

# Area-based Analysis Data and Process Documentation

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## Overview

This document is designed to provide an overview of the principle aspects of Area-based Analysis (ABA), including the objectives, design framework, functionality, data, analysis, processing and reporting requirements. For additional information see *Area-based Analysis: Overview* (April 2013) and *ABA report for northeast BC* (December 2014).

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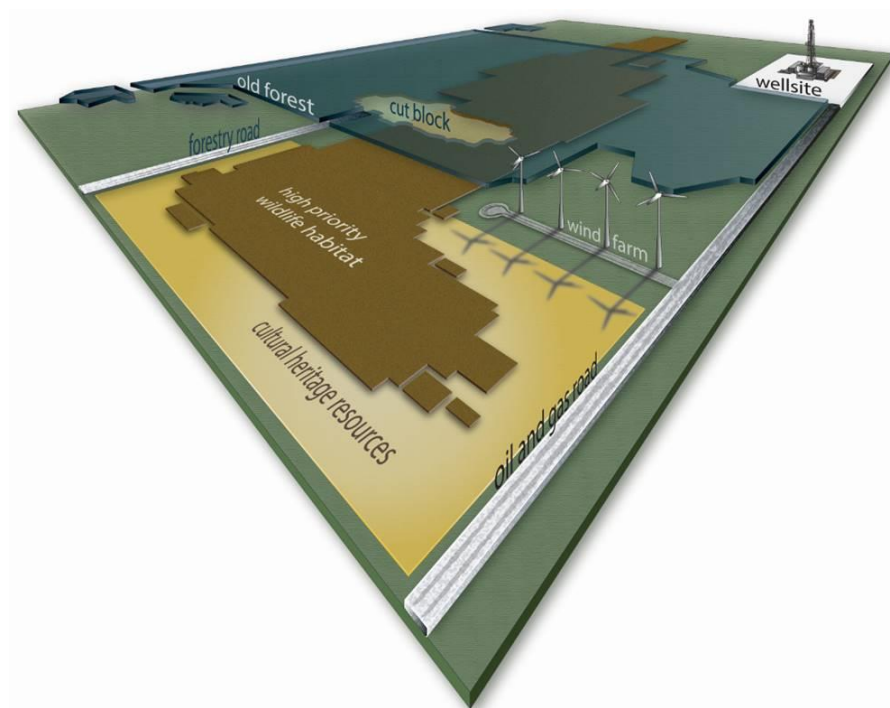
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## Introduction

Area-based Analysis (ABA) is a decision support tool, developed by the BC Oil and Gas Commission (Commission), to measure and manage the cumulative effects of industrial development on the landscape. In simple terms, ABA analyzes the impact of surface land use (industrial and non-industrial build-out) on values such as old forest, high priority wildlife and riparian reserve zone (see Figure 1).

The Province of British Columbia defines cumulative effects as “Changes to environmental, social, and economic values caused by the combined effect of present, past, and reasonably foreseeable future actions or events on the land base”.



**Figure 1: ABA schematic**

Area-based Analysis uses GIS technology to measure the intersection between surface land use and ecological values (such as old forest and riparian reserve zones). ABA monitors changes in surface land disturbance and impacts to ecological values over time to help manage cumulative effects.

## Components of Area-based Analysis

ABA is designed to be both a general reporting tool for assessing cumulative effects and an application review tool for managing permits and authorizations submitted to the Commission.

ABA reports will be completed on a regular basis to summarize surface land use disturbance against the defined values.

The ABA permitting process enables all new development applications received by the Commission to be measured and assessed for cumulative effects, and where applicable, can impact permitting decisions where the proposed impact exceeds a defined trigger.

The ABA project includes the development of two ABA status tools; the ABA WebMap Tool and the ABA Reports

The ABA Reports is a web-based utility that summarizes the level of disturbance and ABA Status for each ABA Value. Figure 2 shows some example output.

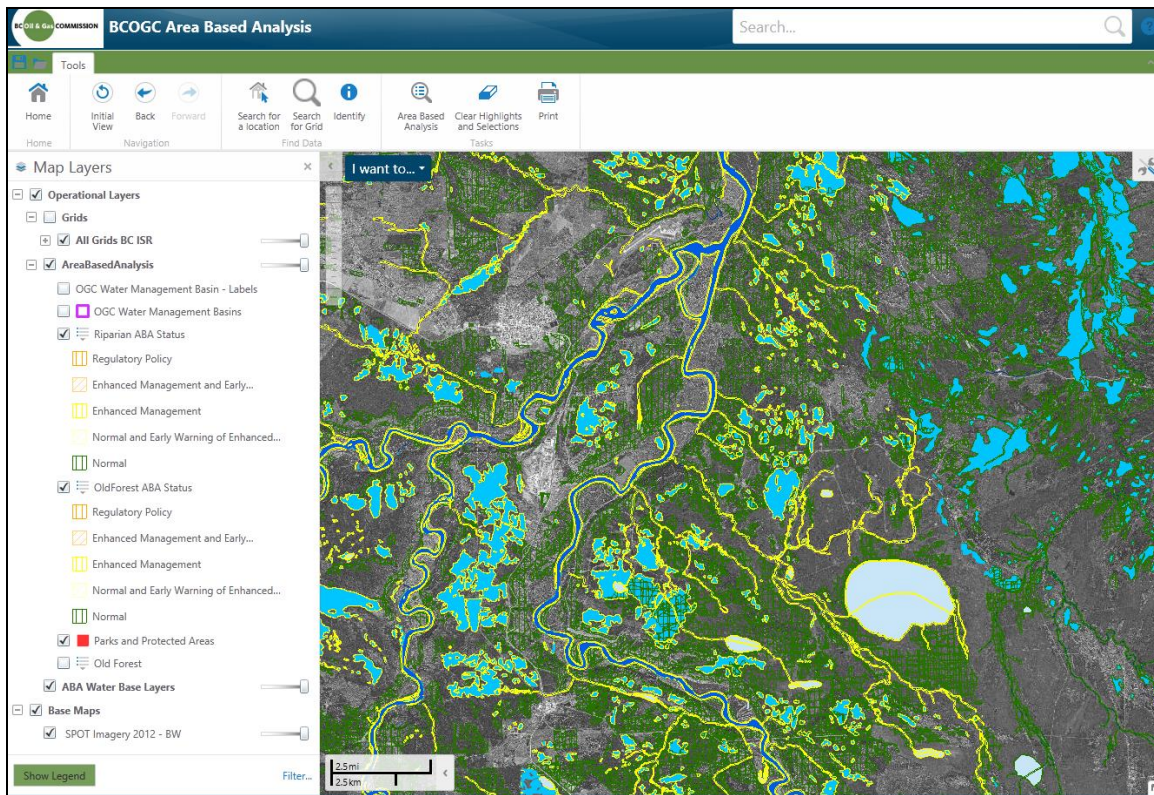
The screenshot shows a web application interface for 'OGC | Area Based Analysis (ABA) Reports'. The left sidebar contains navigation options: 'Area Based Analysis', 'Surface Land Use', 'Riparian Reserve Zone', 'Old Forest', 'Wildlife', and 'Wildlife (WHA and UWR)'. The main content area displays 'ABA Status for Wildlife in Murray River' with a search bar and a table of data. The table columns are: Area ID, Source, Common Species, Crown Area (ha), Trigger em (ha), Trigger rp (ha), Intactness, and ABA Status. The ABA Status column uses color coding: green for Normal, yellow for Enhanced Management, and red for Regulatory Policy.

Area ID	Source	Common Species	Crown Area (ha)	Trigger em (ha)	Trigger rp (ha)	Intactness	ABA Status
9-065	WHA_UWR	Northern Caribou	4,685	4,591.11	4,450.57	100 %	Normal
9-066	WHA_UWR	Northern Caribou	10,918	10,699.68	10,372.14	94.5 %	Regulatory Policy
9-123	WHA	Black-Throated Green warbler	64	61.79	57.33	88.9 %	Regulatory Policy
9-124	WHA	Connecticut warbler	64	61.60	57.16	93.5 %	Enhanced Management
9-125	WHA	Black-Throated Green warbler	46	44.30	41.11	95.8 %	Enhanced Management
u-7-003_P-065	UWR	S. Caribou	587	557.35	498.68	100 %	Normal
9-058	WHA_UWR	Northern Caribou	9,426	9,237.73	8,954.94	96.8 %	Enhanced Management
9-059	WHA_UWR	Northern Caribou	8,198	8,033.64	7,787.71	99.8 %	Normal
9-060	WHA_UWR	Northern Caribou	5,535	5,424.10	5,258.05	84.8 %	Regulatory Policy
9-061	WHA_UWR	Northern Caribou	9,590	9,397.86	9,110.18	98.3 %	Normal
9-062	WHA_UWR	Northern Caribou	470	460.27	446.18	99.7 %	Normal
9-063	WHA_UWR	Northern Caribou	7,310	7,163.79	6,944.49	79.5 %	Regulatory Policy
9-064	WHA_UWR	Northern Caribou	1,930	1,891.75	1,833.84	99.7 %	Normal
u-9-001_SPE-015	UWR	Elk	561	532.62	476.55	92.8 %	Enhanced Management
u-9-001_SPE-016	UWR	Elk	156	148.48	132.85	100 %	Normal

Figure 2: ABA Reports

The ABA WebMap Tool was designed to be a dynamic permitting and authorization review utility for use during the application review process that evaluates the cumulative impact of proposed oil and gas activity. The tool evaluates the spatial extent of proposed development and calculates the impact that an approval would have on the values. The WebMap Tool reports the proposed disturbance in hectares, the current ABA status and the anticipated ABA status if the proposed permit/authorization is approved. This information is designed to be used by the Natural Resource Officers, Resource Application Review Officers and the Statutory Decision Maker in the Commission to help review applications in relation to cumulative effects. Figure 3 is an example of a screen from the WebMap tool.





**Figure 3: ABA WebMap tool**

The ABA system was developed within the Commission’s Spatial Data Infrastructure. This system includes the creation, processing, analysis, storage and interpretation of spatial data for mapping, analysis and reporting, the ABA WebMap Tool and the Impact Assessment Tool. The databases used are documented in specific sections below.

## Technical description of Area-based Analysis

### The ABA Infrastructure

The ABA infrastructure diagram in Figure 4 provides an overview of the data and applications associated with ABA. The main components include:

1. Utilizing standard & publically available DataBC & Commission data as source information.
2. Processing source data with scripts to create SLU datasets for ABA.
3. Storing processed/derived ABA datasets internally at the Commission.
4. Using standard geoprocessing techniques (unions, dissolves) to combine data.
5. Calculating results datasets ( % disturbance and ABA Status) from the spatial data.
6. Ensuring that data can be dynamically updated by scripts so that data is current.
7. Hosting applications (ABA reports, Online WebMap) internally at the Commission.
8. Embedding ABA in business process including the Application Management System.

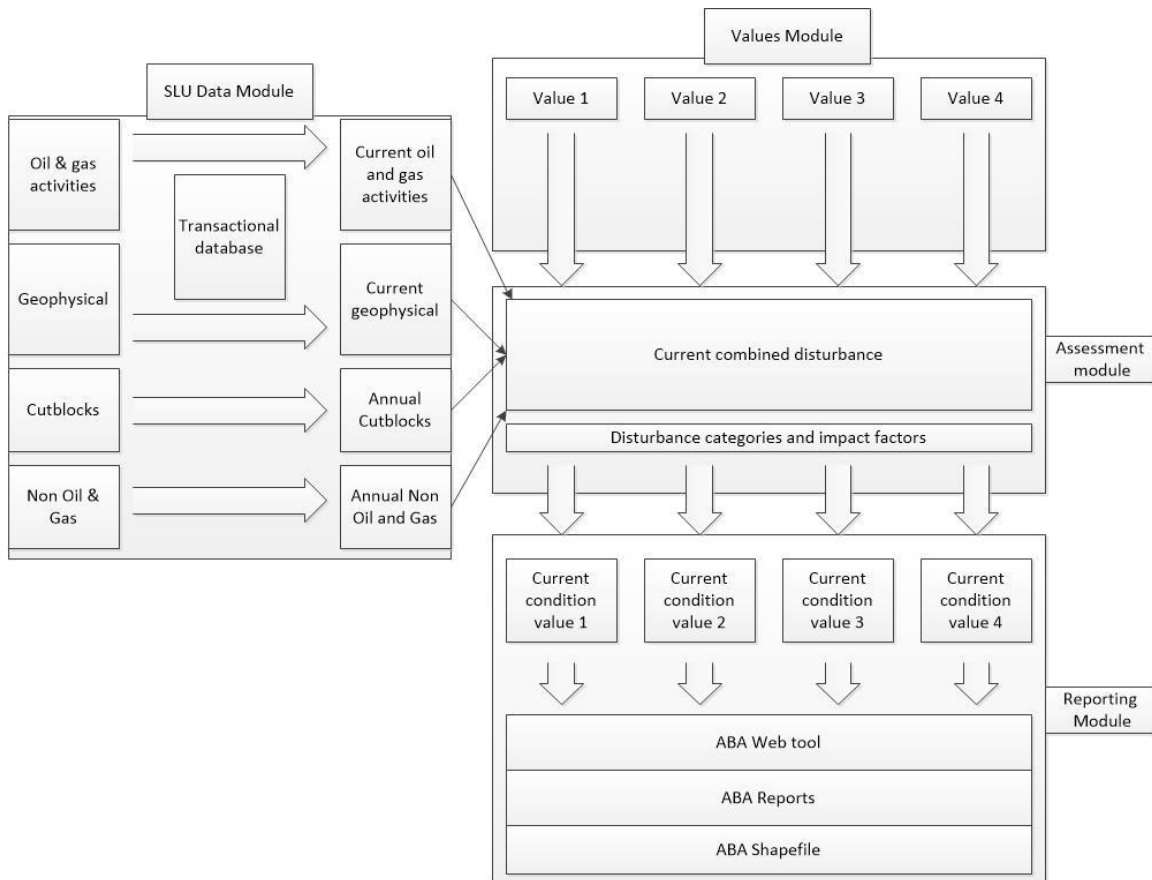


Figure 4: ABA data schematic

## Surface land use data

The current condition of a value is based on the total anthropogenic disturbance (cutblocks, roads, all oil and gas activities, geophysical exploration lines, railway and transmission lines, etc.) within the assessment unit defined for each value. For example the assessment unit for old forest is a Natural Disturbance Unit, and there are 6 in northeast BC. In contrast, the assessment unit for Hydro-riparian ecosystems is a water management basin and there are 69 in northeast BC.

With the first version of ABA, each individual disturbance is assumed to be in the same condition as it was immediately following establishment. In other words, there has been no consideration of revegetation, reforestation, reclamation, or restoration of any type within that footprint, on the recovery of the value being assessed. While the area of total disturbance provides an accurate assessment of the total anthropogenic disturbances over time regardless of current state, it likely overestimates the actual impact of the footprint that ecological succession and management has had on some values. Over time ABA will evaluate strategies from removing disturbance by assessing regrowth, reclamation and restoration.

Figure 5 summarizes the various types of SLU data that are required for ABA and the structure of that data.

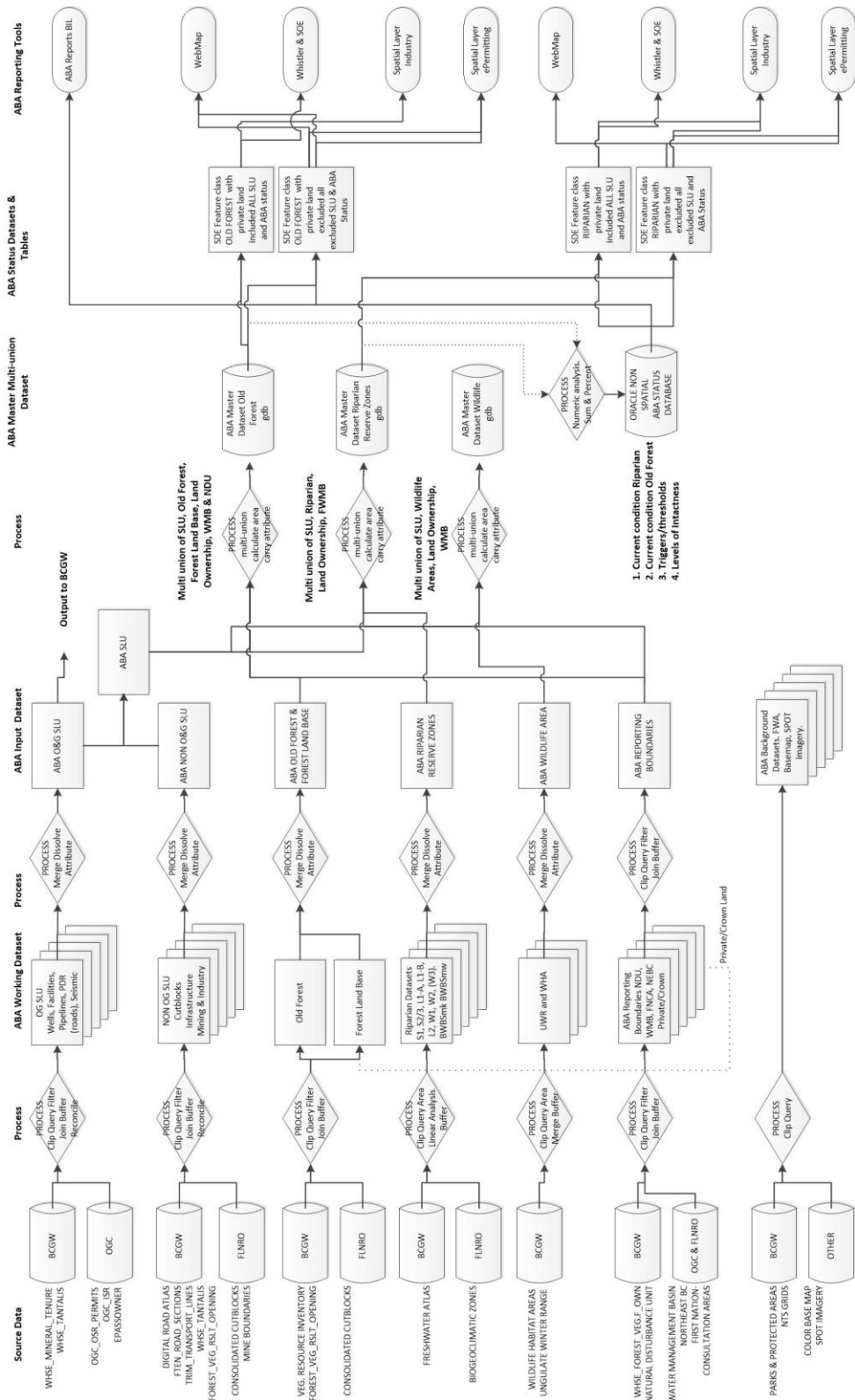


Figure 5: SLU data flow

### SLU: Data sources and processing.

The geographic extent of northeast BC is vast and the mapping of surface land use over such a large area is challenging due to differences in resolution, accuracy, format, acquisition method and year, vintage and quality of data used. It should be noted that ABA includes more disturbance when data appears ambiguous. In the quality control process it was evident that the delineation of surface land use often exceeded the disturbance visible on aerial images and satellite images.

Figure 6 highlights the region where ABA is used and the spatial extent over which surface land use information was captured.



Figure 6: Geographic extent of ABA

The SLU data is sorted into four categories:

1. Oil and gas surface land use
2. Geophysical surface land use
3. Non-oil and gas surface land use
4. Cutblocks

When land is used for multiple purposes over time there can be overlap between the four categories. A hierarchy was developed and oil and gas related activity always supersedes other categories. For example a well pad in a cutblock is assigned as oil and gas surface land use, similarly, roads in oil and gas development basins are assigned to oil and gas surface land use and not to non-oil and gas land use. The rest of the SLU hierarchy is; non-oil and gas SLU superceding geophysical SLU superceding cutblocks. Figure 7 below shows an example of surface land use in northeast BC.

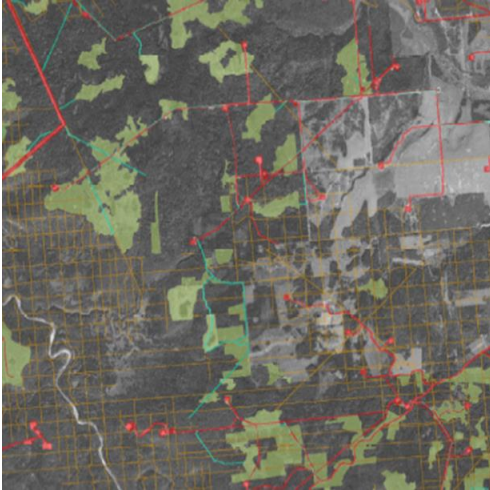


Figure 7: Surface land use (Red-oil & gas, Aqua-non-oil & gas, Orange-geophysical, Green-cutblocks)

### Oil and Gas SLU

The Commission was established in 2006 and has collected and stored data relating to oil and gas activities since then. Data prior to 2006 was assembled from a variety of sources including; the Ministry of Mines, Petroleum and Energy Resources and its predecessors, the Ministry of Forest, Lands and Natural Resource Operations and its predecessors, and the Ministry of Environment and its predecessors. Spatial and attribute data from DataBC and the Commission were used to prepare the comprehensive SLU footprint.

All of the data used can be accessed through DataBC at:  
<https://apps.gov.bc.ca/pub/geometadata/home.do>.

**Table 1. Data Sources for Oil and Gas Surface Land Use Calculations**

Oil and Gas Activity Type	Source	File name (DataBC)	Geometry	Timeline	Update Cycle	
Road	Road Rights of Way	Commission	WHSE_MINERAL_TENURE.OG Ancillary_Other_Apps_Pub_SP	Polygon	>2006	Nightly
	Access Roads	Commission	WHSE_MINERAL_TENURE.OG PETRLM_ACCESS_ROADS_PUB_SP	Line	>2006	Nightly
	Development Roads	Commission	WHSE_MINERAL_TENURE.OG PETRLM_DEV_ROADS_PUB_SP	Line	>2006	As required
	Historical Development Roads	Commission	WHSE_MINERAL_TENURE.OG PETRLM_DEV_RDS_PRE06_PUB_SP	Line	<2006	n/a
Pipeline	Pipeline Rights of Way	Commission	WHSE_MINERAL_TENURE.OG PIPELINE_RW_PUB_SP	Polygon	>2006	Nightly
	Pipeline Crown Tenures	DataBC	WHSE_TANTALIS.TA_CROWN_TENURES_SVW	Polygon	<2006	Ongoing
Well	Well Sites	Commission	WHSE_MINERAL_TENURE.OG WELL_SITES_PUB_SP	Polygon	>2006	Nightly
	Well Surface Location	Commission	WHSE_MINERAL_TENURE.OG SURFACE_HOLE_STATUS_SP	Point	All	Nightly
	Well Pad Boundaries	Commission	OGC_ISR_APP.PAD_WELL	Polygon	All	Nightly
	Well Crown Tenures	DataBC	WHSE_TANTALIS.TA_CROWN_TENURES_SVW	Polygon	<2006	Ongoing
Facility	Facility Sites	Commission	WHSE_MINERAL_TENURE.OG FACILITY_SITES_GOV_SP	Polygon	>2006	Nightly
	Facility Crown Tenures	DataBC	WHSE_TANTALIS.TA_CROWN_TENURES_SVW	Polygon	All	Ongoing
Other Oil and Gas Activity	Ancillary and Other Applications	Commission	WHSE_MINERAL_TENURE.OG Ancillary_Other_Apps_Pub_SP	Polygon	>2006	Nightly
	Other Oil and Gas					
	Crown Tenures	DataBC	WHSE_TANTALIS.TA_CROWN_TENURES_SVW	Polygon	<2006	Ongoing
Geophysical	Seismic Lines	Commission	WHSE_MINERAL_TENURE.OG GEOPHYSICAL_PUB_SP	Line	>2006	Nightly
	Historical Seismic Lines	Commission	WHSE_MINERAL_TENURE.OG GEOPHYSICAL_2002_2006_SP	Line	<2006	n/a
	Historical Seismic Lines	Commission	WHSE_MINERAL_TENURE.OG GEOPHYSICAL_1996_2004_SP	Line	<2006	n/a
	Historical Seismic Lines	DataBC	WHSE_BASEMAPPING.TRIM_MISCELLANEOUS_LINES	Line	<2007	n/a

### Data Selection Criteria by OG\_SLU Type

SLU datasets created each year for SLU reporting include:

- SLU\_WELLSITE - dissolved all wellsite data
- SLU\_FACILITY - dissolved all facility data
- SLU\_ROAD - dissolved all oil and gas road data
- SLU\_PIPELINE - dissolved all oil and gas pipeline data
- SLU\_ANCILLARY - dissolved all ancillary and other oil and gas data
- SLU\_GEOPHYSICAL – dissolved all polygon geophysical data

### Wellsites

Wells are located on cleared areas termed a wellpad. The area of the well pad is identified as the SLU area for the well. Multiple wells may exist on a single well pad. Cleared well pads are represented in the PAD\_WELL dataset. Any cleared well pad is included in the dataset. This includes the wellpads associated with any built wells and any pads recently cleared to allow wells to be built.

Dataset	Selection Query	Additional Actions
WHSE_MINERAL_TENURE.OG_SURFACE_HOLE_STATUS_SP	APPLICATION_STATUS IN ( 'POSTCONST', 'SRW')	
OGC_ISR_APPS.PAD_WELL	WA_NUM links to WELL_AUTHORITY_NUMBER in OG_SURFACE_HOLE_STATUS_SP DATASET	
WHSE_TANTALIS.TA_CROWN_TENURES_SVW	TENURE_STAGE = 'TENURE' AND TENURE_SUBPURPOSE = 'DRILLSITE/WELLSITE'	
WHSE_MINERAL_TENURE.OG_WELL_SITES_PUB_SP	APPLICATION_STATUS IN ('POSTCONST','SRW')	

### Facilities

Facilities supporting oil and gas development include sites for compressors, battery, plants and flare sites found in the OG\_FACILITY\_SITES\_PUB\_SP dataset. Other facilities (including gas plants) have crown tenures in TA\_CROWN\_TENURES\_SVW.

Dataset	Selection Query	Additional Actions
WHSE_MINERAL_TENURE.OG_FACILITY_SITES_GOV_SP	APPLICATION_STATUS IN ( 'LTO', 'POSTCO', 'SRW')	
WHSE_TANTALIS.TA_CROWN_TENURES_SVW	TENURE_STAGE = 'TENURE' AND TENURE_SUBPURPOSE NOT IN('DRILLSITE/WELLSITE','GAS AND OIL PIPELINE')	

### Roads

The location of roads data relating to oil and gas development has changes over the years. Current linear road data is stored in the Petroleum Access Roads dataset and right-of-way polygons submitted electronically are stored in the ancillary oil and gas activity dataset. Historical roads are also stored in the Petroleum development datasets.

Dataset	Selection Query	Additional Actions
WHSE_MINERAL_TENURE.OG_ANCILLARY_OTHER_APPS_PUB_SP	ANCILLARY_OTHER_APP_TYPE = 'ROAD' AND APPLICATION_STATUS IN ('APPROVED','POSTCONST')	None
WHSE_MINERAL_TENURE.OG_PETRLM_ACCESS_ROADS_PUB_SP	APPLICATION_STATUS IN ( 'APPROVED', 'POSTCONST')	Buffer line by PETRLM_EVELOPMENT_ROAD_TYPE (HIGH (10m), LOW(7.5),WINT(5), UNKN(7.5) ETWA(7.5))
WHSE_MINERAL_TENURE.OG_PETRLM_DEV_ROADS_PUB_SP	APPLICATION_STATUS IN ( 'APPROVED', 'POSTCONST')	Buffer line by PETRLM_EVELOPMENT_ROAD_TYPE (HIGH (10m), LOW(7.5),WINT(5), UNKN(7.5) ETWA(7.5))
WHSE_MINERAL_TENURE.OG_PETRLM_DEV_RDS_PRE06_PUB_SP	PETRLM_DEVELOPMENT_ROAD_STATUS IN ( 'APPROVED', 'IN_PROGRESS', 'INTERIM_APPROVAL')	Buffer line by PETRLM_EVELOPMENT_ROAD_TYPE (HIGH (10m), LOW(7.5),WINT(5), UNKN(7.5) ETWA(7.5))

## Pipelines

Pipeline Right-of-Way (RoW) data is stored in the OG\_PIPELINE\_RW\_PUB\_SP dataset. Additional pipeline data is stored in the TA\_CROWN\_TENURES dataset.

Dataset	Selection Query	Additional Actions
WHSE_MINERAL_TENURE.OG_PIPELINE_RW_PUB_SP	APPLICATION_STATUS IN ( 'POSTCO', 'LTO', 'SRW')	
WHSE_TANTALIS.TA_CROWN_TENURES_SVW	TENURE_STAGE = 'TENURE' AND TENURE_SUBPURPOSE = 'GAS AND OIL PIPELINE'	

## Ancillary and Other

Ancillary and Other activities include the cleared location for supporting activities in oil and gas development. This includes a variety of types including clearings, camps, decking sites, borrow pits, sump sites, helicopter pads and storage sites.

Dataset	Selection Query	Additional Actions
WHSE_MINERAL_TENURE.OG_ANCILLARY_OTHER_APPS_PUB_SP	ANCILLARY_OTHER_APP_TYPE NOT IN ( 'ROAD','GEOT','INV') AND APPLICATION_STATUS IN ('APPROVED','POSTCONST')	AND APPLICATION_TYPE <> 'Pipeline (New)

## Geophysical

Linear data to identify geophysical activity since 1996 is included in SLU. All geophysical clearing wider than 1.75m is included as part of SLU. Lines less than or equal to 1.75m in width are considered low impact with minimal disturbance and only short term impacts.



Dataset	Selection Query	Additional Actions
WHSE_MINERAL_TENURE.OG_GEOPHYSICAL_PUB_SP	APPLICATION_STATUS IN ('FPLN','POSTCONST') AND GEOPHYSICAL_WIDTH > 1.75m	Buffer line by GEOPHYSICAL_WIDTH/2
WHSE_MINERAL_TENURE.OG_GEOPHYSICAL_2002_2006_SP	If GEOPHYSICAL_WIDTH > 1.75m	Buffer by GEOPHYSICAL_WIDTH /2
WHSE_MINERAL_TENURE.OG_GEOPHYSICAL_1996_2004_SP	If width is NULL	buffer line by 3.5 (assume width 7m) for 2D programs. 3D programs buffer Source Lines (3.5) and Receiving lines (1.0)
WHSE_MINERAL_TENURE.OG_GEOPHYSICAL_1996_2004_SP	If Width is NULL	buffer line by 3.5 (assume width 7m) for 2D programs. 3D programs buffer Source Lines (3.5) and Receiving lines (1.0)
WHSE_BASEMAPPING.TRIM_MISCELLANEOUS_LINES	If Width is NULL	buffer line by 3.5 (assume width 7m) for 2D programs. 3D programs buffer Source Lines (3.5) and Receiving lines (1.0)

### Non-Oil and Gas SLU

Named transportation corridor polygons in the *Tantalis* database table *TA\_TRANSPORTATION\_SVW* were classified separately from oil and gas Roads and used to represent major road and rail line right-of-ways.

Digital road atlas arcs *DRA\_DIGITAL\_ROAD\_ATLAS\_LINE\_SP* were buffered according to road surface type and number of lanes. Paved 2 lane roads were buffered 20m, rough and loose 2 lane roads were buffered 15m, paved single lane roads and any named roads were buffered 10m and all other arcs were buffered 7m. Arcs assigned to more than 2 lanes were represented in the transportation corridor polygons but were buffered to 30m to ensure representation.

Forest harvesting and haul roads were included from the dataset *WHSE\_FOREST\_TENURE.FTEN\_ROAD\_SECTION\_LINES\_SVW* and buffered 15m.

Additional transportation data such as airfields were extracted from the *Tantalis* dataset *WHSE\_TANTALIS.TA\_TRANSPORTATION\_SVW*. Airports, airstrips and airfields lines were designated based on the *F\_CODE FOR AIR*. *TRIM* data was also used in conjunction with *Tantalis* for railways. Transmission lines were derived from *Tantalis* survey parcels and BC Hydro transmission lines.

Other industrial activity was also combined into the non-oil and gas surface land use dataset from the *Tantalis* dataset. Right of way data was extracted from the *Tantalis* dataset *WHSE\_TANTALIS.TA\_CROWN\_RIGHTS\_OF\_WAY\_SVW* and *WHSE\_TANTALIS.TA\_CROWN\_TENURES\_SVW* to represent utility corridors, easements, wind power, mining, electrical utility lines, rail lines and communication installations. Table 2 lists the source of non-oil and gas SLU information.

Feature	Data Source	Source Name	Open Data
Forest Service Roads	DataBC	<a href="#">WHSE_FOREST_TENURE.FTEN_ROAD_SECTION_LINES_SVW</a> (LIFE_CYCLE_STATUS_CODE<>'PENDING')	Y
Digital Road Atlas	DataBC	<a href="#">WHSE_BASEMAPPING.DRA_DGTL_ROAD_ATLAS_MPAR_SP</a>	Y
Transport Lines	DataBC	<a href="#">WHSE_BASEMAPPING.TRIM_TRANSPORTATION_LINES</a>	N

Feature	Data Source	Source Name	Open Data
		(F_CODE IN ('DD932000000','DE22850000','DE22900000','DE950000','DE22950001'))	
Tantalus transport	DataBC	<a href="#">WHSE TANTALIS.TA TRANSPORTATION SVW</a> (DESCRIPTION IS NOT NULL)	Y
Crown tenure	DataBC	<a href="#">WHSE TANTALIS.TA CROWN TENURES SVW</a> (TENURE_PURPOSE="TRANSPORTATION' AND TENURE SUBTYPE IN ('STATUTORY RIGHT OF WAY(OR EASEMENT), LICENSE OF OCCUPATION) (TENURE_PURPOSE='UTILITY' AND TENURE_STATUS<>'INTERIM LICENSE') (TENURE_PURPOSE='WINDPOWER' AND TENURE_TYPE='LICENSE OF OCCUPATION') (TENURE_PURPOSE='INDUSTRIAL' AND TENURE_TYPE='LICENSE OF OCCUPATION') (TENURE_PURPOSE='COMMUNICATION' AND TENURE_TYPE='LICENSE OF OCCUPATION')	Y
RoW	DataBC	<a href="#">WHSE TANTALIS.TA CROWN RIGHTS OF WAY SVW</a> (TENURE_SUBTYPE<>'INTERIM LICENSE')	Y

Table 2: Non-oil and gas source data

### Cutblocks

The *WHSE\_FOREST\_VEGETATION.VEG\_CONSOLIDATED\_CUT\_BLOCKS\_SVW* in BCGW depicts the cutblock boundaries and year of harvest for crown lands within BC. It is created from the Provincial Forest Cover, the RESULTS reporting system, from Forest Tenure applications and satellite imagery. This dataset is clipped to northeast BC. A year of harvest is carried with the data. Table 3 lists the data used.

Feature	Data Source	Source Name	Open Data
Consolidated cutblocks	BGCW	<a href="#">WHSE FOREST VEGETATION.VEG CONSOLIDATED CUT BLOCKS SVW</a>	Y

Table 3: Cutblock source data

### Transactional layers - approved/permittted.

Transactions layers are comprised of on-going oil and gas surface land use so that analysis is current and routinely updated.

The current condition for a value is the combination of the four SLU categories described above and all of the approved/pending oil and gas activities. The current condition will be generated as follows:

- The oil and gas SLU and geophysical data for all *built* activities will be determined
- The oil and gas SLU and geophysical data for all *approved/pending* activities will be determined
- The annual refresh of the cutblock information will be incorporated
- The annual refresh of all other industrial disturbances such as roads, transmission lines, wind farms, mines, etc will be incorporated

- These four data sources are added together, the SLU hierarchy will be run, and an updated current condition determined.

## ABA Value: Hydro riparian ecosystems

ABA currently has three ABA Values; the first two were included in the inaugural release of ABA. The current values are:

1. Hydro-riparian ecosystems (riparian habitat, water quantity)
2. Old Forest
3. Wildlife

### Water Quantity and Riparian Reserve Zones

Two components comprise the hydro-riparian ecosystem value. *Riparian habitat* as measured through an assessment of the intactness of the riparian reserve zones and *In-stream flow* (water quantity) as measured through water allocation – a proxy for water withdrawals. Figure 8 illustrates the two components.

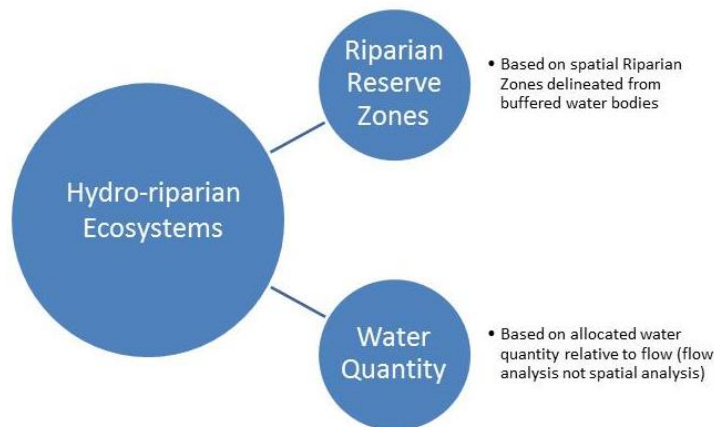


Figure 8: Hydro-riparian ecosystem components

The current condition of the water quantity value is characterized by using aggregated flow and water allocation data and the water allocation model “Northeast Water Tool” (NEWT) developed by the Commission, Ministry of Forests, Lands and Natural resource Operations (FLNRO) and GeoScience BC. Technical information and development criteria for NEWT are available on the Commission’s website; the remainder of this section is focused on riparian habitat component of the value.

### Ecological Assessment Unit

The ecological assessment units for Hydro Riparian Ecosystems are the 69 Water Management Basins defined by the Commission, illustrated in Figure 9.

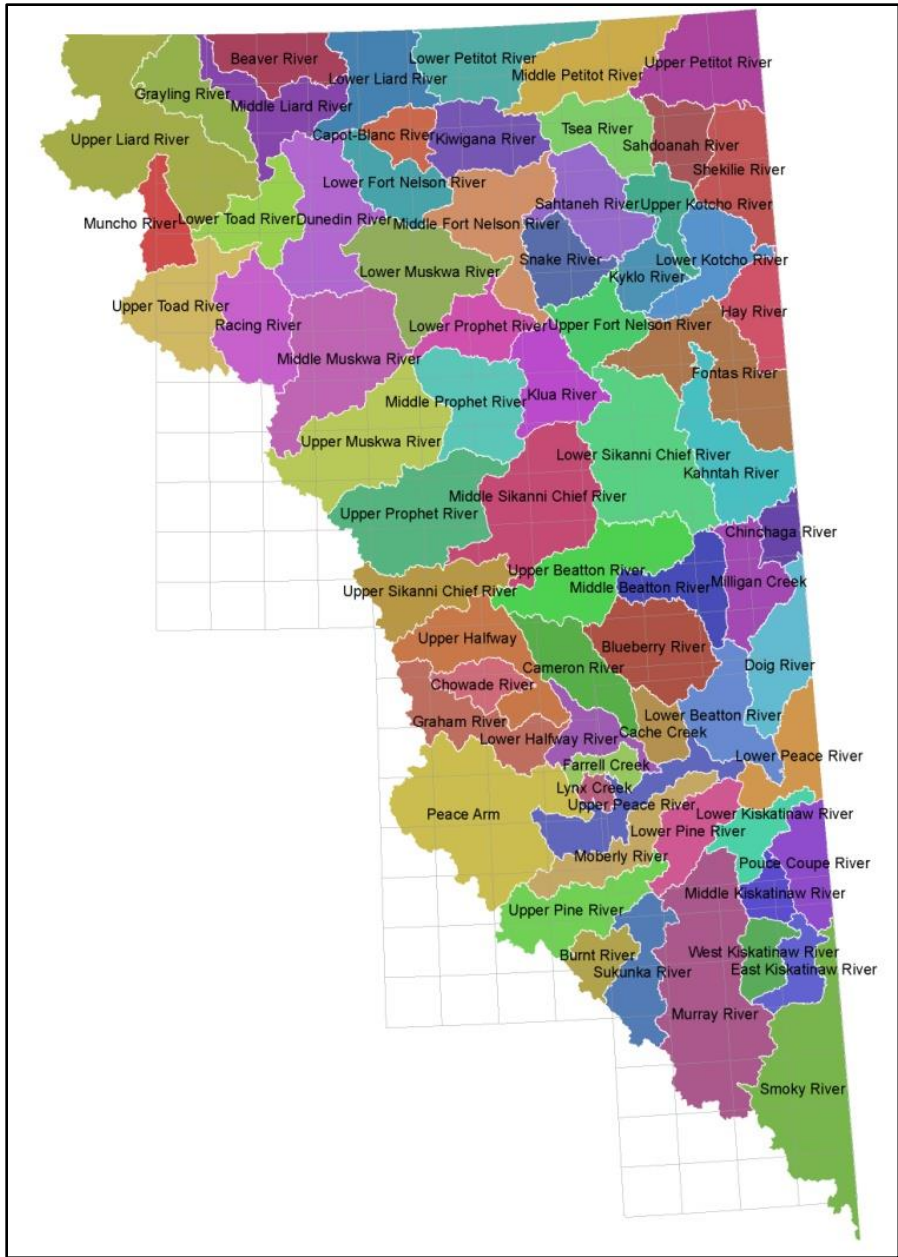


Figure 9: Water management basins in northeast BC

## Defining Riparian Reserve Zones

The Riparian Reserve Zones (RRZ's) and physical descriptions for each riparian class are defined in the Environmental Protection and Management Regulation (EPMR). The RRZ zone does not include the water body itself only the area surrounding the water body. To manage overlaps, the buffers for lakes, wetlands, stream and rivers are dissolved to a single RRZ area.

Table 4, Table 5, Table 6 summarize the buffers for different riparian features and classes within each feature. These buffers are used to define the riparian landbase that will be assessed in ABA.

Riparian Class	RMA <sup>1</sup>	RRZ	RMZ
S1-A	100	50	50
S1-B	70	50	20
S2	50	30	20
S3	40	20	20
S4	30	0	30
S5	30	0	30
S6	20	0	20

Table 4: EPMR stream reserve and management zones

Riparian Class	RMA	RRZ	RMZ
W1	50	10	40
W2	30	10	20
W3	0	0	0

Table 5: EPMR wetland reserve and management zones

Riparian Class	RMA	RRZ	RMZ
L1-A	70	50	20
L1-B	40	20	20
L2	30	10	20
L2	30	0	30
L4	30	0	30

Table 6: EPMR lake reserve and management zones

## Methodology for mapping RRZ's

### Rivers/streams

In practice, each individual water feature is classified using the EPMR stream classification copied below:

A stream that is a fish stream or is located in a community watershed has the following riparian class:

- S1A, if the stream averages, over a one km length, either a stream width or an active flood plain width of 100 m or greater;
- S1B, if the stream width is greater than 20 m but the stream does not have a riparian class of S1A;

<sup>1</sup> RMA = Riparian Management Area RRZ = Riparian Reserve Zone RMZ = Riparian Management Zone

- S2, if the stream width is not less than 5 m but not more than 20 m;
- S3, if the stream width is not less than 1.5 m but is less than 5 m;
- S4, if the stream width is less than 1.5 m.

A stream that is not a fish stream and is located outside of a community watershed has the following riparian class:

- S5, if the stream width is greater than 3 m;
- S6, if the stream width is 3 m or less.

Extensive coverage of field-based EPMR classification is not available so assumptions were made using the Fresh Water Atlas (FWA) stream order classification.

Where a FWA river exists, it was assumed to be an S1 river, no distinctions were made between S1-A and S1-B, and an average buffer width of 50m (S1-A 50m, S1-B 50m) was applied to each side.

For remaining FWA linework:

- Streams are assumed to be S2/S3 when the FWA feature code is *GA24850000* (streams are “definite”). An average buffers width of 25m (S2 30m, S1 20m) was applied to each side. All S2, S3 streams are assumed to be fish bearing
- Streams are assumed to be S4 when the FWA feature code is *GA24850140* (streams are “indefinite”) or *GA24850150* (streams are “intermittent”), and no buffers were applied. All S4 streams are assumed to be non-fish bearing.

An example of the composite riparian reserve zones along the stream network is shown in Figure 10.

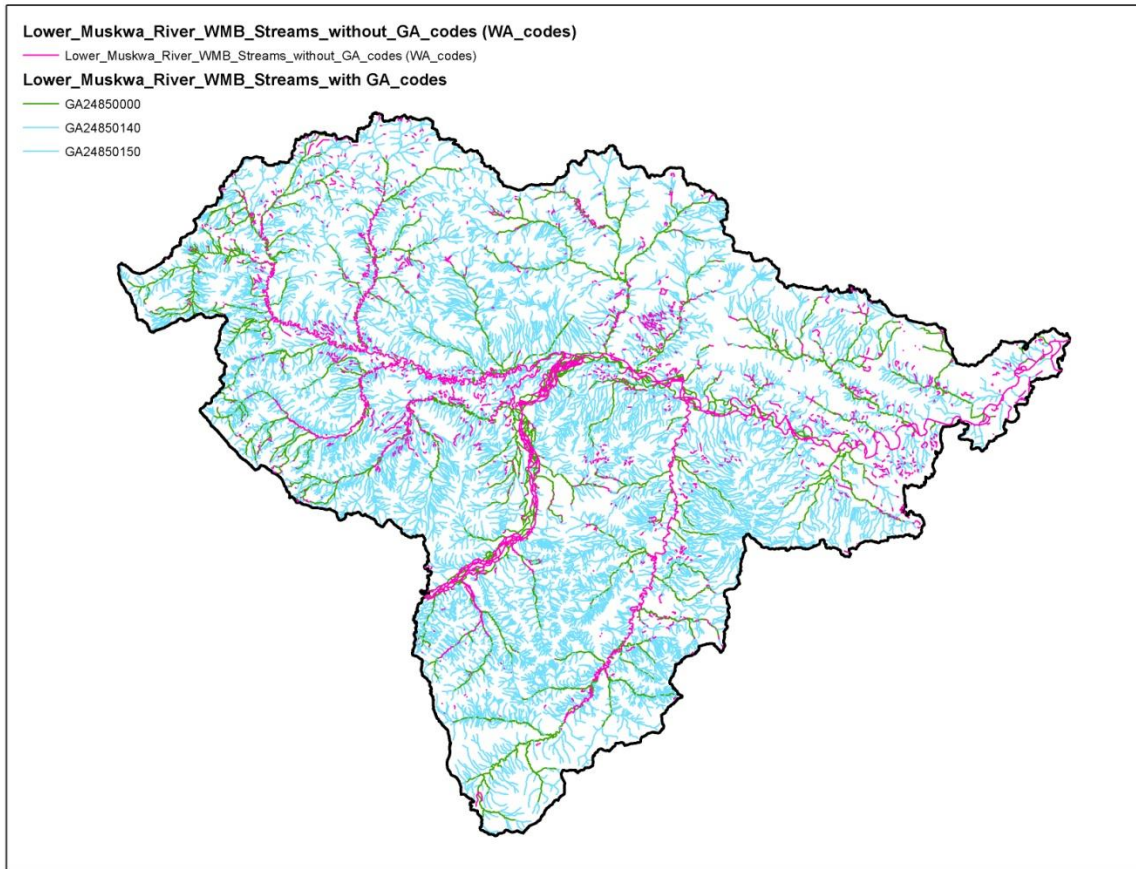


Figure 10: Stream classes for the Lower Muskwa River water management basin

### Wetlands

Wetland riparian classes are defined in the EPMR, and these are copied below:

- W1, if the wetland is greater than 5 ha in size but is not a wetland with a riparian class of W3;
- W2, if the wetland is not less than 0.25 ha but not more than 5 ha in size;
- W3, if the wetland is greater than 1000 ha in size and located in the BWBSmw or BWBSmk biogeoclimatic subzone.

A comparison was made between the biogeoclimatic classification used in the EPMR and the most recent biogeoclimatic classification. Figure 11 below compares the BWBSmw1 and BWBSmw2 zones with the new zones BWBSmw and BWBSmk. All of the wetlands in the BWBSmk greater than 1000 ha are within the BWBSmw2 area. There are no additional large wetlands in the new and expanded BWBSmk zone to the west. The Commission substituted the BWBSmk biogeoclimatic zone for the BWBSmw2 zone to be consistent with the most recent FLNRO mapping with no change to wetland classification.

The EPMR size and location criteria were applied to the FWA wetland data and buffered accordingly.

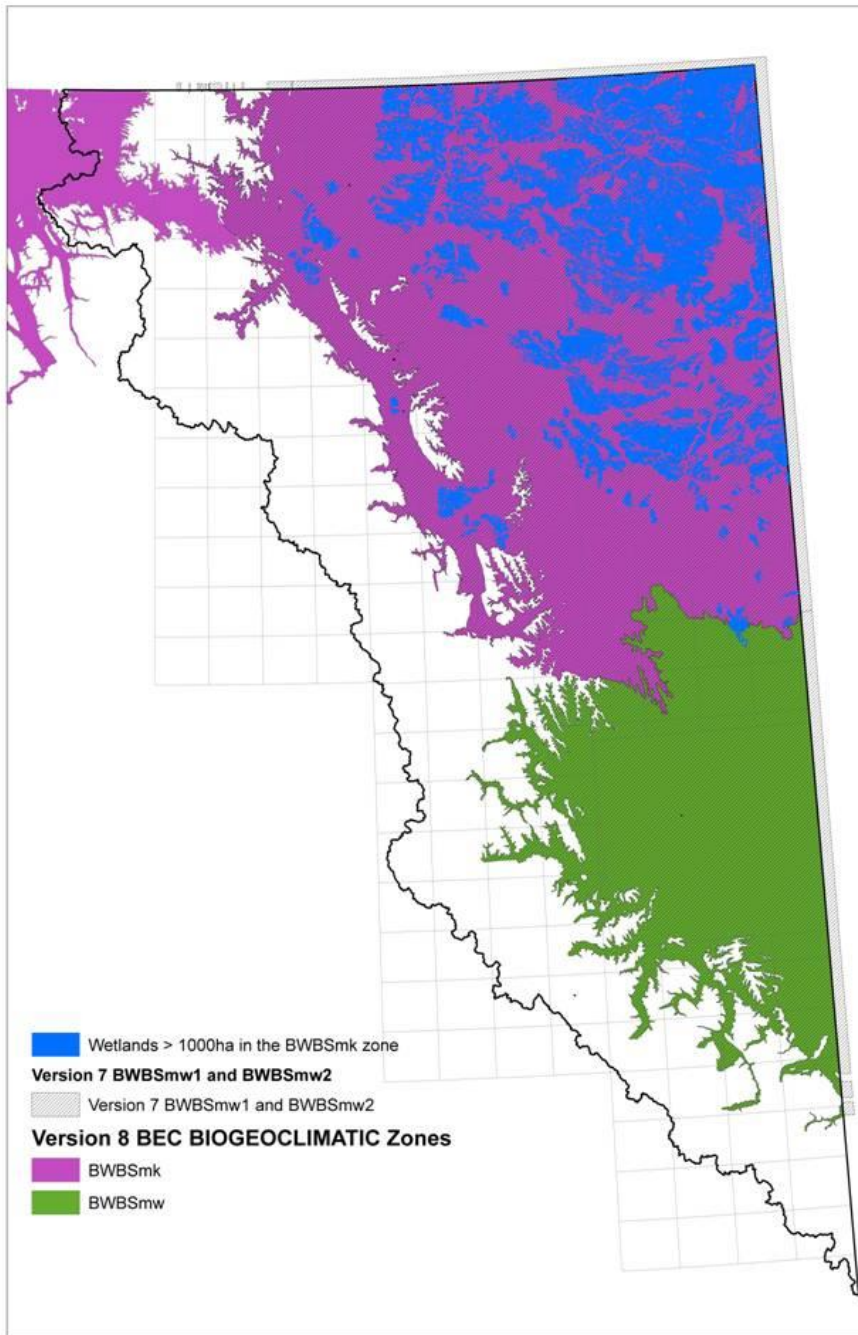


Figure 11: Biogeoclimatic comparison with lake size mapping

### Lakes Methodology

Lake classes are defined in the EPMP and based on size and location. The criteria were applied to the FWA lake data and features were buffered accordingly. The classification criteria for lake riparian classes are below.



- L1-A, if the lake is 1 000 ha or greater in size;
- L1-B, if the lake is greater than 5 ha but less than 1 000 ha in size;
- L2, if the lake is not less than 1 ha and not more than 5 ha in size and is located in biogeoclimatic zones or subzone that is
  - Ponderosa Pine,
  - Bunch Grass,
  - Interior Douglas-fir, very dry hot, very dry warm or very dry mild,
  - Coastal Douglas-fir, or
  - Coastal Western Hemlock, very dry maritime, dry maritime or dry submarine;
- L3, if the lake is not less than 1 ha and not more than 5 ha in size and is in a biogeoclimatic zone or subzone other than one referred to in paragraph (c);
- L4, if the lake is
  - not less than 0.25 ha and not more than 1 ha in size and is in a biogeoclimatic zone or subzone referred to in paragraph (c) (i), (ii) or (iii), or
  - not less than 0.5 ha and not more than 1 ha in size and is in a biogeoclimatic zone or subzone referred to in paragraph (c) (iv) or (v).

An example of the composite wetland, lakes and river reserve zones along the stream network is shown in Figure 12.

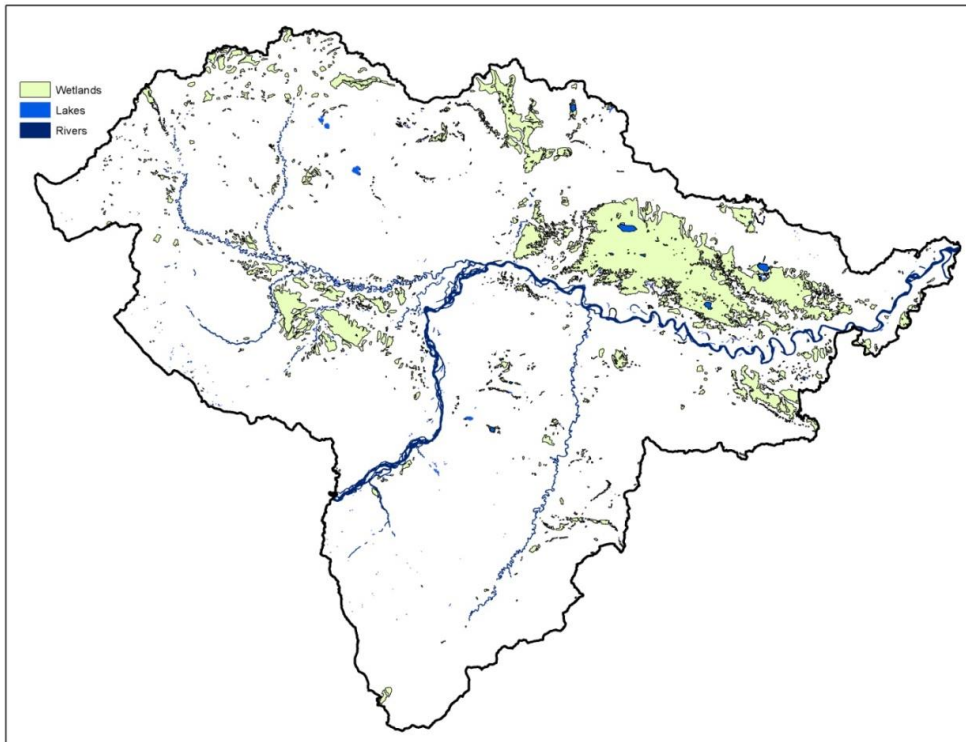


Figure 12: Wetland, lake and river classes for the Lower Muskwa River water management basin

Table 7 lists the source of riparian feature information.

Feature	Data Source	Source Name	Open Data
FWA Rivers	DataBC	<a href="#">WHSE BASEMAPPING.FWA RIVERS POLY</a>	Y
FWA Lakes	DataBC	<a href="#">WHSE BASEMAPPING.FWA LAKES POLY</a>	Y
FWA Wetlands	DataBC	<a href="#">WHSE BASEMAPPING.FWA WETLANDS POLY</a>	Y
FWA Streams	DataBC	<a href="#">WHSE BASEMAPPING.FWA STREAM NETWORKS SP</a>	Y
Biogeoclimatic Ecosystem Classification	DataBC	<a href="#">WHSE FOREST VEGETATION.BEC BIOGEOCLIMATIC POLY</a>	Y

Table 7: Riparian source data

## Riparian data processing and output summary

The data was processed and managed by each WMB to accommodate the size and volume of information in northeast BC. Water Management Basins are found on the Commission's website. *OGC\_WMB* uses *WMB\_NAME* for Water Management Basin Names and each has a unique identification number *BASIN\_ID*. This resulted in 69 individual *RIPARIAN* datasets (1-69) plus two consolidated regional output datasets *ABA\_RIPARIAN\_FULLL* and *IN\_RRZ\_ONLY\_ALL*. Table 8 lists the datasets and descriptions used.

Dataset	Description
RIPARIAN1 to RIPARIAN69	RRZ by Commission Water Management Basin
ABA_RIPARIAN_FULLL	Summary dataset for all 69 basins
IN_RRZ_ONLY_ALL	Riparian Reserve Zone areas for all 69 basins

Table 8: Riparian data sets and descriptions

A specific set of features for each data type was processed to generate the feature buffers. Buffers are outlined above and water courses were identified from the FWA classifications.

To enhance the stream classification the *blue\_line\_key* value on the FWA dataset was used to identify a continuous stream. Arcs for streams which are identified as definite (*F\_CODE* = 'GA24850000') are buffered each side by 25m. This is the base for the set of stream arcs. The *blue\_line\_key* value identifies a unique key for the collection of arcs which forms a stream. The set of *blue\_line\_keys* generated from the definite streams was used to identify an additional set of arcs which *connect* the definite streams, by adding these segments identified as *constructor lines*.

*FWA\_RIVER* is a polygon representation of rivers. Each polygon was buffered on the outside to a distance of 50m. Rivers often follow a meandering path which leads to overlapping buffers. Any areas generated in buffers which fall within the original river polygons were erased. Islands within the river are considered an outside edge so these buffered as well.

*FWA\_LAKE* contains lake polygons. Only lakes greater than 5 ha in size were buffered. Lakes between 5 and 1000 ha were buffered to 20m and lakes 1000 ha or more were buffered to 50m. All buffers were formed on the outside (land side) of the lake, and any overlaps within the lake polygon were erased.

*FWA\_WETLANDS* contains wetland polygons. Wetlands cover much of northeast BC. Wetland polygons over 1000ha in size which fall within the BWBSmk biogeoclimatic zone were not buffered. All other wetlands over 0.25ha in size are buffered by 10m, and any buffer which falls within the wetland polygon was erased.

Figure 13 below summarizes the FWA datasets and key criteria used.

FWA Dataset	Selection Criteria (Assigned sequentially as listed)	Code	Buffer Distance	Post Processing
FWA_STREAM_NETWORK_SP	F_CODE = 'GA2485000'	S2/S3	25	Arc Buffered and dissolved
FWA_RIVER	F_CODE = 'GA2485000'	R	50	Polygons buffered to outside only. Polygon overlap with FWA_RIVER erased
FWA_LAKE	LAKE_CLASS = 'L1-A' LAKE_CLASS = 'L1-B'	L1-A L1-B	50 20	Buffered to outside only. Polygon overlap with FWA_LAKE erased
FWA_WETLANDS	Area > 1000 ha in BSBWmk BEC Zone Area > 5 ha Area > 0.25ha	W3 W1 W2	Not buffered 10 10	 Buffered to outside only. Polygon overlap with FWA_WETLANDS erased

**Figure 13: Summary of riparian processes**

The riparian layer combined the stream, river, lake and wetland buffers to a single layer. The field *IN\_BUFFER* was used to identify all areas within the buffer, and in some areas the buffers for different features overlapped. To ensure that no buffer areas are identified inside river or lake polygons a hierarchy was developed to assign which buffer belonged to which riparian feature. River buffers were assigned first, then lakes, streams and finally wetlands. Streams buffers within a wetland are not erased and remain as stream buffers. Area inside a wetland was identified *INSIDE* however buffers from other features which extend into the wetland were not erased. The riparian feature class was *unioned* with the water management basins *OGC\_WMB* to create the layer used in ABA.

The ABA dataset created for Riparian Reserve Zone includes the following attributes and data codes:

Figure 14 summarizes the datasets created during the processing of riparian data.

Buffer Dataset	Description	Fields
OGC_WMB	Water Management Basins for NEBC	WMB_NAME BASIN_ID
BUF_STREAMS	S2 and S3 (Definate) streams arcs buffered	STREAM_CLASS BUF_DIST_STREAM
BUF_RIVERS	River polygons buffered to outside edge	RIVER_CODE BUF_DIST_RIVER
BUF_LAKES	Lake polygons bufferd to outside edge	LAKE_CLASS BUF_DIST_LAKE
BUF_WETLANDS	Wetland polygons buffered to outside edge	WETLAND_CODE BUF_DIST_WETLAND
WATER_WETLANDS	Lake, River and Wetland Polygons to identify inside area of buffers	INSIDE
RIPARIAN_WATER	Buffer area and water features combined	IN_BUFFER INSIDE

Figure 14: Summary of key information for riparian data processing

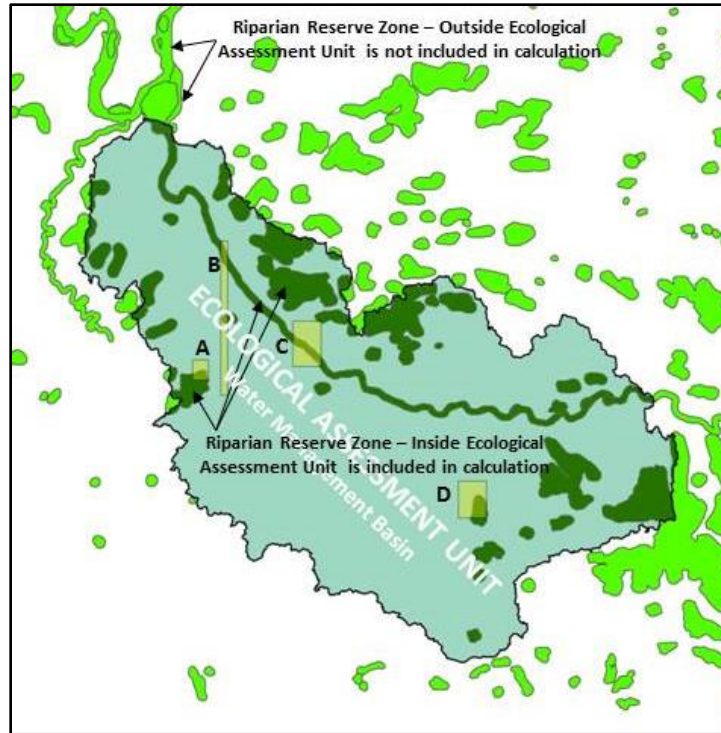
## Riparian enhanced management and regulatory policy triggers

The values for enhanced management trigger and regulatory policy trigger are defined in Table 9 below.

Trigger	Value
Enhanced management	<95 percent of RRZ intact by WMB
Regulatory policy	<90 percent of RRZ intact by WMB

Table 9: Hydro-riparian triggers

Figure 15 and the calculations below illustrate how the ABA values will be calculated for Riparian Reserve Zones.



**Figure 15: Example RRZ intactness calculation**

Total area of the WMB = 1,728 km<sup>2</sup>

Total RRZ in the WMB = 272 km<sup>2</sup>

Total SLU in A, B, C & D = 40 km<sup>2</sup>

Total SLU = 6.3km<sup>2</sup>

Impact = Total SLU within RRZ/Total RRZ in the WMB = 6.3/272.0 = 0.023 = 2.3%

Therefore 97.7% of RRZ is intact

## ABA Value: Old Forest

Old Forest is defined as forested habitat associated with an abundance of large and old live trees, large dead trees, multi-storied canopies and abundant downed wood. The assessment units used are the natural disturbance units (NDU) identified in technical report 059<sup>2</sup>. Within northeast BC, 6 of the 10 units will be considered and are shown in Figure 16

An NDU is a broad ecological unit separated from adjacent units based on differences in ecological disturbance processes, stand development, and temporal and spatial landscape patterns.

<sup>2</sup> Natural disturbance units of the former Prince George Forest Region, Technical Report 059 2011, FNLRO

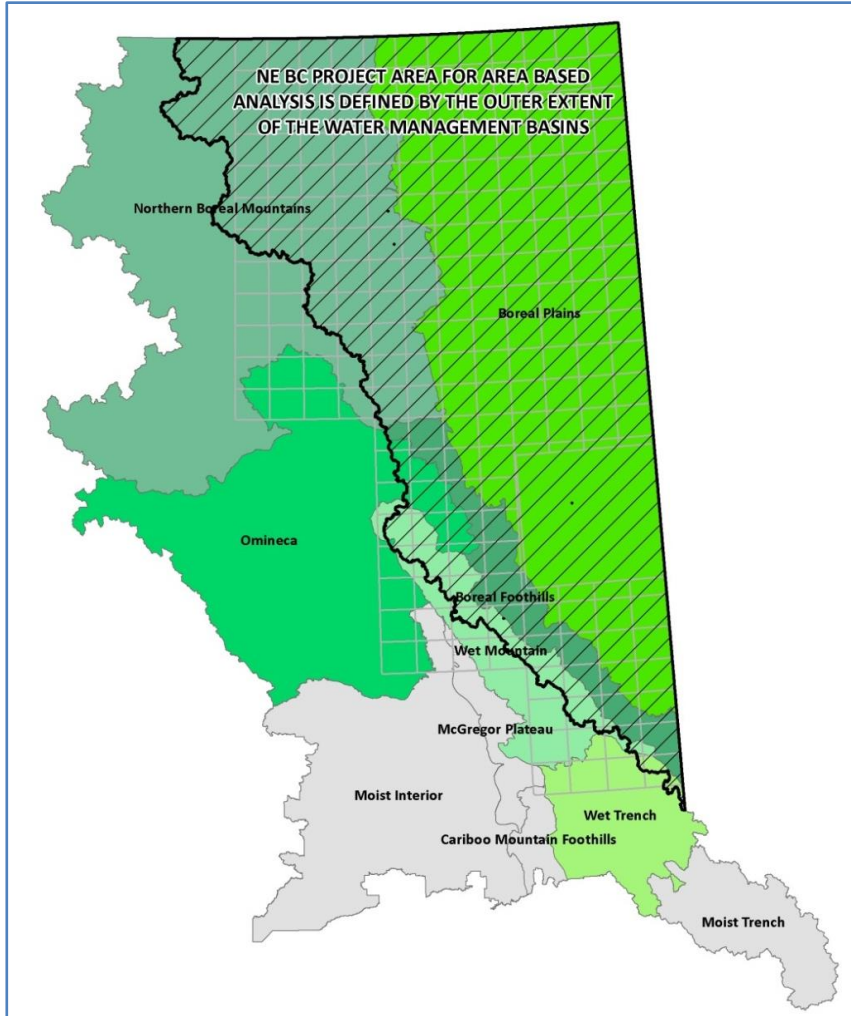


Figure 16: Natural disturbance units in northeast BC

## Defining Old Forest

Old Forest area is identified in the Vegetation Resource Inventory (VRI) dataset using the old forest definitions in Table 10 . An example of a forest cover map is in Figure 17.

Stand Type	Description	Old definition
Conifer Leading Stands	Stands 80-100% coniferous	>140yrs
Deciduous Leading Stands	Stands 80-100% deciduous	>100yrs
Mixedwood Stands	Stands greater than 20% but less than 80% coniferous	>120yrs

Table 10: Old forest definitions

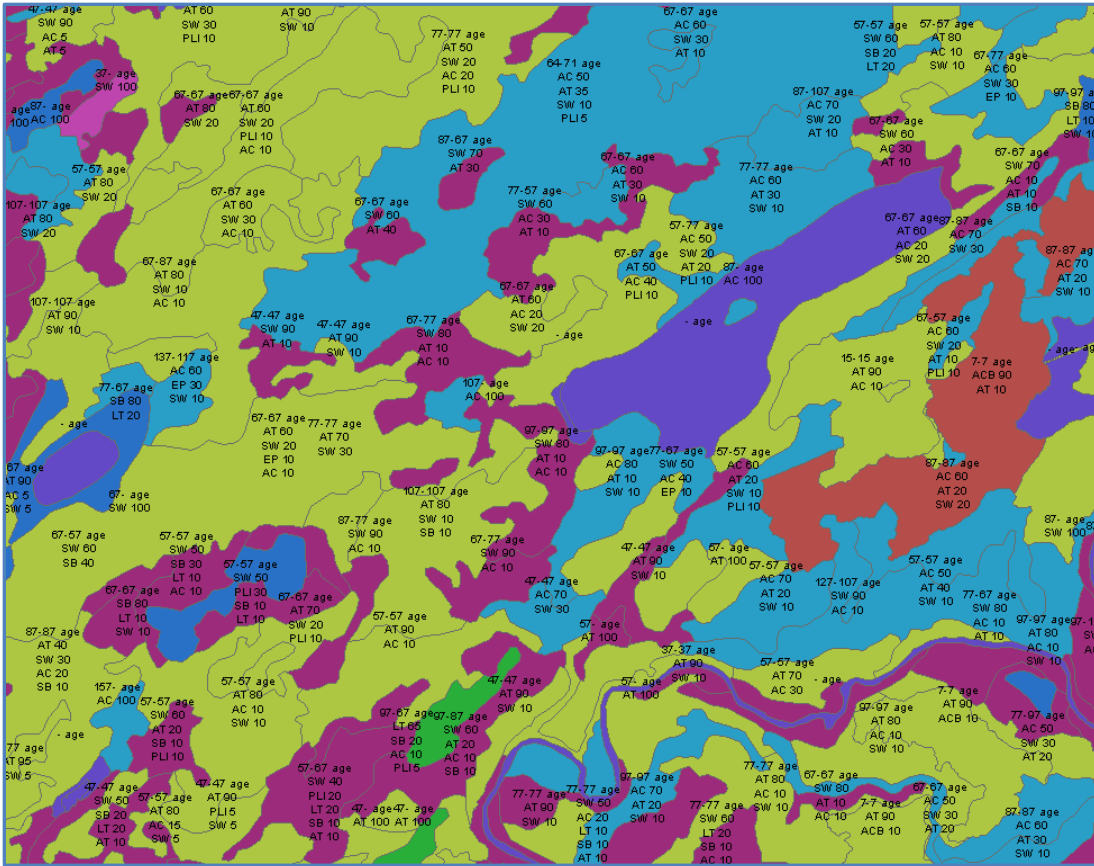


Figure 17: VRI age class map in northeast BC showing projected age of species 1 and 2 (if available) and composition (species and percentage of stand)

This classification requires an interpretation of the VRI dataset to determine stand composition, considering: *WHSW\_FOREST\_VEGETATION.VEG\_COMP\_LYR\_L1\_POLY* attributes *SPECIES\_CD\_1,2,3* and *SPECIES\_PCT\_1,2,3*, *FULL\_LABEL*, *LINE\_3\_TREE\_SPECIES* and *PROJ\_AGE\_1, 2,3*.

Old forest ABA results are reported as a percentage of the forest land base. This is based on Craig DeLong's work which reports old forest against total forested area. Note that there is stand and age information in VRI for most woodlots and 2004 VRI was used to derive stand information in Tree Farm License 48. The diagram below summarizes the forest land base and the associated data classes. Note that the forest land base does not include private land, but it does include crown, Indian Reserves, TFL, Parks and Recreation Areas. The forest land base is determined by identifying land that is:

- Land that is not private
- Land that is vegetated/treed according to the BC Land Classification System
- Land that is a cutblock or recently harvested from VRI and *FTEEN\_HARVEST* information.

VRI information is used as a base to identify forested land and was used to define the attribute *FRL1* in the old forest dataset. The *FRL1* assignment indicates that the area is identified in VRI as forested land and is based on the BC Land Classification system coding

as designated from the *BCLCS\_LEVEL\_1* and *BCLCS\_LEVEL\_2* attributes in the VRI data (Figure 18).

Attribute Field	Selection Criteria	Assignment	Description
FRL	BCLCS_LEVEL_1 = 'V' and BCLCS_LEVEL_2 = 'T' All other area	FRL1 X	Treed Vegetated Land

Figure 18: Selection criteria for defining forest land from the BC land classification system

The *FRL* designation is combined with ownership information and cutblock data to determine the forest land base for ABA. The forest land base is calculated where *FOREST* (defined as *FRL1*) or *CUTBLOCKS* (defined in the SLU) intersect with *NON\_PRIVATE LAND* (*FOWN*). Table 11 shows the source data.

Feature	Data Source	Source Name	Open Data
FOWN - Generalized Forest Cover Ownership	DataBC	<a href="#">WHSE_FOREST_VEGETATION.F OWN</a>	Y

Table 11: FOWN source data

The *ICIS* cadastral fabric was considered as a source for land ownership information. Analysis showed that *ICIS* cadastral fabric and *FOWN* dataset were similar, the *FOWN* was more appropriate for defining forest land base.

## Old Forest data processing and output and summary

Spatial data was sourced through DataBC. Most of northeast BC is covered by the VRI and was updated to 2013. A 2004 inventory of TFL48 was used to ensure complete coverage. A summary of the inventory information used is in Table 12.

Feature	Data Source	Source Name	Open Data
VRI - Forest Vegetation	DataBC	<a href="#">WHSE_FOREST_VEGETATION.VEG_COMP_LYR_L1_POLY</a> (NEBC_WHSE_FOREST_VEGETATION_VEG_COMP_LYR_L1_POLY)	Y
VRI - Forest Vegetation	DataBC	<a href="#">WHSE_FOREST_VEGETATION_2004.VEG_VEGETATION_COVER_POLYGON</a> (TFL_48_INVENTORY_VEG_2004)	Y
VRI - Forest Vegetation	DataBC	<a href="#">WHSE_FOREST_VEGETATION_2004.TREE_SPECIES</a> (WHSE_FOREST_VEG_2004_TREE_SPECIES_LYR1)	Y
Natural Disturbance Units	DataBC	<a href="#">REG_LAND_AND_NATURAL_RESOURCE.NATURAL_DIST_UNITS_RPG_POLY</a>	N
FOWN - Forest Cover Ownership	DataBC	<a href="#">WHSE_FOREST_VEGETATION.F OWN</a>	Y

Table 12: Forest inventory source data

The inventory (VRI) holds tree species information by layer and by individual species shown in order of percent crown cover from species 1 to species 6 (if present). The total of these species percent values is 100 for each layer. In the forest inventory Layer 1



represents the tallest trees and is used to characterize the dominant forest species composition, height and age. Layer 1 was used to define the old forest.

ABA requires the forest information to be characterized by the forest type, a group of species by percent to identify conifer, deciduous or mixedwood types. The information in Table 10 above was used to classify the VRI data, and the coding is shown in Figure 19 below.

Attribute Field	Selection Criteria	Assignment1	Assignment2
SPECIES_CD(1-6)	For each species code listed ...		
SPECIES_PCT(1-6)	Is code in Deciduous Species List?	SP_GRP = 'D'	Add Species PCT to DECID_PCT
	Is code in Conifer Species List?	SP_GRP = 'C'	Add Species PCT to CONIF_PCT
BCG	Assign broad cover group based on Deciduous and Conifer percentages		
	DECID_PCT >= 80	'D'	
	CONIF_PCT >= 80	'C'	
	CONIF_PCT >= 20 and DECID_PCT >= 20	'MX'	
	DECID_PCT = 0 and CONIF_PCT = 0	'X'	

Deciduous species list ('AC','ACB','ACT','AD','AT','D','DR','E','EA','GP','EE','EP','J','JR','W','WS','X','XC','XH','ZC','WA','WP','AX','EW','WB')  
 Conifer species List ('B','BA','BB','BG','BL','CW','F','FD','FDC','FDI','H','HM','HW','L','LA','LW','PW','PY','S','SB','SE','SW','SX','SXW','SS','P','LT','PA','PL','PJ','PLI','T','YC','C','BP','LS','PM')

Figure 19: Species composition details for old forest

Figure 20 shows an example of the forest land base and the old forest:

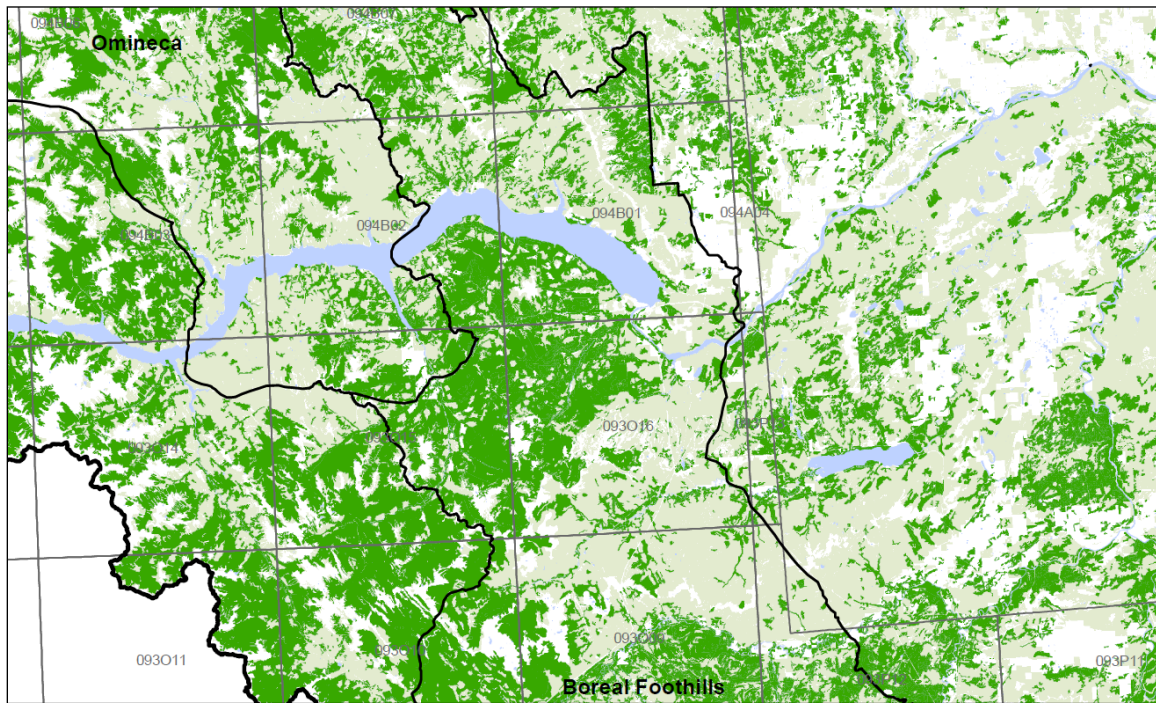


Figure 20: Old forest (dark green) and forest land base (light green)

## Old Forest enhanced management and regulatory policy triggers

The goal of ABA is to measure the extent of old forest in each Natural Disturbance Unit and report the percentage of land in each NDU that is covered by old forest. The designated amount of old forest required for each NDU is defined in Table 13 below.

Natural disturbance unit	Designated Target % of old forest in NDU	Enhanced Management Trigger
Boreal Foothills	33% forest land base <sup>3</sup>	33% forest land base <sup>3</sup>
Boreal Plains	17% forest land base <sup>4</sup>	17% forest land base <sup>4</sup>
North Boreal Mountains	37% forest land base <sup>4</sup>	37% forest land base <sup>4</sup>
Wet Mountain	84% forest land base <sup>4</sup>	84% forest land base <sup>4</sup>
Wet Trench	80% forest land base <sup>3</sup>	80% forest land base <sup>3</sup>
Omineca	58% forest land base <sup>5</sup>	58% forest land base <sup>5</sup>

Table 13: NDU old forest target percentages

## ABA Value: Wildlife

Area-based Analysis will manage for cumulative disturbance to UWR and WHA in northeast BC by calculating the intactness of WHA and UWR at a sub-unit level. ABA Wildlife will assign an ABA Status to each WHA and UWR to highlight the level of risk associated with resource development.

ABA will consider all UWR and WHA in northeast BC that are designated under OGAA with the exception of Boreal Caribou. Boreal Caribou will not be incorporated until inter-agency agreements and protocol are provided by the Ministry of Forest, Lands and Natural Resource Operations.

UWR and WHA will be consolidated into a single spatial layer to allow for Wildlife to managed as single value and to prevent conflicting management guidance for a single management area. WHA will have precedence over UWR, so any UWR that is overlapped by a WHA will be designated as WHA where the overlap occurs.

ABA will carry species information for primary and secondary species as per BCGW.

ABA will apply a 100m buffer to small WHA <100ha to increase protection of edge sensitive species such as warblers and fisher.

Feature	Data Source	Source Name	Open Data
Wildlife Habitat Areas	BCGW	<a href="#">WHSE WILDLIFE MANAGEMENT.WCP WILDLIFE HABITAT AREA POLY</a>	Y

<sup>3</sup> Dawson Creek TSA Old growth management project

<sup>4</sup> Fort Nelson Non-spatial old forest order

<sup>5</sup> Mackenzie LRMP

Ungulate Winter Range	BCGW	<a href="#">WHSE WILDLIFE MANAGEMENT.WCP UNGULATE WINTER RANGE SP</a>	y
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Table 14: Wildlife Source data

## ABA Wildlife Triggers for enhanced management and regulatory policy

The following triggers are applied to determine ABA Status for WHA and UWR.

Note that the triggers are different for UWR and for small WHA.

The WHA/UWR triggers are guided by:

- Best available scientific knowledge<sup>6</sup>.
- Wildlife studies and cumulative effects research.
- Government management strategies and best practices.
- The Canadian Institute of Resources Law.<sup>7</sup>

WHA are managed to a higher level (for less disturbance) than UWR as they are generally more sensitive to disturbance than UWR as they are associated with species life request (such as lambing, calving, natal and maternal dens, mating, nesting, rutting and critical escape terrain and connectivity).

Small WHA <100ha are assigned the highest triggers in ABA as they manage for edge intolerant sensitive species such as Fisher and Warblers.

Intactness Triggers	Normal	Enhanced Management	Regulatory Policy
WHA Small <=100ha	>=98%	95% and < 98%	<95%
WHA Large > 100 ha	>=97%	90% and < 97 %	<90%
UWR	>=95%	85% and < 95%	<85

Table 15: Wildlife Triggers for UWR and WHA

<sup>6</sup> Culling et al 2006. Ecology and seasonal habitat selection of boreal caribou in the Snake-Sahtaneh watershed, British Columbia. Imbeau et al. 1999. Effets a court et a long terme de L'amenagement forestier sur L'avifaune de la forest boreale et une de ses especes-cles: le pic tridactyle. Drapeau et al. 2000. Landscape-Scale Disturbances and Changes in Bird Communities of Boreal Mixed-Wood Forests. Venier and Pearce, 2005. Effects of natural resource development on the terrestrial biodiversity of Canadian boreal forests. Boulanger and Stenhouse, 2014. The impact of roads on the demography of Grizzly bears in Alberta. Mattson, 1993. Changes in mortality of Yellowstone Grizzly bears. Salmo 2003, Cumulative effects indicators, thresholds and case studies. Guky et al, 2004. Environmental, biological and anthropogenic effects on grizzly bear body size: temporal and spatial considerations. Nellemann and Cameron, 1996. Effects of petroleum development on terrain preferences of calving caribou. Dyer et al, 2002. Quantifying barrier effects of roads and seismic lines on movements of female woodland caribou in northeastern Alberta

<sup>7</sup> Kennett, S. 2006. From science-based thresholds to regulatory limits: Implementation issues for cumulative effects management

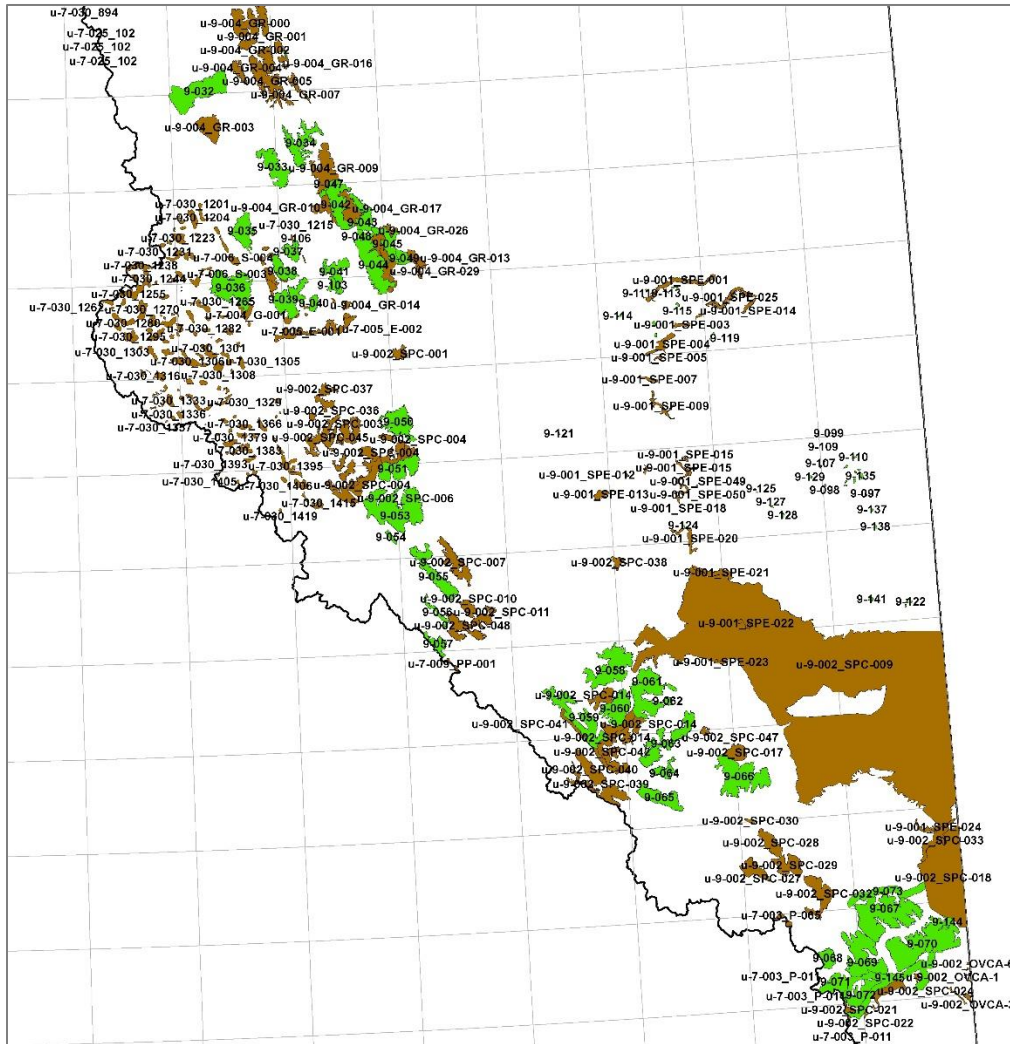


Figure 21: Wildlife Areas in ABA

## Wildlife data processing and output and summary

The following summary captures the data processing steps to for the ABA Wildlife areas.

Selection criteria for WHA:

Include all boundaries legally designated under OGAA (not FRPA only) with the exception of WHA that are specifically designated for boreal caribou or "sensitive species".

Exclude: (COMMON\_SPECIES\_NAME IN ('Boreal Caribou', 'Data sensitive'))  
OR LEGISLATION\_ACT\_NAME = 'FRPA'

For polygons with an area of < 100ha:

buffer these by 100m (WHA\_BUF100) and retain the attributes needed.

Erase WHA\_BUF100 with the original WHA\_SEL to remove overlap with original polygons (#1).

If any overlap between the buffered polygons occur and the overlap is between polygons with different species then assign overlap area to one type in the following order of common species name:

1. Fisher
2. Connecticut warbler
3. Black-Throated Green warbler
4. Mountain Goat
5. Northern Caribou
6. Boreal Caribou
7. Data sensitive

If any buffers for the same species overlap then the buffer for the polygon with the largest area will erase the second polygon.

Combine WHA and WHA buffers to a single layer (WHA\_WITH\_BUFF\_NO\_OVERLAP). Dissolve by Tag# [and other fields as needed].

Selection criteria for UWR:

Exclude:

`((SPECIES_1 = 'M-RATA-14' AND SPECIES_2 IN (' ', 'N/A')) OR LEGISLATION_ACT_NAME = 'FRPA')`

To drop boreal caribou and FRPA only areas.

Prepare Wildlife Value Dataset

Combine prepared WHA and UWR datasets. Any overlap is assigned as a WHA but tracked as an area which has UWR within the polygon (WHA\_UWR). Each polygon has a unique AREA\_ID assigned as the WHA TAG# or a combination of UWR\_NUMBER and UNIT\_NUMBER. Identify common species for each polygon.

Combine polygons with land ownership and surface land use information to identify areas of crown land with no surface land use in the polygon (Current Condition). Calculate Intactness as:

$$100 * \frac{\text{Area with no Surface Land Use}}{\text{Area of Crown Land within polygon}}$$

## Geoprocessing overview for data integration and analysis

The number, size and complexity of northeast BC datasets limited processing full spatial datasets. The 69 water management basins identified in *OGC\_WMB* cover the area of interest, do not overlap and were used to process data to improve performance. Once processing was completed, the data were appended together to a final dataset.

ABA calculations and reporting required a suite of zone based attributes to separate and summarize results, and included:

- Commission water management basins. 69 basins cover northeast BC. The basin is also the reporting boundary for riparian calculations.
- Natural disturbance units. Portions of 6 NDUs cover northeast BC. The NDU is the reporting boundary for old forest calculations.
- Land ownership class. ABA summarizes crown land in northeast BC. The *OWN\_CLASS* identifies all private lands for exclusion and assigns additional land classification to crown lands (parks, reserves, crown forests, woodlots, community forests and timber leases)

## Summary of ABA Reporting Requirements

The first release of ABA focused on two values; old forest and the riparian ecosystem component of the hydro-riparian ecosystems in northeast BC. In 2017 Wildlife was added to ABA. The intention of ABA is to report the current condition (hectares) of each ABA value relative to predefined triggers. The old forest condition is determined by the amount available, while the riparian reserve zone and wildlife condition is assessed as the level of intactness.

### Periodic and ad hoc current condition reports

ABA will report the following statistics for RRZ in each of the 69 Water Management Basins (WMB) in Northeast BC:

1. The total area of private and crown, the total area of crown and the total area of private land.
2. For each land category in 1:
  - a. The total area of RRZ in hectares.
  - b. The total area of RRZ as a percent.
  - c. The total area of RRZ without SLU.
  - d. The area of RRZ with SLU by 4 categories (oil and gas, non-oil and gas, geophysical and cutblocks).
  - e. The percent intactness (2c/2a).
3. The percent intactness will be measured against the trigger values (95% - enhanced management trigger and 90% - regulatory policy trigger) to determine the status of the RRZ on crown land
4. Colour coded thematic maps will be generated that code RRZ on crown land by their intactness status (green, yellow, orange).
5. The above mentioned statistics are assessed for every permit or authorization, and reported periodically.

ABA will report the following statistics for old forest in each of the 6 Natural Disturbance Units (NDU) in Northeast BC:

1. The enhanced management and regulatory policy triggers in percent.
2. The total area of crown land in hectares.
3. The forested landbase in hectares.

4. The total area of old forest within the forest land base in hectares
5. The percent area of old forest within the forest land base and areas by three species mixes (coniferous, deciduous, mixedwood).
6. The total area of old forest without SLU.
7. The area of forest land base with SLU by 4 categories (oil and gas, non-oil and gas, geophysical and cutblocks).
8. The amount of old (4) is compared to the trigger expressed in hectares (1\*3) to determine the status of the old forest on crown land
9. Colour coded thematic maps will be generated that code old forest on crown land by their intactness status (green, yellow, orange).
10. The above mentioned statistics are assessed for every permit or authorization, and reported periodically.

ABA will report the following statistics for Wildlife for each Wildlife Area (UWR or WHA) in Northeast BC:

1. For each Wildlife Area
  - a. The total area in hectares.
  - b. The total disturbed area.
  - c. The area of SLU by each categories (oil and gas, non-oil and gas, geophysical and cutblocks) in each Wildlife Area.
  - d. The percent intactness.
2. The percent intactness will be measured against the trigger values (See ABA Wildlife Triggers) to determine the status of each Wildlife Area
3. Colour coded thematic maps will be generated that code RRZ on crown land by their intactness status (green, yellow, orange).
4. The above mentioned statistics are assessed for every permit or authorization, and reported periodically.

## Next steps

This document will be updated as new values are incorporated into ABA, and when improvements in the underlying data or analysis are made.