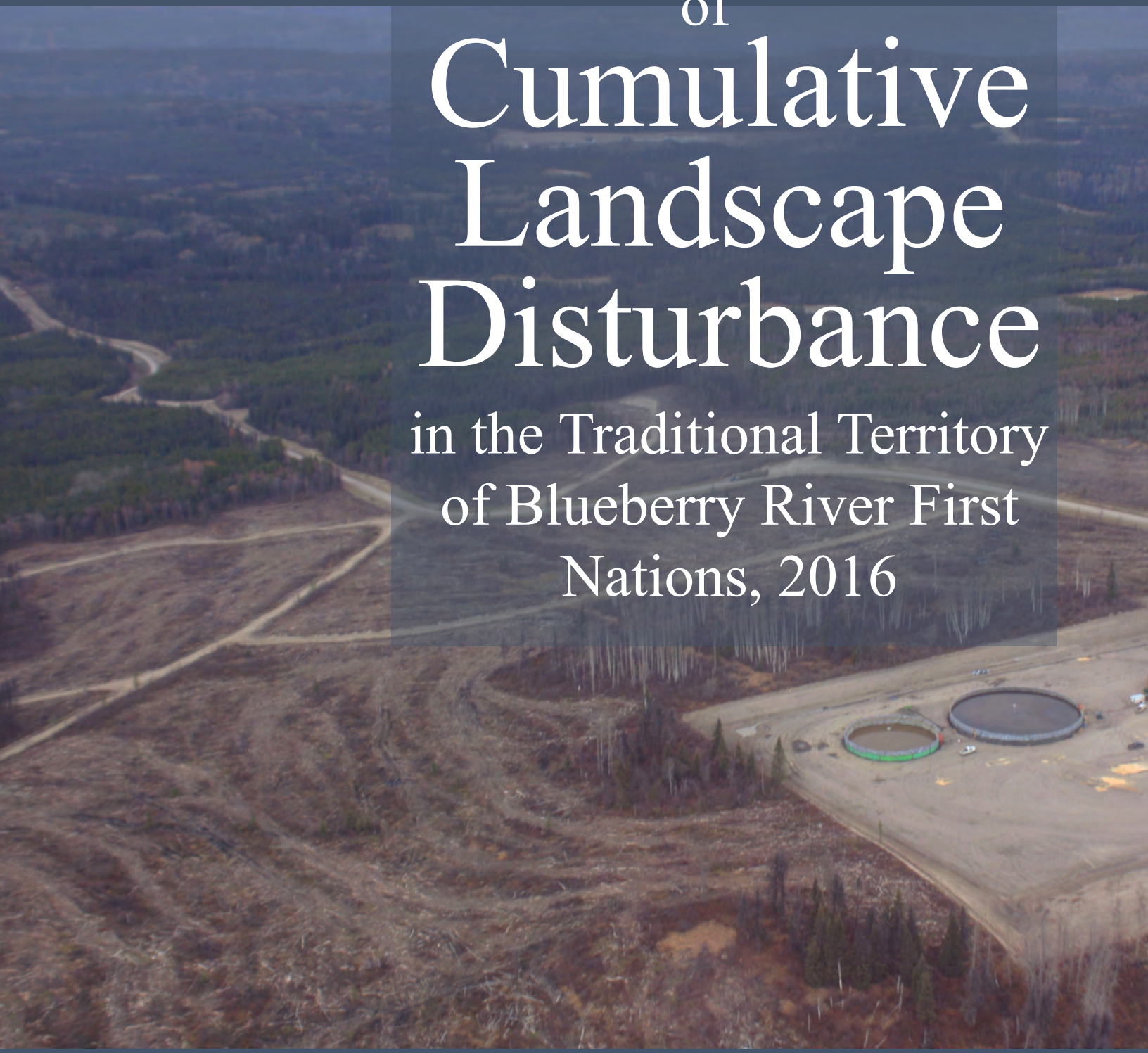
Atlas of Cumulative Landscape Disturbance

in the Traditional Territory of Blueberry River First Nations, 2016



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Atlas of Cumulative Landscape Disturbance in the Traditional Territory of Blueberry River First Nations, 2016

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Executive Summary

This Atlas follows from the 2012 Atlas produced by Global Forest Watch Canada, entitled *Atlas of land cover, industrial land uses and industrial-caused land changes in the Peace Region of British Columbia*, which provided a clear and stark picture of the significant scale and rate of clearing and industrial disturbance of the natural landscape in the Peace Region.

The members of Blueberry River First Nations rely upon the lands, waters and wildlife that lie at the heart of the Peace Region to sustain the First Nation's way of life. In 2015, Blueberry River First Nations brought a civil claim against the government of British Columbia asserting that the scale and rate of the industrial disturbances to the landscape authorized by the government has gone too far: the displacement caused by the cumulative impacts of all of these various activities prevents the First Nation's members from meaningfully carrying on the traditional activities whose continuity was assured to them by the Crown under Treaty 8. The claim asserts that members no longer have access to sufficient land and resources that are in an uncontaminated state capable of sustaining the patterns of economic activity, land use and occupation essential to their livelihood.

Since the 2012 *Atlas* was publicly released, the government of British Columbia has authorized construction in Blueberry River First Nations traditional territory of more than 2,600 oil and gas wells, 1,884 km of petroleum access and permanent roads, 740 km of petroleum development roads, 1,500 km of new pipelines and 9,400 km of seismic lines. Also since that time, approximately 290 forestry cutblocks were harvested in the Nation's traditional territory.

This Atlas updates the information in the 2012 *Atlas* to 2016, focusing specifically on Blueberry River First Nations traditional territory.

Examining cumulative effects upon a landscape is inherently a multi-layered endeavor and no single snapshot can tell the whole truth at once. Numbers and maps are only two of the tools that can assist in gaining an understanding of the nature and scale of cumulative effects upon the traditional territory of Blueberry River First Nations. This Atlas is a necessary starting point. The analysis in this Atlas, which is based upon government of British Columbia data, reveals that approximately 73% of the area inside Blueberry River First Nations traditional territory is within 250 metres of an industrial disturbance, and approximately 84% is within 500 metres of an industrial disturbance.

Summary of Selected Findings

- Based on government data, 73% of the area inside Blueberry River First Nations traditional territory is within 250 metres of an industrial disturbance, and 84% is within 500 metres of an industrial disturbance.

- While 60% of British Columbia is considered intact forest landscape, Blueberry River First Nations traditional territory has little intact forest landscape remaining — less than 14%.

- Provincial parks and protected areas make up less than 1% of Blueberry River First Nations traditional territory.

- Of the total area of B.C. reserved for pipelines via tenures, 46% falls within Blueberry River First Nations traditional territory.

- Including roads, transmission lines, seismic lines and pipelines, there are 110,300 km of linear features in 38,327 km^2 of territory – or 2.88 km of linear disturbance per square kilometre. Significant portions of the territory have a linear disturbance density that is much higher (ranging from 6.1 to 12 km per km^2) with other areas spiking over 24 km per km^2 (see Map 6).

- Active petroleum and natural gas tenures cover 69% of Blueberry River First Nations traditional territory.

- Of the 19,974 oil and gas wells in Blueberry River First Nations traditional territory, 36% are active. There are 9,435 oil and gas facilities, primarily test facilities (6,210) and battery sites (1,120).

- The total percentage of land in B.C. that is set aside in the Agricultural Land Reserve is about 5%, whereas 28% of Blueberry River First Nations traditional territory falls within the ALR.

- Agricultural lands comprise 13% of Blueberry River First Nations traditional territory. Privately owned land now makes up 20% of the First Nation's traditional territory.

- Two hydro dams, W.A.C. Bennett and Peace Canyon, lie within Blueberry River First Nations traditional territory, and construction on a third dam, Site C, is now underway. BC Hydro has identified 104 potential run-of-the-river developments in the First Nation's traditional territory.

Introduction

This Atlas shows the current extent of agricultural and industrial disturbance to the natural land cover in the traditional territory of Blueberry River First Nations in British Columbia's Peace River Region.

Walking, driving or riding through the landscape reveals roads, cutblocks, reservoirs, pipeline rights of way, seismic lines, well pads and other oil and gas facilities. However, it is difficult to conceptualize the cumulative impacts of all these industrial activities and land uses without stepping back from, or rising above, the landscape. In 2012, Global Forest Watch Canada produced and released the *Atlas of land cover, industrial land uses and industrial-caused land changes in the Peace Region of British Columbia,*[1] which provided helpful maps and tables demonstrating the extent of anthropogenic change to the landscape from oil and gas developments, logging, agriculture and other activities.

Since the release of the 2012 *Atlas*, thousands more oil and gas activities have been authorized and thousands more hectares of forest have been cut in the region. In 2015, the Blueberry River First Nations filed a civil claim against the province of British Columbia asserting that the scale and rate of industrial disturbances to the landscape authorized by the provincial government has gone too far. The displacement caused by the cumulative impacts of all these activities prevents the First Nation's members from meaningfully carrying on the traditional activities whose continuity was assured to them by the Crown under Treaty 8. The claim asserts that members no longer have access to sufficient land and resources in an uncontaminated state to sustain the patterns of economic activity, land use and occupation essential to their livelihood.

This Atlas updates the information in the 2012 *Atlas* to 2016, focusing specifically on the traditional territory of the Blueberry River First Nations Region (Map 1). The territory outlined in Map 1 lies at the heart of the Peace Region, and is the territory identified in Blueberry River First Nations' civil claim as territory in which the Nation's members have traditionally carried out the activities that are central to their way of life. While members of the Nation may also rely on other areas inside Treaty 8 territory to exercise their treaty rights, the area outlined in Map 1 is identified by Blueberry River First Nations as being of central concern to the Nation.

This Atlas puts the landscape disturbances in Blueberry River First Nations traditional territory in context. For instance, it demonstrates that while 60% of British Columbia overall is made up of intact forest landscape, in Blueberry River First Nations traditional territory, less than 14% of the land is intact forest landscape. Approximately 73% of Blueberry River First Nations traditional territory has been affected by industrial activities when buffered by 250 metres (approximately 84% when buffered by 500 metres).

1 *Lee, P and M. Hanneman. 2012. Atlas of land cover, industrial land uses and industrial-caused land changes in the Peace Region of British Columbia. Global Forest Watch Canada report #4 International Year of Sustainable Energy for All. 95 pp.*

Data notes

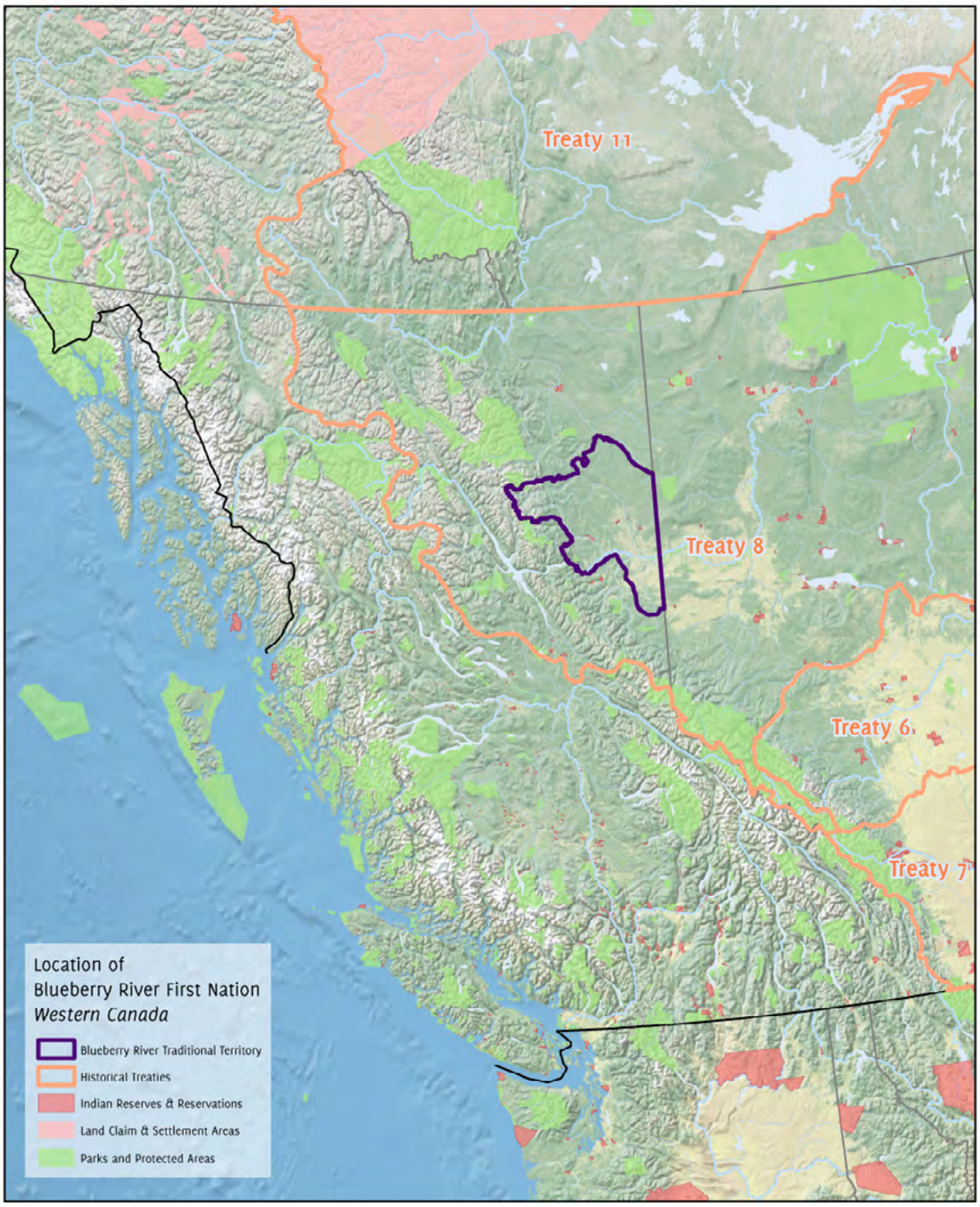
The maps and spatial analysis in this Atlas were produced independently by Ecotrust Canada in 2016, using generally similar methodology to that used to produce the 2012 *Atlas*. The information and data in this Atlas come from publicly available information produced and maintained by the province of British Columbia.

The data was accessed between mid-December, 2015, and mid-January, 2016. Each dataset has a source as a footnote. In all case, this is the most up-to-date data available through public sources. Some data was included from Ecotrust Canada's data catalogue when public data was not available.

A note about size representation: the maps that show the traditional territory of the Blueberry River First Nations are at a scale of 1:1,800,000. This means that one millimetre on the map represents 1,800,000 millimetres, or 1.8 kilometres, on the ground. Such a representation may give the impression that a feature marked on the map is larger than it actually is on the ground. However, such depiction may be necessary for the data to be visible at the small scale of maps used. The maps' size is necessarily limited by the format of this report.

Wherever possible, the actual feature footprint has been used. In cases where it has been estimated, this has been stated and the basis for the estimation provided.

The term "buffer" has been employed in this manual to mean an area surrounding a map feature at a specified distance. A buffer allows the distance from a feature to be determined, as well as the extent of the area that the distance covers.



Map 1. Blueberry River First Nations traditional territory in Western Canada

The territory outlined in Map 1 is the territory identified in Blueberry River First Nations' civil claim as territory in which the Nation's members have traditionally carried out the activities that are central to their way of life. While members of the Nation may also rely on other areas inside Treaty 8 territory to exercise their treaty rights, the area outlined in Map 1 is identified by Blueberry River First Nations as being of central concern to the Nation. Portions of the territory outlined in Map 1 are also shared and relied upon by other First Nations under Treaty 8.

The Traditional Territory of Blueberry River First Nations.

Local boundaries and watersheds

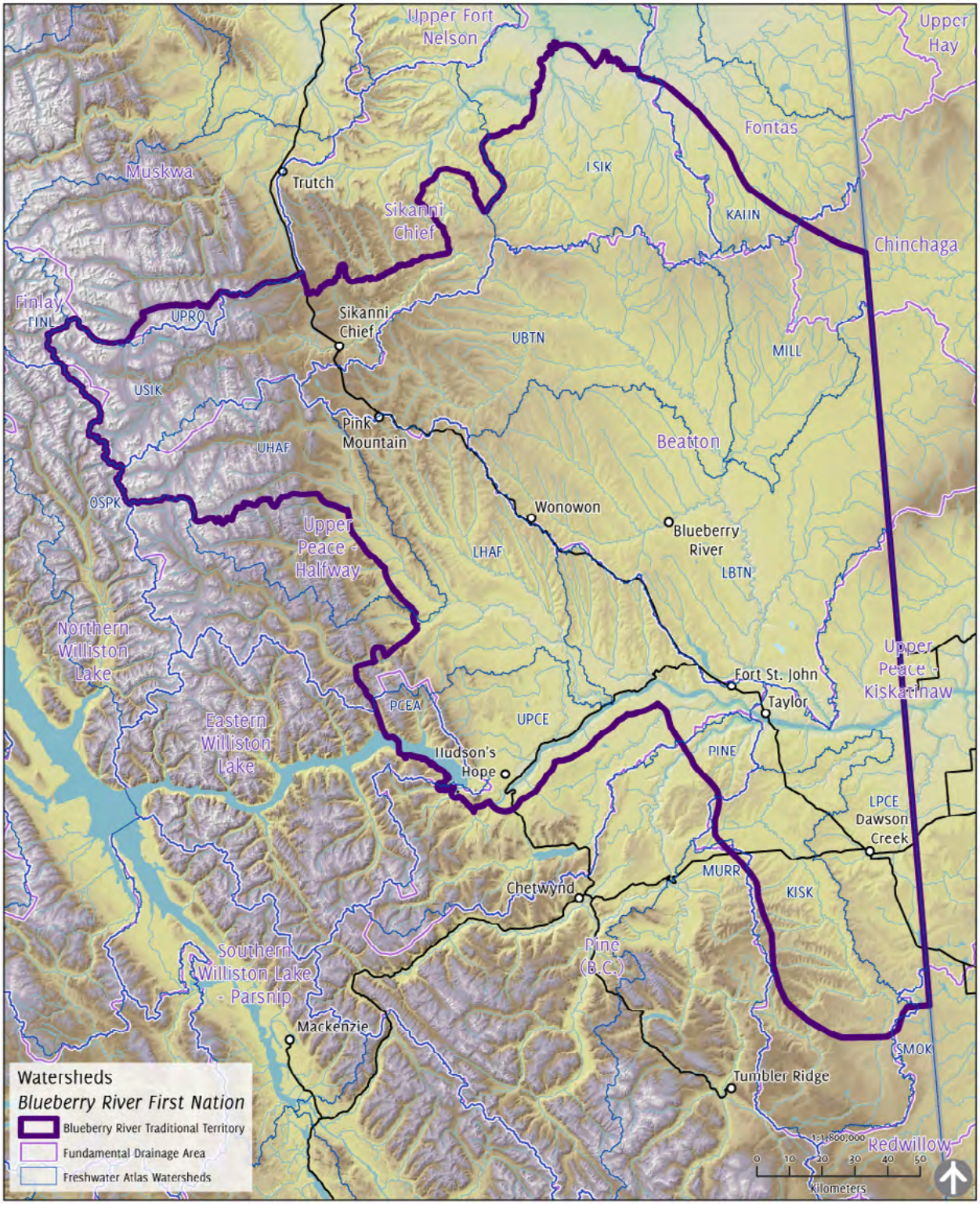
Within the 3,832,749 hectares of Blueberry River First Nations traditional territory, there are 18 watershed[2] groups. Most of the territory drains into Great Slave Lake, except for the Upper and Lower Sikanni Chief Rivers and the Kahntah River, which drain directly into the Arctic Ocean. For reference, the fundamental drainage units that Lee & Hanneman (2012) used to describe the Peace Region study area are overlaid on Map 2. Aerial imagery[3] and Indian Reserves are shown on Map 3.

Table 1. Watershed groups

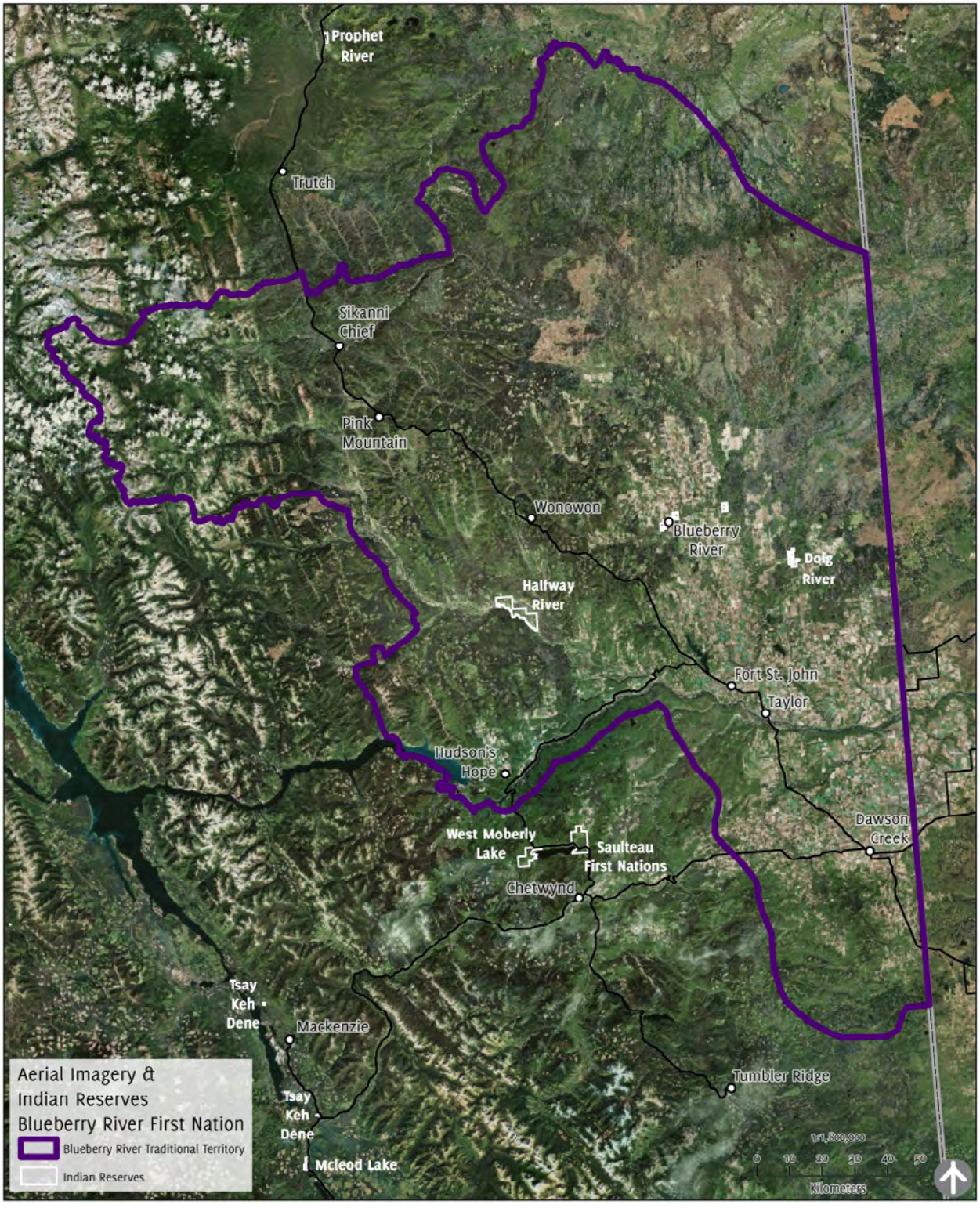
Watershed Code	Name	Area (ha)	% BRFN
FINL	Finlay River	9.68	<0.01%
KAHN	Kahntah River	74,579.38	1.95%
KISK	Kiskatinaw River	246,819.88	6.44%
LBTN	Lower Beatton River	723,893.97	18.89%
LHAF	Lower Halfway River	348,308.11	9.09%
LPCE	Lower Peace River	330,811.57	8.63%
LSIK	Lower Sikanni Chief River	309,209.23	8.07%
MILL	Milligan Creek	237,378.72	6.19%
MURR	Murray River	2,463.67	0.06%
OSPK	Ospika River	38.77	<0.01%
PCEA	Peace Arm	47,786.36	1.25%
PINE	Pine River	39,103.41	1.02%
SMOK	Smoky River	5,467.49	0.14%
UBTN	Upper Beatton River	520,714.12	13.59%
UHAF	Upper Halfway River	246,631.31	6.43%
UPCE	Upper Peace River	314,034.62	8.19%
UPRO	Upper Prophet River	19,945.37	0.52%
USIK	Upper Sikanni Chief River	365,553.25	9.54%

2 Freshwater Atlas Assessment Watersheds: http://catalogue.data.gov.bc.ca/dataset/freshwater-atlas-assessment-watersheds

3 Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community. Copyright 2016.



Map 2. Watersheds and elevation within Blueberry River First Nations traditional territory



Map 3. Imagery and Indian Reserves

Land Cover

Classification of major land cover types

The source of the land cover data is the Land Cover for Agricultural Regions of Canada, circa 2000.[4] The following classes are found within Blueberry River First Nations traditional territory:

1. **Annual Cropland**

   Fall seeded crops such as winter wheat may be erroneously identified in this class. Grassland and shrubland may be delineated within in this class.

2. **Developed**

   Land predominantly built-up or developed; including vegetation associated with these cover conditions. This may include road surfaces, railway surfaces, buildings and paved surfaces, urban areas, parks, industrial sites, mine structures and farmsteads. May also include golf courses and ski hills.

3. **Exposed Land**

   Predominately non-vegetated and non-developed. Includes: exposed lands, bare soil, snow, glacier, rock, sediments, burned areas, rubble, mines, other naturally occurring non-vegetated surfaces.

4. **Coniferous Forest**

   Predominantly coniferous forests or treed areas. May include mixed forests and shrubland areas.

5. **Deciduous Forest**

   Predominantly broadleaf/deciduous forests or treed areas. May include mixed forests and shrubland areas.

6. **Mixed Forest**

   Mixed coniferous and broadleaf/deciduous forests or treed areas

7. **Grassland, Native Grass**

   Predominantly native grasses and other herbaceous vegetation may include some shrubland cover. Land used for range or native unimproved pasture may appear in this class.

4 Government of Canada / Agriculture and Agri-Food Canada (GC/AAFC). Publication Date:2009-04. Title: Land Cover for agricultural regions of Canada, circa 2000. Geospatial Data Presentation Form (Product type): Raster Digital. http://open.canada.ca/data/en/dataset/16d2f828-96bb-468d-9b7d-1307c81e17b8

8. **Unclassified/No Data**

   Areas unclassified due to cloud, shadow or other image quality factors. No Data areas include a small section outside the analysis area.

9. **Perennial Cropland and Pasture**

   Periodically cultivated cropland. Includes tame grasses and other perennial crops such as alfalfa and clover grown alone or as mixtures for hay, pasture or seed.

10. **Shrubland**

    Predominantly woody vegetation of relatively low height (generally +/-2 meters).

11. **Water**

    Water bodies (lakes, reservoirs, rivers, streams, salt water, etc.)

12. **Wetland**

    Land with a water table near/at/above soil surface for enough time to promote wetland or aquatic processes (semi-permanent or permanent wetland vegetation, including fens, bogs, swamps, sloughs, marshes, etc.).

Major land cover types within Blueberry River First Nations traditional territory

Coniferous forest (29.3%) predominates the land cover, followed by wetland (21.6%), deciduous forest (18.4%) and perennial crops and pasture (9%). It is important to note that land cover may be disturbed, and even significantly disturbed, but still be included in the class description for the purposes of this section.

Table 2. Land cover classes

Land cover	HA	%
Annual Cropland	166,991.03	4.4%
Developed	7,840.34	0.2%
Exposed land	92,910.58	2.4%
Forest - Coniferous	1,124,836.22	29.4%
Forest - Deciduous	706,855.20	18.4%
Forest - Mixed	200,324.48	5.2%
Grassland, Native Grass	24,740.02	0.7%
No Data/Unclassified	19,977.31	0.5%
Perennial Crops and Pasture	346,095.43	9.0%
Shrubland	276,618.66	7.2%
Water	38,418.08	1.0%
Wetland	827,141.58	21.6%
Grand Total	3,832,748.94	100%

Intact forest landscapes

It is important to measure intact forest landscape as a means of gauging the capacity of the landscape to support biodiversity and wildlife. Forest that is left too small, or too fragmented, does not provide the necessary support to natural ecological processes that intact forest landscape provides.

Global Forest Watch Canada defines intact forest landscape (IFL) as "a contiguous mosaic of natural ecosystems in a forest ecozone, essentially undisturbed by human influence, including both treed and naturally treeless areas. An intact forest landscape should be large enough to contain and support natural biodiversity and ecological processes, and to provide a buffer against human disturbance from surrounding areas." [5] Intact forest landscapes are "areas of at least 5,000 hectares (50 km^2) within boreal forest ecozones and 1,000 (10 km^2) within temperate forest ecozones that contain forest and non-forest ecosystems minimally disturbed by human activity, as detected on Landsat satellite imagery." [6] Islands are a lso included in the analysis, though they might be smaller than 1,000 hectares.

The concept is described by the intact forest landscape mapping team:[7]

"Most of the world's original forests have either been lost to conversion or altered by logging and forest management. Forests that still combine large size with insignificant human influence are becoming increasingly important as their global extent continues to shrink.

There are several reasons to focus on large undeveloped forest areas:

- Ecosystems are generally better able to support their natural biological diversity and ecological processes the lower their exposure to humans and the greater their area. They are also better able to absorb and recover from disturbance (resistance and resilience).
- Large natural forest areas are important for the preservation of all strata of biological diversity. Fragmentation and loss of natural habitats are the main factors threatening plant and animal species with extinction. Large, roaming animals (such as forest elephants, great apes, bears, wolfs, tigers, jaguars, eagles, deer etc.) especially require that intact forest landscapes be preserved.
- Large natural forest areas are also important for maintaining ecological processes and supplying ecosystem services like water and air purification, nutrient cycling, carbon sequestration, erosion, and flood control.
- The conservation value of forest landscapes that are free from human disturbance is therefore high, although it varies among regions. At the same time, the cost of conserving large unpopulated areas is often low. The same factors that have kept them from being developed, such as remoteness and low economic value, also help to reduce the cost of protecting them.

The concept of an intact forest landscape and its technical definition were developed to help create, implement, and monitor policies concerning the human impact on forest landscapes at the regional or country levels."

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5 PG Lee, Hanneman M, Gysbers JD, Cheng R, Smith W. 2010. Atlas of Canada's Intact Forest Landscapes. Edmonton, Alberta: Global Forest Watch Canada 10th Anniversary Publication #1. 74 pp. p.12.

6 GFWC Bulletin: Canada's Intact Forest Landscapes: Partial Update to 2010 and Three Overviews. 2013. p.3 http://www.globalforestwatch.ca/node/189. This is the data used in the analysis.

7 Intact Forest Landscapes - Concept: http://www.intactforests.org/concept.html

In British Columbia, approximately 60% of the land is considered an intact forest landscape. In contrast, the traditional territory of the Blueberry River First Nations has little intact forest landscape remaining – less than 14% of the First Nation's traditional territory is "intact," according to the dataset produced in 2013. One portion of a large intact forest landscape (greater than 250,000 hectares) remains in the Muskwa-Kechika Management Area (MKMA). If the intact forest landscape within the MKMA is removed, then intact forest landscape makes up 5.5% of Blueberry River First Nations traditional territory.

Between the original (2010) and updated (2013) dataset, 56,189 hectares of intact forest landscape disappeared in the First Nation's traditional territory, which amounts to 9.6% of the 2010 intact forest landscape in the First Nation's traditional territory and 21% of the intact forest landscape outside MKMA. This is a rate of disappearance of 3.2% and 10.3 % a year, respectively, and clearing and harvest of intact forest landscape has likely continued since the 2013 update. Note too that this number does not include the disappearance of forest that was already too fragmented to qualify as intact forest landscape in 2010.

Aerial view of the Traditional Territory of Blueberry River First Nations.

Table 3. Area of intact forest landscape in B.C.

Intact Forestry Type	Small Islands	Temperate IFLs (1,000-5,000 ha)	IFL Fragments (5,000-50,000 ha)	Large IFLs (> 50,000 ha)	Grand Total
<1,000 ha (Islands)	57,677.34				57,677.34
1,000-5,000 ha		1,963,350.97			1,963,350.97
5,000-10,000 ha			1,275,787.35		1,275,787.35
10,000-25,000 ha			1,921,283.29		1,921,283.29
25,000-50,000 ha			2,034,506.40		2,034,506.40
50,000-100,000 ha			13,911.55	2,273,350.26	2,287,261.81
100,000-250,000 ha				2,708,136.79	2,708,136.79
>250,000 ha			15,613.35	44,933,264.61	44,948,877.96
Grand Total	57,677.34	1,963,350.97	5,261,101.94	49,914,751.66	57,196,881.91
% BC Area	0%	2%	6%	53%	60%

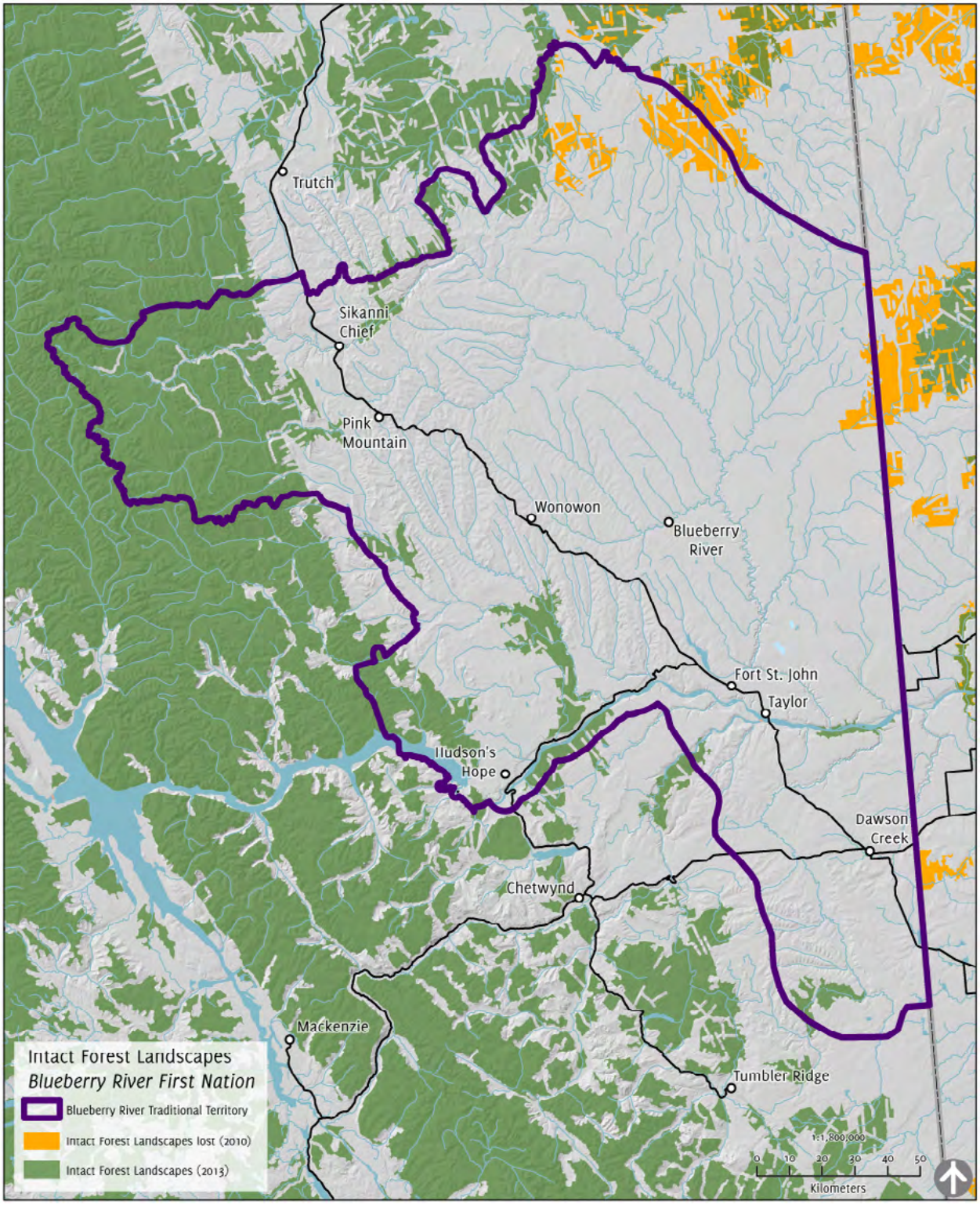
Table 4. Area of intact forest landscape in Blueberry River First Nations traditional territory

Intact Forest Type	1,000-5,000 ha	5,000-10,000 ha	10,000-25,000 ha	25,000-50,000 ha	>250,000 ha	Grand Total	% BRFN Area
IFL Fragments		52,750.41	52,238.48	46,402.09		151,390.98	3.95%
Large IFLs					374,882.34	374,882.34	9.78%
Temperate IFLs	1,858.15					1,858.15	0.05%
						528,131.47	13.78%

Table 5. Intact forest landscape change from 2010 to 2013 within Blueberry River First Nations traditional territory

IFL Area	Outside MKMA (ha)	Within MKMA (ha)	Grand Total (ha)
Area in 2010	268,193	316,127	584,320
Area in 2013	212,004	316,127	528,131
Area lost from 2010-2013	56,189		56,189
Percent lost from 2010-2013	21.0%		9.6%
Average rate	-7.0%		-3.2%

Map 4. Intact forest landscape in B.C.



Map 5. Intact forest landscape in Blueberry River First Nations traditional territory

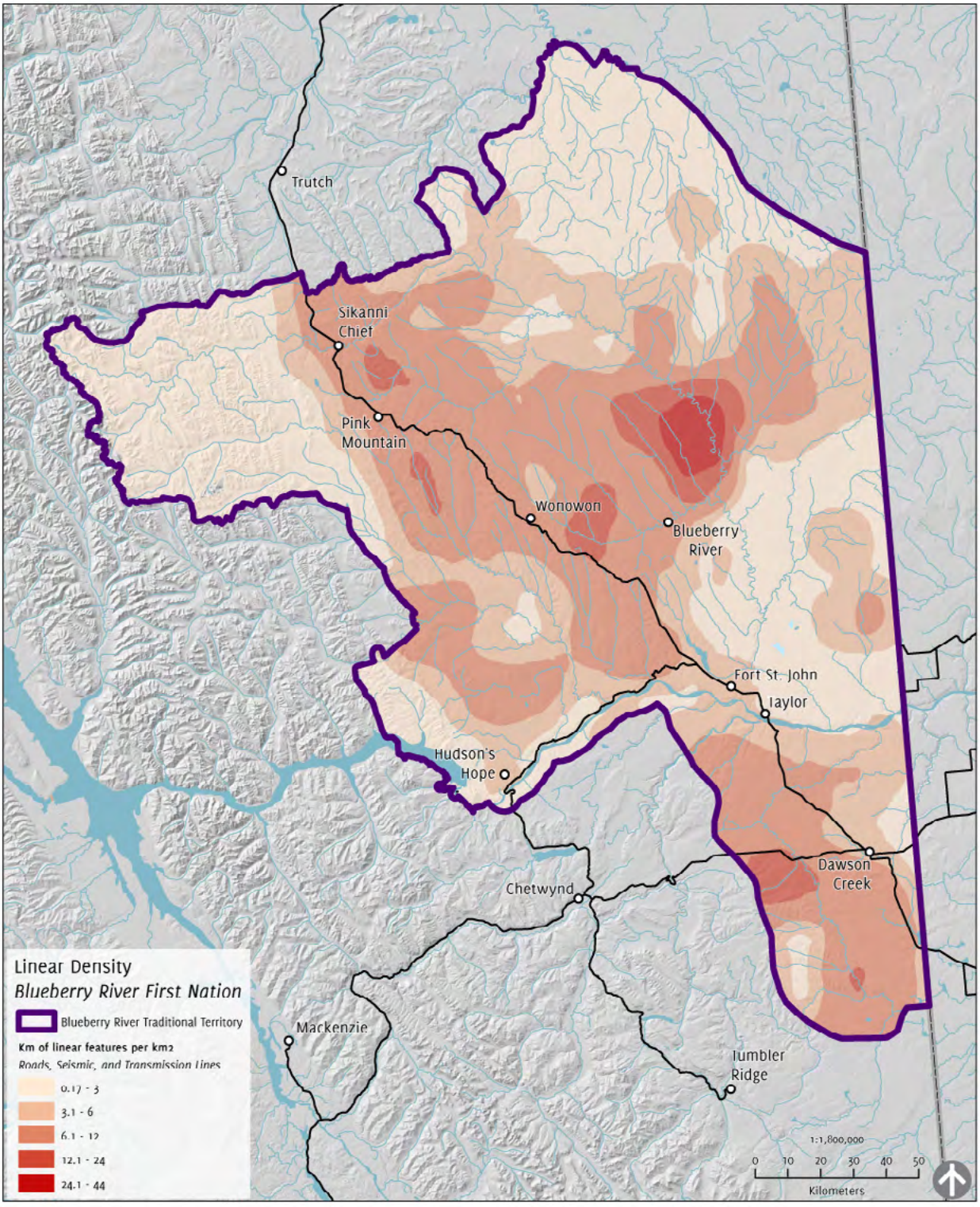
Density of linear disturbance

Linear developments create corridors that can affect wildlife. While the effects vary, and are species specific, the measurement of linear density is recognized as an important indicator. For example, a report prepared for the Canadian Association of Petroleum Producers cites a study that bears use habitat less when it is within 500 m of a road.[8] Another study in the report showed that for deer, "20% loss in habitat effectiveness occurred when road densities were about... 1.24 km/km^2 of summer habitat. Extrapolations of the data predicted that at road densities of... 3.72 km/km^2 habitat effectiveness would decline by 50-95% depending on the road type." A study cited in a B.C. Ministry of the Environment report found that "an increase in roads from 0 km/km^2 to 0.3 km/km^2 resulted in a decrease of caribou density by 63%, with complete avoidance of an area when road density increased to greater than 0.3 km/km2."[9]

The measure of linear disturbance density depicted in Map 6 includes roads, seismic lines and transmission lines. Despite the linear disturbance caused by pipelines, pipeline tenures are not included here because they are provided in the provincial dataset as areas/polygons, and thus cannot be easily mapped as lines. As a result, this map analysis is a conservative estimate.

8 Jalkotzy, M.G., P.I. Ross, and M.D. Nasserden. 1997. The Effects of Linear Developments on Wildlife: A Review of Selected Scientific Literature. Prep. for Canadian Association of Petroleum Producers. Arc Wildlife Services Ltd., Calgary. 115pp.

9 Goddard, A.D. 2009. Boreal Caribou in northeastern British Columbia. Biological rationale, data summary and literature review. B.C. Min. Environ., Fort St. John, BC. Peace Region Technical Report. 21 pp. http://www.env.gov.bc.ca/wld/speciesconservation/bc/index.html



Map 6. Density of linear disturbance in Blueberry River First Nations traditional territory

Parks and protected areas

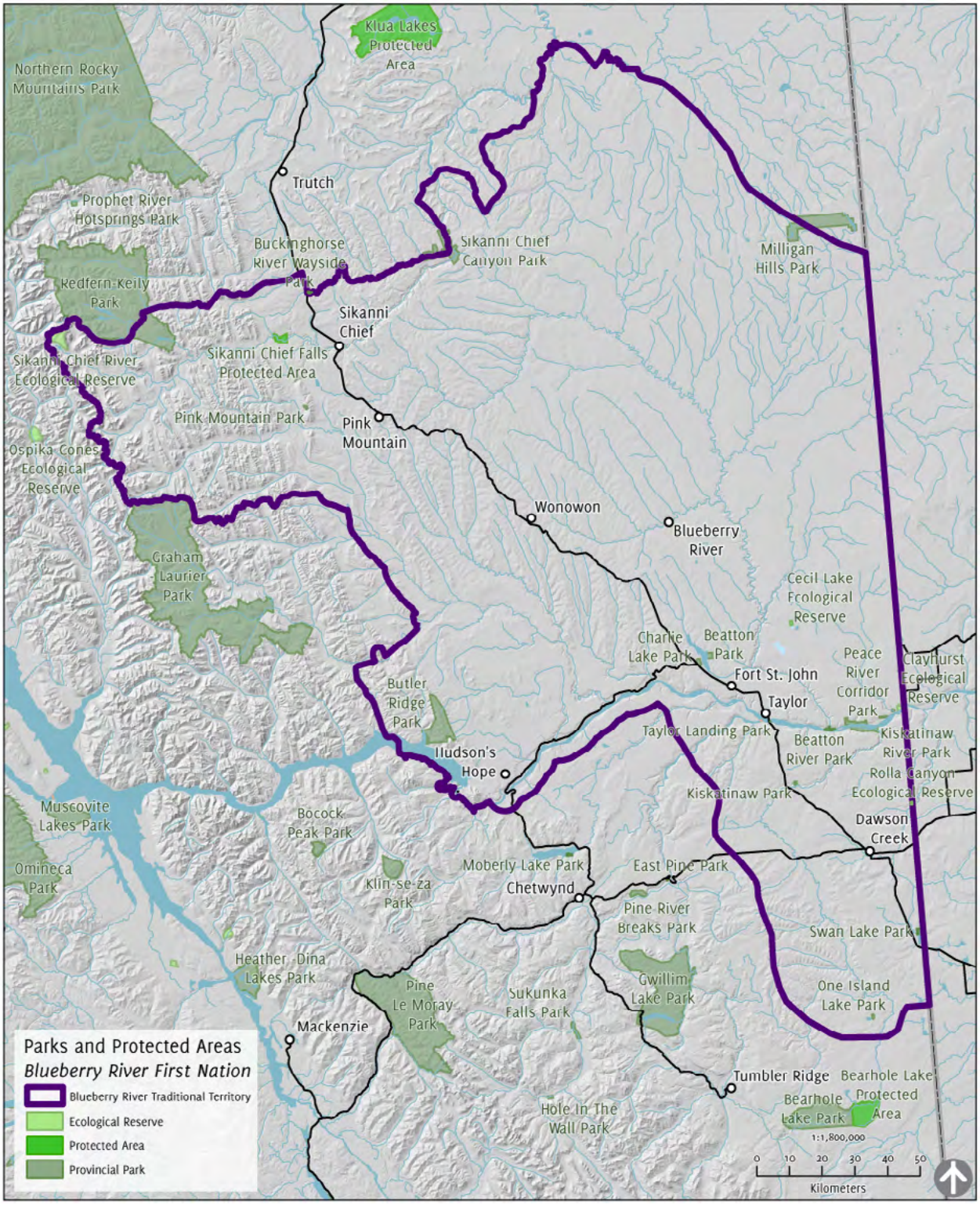
There are 21 provincial parks and protected areas[10] in the traditional territory of the Blueberry River First Nations, as defined by the provincial government. The mapped dataset is published by the Ministry of Forests, Lands and Natural Resource Operations via GeoBC. According to the metadata provided with the dataset, "The Parks, Ecological Reserves, and Protected Areas represented in this view are a subset of the Crown tenure types held in the Crown Land Registry system (Tantalis)." The dataset is continuously updated but does not include federal or municipal parks, although there are no federal parks in the study area.

Table 6. Amount of protected area within the study area

Name	Designation	HA	% BRFN Area
BEATTON PARK	PROVINCIAL PARK	329.34	0.009
BEATTON RIVER PARK	PROVINCIAL PARK	193.40	0.005
BUCKINGHORSE RIVER WAYSIDE PARK	PROVINCIAL PARK	0.13	<0.001
BUTLER RIDGE PARK	PROVINCIAL PARK	6845.21	0.179
CECIL LAKE ECOLOGICAL RESERVE	ECOLOGICAL RESERVE	129.53	0.003
CHARLIE LAKE PARK	PROVINCIAL PARK	176.27	0.005
CLAYHURST ECOLOGICAL RESERVE	ECOLOGICAL RESERVE	399.88	0.010
GRAHAM - LAURIER PARK	PROVINCIAL PARK	280.70	0.007
KISKATINAW PARK	PROVINCIAL PARK	54.47	0.001
KISKATINAW RIVER PARK [11]	PROVINCIAL PARK	198.35	0.005
MILLIGAN HILLS PARK	PROVINCIAL PARK	2143.37	0.056
ONE ISLAND LAKE PARK	PROVINCIAL PARK	58.93	0.002
PEACE RIVER CORRIDOR PARK	PROVINCIAL PARK	2014.52	0.053
PINK MOUNTAIN PARK	PROVINCIAL PARK	97.69	0.003
REDFERN-KEILY PARK	PROVINCIAL PARK	8904.69	0.232
ROLLA CANYON ECOLOGICAL RESERVE	ECOLOGICAL RESERVE	42.98	0.001
SIKANNI CHIEF CANYON PARK	PROVINCIAL PARK	2403.39	0.063
SIKANNI CHIEF FALLS PROTECTED AREA	PROTECTED AREA	799.15	0.021
SIKANNI CHIEF RIVER ECOLOGICAL RESERVE	ECOLOGICAL RESERVE	2165.98	0.057
SWAN LAKE PARK	PROVINCIAL PARK	81.92	0.002
TAYLOR LANDING PARK	PROVINCIAL PARK	0.91	<0.001
	Total	27,320.81	0.713

10 BC Parks, Ecological Reserves, and Protected Areas: http://catalogue.data.gov.bc.ca/dataset/bc-parks-ecological-reserves-and-protected-areas

11 Note, the dataset describes Kiskatinaw River Park as a Provincial Park, but the B.C. Parks website calls it a Protected Area: http://www.env.gov.bc.ca/bcparks/explore/parkpgs/kiskatinaw_rv/



Map 7. Parks and protected areas

Land and Resource Management Plans

Crown land in British Columbia is currently managed through Land and Resource Management Plans. The traditional territory of the Blueberry River First Nations falls within two of these LRMP areas: Fort St. John[12] and Dawson Creek.[13] Both management plans were approved in 1997. The Fort St. John LRMP notes that First Nations were not involved in that LRMP planning process.[14] Muskwa-Kechika is covered by a separate management plan that overlaps with the Fort St. John LRMP area. In addition, two Sustainable Resource Management Plans (SRMP) were pursued as a result of the LRMP process: Dunlevy Creek and Peace Moberly Tract. LRMPs are composed of different subzones, known as Legal Planning Objectives,[15] for each area, though none exists within Blueberry River First Nations traditional territory. The only subzones in the First Nation's traditional territory are Non-Legal Planning Objectives that guide planning via policy but are not legally enforceable.[16]

Table 7. Land and Resource Management Planning zones in Blueberry River First Nations traditional territory

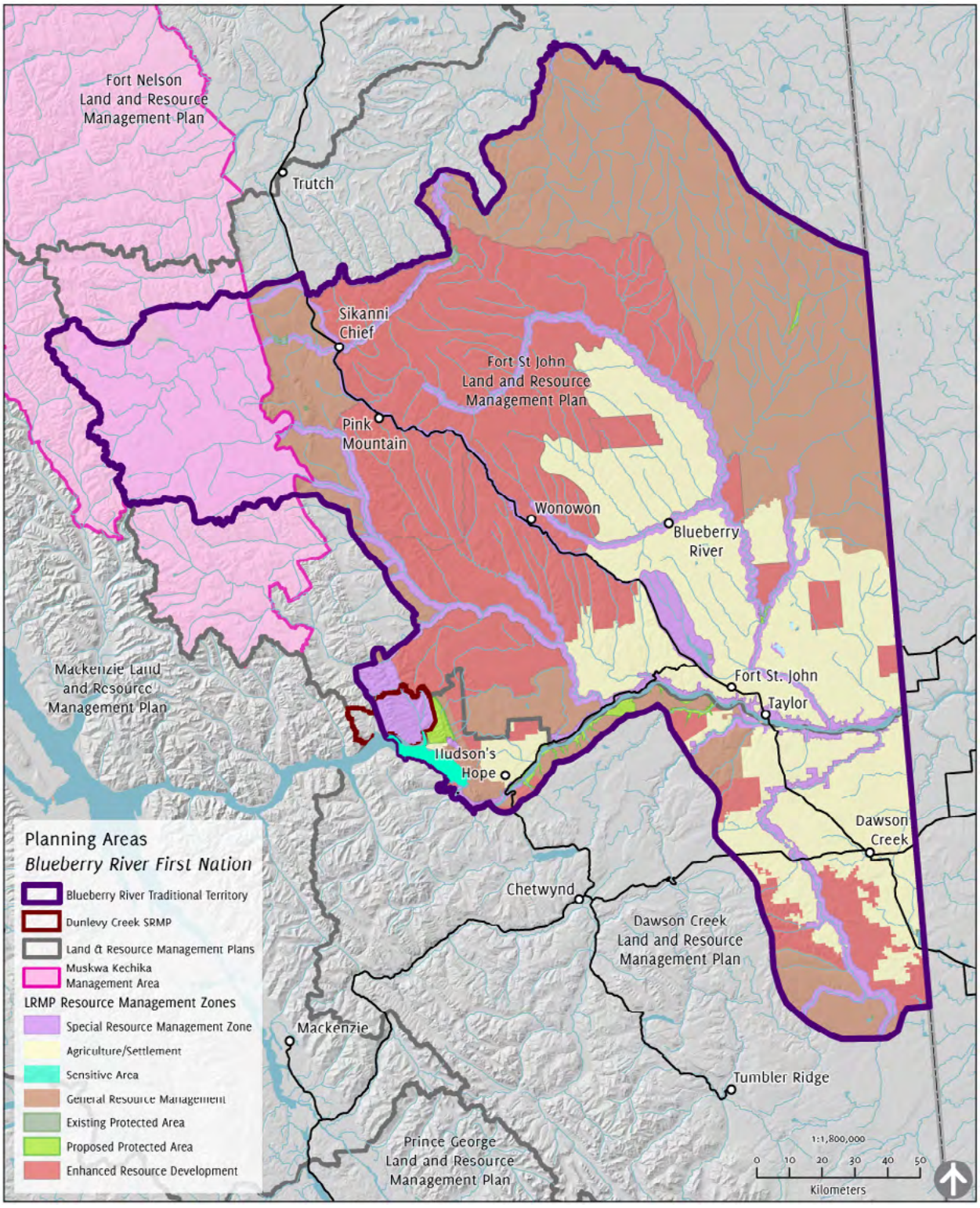
LRMP Zone Type	Dawson Creek (HA)	Fort St. John (HA)	Grand Total (HA)	% Total
Agriculture/Settlement	306,972.85	557,450.92	864,423.77	22.6%
Enhanced Resource Development	118,884.39	968,418.69	1,087,303.08	28.4%
General Resource Management	116,566.05	1,026,206.33	1,142,772.38	29.8%
Special Resource Management	82,441.26	601,017.48	683,458.74	17.8%
Existing Protected Area	197.27	17,143.87	17,341.14	0.5%
Proposed Protected Area[18]	23,626.80	3,572.95	27,199.75	0.7%
WILLISTON LAKE – PEACE ARM*	10,188.65		10,188.65	0.3%
Total	658,877.27	3,173,810.24	3,832,687.51	

**Note: the Williston Lake – Peace Arm zone is not named in the Dawson Creek LRMP, though it appears on the LRMP map as a Sensitive Area. On the accompanying map, it appears as a Sensitive Area.*

Broad provincial land use category descriptions[17]

- The **Agriculture/Settlement** category includes land that is managed under the Municipal Act, or is used or could be used for agriculture or "agriculturally compatible" activities such as oil and gas exploration or forest management.
- The **Enhanced Resource Development** category includes lands with existing or future potential suitability for intensive resource development.
- The **General Resource Management** category includes lands to be managed for a wide range of resource values. Strategies for achieving non-extractive resource objectives may modify resource development, in accordance with the level of conflicts between land uses (e.g., few land use conflicts would encourage more investment in resource development).
- The **Special Resource Management** category is subdivided into specific land use categories based on the major resource values, which are to be given a high priority in land and resource planning and development. It is recognized that these lands contain extractive resource values, and thus resource development is permitted but must consider and address all significant values identified.
- The **Protected Area** category includes land uses that are recommended for inclusion in any subsequent Protected Area (such as existing land and resource use activities: non-commercial hunting and fishing, guide outfitting, trapping, grazing in support of guide outfitting, camping and hiking). Logging, mining, hydroelectric development and oil and gas exploration and development generally are not permitted.

12 Fort St. John Land and Resource Management Plan: https://www.for.gov.bc.ca/tasb/slrp/plan34.html
13 Dawson Creek Land and Resource Management Plan: https://www.for.gov.bc.ca/tasb/slrp/plan27.html
14 Fort St. John Land and Resource Management Plan Section 1.3
15 http://catalogue.data.gov.bc.ca/dataset/legal-planning-objectives-current-polygon; http://catalogue.data.gov.bc.ca/dataset/legal-planning-objectives-current-line; http://catalogue.data.gov.bc.ca/dataset/legal-planning-objectives-current-point
16 http://catalogue.data.gov.bc.ca/dataset/non-legal-planning-features-current-point; http://catalogue.data.gov.bc.ca/dataset/non-legal-planning-features-current-polygon; http://catalogue.data.gov.bc.ca/dataset/non-legal-planning-features-current-line
17 These categories are outlined in more detail within the Fort St. John and Dawson Creek LRMP documents.
18 Some but not all of the Proposed Protected Areas have become Existing Protected Areas since the plan was approved.



Map 8. Planning areas in Blueberry River First Nations traditional territory

Industrial and Infrastructure Land Uses

Agriculture and private lands

Agricultural lands make up 13% of Blueberry River First Nations traditional territory, according to the Prairie Farm Rehabilitation Administration (PFRA) generalized land cover dataset.[19]

Table 8. Agricultural land cover

Type	Area (ha)	%BRFN
Cropland	223776.2893	5.84%
Forage	177648.7109	4.64%
Grassland	92007.91244	2.40%
Total	493432.9126	12.88%

Cultivated cropland is land that is in annually seeded crops or summer fallow.
Forage (hay) is land that is in perennial forage for hay or silage production (dominantly alfalfa).
Grassland is land that is in perennial grasses and herbaceous species for grazing or other uses, including native range, seeded tame pasture, abandoned farm areas and other non-cultivated uses (ditches, riparian areas, etc.).

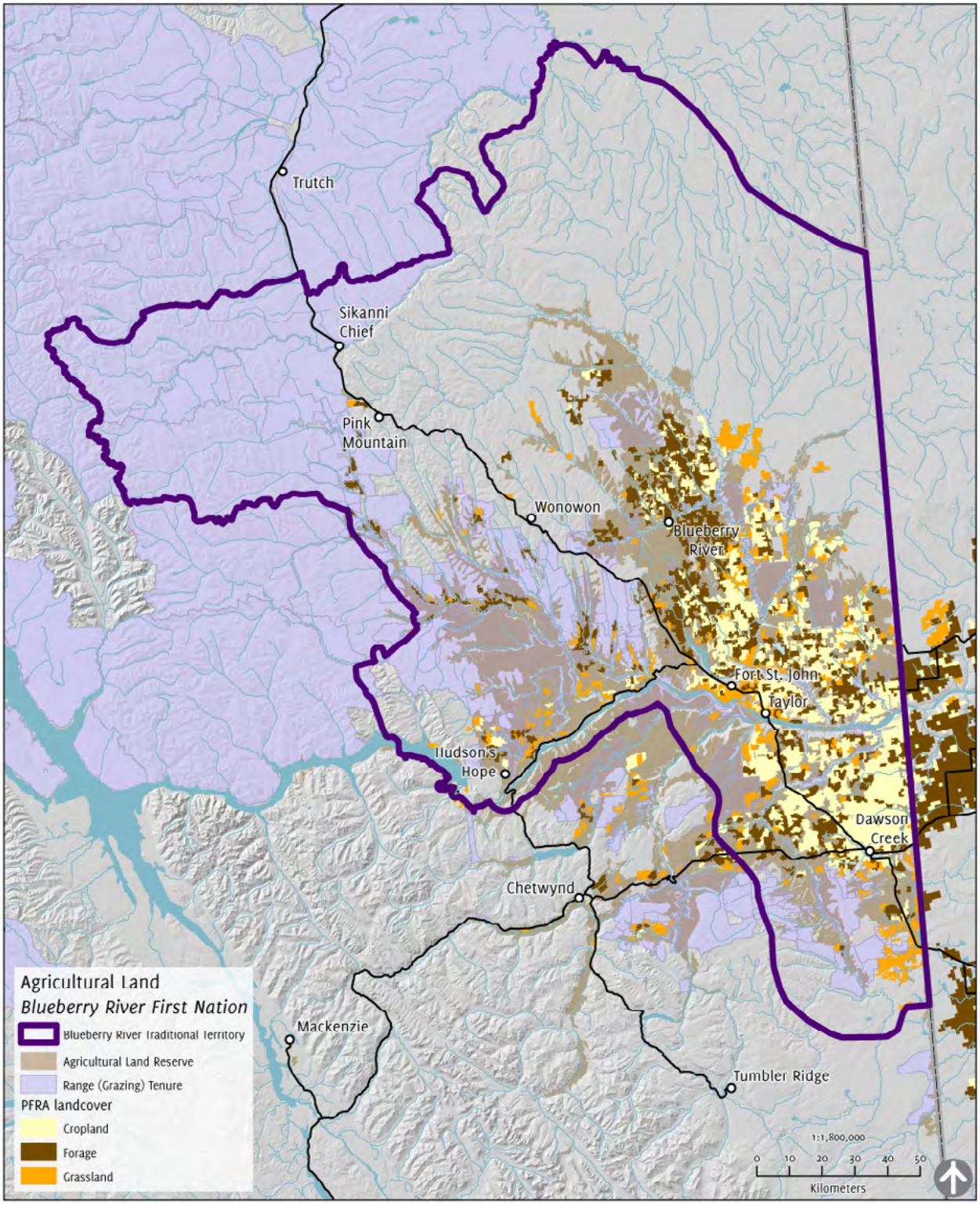
Active or pending grazing tenures cover 1,051,504 ha (27.4%) of Blueberry River First Nations traditional territory[20].

One-fifth of the First Nation's traditional territory is privately owned[21] land (20%).The majority (60%) of Agricultural Land Reserve (ALR) land in the First Nation's traditional territory is held privately. The total percentage of B.C. set aside in ALR lands, which were designated in the 1970s, is about 5%,[22] whereas 28% of the traditional territory of the Blueberry River First Nations falls within the ALR.

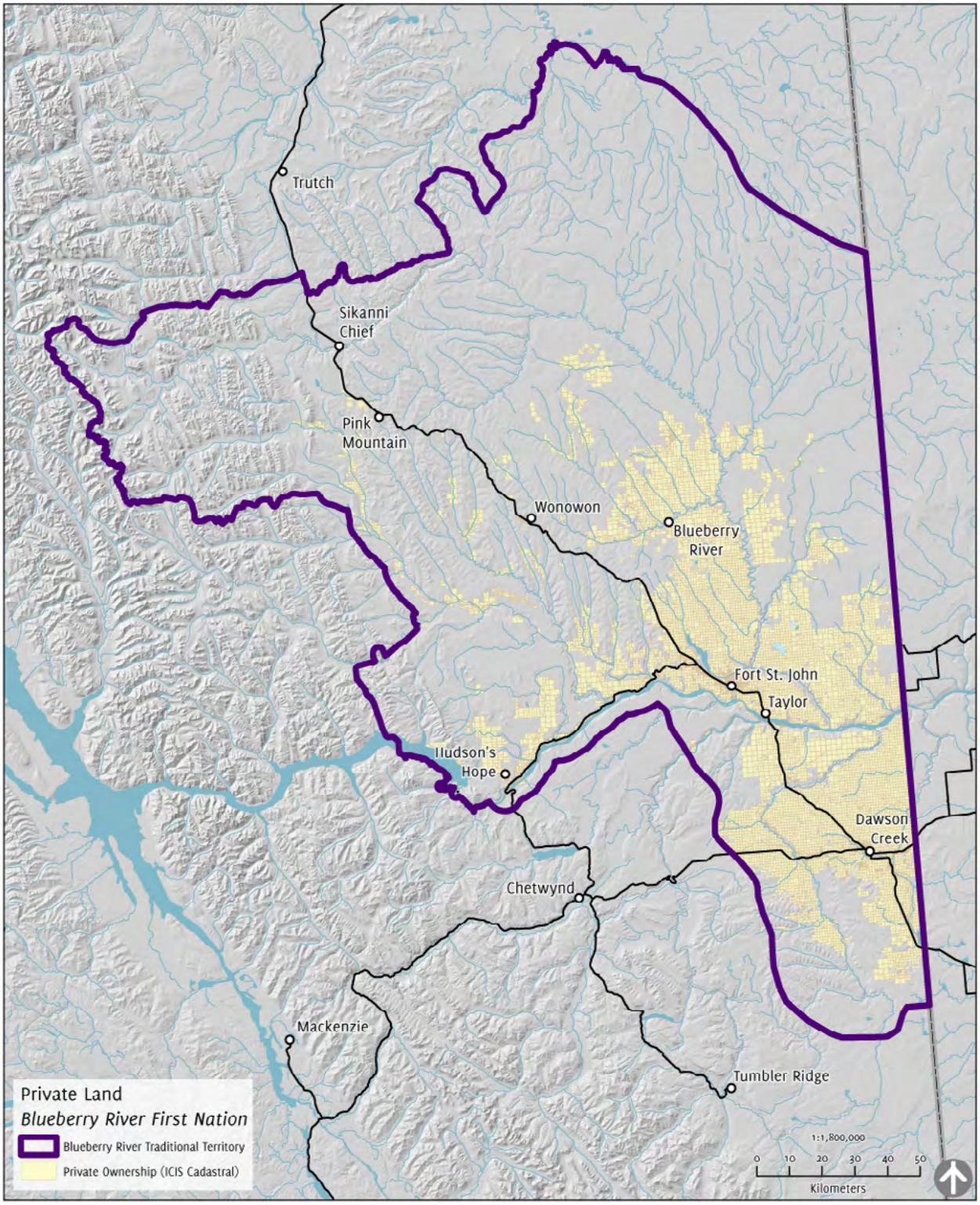
Table 9. Agricultural Land Reserve and privately held land

Ownership	ALR (ha)	% BRFN	non-ALR (ha)	% BRFN	Total (ha)	Total % BRFN
Crown Land	439,224.00	11.46%				
Private	650,791.24	16.98%	127,978.5	3.34%	778,769.74	20.32%
Grand Total	1,090,015.24	28.44%				

19 http://databasin.org/datasets/f0cdd92d7f5145d19467d8e999ab1b01
20 Range Tenure: https://catalogue.data.gov.bc.ca/dataset/range-tenure
21 Integrated Cadastral Information Society. Dataset dates from April 2015. http://www.icisociety.ca/bc-spatial-services/
22 http://www.alc.gov.bc.ca/alc/content/alr-maps/alr-history



Map 9. Agricultural land and ALR



Map 10. Private land

Agricultural land in the Traditional Territory of Blueberry River First Nations.

Roads

Blueberry River First Nations traditional territory has 50,237.74 kilometres of roads.[23] Less than 4% of the roads are paved, 49% are rough and 45% are loose. Resource and unclassified roads account for 90% of the roads in the First Nation's traditional territory.

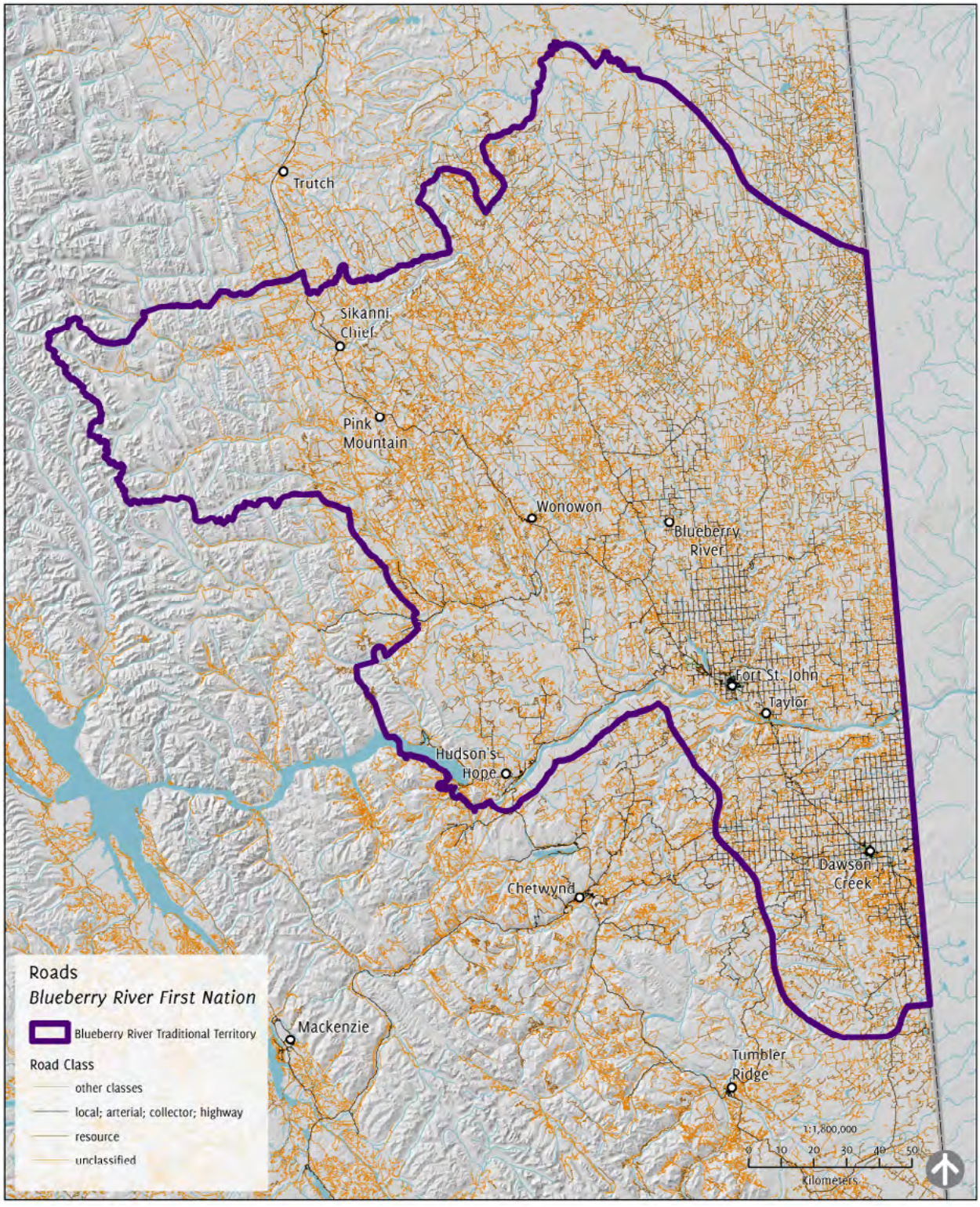
Map 11 shows the extent and type of roads within and near the First Nation's traditional territory.

As noted in the data notes section, lines on a small-scale map may under- or over-represent the actual footprint of a feature. In order to estimate a footprint, Map 12 shows roads buffered by 5 m on either side of the line to represent 10 m in width.

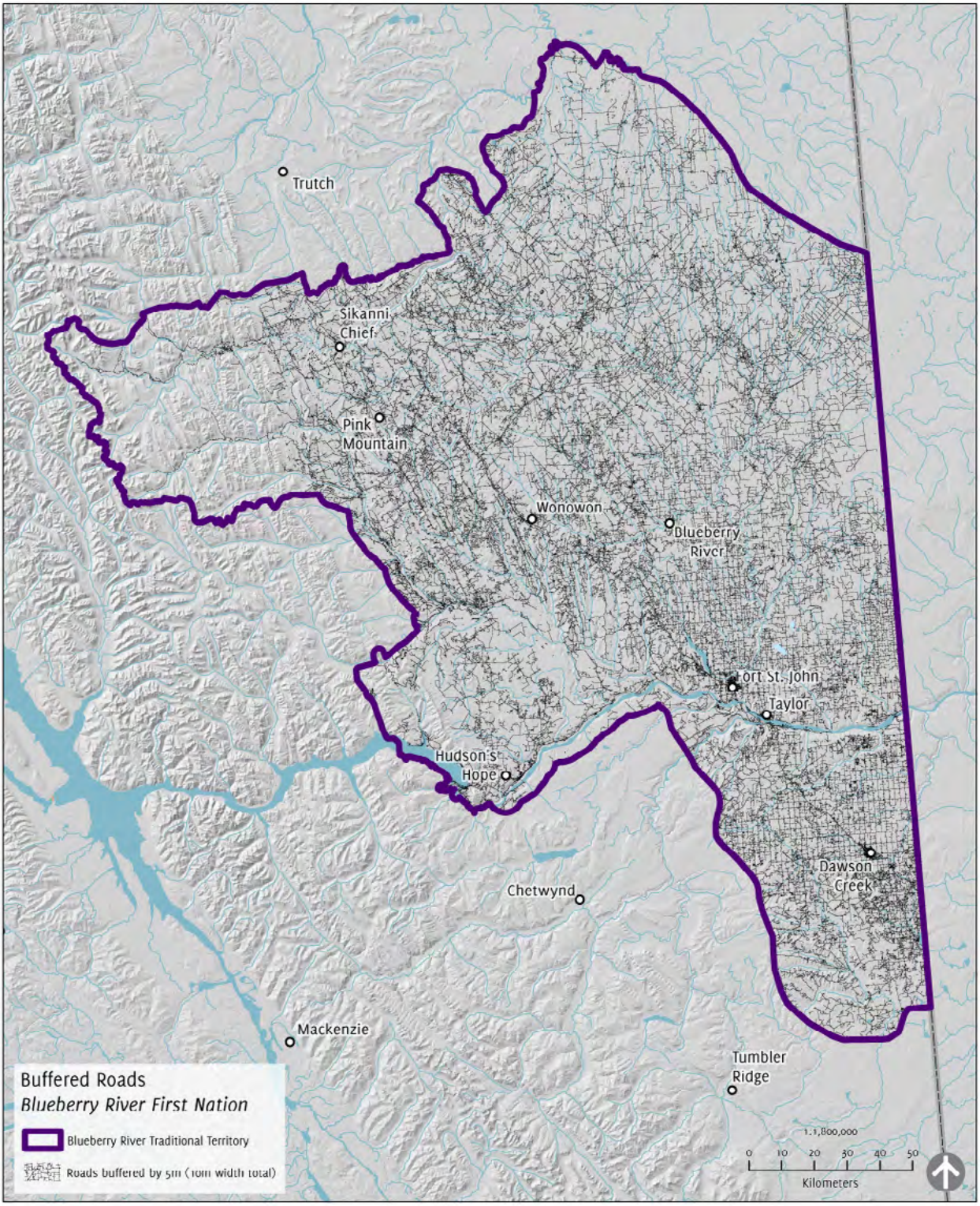
Table 10. Roads by type and length in kilometres

Type	paved	rough	loose km	decommissioned/ overgrown/ unknown	Grand Total
alleyway	0.34	2.16	13.00		15.50
arterial	92.09		0.93		93.03
collector	639.54		289.40		928.93
driveway		2.26	16.94		19.20
highway	464.27				464.27
lane	0.46	0.05	1.45		1.96
local	505.01	27.93	2,828.27		3,361.20
ramp	6.13		0.04		6.17
recreation	3.10	1.01	5.26		9.38
resource	6.99	246.81	9,683.86	866.64	10,804.31
restricted	1.02	0.19	8.18		9.39
service	4.86		9.36		14.22
strata	13.53		2.27		15.80
unclassified	62.23	24,375.20	9702.27	354.68	34,494.38
Grand Total	1,799.57	24,655.61	22,561.23	1,221.32	50,237.74

23 Digital Road Atlas (DRA) – Master Partially-Attributed Roads: https://catalogue.data.gov.bc.ca/dataset/digital-road-atlas-dra-master-partially-attributed-roads



Map 11. Roads represented as lines

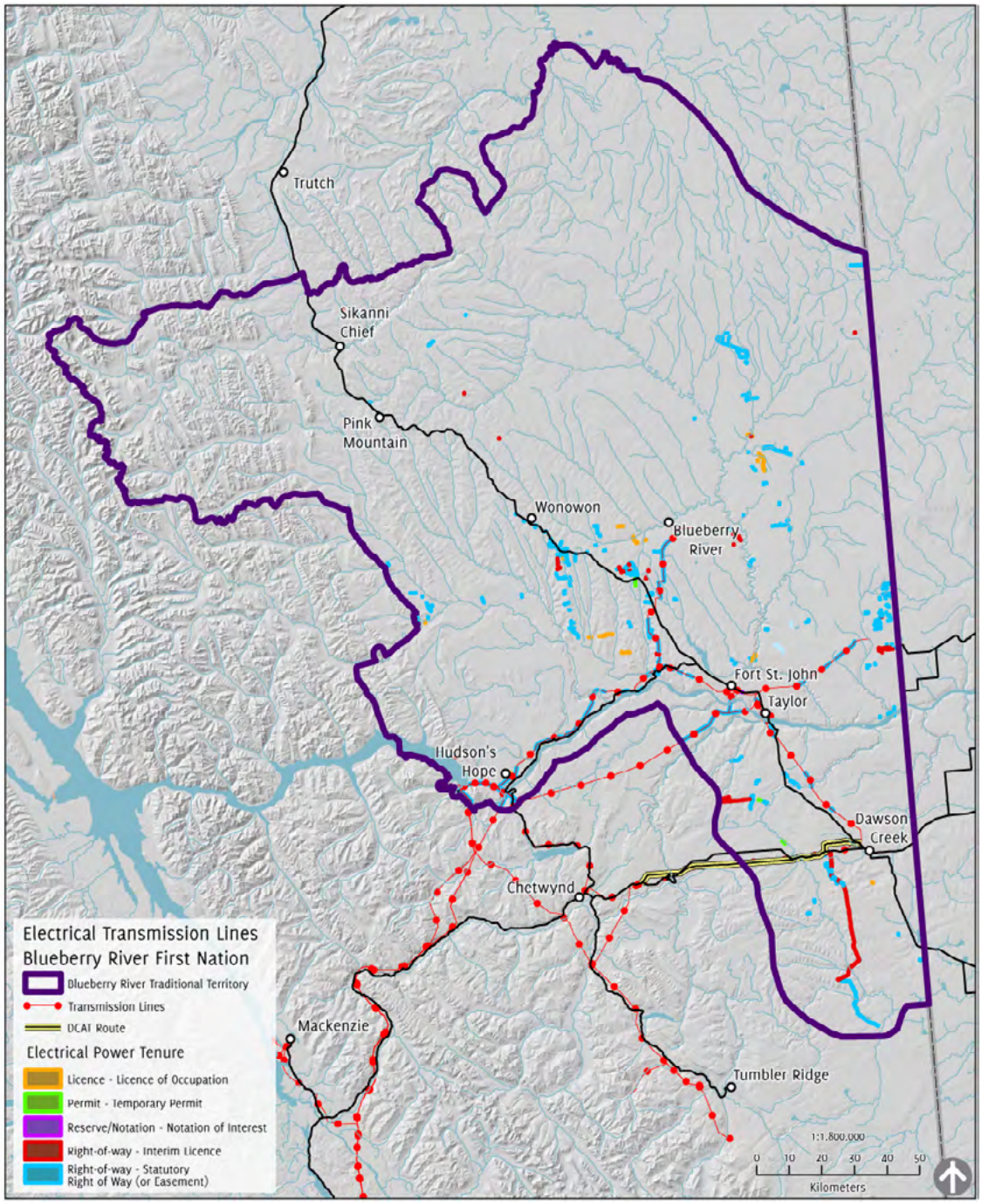


Map 12. Roads represented as polygons

Roads through the Traditional Territory of Blueberry RIver First Nations.

Transmission lines

The total length of BC Hydro transmission lines[24] is 480.15 kilometres in Blueberry River First Nations traditional territory.



Map 13. Transmission lines and powerline tenure

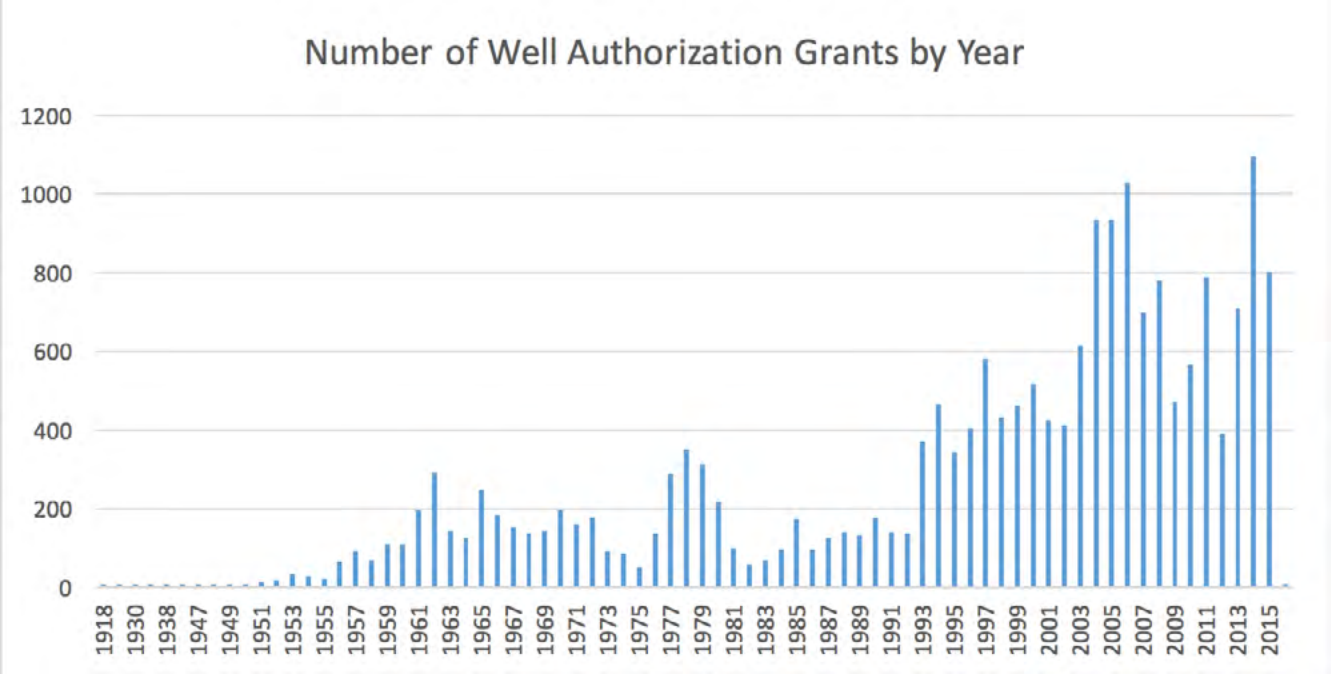
24 The Transmission Lines data file used dates from 2009. It is part of Ecotrust Canada's data catalogue. There are currently no publicly available datasets, though the file is visible here: https://catalogue.data.gov.bc.ca/dataset/bc-hydro-transmission-lines. The powerline tenure is part of the Tenures dataset, described elsewhere in this document.

The Traditional Territory of Blueberry River First Nations.

Oil and gas

Oil and gas wells

Figure 1. Number of new wells approved in Blueberry River First Nations traditional territory per year (all statuses)



There are 19,974 wells[25] in Blueberry River First Nations traditional territory, 36% of which are active. Of these active wells, 74% are solely gas.

25 Oil and Gas Well Surface locations for British Columbia: https://www.bcogc.ca/public-zone/gis-data

Table 11. Oil and gas wells by fluid type and well status

Well Type	Gas	Gas Cap	Multi-zone gas	Multi-zone oil and gas	Multi-zone oil	Oil	Undefined*	Water	Confidential	Grand Total	% of total
Abandoned	665	18	115	25	10	302	3389	152		4676	23.41%
Active	5288	34	535	29	33	929		301		7149	35.79%
Cancelled							2821			2821	14.12%
Cased							338	2		340	1.70%
Completed	216		6			15	702	8		947	4.74%
Drilling							7		43	50	0.25%
Gas Testing	7		1							8	0.04%
Suspended	1081	30	254	62	29	571	222	131		2380	11.92%
Well Authorization Granted							1464			1464	7.33%
Confidential									139	139	0.70%
Grand Total	**7257**	**82**	**911**	**116**	**72**	**1817**	**8943**	**594**	**182**	**19974**	100.00%

* "Undefined" fluid types are wells that have completed the first stage, but have not completed the second. When the type of fluid has been determined, this status is updated by the Oil and Gas Commission (unless they are abandoned or cancelled prior to the fluid type determination).

Well Status definitions:[26]

- Abandoned – A well permanently closed off where no viable hydrocarbons are discovered, or where a well is depleted and no longer capable of producing profitably.
- Active – A well actively producing petroleum or gas, or being used for deep disposal/injection of fluids.
- Cancelled – Permit to license, drill and operate the well cancelled prior to drilling activity. (See Table 15 for more information.)
- Cased – Wellbore cased in by pipe in order to protect the drilled open-hole from fluids, pressure and wellbore stability problems.
- Completed – Preparation of wellbore for production or injection through perforations, fracturing and cementation.
- Drilling – Well hole drilled by drilling rig in preparation for casing and completion activities, not yet ready for producing.
- Drilling Suspended – Drilling rig released, but drilling of well not complete. Permit holder intends to resume drilling within one year of rig release.
- Gas Testing – A well which flows freely (in-line or flared) in order to determine viable engineering and geological information (e.g. flow rates, fluid composition or reservoir temperatures).
- Suspended – A well that was previously completed and/or producing, but is no longer producing or injecting.
- Well Authorization Granted – Permit to license, drill and operate the given well granted to the permit holder by the Commission.

Table 12. Number and average annual rate of growth for new oil and gas wells

Date	New Well Authorization Grants (#)	Total Wells (#)	% change	average annual rate of growth
Dec. 31, 1949	26	21		
Dec. 31, 1969	2195	2221		
1949-1969			10476.19%	523.81%
Dec. 31, 1989	3068	5289		
1969-1989			138.14%	6.91%
Dec. 31, 2009	10335	15624		
1989-2009			195.41%	9.77%
Dec. 31, 2015	4340	19964		
2009 - 2015			27.78%	4.63%

26 The well status definitions are directly quoted from the metadata document provided with the data.

Oil and gas facilities

Within Blueberry River First Nations traditional territory, there are 9,435 oil and gas facilities,[27] primarily test facilities (6,210) and battery sites (1,120).

Table 13. Oil and gas facilities in Blueberry River First Nations traditional territory by type

Facility Types	Number	% of total
BATTERY SITE	1120	11.87%
PROCESSING BATTERY	107	1.13%
COMPRESSOR DEHYDRATOR	311	3.30%
COMPRESSOR STATION	290	3.07%
DISPOSAL STATION	61	0.65%
GAS DEHYDRATOR	52	0.55%
GAS PLANT	71	0.75%
INJECTION STATION	32	0.34%
NGL FACILITY	1	0.01%
OIL SALES METER	80	0.85%
SHARED FACILITIES	235	2.49%
PIPELINE EQUIPMENT	4	0.04%
PIPELINE GATHERING	201	2.13%
PUMP STATION	5	0.05%
SATELLITE BATTERY	211	2.24%
GAS SALES METER	421	4.46%
TEST FACILITY	6210	65.82%
TANK TERMINAL	5	0.05%
WATER HUB	18	0.19%
Grand Total	**9435**	**100.00%**

These types are defined[28] as:

Battery Site: A gas or oil facility with product separation and multiphase delivery point measurement (as defined in the BCOGC Measurement Requirements for Upstream Oil and Gas Operations Guideline) for one or more wells.

Processing Battery: An oil battery (see above definition) where additional equipment is added to process the oil or solution gas such as: compression, gas dehydration, injection, or disposal, but not gas processing equipment as the term is defined in the Drilling & Production Regulation.

27 Oil and Gas Facility locations for British Columbia (Points): https://www.bcogc.ca/public-zone/gis-data

28 Facility Application and Operations Manual Appendix I: http://www.bcogc.ca/facility-application-and-operations-manual

Compressor Dehydrator: A facility that includes both natural gas compression equipment and dehydration equipment for one or more wells.

Compressor Station: A facility that includes natural gas compression equipment for one or more wells. This does not include booster compressors for single wells, or for well pads with more than one well.

Disposal Station: A facility that includes equipment that handles oil and gas waste. The equipment may include, but is not limited to the treatment, recovery, storage, or disposal of drilling or completions waste, well fracture returns/flowback, and acid gas from a processing plant.

Gas Dehydrator: A facility that includes natural gas dehydration equipment for one or more wells. The molecular sieve and glycol regenerative systems both fit within the scope of this definition.

Gas Plant: *gas processing plant* means a facility for the extraction from natural gas of hydrogen sulphide, carbon dioxide, helium, ethane, natural gas liquids or other substances, but does not include a facility that:

(a) uses, for the exclusive purpose of processing low-volume fuel gas,

(i) a regenerative system for the removal of hydrogen sulphide or carbon dioxide and emits less than 2 tonnes/day of sulphur, or

(ii) a liquid extraction process such as refrigeration to extract hydrocarbon liquids from a gas stream, or

(b) uses a non-regenerative system for the removal of hydrogen sulphide or carbon dioxide.

Injection Station: A facility that includes gas compression or fluid pumping equipment to inject the gas or fluid into underground reservoirs for the purpose of enhancing production.

NGL Fractionation Facility: A processing facility that receives hydrocarbon liquids for the purpose of processing off-spec natural gas liquids (NGL) into one or more spec components such as propane and butane.

Oil Sales Meter: A facility where oil or hydrocarbon liquid (LVP or HVP) is metered, and typically includes pumping equipment such as a LACT[29] unit transporting the liquid into a pipeline. An oil sales meter can be a separate facility located on its own site, or it can be located on an existing facility site such as a gas processing plant or battery.

Shared Facilities: A facility designated for minor equipment that is shared by more than one well, and that equipment does not constitute the establishment of a larger facility such as a compressor, gas dehydrator, or battery. There are no linkages established between shared facilities and wells, or other facilities. Examples include: test separator at a multi-well (gas) pad, flare stack and /or production tanks at a multi-well pad.

29 Lease Automatic Custody Transfer Unit: A system providing for the automatic measurement, sampling, and transfer of oil from the lease location into a pipeline. (http://www.mineralweb.com/library/oil-and-gas-terms/lease-automatic-custody-transfer-unit-lact-unit-definition)

Pipeline Equipment: This facility type is for internal BCOGC use only at this time.

Pipeline Gathering: A facility created internally by BCOGC staff in collaboration with the permit holder for reporting production when one or more wells simultaneously flow to more than one reporting facility.

Pump Station: A facility that includes pumping equipment used to transport hydrocarbon liquid in a major pipeline (oil, LVP or HVP), or a facility that is used to pump fresh water from a major water source. (This does not include LACT units at gas processing plants and oil batteries, methanol and chemical pumps, truck loading pumps, and water disposal, transfer, or injection pumps at water hubs and disposal facilities).

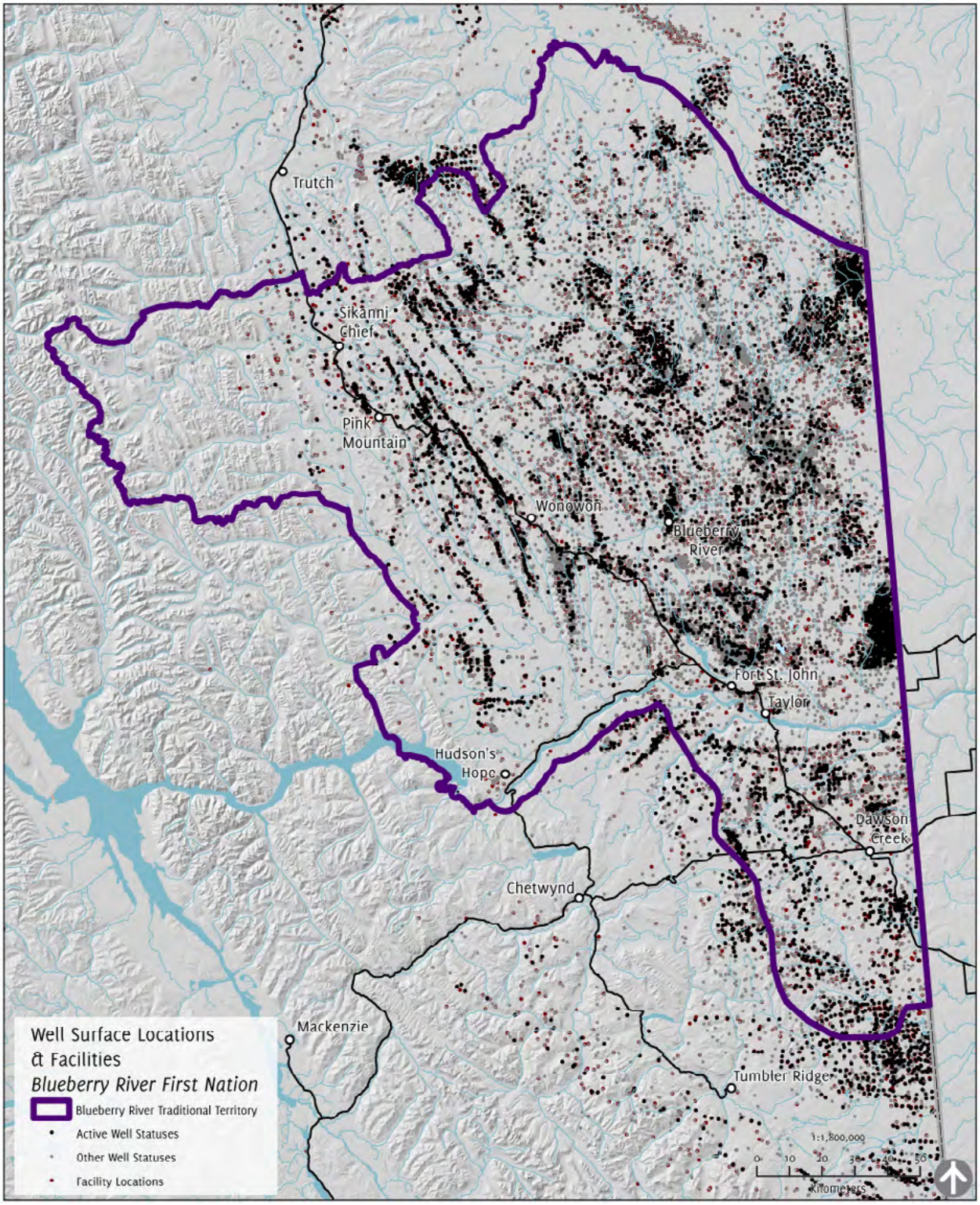
Satellite Battery: A facility for testing oil wells and typically includes a test separator with no oil storage.

Gas Sales Meter: A natural gas metering station. A gas sales meter can be a separate facility located on its own site, or it can be located on an existing facility site such as a gas plant or compressor dehydrator site.

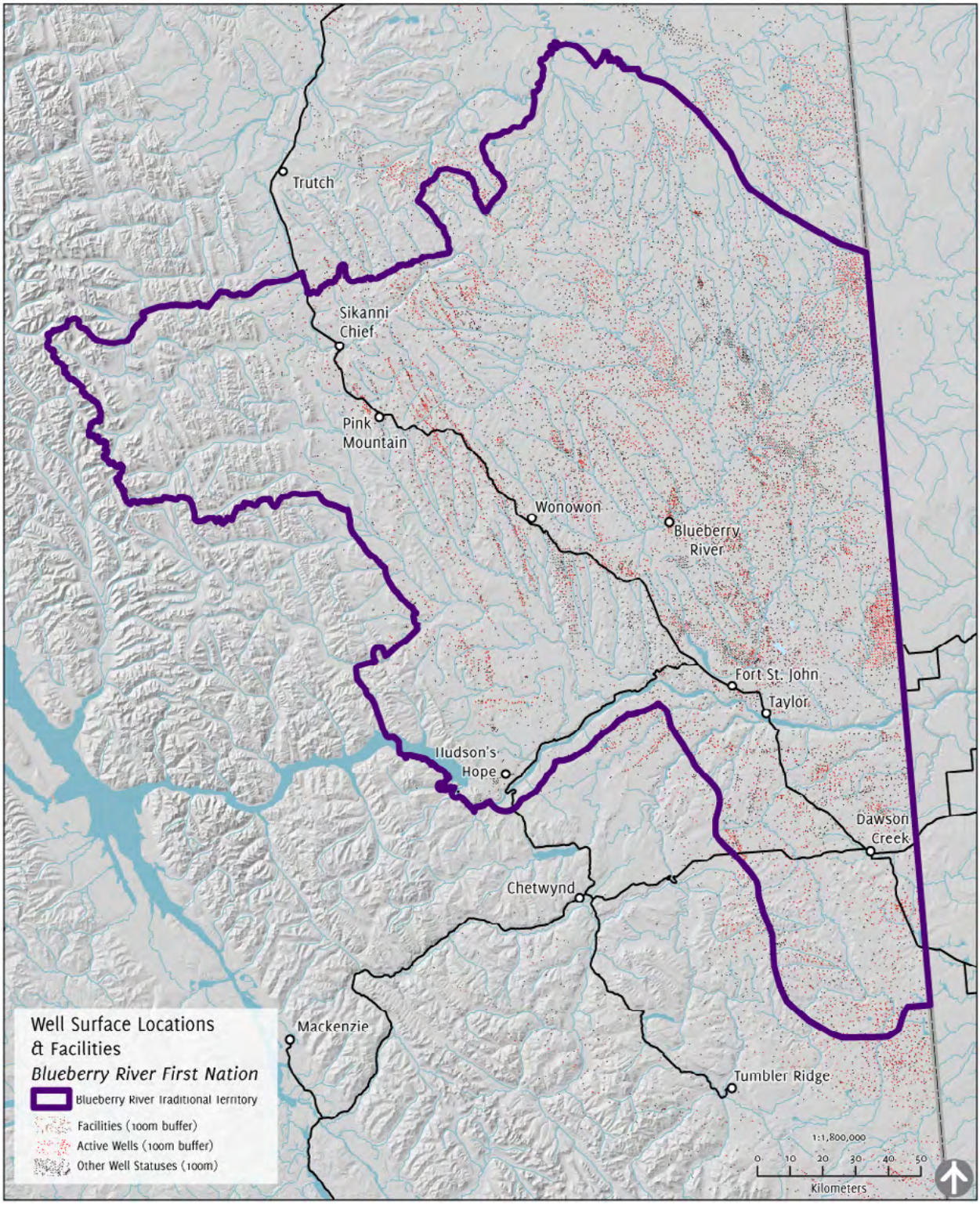
Test Facility: A facility established for reporting gas production only when a well is being drilled using the "Gas While Drilling" process.

Tank Terminal: A facility where produced hydrocarbons and/or produced water is delivered by truck, rail, or pipeline, from or to the facility, and typically includes fluid storage tanks and/or pumping equipment. This type includes all previously identified Pipeline Terminal facilities.

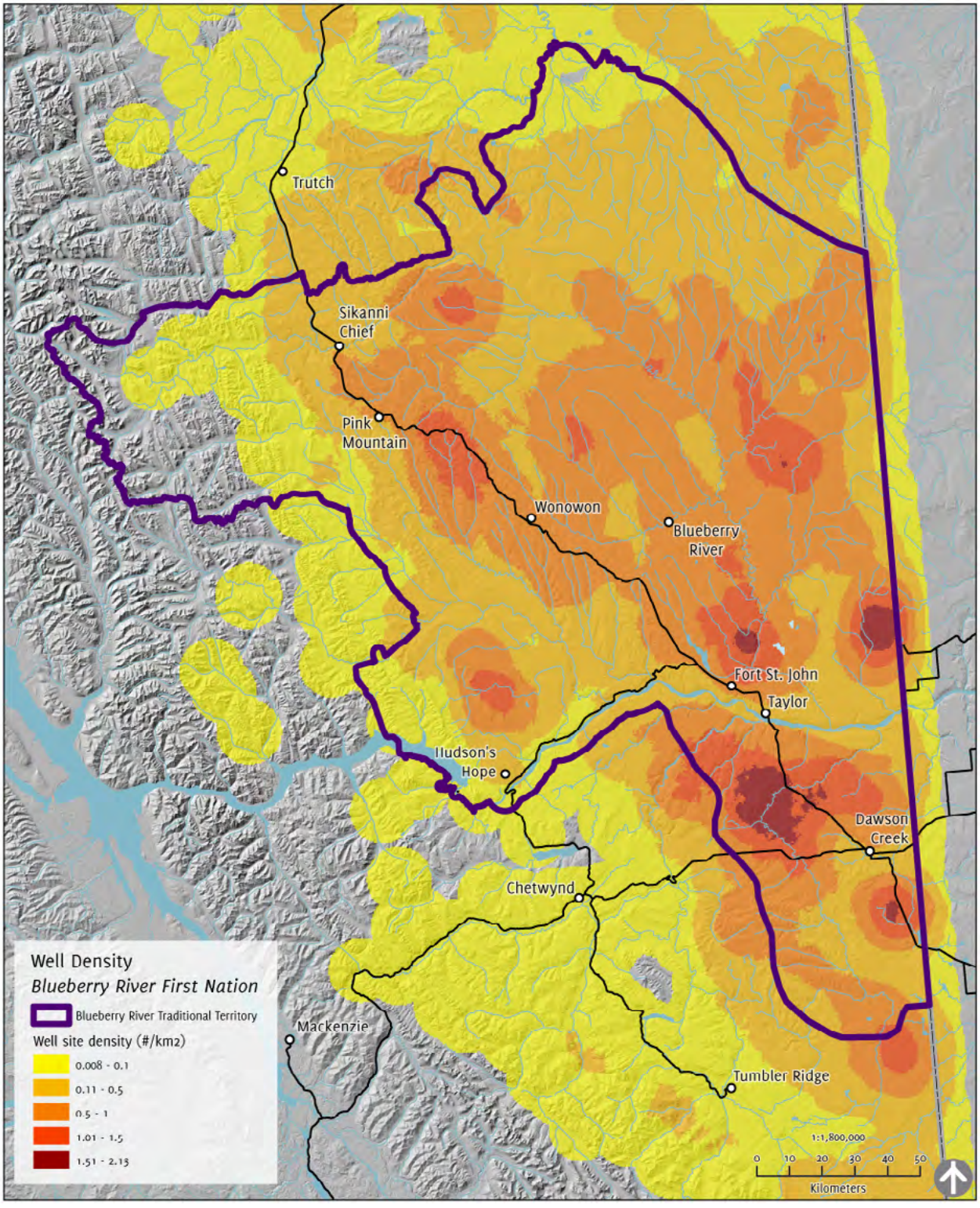
Water Hub: A facility where produced water or well fracture flow back is being stored from one or more well pads, either in above-ground tanks, open-top containers, or in excavated ponds, and utilized for storage and/or well completions operations on more than one well, or multi-well pad. The associated equipment may include storage tanks, generators, pumps, piping, meters and filters. The installation may be temporary or permanent in nature.
A water hub can be a standalone facility, or may exist at the same site as another facility such as a compressor station or gas processing plant. It is established only where the produced fluid is stored separate from a facility used to compress, dehydrate, or process gas or oil. Historically, when the water hub was part of one of these facilities it became integral with the facility, and did not require the distinct designation of a water hub. The BCOGC now assigns a separate water hub facility designation along with the other adjacent facility type at the same site (i.e.: CS – compressor station & WH – water hub). These two facilities can co-exist at the same location, and be permitted under the same facility permit.



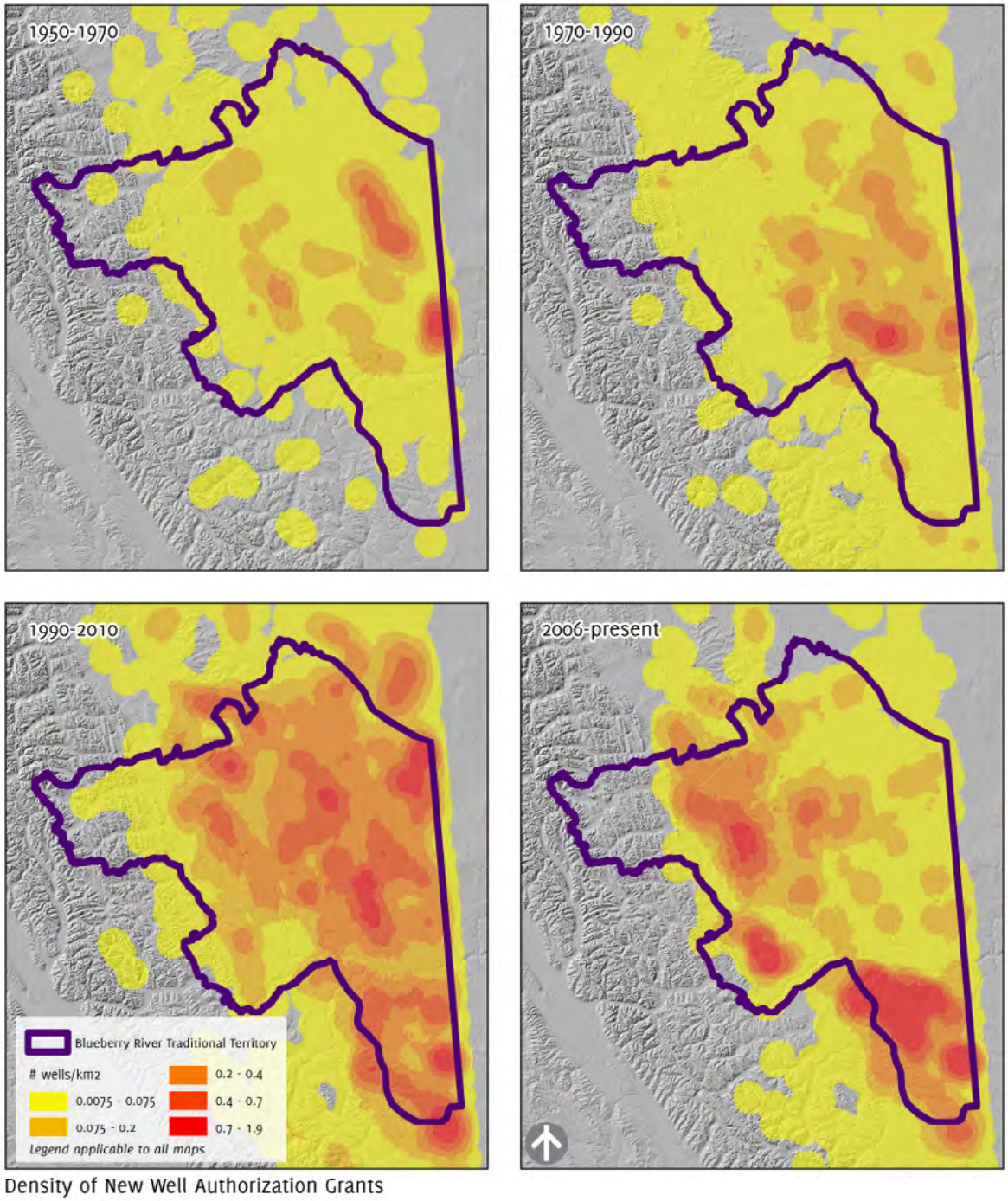
Map 14. Oil and gas wells and facilities as points



Map 15. Oil and gas wells and facilities (100-metre buffer)



Map 16. Density of wells (all statuses)



Map 17. Density of new oil and gas wells between 1950-1970, 1970-1990, 1990-2010, and 2006-present

Oil and gas pipelines

Two pipeline datasets are available publically: those within the Crown Land Tenures,[30] and those from the BC Oil and Gas Commission.[31] While they overlap, some data appears within one dataset and not the other. For this analysis, both datasets were used: the OGC tenure dataset in its entirety, and a filtered[32] Crown Land Tenures. They were combined via a GIS process (union), which creates a new composite feature. As various types of tenure may overlap, the features were then dissolved into a single feature to obtain the total area of pipeline tenure in Blueberry River First Nations traditional territory: 26,334 hectares. The total length[33] of the pipeline tenure is approximately 13,239.76 kilometres. According to the OGC pipeline dataset, 46% of the total area reserved for pipelines as tenures in B.C. is in the traditional territory of Blueberry River First Nations.

Table 14. Oil and gas pipeline rights of way by area

Pipeline Tenures	outside OGC (ha)	inside OGC (ha)	Grand Total
outside Crown (ha)		7,318.4	7,318.4
inside Crown (ha)	14,861.0	4,155.3	19,016.3
Grand Total	14,861.0	11,473.7	26,334.7

Several proposed LNG lines could extend into Blueberry River First Nations traditional territory, including Spectra Westcoast Connector, Coastal GasLink, North Montney Mainline and Prince Rupert Gas Transmission Project. Map 18 also includes pipeline routes from the Government of Canada.[34]

Pipelines in the Traditional Territory of Blueberry River First Nations.

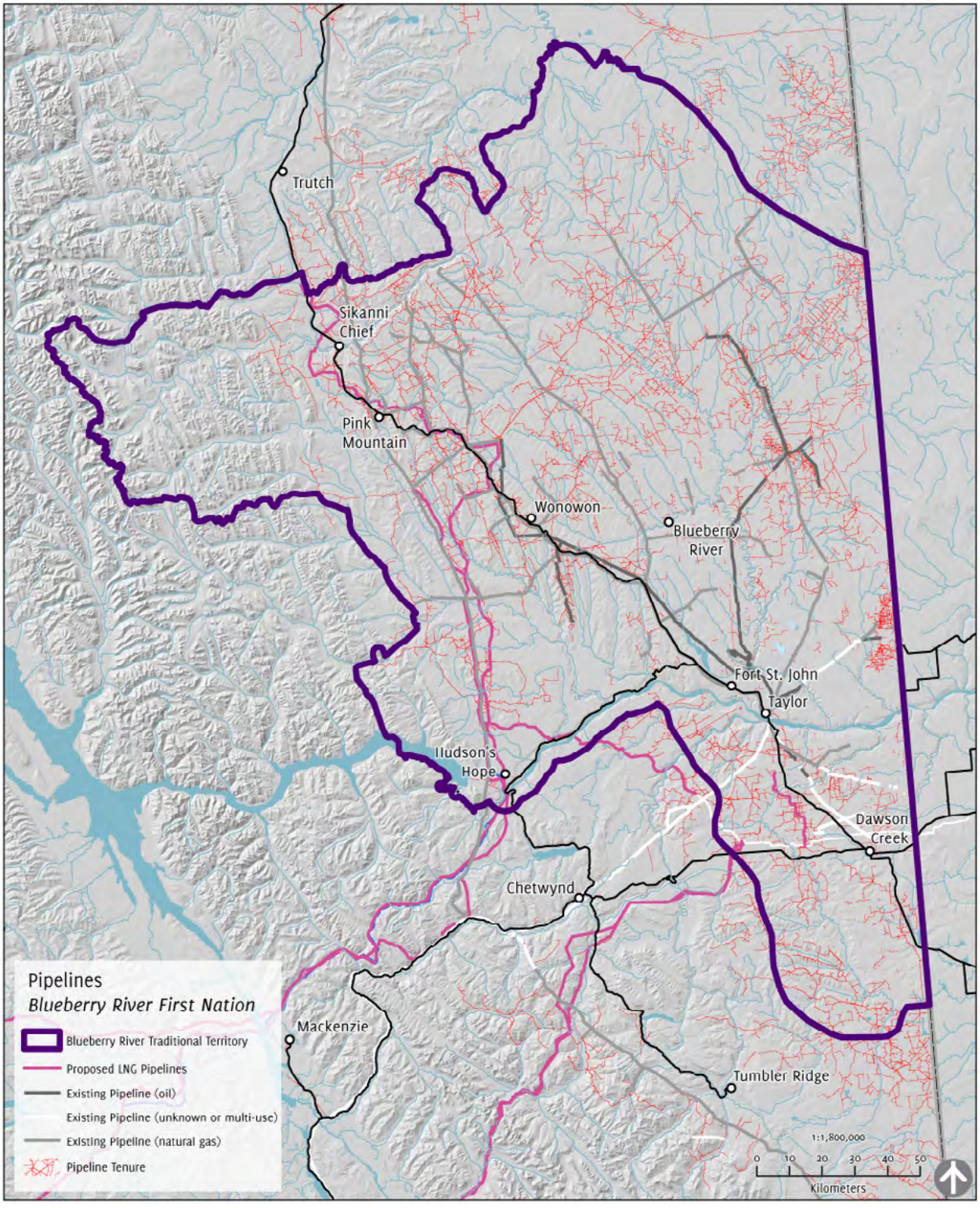
30 Subset of Crown Tenures: http://catalogue.data.gov.bc.ca/dataset/tantalis-crown-tenures

31 Pipeline Rights of Way for British Columbia (polygons): https://www.bcogc.ca/public-zone/gis-data. Note, the same dataset can be obtained from GeoBC here: http://catalogue.data.gov.bc.ca/dataset/ogc-pipeline-rights-of-way-public-version

32 Filtering included: Subpurpose = Gas and Oil Pipeline; Tenure Stage = Tenure (to omit applications); and Tenure Type does not equal Reserve/Notation. Thus, only pipelines with approved tenure are shown and those where tenure stage is application are omitted.

33 The length of the pipelines was calculated from both of the datasets by converting a simplified polygon to lines. It likely overstates the length of the line, as the polygons are larger than the actual line.

34 Pipelines data from CanVec: http://geogratis.gc.ca/site/eng/download. Proposed pipelines from Ecotrust Canada's data catalogue.



Map 18. Oil and gas pipeline rights of way

Oil and gas tenures and fields

Within the Petroleum Titles,[35] petroleum and natural gas leases make up the majority of active tenures (89%). Tenures overlap, including different types of active tenures. For example, a drilling licence could overlap with a petroleum and natural gas lease, as each tenure type confers different rights. Thus, the total area of tenures is larger than the total area of Blueberry River First Nations traditional territory. Accounting for the overlapping tenures, 69% (2,659,002 hectares) of the First Nation's traditional territory is covered in some type of active tenure.

New petroleum and natural gas (PNG) tenures in the Muskwa-Kechika area are limited by the non-legal planning protections of Resource Review Areas[36] as well as Pre-Tenure Plans.[37] Withdrawing these areas as well as parks, 77.66% of the remaining traditional territory of Blueberry River First Nations is covered by active PNG tenures. Sustainable Resource Management Plans can also provide guidelines to help manage oil and gas exploration within the First Nation's traditional territory. The Ministry of Environment has also set out interim operating procedures for oil and gas activities within caribou Wildlife Habitat Areas and Ungulate Winter Ranges, which they expect the Oil and Gas Commission to consider.[38]

Table 15. Oil and gas tenures by tenure type and status

Tenure Type	Active	Cancelled***	Pending	no bid**	Unaccepted**	Withdrawn*	Total (HA)
WESTAR PERMITS		280,090.71					280,090.71
PERMIT "A"		2,641,016.13					2,641,016.13
PERMIT "B"		962,748.05		7,701.83			970,449.88
PERMIT "C"		3,319,480.17					3,319,480.17
PERMIT "D"		39,429.33					39,429.33
DRILLING LICENCE	283,168.64	4,093,231.53	4,489.53	235,532.99	233,924.82	26,476.25	4,876,823.76
DRILLING RESERVATION		1,279,704.86					1,279,704.86
NATURAL GAS LICENCE		229,167.37					229,167.37
NATURAL GAS LEASE	106,262.10	27,669.45					133,931.55

35 Petroleum Title Polygons: http://catalogue.data.gov.bc.ca/dataset/petroleum-title-polygons

36 Resource Review Areas: http://www2.gov.bc.ca/gov/content/industry/natural-gas-oil/petroleum-natural-gas-tenure/information-letters/boreal-caribou and http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-gas-oil/png-crown-sale/information-letters/udd1403revisedresourcereviewareas-fornortherncaribouinthesouthpeaceareaofbc.pdf. Note that RRAs preserve PNG tenures that were active prior to the creation of RRAs.

37 Muskwa-Kechika Pre-Tenure Plans: http://www2.gov.bc.ca/gov/content/industry/natural-gas-oil/petroleum-natural-gas-tenure/pre-tenure-plans

38 Boreal Caribou Management: http://www.env.gov.bc.ca/wld/speciesconservation/bc/index.html

PETROLEUM LEASE	1,112.20	264.14					1,376.34
PETROLEUM AND NATURAL GAS LEASE	3,227,907.51	2,907,072.98		143,585.30	163,880.63	12,561.31	6,455,007.73
SPECIAL AGREEMENT	147.27						147.27
UG/STORAGE LEASE	3,097.00	4,268.65					7,365.65
	3,621,694.72	15,784,143.37	4,489.53	386,820.12	397,805.45	39,037.56	20,233,990.75

* The Ministry has the ability to withdraw a parcel after it has been advertised for disposition. Never sold, withdrawn from sale process by crown, and could not proceed. Withdrawn from posting company itself.

** A parcel that receives no bids or no acceptable bids returns to Crown reserve.

*** A tenure status is listed as cancelled when it is withdrawn, returned or replaced.

Westar Permits, **Drilling Reservations** and **Natural Gas Licences** are historical and no longer issued, which is why the tenure status for each is cancelled. [39]

The Minister can define terms and conditions of **Special Agreements**,[40] which can be more restrictive or liberal than other types of permits and licences. Recent Special Agreements have tended to be partially modeled after drilling licences, and include special terms and conditions specific to those agreements. They are unique areas: sometimes extremely large to encourage exploration (e.g. Klappan), or sometimes related to parks boundaries. There are only a couple of Special Agreement tenures in the province. The tenure that appears in Blueberry River First Nations traditional territory was awarded to Crew Energy as a swap for tenure that falls within the Peace Moberly Tract.

UG/Storage Lease[41] is a lease for a storage container, into which gas is injected so the owner can wait until prices improve.

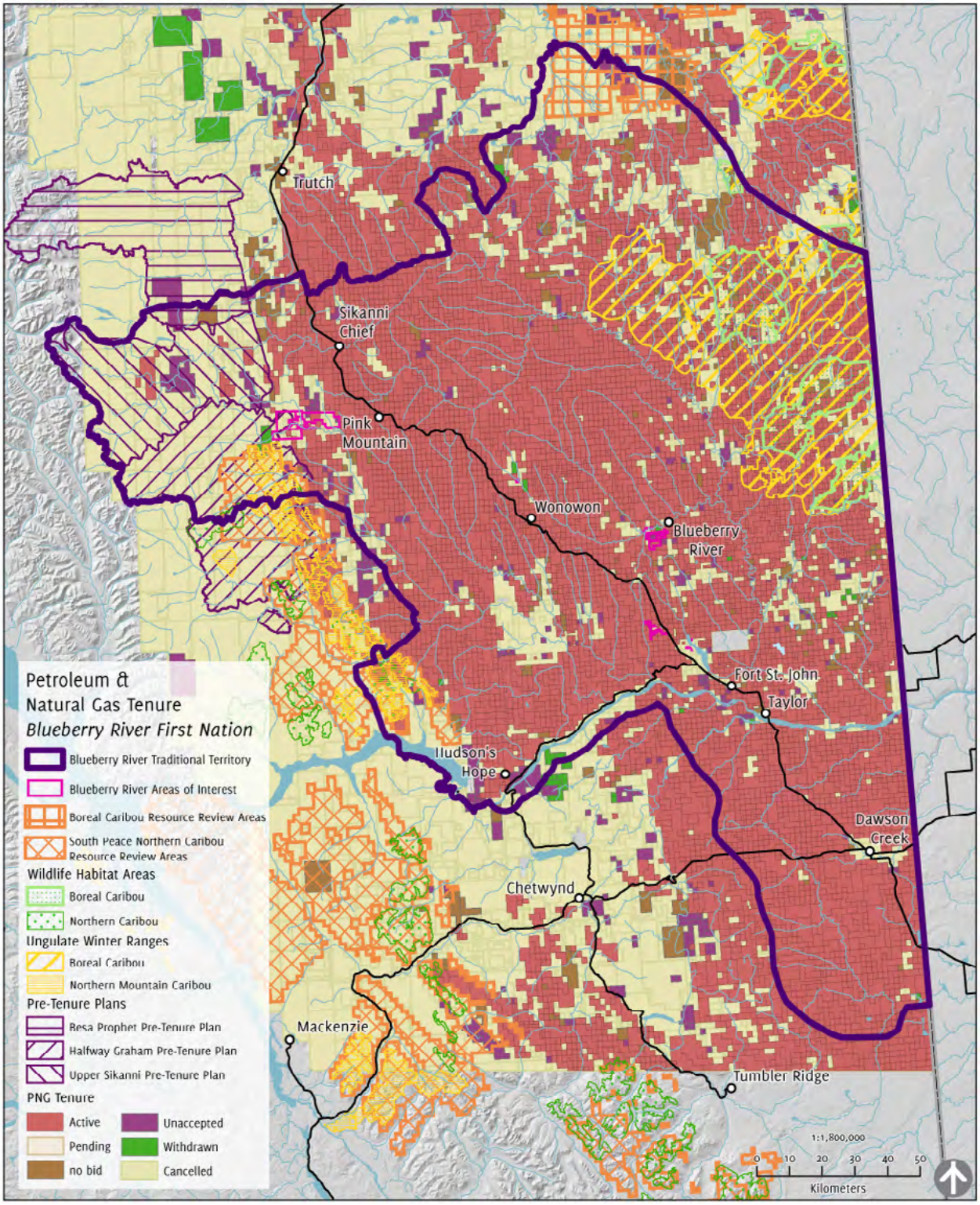
In general, the purpose of **Permits**[42] is to incentivize exploration in relatively unknown areas, via exploratory drilling for one year. The class of the permit depends on its relative accessibility. The purpose of **Drilling Licences** is to incentivize exploration in the form of drilling, for three to five years. Both Permits and Drilling Licences are convertible to leases. The purpose of **Leases** is exploration and production; it is the only form of tenure granting the right to produce natural gas and/or petroleum resources.

39 Terrence Branscombe, Senior Tenure Management Advisor, B.C. Ministry of Natural Gas Development. Personal communication, March 2016.

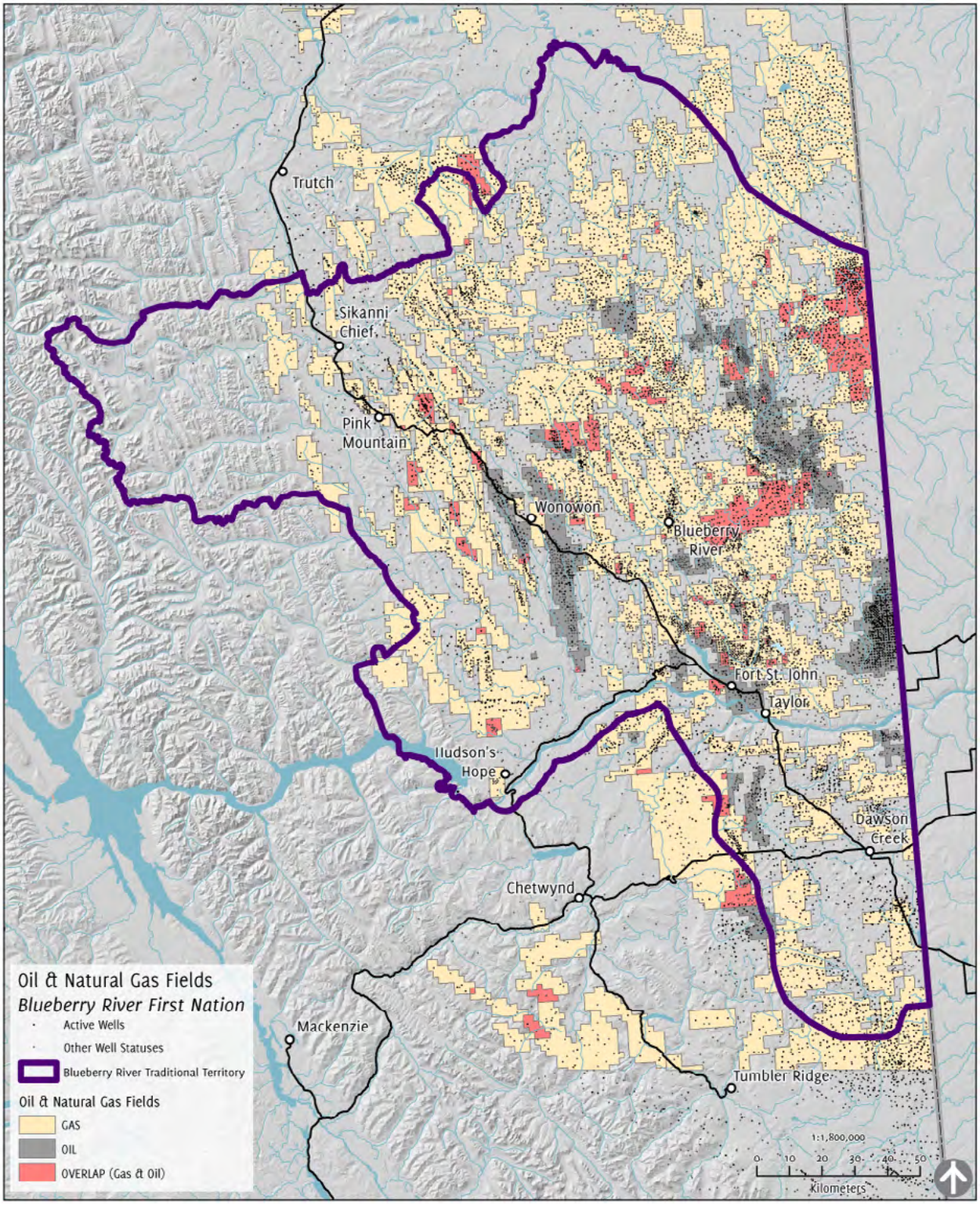
40 Ibid.

41 Ibid.

42 Discussion paper on the tenure provisions of the Petroleum and Natural Gas Act and Regulations: www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-gas-oil/png-crown-sale/publications/png_tenure_discussion_paper.pdf



Map 19. Oil and gas tenures



Map 20. Oil and gas fields with wells

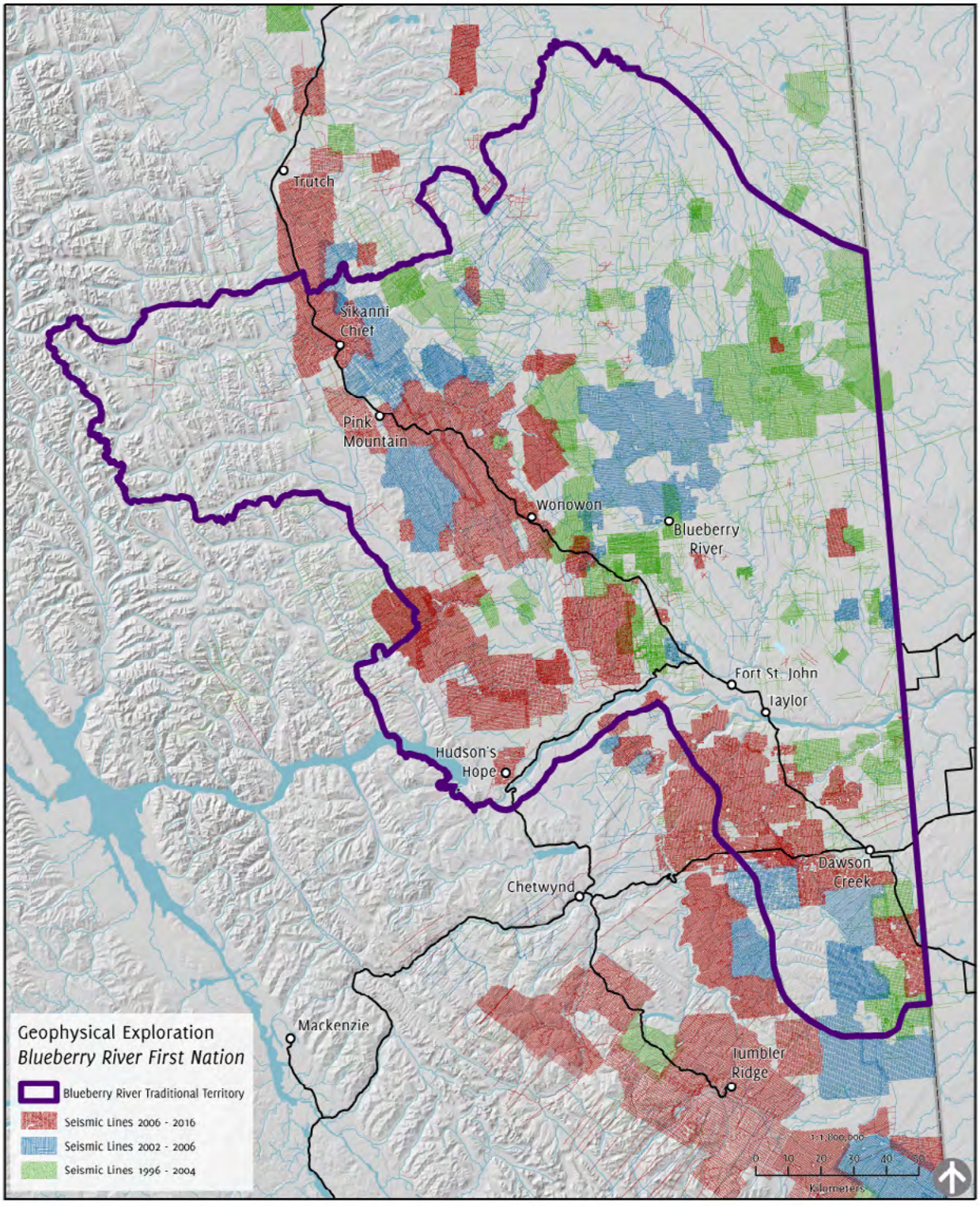
Geophysical exploration

Seismic lines[43] are areas that have been cleared to accommodate oil and gas exploration via reflection of seismic waves that are intentionally created. From 2006 to 2016, 45,603 km of seismic lines have been recorded by the BC Oil and Gas Commission in Blueberry River First Nations traditional territory. The intensity of seismic exploration has shifted westward within the past decade (see Map 22 and Map 23).

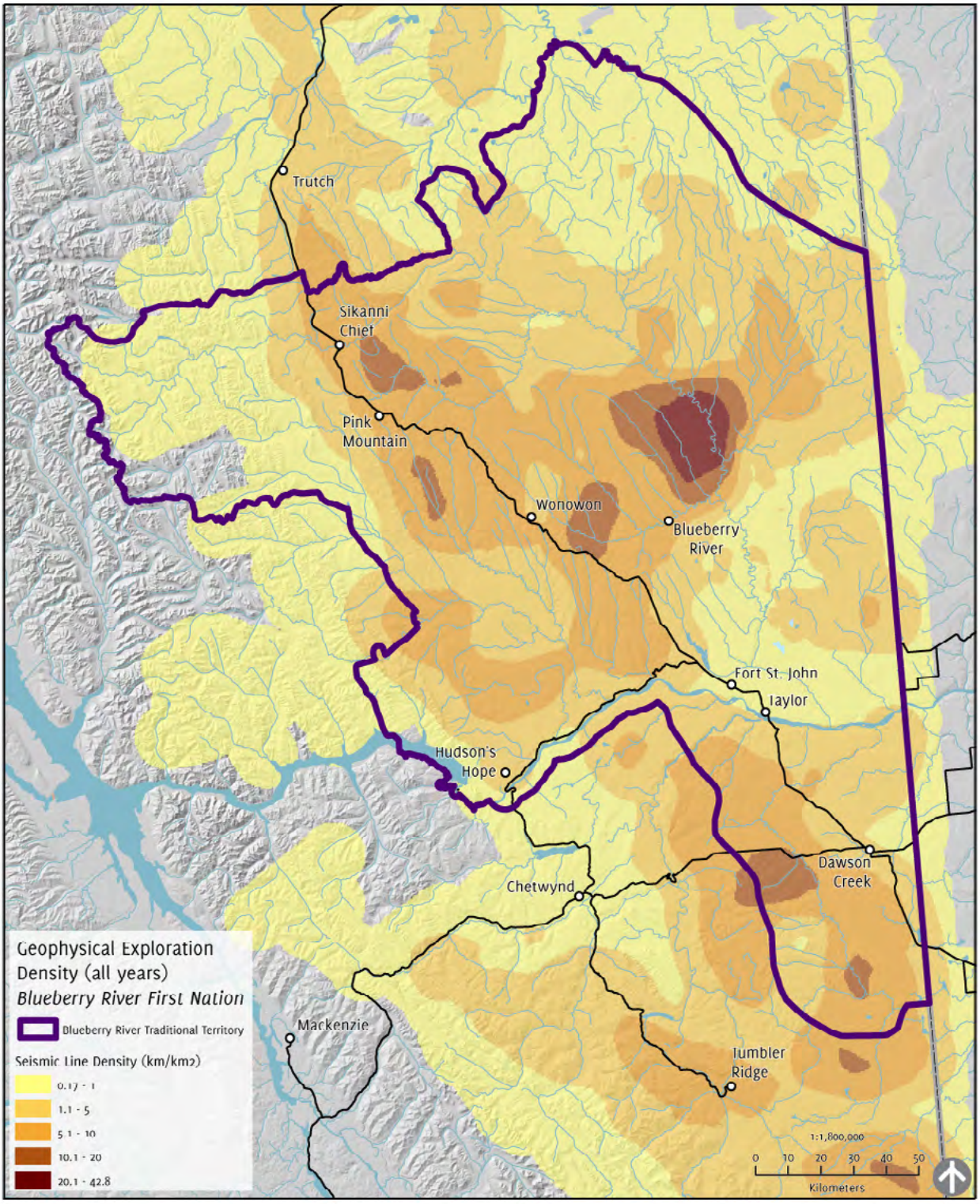
Table 16. Geophysical lines (2006 - 2016) in kilometres, by year of approval and width of line

Year	0-1 m	1-2m	2-3m	3-4m	4-5m	5-6m	Total (km)
2003		80.17	6.38			122.27	208.82
2004		312.39	24.94		19.11	283.59	640.03
2005	0.71	598.94	11.27	604.14	38.57	181.73	1,435.36
2006		627.26	55.54	114.18	688.05	199.57	1,684.60
2007	0.08	1,689.78	490.99	544.24	1,936.27	636.21	5,297.57
2008	1,364.67	4,403.43	1,023.58	1,378.25	2,318.80	447.07	10,935.80
2009	602.44	269.53	189.68	121.45	119.26	516.70	1,819.06
2010		2,110.38	824.53	1,062.48	65.61	127.07	4,190.07
2011		2,928.63	816.59	1,946.36	530.84	550.56	6,772.98
2012		1,246.73	851.99	1,170.49	649.93	67.01	3,986.15
2013	737.69	1,844.74	1,244.91	1,064.23	136.23	166.43	5,194.23
2014	0.79	1,207.15	1,166.89	692.81	29.03	30.87	3,127.54
2015		369.47	417.16	449.69	35.44	38.65	1,310.41
Total	2,706.38	17,688.60	7,124.45	9,148.32	6,567.14	3,367.73	46,602.62

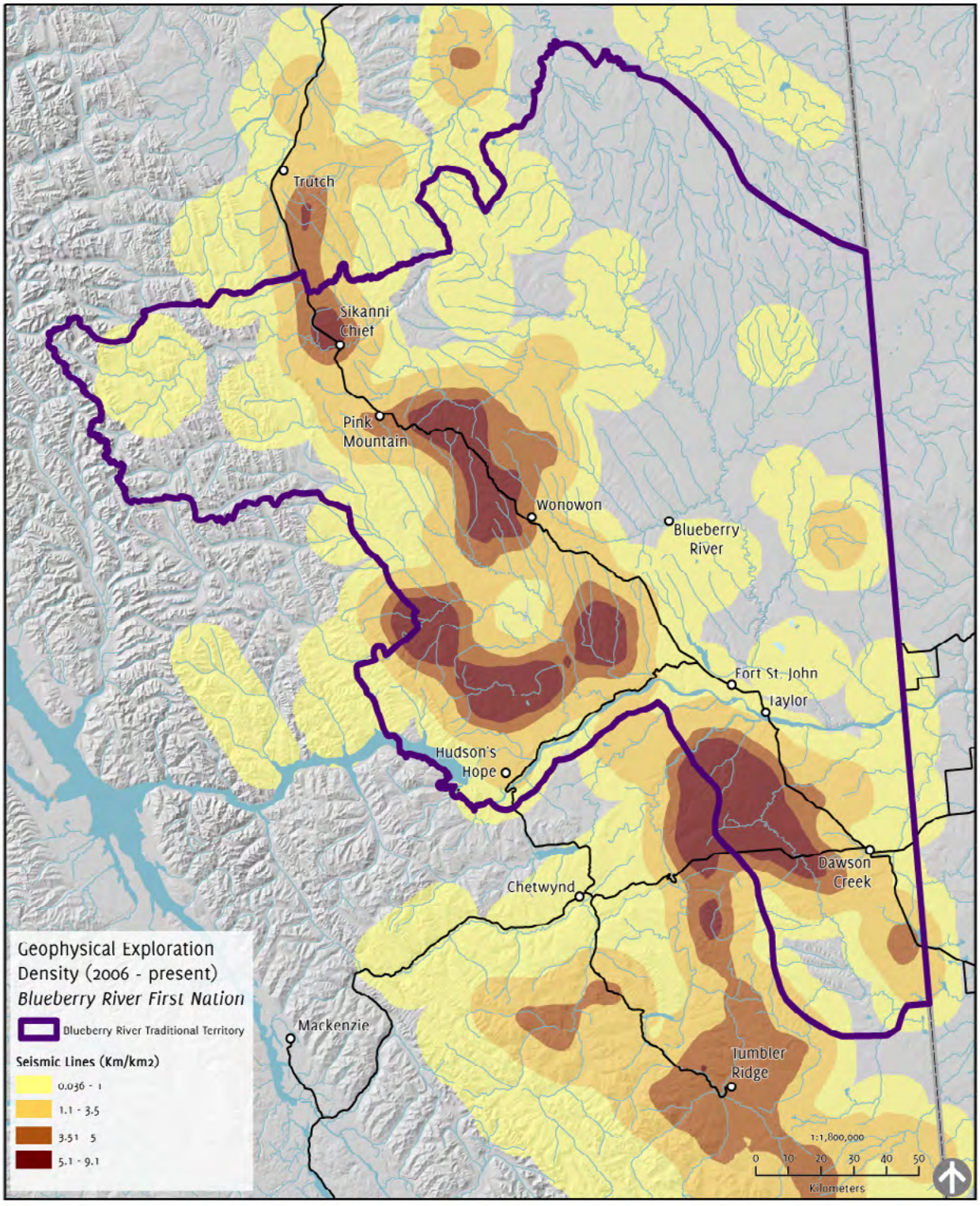
43 Geophysical (Seismic) Features for British Columbia (Lines): https://www.bcogc.ca/public-zone/gis-data



Map 21. Geophysical exploration lines



Map 22. Density of seismic exploration (all years)



Map 23. Density of seismic exploration (2006-present)

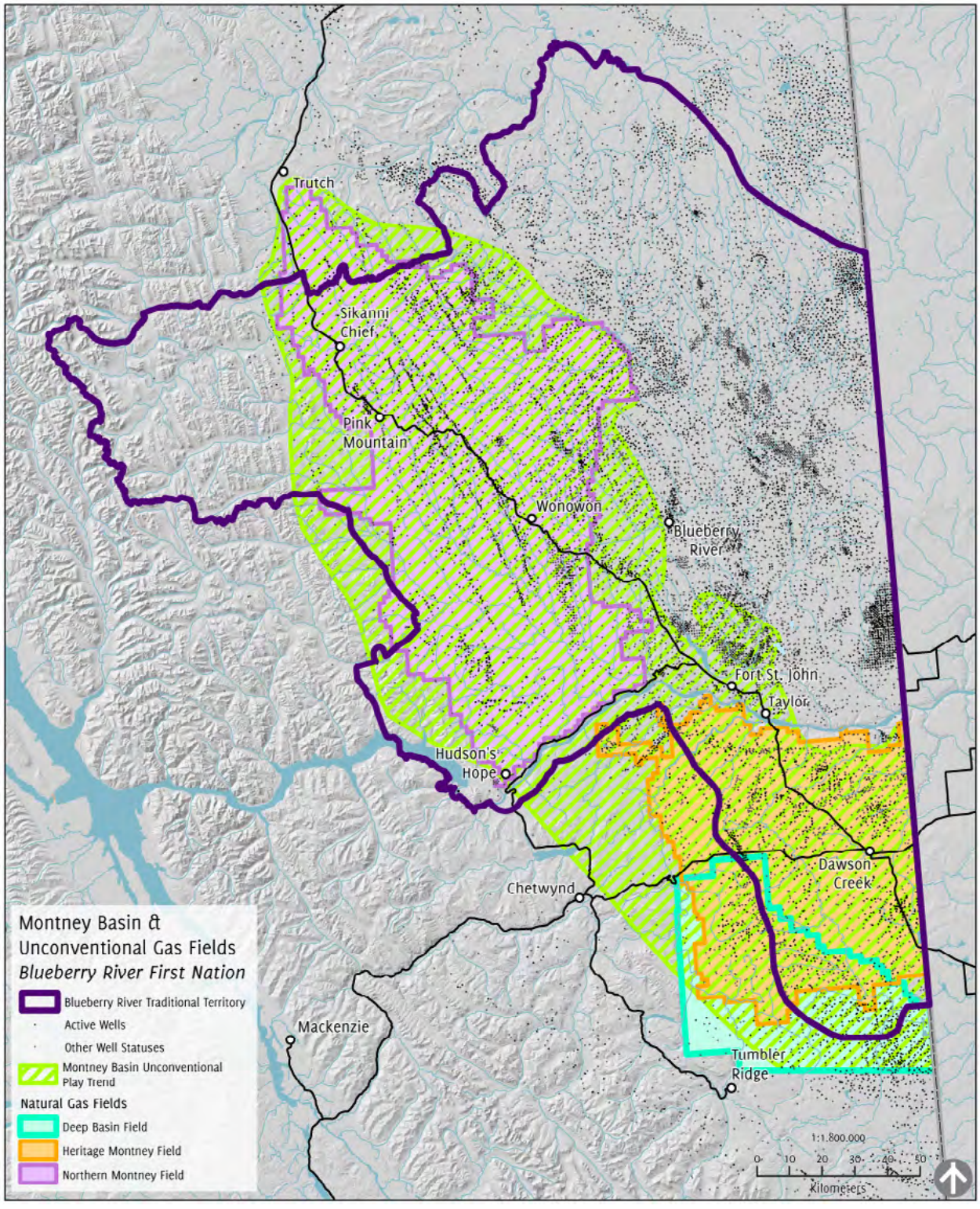
Unconventional natural gas fields and Montney Basin play trend

The Montney Formation is a geologic unit with major oil and gas reserves. A recent report by the National Energy Board found that "the potential for unconventional petroleum in the Montney Formation is estimated to be very large with expected volumes of 12,719 billion m^3 (449 Tcf) of marketable natural gas, 2,308 million m^3 (14,521 million barrels) of marketable natural gas liquids (NGLs), and 179 million m^3 (1,125 million barrels) of marketable oil. The marketable gas estimate makes it one of the largest known gas resources in the world."[44]

Unconventional natural gas fields, the Montney Basin and oil and gas wells are shown on Map 24. Unconventional natural gas can include shale gas, coalbed methane and tight gas.

The Traditional Territory of Blueberry River First Nations.

44 https://www.neb-one.gc.ca/nrg/sttstc/ntrlgs/rprt/ltmtptntlmntnyfrmtn2013/ltmtptntlmntnyfrmtn-2013fq-eng.html



Map 24. Unconventional oil and gas fields and Montney Basin

Water withdrawals and stream crossings

The BC Oil and Gas Commission can authorize access to surface water for oil and gas activities, under Section 8[45] of the Water Act.[46] These water use approvals last for up to one year, and are non-transferrable.

Streams and rivers are the source of the largest volume of water withdrawn (64%) in Blueberry River First Nations traditional territory from 2006 to 2015. The highest number of water withdrawals[47] in the First Nation's traditional territory is from water source dugouts, which account for 59% of all withdrawal points. They are defined as a borrow pit that has accumulated water, such as from snowmelt, rainfall or groundwater inflow.[48]

Table 17. Types of water withdrawal

Water Withdrawal Locations	Approved Total Volume (m3)	Number of Withdraw-als	Volume per withdrawal (m3)	% of overall withdrawal
Lake	46,990	6	7,832	0.4%
Other	78,900	12	6,575	0.6%
Stream/River	8,392,232	88	95,366	63.8%
Water Source Dugout	3,949,248	278	14,206	30.0%
Water Storage Site	683,446	23	29,715	5.2%
Unidentified	-	61		
Total	13,150,816	468	28,100	100.0%

Section 9 of the Water Act regulates "changes in or about a stream." Section 9[49] crossing points are shown where the Commission has approved points of crossing over streams. These points must be applied for by an oil and gas operator in relation to their own oil and gas operations and are approved under the delegated authorities by the Water Act. The total number of points under Section 9 of the Water Act in Blueberry River First Nations traditional territory is 1,076.

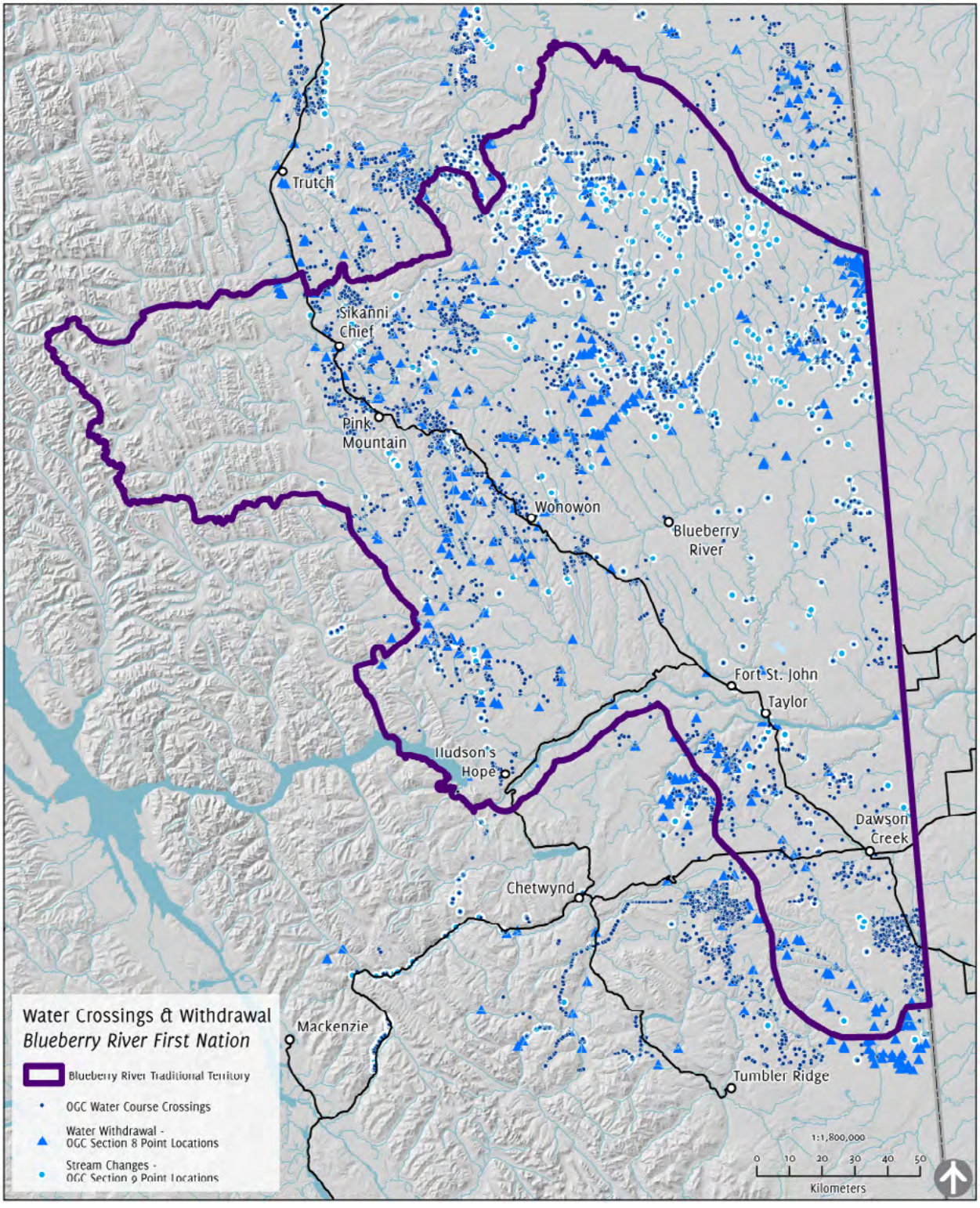
45 The Water Sustainability Act SBC 2015 c. 14 took effect February 29, 2016 and replaced the Water Act. What was Section 8 in Water Act is now Section 10 in the Water Sustainability Act and what was Section 9 is now Section 11.

46 BC Oil and Gas Commission Fact Sheet: https://www.bcogc.ca/node/11474/download

47 OGC Section 8 Point Locations (Public Version): http://catalogue.data.gov.bc.ca/dataset/ogc-section-8-point-locations-public-version (also available at the OGC website)

48 http://fracfocus.ca/hydraulic-fracturing-how-it-works/casing/borrow-pits-water-storage-sites

49 OGC Section 9 Point Locations (Public Version): http://catalogue.data.gov.bc.ca/dataset/ogc-section-9-point-locations-public-version (also available at the OGC website).



Map 25. Oil and gas water withdrawal and stream crossings

Watercourse crossings[50] refer to any type of stream crossing as indicated in the Northeast BC Stream Crossing Planning Guide, such as a clear-span, snowfall, ice bridge, etc. The method by which a stream is crossed may be indicated on a Section 9 application form, or may be noted on any other type of application received by the Commission where a stream crossing is required.

Table 18. Number of stream crossings by type of crossing

Type of Crossing	Number of Crossings
Bore	644
Blown Snow Bridge	1
Clearspan Bridge	66
Culvert	432
Ice Bridge	2
Bridge	4
Major Culvert	12
Native Timber Bridge	73
Open Cut	283
Other	1842
Snowfill	217
Winter Crossing	106
Grand Total	3682

50 OGC Water Course Crossings (Public Version): http://catalogue.data.gov.bc.ca/dataset/ogc-water-course-crossings-public-version (also available at the OGC website)

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Forestry

A variety of datasets can be used to describe forestry activities in British Columbia.

Forest Tenure Cutblocks reflect where an agreement holder has the authority to harvest timber and does not necessarily represent harvested areas. RESULTS Openings are administrative boundaries for areas harvested with silviculture obligations or natural disturbances with intended forest management activities on Crown Land.

Table 19. Forest disturbances based on RESULTS Openings and Forest Tenure Cutblocks data

Opening Code	Forest Tenure Cutblocks	Not Forest Tenure Cutblocks	Total (ha)	% BRFN
Burnt Wildfire	917.49	26,702.61	27,620.10	0.72%
Flood	101.80	108.64	210.44	0.01%
Logging	83,193.25	96,924.50	180,117.75	4.70%
Pest (beetle)		223.91	223.91	0.01%
Rehabilitation	261.66	3,910.49	4,172.15	0.11%
Salvage	429.33	3,014.96	3,444.29	0.09%
No code	61,690.96	388.45	62,079.41	1.62%
Grand Total	146,594.49	131,273.56	277,868.05	7.25%
% BRFN	3.82%	3.43%		

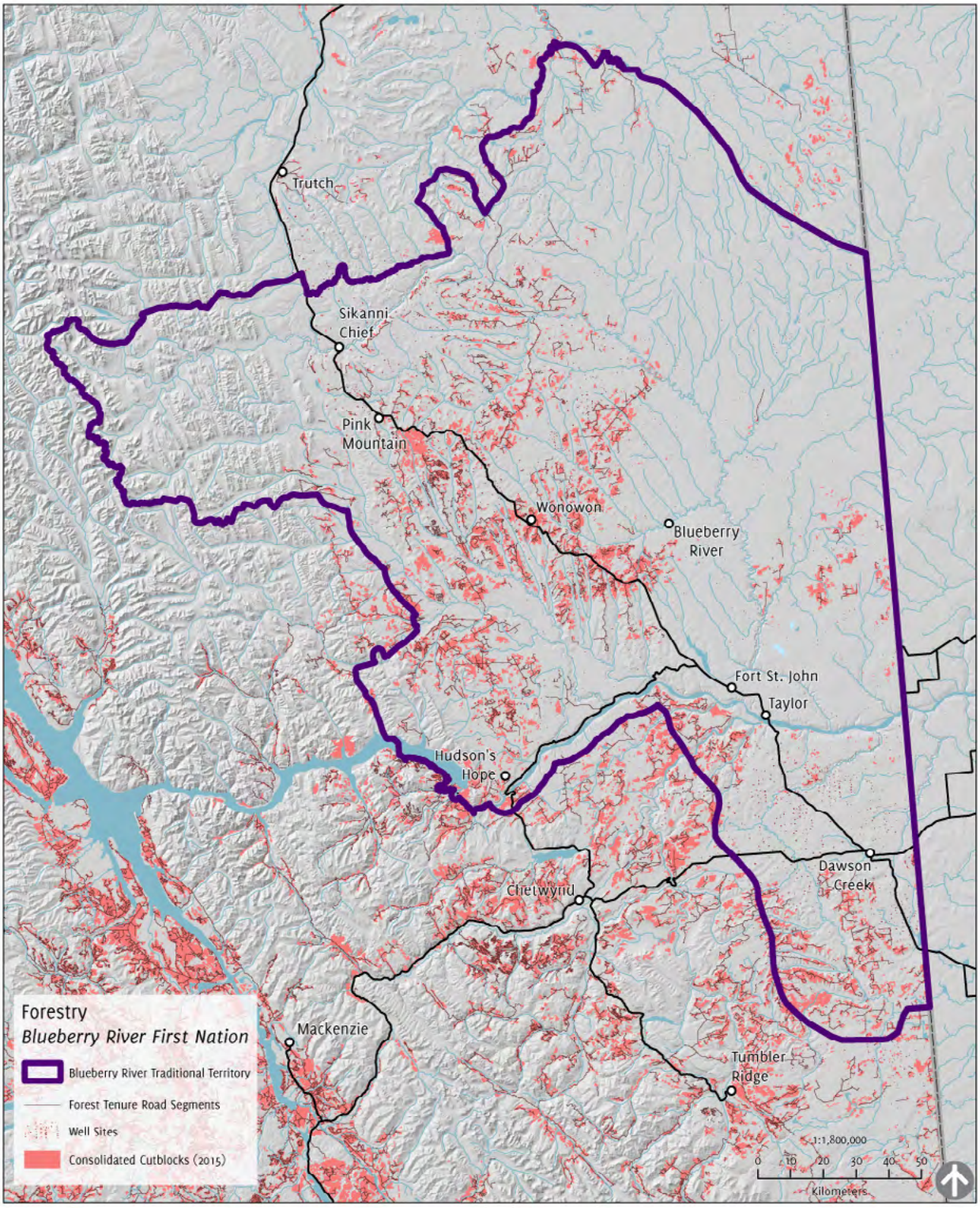
A compilation dataset is available on the Ministry of Forests FTP[51] site. It uses a compilation of both of the above datasets, as well as the Vegetation Resources Inventory and an analysis via remote sensing.

The 2015 compilation dataset indicates that 195,091 ha, or 5%, of Blueberry River First Nations traditional territory has been logged since 1950. A 2015 THLB dataset[52] indicates that the Timber Harvesting Land Base in the First Nation's traditional territory is 1,087,757.7 ha.

The data does not include the clearing required for other industrial activities, such as agriculture, pipelines, seismic lines, well sites, roads, facilities, etc. The area of well site locations in Blueberry River First Nations traditional territory is 10,482 ha.

51 2015 Consolidated Cutblocks: https://www.for.gov.bc.ca/ftp/hts/external/!publish/consolidated_cutblocks/

52 https://www.for.gov.bc.ca/ftp/hts/external/!publish/THLB/2015_BC_THLB/



Map 26. Forestry: consolidated cutblocks

The Traditional Territory of Blueberry River First Nations.

Mining

There are currently no mines[53] within Blueberry River First Nations traditional territory, although there are four past producers, six prospects, one developed prospect and 20 showing surface location of a mineral. Two major proposed coalmines are located very close to the First Nation's traditional territory.[54]

Mining tenures[55] cover 2% of the First Nation's traditional territory. Coal tenures account for 96% of these tenures.

Table 20. Mining tenures by owner

Owner	Coal (ha)	Mineral (ha)	Grand Total
CANADA BENELAND ENERGY LTD.	20,371.56		20,371.56
CANADIAN KAILUAN DEHUA MINES CO., LTD	940.58		940.58
CANADIAN SUN COAL EXPLORATION LTD.	3,228.89		3,228.89
CENTERPOINT RESOURCES INC.	16,648.27		16,648.27
DUNLEVY ENERGY INC.	2,499.23		2,499.23
HUNEAULT, JOSEPH LLEWELLYN		180.94	180.94
KITZUL, BLAINE BRENT		72.13	72.13
NORTH AMERICA MINING INC.		140.82	140.82
NWP COAL CANADA LTD.	1,702.05		1,702.05
PANSTONE MINES AND MINERALS INC.	5,920.11		5,920.11
PEACE RIVER COAL INC.	428.44		428.44
PRUDEN, RALPH DONALD		18.05	18.05
RICHFIELD MINERALS INC.	6,761.88		6,761.88
ROBATZEK, MICHAEL ERNEST		72.21	72.21
SELKIRK METALS CORP.		1,887.78	1,887.78
ZUCTON MINING CORP.	504.49		504.49
Grand Total	59,005.50	2,371.93	61,377.43

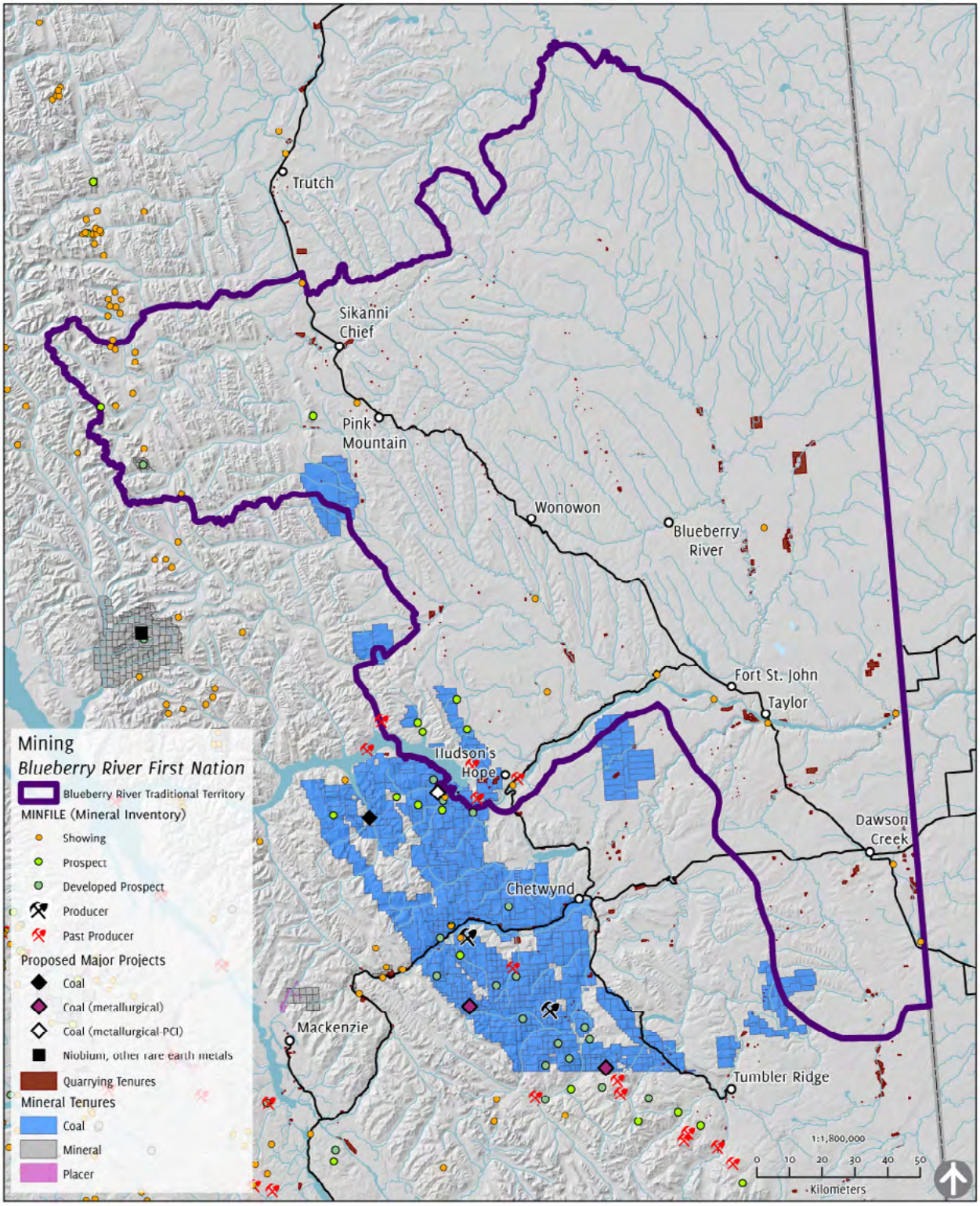
There are 310 tenures or tenure applications for quarrying within Blueberry River First Nations traditional territory. The majority (96%) are for sand and gravel.[56]

53 MINFILE Mineral Occurrence Database: http://catalogue.data.gov.bc.ca/dataset/minfile-mineral-occurrence-database

54 Natural Resource Sector Major Projects – Points: https://catalogue.data.gov.bc.ca/dataset/natural-resource-sector-major-projects-points

55 MTA – Mineral, Placer and Coal Tenure Spatial View: http://catalogue.data.gov.bc.ca/dataset/mta-mineral-placer-and-coal-tenure-spatial-view

56 Crown Land tenures, described elsewhere in this document.



Map 27. Mining tenure and projects

Hydropower

In 2013, BC Hydro completed a Resource Options Report Update,[57] intended to assess various resources that could provide electricity. One of the potential technologies examined is run-of-the-river. The update provided a further refinement of previous estimations and removed many of the potential sites previously identified.

Table 21. Number of potential run-of-the-river developments by capacity

Installed Capacity (MW)[58]	Number of Sites
0.124-0.624	79
0.624-1.124	18
1.124-1.624	4
1.624-2.124	1
2.624-3.124	1
3.124-3.624	1
Grand Total	104

Two hydro dams are located within Blueberry River First Nations traditional territory: W.A.C. Bennett (completed in 1968, creating the Williston Reservoir) and Peace Canyon (completed in 1980, creating the Dinosaur Reservoir). W.A.C. Bennett has a generating capacity of 2,730 MW; Peace Canyon's generating capacity is 694 MW. The permit over Crown Land for Dinosaur Reservoir covers 861 ha (all but two hectares within Blueberry River First Nations traditional territory). The permit for Williston Reservoir covers 175,615 ha, 10,329 ha of which is located within the First Nation's traditional territory.

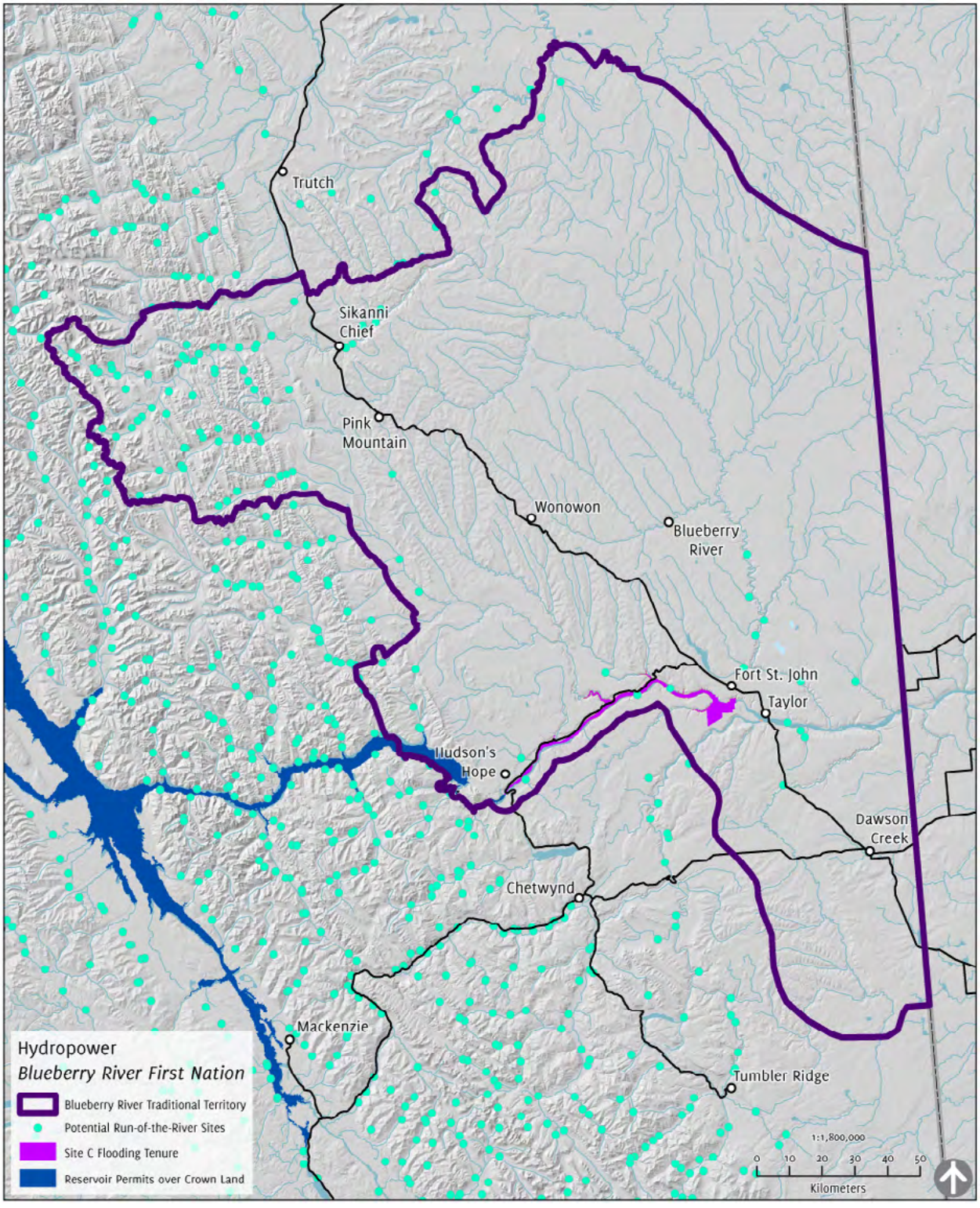
Site C dam and reservoir was approved[59] on Dec. 16, 2014, and construction is underway. It will provide 1,100 MW of capacity. The tenure allocated for flooding is 17,203 ha, however the total reservoir surface area is planned to be 9,310 hectares.[60]

57 2013 Resource Options Report Update: https://www.bchydro.com/energy-in-bc/meeting_demand_growth/irp/document_centre/reports/2013-ror-update.html

58 Installed capacity is the maximum power that can be generated at the site.

59 https://www.sitecproject.com/news-and-information

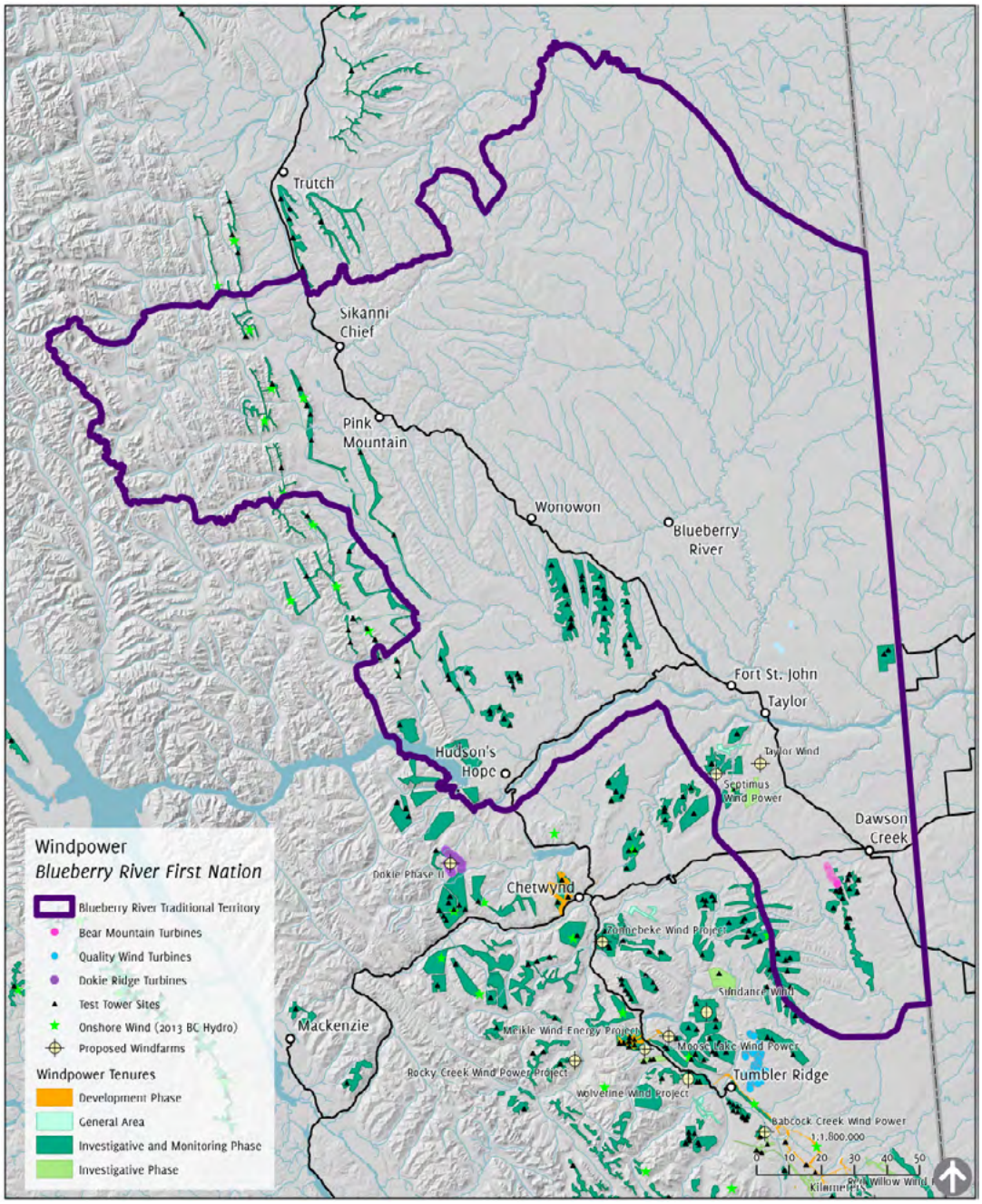
60 https://www.bchydro.com/content/dam/hydro/medialib/internet/documents/news/press_releases/clean_energy_act/fact_sheet_site_c.pdf



Map 28. Current and potential run-of-the-river hydropower development

Wind

There are 91,183 ha of wind power tenures[61] within Blueberry River First Nations traditional territory (2%). One operational wind farm[62] along Bear Mountain contains 34 turbines. Eighty-nine tenure plots appear to be for investigative towers. BC Hydro also identified six on-shore wind power sites in the 2013 Resource Options inventory. Two wind farms are proposed within the First Nation's traditional territory.[63]



Map 29. Wind power tenure and towers

61 Subset of Crown Tenures: http://catalogue.data.gov.bc.ca/dataset/tantalis-crown-tenures

62 http://aeoliswind.ca/chapter-links/bear-mountain/

63 Natural Resource Sector Major Projects – Points: https://catalogue.data.gov.bc.ca/dataset/natural-resource-sector-major-projects-points

Cumulative Effects

The Canadian Environmental Assessment Agency defines cumulative effects as "changes to the environment that are caused by an action in combination with other past, present and future human actions."[64]

Using several industrial and infrastructure datasets, the data presented above was analyzed in order to determine disturbed areas in Blueberry River First Nations traditional territory.

For the footprint, roads (buffered from the centerline by 5 m, for a total width of 10 m), transmission lines (buffered from the centerline by 5 m, for 10 m total width), seismic lines (buffered from the centerline by 1 m, for 2 m total width), pipeline tenures, consolidated cutblocks and agricultural areas were used.[65]

Since industrial activities have ecological effects beyond their actual footprint, the footprint datasets (roads, transmission lines, pipeline tenures, cutblocks, agricultural areas and seismic lines) were buffered by 250 m (Map 31) and 500 m (Map 32). The roads and seismic lines were buffered from the original centerlines, whereas the transmission lines were buffered from the width in the footprint (10 m). The other features are areas; the buffer is measured from their original extent.

Seismic lines were included in the analysis as they can have a significant impact on the landscape. However, an analysis was also included without them in order to make a comparison to Lee & Hanneman (2012), which did not include seismic data. The seismic data included in this analysis is used as publicly published by the government of British Columbia.

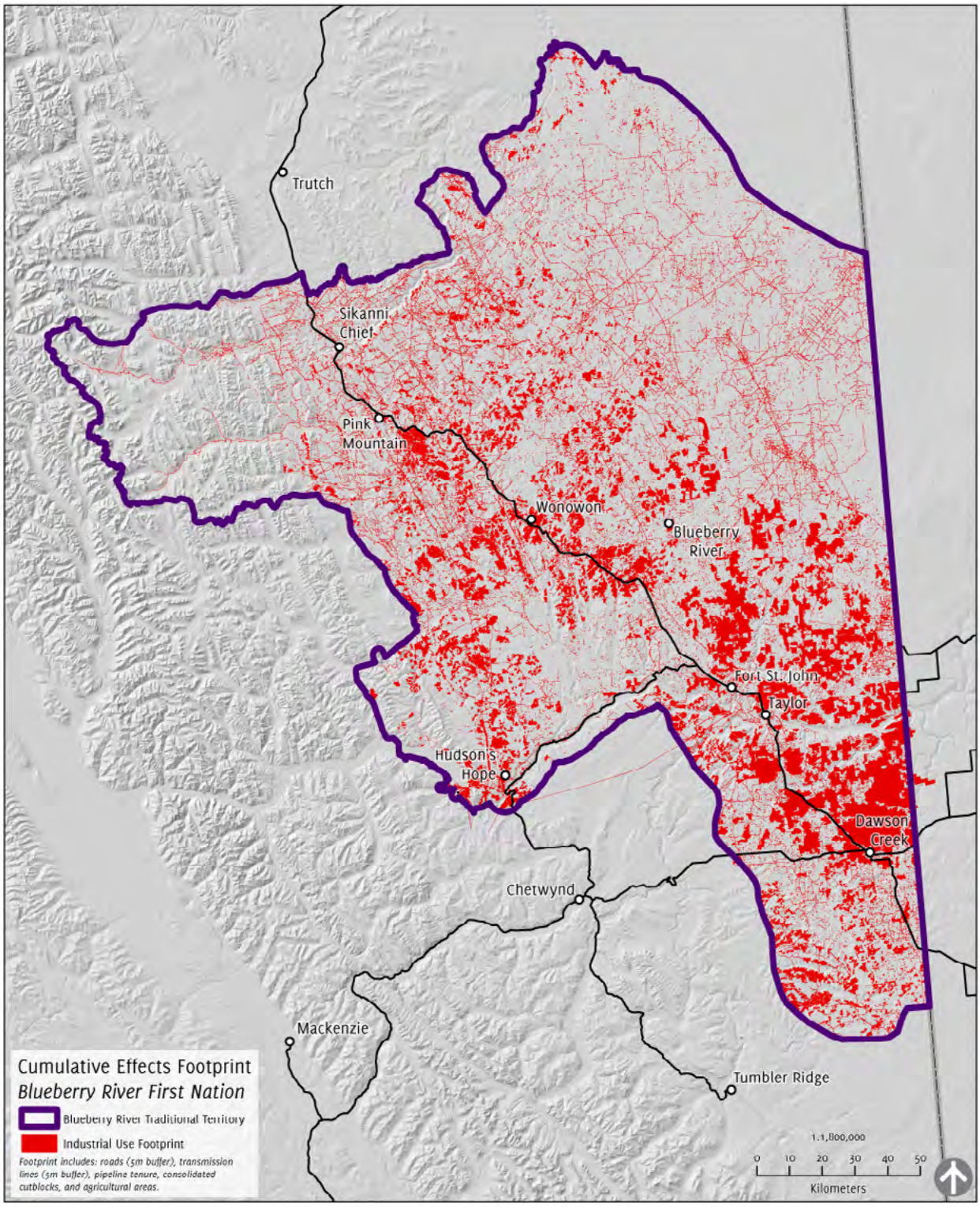
73% of the area inside Blueberry River First Nations traditional territory is within 250 metres of an industrial disturbance, and 84% is within 500 metres of an industrial disturbance.

Table 22. Extent of cumulative effects in Blueberry River First Nations traditional territory

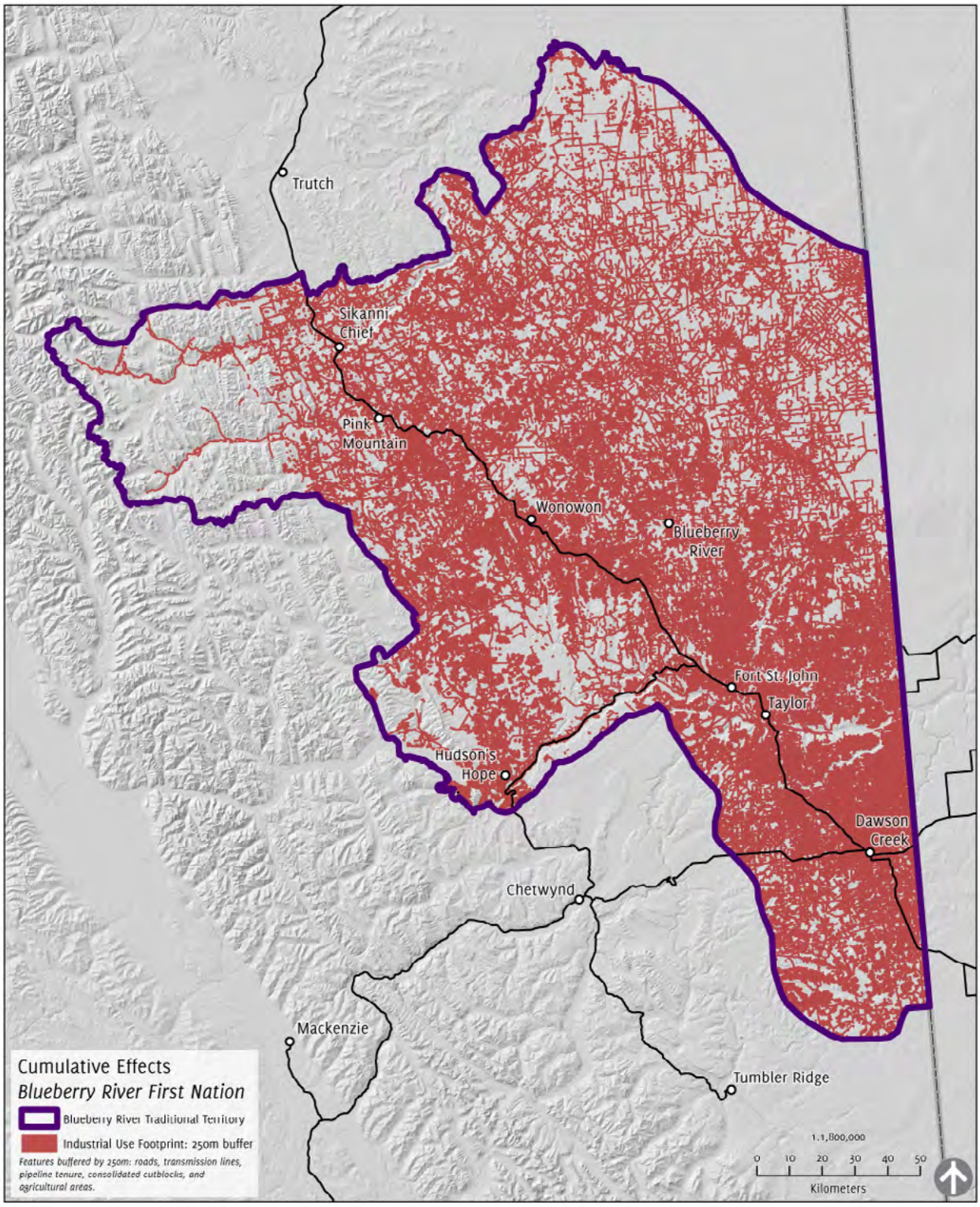
Buffer distance	Without seismic lines (HA)	% BRFN affected	With seismic lines (HA)	% BRFN affected
Footprint	481,575	12.6	499,318	13.0
250m	2,123,305	55.4	2,783,747	72.6
500m	2,854,523	74.5	3,215,578	83.9

64 Cumulative Effects Assessment Practitioners' Guide: http://www.ceaa.gc.ca/default.asp?lang=En&n=43952694-1&toc=show&offset=6

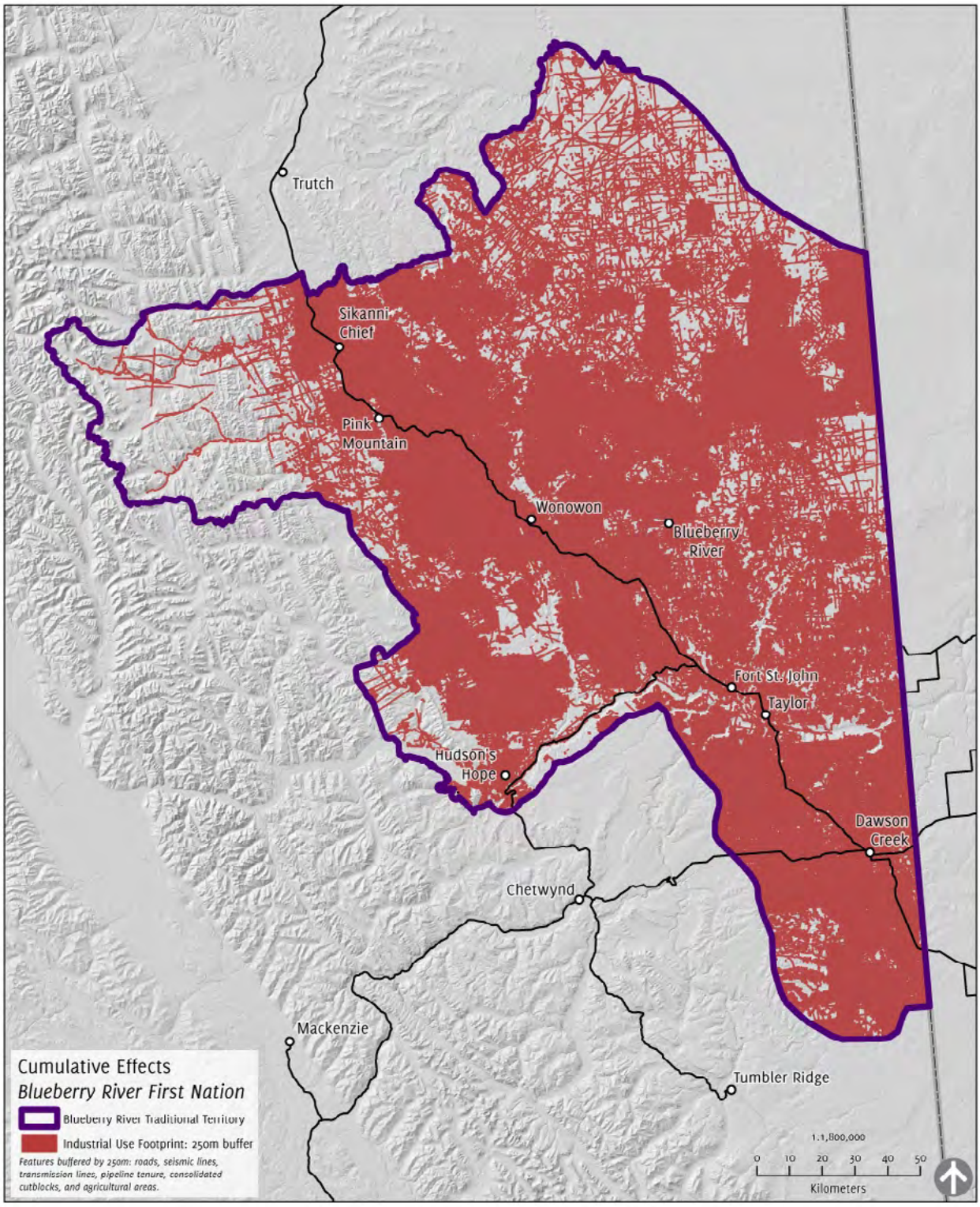
65 The buffer for the roads was determined in conjunction with a Registered Professional Forester staff member at Ecotrust Canada (Satnam Manhas). Ten metres is considered the minimum amount of width a road will use. The width for transmission lines was determined by reviewing the width allowed in Crown Land tenure as well as the cleared area on satellite imagery. The buffer for seismic lines was determined based on the width column within the data. For the 2006-2016 dataset, the average width of the features is 2.3 m.



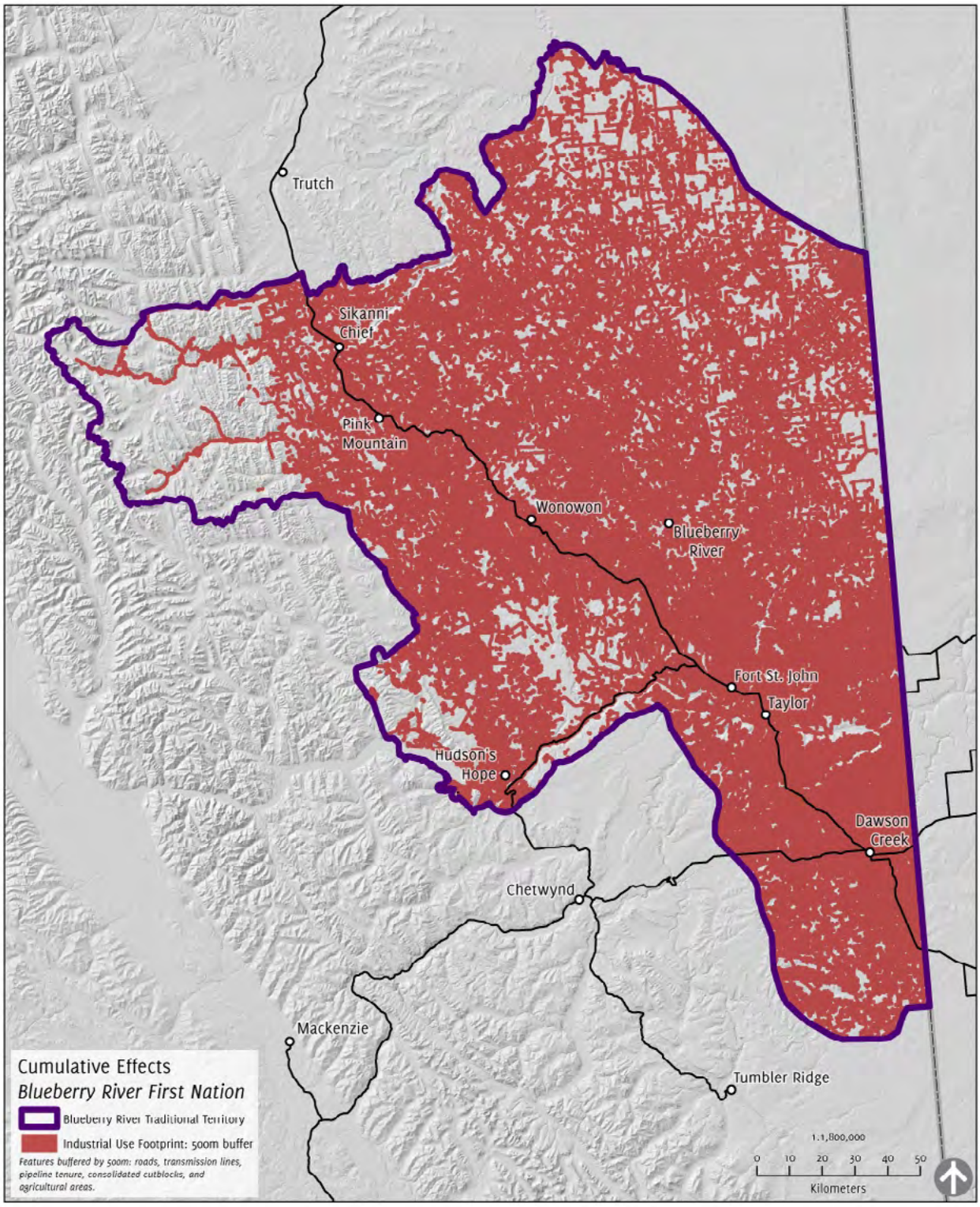
Map 30. Cumulative effects footprint



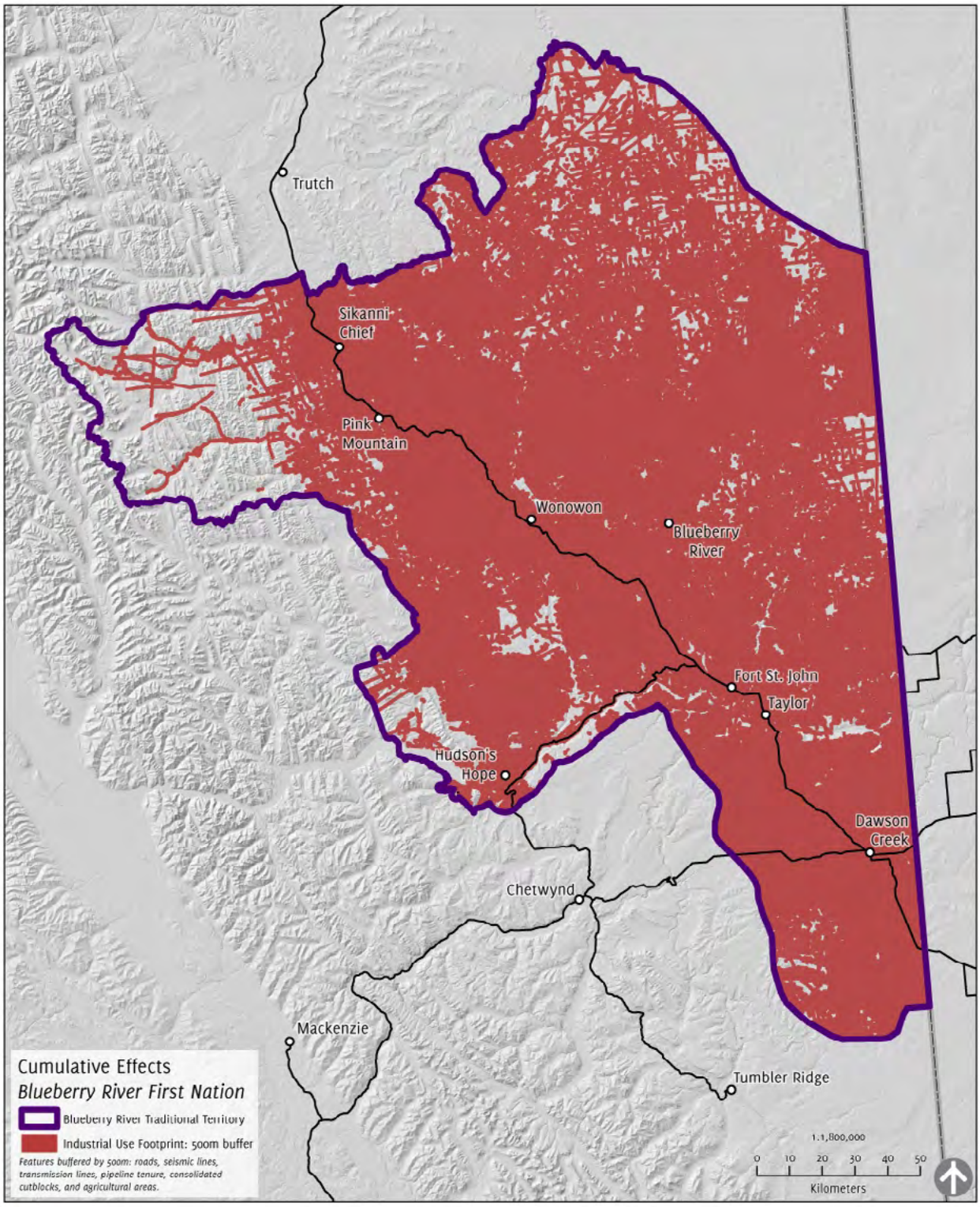
Map 31. Cumulative changes (buffered by 250 m)



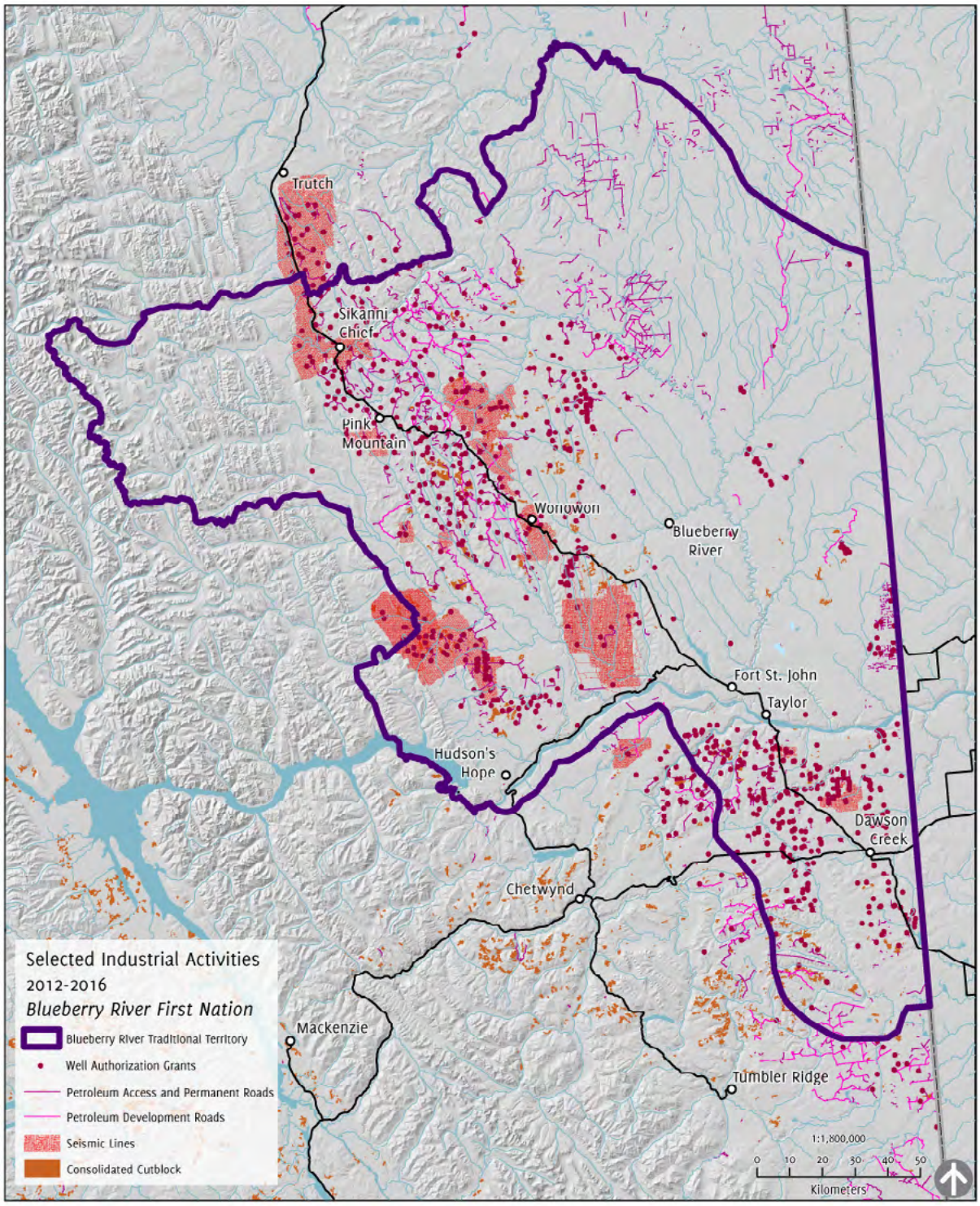
Map 32. Cumulative changes – including seismic lines (buffered by 250 m)



Map 33. Cumulative changes (buffered by 500 m)

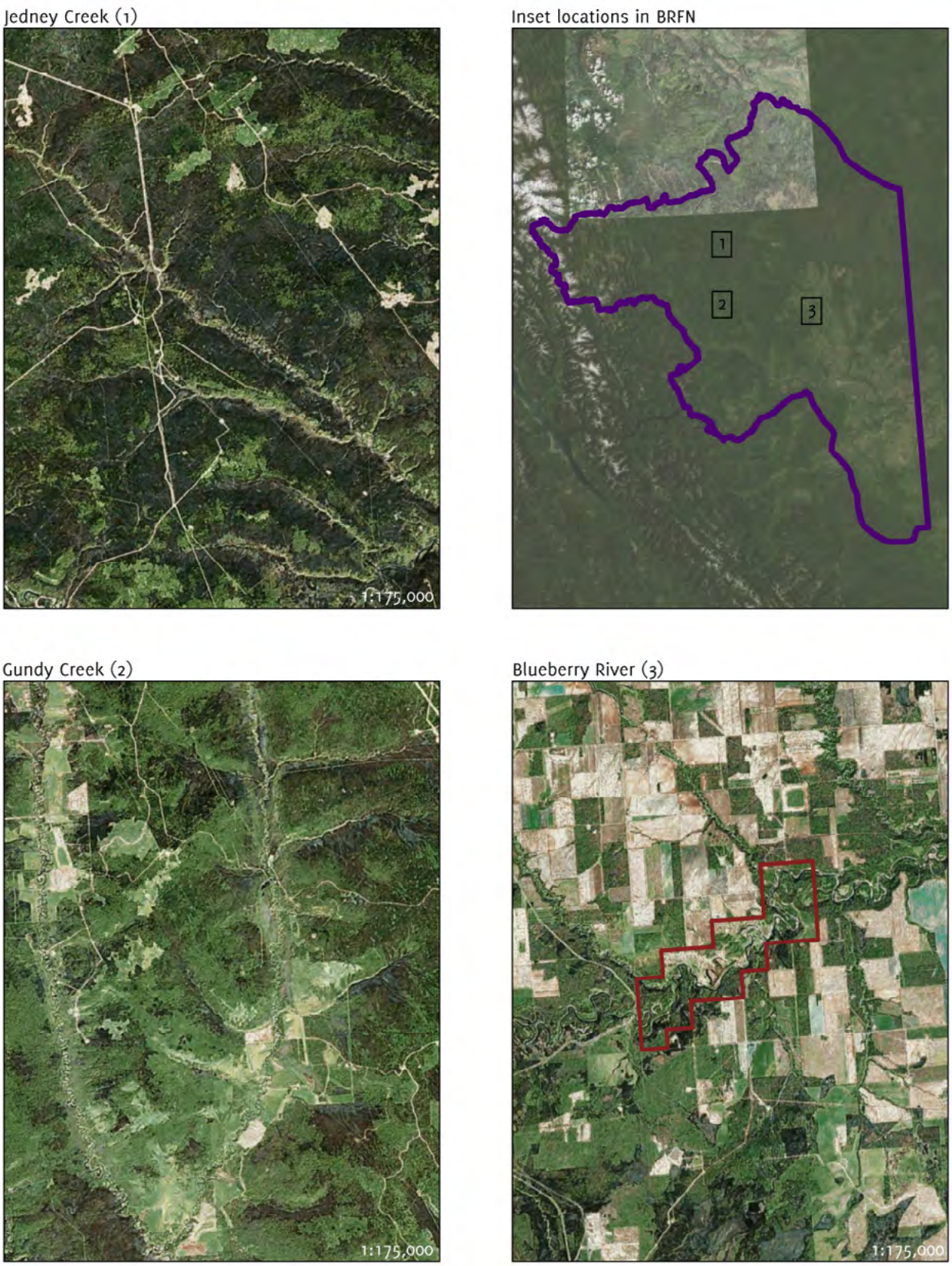


Map 34. Cumulative changes – including seismic lines (buffered by 500 m)



Map 35. Selected industrial activities, 2012-2016

Since January 1, 2013, the government of British Columbia has authorized construction in Blueberry River First Nations traditional territory of more than 2,600 oil and gas wells, 1,884 km of petroleum access and permanent roads, 740 km of petroleum development roads, 1,500 km of new pipelines and 9,400 km of seismic lines. Also since that time, approximately 290 forestry cutblocks were harvested in the Nation's traditional territory.



Map 36. Examples of landscape impacts as visible on satellite imagery

The Traditional Territory of Blueberry River First Nations.

Summary of Findings

- 73% of the area inside Blueberry River First Nations traditional territory is within 250 metres of an industrial disturbance, and 84% is within 500 metres of an industrial disturbance.
- Blueberry River First Nations traditional territory totals 3,832,749 ha and contains 18 watershed groups.
- While 60% of British Columbia is considered intact forest landscape, Blueberry River First Nations traditional territory has little intact forest landscape remaining – less than 14%.
- Provincial parks and protected areas make up less than 1% (0.713%) of Blueberry River First Nations traditional territory.
- The predominate LRMP zones are: General Resource Management (29.8%), Enhanced Resource Development (28.4%), Agriculture/Settlement (22.6%) and Special Resource Management (17.8%).
- Of the total area of B.C. reserved for pipelines via tenures, 46% falls within Blueberry River First Nations traditional territory.
- Active petroleum and natural gas tenures cover 69% of Blueberry River First Nations traditional territory.
- Including roads, transmission lines, seismic lines and pipelines, there are 110,300 km of linear features in 38,327 km^2 of territory – or 2.88 km of linear disturbance per square kilometre. Significant portions of the territory have a linear disturbance density that is much higher (ranging from 6.1 to 12 km per km^2) with other areas spiking over 24 km per km^2 (see Map 6).
- The First Nation's territory has 50,238 km of roads. Less than 4% of the roads are paved; 49% are rough and 45% are loose. Resource and unclassified roads account for 90% of the roads in the First Nation's traditional territory.
- The total area of pipeline tenure in Blueberry River First Nations traditional territory is 27,918 ha. The total length of the pipeline tenure is approximately 13,979 km.
- From 2006 to 2016, 45,603 km of seismic lines have been recorded by the Oil and Gas Commission in the First Nation's traditional territory.
- Of the 19,974 oil and gas wells in Blueberry River First Nations traditional territory, 36% are active. There are 9,435 oil and gas facilities, primarily test facilities (6,210) and battery sites (1,120).

- The total percentage of land in B.C. that is set aside in the Agricultural Land Reserve is about 5%, whereas 28% of Blueberry River First Nations traditional territory falls within the ALR.

- Agricultural lands comprise 13% of Blueberry River First Nations traditional territory. Privately owned land now makes up 20% of the First Nation's traditional territory.

- 195,091 ha of the First Nation's traditional territory has been logged since 1950.

- Streams and rivers account for the most water volume withdrawn (28,100 m^3 or 64%) in Blueberry River First Nations traditional territory.

- Two hydro dams, W.A.C. Bennett and Peace Canyon, lie within Blueberry River First Nations traditional territory, and construction on a third dam, Site C, is now underway. BC Hydro has identified 104 potential run-of-the-river developments in the First Nation's traditional territory.

- The total length of BC Hydro Transmission Lines is 480.15 km in Blueberry River First Nations traditional territory.

- Mining tenures (61,377 ha) cover 2% of Blueberry River First Nations traditional territory. Coal tenures account for 96% of these tenures.

- There are 91,183 ha of wind power tenures in the First Nation's traditional territory (2%). One operational wind farm along Bear Mountain contains 34 turbines. Two proposed wind farms are located in the First Nation's traditional territory.

- Since January 1, 2013, the government of British Columbia has authorized construction in Blueberry River First Nations traditional territory of more than 2,600 oil and gas wells, 1,884 km of petroleum access and permanent roads, 740 km of petroleum development roads, 1,500 km of new pipelines and 9,400 km of seismic lines. Also since that time, approximately 290 forestry cutblocks were harvested in the Nation's traditional territory.

Conclusion

The data that is publicly available from government databases reveals that the landscape within the traditional territory of Blueberry River First Nations has undergone severe clearing and industrial disturbance. Whereas 60% of British Columbia is considered intact forest landscape, less than 14% of Blueberry River First Nations traditional territory is intact forest landscape. The diminishment and fragmentation of the natural landscape is consistent with the fact that less than 1% (0.713%) of the First Nation's traditional territory is protected as a provincial park or protected area. Meanwhile, 46% of the total area of British Columbia that is reserved for pipelines as tenures is located in Blueberry River First Nations traditional territory. The First Nation's territory is managed to meet the predominant Land and Resource Management Plan zones that have been established by the government of British Columbia: General Resource Management (29.8% of the territory), Enhanced Resource Development (28.4% of the territory), Agriculture/Settlement (22.6% of the territory) and Special Resource Management (17.8% of the territory). Of the 50,238 km of roads that have been built in the First Nation's traditional territory, less than 4% are paved, the other 96% being rough or loose roads, which is consistent with industrial uses, such as forestry and oil and gas activities.

There are 13,979 km of pipeline tenure in Blueberry River First Nations traditional territory and 19,974 wells in the territory, 36% of which are active. The First Nation's traditional territory has 2,659,002 hectares of active petroleum and natural gas tenures. From 2006 to 2016, 45,603 km of seismic lines were recorded by the BC Oil and Gas Commission in Blueberry River First Nations traditional territory. Including roads, transmission lines, seismic lines and pipelines, there are 110,300 km of linear features in 38,327 km^2 of territory – or 2.88 km of linear disturbance per square kilometre on average over the whole territory. Significant portions of the territory have a linear disturbance density that is much higher (ranging from 6.1 to 12 km per km^2) with other areas spiking over 24 km per km^2 (see Map 6).

Additionally, two hydro dams, W.A.C. Bennett and Peace Canyon, are sited within Blueberry River First Nations traditional territory. Construction of Site C dam is underway, which will result in flooding of the Peace River valley and its tributaries, create an approximately 9,300 ha reservoir. BC Hydro has also identified 104 potential run-of-the-river developments in the First Nation's territory.

Transmission lines (480.15 km in the First Nation's traditional territory), wind power tenures (currently covering 2% of the territory, although not all are yet developed), water withdrawals (13,150,816 m^3 from 2006 to 2015) and mining tenures (2% of the territory) are other cumulative impacts in the First Nation's traditional territory.

Examining cumulative effects upon a landscape is inherently a multi-layered endeavor and no single snapshot can tell the whole truth at once. Numbers and maps are only two of the tools that can assist in gaining an understanding of the nature and scale of cumulative effects upon the traditional territory of Blueberry River First Nations. This understanding can only be crude, but it is a necessary starting point. The analysis in this Atlas, which is based upon government of British Columbia data, reveals that approximately 73% of the area inside Blueberry River First Nations traditional territory is within 250 metres of an industrial disturbance, and approximately 84% is within 500 metres of an industrial disturbance.

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