

Northeast Water Strategy

Ensuring the responsible
use and management of
Northeast British Columbia's
water resources





Image of Yedhe River courtesy of Jason Lawson

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Christina Falls on the Graham River

Image courtesy of Karrilyn Vince

Message from Ministers, Natural Resources Sector

The *Northeast Water Strategy* is a proactive, long-term approach for the sustainable use and management of water resources in Northeast B.C. It recognizes water is our most valuable resource, necessary for life to exist, for communities to be healthy and for our economy to thrive.

While British Columbia is fortunate to have an ample supply of water, effective water stewardship is vital to meet increasing water demands. This is especially true for Northeast B.C. The region is experiencing change and growth. Expansion in agriculture, mining and the natural gas and oil sector will create new demands for water. This will require government to be increasingly responsive in managing water, and industry and communities to be more creative and innovative in its use.

The Province is in the enviable position of being able to anticipate the demands development will place on our resources. We can build on the strengths of the existing water stewardship regime within the region, and prepare now to manage water effectively in the future.

Many partners were involved in the development of this strategy. They include provincial and local governments, regulatory bodies, Treaty 8 First Nations and industry. Implementing the strategy will require ongoing cooperation and coordination. Working together to protect water sources, manage water demands, and modernize water systems and infrastructure is key in ensuring the sustainable use of water—now, and into the future.

The Ministers of the natural resource sector are committed to this strategy. However we cannot do it alone. In order to reach our joint objectives we will establish a multi-partner water working group to guide the priorities and implementation of the strategy over the coming years.

Annual progress reports and updates on specific products developed under the strategy will be available online. We also invite your feedback. It will help the partners continue to adapt and improve the strategy as required over the coming years. For more information and to provide feedback on the strategy, please visit the website:

<http://www2.gov.bc.ca/gov/topic.page?id=CB2ECF355985423A91F8D7DC3F9963B3>.



Hon. Norm Letnick
Minister of Agriculture



Hon. Steve Thomson
Minister of Forests, Lands and Natural
Resource Operations



Hon. Mary Polak
Minister of Environment



Hon. Bill Bennett
Minister of Energy and Mines



Hon. Rich Coleman
Minister of Natural Gas Development

Introduction

Water is our most valuable resource. Our survival depends on clean and abundant water. Communities, First Nations and industry rely on a sustainable and clean supply of surface and ground water.

Northeast B.C. has an abundance of water. There is an estimated annual average surface water flow of 120.6 billion cubic metres per year—enough to fill 48 million Olympic-size swimming pools,¹ or 1.6 times the annual volume of water tumbling over Niagara Falls.²

Surface water runs over or sits on the land. It is captured in creeks, rivers, lakes, reservoirs and wetlands, and drains into the Peace, Liard and Hay Rivers, and ultimately into the Mackenzie River.

Groundwater is beneath the earth's surface, often between saturated soil and rock. It supplies wells and springs, and is an important source of drinking water. Groundwater helps sustain and recharge river flows when water levels are low. Northeast B.C. is predicted to have a large supply of groundwater, but there has been limited work to identify groundwater resources in Northeast B.C.

Northeast B.C. will be a centre of economic growth over the next two decades. As the economy expands, the demand for surface water and groundwater will increase. The *Northeast Water Strategy* is a proactive, long-term approach for the responsible use and stewardship of water resources in the region. It calls for a shared water stewardship ethic to meet increasing water demand.

The strategy has been developed specifically to be delivered by a partnership of people and organizations that rely on an abundant source of clean, fresh water. It is guided by seven core principles:

1. Water stewardship is a shared responsibility between the Province, First Nations, regulatory bodies, federal and local governments, communities, industry and academia.
2. The strategy recognizes existing legal and constitutionally recognized rights and responsibilities. These include: existing rights and responsibilities under current water licencing; constitutionally protected treaty rights of the Treaty 8 First Nations; consultation obligations of the Crown with regard to First Nations' treaty rights, aboriginal rights and title claims; conservation of fish habitat; and protection of human health and safety.
3. There are limits to the available water supply. Water resources must be managed for quantity and quality within the natural range of variability of individual watersheds and aquifers.
4. Accurate data is critical in managing the water supply. Knowledge of the state of Northeast B.C.'s water and its aquatic ecosystems is the foundation for informed and effective decision-making.
5. The survival and quality of life in communities and for First Nations in Northeast B.C. depends on healthy aquatic ecosystems.
6. Protecting the quality of ground and surface water must be a priority in all decisions affecting community life and economic development.
7. Safe and sufficient drinking water is a basic human right.

1 An Olympic sized swimming pool holds 2,500 cubic metres of water.

2 Average annual flow over Niagara Falls is 2,400 cubic metres per second or 75.7 billion cubic metres per year.

This Strategy builds on a strong water stewardship regime by the B.C. government and its partners.³ This includes:

- ◆ Strong leadership on water management across all natural resource agencies in particular Ministries of Forests, Lands and Natural Resource Operations (FLNRO), Environment (MOE), and the BC Oil and Gas Commission (Commission).
- ◆ Active First Nations' stewardship of water resources.
- ◆ Leading practices for efficient use of water in natural gas extraction.
- ◆ Leading edge water decision support tools developed specifically for the Northeast region including the Northeast Water Tool (NEWT)⁴ and the Northeast Water Data Portal.⁵
- ◆ Public reporting on actual water use in the oil and gas sector required by the BC Oil and Gas Commission.
- ◆ Innovative work underway by industry partners.

Appendices A – C provide the information used to develop the Strategy's objectives and action areas. Appendix A includes an overview of water resources in the region, including current uses, forecast uses and the potential impact of climate change on the region. Appendix B provides information about the water use and stewardship activities of key industry sectors in Northeast B.C.: agriculture and range, conservation, forestry, hydropower, mining, oil and natural gas, and rural domestic and community water supply. Appendix C states the Treaty 8 First Nations' interests on water rights and interests within Northeast B.C. Appendix D provides a glossary of key terms used in this strategy.

The *Northeast Water Strategy*:

- ◆ Coordinates existing water stewardship and management efforts into a single strategy, enhancing both transparency and effectiveness.
- ◆ Builds on an existing strong water stewardship and management regime and enhances the system so we can be confident the forecasted increase in water use can be managed sustainably.
- ◆ Lays the framework to ensure healthy and sustainable water resources for First Nations, communities, industry and the environment now and into the future.
- ◆ Lays the foundation for a shared water stewardship ethic between the Province, First Nations, other levels of government, communities, industry and academia.

Implementation will be initiated in 2015, and the B.C. government will issue an annual progress report starting in 2016. This report as well as other key information, resources and tools will be available on the strategy's website: <http://www2.gov.bc.ca/gov/topic.page?id=CB2ECF355985423A91F8D7DC3F9963B3>.

3 Summary of Water Stewardship Activities in Northeast B.C. [<http://www2.gov.bc.ca/gov/topic.page?id=CB2ECF355985423A91F8D7DC3F9963B3>]

4 NEWT is a GIS-based hydrology decision-support tool developed by the BC Oil and Gas Commission in partnership with FLNRO and Geoscience BC. It provides guidance on water availability across northeast BC, and supports the decision-making process for water use approvals and licences. It is a public-facing application and is available to all British Columbians. <http://geoweb.bcogc.ca/apps/newt/newt.html>

5 Northeast water data portal is a map-based water information tool designed to provide public access to a wide range of water-related data and information in northeast B.C. The data is displayed with flexible charts and analytical tools to assist users to understand and use the data. <http://waterportal.geoweb.bcogc.ca/>

The Northeast Water Strategy

Goal and Objectives

The goal of the *Northeast Water Strategy* is **the responsible use and care of water resources through conservation and sustainable practices to ensure human and ecosystem needs are met now and into the future.** This will be achieved by meeting four water stewardship objectives guided by the Strategy's core principles:

1 Unified water stewardship

- Develop and implement water stewardship actions together with First Nations, federal, provincial and local governments, regulatory bodies, communities, industry and academia.
- Share information and advice, and collaborate amongst partners in the delivery of this Strategy.

2 Healthy aquatic ecosystems

- Connect ecology with water quality and quantity, including wetlands.
- Understand and inform decisions on ecological carrying capacity.
- Protect and enhance riparian habitat, aquatic ecosystems and species.

3 Clean water

- Protect drinking water.
- Minimize impacts from resource development.

4 Sustainable use of water

- Make conservation a fundamental requirement for all water users.
- Understand sustainable watershed health and apply knowledge to economic and community development decisions.
- Manage water demand.
- Protect and manage surface flows and groundwater levels within their natural range of variability.
- Prepare for climate change.
- Manage water through a water balance lens considering water uses (both ecological and human) now, through seasonal variation, and into the future.

First Nations in Northeast B.C. have a deep connection to water and are strong stewards of water. The Province and First Nations share common interests in ensuring water resources are sustainably managed. The Province acknowledges the following points:

- ◆ Water is not only a resource, it is a life source.
- ◆ First Nations traditional activities, whether in the exercise of treaty rights or aboriginal rights depend on water.
- ◆ First Nations are committed to the shared stewardship of Northeast B.C.'s water resources through active participation in implementation of this *Northeast Water Strategy*.

Achieving these objectives will require a coordinated approach, drawing from the resources, knowledge, expertise and data of the provincial, federal and local governments, First Nations, communities, regulators, industry and academia.

Action Areas

Five action areas have been identified to achieve Northeast B.C.'s water stewardship objectives, based on water issues identified by First Nations, other levels of government, industry and local communities. These actions recognize both the existing water stewardship and management activities, and the current and future demand for water resources. They form the framework for provincial, federal and local governments, First Nations, communities, industry and academia to work together to achieve the responsible use and management of water resources in Northeast B.C.

1 Enhance information to support decision-making

Improving information resources and addressing knowledge gaps based on forecasted development opportunities and water use will support informed and effective decision-making.

Next Steps:

- ◆ Address gaps in water quality and quantity data:
 - Strengthen the existing network of hydrometric, water quality, observation well, and climate stations.
 - Follow a risk-based approach to monitoring water quality and quantity across Northeast B.C.
- ◆ Implement the Northeast B.C. water research strategy:
 - Address priority water knowledge gaps such as groundwater characterization and surface interactions, management and disposal of hydraulic fracturing flowback and produced water, and the effects of climate change on wetlands, riparian zones and river flows.
 - Initiate collaborative studies in priority watersheds to understand possible effects of development and water use activity on water quality, flows, and aquatic habitats.
- ◆ Integrate traditional knowledge:
 - Develop a protocol for gathering and integrating traditional knowledge about watershed characterization and function.
- ◆ Determine current and future water needs for all users including:
 - A water-demand model for First Nations' on-reserve water and related waters.
 - An agriculture water demand model for Northeast B.C.
 - Forecast water use for oil and gas activities in Northeast B.C.

2 Strengthen the regulatory regime

Creating new regulations and effectively implementing existing legislation will strengthen the current regulatory regime. The new *Water Sustainability Act* received Royal Assent on May 29, 2014. It contains measures to protect stream health, regulate groundwater, address water use during times of scarcity, and expand opportunities to participate in decision-making processes. It will come into effect beginning in 2016, as supporting regulations are developed.

Next Steps:

- ◆ Begin implementing the new *Water Sustainability Act* in 2016. This will result in improvements in a number of key areas:
 - Protect stream health and aquatic environments through mandatory consideration of the Environmental Flow Needs of a stream in all new licensing decisions.
 - Consider water in land-use decisions through establishment of water objectives that will guide decisions on water.

- Regulate and protect groundwater. Regulate water use during times of scarcity through temporary water use restrictions to protect critical environmental flows.
- Improve security, water-use efficiency and conservation through conservation targets and audits.
- Establish monitoring and reporting requirements for large-volume water users.
- Provide for a range of governance approaches and more opportunities for local involvement in water stewardship and decision processes.
- ◆ Further engage with First Nations, key sector groups, communities and other interests as supporting regulations are developed.
- ◆ Clarify requirements for the authorization of diversions and storage in dugouts and reservoirs.
- ◆ Reduce demands on the freshwater resource by developing policies and procedures for the reuse and recycling of water.
- ◆ Establish regulatory enhancements for freshwater groundwater protection.
- ◆ Manage and protect special streams and watersheds under the *Forest and Range Practices Act* and the *Oil and Gas Activities Act*.
 - Continue to designate community watersheds, wetlands, fisheries sensitive watersheds and temperature sensitive streams as determined by analysis of environmental conditions and land use.
- ◆ Manage and protect aquifers under the *Oil and Gas Activities Act* (Environmental Protection and Management Regulation) through the identification and designation of aquifers.
- ◆ Measure, audit and improve the regulatory regime over time.

3 Coordinate and streamline decision-making processes

There are more than 20 decision-making processes involved in managing water across Northeast B.C. Coordinating and streamlining these processes and meaningfully consulting with First Nations on decisions that may have the potential to infringe upon their rights and interests, will improve the efficiency and durability of water decisions.

Next steps:

- ◆ Work collaboratively with First Nations and other partners on co-stewardship of water resources of a multi-partner Water Working Group to implement key actions in this strategy, and to work cooperatively to review, revise or periodically update this strategy in the spirit of shared decision making.
- ◆ Coordinate diverse and overlapping water management activities in the region, ensuring shared knowledge, research and data.
- ◆ Implement the provincial cumulative effects framework in Northeast B.C. focusing on the sustainable management of water quality and quantity within provincial Crown lands and across all natural resource sectors.
- ◆ Promote water conservation in decision-making processes.
- ◆ Support the development of Water Sustainability Plans in priority watersheds.
- ◆ Work collaboratively with First Nations and other partners to develop a Liard Basin watershed plan.
- ◆ Provide information on streamflow and water availability in the region.
 - Continue to support and refine the Northeast Water Tool (NEWT), a publically available decision-support tool.

4 Enhance monitoring and reporting

Effective water monitoring and reporting are the cornerstone of adaptive management of Northeast B.C.'s water resources. They require coordination across all natural resource activities, and commitment from multiple partners to ensure long-term delivery.

Next steps:

- ◆ Enhance surface water and groundwater monitoring of water quality and quantity.
- ◆ Enhance reporting requirements by industry and governments. This includes:
 - Regular “state of” reports for water quality, quantity and aquatic ecosystem health, and enhanced reporting responsibilities by identified industries.
 - Cumulative effects assessment reporting on water quality and quantity.
 - Monitoring and reporting the impacts of climate change on water resources.
- ◆ Bolster compliance and enforcement of water-related activities by all relevant B.C. ministries and agencies, health authorities, and federal ministries and agencies.
 - Integrate site-operation inspections with water-environment checklists, including the option of interagency inspections.
- ◆ Ensure web-based public reporting of water quality and quantity data for surface and groundwater, water allocation and use information and climate data through the Northeast B.C. water data portal and the Northeast Water Tool (NEWT).
- ◆ Build capacity within First Nations to participate in the enforcement, oversight, and reporting of water use and impacts to water resources.

5 Build a water stewardship ethic

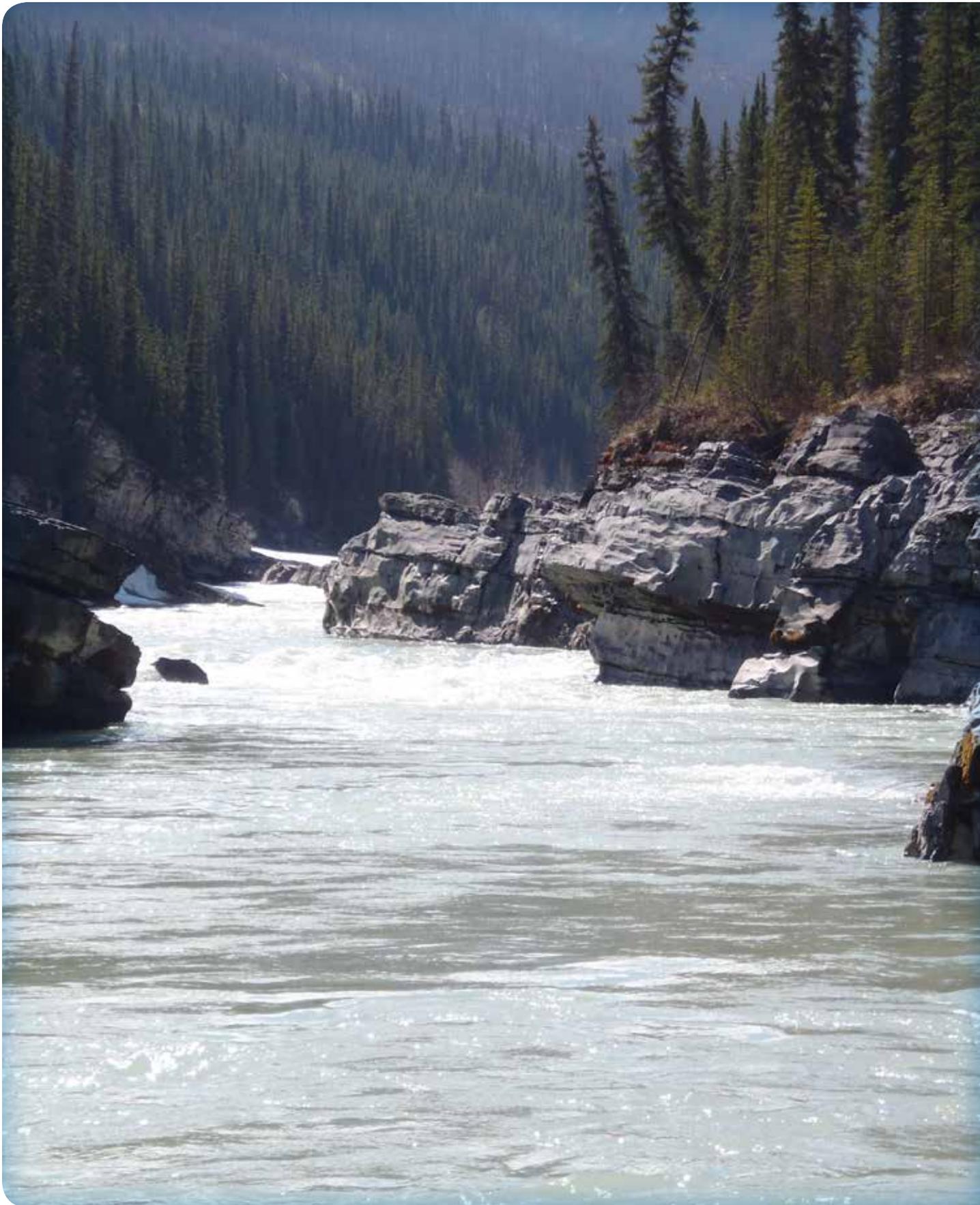
Water stewardship is everyone’s responsibility. The success of this strategy will be measured years into the future, based on the knowledge, awareness and informed actions of the B.C. government and its partners.

Next steps:

- ◆ Establish a multi-partner Water Working Group with First Nations, provincial, federal and local governments, regulators, industry and academia to implement this Strategy.
- ◆ Engage with First Nations on a shared decision-making framework⁶
- ◆ Explore options for multi-party watershed forums to facilitate improved water management, monitoring, research, and compliance and enforcement.
- ◆ Actively promote water stewardship, conservation and efficiency practices to individual water use sectors.
- ◆ Enhance public access to water data and information.
- ◆ Communicate the cultural significance of water for sustaining traditional uses.

6 Shared decision-making is a valuable tool in achieving reconciliation of land and resource interests. For this purpose, “shared decision-making” means the parties’ collaboration on land and resource management structures, processes and initiatives (and as may be further defined by government to government agreements), all of which are intended to gather information to guide and inform decision-making. The objective of this approach, is to support the role of statutory decision-makers who must continue to make operational decisions on actual transactions in accordance with the law.





Appendices

Appendix A: Overview of Water Resources in Northeast B.C.

Northeast B.C. has an abundance of water.

Surface water, captured in creeks, rivers, lakes, reservoirs and wetlands, drain into the Peace, Liard and Hay Rivers. The mean annual flow from these Northeast B.C. rivers, which drain into the Mackenzie River Basin and ultimately out to the arctic ocean, is estimated to be 120.6 billion m³/yr.⁷ Although only a small fraction of the drainage basin covers Northeast B.C. (280,000 km²), the Mackenzie River Basin is the largest drainage system in the province.

Surface water is plentiful during heavy rains and spring snowmelt. River flows in the Northeast region may be naturally low in the late summer, when there is little rain, and in late winter when most tributary streams are frozen. The monitoring network for stream flow measurement in the area is limited, focused mainly on the larger river mainstems.

Wetlands are a prominent ecosystem in the headwaters of major rivers within the region. Much needs to be learned about these systems and their inter-connection with surface water flows and groundwater.

Aquatic Biodiversity

The Peace, Liard and Hay Rivers within Northeast B.C. contain 40 known native freshwater fish species. Many of these species occur nowhere else in the province, and include the White Sucker (*Catostomus commersoni*), Longnose Dace (*Rhinichthys cataractae*), Spoonhead Sculpin (*Cottus ricei*), Brassy Minnow (*Hybognathus hankinsoni*), Cisco (*Coregonus artedii*), Spottail Shiner (*Notropis hudsonius*), Emerald Shiner (*Notropis atherinoides*), and Ninespine Stickleback (*Pungitius pungitius*).

The region is also rich with mammals, mussels, birds, invertebrates and aquatic plants, including the beaver (*Castor Canadensis*). The Fat Mucket Mussel (*Lampsilis siliquoidea*), Nelson's Sharp-tailed Sparrow (*Ammodramus nelson*), and the damselfly Prairie Bluet (*Coenagion angulatum*) are exclusive to Northeast B.C., living nowhere else in the province. Hotwater Physa (*Physella wright*) is an endemic species found only at Liard Hotsprings in Northeast B.C.

Groundwater is water beneath the earth's surface, often between saturated soil and rock. It supplies wells and springs, and is an important source of drinking water. It is also used by industry and the agriculture sector. Groundwater helps sustain and recharge river flows when water levels in rivers and creeks are low. Knowledge of groundwater in Northeast B.C. is limited. There is a need to characterize aquifers across the region and establish observation wells to provide needed information for water allocation and stewardship decision-making.

For further definitions of surface water and groundwater, see Appendix D.



The spatial boundary of the Northeast Water Strategy is depicted by the red boundary line.⁸

7 Data generated by Northeast Water Tool <http://geoweb.bcogc.ca/apps/newt/newt.html> based on all rivers either flowing through or contained entirely within Northeast B.C.

8 This boundary is not intended to be an acknowledgment of the position of British Columbia or the Treaty 8 First Nations with regard to: the geographic extent, including the western boundary of Treaty 8; the nature and extent of the Treaty 8 First Nations' rights recognized and affirmed by section 35(1) of the Constitution Act, 1982; or the geographic extent of the application of the Crown's duty to consult the Treaty 8 First Nations.

Current Use of Water Resources

Communities, First Nations and industries in the region rely on a sustainable supply of water. Primary industries in the region agriculture and range, rural domestic and community water supply, forestry, hydropower generation, mining, and natural gas and oil are largely water-dependent (Figure 1 and 2). As the economy of Northeast B.C. expands, the demand for surface water and groundwater will increase.

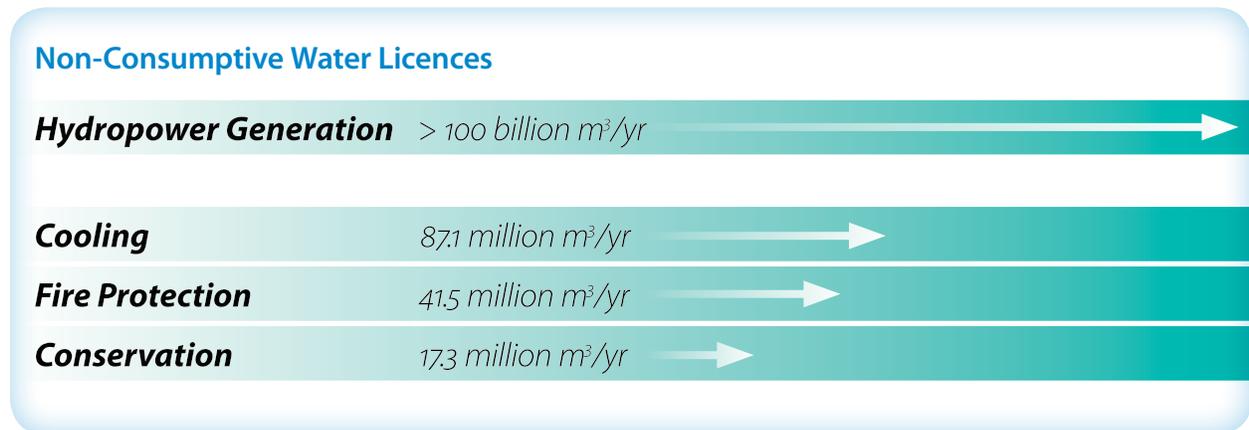


Figure 1. Non-consumptive surface water allocation licences (m³/yr) for Northeast B.C. These are “flow-through” licences—water is not removed from lakes or rivers.⁹

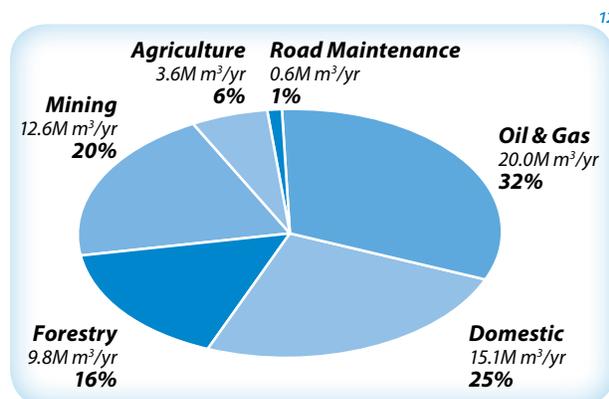


Figure 2. Approved licensed surface water allocation (m³/yr) in Northeast B.C. for consumptive uses by sector.¹² Total to date is 61.8 million m³/yr.¹⁴

In 2013, Metro Vancouver consumed 401.9 million m³ of water¹⁵—approximately 6.5 times the amount of all licensed surface water allocated for consumptive use in Northeast B.C.

Allocated consumptive use of surface water in the region is small compared to the total amount of surface water available (0.05 per cent of mean annual flow of all rivers in the region¹⁰). However, careful management is needed to minimize impacts in the headwaters areas, wetlands, small lakes and smaller streams during low flow times. Figure 2 illustrates the current licensed surface water allocation in Northeast B.C. for consumptive uses. The amount of surface water licensed for use is generally more than the amount actually used.¹¹

9 Fire protection is categorized as a flow through licence given the rarity of water use for this purpose within oil and gas and mining sectors for which this allocated use has been licenced.

10 Calculated as licensed water allocation for consumptive use (61.8 million m³/yr) divided by mean annual flow of all rivers in the region (120.6 billion m³/yr).

11 For example see Water Use in Oil and Gas Activities: 2013 Annual Report. B.C. Oil and Gas Commission <http://www.bco.gc.ca/node/11263/download>.

12 This number does not include First Nations on-reserve water rights that are held by the Federal government.

13 Water consumption is defined as the extraction and use of water.

14 These water licence allocations are representative of December 31, 2014. There are additional short-term water use approvals under section 8 of the *Water Act* for many of these purposes.

15 Metro Vancouver Operations and Maintenance Department. 2013. Metro Vancouver Water Consumption Statistics Report. 70p.

Regional water managers in the Ministry of Forests, Lands and Natural Resource Operations have responsibility for all water authorizations under the *Water Act* in all sectors except natural gas and oil. The regional water manager in the BC Oil and Gas Commission manages all water authorizations (both water licences and short-term water use approvals) for the natural gas and oil sector. Water licences in the oil and gas sector are currently issued under the *Water Act*. The *Oil and Gas Activities Act* provides authority to the Commission to issue short-term water use permits under Section 8 of the *Water Act*. All provincial regional water managers follow a rigorous application review and determination process. This involves hydrological analysis, consideration of environmental flow needs, and consultation with rights holders.

Water source wells for oil and gas activities are regulated under the *Oil and Gas Activities Act*. Other groundwater uses are currently unregulated and therefore the quantity used in Northeast B.C. can only be estimated and not definitively known. Implementation of the *Water Sustainability Act* will enable regulation and protection of groundwater.

Forecasted Uses of Water Resources

In 2011, the Northeast was home to approximately 75,000 British Columbians. The largest population centres are Fort St. John (18,600), Dawson Creek (11,600), and Fort Nelson (3,900). The region's population is expected to increase by 30 per cent over the next 25 years,¹⁶ thereby increasing the demands of domestic water use for drinking and waste management. Several First Nations are developing demographic profiles and population projections to model future water needs on reserves.

The economy of Northeast B.C. will continue to be driven by natural gas exploration and development, mining (coal), agriculture (ranching and grain production), hydroelectric generation, and logging and wood products. Water use demands are expected to increase over the next 20 years.

Liquefied natural gas (LNG) development represents a significant new economic opportunity for B.C. (see: *Liquefied Natural Gas: A Strategy for B.C.'s Newest Industry*¹⁷). Numerous LNG plants could be in operation along the coast of B.C. in the near future, supplied by unconventional natural gas extracted from Northeast B.C. and Alberta. Completion technologies for these unconventional natural gas wells depend on hydraulic fracturing technology, which requires considerable amounts of water at key periods of time. These demands are currently met by providing access to surface and fresh groundwater sources, as well as saline groundwater, reuse of municipal wastewater, and recycling flowback and produced water. This will require development of more wells in Northeast B.C. Ongoing monitoring and management will be necessary to ensure the environment, water quality and quantity are protected.

Climate Change in Northeast B.C.

In addition to managing changes in water demand, climate change may increasingly challenge our ability to balance water use with available supply and ecological needs.

Studies of climate change impacts in the Peace Watershed¹⁸ indicate the region can expect to experience

16 <http://www.bcstats.gov.bc.ca/StatisticsBySubject/Demography/PopulationProjections.aspx>.

17 "Liquefied Natural Gas: A Strategy for B.C.'s Newest Industry," http://www.gov.bc.ca/ener/popt/down/liquefied_natural_gas_strategy.pdf.

18 IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 7-22.
Zweirs, F.W., M.A. Schnorbus, G.D. Maruszeczka. 2011: *Hydrologic Impacts of Climate Change on BC Water Resources: Summary report for the Campbell, Columbia and Peace River Watersheds*. Pacific Climate Impacts Consortium, University of Victoria, Victoria, B.C.

changes in weather and water resources by the middle of the century (2041–2069), as compared to average historical conditions (1961–1990). Average temperatures are forecast to increase in all seasons. In summer, this is projected to mean greater water demands for crops and livestock, increased evaporation and higher water temperatures in many lakes and rivers. In fall, winter and spring, higher temperatures are expected to result in an overall increase in precipitation and more precipitation falling as rain instead of snow.

These predicted climate changes may see annual stream flow in rivers increase by five to 12 per cent, depending on the location. This is expected to influence seasonal patterns, with stream flows likely to be higher in fall and winter due to increased rainfall, and lower in summer because of higher evaporation rates and reduced runoff. Warmer spring temperatures may trigger an earlier start to the spring snowmelt freshet.¹⁹

The impact of climate change has been at the forefront of the B.C. government's agenda for the past five years.²⁰ Several strategies and policy directions have been developed to prepare for the change, including the development of a provincial drought response plan.²¹

The Role of Governments in Water Management

Water management is a complex practice involving legislation, regulations, policy, guidance documents and regulatory authorities. In Northeast B.C., water management is coordinated and delivered through:

- ◆ Five provincial government ministries
 - Environment
 - Forests, Lands and Natural Resource Operations
 - Health
 - Agriculture
 - Energy and Mines.
- ◆ The Ministry of Natural Gas Development is a policy advisor on water management with regard to natural gas development.
- ◆ The BC Oil and Gas Commission
- ◆ Numerous federal departments, predominantly
 - Fisheries and Oceans
 - Environment
 - Aboriginal Affairs and Northern Development Canada
 - Health Canada (for First Nations' on-reserve water rights)
- ◆ Local government

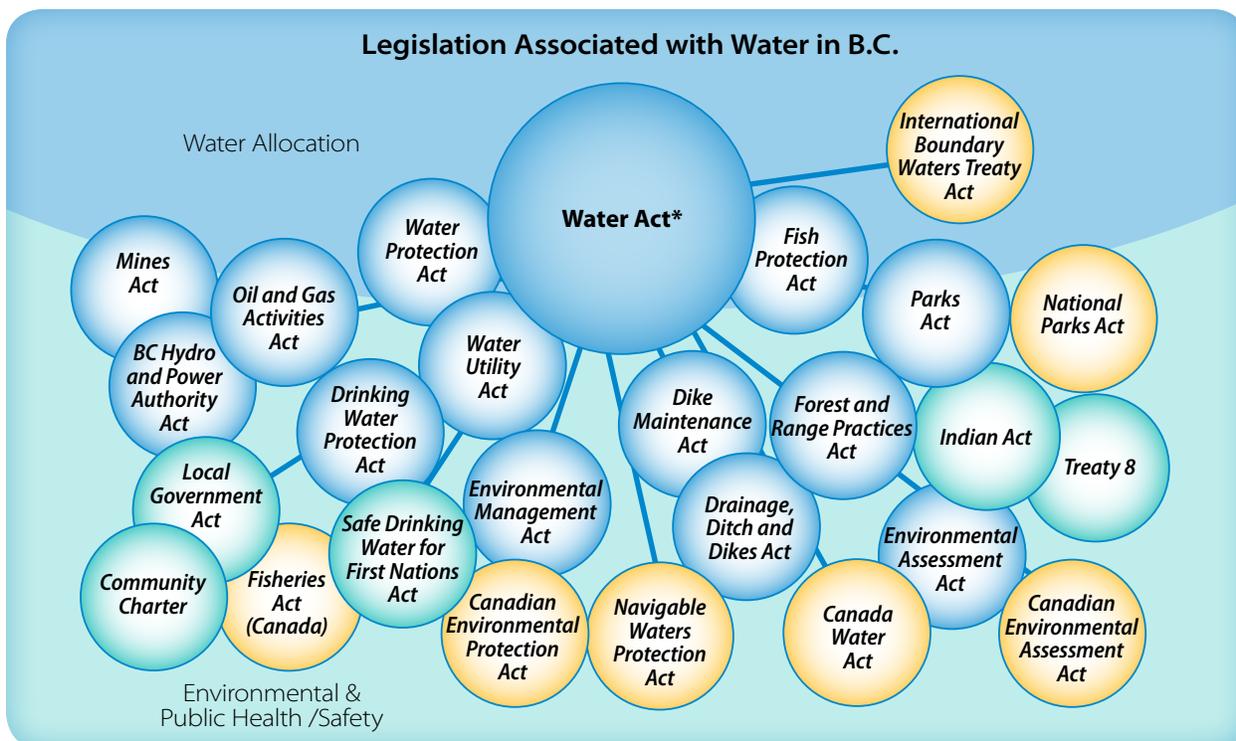
More than 20 pieces of legislation govern water use in B.C.

19 IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 7-22.

Zweirs, FW., M.A. Schnorbus, GD Maruszeczka. 2011: *Hydrologic Impacts of Climate Change on BC Water Resources: Summary report for the Campbell, Columbia and Peace River Watersheds*. Pacific Climate Impacts Consortium, University of Victoria, Victoria, BC. (<http://www.pacificclimate.org/sites/default/files/publications/Zweirs.HydroImpactsSummary-CampbellPeaceColumbia.Jul2011-SCREEN.pdf>)

20 B.C.'s Climate Action Secretariat <http://www.env.gov.bc.ca/cas/>

21 http://www.livingwatersmart.ca/drought/docs/2010/bc_drought_response_plan_june-2010.pdf



* The new Water Sustainability Act will replace the Water Act when regulations are brought into effect in 2016.

To support legislation, policy and the development of guidance documents, the B.C. government is involved in the following activities:

- ◆ Applied research to address knowledge gaps in water-related decision making.
- ◆ Establishment of leading edge water decision support tools.
- ◆ Groundwater and surface water monitoring.
- ◆ Ongoing effectiveness monitoring of practices, policies and decisions related to water.
- ◆ Public reporting and engagement on water.
- ◆ Regulation and compliance/enforcement of water allocation and use.
- ◆ Planning and water resource management.

The B.C. government’s natural resource sector agencies work cooperatively on water resource management. The various policies, information systems and local stewardship strategies are intended to ensure seamless and coordinated management.

For information on B.C. government’s water stewardship activities, refer to “Summary of Water Stewardship Activities in Northeast B.C.” [<http://www2.gov.bc.ca/gov/topic.page?id=CB2ECF355985423A91F8D7DC3F9963B3>]

Living Water Smart: *British Columbia’s Water Plan*,²² is the B.C. government’s vision for sustainable water stewardship. Released in 2008, Living Water Smart provides an important foundation for the *Northeast Water Strategy*. Actions and targets include:

- ◆ Protecting sources of drinking water and strengthening flood protection to adapt to climate change.
- ◆ Ensuring wetlands and waterways will be protected and rehabilitated and land activities will not negatively impact water.
- ◆ Modernizing B.C.’s *Water Act* to ensure adequate stream flows, ecosystem health, more community involvement, and protection of groundwater.

22 livingwatersmart.ca.

- ◆ Working with all sectors to reduce water consumption.
- ◆ Improving science and information so British Columbians can better prepare for the impacts of climate change.
- ◆ Facilitating two-way knowledge sharing to help governments and communities learn about, respect and uphold what is important to First Nations.

The new *Water Sustainability Act*, passed in May 2014, will update and replace the *Water Act*. For more information, visit engage.gov.bc.ca/watersustainabilityact.

The B.C. government's Natural Resource Permitting Project proposes to transform existing legislation, business procedures, and technological tools and applications to enable a strategic shift to more consistent, effective and integrated decision-making for natural resource management. Better information and tools to consider the cumulative effects of all resource activities in relation to water is one important component of this shift.

Specific economic and industry sector strategies identify current and future water needs and management approaches. For more information about water use and stewardship in agriculture and range, conservation, forestry, hydropower, mining, natural gas and oil, and rural domestic and community water use in Northeast B.C., see Appendix B.

Appendix B: Water Use by Sector in Northeast B.C.

Appendix B summarizes how each sector uses and contributes to stewardship of water resources in Northeast B.C.

Agriculture and Range²³

There are more than 1,500 farms and ranches, occupying more than 823,000 hectares of land in Northeast B.C. It is the largest piece of contiguous agricultural land in the province, and more than 33 per cent of the provincial Agricultural Land Reserve.

Agriculture:

Dominant crops include wheat, oats, barley and canola, with expansion into forage seed crops, specialty field crops, honey, livestock and game farming. More canola, wheat, oats, barley, peas and forage seeds are produced in this area than in any other region in the province. Between 80-85 per cent of B.C.'s grain and approximately 95 per cent of canola are produced in the Northeast region.

Northeast B.C. accounts for five per cent of Total Gross Farm Receipts in B.C., more than \$144 million. The sector employs 730 British Columbians, as reported in 2011 census data.

Range:

There are between 55,000 to 60,000 beef livestock in Northeast B.C. Livestock producers are largely cow/calf and yearling beef operations. Beef cattle production plays a major role in the Northeast region's agriculture economy. More than 43,000 cows account for over 25 per cent of the breeding stock in B.C. Game farming has stabilized over the last decade, and now, the Northeast region produces more than 80 per cent of the Plains Bison in B.C.

Grazing on Crown land is authorized under the *Range Act* and regulated under the *Forest and Range Practices Act*. Access is allocated through animal unit months (AUMs). AUMs are a measure of forage consumption by livestock, and how much forage can be grown on a parcel of land. With 105,000 AUMs, the Northeast region is the second largest in the province. There are more than 300 clients and 250 active tenures in the Northeast region. Crown range land in the Northeast region is the second largest in the province. Because much of it is unoccupied, there is significant growth potential.

The total economic output generated by cattle producers in B.C. is estimated to be \$606 million. There are approximately 4,242 full-time equivalent employee (FTE) positions in B.C.'s cattle industry, including 2,349 in direct and 1,893 in indirect and induced FTEs. Cattle production generated an estimated \$52 million in taxation revenue including \$27 million, \$20 million and \$5 million in revenues to the federal, provincial and municipal governments respectively.²⁴



²³ BC Agrifoods: A Strategy for Growth, page 28

²⁴ Excerpt from the Economic Impact Analysis 2012

Water Allocation

Water is used for irrigation, watering, stock watering and ponds. The bulk is collected in small dugouts throughout the region for livestock. Because there is a high average amount of rainfall in the Northeast, there is little need to irrigate pastures.

Water use reporting is currently not required for the agriculture sector. The *Water Sustainability Act* will make monitoring and reporting on actual water use mandatory for all large users. The agricultural sector is allocated 3.6 million m³/ year of surface water in the Northeast region. This equates to approximately six per cent of all licensed surface water allocation in Northeast B.C. for consumptive uses.

Water Stewardship Strategies

- ◆ The Ministry of Agriculture has been funding and promoting beneficial water management practices with the agriculture sector through activities and programs such as the Environmental Farm Plan program including:
 - Use of herding and salt lick placement to keep cattle away from riparian zones.
 - Creation of separate riparian pastures in order to control time and duration of use.
 - Using prescribed grazing to achieve stubble height management in riparian zones (10 cm for bluegrass, 20 cm for riparian sedges).
 - Creation of off-stream watering sources to discourage direct access to water bodies.
 - Temporarily resting damaged riparian communities to allow shrubs and forage plants time to recover.
 - Elimination of season-long grazing and implementation of grazing schemes that allow return of animals based on plant growth, not calendar days.
 - Limiting fall grazing of the riparian willow/sedge community. (Fall use is especially detrimental to willows.)
 - Delaying spring grazing in riparian areas until forage reaches 15 cm (6 in.) in height.
 - Restricting grazing during times of peak water flow or saturated soils.
 - Leaving natural range barriers in place.
 - Encouraging livestock managing to meet all water quality guidelines/regulations (Range Planning and Practices Regulation s.33, *Drinking Water Protection Act*).
 - Restricting cattle access to water being diverted for human consumption.
- ◆ The Province is working with the agriculture sector to help secure water needs for agriculture. As a first step, the B.C. and federal governments have invested \$2 million to develop an Agriculture Water Demand Model across the province to determine current and future needs on a property by property basis.
- ◆ The Ministry of Forests, Lands and Natural Resource Operations issues range agreements under the Range Act. Under the Range Planning and Practices Regulation, range agreement holders must establish a Range Stewardship Plan that meets the following objectives for water:
 - Maintain or improve water resources.
 - Maintain or promote healthy riparian and upland areas.
 - Maintain or promote riparian vegetation that provides sufficient shade to maintain stream temperature within the natural range of variability.
 - Maintain or promote desired riparian plant communities.
- ◆ The agriculture sector has been working with numerous stewardship groups, including those in Charlie Lake, Tupper/Swan Lake, and Kiskatinaw River, to protect source water for these watersheds.

Conservation

The conservation use of water is a licensed use to store water for habitat protection and enhancement. It augments natural wetlands and lakes and provides habitat for waterfowl, amphibians, songbirds, fish, and wildlife. Conservation use provides flood protection for downstream communities; buffers runoff spikes during freshet and heavy rainstorms, filters sediments and processes pollutants for downstream users, and holds the water on the landscape to recharge groundwater and aquifers. It also ensures water is available on the landscape to recharge downstream systems during summer and fall.

Water Allocation

In Northeast B.C. 173 million m³/yr of water is allocated for conservation use. Ducks Unlimited Canada and its partners hold 15 million m³/yr of that allocation and their conservation projects restore drained wetlands, enhance the security of existing wetland systems, create and enhance lakes for fish, and create new wetlands. These projects account for over 25,000 acres of conserved wetlands in Northeast B.C. Unlike the other uses of water in Northeast B.C., these allocations are specifically used for water stewardship.

Water Stewardship Strategies

Water stewardship strategies focus on protecting existing wetland, lake and riverine systems by improving upland management to improve water quality and quantity, restore drained wetlands, create new wetlands, reduce the impact on existing wetlands, and mitigate the impact on wetland and aquatic systems. Specific stewardship strategies include:

- ◆ Developing policies to conserve wetlands and promote sustainable industrial development.
- ◆ Purchasing land to restore drained wetlands.
- ◆ Promoting conservation use of water.
- ◆ Developing and enhancing spatial wetland conservation tools.
- ◆ Improving grazing management to improve quality of surface runoff while providing habitat.
- ◆ Controlling access of livestock to streams and wetlands to limit impacts to habitat.
- ◆ Providing alternate water sources for livestock such as dugouts to eliminate or reduce the impact to wetlands and streams.
- ◆ Promoting the establishment of permanent cover and buffer areas along streams and around wetlands to improve runoff quality.
- ◆ Restoring and conserving old sites that show hydrological impairment such as roads, seismic lines and well pads.
- ◆ Creating new wetlands in suitable areas to mitigate impacts on wetlands and wetland loss.
- ◆ Partner with stakeholders to promote best management practices that reduce or eliminate the impacts to wetland and riverine ecosystems.





Forestry

The potential footprint of forestry on the landscape of Northeast B.C. is 4.8 million hectares. This includes forests that have been recently harvested to those more than 80-years-old. While the prime forest products come from softwood species (spruce and pine), markets have developed for hardwoods (primarily aspen). Over the last few decades there has been a transition to mixed wood management (e.g., spruce and aspen stands).

There are three timber supply areas (TSAs) in Northeast B.C.:

Dawson Creek TSA:

- ◆ The Dawson Creek TSA covers about 2.3 million hectares.
- ◆ Approximately 60 per cent is considered productive forest land, with 52 per cent available for harvesting.
- ◆ The current Annual Allowable Cut (AAC) is 1.86 million cubic metres.
- ◆ There are four mills: Louisiana-Pacific Canada Ltd.; Chetwynd Mechanical Pulp; Canadian Forest Products Ltd. and Chetwynd Forest Industries (CFI).²⁵

Fort St. John TSA:

- ◆ The Fort St. John TSA covers approximately 4.7 million hectares.
- ◆ Approximately 48 per cent is considered productive forest land, with 23 per cent available for harvesting.²⁶
- ◆ The current AAC is 2.115 million cubic metres.
- ◆ There are three mills in operation: Canadian Forest Products Ltd.; Taylor Pulpmill, and Peace Valley OSB.

Fort Nelson TSA:

- ◆ Fort Nelson TSA covers approximately 9.9 million hectares. It is the second largest TSA in the province.
- ◆ Approximately 58 per cent is considered productive forest area, with 25 per cent available for harvesting.²⁷
- ◆ The current AAC for the Fort Nelson TSA is 1.625 million cubic metres, with no partition between coniferous and deciduous leading stands.
- ◆ There are two mills in the Fort Nelson TSA: Canadian Forest Products Ltd.; and Tackama. Neither is currently in operation.

Revenue generated by the forestry sector varies based on market prices. The average annual revenue from 2008–2012 was approximately \$3 million in Northeast B.C.

²⁵ Division of West Fraser Mills Ltd.

²⁶ 2002 Analysis Report

²⁷ 2002 Analysis Report

Water Allocation

Water use reporting is currently not required for the forestry sector. The *Water Sustainability Act* will make monitoring and reporting on actual use mandatory for all large users. The forest industry is allocated approximately 9.8 million m³/year, or 16 per cent of all licensed surface water allocation in Northeast B.C. The majority of all licensed surface water use is associated with pulp mill facilities. Minor uses include dust control on forest roads.

Water Stewardship Strategies

The *Forest and Range Practices Act* and its regulations govern forest management in B.C. Forest companies' forest stewardship plans must be consistent with 11 objectives set by the provincial government. Five of the objectives directly relate to water and watersheds:

- ◆ Soils
- ◆ Wildlife
- ◆ Water quality, fish, wildlife and biodiversity in riparian areas
- ◆ Fish habitat in fisheries and temperature sensitive watersheds
- ◆ Community watersheds.

Forest licencees are required to prepare Forest Stewardship Plans to identify specific results or strategies to achieve the objectives set by the provincial government. The performance of forest licencees relative to their plans are monitored by provincial Natural Resource Officers.

The Ministry of Forests, Lands and Natural Resource Operations conducts effectiveness evaluations through the Forest and Range Evaluation Program to assess if the desired outcomes for managing and protecting the 11 values are being achieved. Specific protocols have been developed for evaluating water quality and riparian zones. The results of water quality and riparian effectiveness evaluations for the Northeast region are published in extension notes and reports available at www.for.gov.bc.ca/hfp/frep/index.htm.

The Ministry of Forests, Lands and Natural Resource Operations manages the Land Based Investment Strategy that targets short-term investments in natural resources to realize environmental sustainability and economic prosperity.

The Forest Practices Board is an independent watchdog that audits, investigates and issues public reports on how well industry and government are meeting the intent of B.C.'s forest practices legislation.²⁸ A recent investigation conducted by the Board involved an overview of the Kiskatinaw watershed, the drinking water source for Dawson Creek.²⁹

²⁸ www.fpb.gov.bc.ca/

²⁹ http://www.fpb.gov.bc.ca/ARC121_Kiskatinaw_River_Watershed.htm.



Image of Peace Canyon Dam courtesy of BC Hydro

Hydropower

The Province is committed to becoming self-sufficient in electricity supply by 2016 and to ensuring that at least 93 per cent of B.C.'s electricity supply continues to come from clean or renewable resources including hydropower.

While the Clean Energy Act sets a target for BC Hydro to meet 66 per cent of its incremental demand through demand side management and energy conservation, new supply will still be needed to ensure adequate electricity is available in the future. To accomplish this, the Province has encouraged private sector businesses, First Nations and other organizations to develop new supplies of electricity—and in particular—from clean and renewable sources.

Water Allocation

More than 100 billion m³ of water is licensed per year for use in hydropower generation in Northeast B.C., through the W.A.C. Bennett and Peace Canyon Dams as “flow through” water licences (i.e., for non-consumptive use). Management of these hydroelectric facilities is subject to water use planning and any new projects are subject to provincial and federal permitting and licensing processes. These dams on the Peace River currently produce about 30 per cent of BC Hydro's electricity requirements. With the addition of the proposed Site C project, the contribution would increase to 40 percent.

- ◆ The W.A.C. Bennett Dam was completed in 1967 and is one of the world's largest earthfill structures, stretching two kilometres (1.25 miles) across the head of the canyon and measuring 183 metres (600 feet) in height. Behind the dam is British Columbia's largest reservoir, Williston Reservoir, which covers an area of 1,770 km² with an active licensed storage of approximately 39,470 million cubic metres. The GM Shrum powerhouse (2,730 MW), carved deep in bedrock under the east shoulder of Bennett Dam, was the largest underground powerhouse in the world when it began generating electricity in 1968.
- ◆ The Peace Canyon project (694 MW) is the second hydroelectric development to harness the discharge from Bennett Dam. The Peace Canyon Dam creates the much smaller Dinosaur Reservoir (49 million cubic metres) and is situated at the outlet of the Peace River Canyon 23 kilometres (14 miles) downstream from Bennett Dam.
- ◆ With an environmental assessment certificate in place, the Province made the final investment decision related to the Site C Clean Energy Project (Site C) on December 16, 2014. The Project, if licensed as proposed, would be the third dam and hydroelectric generating station (proposed 1,100 MW) on the Peace River in Northeast B.C., approximately 83 kilometres downstream of Peace Canyon. As the third project on one river system, Site C would gain significant efficiencies by taking advantage of water already stored in the Williston Reservoir. This means that Site C should be able to generate approximately 35 per cent of the energy produced at the W.A.C. Bennett Dam with five per cent of the reservoir area.³⁰

30 Doig River First Nation, Prophet River First Nation, West Moberly First Nations and McLeod Lake Indian Band have brought judicial review proceedings in both Federal Court and British Columbia Supreme Court seeking to quash the environmental approvals by the Federal Government and the Provincial Government for the Site C project.

Water Stewardship Strategies

BC Hydro's Peace River projects are regulated under the provincial *Water Act*, *Water Regulation*, and *Dam Safety Regulation*. Associated water licences govern maximum generation discharge and reservoir storage management. BC Hydro's projects are also subject to requirements ordered by the Province following the Water Use Planning Process. Water Use Plans (WUP) are developed by BC Hydro through a consultative planning process involving government agencies, First Nations, local citizens and other interest groups. The overall goal of the Peace WUP was to find a better balance between providing reliable and low cost energy, and protecting fish and wildlife, recreation use, heritage values, First Nations' rights and interests, and flood risk reduction. Implemented in 2007, the Peace WUP resulted in operational changes (minimum fish flows), monitoring studies for environmental interests (e.g., fish and riparian vegetation) and physical works programs (e.g., boat ramp improvements and habitat enhancement).

In addition, the Fish and Wildlife Compensation Program—Peace (FWCP) was established in 1988. The program funds projects within the watersheds of the Williston and Dinosaur reservoirs to enhance and protect fish, wildlife, and habitat affected by the construction of the W.A.C. Bennett and Peace Canyon dams.

Mining³¹

Mining is a prominent driver of B.C.'s economy, supporting communities and contributing to provincial revenues. The BC Jobs Plan committed to eight new mines and nine mine expansions throughout B.C. by 2015.³² Should this target be met, it is estimated these operations could generate around 2,000 new direct jobs and 3,000 indirect jobs. Under current market conditions, this could provide tens of millions of dollars in mineral tax revenue to the province.

The mining sector is broadly sub-divided into coal and mineral extraction. Coal is the predominant resource explored and mined in Northeast B.C. One of two dominant coal producing regions in B.C., the northeast coal belt stretches from the Alberta border in the east, to over 500 km northwest of Prince George towards the Yukon border. Because of the very large geographic size of these coal horizons, this coal belt is considered to be in the early stages of exploration and development, with significant untapped potential and long-term economic benefits to the province.

There are five permitted coal mines in Northeast B.C.: Trend-Roman, Brule, Wolverine, Willow Creek and Quintette. Quintette and Roman are expected to be fully operational in the future, and the combined Trend-Roman operations will have an annual production capacity of two to four million tonnes of metallurgical coal. There are also a number of proposed coal mine projects in the area, including Murray River, Gething and Sukunka.

Exploration in Northeast B.C. remained strong in 2013 in spite of lower commodity prices and uncertainties in global markets. Approximately \$476 million was spent on mineral and coal exploration in B.C., in 2013, and \$81.6 million (about 17 per cent) of this spending took place in Northeast B.C. This accounted for over 70 per cent of B.C.'s total coal exploration.



31 British Columbia's Mineral Exploration and Mining Strategy, page 16–17

32 B.C. Jobs Plan <http://www.bcjobsplan.ca/bcjobsplan/page1>

Water Allocation

The mining industry is currently allocated approximately 12.6 million m³ of water. This equates to about 20 per cent of all licensed surface water allocation in Northeast B.C. for consumptive uses. This water is used for washing coal, land improvements, dust control, sediment control, equipment, processing ore and road maintenance.

Mining water allocation permits identify allocation (maximum use) and do not require reporting of actual water use. The *Water Sustainability Act* will make reporting of water use mandatory for all large users.

In advance of mining activities, the B.C. mining sector spends millions of dollars during the federal and provincial environmental assessment and permitting processes to ensure they meet or exceed government requirements related to the environment, including water quality. A key potential issue with coal mining is selenium, a natural element contained in rock, that can be released into surface and groundwater systems through mining practices. Mining companies are required to develop mitigation plans and monitor water quality throughout the life of the mine to protect the environment. They are also required to implement reclamation and closure plans to ensure mining lands are returned to a productive use.

Water Stewardship Strategies

- ◆ Murray River Water Quality Cumulative Effects Assessment Pilot Project is a multi-partner effort focused on the assessment and management of cumulative effects related to surface water quality and quantity within the watershed. Partners include industry (mining, oil and gas, forestry), First Nations, local government and provincial government agencies.
- ◆ All resource extraction activities in B.C. must meet the provincial government's strict environmental standards. Mining operations can only discharge effluent, emissions or solid waste under the terms of a waste discharge permit issued by the Ministry of Environment. There are a minimum of 13 permits, across three government agencies, required regarding the use and discharge of water at a mine site. They are legislated by the *Environmental Management Act*, the *Water Act*, and the *Public Health Act*.
- ◆ The *Environmental Management Act* guidelines for water quality include monitoring and reporting of actual water quality in streams that have mining operations. Permitting and monitoring requirements in the *Environmental Management Act* address the total discharge of all operations into the receiving environment.
- ◆ Federal and provincial guidelines for water quality provide further direction to companies on the issue of water quality. The objective of water quality guidelines is to protect a given water use, including drinking water, freshwater aquatic life, wildlife, livestock, irrigation and recreation.
- ◆ The B.C. Ministry of Environment is updating its water quality guideline for cadmium, and has already updated guidelines for selenium, nitrate and sulphate. These substances can be released as a result of mining activities.
- ◆ The Province, in consultation with the mining industry, has developed the *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators*.³³ The document describes baseline environmental study requirements in areas including air

33 www.env.gov.bc.ca/epd/industrial/mining/pdf/water_air_baseline_monitoring.pdf

quality, water quality and quantity, groundwater, hydrology, sediment quality and geological conditions.

- ◆ The *Mines Act* and Health Safety and Reclamation Code for Mines in British Columbia establish the regulatory framework for the protection and reclamation of the land and watercourses affected by mining.
- ◆ The mining industry has a demonstrated commitment to responsible water management through the Towards Sustainable Mining (TSM) initiative. TSM is a set of guiding principles and performance elements that govern key activities of companies in the mining industry. Its goal is to help the industry continually improve its performance by aligning mining activity with the priorities and values of its communities of interest. TSM is monitored and reviewed by a Community of Interest Advisory Panel comprised of representatives from Aboriginal and labour organizations, communities where the industry is active, environmental and social NGOs, and the financial community, along with representatives from the mining industry. Goals include ongoing improvements in the area of tailings management, biodiversity conservation, crisis management and planning, and Aboriginal and community outreach.

Natural Gas and Oil³⁴

B.C.'s natural gas industry is a major driver of the provincial economy, and Liquefied Natural Gas (LNG) is identified as a key, new economic opportunity. The natural gas and oil sector was responsible for \$4.0 billion³⁵ in exploration and development activity in B.C. in 2012–13, and \$5.0 billion in 2013–14.³⁶ Based on recent research, B.C. will need more than 75,000 permanent workers once LNG projects are fully operational, a dramatic increase from the 13,235 jobs in the natural gas sector in 2012.³⁷

Natural gas production from unconventional shale and tight formations within B.C. provides more than 75 per cent of the province's total annual production. Approximately 92 per cent of new wells exclusively target unconventional formations.

B.C.'s major commercial natural gas production is in the northeast, with most exploration and production in the Montney Play, and Horn River Basin. There is currently minimal production in the Cordova Embayment, and very early exploration in the Liard Basin.

Unconventional shale gas development depends on hydraulic fracturing, which requires varying amounts of water for a generally one-time use over the lifespan of a well. The flowback water is disposed of through deep well injection and taken out of the water cycle. Water used in fracturing comes from surface and groundwater sources, deep saline aquifers, reuse of municipal wastewater, and recycling flowback and produced water. B.C. has world-leading practices in natural gas extraction as outlined below.



The four geological basins within B.C. that are recognized sources of shale and tight gas (Cordova Embayment, Liard Basin, Horn River Basin and Montney) all within the Western Canadian Sedimentary Basin.

34 British Columbia's Natural Gas Strategy, page 12-13

35 Source: www.capp.ca/library/statistics/handbook/pages/statisticalTables.aspx?sectionNo=4

36 Source: www.capp.ca/canadaIndustry/industryAcrossCanada/Pages/BritishColumbia.aspx

37 Source: B.C. Natural Gas Workforce Strategy and Action Plan: www.rtobc.com/Resources/Reports.htm

Water Allocation³⁸

While the natural gas and oil industry was allocated 313 million m³/year of surface water as of December 31, 2014 for consumptive uses from Northeast B.C., much less is actually used. 20.0 million m³/yr was authorized through water licences and 11.3 million m³/yr through short-term water use approvals. By directive, the BC Oil and Gas Commission requires holders of short-term water use approvals and oil and gas related water licences to report actual water use.

Water used in hydraulic fracturing in 2013

Shale Basin	# of Wells	Mean (m ³ /well)	Total Water Use (m ³)
Horn River Basin	18	79,069	1,423,242
Montney Play	403	9,603	3,869,942
Liard Basin	1	20,106	20,106
Cordova Embayment	0	N/A	0
Other	11	2,577	28,345
Total	433	17,376	5,341,635

In 2013, 5.3 million m³ of water was used for hydraulic fracturing from short-term water use approvals:

- ◆ A total of 3.3 million m³ of water was taken from surface sources.
 - 2.6 million m³ from short-term (two years or less) use approvals.
 - 0.7 million m³ from long-term water licences.
- ◆ 0.4 million m³ was provided by service wells (water source wells) or groundwater sources.
- ◆ The remaining volume (1.6 million m³) includes reuse of flowback and produced water, recycled municipal wastewater, municipal bulk water and private water purchases (see Figure 3).

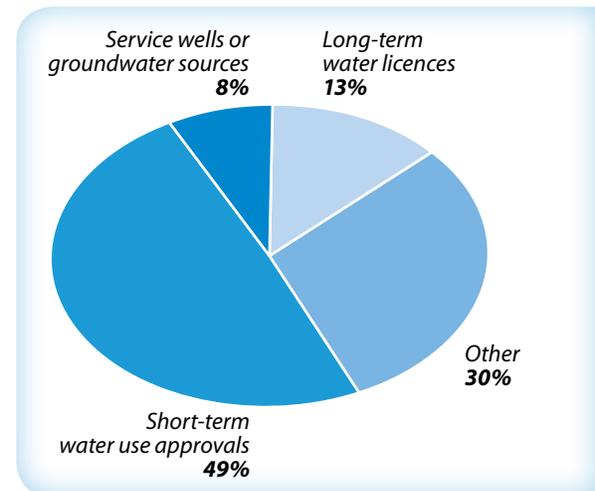


Figure 3. Acquisition of hydraulic fracturing water in 2013. The category “other” includes reuse of flowback and produced water, recycled municipal wastewater, municipal bulk water and private water purchases.

Water Stewardship Strategies

- ◆ B.C. has a regulatory framework to manage water use for natural gas development. Provincial laws outline how the industry must protect water resources during drilling and production operations. The *Oil and Gas Activities Act* and associated regulations were designed to encompass the technologies now being employed in natural gas development, including hydraulic fracturing and the use of water. The act and regulations, introduced in 2010, will continue to be monitored to ensure they are effective, community concerns are addressed and industry’s need for water is met.
- ◆ The BC Oil and Gas Commission (the Commission) has the legislative authority to make decisions in regard to water use in natural gas and oil activities:

³⁸ Water Use in Oil and Gas Activities 2013 Annual Report, BC Oil and Gas Commission <http://www.bcogc.ca/publications/reports>

- Water permits and water licences for natural gas and oil use are reviewed and approved by the Commission under the provincial *Water Act* (authority for Section 8 for short term water use is a specified enactment; authority for water licences is through Regional Water Manager designation from FLNRO).
- Provincial laws outline how the industry must protect water resources during drilling and production operations.
- The Commission manages water approvals and use with specific focus on environmental values.
- Commission staff are designated as regional water managers and assistant regional water managers, which provide authority to review and adjudicate water licence applications.
- Commission experts review each water use application with a specific focus on environmental values. Tools include:
 - › *Watershed base map for Northeast B.C.*
 - › *Basin review of applications with an understanding of cumulative effects management, which ensures withdrawals do not exceed environmental limits and environmental flows.*
 - › *Northeast Water Tool, a publicly available hydrologic model for northeast B.C. developed specifically to track watershed volumes and industry use.*
- ◆ The Commission can and will suspend water use, as took place during droughts in Northeast B.C. in 2010, 2012 and 2014.
- ◆ Companies are now required to report all water produced, including flow-back fluid.
- ◆ Industry is continually seeking ways to reduce freshwater use and increasingly uses alternative sources such as:
 - Recycled hydraulic fracturing flowback water.
 - Nonpotable saline water from deep wells.
 - Recycled municipal waste water.
 - Nitrogen or CO₂.
- ◆ B.C. requires mandatory disclosure of hydraulic fracturing fluids injected into the subsurface by industry. A public disclosure registry for hydraulic fracturing additives, <http://www.fracfocus.ca>, was launched in early 2012. This registry provides British Columbians with site specific information about hydraulic fracturing and water management in shale gas development.
- ◆ In addition to government-run monitoring program, water quality and quantity monitoring stations have been installed by industry where they are operating. Monitoring is a top priority that involves government, regulator and industry participation and is crucial in addressing ecological, community, regional and First Nations concerns.
- ◆ Generating and distributing scientific information to the public is important for the ongoing development of natural gas. Public outreach and transparency from numerous sources—academic, government, regulators, industry, media—is vital.
- ◆ The need to manage water to ensure all community and ecological needs are addressed in a sustainable manner is acknowledged by the B.C. Government and industry. The Canadian Association of Petroleum Producer's (CAPP) has developed a set of "Hydraulic Fracturing Guiding Principles and seven supporting Operating Practices" that guide the use of source

The hydraulic fracturing process creates "produced water" (the natural salt water found in oil and gas reservoirs), and "flowback water" (fracture return water). Produced water and flowback water are prohibited from being introduced into surface waters (i.e., lakes and streams) or near surface aquifers that are used to supply drinking water. They are either recycled and used for further gas extraction, or injected deep into subsurface formations through a regulated water disposal well.

water for hydraulic fracturing, and stress the importance of water measurement and reuse, and making data publicly available.

- ◆ Industry had led extensive development in reuse technology and is working with other sectors on wastewater utilization. There are numerous examples of individual oil and gas operators that are demonstrating large-scale water conservation practices throughout the region.



Rural Domestic and Community Water Supply

Rural domestic and community water supply is used for drinking water and sanitation.

The delivery of safe drinking water is a complex process. Partners include local governments, health authorities, federal and provincial government agencies and ministries, First Nations and the general public. Activities include:

- ◆ Understanding the risks from the natural environment and land use in the watershed that could harm drinking water quality.
- ◆ Managing risks to drinking water sources by effective land and resource use decision-making upstream from the intake.
- ◆ Appropriate water treatment and management to address the risks identified in the watershed.
- ◆ A sound and well-maintained water distribution system.
- ◆ Water quality monitoring.

Water Allocation

Rural domestic and community water supply accounts for 15.4 million m³/year or approximately 28 per cent of all licensed surface water allocation in Northeast B.C. for consumptive use. Under the *Water Act*, local authorities, which are mainly composed of irrigation districts and municipalities, are required to report on annual water use.

Annually, the City of Dawson Creek is licenced to use 3.3 million m³ of water from the Kiskatinaw River. The City of Fort St. John's water system consists of five shallow wells drawing water from approximately eight metres under the Lower Peace River floor. Smaller communities are served by water from their own wells.

Water Stewardship Strategies

Source water protection is an important component of ensuring safe drinking water. While it is not the solution for all drinking water problems, source water protection helps maintain water quality by making sure it is not degraded through industrial, agricultural, or recreational activities, or through land development.

Protecting sources of drinking water is complex and relies on the work of many individuals and organizations, including provincial government ministries and agencies, federal government departments, local governments, First Nations, non-governmental organizations, special interest groups, and the general public.

The following projects highlight some key water stewardship work including source water protection underway or completed in Northeast B.C.:

- ◆ Moberly Community Water Stewardship Strategy (2008), a collaborative effort of the Moberly Lake Community Association, Saulneau and West Moberly First Nations.
- ◆ A water use plan developed by Fort Nelson First Nation for their traditional territory.
- ◆ Establishment of a Peace River Regional District Water Stewardship Committee.
- ◆ Groundwater testing undertaken by the Peace River Regional District, in partnership with the Prairie Farm Rehabilitation Administration Division of Agriculture Canada in Arras, Sunset Prairie, Chetwynd, Fort St. John, Groundbirch, Kiskatinaw, Moberly Lake, Pouce Coupe, Prespatou, Rolla and Wonowon.
- ◆ The City of Dawson Creek has numerous water stewardship activities underway, including:
 - Completion of Integrated Watershed Management and Source Water Protection Plans.
 - Initiation of a Watershed Research Program.
 - Approval and development of a waste water re-use system.
 - Support for water/sewer utility measures and practices to promote conservation and sustainability in the City.
 - Input to various water policy and regulatory regimes to foster stewardship and ensure environmental compliance.
 - Water management best practices to encourage cost-effective innovation by all resource industries.
 - Promoting community education and extension on watershed stewardship with local organizations such as Dawson Creek Watershed Stewardship Society.
 - Groundwater characterization and monitoring in the Upper Kiskatinaw River watershed.

Appendix C: Treaty 8 First Nations³⁹ Interests on Water Rights and Interests within Northeast B.C.

Foreword

The B.C. government and Treaty 8 First Nations are committed to working collaboratively to implement the *Northeast Water Strategy*. Our common intention is that this collaboration be undertaken in a manner that is respectful of our differing legal views, positions, and interests, and without prejudice to either party's positions as to our respective legal and constitutional rights and responsibilities. The B.C. government respects that the Treaty 8 First Nations hold differing views from those of the government in these matters. Notwithstanding our differing views, both British Columbia and the Treaty 8 First Nations are committed to working together under the *Northeast Water Strategy*.

What is reproduced in this Appendix is a summary of the Treaty 8 First Nations' views on the nature of their water rights within Northeast B.C. This summary is not intended to comprehensively set out the position of the Treaty 8 First Nations regarding their Aboriginal and Treaty rights related to water and water management. By including this summary as an Appendix to the Strategy, the B.C. government is not endorsing, accepting or supporting the views and opinions expressed in it, which involve complex legal issues not intended to be addressed or determined in the context of the Strategy. The inclusion of this summary as an Appendix to this document will not limit the positions that may be taken in negotiations or current or future court actions, but is reproduced at the request and for the purpose of the Treaty 8 First Nations identifying the legal views, positions and interests they assert in regard to water rights and interests.

Introduction

The Treaty 8 First Nations situated within northeastern B.C. have a direct and long-standing relationship with the lands and waters of northeastern British Columbia. This relationship was established through a covenant with the Creator when they were first placed on these lands. These lands and waters, and the resources found within them, have sustained them as a peoples for countless millennia. First Nations peoples depend on healthy watersheds in order to maintain their culture and way-of-life, and to engage in economic activities like hunting, trapping, fishing, and other harvesting and gathering practices.

In accordance with their custom and traditional modes of governance, First Nations communities assert that, as the indigenous peoples of northeastern B.C., they have and continue to exercise Aboriginal and Treaty rights over water management within their traditional territories and they accept their responsibility for keeping water healthy and abundant as traditional stewards of these watersheds.

While the Treaty 8 First Nations want to participate in consultations about the *Northeast Water Strategy* as a means of developing Watershed Protection strategies that will reflect and create new relationships with a variety of partners, the First Nations must be equal partners with participating provincial, and federal Crown agencies consistent with

³⁹ First Nations represented by the Treaty 8 Tribal Association.

government-to-government relationships respecting the design and implementation of water management plans.

Jurisdictional issues and treaty rights must be recognized, acknowledged, addressed and resolved in the spirit of reconciliation. The Treaty 8 First Nations insist upon recognition as a government whose water rights within northeast B.C. areas are to be respected. This includes:

- ◆ Full Crown recognition of First Nations' rights and Crown obligations related to allocation and management of water within the watersheds in northeastern B.C..
- ◆ Recognition of the jurisdiction and role of the federal Crown in respect of the ownership of waters situated on, under, or appurtenant to, Indian Reserves, and the need for negotiation of water management agreements which formalize the allocation of water rights in accordance with the objectives for which these Indian Reserves have been set aside.

Treaty-based Water Rights & Interests within Crown Lands:

Monique Ross⁴⁰ has characterized the Treaty rights of Treaty 8 peoples within Crown lands to include the aboriginal right to *a livelihood*, to maintain *a way of life* and to *maintain control over lands and resources*, including but not limited to their *right to pursue their usual vocations of hunting, trapping and fishing within lands not taken up by the Crown for other purposes*.

For certainty, Treaty 8 First Nations consider this to be a Treaty-protected, land-based interest. By characterizing it as land-based, we assert that Treaty 8 livelihood and vocational interests are grounded in a residual First Nation proprietary interest within Crown lands not taken up by the Crown. From our perspective, Treaty 8 affirmed the ongoing right of Indians to occupy and use all Treaty 8 lands not taken up by the Crown to support their *way-of-life* and their *usual vocations of hunting, trapping and fishing*. From the First Nation perspective, Treaty 8:

- ◆ Allowed the Crown to “take up” lands within the Treaty territory for a variety of purposes.
- ◆ Affirmed the ongoing right of Indians to occupy and use those Treaty 8 lands, not taken up by the Crown, in support of their *way-of-life* and their *usual vocations of hunting, trapping and fishing*.
- ◆ Imposed a wave of duties,⁴¹ upon Crown governments to maintain an environment within Crown lands not taken up which will support their ongoing occupation and use by Treaty 8 peoples.⁴²

Treaty 8 First Nations concur with the observation of Monique Ross and Veronica Potes⁴³ that Crown governments have an overarching duty to respect, protect and ensure the full exercise of the particular set of land-based rights guaranteed to Treaty 8 signatories and their descendants.

In summary, while Treaty 8 provides the Crown with the ability to take up lands, the Treaty also affirms First Nations retention of comprehensive land-based rights to a livelihood, and rights to

40 Monique Ross & Veronica Potes, “Treaty 8 Land-Based Rights: A Legal & Ethical Analysis”, *Changing the Culture of Forestry in Canada*, Marc Stevenson & David Natcher, eds. 2009, Chapter 11, page 181

41 Monique Passalac-Ross & Veronica Potes, *Treaty 8 Land-Based Rights: A Legal & Ethical Analysis*, pg 191, in “*Changing the Culture of Forestry in Canada*”, Stevenson, Marc G. and David C. Natcher, eds. 2009

42 *R. v. Horseman* [1990] 1S.C.R. 901 at p. 913.

43 Monique Passalac-Ross & Veronica Potes, *Treaty 8 Land-Based Rights: A Legal & Ethical Analysis*, pg 191, in “*Changing the Culture of Forestry in Canada*”, Stevenson, Marc G. and David C. Natcher, eds. 2009

maintain control over their peoples' occupation and use of these lands to support their *way of life* and *usual vocations* in accordance with their natural law, customs and traditions (fishing, hunting and trapping are specific manifestations of those Treaty-protected Aboriginal rights). Neither right trumps the other; they are competing rights that must be balanced against one another.⁴⁴

The Treaty established an ongoing Crown obligation to secure a continued supply of game and fish for the support and subsistence of the First Nations; and this implies ongoing Crown duties to protect fish and wildlife populations and to protect and safeguard their habitat, including water resources within lands not taken up. But that is not the end of the story. First Nation rights to occupy and use Crown lands and resources to support their way-of-life and *livelihood, have been interpreted to include rights which are incidental to rights-based practices. The right of access to safe drinking water within their traditional territories, and their legitimate expectation that the Crown will manage waters so as to maintain reasonable access to safe drinking water by Treaty 8 peoples is one aspect of the duties owed to First Nation peoples by the Crown.*

On-reserve Treaty-based Water Rights

Treaty No. 8 Nations in British Columbia understand that:

- 1 Canada held water rights (as above) incidental to its lands in the federal Peace River Block in 1914.
- 2 The establishment of reserve lands in 1914 would have necessarily included proprietary water rights for the reasons set out in *Burrard Power*.
- 3 Any transfer of Treaty Land Entitlement Lands ("TLE") must necessarily include proprietary water rights—providing land without water would defeat the purpose of a conveyance.

The legal principle the Treaty 8 First Nations are relying on was best articulated in the Privy Council decision in *Burrard Power*.⁴⁵ The *Burrard Power* case affirmed federal ownership of water rights in the federally-controlled lands within the Railway Belt.

The Dominion had transferred the land within the Railway Belt (like the Peace River Block) to Canada pursuant to Article 11 of the Terms of Union. British Columbia claimed that it had retained water rights in the transfer. Canada disagreed. The Privy Council said that any transfer of land from the Province to Canada "undoubtedly passed the water rights incidental to those lands". The *Burrard Power* decision was reviewed at length in the *Halalt* case;⁴⁶ as follows:

The Privy Council refused to sever the water rights from the land and concluded that the grant of the public lands by the provincial government to Canada "undoubtedly passed the water rights incidental to those lands" (*Burrard Power* at page 94). The object of the agreement was to permit Canada to recoup its costs for the construction of the railway by selling the transferred lands to settlers. To hold that the Province continued to have the power to legislate respecting the lands or rights incidental to them, said the Privy Council, "would be to defeat the whole object of the agreement" (*Burrard Power Co. v. R.* at page 94).

The decision of the Privy Council upheld the decision of the Supreme Court of Canada, (1910), 43 S.C.R. 27 (S.C.C.), where Idlington J. asked, rhetorically, the following (at page 41):

44 *Halfway River*, at para. 134; This was also the approach taken by Chief Justice Finch in *West Moberly* at para. 150 and 151.

45 *Burrard Power Co. v. The King* 1910 CarswellNat 25, 43 S.C.R. 27.

46 *Halalt First Nation v. British Columbia*, 2011 BCSC 945 ("Halalt") at para. 534

Is it to be supposed that it was contemplated as competent for the party making such a concession of public lands, forty miles wide and hundreds of miles long, of its own volition, so to drain therefrom the water thereon to serve other lands and uses on either side thereof as to leave this strip a barren waste?

In sum, B.C. could not, and cannot now, refuse to convey land without water because it would defeat the purpose of the transfer: “in order to fulfill the object or purpose of the conveyance of the land, the conveyance must include such water rights as would allow that object or purpose to be met.”⁴⁷ We understand that same principle holds true for any lands that were, or should have been transferred to a Treaty 8 First Nation from the Peace River Block in settlement of their TLE claims. As all are aware, these First Nations are currently negotiating a TLE claim with Canada, grounded in the demonstration that there was a historic shortfall in the quantum of lands provided to the First Nations at the date of first survey.

Treaty 8 Participation in Collaborative Water Management Initiatives:

The Treaty 8 First Nations are not opposed to development and implementation of collaborative approaches to addressing water uses incidental to industrial development on Treaty 8 lands, however, the First Nations must be involved from the outset in decision-making processes for effective watershed management and planning. First Nation water rights and interests, and their stewardship responsibilities require the development of full partnership approaches to discussions about exploration, ownership, participation and production and long term sustainability of waters and aquatic environments. This approach requires both engagement and involvement from the outset of planning, and the development of a joint-decision making approach to consultation.

As stewards of their communities and their territories, First Nations will support responsible economic development and sustainable development practices built on and grounded in management regimes based on sound conservation and environmental protection principles. Without limitation, these include:

- ◆ Respect First Nations’ Treaty rights and Aboriginal title and rights as the basis of First Nations’ management prerogatives over lands and waters to enable respectful partnerships with Crown government agencies, industry and NGOs.
- ◆ Support First Nations’ rights to access water, and protect water and other natural resources and support the use of water and other natural resources for the conduct of their traditional seasonal round within their territories.
- ◆ Recognize the importance of watersheds and aquifers within their traditional territories, and watershed protection strategies grounded in the legitimate expectation of Treaty 8 First Nations peoples that access to clean drinking water during the conduct of activities associated with their traditional seasonal round is a basic human right.
- ◆ Facilitate opportunities for First Nations to apply and share traditional knowledge and practices throughout their traditional territories.

⁴⁷ Halalt at para. 561. Halalt was overturned but on a different point at the Court of Appeal (consultation was found to be adequate, regardless of whether Halalt held a *prima facie* claim to the groundwater) and the Supreme Court of Canada refused leave to appeal. That leaves the principles and analysis intact.

- ◆ Promote responsible and sustainable development mutually-agreed upon commitments to use environmental resources in a balanced fashion, in keeping with the reconciliation of community social, health, environment and economic needs.
- ◆ Provide assistance in building capacity in First Nation watershed protection strategies at the local and regional levels.
- ◆ Confirm First Nations' involvement at the regional and community levels to ensure best efforts are achieved towards a coordinated approach.

Appendix D: Water Definitions

Surface Water is water that runs over or sits on the land. This includes lakes, rivers, streams, creeks and ponds. It is usually freshwater and is not stored in the ground. Surface water supports aquatic ecosystems and may be used by communities, agriculture and other industries.

Watershed is the area of land that drains into a river, stream or lake. Watersheds are divided by heights of land.

Aquifer is an underground deposit of permeable materials (such as sand or gravel or porous bedrock), where groundwater can be readily transmitted and stored. Aquifers can be interconnected to other aquifers and surface water and can occur at various depths.

Groundwater is water found in the soil or rock below the surface where the pores and openings are filled with water.

Shallow Groundwater is freshwater accessed from shallow aquifers up to about 300 metres (m) deep. Usually shallow groundwater is found in unconsolidated sands and gravels along modern river valleys or in buried glacier meltwater channels, although shallow bedrock formations may also contain aquifers. Shallow fresh water aquifers are also used by communities, individual domestic users and agriculture.

Deep Groundwater is water found deeper than 600 metres below the surface and is disconnected to the surface water. Subsurface water tends to become more saline with depth as it is increasingly isolated from recharge by precipitation. Also, it has resided for a long period of time within the aquifer rock and will have dissolved various salts and minerals within the rock. Salinity for deep groundwater can range from brackish up to 200,000 mg/l or more (for reference seawater is about 35,000 mg/l). Deep groundwater is not feasible for use by communities or agriculture without significant treatment.

Produced Water is water from an underground formation that is brought to the surface along with oil or natural gas from the well. It may contain salts, organic and inorganic compounds including oil or dissolved gas as well as additives used in drilling and possible naturally occurring radioactive materials dissolved from the rock. Surface discharge of produced water is not allowed in B.C.

Flowback Water is water-based hydraulic fracturing fluid that flows back to the wellbore after a hydraulic fracturing stimulation treatment is completed and before the well is transferred to production. Surface discharge of flowback water is not allowed in B.C.

Water Stewardship is the responsible use and care of water resources through conservation and sustainable practices to ensure human and ecosystem needs are met now, and into the future.

Consumptive Water Use is the extraction and use of water.

Non-consumptive Water Use is the use and return of water to its source.

Water Cycle (also called the hydrologic cycle) is the cycle of processes by which water circulates between the earth's oceans, atmosphere and land, involving precipitation as rain and snow, drainage in streams and rivers to the ocean, and return to the atmosphere by evaporation and transpiration.





Aerial view of Fort St. John and the Peace River

