past 62 Years in Rocky Mountain Alpine Tundra: Possible Causes and Consequences. *Arctic, Antarctic, and Alpine Research*, 46:3, 616-631, DOI: 10.1657/1938-4246-46.3.616.
- Geological Survey of Canada (GSC). 2018. Bologna Glacier mass balance 2015, 2016 and 2017. Draft report. 3 pp.
- Golder Associates. 2014. Occupancy pattern of caribou in the Prairie Creek Road and surrounding area. Report Number: 1414330002-001-R-RevA.
- Harris, A.G., and R.F. Foster. 2012. Summary of 2012 field surveys for Nahanni Aster (*Symphyotrichum nahanniense*). Northern Bioscience. Report. 14 pp.
- Hegel, T., K. Russell, W.J. Rettie, and D.P. Tate. 2016. South Nahanni and Coal River Northern Mountain Caribou herds: Population status and demographic characteristics. Yukon Fish and Wildlife Branch Report TR-14-06. Whitehorse, Yukon, Canada.
- Horne, G., and D. Critchley. 2019. Nahanni National Park Reserve: Report of Bat & Cave Monitoring – 2019. Parks Canada, Northern Alberta Institute of Technology, and Wildlife Conservation Society Canada. Report. 53 pp.
- Jermyn, C., and M. Geertsema. 2015. An Overview of Some Recent Large Landslide Types in Nahanni National Park, Northwest Territories, Canada. In *Engineering Geology for Society and Territory - Volume 1*, Lollino G., Manconi A., Clague J., Shan W., Chiarle M. eds. Springer, Cham. https://doi.org/10.1007/978-3-319-09300-0_59.
- Kennedy, B., M. Manseau, L. Andrew, and D. Simmons. 2020. Mapping Historical Changes to Alpine Extent and Treeline Ecotones across the Greater Mackenzie Mountains, Northwest Territories, Canada. Poster presented at Arctic Change 2020 Annual Scientific Meeting, December 7-10, 2020.

- Kokelj, S.V., D. Lacelle, T.C. Lantz, J. Tunnicliffe, L. Malone, I.D. Clark, and K.S. Chin. 2013. Thawing of massive ground ice in mega slumps drives increases in stream sediment and solute flux across a range of watershed scales, *J. Geophys. Res. Earth Surf.*, 118, 681– 692, doi:10.1002/jgrf.20063.
- Lifeways of Canada Limited. 2019. Cultural Heritage Protection Plan Phase 1 Winter Road Prairie Creek Mine, NT. Prepared for Canadian Zinc Corporation. 28 pp.
- Mackenzie Valley Environmental Impact Review Board (MVEIRB). 2009. EA0708-001: Selwyn Resources Ltd. Mineral Exploration at Howard's Pass Report of Environmental Assessment and Reasons for Decision. 58 pp.
- Mackenzie Valley Environmental Impact Review Board (MVEIRB). 2016. Reasons for Decision on the Scope of Environmental Assessment: HPAR Upgrade Project EA1516-01. 8 pp.
- Mackenzie Valley Environmental Impact Review Board (MVEIRB). 2017. EA1415-01: Canadian Zinc Corp., Prairie Creek All Season Road Project Report of Environmental Assessment and Reasons for Decision. 457 pp.
- Mochnac, N.J., R. Bajno, L. Sawdon, J. Reist, M. Suitor, D. Tate, and C. Barth. 2011. Bull trout habitat use and movement in the Prairie Creek area [Presentation]. Fisheries and Oceans Canada.
- Mochnac, N., B. Lewis, and M. McPherson. 2016. A watershed-scale sample protocol for distribution and trend assessment of stream salmonids in the Northwest Territories. NWT Cumulative Impact Monitoring Program – Final Project Report. 16 pp.
- Mochnac, N., S. Arnold, and M. Taylor. 2018. Fish occupancy measure assessment. Nahanni National Park Reserve State of the Park Assessment. Parks Canada, Fort Simpson, Northwest Territories.
- Myers-Smith, I.H., B.C. Forbes, M. Wilmking, M. Hallinger, T. Lantz, D. Blok, K.D. Tape, M. Macias-Fauria, U. Sass-Klaassen, E. Lévesque, S. Boudreau, P. Ropars, L. Hermanutz, A. Trant, L.S. Collier, S. Weijers, J. Rozema, S.A. Rayback, N.M. Schmidt, G. Schaepman-Strub, S. Wipf, C. Rixen, C.B. Ménard, S. Venn, S. Goetz, L. Andreu-Hayles, S. Elmendorf, V. Ravolinen, J. Welker, P. Grogan, H.E. Epstein, and D.S. Hik. 2011. Shrub expansion in tundra ecosystems: dynamics, impacts and research priorities. *Environ. Res. Lett.*, 6, 045509, doi:10.1088/1748-9326/6/4/045509.
- Northwest Territories. 2015. Statement on Cantung Mine and Mactung property [News release]. Retrieved from <https://www.gov.nt.ca/newsroom/statement-cantung->

mine-and-mactung-property.

Northwest Territories. 2016. Northwest Territories State of the Environment Report: Highlights 2016. Dept. of Environment and Natural Resources, Northwest Territories, ISBN 978-0-7708-0227-1.

Northwest Territories. 2018. 2030 NWT Climate Change Strategic Framework. Report. 108 pp.

O'Neill, H.B., S.A. Wolfe, and C. Duchesne. 2020. Ground ice map of Canada. Geological Survey of Canada, Open File 8713 (version 1), 1 .zip file. <https://doi.org/10.4095/326885>.

Parker, B.R., L.M. Levesque, A. Gue, L. Perry, T. Dessouki, D. Halliwell, and D.R. Haggarty. 2010. Nahanni National Park Reserve Water Quality Status and Trends. Water Quality Monitoring & Surveillance, Prairie and Northern, Environment Canada. 96 pp.

Parker, S. 2017. Let's Talk about Climate Change: Northwest Region. Parks Canada, Office of the Chief Ecosystem Scientist. 41 pp.

Parker, S. 2018. Supplemental Climate Information for Nahanni National Park Reserve. Parks Canada, Office of the Chief Ecosystem Scientist. 24 pp.

Parker, S., J. Wu, D. Whitaker, B. Bateman, C. Harpur, and D. Lepage. 2019. Birds and Climate Change: Nahanni National Park Reserve. Report. 5 pp.

Parks Canada. 2009. Nahanni National Park Reserve Nah?à Dehé State of the Park Report 2009. Parks Canada, Gatineau, Québec. 67 pp.

Parks Canada. 2010. Nahanni National Park Reserve of Canada Nah?à Dehé: Management Plan. Parks Canada, Gatineau, Québec.

Parks Canada. 2017. Nááts'ihch'oh National Park Reserve of Canada: Management Plan. Parks Canada, Gatineau, Québec.

Parks Canada. 2018. Nahanni National Park Reserve State of the Park Assessment. Parks Canada, Gatineau, Québec. 10 pp.

Parks Canada. 2019. Nahanni National Park Reserve Scoping Submission. Document. 6 pp.

Parks Canada. 2021. Management Plan for the Nahanni Aster (*Symphotrichum nahanniense*) in Canada [Proposed]. Species at Risk Act Management Plan Series. Parks Canada Agency, Ottawa. xx + XX pp.

Parks Canada. 2021. Nahanni National Park Reserve of Canada Management Plan,

2021. Parks Canada, Gatineau, Québec.
- Polfus, J. L., M. Manseau, D. Simmons, M. Neyelle, W. Bayha, F. Andrew, L. Andrew, C. F. C. Klütsch, K. Rice, and P. Wilson. 2016. Łeghágots'enetę (learning together): the importance of indigenous perspectives in the identification of biological variation. *Ecology and Society* 21(2):18. <http://dx.doi.org/10.5751/ES-08284-210218>.
- Rocheleau, J., K.M. Fiess, L.J. Pyle, F. Ferri, and T.A. Fraser. 2014. Source rock characterization of the carboniferous Golata Formation and Devonian Besa River Formation outcrops, Liard Basin, Northwest Territories. Search and Discovery Article #90224 GeoConvention.
- Schock, D.M. 2009. Amphibian Population and Pathogen Surveys in the Dehcho and Sahtu, Northwest Territories, 2007 and 2008. Dept. of Environment and Natural Resources, Northwest Territories, Manuscript Report. 122 pp.
- Scrimgeour, G.J., J.L. Bailey, T.B. Reynoldson, D. Haggarty, K. Thomas, R. Hall, and D. Tate. 2013. An assessment of the ecological integrity of streams in the South Nahanni Watershed: development and application of a reference condition model. Internal report produced by the Office of the Chief Ecosystem Scientist, Protected Areas Establishment and Conservation, Parks Canada Agency, Calgary, Alberta. 59 pp.
- Selwyn Chihong Mining Ltd. (SCML). 2012. Annual report for Parks Canada Research Permit #NAH-2011-10213: Selwyn Project 2012. Report. 17 pp.
- Selwyn Chihong Mining Ltd. (SCML). 2013. Annual report for Parks Canada Research Permit #NAH-2011-10213: Selwyn Project 2013. Report. 10 pp.
- Selwyn Chihong Mining Ltd. (SCML). 2014. Annual report for Parks Canada Research Permit #NAH-2011-10213: Selwyn Project 2014. Report. 10 pp.
- Selwyn Chihong Mining Ltd. (SCML). 2015. Rut count survey 2015. Report. 4 pp.
- Selwyn Chihong Mining Ltd. (SCML). 2015. Project Timeline. Webpage. Retrieved from <http://selwynchihong.com/project/timeline/>.
- Selwyn Resources Ltd. 2008. Selwyn Project Access Road fisheries investigations of stream crossing locations. Report. 41 pp.
- Smith, S.L., J. Chartrand, and C. Duchesne. 2018. Report on 2017 field activities and collection of ground-thermal and active-layer data in the Mackenzie corridor, Northwest Territories. Geological Survey of Canada, Open File 8492, 114 p. <https://doi.org/10.4095/313036>.

- Staple, T., and G. Wall. 1996. Climate change and recreation in Nahanni National Park Reserve. *Canadian Geographer / Le Géographe canadien*, 40: 109-120. <https://doi.org/10.1111/j.1541-0064.1996.tb00439.x>.
- Stotyn, S. 2012. Wild bumble bees of the Nahanni River Region, Northwest Territories. Canadian Wildlife Service. Report. 10 pp.
- Tate, D.P. 2003. Expanding Nahanni National Park Reserve – the contributions of research, consultation and negotiation. In: *Making Ecosystem Based Management Work, Proceedings of the Fifth International Conference on Science and Management of Protected Areas*. (N.W.P. Munro, P. Dearden, T.B. Herman, K. Beazley, S. Bondrop-Nielsen, eds.) CD-ROM Proceedings, Chapter 9.
- Tate, D. 2016. Preliminary Data Report – Prairie Creek Caribou Research. Nahanni National Park Reserve, Parks Canada. Preliminary Report. 6 pp.
- Tetra Tech Canada Inc. 2019a. Prairie Creek Winter Road – Phase 1 Construction: Rare Plant Management Plan. Prepared for Canadian Zinc Corporation. File: 704-ENG.EARCO3145-01.
- Tetra Tech Canada Inc. 2019b. Prairie Creek Mine All-Season Road Caribou Data Gap Analysis. Prepared for Canadian Zinc Corporation. File: ENW.EENW03326-01.
- Tetra Tech Canada Inc. 2019c. Prairie Creek Proposed Phase 1 Road Collared Pika Habitat Loss Estimates. Prepared for Canadian Zinc Corporation. File: 704-ENW.EENW03326-01.
- Tetra Tech Canada Inc. 2019d. Prairie Creek All-Season Road Effects Assessment Addendum, Canada Warbler (*Cardellina canadensis*). Prepared for Canadian Zinc Corporation. File: 704-ENW.EENW03326-01.
- Tetra Tech Canada Inc. 2021. Prairie Creek Mine All-Season Road: Woodland Caribou & Remote Camera Baseline. Prepared for Canadian Zinc Corporation. File: ENW.EENW03326-02.100 pp.
- Triton Environmental Consultants. 2014. Fish and fish habitat inventory of the Howard's Pass Access Road. Prepared for Selwyn Chihong Mining Ltd. 70 pp.
- Weaver, J.L. 2006. Big animal and small parks: Implications of wildlife distribution and movements for expansion of Nahanni National Park Reserve. *Wildlife Conservation Society Canada Conservation Report No. 1*. Toronto, ON.

Appendix A – Research & Monitoring Activities in the Nahʔa Dehé Ts'ı̨ Tu Zhánîlî (2008-2021)

Research and Monitoring Activities	Description	Year(s) Conducted	Reference(s)
Amphibian Surveys	To assess the presence of amphibians and amphibian pathogens within NNPR (and other locations within the Dehcho and Sahtu regions), foot and dipnet surveys were conducted at sites along the Nahʔa Dehé, starting at Tuleetsee, and on the trail to Chitú. Wood frog was the only species observed within NNPR. Ranivirus was detected at one site (Chitú) within NNPR.	2008	Schock 2009
Soapberry Production	An index of soapberry production was obtained by counting the number of berries on two stems per soapberry bush at 50 randomly selected bushes along the Gahnjthah trail.	2008	

Documenting Outfitter & Guiding History	Interviews were conducted to document the stories and land-use history associated with a pack-train guiding operation located at the headwaters of the Nahᑦᑦ Dehé between 1968-1975.	2008	
Multi-Trophic Level Examination of Metal Concentrations in Nahᑦᑦ Dehé Ts'ᑦ Tu Zháníí	Water, sediment, benthic invertebrate, and fish samples were collected from multiple locations along Tu Naka Dé and Tí'o Dehé. Samples were analysed to determine metal concentrations upstream and downstream from mining operations.	2008-2009	Dubé and Scrimgeour 2008
Population Monitoring of the South Nahanni and Coal River Caribou Herds and Habitat Use by the South Nahanni Herd	Radio-collars were deployed on 30 adult female caribou from the South Nahanni herd to assess habitat use, including in the vicinity of the HPAR, and to obtain a population estimate in 2009 using mark-resight methods. Collar data collection ended in 2013. Fall composition surveys were conducted annually between 2008 and 2011 to obtain sex and cow-calf ratios for the South Nahanni and Coal River herds.	2008-2013	Hegel et al. 2016, DeMars et al. 2016
Fish and Fish Habitat Inventory of the Howard's Pass Access Road	Fish occupancy and habitat were assessed at HPAR bridge crossings (2008) and at all HPAR watercourse crossings and waterbodies in close proximity to the HPAR right-of-way (2014). Species detected include: Arctic grayling, burbot, slimy sculpin, and lake trout.	2008, 2014	Selwyn Resources Ltd. 2008, Triton Environmental Consultants 2014

Moose Occupancy along the Nahʔa Dehé Corridor	Aerial surveys were conducted along the Nahʔa Dehé corridor between Nájl̓cho and Gahn̓hthah, using fixed and rotary-wing aircraft, to provide annual moose occupancy estimates. Other large animals (e.g., caribou, bears, wolves, swans, etc.) were also recorded.	2008-2014	
Campground Impact Monitoring	To inform the need for management actions such as campsite closures, the condition of popular campsites along the Nahʔa Dehé were assessed based on level of disturbance (e.g., presence of invasive species, catholes, soil erosion, vegetation damage, trail braiding, etc.).	2008-2011, 2013, 2018	
CABIN Monitoring	Benthic invertebrate monitoring, following Canadian Aquatic Biomonitoring Network (CABIN) protocols, was conducted to assess stream health across Nahʔa Dehé Ts'ç Tu Zhán̓l̓ .	2008-2009, 2014, 2016, 2018, 2019, 2021	Scrimgeour et al. 2013
Forest Health Surveys	Aerial surveys of forest insect outbreaks and disease (e.g., spruce budworm, aspen serpentine leafminer, red belt, etc.) were conducted annually along Nahʔa Dehé and Tu Naka Dé.	2008-2019, 2021	Brett 2008, Brett 2009, Brett 2013, Brett 2016, Brett 2018
Water Quality Monitoring	Water samples were collected three times annually (during base flow, freshet, and recession) from nine sites including: two sites on Nahʔa Dehé, two sites on Tu Naka Dé (both downstream of Cantung mine), and five sites on Tł'o Dehé (both above and below the Prairie Creek mine). Samples were analysed for physical parameters, nutrients, major ions, metals, and organic contaminants.	2008-2021	Parker et al. 2010

Bear Monitoring	Accounts of black bear and grizzly bear sightings, encounters and incidents were obtained from staff trip reports, duty officer logs and river surveys to examine trends and assess the need for management actions (e.g., warnings, area closures, etc.).	2008-2021	
Forest Bird Community Monitoring	The composition and activity of forest bird communities was monitored annually near Dahtaehth'j and Chitú. Up until 2017, when automatic recording units were first deployed, monitoring was conducted via point counts.	2008-2021	
Climate Monitoring	Weather stations at Chitú, Dahtaehth'j, and Gahnjthah measured temperature, dew point temperature, relative humidity, wind speed and direction, atmospheric pressure, and wind chill.	2008-2021	
Ice Phenology	Ice phenology was monitored, using remote cameras or discharge data from Water Survey of Canada gauges, at Gahnjthah Mje, Chitú, Glacier Lake, Mac Creek, Tułetsee, Tl'o Dehé, Nah?ā Dehé and Tu Naka Dé.	2008-2021	
Wildland Fire Monitoring	Wildfires within NNPR were monitored to ensure the safety of visitors and facilities, and monitor trends in the fire cycle.	2008-2021	
River Discharge and Flow	River discharge and flow were monitored using two gauges located at Nájljcho above the falls and at the mouth of Tu Naka Dé. The gauges are maintained by Water Survey of Canada.	2008-2021	

Aspen Phenology	Phenology of trembling aspen, including catkin flowering and bud burst, was monitored for 26 trees at Gahnjithah Mje.	2009-2011	
Amphibian Monitoring	Autonomous recording units were deployed at potential amphibian breeding locations within NNPR (Chitú, Nájljcho, Gahnjithah Mje, and Mac Creek) to detect amphibian presence.	2009-2013	
Archeological Impact Assessments along the Prairie Creek Proposed Winter and All Season Road Alignments	Aerial and foot surveys, as well as shovel tests were conducted as part of archeological impact assessments along the Prairie Creek proposed winter and all season road alignments, including within proposed borrow sources and geotechnical testing sites. One regionally significant cultural site was found on the Ram Plateau during the assessments.	2009, 2012, 2018-2019	Lifeways of Canada 2019
Invasive and Rare Plant Surveys	Invasive and rare plant surveys were conducted along the Prairie Creek Mine access road and proposed road realignments.	2009-2010, 2016-2017	EBA Engineering Consultants Ltd. 2011, Tetra Tech Canada Inc. 2019a
Cultural Heritage Recording and Monitoring	Heritage recording and monitoring was completed at Kraus Homestead and Poole Field cabin sites.	2009	
Bull Trout Spawning, Winter Habitat, and Genetics Study	150 bull trout were captured in Tl'o Dehé and Funeral Creek. Genetic samples were taken from all fish and acoustic tags, used to examine movement between spawning and winter habitat, were attached to 54 fish.	2010-2011	Mochnacz et al. 2011

Bumble Bee Diversity	Bee specimens were collected from riparian areas along the Nahʔa Dehé to increase knowledge of bee diversity in the area. Thirteen species were identified, including the SARA-listed yellow-banded bumble bee.	2011	Stotyn 2012
Caribou Occupancy in the Vicinity of the Prairie Creek Mine Access Road	Aerial surveys were conducted in the vicinity of Prairie Creek Mine site and proposed winter and all season road alignments to estimate caribou occupancy rates (2010, 2011, and 2014) and relative abundance and distribution (2019).	2010-2011, 2014, 2019	Golder Associates 2014, Tetra Tech 2021
Genetic Connectivity of Caribou Herds within Nahanni	Since 2011, scat samples have been collected opportunistically, and in dedicated winter helicopter flights. Scat samples were genotyped at Trent University's Natural Resources DNA Profiling & Forensic Centre to assess the genetic overlap of caribou herds occurring within NNPR.	2011-2021	Polfus et al. 2016
Nahanni Aster Surveys	In 2012, 50 thermal springs, mostly within NNPR, were flown over to assess habitat potential for Nahanni Aster. Ground searches were conducted at 24 thermal springs and Nahanni Aster counts were conducted at the 6 sites where it was found, two of which had not been previously documented. In 2019, NNPR staff surveyed the six known sites and discovered a seventh subpopulation.	2012, 2019	Harris and Foster 2012, Parks Canada 2021
Aerial Ungulate Surveys in the Vicinity of HPAR	Late-winter ungulate (moose and caribou), caribou calving, caribou post-calving, caribou rut, and ungulate (moose and caribou) post-rut surveys were conducted in the vicinity of the HPAR and the mine site regional study area.	2012-2015	SCML 2012, SCML 2013, SCML 2014, SCML 2015

Sheaf Creek and Besa River Geology	Geochemical studies of the Golata and Besa River Formations were conducted at Sheaf Creek and the Besa River.	2013	Rocheleau et al. 2014
Bull Trout and Arctic Grayling Occupancy	From 2012-2016, electrofishing-based surveys were conducted in the Tl'o Dehé and Little Nahanni watersheds to determine bull trout and Arctic grayling occupancy respectively. Water temperature loggers were installed in both watersheds to improve understanding of thermal habitat requirements. From 2018-2020, eDNA samples, primarily from the Tl'o Dehé watershed, were collected to assess bull trout occupancy and compare results to those from previous electrofishing surveys. In 2021, the program expanded to include eDNA sampling within the Wrigley Creek watershed. As there is no upstream development occurring within this watershed, it will serve as a reference watershed in future assessments, once baseline occupancy has been determined.	2012-2016, 2018-2021	Mochanacz et al. 2016, Mochanacz et al. 2018
Archaeological Impact Assessment	To increase knowledge and understanding of the region's ancient and twentieth century history, an archaeological Impact Assessment was conducted at Glacier Lake and the Cirque of the Unclimbables.	2012	
Barcode of Life	Two malaise traps were deployed at Nájłıcho as part of the Canadian National Parks 'Barcode of Life' Malaise Program. From the 19,518 arthropod specimens collected, 2,938 Barcode Index Numbers were observed, representing 186 different families and 616 genera.	2014	Bio-Inventory and Collections Unit 2015

Alpine Vegetation Monitoring	Alpine vegetation monitoring plots were established in the Tł'ogotsho Plateau, Ragged Range, and Tundra Ridge. Plots were surveyed to determine surface cover and species diversity.	2014-2016	
Bat Hibernacula	Bat roost loggers were deployed in Grotte Valerie in 2014 and in 8 caves near Lafferty Creek and Tułetsee in 2016 to provide information about potential hibernacula within NNPR. The loggers deployed in 2016 were collected in 2019 along with genetic samples (e.g., guano) from the caves. Analysis of the roost logger and genetic data provided strong evidence that multiple caves were used by bats (including two endangered myotis species) as hibernacula; the northernmost known in North America.	2014, 2016, 2019	Horne and Critchley 2019
Pika Monitoring	Monitoring of collared pika was initiated in the Tł'ogotsho Plateau, Ragged Range, and Tundra Ridge. During this exploratory monitoring phase, sites where pika had been observed previously, or were likely to occur based on habitat attributes, were surveyed to confirm pika presence and delineate territories.	2014-2016, 2021	
Forest Vegetation Monitoring	Forest vegetation monitoring plots were established along the Nahʔa Dehé between Moore's Hotsprings and Dahtaethth'j. Plots were surveyed to determine species diversity and the diameters at breast height of 20 canopy spruce trees were measured.	2014-2015, 2017	

Glacier Monitoring	Mass balance (i.e., the difference between snow accumulated during the winter and snow and ice melted during the summer) of the Bologna Glacier, the runoff from which flows into the Nahᐅᐅ Dehé from Bologna Creek, was monitored annually.	2014-2019, 2021	GSC 2018
Caribou Habitat Use in the Vicinity of the proposed Prairie Creek All Season Road	18 female caribou were collared in 2015 to determine seasonal ranges and assess habitat use in the vicinity of the Prairie Creek Mine and proposed All Season Road to examine potential impacts of mining and road operations on caribou.	2015-2017	Tate 2016, Tetra Tech Canada Inc. 2019b
Howard's Pass Access Road Baseline Surveys	A variety of baseline wildlife surveys and water and sediment quality and quantity programs were conducted along the HPAR between 2015 to 2020 to inform the Developer's Assessment Report for the HPAR Road Upgrade Project. Surveys included: songbird and crepuscular birds, wetland-based birds, amphibians, beaver lodge, collared pika, sheep and goat post-lambing, cliff nesting raptors, bat acoustic, caribou post-calving, caribou and moose rut, caribou and moose post-rut, and grizzly bear den spring emergence.	2015, 2018-2020	Associated Environmental Consultants Inc. 2020, EDI 2020
Cultural Resource Monitoring	Condition monitoring of the Deadman Valley Forestry Cabin was conducted.	2017	

Baseline Wildlife Surveys in the Vicinity of the Proposed Prairie Creek All Season Road	Surveys were conducted to evaluate collared pika occupancy and relative abundance in the vicinity of the proposed Prairie Creek All Season Road (ASR). Automatic recording units were deployed along the proposed ASR to evaluate occupancy, relative abundance, and distribution of migratory birds. In June 2019, 46 remote cameras were deployed along the first 56 km of proposed ASR and in 3 transects (perpendicular to the proposed ASR) to examine the activity and distribution of caribou in the vicinity of the proposed ASR. An aerial bear den survey was conducted along the proposed ASR in fall 2019 and fall 2021.	2017, 2019-2021	Tetra Tech Canada Inc. 2019c, Tetra Tech Canada Inc. 2019d , Tetra Tech Canada Inc. 2021
Archaeological Investigations at Gahnjthah Mje	In 2017, NDCT member George Tsetso discovered the base of a projectile point and a piece of a cutting stone that had eroded out from under the bear cache next to the staff cabin at Gahnjthah. This led to an archaeological impact assessment of the site in 2018, which confirmed the presence of in situ cultural resources, and further excavations in 2019. Cultural resources found during the excavations included tool pieces, obsidian flakes (which were sourced to Mount Edziza in northwestern BC and tested positive for canid residue), and hearth remnants, including charcoal that was dated back to approximately 1200-1300 years ago.	2018-2019	

Bat Acoustic Monitoring	Bat activity levels and species occupancy were monitored opportunistically at Lafferty Creek in 2018 and at Dahtaehth'j and HPAR between 2019 to 2020 using full spectrum bat acoustic recorders. In 2021, 14 long-term bat acoustic monitoring stations were established across NNPR.	2018-2021	
Use of Speleotherm Samples from Grotte Valerie to Identify Permafrost Thaw Events	Isotope analysis was conducted on speleotherm (cave deposit) samples from Grotte Valerie to determine the timing of permafrost thaw events in the geologic past.	2019	Biller-Celander et al. 2021
Invasive Species Monitoring	Invasive species surveys were conducted at HPAR, Glacier Lake, and various sites along the Nah'ą Dehé.	2019, 2021	
Movements and Status of the Coal River Caribou Herd	26 caribou from the Coal River herd were collared in the southeast Yukon in October 2020 to provide information on migration and habitat use in the vicinity of the Nahanni Range Road, and obtain an updated population estimate via a mark-resight survey. 9 additional caribou were collared within NNPR in March 2021.	2020-2021	
Paleozoic Rift History of Western Laurentia	Volcanic rocks were collected from NNPR for geochemistry, age, and isotopic signature analyses. This was part of a larger project to better understand the geologic evolution of the Northwest Territories, Yukon, and Alaska.	2021	

Geothermal Potential of the Nahanni Formation	To assess the geothermal potential of the Nahanni Formation, measurements were taken and description of rock outcrops were recorded at multiple sites in the Dehcho Region of the Northwest Territories, including one site within NNPR. Rock samples were collected for porosity and permeability testing.	2021	
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Appendix B – CHRS

Integrity Guidelines

Natural Integrity Values

- The nominated section is of sufficient size to include significant representations of all of the natural processes, features, or other phenomena which give the river its outstanding natural value;
- The nominated section includes those ecosystem components which contribute significantly to the provision of habitat for species in need of protection;
- There are no human-made impoundments within the nominated section;
- All key elements and ecosystem components are unaffected by impoundments located outside the nominated section;
- The water in the nominated section is uncontaminated to the extent that its natural aquatic ecosystem is intact; and
- The natural aesthetic character of the nominated section is free of, or not adversely affected by, human developments.

Cultural Integrity Values

- The nominated section is of sufficient size to include significant representations of all of the features, activities or other phenomena which give the river its outstanding cultural value;
- The visual character of the nominated section enables uninterrupted appreciation of at least one of the periods of the river's historical importance;
- The key artifacts and sites comprising the cultural values for which the river is nominated are unimpaired by impoundments and human land uses; and
- The water quality of the nominated section does not detract from the visual character or the cultural experience provided by its cultural values.

Recreational Integrity Values

- The river possesses water of a quality suitable for contact recreational activities, including those recreational opportunities for which it is nominated;
- The river's visual appearance is capable of providing river travelers with a continuous natural experience, or a combined natural and cultural experience, without significant interruption by modern human intrusions; and
- The river is capable of supporting recreational uses without significant loss of, or impact on, its natural and cultural values or its visual character.