

Environmental Protection and Management Guide November | 2012

Version 1.8

Contents

MANUAL REVISIONS	4
SUMMARY OF REVISIONS.....	4
1 PREFACE.....	5
PURPOSE.....	5
SCOPE	5
HOW TO USE THIS GUIDEBOOK	6
ADDITIONAL GUIDANCE	7
2 WATER	9
WATERWORKS AND WATER SUPPLY WELLS	9
AQUIFERS AND GROUNDWATER RECHARGE AREAS.....	9
DESIGNATED WATERSHEDS.....	10
TEMPERATURE SENSITIVE STREAM	10
3 RIPARIAN VALUES	11
WATERBODY CLASSIFICATION.....	12
RIPARIAN MANAGEMENT AREAS.....	21
BEST MANAGEMENT PRACTICES (BMPs) WITHIN CLASSIFIED RIPARIAN AREAS.....	23
STREAM/LAKE/WETLAND CROSSINGS.....	25
4 WILDLIFE AND WILDLIFE HABITAT	42
FISH AND WILDLIFE TIMING WINDOWS FOR OIL AND GAS EXPLORATION AND DEVELOPMENT IN NORTHEAST BRITISH COLUMBIA	42
WILDLIFE HABITAT AREAS	46
UNGULATE WINTER RANGE	51
FISHERIES SENSITIVE WATERSHED	53
WILDLIFE TREE RETENTION AREA.....	53
WILDLIFE HABITAT FEATURES.....	54
FISH AND FISH HABITAT	55
5 OLD GROWTH MANAGEMENT AREAS, RESOURCE FEATURES, CULTURAL HERITAGE RESOURCES	56
OLD GROWTH MANAGEMENT AREAS	56
RESOURCE FEATURES.....	56
CULTURAL HERITAGE RESOURCES.....	60
6 NATURAL RANGE BARRIERS	62
7 INVASIVE PLANTS.....	63
INTEGRATED MANAGEMENT OF INVASIVE PLANTS.....	63
ADDITIONAL GUIDANCE	68
8 FOREST HEALTH.....	70
MOUNTAIN PINE BEETLE	71
SPRUCE BARK BEETLE	71
9 CONSERVING SOIL	72
MINIMIZE NEW SOIL DISTURBANCE.....	72
SOIL PRODUCTIVITY	73

NATURAL SURFACE DRAINAGE PATTERNS	76
PRE –CONSTRUCTION SITE ASSESSMENT (PCSA)	76
10 SEISMIC LINES	78
11 AREAS TO BE RESTORED	79
FINAL RESTORATION PLANNING	79
FINAL RECLAMATION ACTIVITIES	80
APPENDIX A – DEFINITIONS	87
APPENDIX B – DEVIATIONS AND MITIGATION.....	95

Manual Revisions

Summary of Revisions

The Environmental Protection and Management Guide has been revised based upon feedback to provide clarity in terms of requirements and process. Changes by section in the updated manual are highlighted below.

Applications received on or after the effective date are required to meet the revised application standards.

Effective Date	Section	Description/Rationale
1-Aug-2011	4	Added revised information and table for fish timing windows. Updated Wildlife Habitat Areas, Ungulate Winter Range and Fisheries Sensitive Watershed.
	5	Revised Old Growth Management Areas.
	3	P. 14. Changed > 1.5m to < 1.5m in Figure 2.
		P. 27. Changed reference from Figures 1 and 2 to Figures 6 and 7.
1-Oct-2011	3	Section on Shrub-carrs added.
	3	Clarification to "Directional Drill".
	11	Updates.
	Appendix A	"Qualified Specialist" definition added.
	2	Updated "Designated Watersheds" section.
1-Dec-2011	4	Updated WHAs and UWRs to represent new EMPR regulation.
	General	Updated all references to Best Management Practices Deviations.
1-Mar-2012	4	Updated categories of species reference, including link.
	4	Updated Northern Caribou WHAs and UWRs.
1-April-2012	3	Updated Wetland Classification Map, p.18.
1-Dec-2012	3	Updated Fish-Stream Crossing Guidebook link, p.41.

1 Preface

Purpose

The Commission developed this guidebook to assist oil and gas companies and those potentially impacted by oil and gas activities to understand the requirements of the Environmental Protection and Management Regulation (EPMR).

This guidebook is not intended to take the place of the applicable legislation. The user is encouraged to read the full text of legislation and each applicable regulation and seek direction from Commission staff, if and when necessary for clarification.

This guidebook outlines the minimum legal requirements for environmental protection and management.

Scope

The Environmental Protection and Management Guidebook (EPMG) focuses exclusively on requirements and processes associated with the Commission's legislative authorities, and do not provide information on legal responsibilities that the Commission does not regulate. It is the responsibility of the applicant or permit holder to know and uphold its other legal responsibilities.

How to Use This Guidebook

Each section is classified by topic and the information provided below gives an overview of the information covered in each.

- Section 2** **Water** covers Waterworks and Water Supply Wells, Aquifers and Groundwater Recharge Areas, Designated Watersheds and Temperature Sensitive Streams.
- Section 3** **Riparian Management** covers Waterbody Classification, Riparian Management Areas, Best Management Practices (BMPs) within Classified Riparian Areas, Fish Stream Identification Risk Management Tool, and Stream/Lake/Wetland Crossings.
- Section 4** **Wildlife and Wildlife Habitat** covers Fish and Wildlife Timing Windows, Wildlife Habitat Areas, Ungulate Winter Ranges, Fisheries Sensitive Watersheds, Wildlife Tree Retention Areas, Wildlife Habitat Features and Fish and Fish Habitat.
- Section 5** Old Growth Management Areas, Resource Features, and Cultural Heritage Resources covers these resources and features in the context of oil and gas activities.
- Section 6** **Natural Range Barriers** covers natural range barriers in the context of oil and gas activities.
- Section 7** **Invasive Plants** covers best practices for integrated management of invasive plants.
- Section 8** **Forest Health** covers Mountain Pine Beetle and Spruce Bark Beetle
- Section 9** **Conserving Soil** covers Minimizing New Soil Disturbance, Soil Productivity, Natural Surface Drainage Patterns and Pre-Construction Site Assessments.
- Section 10** **Seismic Lines** covers Seismic Lines as they are addressed in the Environmental Protection and Management Regulation.
- Section 11** **Areas to be Restored** covers Final Restoration Planning, Soil Handling, Revegetation, Site Preparation and Monitoring.

Additional Guidance

The [glossary](#) page on the Commission website provides a comprehensive list of terms.

The appendices contain additional information to be used as reference when compiling information required by the Commission.

Spatial Data

Provincial spatial data is stored within the BC Geographic Warehouse, a central, consolidated repository of land and resource information from across the province. It includes many types of data including:

- Cadastral information (tenures, ownership, boundaries)
- Resource information (vegetation, fisheries, wildlife)
- Provincial atlas (rivers, roads, buildings, topography, surveys)
- Planning and analysis information (land and resource management plans, sustainable resource management plans)

Spatial data from the BC Geographic Warehouse (BCGW) is available to view through iMapBC, discover through the Discovery Service, and download from the Distribution Service.

All services can be accessed through the [GeoBC Gateway](#).

Other navigational and illustrative elements used in the manual include:

- Hyperlinks:** Hyperlinked items appear as blue, underlined text. Clicking on a hyperlink takes the user directly to a document or location on a webpage.
- Sidebars:** Sidebars highlight important information such as a change from an old procedure, new information, or reminders and tips.
- Figures:** Figures illustrate a function or process to give the user a visual representation of a large or complex item.
- Tables:** Tables organize information into columns and rows for quick comparison.

Frequently Asked Questions

A [Frequently Asked Questions](#) (FAQ) link is available on the Commission OGAA page. The information provided is categorized into topics which reflect the manuals for easy reference. Please consult the FAQ page before contacting the Commission to help keep response times short.

Feedback

The Commission is committed to continuous improvement by collecting information on the effectiveness of guidelines and manuals. Clients and stakeholders wishing to comment on Commission guidelines and manuals may send constructive comments to OGC.Documentation@bcogc.ca.

2 WATER

This section pertains to oil and gas operations and water values. For information regarding Water Act authorizations such as water withdrawal, works in or about a stream and temporary transportation or storage of water for the purposes of conducting an oil and gas activity, refer to the Water Permitting Manual (currently in development).

Waterworks and Water Supply Wells

All oil and gas activities must be planned and undertaken in accordance with Sections 4(a) and 9 of the EPMR.

Applicants are expected to identify all known waterworks and water supply wells within 100 meters of the proposed operating area (excluding geophysical applications) as part of the activity application.

Known waterworks information can be obtained from the BCGW. For applications on private land, additional waterworks information can be obtained from the landowner.

Where waterworks and/or water supply wells are within 100 metres of a proposed operating area, the applicant should indicate how adverse effects will be avoided or minimized as part of the additional information requirements.

Aquifers and Groundwater Recharge Areas

All oil and gas activities must be planned and undertaken in accordance with Sections 4(b) and 10 of the EPMR. Applicants are expected to identify all known aquifers that have the potential to be impacted by the activity regardless of their distance from the proposed operating area as part of the activity application.

No aquifers or groundwater recharge areas have been established under Section 34 of the EPMR to date. As these areas are established, additional operational guidance will be published.

Designated Watersheds

All oil and gas activities must be planned and undertaken in accordance with Section 4(b) of the EPMR.

Several designated watersheds have been established under Section 35 of the EPMR by the Minister of Forests, Lands and Natural Resource Operations. The order and its associated map and spatial data are available at the [Ministry of Forests, Lands and Natural Resource Operations website](#).

All oil and gas activity applications within a designated watershed must be accompanied by a detailed mitigation strategy demonstrating how any material adverse effect on the quality and/or quantity of water, and the natural timing of water flow, as a result of the activity and its operating area, will be mitigated.

Kiskatinaw Watershed

The Kiskatinaw watershed, upstream from the City of Dawson Creek municipal water intake, has been formally identified as a Notation of Interest, although it has not been designated under Section 35 of the EPMR at this time.

For all oil and gas activities proposed within the Kiskatinaw watershed, applicants must consider the potential impact of the proposed activity to the values within the watershed and plan activities accordingly. This may include consultation with the City of Dawson Creek. Additional application information should include an explanation of how potential impacts will be avoided or mitigated.

Temperature Sensitive Stream

No Temperature Sensitive Streams have been established under Section 28 of the EPMR at this time. As these areas are established, guidance with respect to operations will be developed.

3 Riparian Values

Riparian areas are transitional areas adjacent to a stream, wetland or lake where there is a distinct shift in vegetation from aquatic to upland communities; as illustrated in [Figure 1](#).

Riparian areas are important to water values, fish, aquatic and wildlife habitat and biodiversity; requiring additional management measures for protection.

Stream, wetland and lake classifications and corresponding riparian widths are described in EPMR, Sections 22, 23 and 24 and this section of the EPMG.

All oil and gas activities must be planned and undertaken in accordance with Section 5 of the EPMR.

Additional information on best practices for operations within riparian areas can be found in the Forest Practices Code (FPC) [Riparian Management Guidebook](#).

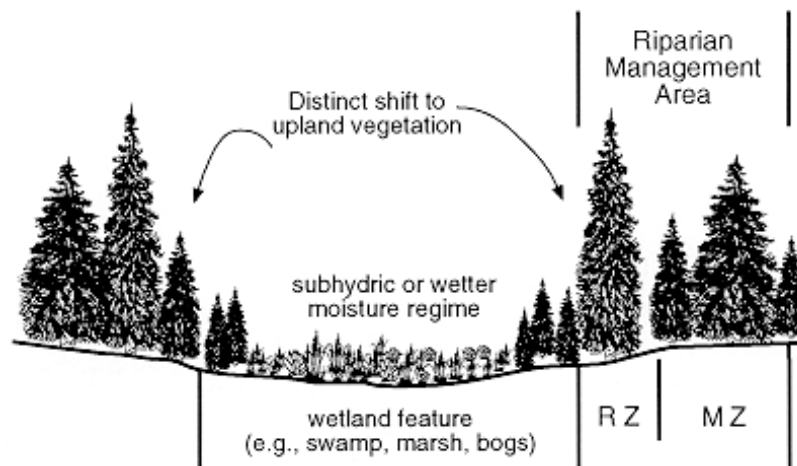


Figure 1: Illustration of a riparian area, a riparian reserve zone and riparian management zone.

Waterbody Classification

Streams

All streams, as defined in Part 1 and Section 22 of the EPMR, are subject to classification and each stream reach receives a riparian classification based on average channel width and the presence of fish.

Classes S1-S4 are fish streams or streams located within a community watershed and classes S5-S6 are non-fish streams located outside a community watershed.

Some smaller streams may have discontinuous streambanks. The stream channel should be detectable throughout the extent of the stream reach, otherwise the stream is considered unclassified.

All oil and gas activities in or about streams must be carried out in accordance with Section 5 of the EPMR.

Classifying Streams

The estuarine portion of a stream should be classified the same as the stream that has formed the estuary.

An applicant must determine the riparian class of all streams that may be impacted by the oil and gas activity. [Figure 2](#) provides the steps to follow in determining stream riparian class.

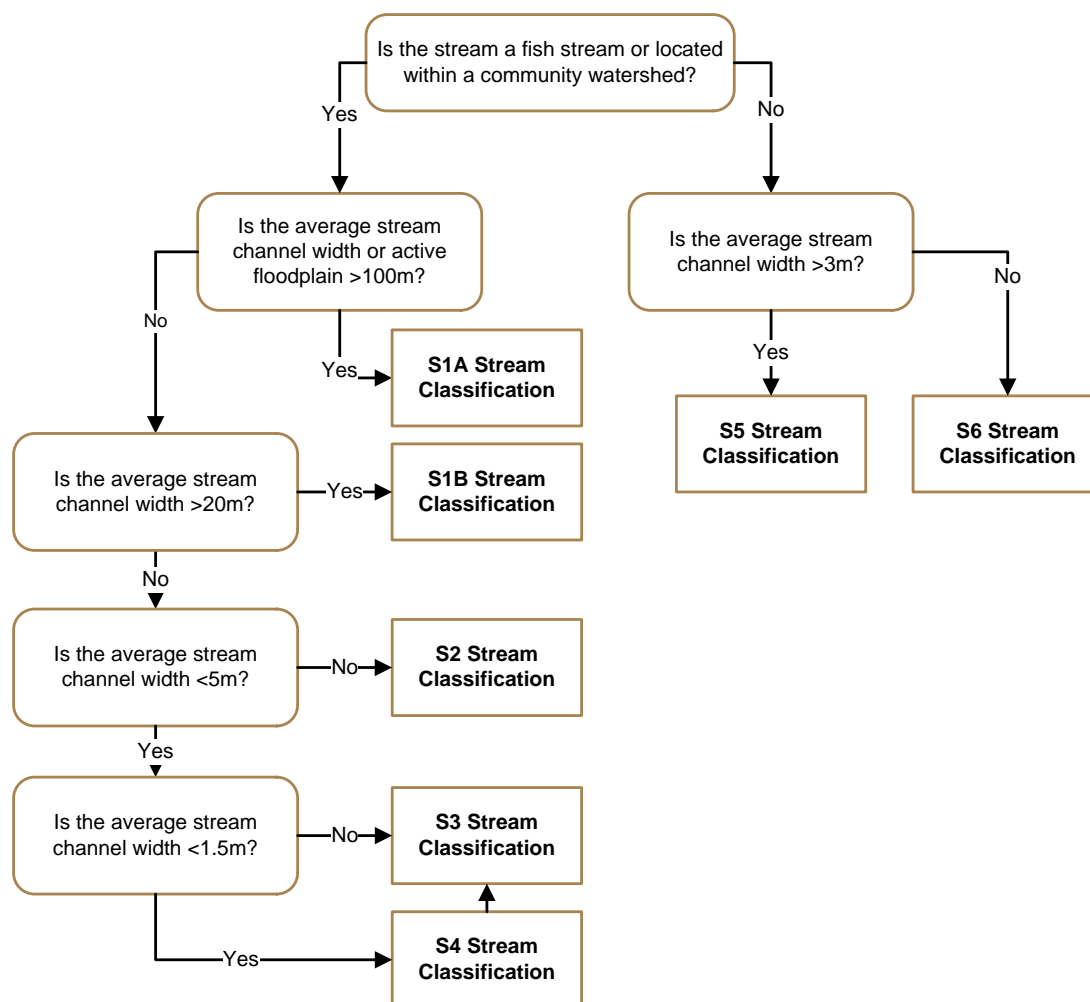


Figure 2: Key to stream riparian classification

Determining fish presence

It is the responsibility of the applicant to determine fish presence or absence when classifying streams. There are several acceptable methods and tools that can be used to assess fish presence potential; however, the accountability for the final classification of the stream rests with the applicant.

Where fish inventories have been carried out by the province, the spatial information is available through the BCGW.

In general, the Commission expects that fish inventories will be completed by qualified environmental technician(s) or biologist(s) experienced in fisheries management. Individuals conducting these assessments must apply the fish and fish habitat sampling methodologies and standards put forth by the Government of British Columbia – Resources Information Standards Committee (RISC) or a comparable, accepted

standard. RISC sampling protocol is available on-line at [RISC Sampling Tool](#).

Determining Community Watershed Status

Community watersheds are the natural watershed area, of not more than 500km², on which a community holds a valid water licence issued under the Water Act. There are 285 community watersheds in B.C. Spatial information identifying community watersheds is available through the BCGW.

Determining Average Stream Channel Width

The average stream channel width for each stream reach (as defined in the EPMR), in part determines the stream riparian class for that stream reach.

Once a stream is broken into reaches the following methodology can be applied to determine the average channel width for the reach. Once the average channel width has been determined, it can be used to classify the entire stream reach:

- The average width of the stream channel is calculated from six width measurements within a homogeneous reach.
- Each measurement should be spaced a distance approximately equal to the channel width from the previous one.
 - This is accomplished by using the first measurement as a guide. For example, if the first stream channel width measurement is 16 meters, the next five measurements should be spaced approximately 16 meters apart (measured in a straight line down the centre of the channel), with the same alignment as the channel.
- [Figure 3](#) illustrates that measurements should be taken perpendicular to the stream flow. Vegetated islands are not included.
- Where multiple channels are separated by one or more islands, the width is the sum of all separate channel widths.
- Un-vegetated channel bars are included in the measured width.

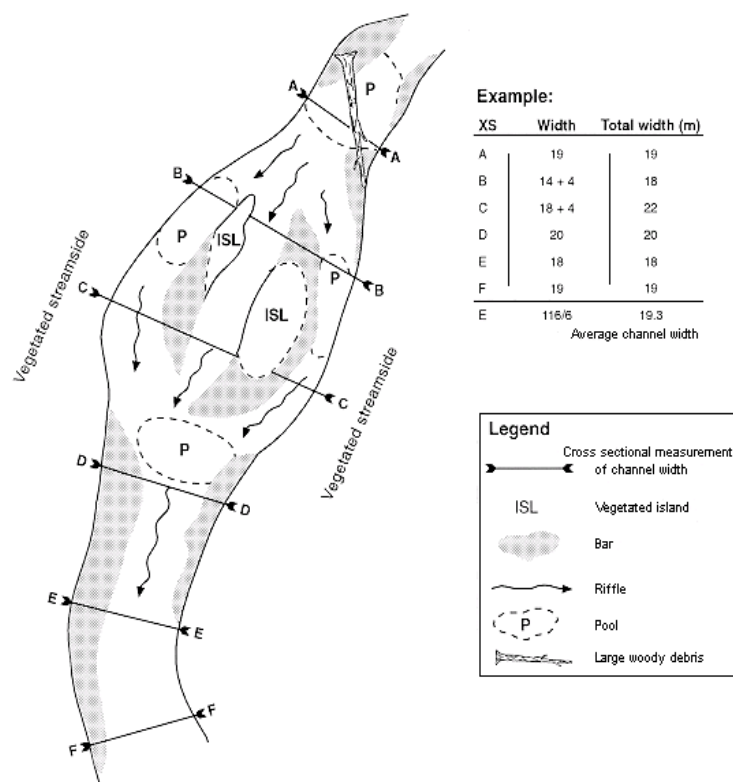


Figure 3: Diagram of stream channel width measurements.

Stream channel widths vary depending on where in a watershed the channel is located. Generally, channels are relatively narrow in headwater areas and relatively wide downstream, near the mouth.

The normal channel width can be greatly altered by both natural and man-induced factors. Channel width can be enlarged beyond the natural undisturbed channel width by debris torrents or flows, bank disturbances from industrial operations, or by the removal of instream Large Woody Debris (LWD).

Determination of stream riparian class is based on normal, non-disturbed, channel widths. Determining stream classification by averaging measurements over a representative portion of the stream or reach will help to ensure that classification is not skewed due to a disturbed or unnaturally wide channel.

Recent debris torrents may cause oversized channels, resulting in a higher classification than is required. Field indicators of channels recently affected by a debris torrent include:

- Extensively eroded banks (over 80 per cent of both banks are eroded)
- Complete loss of undercut banks
- Extensive lengths of runs or riffles (channel consists of less than 20 pool or deep water areas)
- Expansive bars and relatively little flowing water (wetted width is less than about 20 per cent of the channel cross section)
- LWD levees lying along the channel margin
- Minimal instream LWD
- Woody debris incorporated in the sediment accumulations

If the channel displays evidence of recent debris torrents the stream should be assessed both upstream and downstream of the disturbed area and the higher classification of the two taken.

Wetlands

A permit holder carrying out oil and gas activity in a wetland must, to the extent practicable, maintain natural flow of water in the wetland. All oil and gas activities in or about wetlands must be carried out in accordance with Section 5 of the EPMR.

A wetland is a [swamp](#), [marsh](#), [bog](#), [fen](#) or other similar area that supports natural vegetation which is distinct from the adjacent upland areas and may have up to two meters of standing water.

More specifically, a wetland is an area where the water table is at, near, or above the surface. A wetland is an area where soils are water-saturated for a sufficient length of time that excess water and resulting low oxygen levels are principal determinants of vegetation and soil development.

Wetlands include muskeg areas of the Boreal White and Black Spruce (BWBS) mw1 and mw2 biogeoclimatic subzones.

Wetlands may or may not be treed, but when trees are present, the canopy is generally relatively open. That is, less than 15 percent canopy closure of trees greater than 12.5 centimetres Diameter at Breast Height (DBH). Growth rates are much reduced compared to those on the surrounding better drained uplands, and the soil surface is usually hummocky.

Wetlands must have both:

- Hydrophytic vegetation, characterized by the predominance of plant species that normally grow in standing water or in soils that are water-saturated for all or a major portion of their growing season
- Subhydric or hydric soils, distinguished by free water or prolonged saturation, evidenced by dull gray gleyed horizons, within 30 centimetres of the mineral surface or by sedge or moss peat over mineral soils

Hydrophytic Vegetation

To be considered hydrophytic, vegetation should include shrub or herbaceous species that occur only on organic soils or soils that are water-saturated for a major portion of the growing season. These species should make up 20 percent or more of the combined cover of low (less than two metres), shrub and herbaceous vegetation.

Most (greater than 80 percent) of the remaining vegetation should be species that are able to establish and grow on water-saturated soils, even though they may not be restricted to these soils.

Shrub-carrs

Shrub –carrs are unique ecosystems that resemble wetlands without meeting the definition of a true wetland. They occur in various biogeoclimatic zones throughout the province and provide valuable habitat for many species.

Shrub-carrs are low shrub-dominated ecosystems that develop in areas prone to growing-season frosts, which could otherwise support forested ecosystems under normal circumstances. Shrub-carrs are always low shrub ($\leq 2\text{m}$) cover types. They occur in frost-prone depressions or cold-air drainage valleys where frost and cold, moist soils preclude establishment of trees. More information regarding the identification of shrub-carr ecosystems is available in *Wetlands of British Columbia: A guide to Identification*

(<http://www.for.gov.bc.ca/hfd/pubs/Docs/Lmh/Lmh52.pdf>).

Where oil and gas activities areas are proposed within shrub-carrs, the Commission expects the applicant to identify what measures will be taken to minimize impacts to and protect the values associated with these areas. Where appropriate, a mitigation strategy must be submitted as part of the Additional Application Requirements.

Classifying Wetlands

There are three riparian classes of wetlands (W1 to W3) defined in Part 1 and Section 23 of the EPMR based on wetland size and the biogeoclimatic unit in which the wetland occurs.

The applicant is responsible to determine the riparian class of all wetlands potentially impacted by the oil and gas activity. A key to riparian classification of wetlands is illustrated in [Figure 4](#).

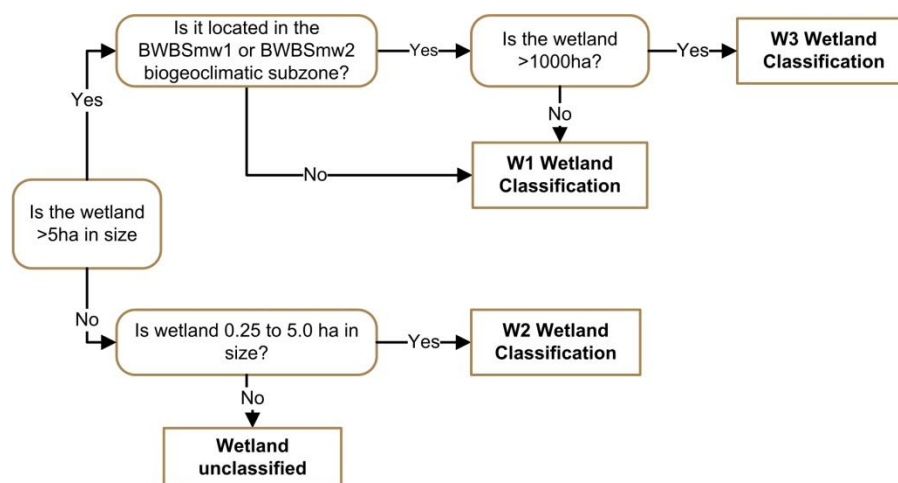


Figure 4: Key to Wetland Classification

Determining the wetland area

Since the outer edge of wetlands is often treed, it may not be possible to determine the wetland boundary, and thus wetland area, directly from forest inventory maps. Wetland boundary can be interpreted from 1:20 000 or larger scale stereoscopic aerial photographs or determined by on-the-ground surveys.

The outer boundary of a wetland can be closely approximated from 1:20 000 or larger scale aerial photographs, by noting where:

- Forest canopy closure is greater than 15 percent or not distinguishable from that characteristic of the better drained uplands
- Evidence of wetland processes, such as channels and surface water pools, and wetland vegetation are not present beneath the tree canopy.

Alternatively, the wetland boundary can be determined from on-the-ground surveys by mapping the upslope extent of the following combination of conditions:

- Predominance of plant species that normally grow in water or water-saturated soils or in peat soils (plant communities that indicate subhydric or hydric ecological moisture regime)
- Soils that are water-saturated or show evidence of prolonged water saturation (gleying) within 30 centimetres of the surface or are peat soils

Determining the biogeoclimatic unit

Biogeoclimatic unit (zone and subzone) can be determined from biogeoclimatic maps and biogeoclimatic ecosystem classification field guides prepared by the [Ministry of Forests, Lands and Natural Resource Operations, Research Branch](#).

Lakes

All oil and gas activities in or about lakes must be carried out in accordance with Section 5 of the EPMR

Classifying Lakes

All lakes within the area of or adjacent to proposed or active oil and gas operations must be classified. There are five riparian classes of lakes (L1-A to L4) as determined by biogeoclimatic zone or subzone and lake size.

The applicant is responsible to determine the riparian class of all lakes that may be impacted by the proposed oil and gas activity. [Figure 5](#) provides a key to determine the lake riparian classification.

Determining lake area

Lake area can be determined directly from 1:20,000 or larger scale aerial photos or maps. The outer edge of a lake can be determined in the field by the normal high-water mark.

Man-Made Waterbodies

Man-made waterbodies are generally not classified under the riparian classification outlined in the EPMP, Section 22, 23, 24. However, some existing man-made waterbodies (excluding ditch lines that have significant fish and wildlife values) may also require the same level of protection given natural waterbodies.

Consult with the appropriate Commission Operations Manager, Ministry of Environment and Fisheries and Oceans Canada to determine the value of these man-made waterbodies and to ascertain whether they need to be classified.

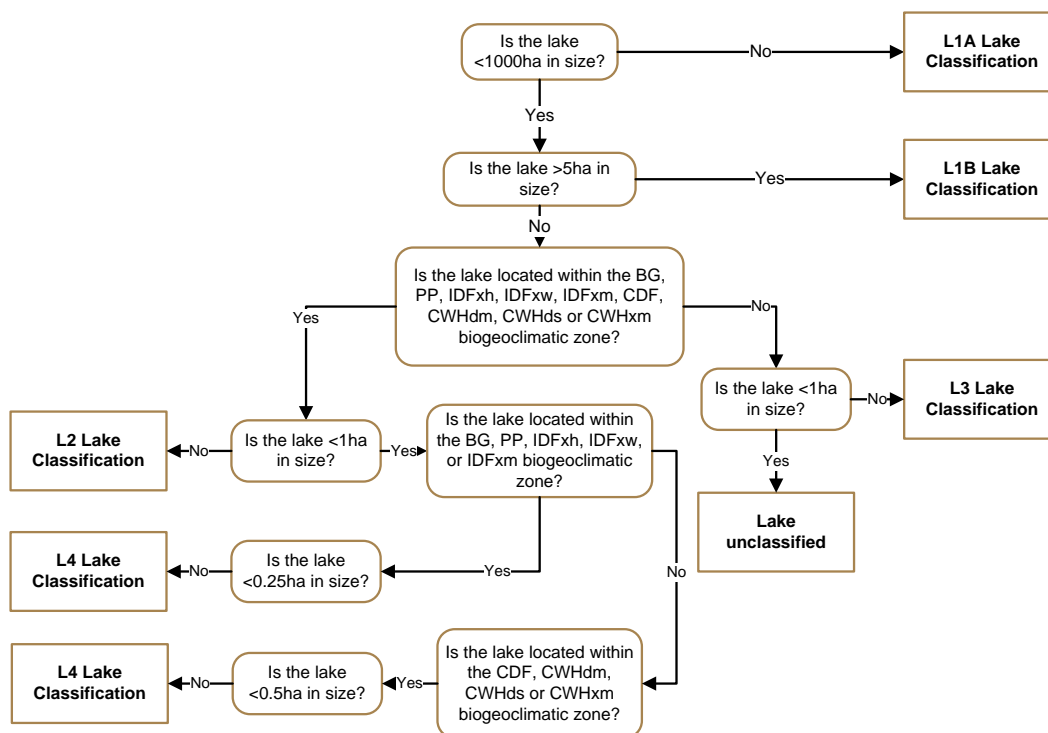


Figure 5: Key to classification of lakes.

Riparian Management Areas

Riparian Management Areas (RMAs) are areas adjacent to streams, wetlands or lakes in which special management is required to conserve fish or wildlife habitat, biodiversity and water values of the area. Refer to [Figure 1](#) for an illustration of RMAs and their components.

RMA objectives are implemented to:

- Minimize or prevent impacts of oil and gas activities on stream channel dynamics, aquatic ecosystems, and water quality of all streams, lakes, and wetlands
- Minimize or prevent impacts of oil and gas activities on the diversity, productivity, and sustainability of wildlife habitat and vegetation adjacent to streams, lakes, and wetlands, or where high wildlife values are present, and
- Allow for oil and gas development activities that are consistent with the above objectives

To achieve RMA objectives, oil and gas planning and practices within the management zone should:

- Retain sufficient vegetation along streams to provide shade, reduce bank microclimate changes, maintain natural channel and bank stability and, where specified, maintain important attributes for wildlife, and
- Adjacent to wetlands and lakes, retain key wildlife habitat attributes characteristic of natural riparian ecosystems

Establishing stream RMA boundaries

The RMA adjacent to streams extends from the top of the streambank to the slope distance as specified in [Table 3.1](#). Where the active flood plain extends beyond the slope distance specified in Table 3.1, the edge of the active flood plain will be considered the edge of the RMA.

[Table 3.1](#) shows the specified slope distance of the respective RMA associated with each stream riparian class. [Figure 1](#) illustrates the division of the RMA into Riparian Reserve Zone (RRZ) and Riparian Management Zone (RMZ).

Table 3.1: Classification criteria and corresponding RMA widths for classified streams.

Item	Riparian Class	Riparian Management Area (metres)	Riparian Reserve Zone (metres)	Riparian Management Zone (metres)
1	S1-A	100	50	50
2	S1-B	70	50	20
3	S2	50	30	20
4	S3	40	20	20
5	S4	30	0	30
6	S5	30	0	30
7	S6	20	0	20

Establishing wetland RMA boundaries

[Table 3.2](#) shows the specified slope distance of the RMA of each wetland classification.

In all cases the RMA extends from the outer edge of the wetland to the slope distance specified in [Table 3.2](#). [Figure 1](#) illustrates the division of the RMA into RRZ and RMZ.

Table 3.2: Classification criteria and corresponding RMA widths for classified wetlands.

Item	Riparian Class	Riparian Management Area (metres)	Riparian Reserve Zone (metres)	Riparian Management Zone (metres)
1	W1	50	10	40
2	W2	30	10	20
3	W3	0	0	0

Establishing Lake RMA boundaries

[Table 3.3](#) shows the specified slope distance of the respective RMA of each lake riparian class. The outer edge of the lake is measured from the high-water mark or the edge of an immediately contiguous wetland. [Figure 1](#) illustrates the division of the RMA into RRZ and RMZ.

Table 3.3: Classification criteria and corresponding RMA widths for classified lakes.

Item	Riparian Class	Riparian Management Area (metres)	Riparian Reserve Zone (metres)	Riparian Management Zone (metres)
1	L1-A	70	50	20
2	L1-B	40	20	20
3	L2	30	10	20
4	L3	30	0	30
5	L4	30	0	30

Best Management Practices (BMPs) within Classified Riparian Areas

The Riparian Management Area (RMA) is comprised of both the Riparian Reserve Zone (RRZ), where applicable, and the Riparian Management Zone (RMZ).

The primary objective of the RMA is to provide for the protection and management of fisheries, important wildlife habitats, and water quality associated with classified waterbodies. These waterbodies provide important wildlife and fisheries habitat and significantly influence downstream fisheries values.

Oil and gas activities should be planned to be consistent with the requirement to maintain stream channel processes, stream temperatures, shoreline and littoral values, wildlife trees and habitat for furbearers and other wildlife.

Except to cross waterbodies, RRZs should never be entered.

Oil and gas activities should be avoided within an RMZ where practicable, except to cross waterbodies. Where it is not practicable to operate outside an RMZ the following BMPs for operations in the RMA of classified waterbodies should be incorporated into all phases of the activity:

- Do not remove trees, shrubs or herbaceous vegetation within the streambank area unless for safety or windthrow prevention, or unless otherwise necessary to carry out authorized oil and gas activities
- Falling and removal of timber during construction should be away from or parallel to the stream, not across it
- Ensure measures are taken to prevent slash and unstable debris from being deposited in the stream during construction; remove any that is inadvertently deposited in the stream during construction
- When crossing a waterbody, remove only those stems that can be lifted without damage to the channel or bank. For those stems that cannot be lifted, leave the portion of the stem that spans the channel. Ensure the stem and limbs do not obstruct stream flow or fish passage
- Retain all windfirm trees with roots embedded in the bank
- Remove dominant stems that are prone to windthrow and maintain windfirm trees within 10 meters of the channel

Windthrow management strategies

Strategies to reduce the risk of windthrow should be considered wherever trees are retained and windthrow risk is moderate or high along the RMA. Selected strategies should not only address windthrow risk but also the other values that are being protected in the RMA.

Best Management Practices Deviation

If the Best Management Practices (BMPs) identified in this guide cannot be achieved, or if a company proposes to use an alternative practice to mitigate potential impacts to wildlife species and habitat values, the applicant may request to deviate from the guidance herein.

Deviation requests must include a rationale, and where appropriate, a mitigation strategy, as per Appendix B of this guide, as part of the additional application requirements. The mitigation strategy is assessed by the Commission to ensure consistency with the government's environmental objectives for riparian values contained in Section 5 of the EPMR.

The mitigation strategy must include:

- Rationale for choosing the alternative practice
- Site-specific riparian information

- Description of the operational activities that will mitigate impacts to the riparian values

Stream/Lake/Wetland Crossings

All oil and gas activities must be planned and undertaken in accordance with Sections 11, 12 and 13 of the Regulation.

Crossing Selection

Crossing methods are to be selected in accordance with Section 11 of the EPMR and using the flow diagrams in [Figure 6](#) (for access crossings) and [Figure 7](#) (for pipeline crossings). To effectively use these flow diagrams, applicants must work through a series of qualifying statements predicated on seasonality, site conditions and fisheries values, until a recommended crossing structure or installation technique has been identified.

Once a crossing method has been determined, applicants can refer to the corresponding [BMPs](#) for guidance, with respect to specific construction, maintenance and removal/deactivation activities.

If the BMPs identified in this Guidebook cannot be achieved for a specific crossing type, or if a company proposes to use another crossing technique (for example fords or aerial pipeline crossings) not listed within [Figures 6](#) and [7](#), the applicant may request to deviate from the guidance contained in this guidebook.

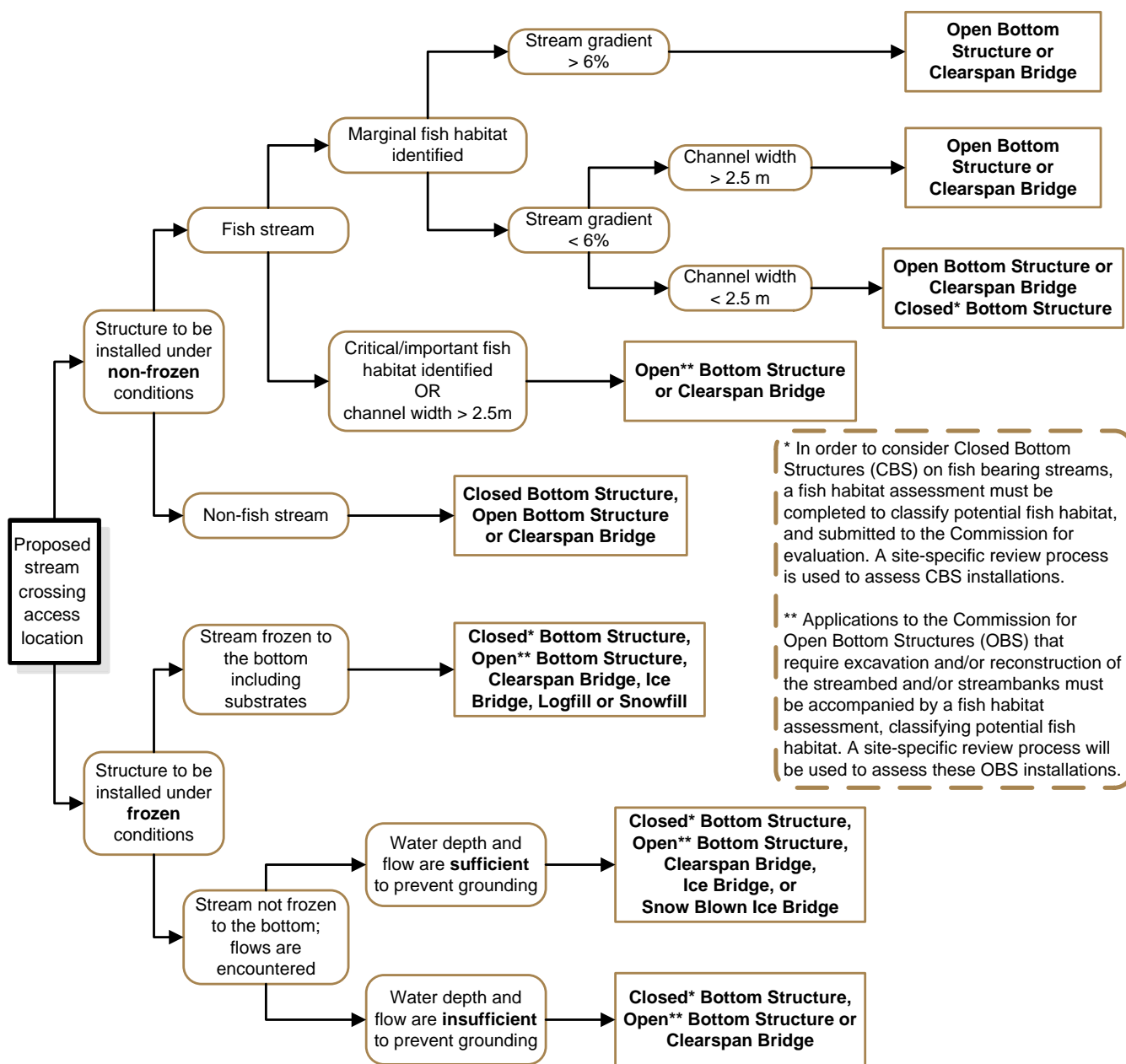


Figure 6: Flow diagram indicating appropriate structures for access stream crossings. Refer to the corresponding BMPs (below) for expectations regarding each crossing type.

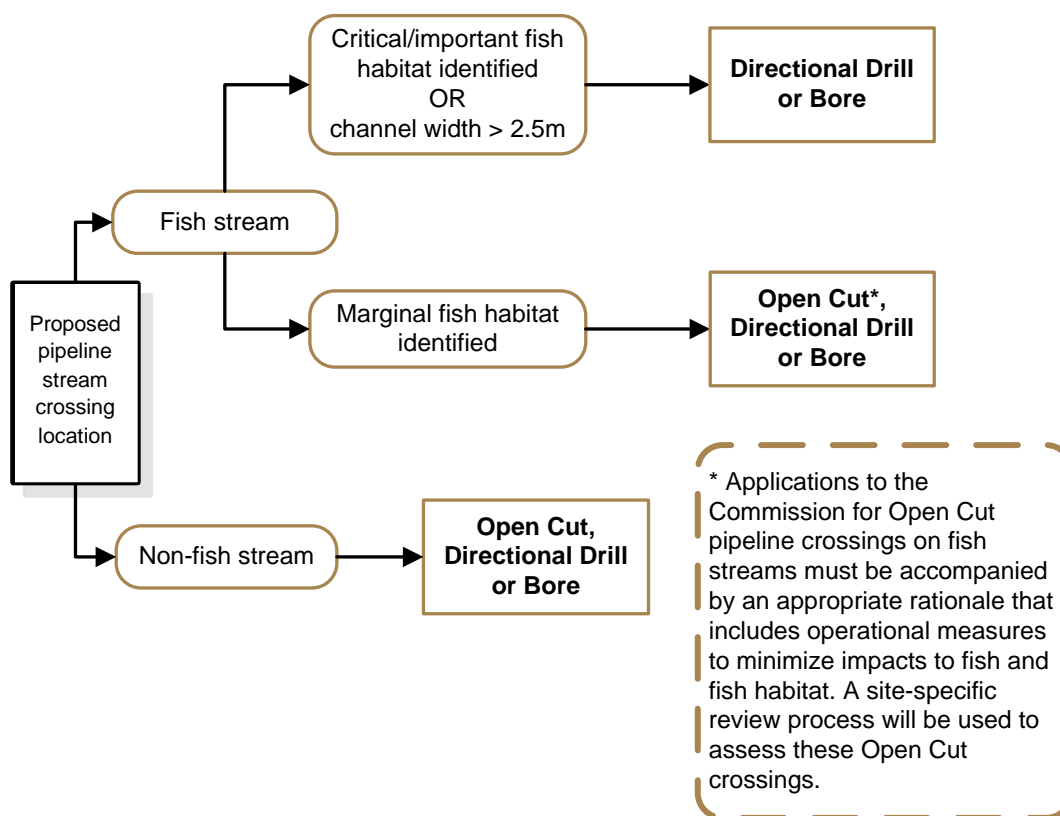


Figure 7: Pipeline stream crossing type flow chart. Refer to the corresponding BMPs (below) for expectations regarding each crossing type.

Fish Habitat Management and Protection for Crossings

Applicants are expected to assess fish streams for fish habitat values prior to application for installation of crossing structures. All streams are assumed to be fish streams unless otherwise confirmed by the applicant.

Assessments are the primary means to classify the fish habitat at the crossing as [marginal](#), [important](#) or [critical](#). A site-specific review process is used to assess all proposed structures where critical or important fish habitat has been identified, and [closed bottom structures](#) or [open cuts](#) where marginal fish habitat has been identified, which makes these assessments a critical component of the activity application regardless of seasonality.

In the event that a qualified biologist or technician has not determined an appropriate in-stream work window for the project (excluding temporary winter stream crossing methods), including installation and/or deactivation activities, operations in the Peace Region may only proceed between July 15 and August 15.

Refer to the [Wildlife Habitat](#) section of this document for more information regarding fish and wildlife timing windows.

[Stream](#) channel and [Streambank](#) excavation works under frozen conditions can still impact fish habitat; the channel morphology and substrates are modified, and sedimentation can result during [spring freshet](#) if the bed/banks are not restored to their previous condition.

Where habitat assessments are not completed, the Commission must assume critical or important fish habitat exists at the crossing location and may require that [trenchless](#) pipeline stream crossing techniques or [clearspan](#) structures for access are used.

Fish Habitat Assessments BMPs

Where companies have developed BMPs or other tools to assess fish habitat, under the direction or guidance of qualified environmental technician(s) or biologist(s), experienced in fisheries management and habitat protection, they should be presented to the Commission as an alternative to having a biologist or technologist complete a formal fish habitat assessment as outlined above.

Where companies have not developed BMPs or other tools to assess fish habitat, the Commission expects that assessments will be completed by qualified environmental technician(s) or biologist(s), experienced in fisheries management and habitat protection.

Individuals conducting these assessments must apply the fish and fish habitat sampling methodologies and standards put forth by the Government of British Columbia – Resources Information Standards Committee (RISC) or a comparable, accepted standard. RISC sampling protocol is available on-line at [RISC Sampling Tool](#).

Fish Stream Installations

The practices described below apply to all fish-stream installations. Deviations from those practices may be considered provided a rationale and where appropriate, a mitigation strategy, accompany the application.

The installation of a stream crossing should simulate conditions like those that existed before the structure in question was installed. Environmental objectives associated with the construction, installation, and use of stream crossings are:

- Protecting fish and fish habitat
- Providing for fish passage

- Preventing impacts on fish eggs and alevin that are present in the gravel, or on adult and juvenile fish that are migrating or rearing
- Reducing the risk of sediment release and other deleterious substances during work at stream crossings

Stream Protection Measures

To achieve those objectives, the following fish-stream protection measures are recommended:

- Complete the work during the appropriate instream work window
- Eliminate or reduce sediment-related problems during installation
- Prevent deleterious substances from entering streams
- Minimize or avoid disturbing fish habitat above and below the area required for actual construction of the stream crossing
- Minimize clearing width at the crossing site and retain streamside vegetation within the stream crossing right-of-way wherever possible, recognizing operational requirements
- Ensure that the design specifications for safe fish passage are achieved
- Revegetate and stabilize the site to prevent post-construction erosion

Best Management Practices Deviation

Deviation requests must include a mitigation strategy as part of the additional application requirements. The mitigation strategy is assessed by the Commission to ensure consistency with the government's environmental objectives for wildlife values contained in Section 5 of the EPMR.

The mitigation strategy must include:

- Rationale for choosing the alternative practice
- Site-specific riparian habitat information
- Description of the operational activities that will mitigate impacts to the riparian values

Alternative Best Management Practices

Alternative BMPs such as the CAPP Pipeline Associated [Watercourse Crossings 3rd Edition](#) are also acceptable tools to

utilize when planning watercourse crossings. In instances where alternative BMPs that have been endorsed by Fisheries and Oceans Canada or the B.C. Ministry of Environment will be followed, this should be indicated as part of the additional application information.

Crossing Types

After using the flow charts in [Figures 6](#) and/or [7](#) to determine an appropriate crossing method, refer to the BMPs for that method outlined in [this section](#).

Construction, Maintenance and Deactivation

All crossings are to be constructed, maintained and deactivated in a manner that prevents erosion of approaches, deterioration of the stream banks or stream channel, and disturbance of the substrates.

Construction, maintenance and deactivation must be carried out in a manner that prevents the addition of deleterious substances to the watercourse. Where construction, maintenance or deactivation activities have left the streambanks exposed to mineral soil; disturbed areas must be re-contoured and re-seeded/planted in a way that stabilizes the site and facilitates its return to a vegetated state.

In areas of erodible soils, monitoring of the reclaimed and/or deactivated sites must be undertaken to ensure successful plant cover re-establishment and long term site stability.

Temporary and permanent stream crossing structures must be designed to withstand the highest peak stream flow that can reasonably be expected within the return period.

Deactivation of all crossing types includes the removal of any in-stream fill material and all approaches.

All temporary crossings must be removed upon completion of the project or prior to spring freshet, whichever comes first.

Any natural construction material removed from within the stream channel must be placed above the high water mark of the stream, to prevent bank erosion and sedimentation of watercourses.

Any man-made construction material must be removed from the site and appropriately disposed of.

Surface water flow must be controlled upon deactivation of all crossing types.

For more information see the [Forest Road Regulation](#).

Snowfill

Snowfills are used to temporarily cross streams where the stream is frozen to the bottom including substrates.

Construction

Snowfill crossings are constructed by depositing clean snow within the stream channel and compacting it. The structure is often strengthened by soaking the compacted snow with water and allowing it to freeze.

Snowfills that are well planned, constructed and removed prior to spring thaw have minimal impact on the aquatic environment and riparian areas. Unlike a culvert, the use of a snowfill does not require instream work such as channel excavation.

The use of mineral soil, silt, or coarse woody debris is not allowed.

When blading snow for fill material, the blade must be raised so it does not contact the ground and entrain mineral soils in the fill material. Grass extending into the snowpack may be cut off by the blade, or vegetative debris may accumulate on top of the snowpack, and are acceptable.

Snowfills should be constructed and deactivated such that they do not affect fish or fish habitat at breakup. Remove any snowfill that may cause damage to the stream because of warmer weather, and reconstruct a new snowfill when colder weather returns.

Logfill

Logfills may be used to temporarily cross streams during winter months where the stream is frozen to the bottom including substrates.

Construction

They are constructed by depositing logs, bound in a bundle, along with clean snow within the stream channel and compacting it. Logfills that are well planned, constructed and removed prior to spring thaw have minimal impact on the aquatic environment and riparian areas. Unlike a culvert, the use of a logfill does not require instream work such as channel excavation. Logfills must be removed prior to spring thaw as they effectively block the stream channel.

As is the case for snowfills, only clean snow can be used in the construction of logfills. Measures must be taken to ensure the streambank and channel integrity are maintained during the construction and removal of logfills.

Ice Bridge (and Snow Blown Ice Bridge)

Ice bridges are effective stream crossing structures for larger northern streams and rivers, where the water depth and streamflow under the ice are sufficient to prevent the structure from grounding, and where there are no concerns regarding spring ice jams.

Ice bridges may be used to temporarily cross streams where the stream is frozen to the bottom including substrates, or where there is sufficient water depth and flow below the ice bridge to prevent grounding of the structure during crossing. Grounding can block streamflow and fish passage and cause scouring of the stream channel.

The ice bridge component of snow blown ice bridges must be constructed, monitored and deactivated with the same consideration as regular ice bridges.

Planning Considerations

Siltation potential and impacts to fish habitat for this type of crossing are minimized through sound planning, appropriate crossing location selection and good construction techniques.

Planning considerations in the design of ice bridges include:

- Depth of water
- Depth of ice required
- Minimum winter daily streamflow
- Maximum load strength
- Substrate
- Time of use
- Crossing location
- Approach construction
- Maintenance and monitoring
- Deactivation

Construction

Ice Bridges are generally constructed using ice and snow to create a very thick layer on top of a waterbody that can support industrial traffic. In some cases, reinforcing material such as logs is used to support the structure.

Ice bridges cannot be constructed where streams have insufficient flow and water depth to prevent the ice bridge from coming in contact with the streambed, causing restricted water movement and/or impeding the passage of fish.

Use of logs in ice bridge construction is unacceptable where there is an increased risk that any logs left in place during break up will cause debris jams, flooding, channel alteration, erosion or habitat loss.

Measures must be taken to prevent impacts to the watercourse associated with streambank disturbance resulting from construction, maintenance or deactivation of the approaches, and impacts to the watercourse resulting from the release of deleterious substances through spills or accidents.

A record of ice thickness and water depth must be kept to verify that stream flow is maintained and grounding does not occur. These records must be made available to the Commission for review upon request.

Where there is a change in site conditions that increases the risk of grounding, or if grounding occurs, the existing structure must be deactivated and an alternate crossing method applied for through the Commission.

Maintenance

Maintenance of the ice bridge must include measures to prevent deleterious substances (including sediment) from being integrated into the crossing structure or approaches.

Approaches must be constructed of clean snow and ice to a thickness that protects streambanks and riparian vegetation.

Deactivation

Deactivation of ice bridges includes removal of any logs used for reinforcement that can safely be extracted from the crossing structure. Any that cannot be safely extracted may be left in the watercourse.

Man-made snow blown over top of the supporting ice structure must be removed from within the stream channel and placed above the high water mark of the stream during deactivation.

Additional information about ice bridges can be obtained from the Canadian Pipeline Water Crossing Committee's document entitled [Watercourse Crossings 3rd Edition](#).

Clearspan Bridge

Clearspan bridges include native timber bridges where appropriate.

Replacement structures will be treated as new installations.

Planning Considerations

When planning a clearspan bridge, avoid building on

- Meander bends
- Braided streams
- Alluvial fans
- Active flood plains
- Any other area that is inherently unstable and may result in the alteration of natural stream functions or erosion and scouring of the bridge structure

Construction

Construction, maintenance and deactivation activities must be undertaken in a manner that ensures bridge abutments, footings and excavation or backfill material does not encroach upon the stream channel width.

Approaches should be designed and constructed so that they are perpendicular to the watercourse to minimize loss or disturbance of riparian vegetation.

Ensure sediment and erosion control structures are available at the crossing location and utilized as necessary to stabilize the site.

Only site appropriate compacted fill material is acceptable to backfill abutments or footings; do not use vegetation, debris or mud.

Maintenance

Develop and conduct routine maintenance schedules for installed bridges to ensure the structure remains in proper functioning condition.

Refer to the Department of Fisheries and Oceans Canada Technical Report No. 1692 entitled [Guidelines for Protection of Fish and Fish Habitat During Bridge Maintenance Operations in British Columbia](#) for more information regarding acceptable practices for maintenance activities.

Open Bottom Structure

Open bottom structures are similar to bridge structures, generally spanning the entire streambed and minimizing impacts to the natural stream channel. They are differentiated from bridges in that the fill placed over these structures is an integral structural element.

Types of open bottom structures include arches constructed of steel, plastic, and other materials.

Replacement structures will be treated as new installations.

Planning Considerations

The bottomless structure should be designed to span the stream channel width and so avoid impacts on fish habitat and fish passage.

Arches

Arches come in various shapes, ranging from low to high profiles and are typically installed on concrete or steel foundations.

It is important to differentiate small, arch-type open bottom structures requiring excavation and reconstruction of the streambed from larger arches that are constructed without disturbance to the streambed.

The small bottomless arches should be installed with the same considerations afforded closed bottom structures (see the following section). Careful engineering is required to ensure that the footings of these small arches are secure and not subject to undercutting.

Construction

Natural stream flows must be maintained upstream and downstream of the worksite during the construction period.

Ensure sediment and erosion control structures are available at the crossing location and used as necessary to stabilize the site.

Ensure adequate erosion control measures are implemented both upstream and downstream of the crossing location to prevent streambank erosion.

Only site appropriate compacted fill material is acceptable to backfill; do not use vegetation, debris or mud.

If channel dewatering is required to create an isolated worksite, fish must be salvaged from within the isolated work site and returned to a suitable in-stream location. Fish salvage requires a [Scientific Collection Permit](#), which can be obtained from the Ministry of Environment.

Wastewater from project dewatering activities must be pumped to stable, well-vegetated areas above the high water mark of the stream so that fine sediment and other particulate matter can settle out prior to re-entry into the watercourse. These locations must be monitored to ensure that neither erosion nor icing occurs.

Maintenance

Develop and conduct routine maintenance schedules for installed open bottom structures to ensure the structure remains in proper functioning condition.

Closed Bottom Structure

Where possible, the Commission prefers that closed bottom structures be avoided on fish streams.

Where unavoidable, acceptable closed bottom structures for fish-stream crossings are corrugated pipes (metal or plastic), which must be embedded to retain stream substrate, and provide fish habitat and fish passage.

Closed bottom structures are not generally allowed in critical fish habitat, but are an option in small streams with a stream channel width of 2.5 metres or less (small S3 and S4 streams) and six percent average stream gradients or less.

If an applicant wishes to use a closed bottom structure on a larger stream or where a gradient greater than six percent exists, the applicant may deviate from the guidance contained in this Guidebook. Deviation requests must include a mitigation strategy as part of the additional application requirements.

Replacement structures will be treated as new installations.

Planning Considerations

Closed bottom structures can be successfully installed when careful consideration is paid to site location conditions and structure design parameters.

The embedment methodology (also known as stream simulation) consists of selecting a culvert (pipe) of adequate opening to encompass the stream channel width, and emulating the streambed within the culvert by lining the bottom with representative streambed substrate. The natural substrate materials are supplemented with additional larger material to help retain the substrate within the culvert and assist fish passage. By emulating the streambed and stream channel width, the culvert's streamflow characteristics should reflect the natural streamflow characteristics.

Construction

Natural stream flows must be maintained upstream and downstream of the worksite during the construction period.

Ensure sediment and erosion control structures are available at the crossing location and utilized as necessary to stabilize the site.

Ensure adequate erosion control measures are implemented both upstream and downstream of the crossing location to prevent streambank erosion.

Only site appropriate compacted fill material is acceptable to backfill; do not use vegetation, debris or mud.

If channel dewatering is required to create an isolated worksite, fish must be salvaged from within the isolated work site and returned to a suitable in-stream location. Fish salvage requires a [Scientific Collection Permit](#), which can be obtained from the Ministry of Environment.

Wastewater from project dewatering activities must be pumped to stable, well-vegetated areas above the high water mark of the stream so that fine sediment and other particulate matter can settle out prior to re-entry into the watercourse. These locations must be monitored to ensure that neither erosion nor icing occurs.

Maintenance

Develop and conduct routine maintenance schedules for installed closed bottom structures to ensure the structure remains in proper functioning condition.

The planning considerations for directional drill/bore crossing are new to the EPMG.

Directional Drill/Bore

Directional drill/bore crossing can be conducted at any time of the year and in some situations are preferable to open-cut and isolated crossings, since the pipeline is drilled underneath the watercourse with very little disturbance to the bed or banks.

Planning Considerations

Oil and gas activity planning should include an assessment of which method will include a greater overall impact to the stream, lake or wetland and the adjacent riparian area. Considerations when determining whether a directional drill/bore is the appropriate crossing method should include:

- Total disturbed area both within and adjacent to the RMA (soil disturbance and vegetation removal)
- Potential impact to stream flow
- Alternate access for carrying out the directional drill/bore and for future pipeline maintenance and activity beyond the crossing.

Geotechnical evaluations are recommended for directional drilling and boring operations where channel and surficial morphology indicate a high risk of crossing failure.

In preparation for [trenchless stream crossing](#) operations, the operator must not remove riparian vegetation between drill or bore entry and exit points except to cross the stream where authorized to do so, through permit approval to facilitate operations.

In-stream works are not permitted at these crossing points except to cross the stream where authorized to do so, through permit approval to facilitate operations.

No machinery is allowed within the RMA on bored/directionally drilled pipeline stream crossings unless for access where identified on the application and included in the permit approval. Mechanical access across the stream is not automatically granted at trenchless pipeline stream crossing locations.

Where applicable, an application to the Commission must include the application for a mechanical crossing and approval from the Commission may be granted providing there is no existing access around the stream that could reasonably be used to reach the temporary workspaces required to facilitate the drill.

If bell hole dewatering is required, wastewater must be pumped onto stable, well-vegetated areas or rip-rapped stable ground to

minimize the potential for erosion and to prevent silt laden waters from returning directly to the watercourse. Dewatering locations must be monitored to ensure that neither erosion nor icing occurs.

Maintenance

Bore/directional drill operations must be monitored for potential fluid pressure loss. In the event that drilling fluid is released into the watercourse, operations must cease followed by immediate site assessment, appropriate agency notification (for example, PEP, DFO) and remediation activities.

Drilling waste disposal at bored and/or directional drilled crossings must meet all requirements of the Environmental Management Act and the [Commission's Drilling Waste Disposal Guidelines](#) associated with ground bores.

Open Cut

Open-cut stream crossing techniques are used when constructing pipelines. Open cut pipeline stream crossings are appropriate on non-fish streams and those fish streams where the application is accompanied by appropriate rationale and mitigation strategy.

Construction

Existing trails, roads or cut lines are to be used wherever possible as access routes to avoid disturbance to the riparian vegetation.

Where practicable open cuts should be located at straight sections of the stream, perpendicular to the banks. Avoid crossing on meander bends, braided streams, alluvial fans, active floodplains or any other area that is inherently unstable and may result in the erosion and scouring of the stream bed.

Crossings should be constructed in a manner that minimizes the duration of instream work.

Additionally machinery should be operated in a manner that minimizes disturbance to the watercourse bed and banks.

Protect entrances at machinery access points (for example, using swamp mats) and establish single site entry and exit.

Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks. Wash, refuel and service machinery and store fuel and other materials for the machinery

away from the water to prevent deleterious substances from entering the water.

Natural stream flows must be maintained upstream and downstream of the worksite during the construction period. Ensure sediment and erosion control structures are available at the crossing location and used as necessary to stabilize the site.

Ensure adequate erosion control measures are implemented both upstream and downstream of the crossing location to prevent streambank erosion. Only site appropriate compacted fill material is acceptable to backfill; do not use vegetation, debris or mud.

If channel dewatering is required to create an isolated worksite, fish must be salvaged from within the isolated work site and returned to a suitable in-stream location. Fish salvage requires a [Scientific Collection Permit](#), which can be obtained from the Ministry of Environment.

Wastewater from project dewatering activities must be pumped to stable, well-vegetated areas above the high water mark of the stream so that fine sediment and other particulate matter can settle out prior to re-entry into the watercourse. These locations must be monitored to ensure that neither erosion nor icing occurs.

Bridges

When designed and constructed with abutments that do not constrict the stream channel, bridges have the least impact on fish passage and fish habitat.

Bridges can be designed for permanent, temporary, or seasonal installation and range from log stringer bridges with gravel or timber decks, to steel girder bridges with timber or pre-cast concrete decks.

Bridges can be supported by various means, including log cribs, steel pipes, steel bin walls, cast-in-place concrete, and pre-cast lock block walls, timber, and piers. Instream piers should be avoided.

Piers can collect debris during flood events, resulting in scouring of bridge foundations. Instream piers can also result in hydrologic changes such as bedload scour or deposition, which may adversely affect fish habitat.

It can be expected that the Commission may approve only bridges with support piers after all other options (e.g. clearspan)

are considered. More information on crossing structures can be found in the Ministry of Forests, Lands and Natural Resource Operations [Fish Stream Crossing Guidebook](#).

Replacement structures will be treated as new installations.

4 Wildlife and Wildlife Habitat

Although some naturally open areas or forest landscapes with a lesser timber value would present themselves as prime locations for oil and gas activities, the habitat value of these areas and the impacts of development related traffic on wildlife, to and from these locations, cannot be dismissed.

Generally, such areas, at specific times of the year provide critical habitat for a variety of species life requisites. Thus, the Commission requires that the measures in this section be incorporated into oil and gas activity site selection to minimize the impact on these species and habitats.

Where practicable, efforts must be taken to avoid placing new cut in alpine and open sub-alpine habitat. Where it is not practicable to do so, the applicant may deviate from this guidebook and include a rationale and, where appropriate, a mitigation strategy with the application.

The use of alpine and open sub-alpine habitat for oil and gas activity construction may be restricted during certain times of the year, depending on specific wildlife values or habitat sensitivities identified in an area.

Fish and Wildlife Timing Windows for Oil and Gas Exploration and Development in Northeast British Columbia

All oil and gas activities must be planned and carried out in accordance with Section 6 (b) of the EPMR.

In general, the timing windows described in this section of this guidebook apply to oil and gas activities within known areas of wildlife sensitivity (for example, core habitat within ranges, and critical habitat areas identified by MOE) or for activities known to have high potential to cause disruption to wildlife during critical life stages (for example, helicopter supported geophysical programs). As wildlife habitat areas and ungulate winter ranges are established under OGAA, acceptable timing of operations prescribed in associated operating protocols will supersede this guidance. If concerns for wildlife during critical life stages are brought to the attention of the decision maker during application review, timing windows may be imposed for some or all phases

of an activity to ensure minimal disturbance to a particular species or population.

Where there is potential to physically disturb high priority wildlife or their habitat, particularly during sensitive seasons and critical life stages, the applicant must include as part of the Additional Application Requirements, a mitigation strategy that details what measures will be taken to avoid or mitigate potential impacts to high priority wildlife.

High priority wildlife include any species that have been identified under Section 29 of the EPMR, are listed as a species at risk or species of special concern under the federal Species at Risk Act, are provincially listed as either red or blue or have been otherwise identified as high priority wildlife. Categories of species of wildlife have been established under Section 29. The order and its associated map and spatial data are available at the Ministry of Environment's [Categories of Species](#) website.

Adherence to fish and wildlife timing windows has been demonstrated as a valuable tool in reducing industrial disturbances to fish and wildlife species during sensitive lifecycle stages when accompanied by appropriate mitigation measures. Harassment or disruption of wildlife is prohibited at any time under the Wildlife Act; as such, operators are advised to be mindful of potential impacts regardless of the timing of operations.

In addition, these windows may require a site-specific review to determine the level of sensitivity to a particular operation. Timing windows may be subject to revision or refinement by the Commission, as well as other Provincial and Federal agencies.

Throughout the lifecycles of most species, there are critical stages of development during which fish and wildlife are more sensitive to particular types of disturbance. In the Peace Region, it has been observed that many species are most susceptible during early life stages. Some species are also sensitive to disturbance during seasonal migrations, rutting, and while occupying their winter habitat.

The following table of timing windows considers a selection of species only. This list was reduced to those species that are considered to be:

- 1) Ecosystem indicators
- 2) Of special management concern
- 3) Those that are more susceptible to disturbance

In the event that additional species of concern are detected at a site, an operator should seek direction from the Commission regarding the appropriateness of added timing considerations.

Disturbance Type

The type of disturbance is an important factor in planning the timing of oil and gas operations.

Typically, on fish streams, most in-stream works are subject to timing windows. In comparison, terrestrial wildlife can be particularly sensitive to aerial disruptions; and therefore, timing windows are commonly applied to geophysical operations.

Timing windows may also apply to ground based operations where site sensitivities are high (for example, within known ungulate winter range or wildlife habitat area not established under OGAA). Site sensitivity is primarily determined by the species present, habitat type, abundance of habitat, forest cover type, and the importance of a habitat type to a critical lifecycle stage.

Fish and Wildlife Timing Windows for Selected Species – Peace Region

	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
Wildlife												
Bison				15			15					
Caribou <i>Northern & Boreal</i>	15				15	15	15			15	15	
Rocky Mountain Elk	15				15	15	15					
Moose					15		15					
Bighorn Sheep	15				15	15	15				15	15
Thinhorn Sheep <i>Dall & Stone Sheep</i>	15				15	15	15				15	15
Mountain Goat	15				15	15	15				15	15
Trumpeter Swan				1			31	31				
Fish												
Arctic Grayling							15					
Bull Trout							15	15				
Burbot	15						15					
Kokanee					31				1			
Lake Trout						15			1			
Lake Whitefish						15			1			
Northern Pike					1	30						
Mountain Whitefish						15			1			
Rainbow Trout				1				15				
Walleye					1	30						
Yellow Perch				15				15				

Low Risk	Timing restrictions would not generally apply. It is recommended that operations are planned for within these timeframes, where ground conditions permit.
Cautionary	Operations <i>may</i> proceed during this time period, subject to Oil and Gas Commission review. It is recommended that operators avoid intensive activities or overlapping operations during these timeframes. Additional mitigation measures may be required.
Critical	Some operations may not be appropriate during these windows of restricted activity. Helicopter operations are to be avoided during the periods identified. Exploration and transmission developments are generally permitted during these windows unless site-specific sensitivities dictate otherwise. On fish bearing watercourses, most in-stream works are subject to timing windows. In the event that working within a <i>critical</i> window is unavoidable, operations must be accompanied by a rationale, mitigation and/or monitoring plans, subject to approval by the Commission.

Wildlife Habitat Areas

Several wildlife habitat areas (WHAs) have been established under Section 30 of the EPMR by the Minister of Forests, Lands and Natural Resource Operations. The order and its associated map and spatial data are available at the [Ministry of Forests, Lands and Natural Resource Operations website](#).

Note: For any oil and gas activities proposed within any of the WHAs listed below, the applicant is required to submit a detailed mitigation strategy demonstrating how any material adverse effect on the wildlife and habitat values listed, as a result of the activity and its operating area, will be mitigated (unless otherwise noted by established operating practices as described or referenced in this section).

American White Pelican

The WHAs established for American White Pelican are primarily located in central B.C., west of Tweedsmuir Park and east of William's Lake and Quesnel.

Ancient Murrelet

The WHAs established for Ancient Murrelet are primarily located along the west coast of the Queen Charlotte Islands.

Antelope Brush/Needle-and-thread Grass

The WHAs established for Antelope Brush/Needle-and-thread Grass are primarily located in the south Okanagan, near Oliver.

Badger

The WHAs established for Badger are primarily located in south-central B.C., north of Clinton and south of 100 Mile House; and in the east Kootenay, near Kimberley.

Bighorn Sheep

The WHAs established for Bighorn Sheep are located in the area southeast of Okanagan Lake, near Penticton.

Black-Throated Green Warbler

The WHAs established for Black-Throated Green Warbler are located primarily within the Montney Basin, south of the Peace River, and northeast of highways 29 and 52.

Generally, the Commission does not support the location of oil and gas activities within WHAs established for Black-Throated Green Warbler; because of their small size, these WHAs are highly sensitive to development. As such, the oil and gas industry is generally expected to avoid these WHAs.

If it is not operationally feasible to avoid these WHAs, the applicant is required to submit a detailed mitigation strategy demonstrating how any material adverse effect, as a result of the activity and its operating area, will be mitigated.

Boreal Caribou

The WHAs established for Boreal Caribou are located in northeastern B.C. and overlap with the Horn River Basin and Cordova Embayment.

For any oil and gas activities proposed within these WHAs, the applicant is expected to follow the Ministry of Environment's [Interim Operating Practices for Oil and Gas Activities in Identified Boreal Caribou Habitat in British Columbia, September 22, 2011](#). If it is not feasible to follow these practices, the application must include a deviation request and mitigation strategy, as detailed below.

Best Management Practices Deviation

Deviation requests must include a mitigation strategy as part of the additional application requirements. The mitigation strategy is assessed by the Commission to ensure consistency with the government's environmental objectives for wildlife values contained in Section 6 of the EPMR.

The mitigation strategy must include:

- Rationale for choosing the alternative practice
- Site-specific wildlife habitat information
- Description of the operational activities that will mitigate impacts to the habitat values
- Assessment by a qualified professional demonstrating how the proposed activity impacts caribou and their habitat. The assessment must include specifics of the inconsistency or alternative practice, but may or may not include an environmental assessment.

Brewer's Sparrow

The WHAs established for Brewer's Sparrow are primarily located in the South Okanagan, near Oliver.

Cassin's Auklet

The WHAs established for Cassin's Auklet are primarily located along the west coast of the Queen Charlotte Islands.

Coastal Tailed Frog

The WHAs established for Coastal Tailed Frog are primarily located in the north coast, near Terrace; in the mid-coast, north of Knight Inlet; and northeast of Hope.

Connecticut Warbler

The WHAs established for the Connecticut Warbler are located primarily within the Montney Basin, south of the Peace River and northeast of highways 29 and 52.

Generally, the Commission does not support the location of oil and gas activities within WHAs established for Connecticut Warbler; because of their small size, these WHAs are highly sensitive to development. As such, the oil and gas industry is generally expected to avoid these WHAs.

If it is not operationally feasible to avoid these WHAs, the applicant is required to submit a detailed mitigation strategy demonstrating how any material adverse effect, as a result of the activity and its operating area, will be mitigated.

Douglas-fir/Garry Oak-Oniongrass

The WHAs established for Douglas-fir/Garry Oak-Oniongrass are primarily located along the northeast coast of Vancouver Island between Nanaimo and Comox.

Fisher

The WHAs established for Fisher are located primarily within the Montney Basin, southwest of Dawson Creek.

Generally, the Commission does not support the location of oil and gas activities within WHAs established for Fisher; because of their small size, these WHAs are highly sensitive to development. As such, the oil and gas industry is generally expected to avoid these WHAs.

If it is not operationally feasible to avoid these WHAs, the applicant is required to submit a detailed mitigation strategy demonstrating how any material adverse effect, as a result of the activity and its operating area, will be mitigated.

Flammulated Owl

The WHAs established for Flammulated Owl are primarily located in the East Kootenay, near Invermere and Kimberly.

Great Basin Spadefoot Toad

The WHAs established for Great Basin Spadefoot Toad are primarily located in south-central B.C., between 100 Mile House and Merritt.

Grizzly Bear

The WHAs established for Grizzly Bear are primarily located through the southern rocky mountains, East Kootenay and along the west coast.

Lewis' Woodpecker

The WHAs established for Lewis' Woodpecker are primarily located in south-central B.C., near Kamloops; in the south Okanagan, near Oliver; and in the East Kootenay, near Invermere and Lake Koocanusa.

Long-Billed Curlew

The WHAs established for Long-Billed Curlew are primarily located in the East Kootenay, near Cranbrook.

Marbled Murrelet

The WHAs established for Marbled Murrelet are primarily located along the west coast; on Vancouver Island; and in the northern Queen Charlotte Islands.

Mountain Caribou

The WHAs established for Mountain Caribou are primarily located near Bowron Lakes and Wells Gray Provincial Parks; and south of Revelstoke.

Mountain Goat

The WHAs for Mountain Goat are primarily concentrated in northeastern B.C. between the Prophet and Sikanni Chief Rivers.

Generally, the Commission does not support the location of oil and gas activities within WHAs established for Mountain Goat; because of their small size, these WHAs are highly sensitive to development. As such, the oil and gas industry is generally expected to avoid these WHAs.

If it is not operationally feasible to avoid these WHAs, the applicant is required to submit a detailed mitigation strategy demonstrating how any material adverse effect, as a result of the activity and its operating area, will be mitigated.

Northern Caribou

The WHAs established for Northern Caribou are primarily located in central B.C., near Anahim Lake; and in the northern Rockies west and southwest of Fort St. John.

Pacific Watershrew

The WHAs established for Pacific Watershrew are primarily located near Chilliwack.

Red-Legged Frog

The WHAs established for Red-Legged Frog are primarily located on Vancouver Island.

Rocky Mountain Tailed Frog

The WHAs established for Rocky Mountain Tailed Frog are primarily located in the East Kootenay, near Lake Koocanusa.

Sandhill Crane

The WHAs established for Sandhill Crane are primarily located along the west coast, near Bella Bella.

Scouler's Corydalis

The WHAs established for Scouler's Corydalis are primarily located on southern Vancouver Island.

Spotted Bat

The WHAs established for Spotted Bat are primarily located in south-central B.C., northeast of Cache Creek.

Spotted Owl

The WHAs established for Spotted Owl are primarily located in southwestern B.C., between Lillooet and Manning Park.

Tall Bugbane

The WHAs established for Tall Bugbane are primarily located in southwestern B.C., near Chilliwack.

Tiger Salamander

The WHAs established for Tiger Salamander are primarily located in the south Okanagan, near Oliver.

Western Screech Owl

The WHAs established for Western Screech Owl are primarily located throughout southern B.C.

White-Headed Woodpecker

The WHAs established for White-Headed Woodpecker are primarily located in the south Okanagan, near Penticton.

Williamson's Sapsucker

The WHAs established for Williamson's Sapsucker are primarily located throughout south-central B.C. and the south Okanagan.

Yellow Breasted Chat

The WHAs established for Yellow Breasted Chat are primarily located in the south Okanagan, near Oliver.

Ungulate Winter Range

Several ungulate winter ranges (UWRs) have been established under Section 31 of the EPMR by the Minister of Forests, Lands and Natural Resource Operations. The order and its associated map and spatial data are available at the [Ministry of Forests, Lands and Natural Resource Operations website](#).

Note: For any oil and gas activities proposed within any of the UWRs listed below, the applicant is required to submit a detailed mitigation strategy demonstrating how any material adverse effect on the wildlife and habitat values listed, as a result of the activity and its operating area, will be mitigated (unless otherwise noted by established operating practices as described or referenced in this section).

Bighorn Sheep

The UWRs established for Bighorn Sheep are primarily located along the Canada/USA border, near Grand Forks, B.C.; and along the B.C./Alberta border, southwest of Monkman Provincial Park.

Black Tailed Deer

The UWRs established for Black Tailed Deer are primarily located in the southern Coast Mountains near Harrison Lake and Hope.

Boreal Caribou

The UWRs established for Boreal Caribou are located in northeastern B.C. and overlap with the Horn River Basin and Cordova Embayment.

For any oil and gas activities proposed within these UWRs, the applicant is expected to follow the Ministry of Environment's [Interim Operating Practices for Oil and Gas Activities in Identified Boreal Caribou Habitat in British Columbia, September 22, 2011](#). If it is not feasible to follow these practices, the application must include a deviation request and mitigation strategy, as detailed below.

Best Management Practices Deviation

Deviation requests must include a mitigation strategy as part of the additional application requirements. The mitigation strategy is assessed by the Commission to ensure consistency with the

government's environmental objectives for wildlife values contained in Section 6 of the EPMR.

The mitigation strategy must include:

- Rationale for choosing the alternative practice
- Site-specific wildlife habitat information
- Description of the operational activities that will mitigate impacts to the habitat values
- Assessment by a qualified professional demonstrating how the proposed activity impacts caribou and their habitat. The assessment must include specifics of the alternative practice, but may or may not include an environmental assessment.

Elk

The UWRs established for Elk are primarily located in northeastern B.C., along the Williston Reservoir and in the Montney Basin, south of the Peace River; and on Vancouver Island.

Moose

The UWRs established for Moose are primarily located throughout southern B.C. and north of the northernmost arm of the Williston Reservoir.

Mountain Caribou

The UWRs established for Mountain Caribou are primarily located throughout B.C.'s Rocky Mountains, south of Mackenzie; and near Takla Lake.

Mountain Goat

The UWRs established for Mountain Goat are located throughout B.C.'s Coast Mountain and Rocky Mountain Ranges.

Mule Deer

The UWRs established for Mule Deer are located throughout south and central B.C., and on Vancouver Island.

Northern Caribou

The UWRs established for Northern Caribou are primarily located throughout B.C.'s northern Rocky Mountains and near Tweedsmuir Park.

Stone's Sheep

The UWRs established for Stone's Sheep are primarily located in northeast B.C., north of the eastern arm of the Williston Reservoir.

White-tailed Deer

The UWRs established for White-tailed Deer are primarily located in the Kootenays, near Slocan, BC.

Fisheries Sensitive Watershed

Several fisheries sensitive watersheds have been established under Section 27 of the EPMR by the Minister of Forests, Lands and Natural Resource Operations. The order and its associated map and spatial data are available at the [Ministry of Forests, Lands and Natural Resource Operations website](#).

For any oil and gas activities proposed within a fisheries sensitive watershed, the applicant is required to submit a detailed mitigation strategy demonstrating how any material adverse effect on the ability of the watershed to protect downstream fisheries and watershed values, as a result of the activity and its operating area, will be mitigated.

Wildlife Tree Retention Area

All oil and gas activities must be planned and undertaken in accordance with Section 6 (c) of the EPMR.

Wildlife Tree Retention Areas (WTRA) are valuable components of stand-level biodiversity, associated with forestry based openings (cutblocks). Spatial information for WTRA is available via the BC Geographic Warehouse.

For more information regarding wildlife tree retention areas and retention of coarse woody debris refer to the [Wildlife Tree Committee Homepage](#).

In cases where there will be decreased overall impact of oil and gas activities, and depending on the purpose of the individual WTRA, it may be preferable to enter a WRTA. In these instances, the applicant should submit a deviation request to the Commission as part of the application.

Best Management Practices Deviation

Deviation requests must include a rationale and, where appropriate, a mitigation strategy as part of the additional application requirements. The mitigation strategy is assessed by

the Commission to ensure consistency with the government's environmental objectives for wildlife values contained in Section 6 of the EPMR.

The mitigation strategy must include:

- Rationale for choosing the alternative practice
- Site-specific wildlife habitat information
- Description of the operational activities that will mitigate impacts to the WTRA values

Wildlife Habitat Features

All oil and gas activities must be planned or undertaken in accordance with Sections 6(d) and 18(3) of the EPMR.

Although there are currently no wildlife habitat features identified under Section 26 of the EPMR, the Commission recognizes that there are significant values associated with various habitat features.

During all phases of oil and gas activities, permit holders should not restrict wildlife movement. Efforts should be made to ensure that wildlife trails are kept free of debris and passable for wildlife.

Suggested Setbacks

Suggested operating setbacks have been developed to help minimize the impacts to some important wildlife habitat features and are identified later in this section. Where minimum construction setbacks are infeasible, applicants may deviate from this Guidebook by submitting a rationale for infringing on the setbacks and where appropriate, a [mitigation strategy](#) with the application.

Note that in some instances additional setbacks may be required due to lack of topographical relief, sparse vegetation density, extensive use of habitat, and other special considerations.

The following are the minimum expected construction setbacks for commonly encountered habitat features:

- Trumpeter Swan Nest – 200 meters
- Other nesting sites (for example, osprey stick nest, sandhill crane ground nests) – 100 meters
- Mineral licks – 100 meters

- Bear dens (applies to winter construction only) – 50 meters

In cases where it is not possible to maintain, or where it makes ecological and operational sense to narrow, these setbacks the applicant should submit a deviation request to the Commission as part of the application.

Best Management Practices Deviation

Deviation requests must include a rationale and, where appropriate, a mitigation strategy as part of the additional application requirements. The mitigation strategy is assessed by the Commission to ensure consistency with the government's environmental objectives for wildlife values contained in Section 6 of the EPMR.

The mitigation strategy must include:

- Rationale for choosing the alternative practice
- Site-specific wildlife habitat information
- Description of the operational activities that will mitigate impacts to the wildlife feature values

Fish and Fish Habitat

Where possible, streams, wetlands, and lakes should not be entered. Instream activities on fish streams, or stream reaches that could affect fish habitat or water quality either directly or downstream, may only be undertaken when conditions are such that impacts to fish or fish habitat are avoided. Specifically, the permit holder must ensure that constraints relative to fish life history or expected streamflows are in an appropriate condition that the activity being carried out will not negatively impact fish or their habitat. These activities are further discussed in [Section 3 – Riparian Values](#).

The Commission has developed [Fish and Wildlife Timing Windows](#) for Oil and Gas Exploration and Development in Northeast British Columbia. Operations proposed in or about streams where identified species are known to live, within critical periods for those species will not be considered for approval unless accompanied by a rationale and, where appropriate a mitigation strategy, subject to review by Commission staff.

Fisheries assessments, or some equivalent, must be completed to determine fish presence for field stream classification.

5 Old Growth Management Areas, Resource Features, Cultural Heritage Resources

Old Growth Management Areas

No Old Growth Management Areas have been established under section 32 of the EPMR at this time. As Old Growth Management Areas are established, additional guidance regarding oil and gas operations within these areas will be developed.

Known old growth management areas established under the Forest and Range Practices Act are not established under OGAA. However, the Commission recognizes that there is significant ecological value associated with these areas that must be addressed for oil and gas activities.

Where oil and gas activities areas are proposed within these areas, the Commission expects the Applicant to identify what measures will be taken to minimize impacts to and protect the values associated with these areas. Where appropriate, a mitigation strategy must be submitted as part of the Additional Application Requirements.

Resource Features

All oil and gas activities must be planned and undertaken in accordance with Sections 7(b) and 18(3) of the EPMR. All resource features, as defined in Section 25 of the EPMR, must be identified during activity planning and included on the activity application.

If a person carrying out a oil and gas activity finds a resource feature that was not identified on an approved operational plan or permit, the person carrying out the activity must modify or stop any activity that is in the immediate vicinity of the feature to the extent necessary to refrain from threatening it, and promptly advise the Commission of the existence and location of the resource feature.

The following resource features are identified in Section 25 the EPMR:

Karst

Karst includes any surface or subsurface element of a karst system.

Karst is recognized as a valuable, non-renewable resource that can be highly sensitive to disturbance. It is a distinctive topography that develops as a result of the dissolving action of water on soluble bedrock, which produces a landscape characterized by fluted and pitted rock surfaces, vertical shafts, sinkholes, sinking streams, springs, subsurface drainage systems and caves. The unique features and three-dimensional nature of karst landscapes result from a complex interplay between geology, climate, topography, hydrology, and biological factors over long time scales.

[Reconnaissance karst potential mapping](#) has been completed for the province and is available through the BC Geographic Warehouse. It should be recognized that this map is not necessarily inclusive of all karst features in the province, but is intended as a guide for areas where karst is likely to be encountered.

Oil and gas activities that have the potential to impact either surface or subsurface elements of a karst system must follow the best management practices outlined in the [Karst Management Handbook for British Columbia](#).

Range Development

This resource feature includes any range development as defined under the Forest and Range Practices Act

A range development includes a structure, an excavation, a livestock trail indicated in a range use plan or a range stewardship plan as a range development, or an improvement to forage quality or quantity on an area that results from the application of seed, fertilizer or prescribed fire to the area, or the cultivation of the area.

Research/Experimental Land

This includes all Crown land used for research or experimental purposes.

The source of information on trial site and research site locations and characteristics is in the individual forest district office or major licensees within the district conducting field experiments; some information can be obtained through BC Geographic Warehouse. The Commission does not hold GIS data related to research sites.

Permanent Sample Site

Specifically, this is defined as a permanent sample site used as a snow course by or on behalf of the federal or provincial government for the purpose of measuring the water content of the snow pack on a given area.

Snow is an important water resource that cannot be accurately measured by snow depth alone. Permanent Sample Sites (PSS) used as snow courses by or on behalf of the federal provincial government have been established to measure snow water equivalent.

Spatial information for provincial [snow courses](#) is available via BC Geographic Warehouse; federal information can be obtained via the [Canadian Cryospheric Information Network](#).

Recreation Features

Recreations features include: an interpretive forest site, a recreation site or a recreation trail established or continued under the Forest and Range Practices Act; a trail or other recreation facility that is authorized under the Forest and Range Practices Act; and a recreation feature identified under the Forest and Range Practices Act

Recreational features have been established by the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) and can be established for commercial ventures through the Land Act. Recreational features are available through the BC Geographic Warehouse. In addition contact should be made through the MFLNRO office to establish the location of resource features identified under the Forest and Range Practices Act.

Where these features have been identified, oil and gas activity planning and operations should ensure that impact to them is minimized. Activity applications must be accompanied by a rationale detailing how impacts were minimized.

The following outlines Best Management Practices (BMPs) for oil and gas activities that have the potential to impact recreation features.

Best Management Practices

Planning

Where recreation tenures may be in conflict with proposed oil and gas development or activities, the applicant or designate should contact a MFLNRO District Recreation Officer to discuss reasonable means of mitigation/accommodation.

Trails

Minimize interactions with and impacts to recreation trails wherever possible.

Minimize the size and number of any crossings. Cross only at right angles to the trail.

Establish adequate and effective treed buffers between the trail and the access road, along with clearly visible signage warning users of the crossing.

In shared rights-of-way, a trail tread or travel portion of the trail should be accommodated for safe travel within the right-of-way. The travel portion of the accommodated trail must be kept free of debris and road maintenance obstructions during applicable periods or seasons of use.

Discuss any proposed alterations to roads or trails within recreation features with the MFLNRO District Recreation Officer.

Discuss location and timing of use of geotechnical trails across motorized recreation trails with the MFLNRO District Recreation Officer to prevent public safety risks, compromise of the collection of accurate seismic data and damage to cables or equipment.

The BMP's for activity that may potentially impact recreation features are new to the EPMG.

Recreation Sites

Avoid locating industrial camps within recreation sites.

Where practicable, do not locate wellsites, facilities or structures within 500m of the developed portion of a recreation site.

Consideration must be taken to minimize disruption to the public resulting from noise, aesthetics and H₂S notices.

Where it is not practicable for oil and gas roads to be located to avoid recreation sites, design access to avoid developed portions of the recreation site and deactivate the access once operations cease.

Design access to minimize and/or mitigate dust, noise and continuous traffic in or near a recreation site.

Where road access has the potential to impact a recreation site, ensure adequate buffering with trees or earth berms.

Discuss any proposed alterations of roads or trails within a recreation site with the MFLNRO District Recreation Officer.

Coordinate with the MFLNRO District Recreation Officer for all oil and gas activities within a recreation site. Partnership agreement holders and known user groups may be involved to avoid potential conflicts.

Avoid accessing water sources through recreation sites wherever possible. Seek out alternative water sources if available.

Consider the use of access barriers or flag persons during periods of activity within recreation sites to prevent public safety issues.

Avoid use of explosives in or near recreation sites. All unexploded charges located near or within a recreation site should be reported to the MFLNRO District Recreation Officer in addition to the Commission's reporting requirements.

Cultural Heritage Resources

All oil and gas activities must be planned and undertaken in accordance with Section 7 (c) of the EPMR.

A cultural heritage resource is an object, site or location, that is not regulated under the Heritage Conservation Act, and that is of historical, cultural, archaeological or traditional significance or is subject to a treaty right.

Applicants contemplating oil and gas activities are expected to engage potentially affected First Nations early in the planning process. Ideally, engagement will begin when companies are determining potential development scenarios for petroleum tenures. As part of this engagement, applicants should work proactively with First Nations to develop data sets cataloguing cultural heritage resources and special management measures for important areas identified through the engagement.

In the event a heritage site, heritage object, or any other feature, place or material that may contain historical or archaeological value as defined by the Heritage Conservation Act [RSBC 1996] Chapter 187 is encountered, the permit holder must cease disturbance activities and immediately notify the Heritage Commission's Conservation Branch.

6 Natural Range Barriers

All oil and gas activities must be planned and undertaken in accordance with Section 14 of the EPMR.

Natural range barrier impact is to be avoided as breaching of natural range barriers and the adverse effect on livestock confinement is of particular concern to range tenure holders. A natural range barrier is a river, rock or other naturally occurring feature that stops or significantly impedes livestock movement to or from an adjacent area. Natural range barriers are identified in the Integrated Land and Resource Registry or the BC Geographic Warehouse.

Where possible, applicants and permit holders should seek to avoid removing or rendering ineffective natural range barriers. Where this is unavoidable, replacement barriers must be constructed as soon as practicable following removal or rendering ineffective of the barrier.

7 Invasive Plants

A person carrying out an oil and gas activity on an operating area must do so in accordance with Section 15 of the EPMR.

An invasive plant is any foreign plant species that causes or has the potential to cause detrimental impacts on human health and safety, the environment and biodiversity, agriculture, animal health, forestry, and the economy.

At this time, no invasive plants have been identified by order under Section 33 of the EPMR. Until invasive plants are identified by order, applicants are responsible under the [B.C. Weed Control Act](#) and the Weed Control Regulation to ensure noxious weeds are controlled on their operating areas. The Weed Control Regulation also addresses the prevention and spread of noxious weeds by transport from construction equipment.

See the [Invasive Plant Strategy for British Columbia](#) for a summary of the detrimental effects of various invasive plants. The term Invasive Plants will be used in this guide to apply equally to invasive plants and noxious weeds.

When planning or undertaking oil and gas activities, the applicant or permit holder should seek to minimize the establishment of invasive plants in their operating area and the spread of invasive plants from their operations.

Permit holders should focus on eradicating invasive plants if found in a small, isolated patch within an operating area. If the infestation in the operating area is significant in terms of number of plant species or area, and a similar pattern is present on the immediately adjacent land, then maintaining a similar or reduced pattern is acceptable.

Controlling invasive plants is a requirement during all phases of operations - construction, cleanup, operations, abandonment and restoration.

Integrated Management of Invasive Plants

The most effective strategy to manage invasive plants is an integrated approach. Good references for an integrated approach are:

Ministry of Agriculture, [Seven Steps to Managing Your Weeds. A Manual for Integrated Weed Management in British Columbia](#)

Ministry of Forests, Lands and Natural Resource Operations, [Invasive Alien Plant Program - Reference Guide Part 1](#). The components of integrated management are: prevention, education and collaboration, inventory, treatment, and monitoring.

Permit holders should seek advice, expertise, and services of trained and/or certified specialists to prepare treatment plans, conduct invasive plant inventories, and implement invasive plant treatment and monitoring. Regional committees of individuals and agencies interested in invasive plant management are established throughout B.C. should contact the local regional [Invasive Plant Council](#) for advice and access to the local network of professionals.

Prevention

Preventing invasive plants from invading is the most cost effective and practical approach to invasive plant management. Three important practices supporting prevention are:

Clean Equipment

Bring clean equipment onto the operating area. Make reasonable efforts to clean construction equipment prior to transport. This reduces the risk of spreading invasive plants and soil-borne plant pests and diseases. The types of cleaning methods include mechanical, washing, and chemical/disinfecting. A recommended first order practice is mechanical cleaning, which involves knocking or scraping off soil lumps and sweeping off loose soil and any plant material. This may be conducted using tools such as brooms, brushes, air compressors, shovels or by hand.

The following are some factors affecting the type and level of cleaning:

- Presence of known invasive plants or soil-borne pests at a site.
- Geographic location of where equipment came from, or is being transported to.
- Land-use of the site and landowner requests and commitments.
- Specific requirements from Weed Inspectors or Weed Control Officers.
- Availability of cleaning equipment.

Please ensure field operations and contractors are aware of the importance of controlling invasive plants and plant diseases by making reasonable efforts to clean construction equipment.

If there is an invasive plant problem on the operating area make sure to clean equipment before leaving the site.

Vehicle Storage

Do not park or store vehicles, equipment, materials or machinery on invasive plant infestations. If an infested area must be used for parking or storage, treat or remove invasive plants prior to use of the area.

Expedient Revegetation

Revegetate sites that have disturbed surface soils as soon as practicable to avert development of a seedbed for invasive plant establishment. See below revegetation guidance and Section 11 of this manual. This is not a requirement in areas that must be vegetation free for safety or other operational requirements.

Education and collaboration

Identifying invasive plants and being knowledgeable regarding their habitat, life-cycle, and strategies for suppression or eradication is key to managing invasive plants. See the [Guide to Weeds in B.C.](#) for a comprehensive listing of invasive weeds found in B.C. and relevant information for control.

Also refer to the Ministry of Agriculture and Lands and the [Ministry of Forests, Lands and Natural Resource Operations](#) websites for more information about invasive plant identification and management.

Permit holders are encouraged to train their field staff and contractors in identifying invasive plant species and prevention practices. Training courses can be arranged through the [Invasive Plant Council](#) (IPC). In addition, Regional Invasive Plant Committees organize training courses focused on identifying and managing locally important invasive plants. Contacts for these committees are available on the IPC website.

Permit holders are encouraged to participate in Regional Invasive Plant Committees. The committees usually meet quarterly and share information, discuss local concerns, and develop regional invasive plant management plans. For northeast B.C., the North East Invasive Plant Committee (NEIPC) is chaired and administered by the Peace River

Regional District (PRRD). Their Plan and Profile is on [PRRD's website](#).

Inventory

Map the location and density of invasive weeds in the operating area. The immediately adjacent land should also be assessed for possible invasion risk either from or to the operating area. This inventory will be the basis for developing a treatment plan if required. During wellsite cleanup (or early in the production phase) the operating area should also be assessed for presence or risk of invasive plants.

[Regional Invasive Plant Committees](#) are also a good source of information regarding the distribution of the species of concern.

Invasive Alien Plant Program (IAPP) Application

Ministry of Forests, Lands and Natural Resource Operations

manages a provincial, web-based invasive plant inventory database called the Invasive Alien Plant Program (IAPP) Application. It shares inventory and treatment information generated by various agencies and non-government organizations involved in invasive plant management. This application can identify species of invasive plants that are known or suspected to occur in the area of a company's operations. Companies are encouraged to use this tool and to contribute to the knowledge database. See the website for further information and to explore the web-tool.

Treatment Plan

If there is an invasive plant problem in or immediately adjacent to the operating area, then a suitable combination of strategies to control the population must be developed and implemented. The selection of treatment methods should consider the control options available, potential cost of treatment, and environmental impact of the targeted invasive plant. Depending on the objectives for the site, treatment methods should focus on practices that prevent weeds from producing viable seed, prevent vegetative propagation, suppress growth or vigour of the invasive weeds; or eradication.

For a typical oil and gas company with a large a number of operating areas, an integrated invasive weed management plan for a whole operational unit is recommended (for example by petroleum field, play or region). This allows for more flexibility and efficiencies for managing available resources.

The following are treatment strategies available for oil and gas operating areas:

Physical or cultural control

Cultural control involves removing the whole plant or portions of the plant at critical times in the plants life cycle. Hand weeding, mowing or cutting, cultivation and burning are the main approaches.

- Hand weeding is useful for small patches. Plants should be pulled prior to seed production and when soil is wet. Mowing / weed-whacking is acceptable when there are too many plants for hand pulling and cultivation or herbicides are not practical. Annual species should be cut before seed-set; perennials will require several cuts to deplete root reserves.
- Noxious weeds removed should be disposed of by bagging and taking to a landfill to avoid re-introduction.
- Cultivation utilizes tilling to prevent seed production in annuals, and deplete reserves and destroy underground roots in perennials. It is most useful in agricultural fields. Sites must be reseeded immediately after cultivation to prevent establishment of more or other invasive species.
- Burning can be an effective measure to destroy seeds and should be used where seed production has already occurred. Safety precautions need to be considered if planning burning treatments.

Maintaining cover

Maintaining a vigorous plant cover and revegetating as soon as practicable after soil disturbance, are viable options to prevent the establishment of invasive plants on oil and gas activity sites. Revegetation is not expected in areas required to be vegetation free for safety or other operation requirements.

Herbicides

Herbicides are chemicals that are designed to kill or injure plants, and can be very effective. The federal [Pest Control Products Act](#) regulates the use of herbicides in Canada. The herbicide label indicates which plant species can be treated, application rates, and what types of restrictions apply, such as buffer zones required around sensitive habitats.

The application of herbicides on Crown land in B.C. is further regulated through the provincial [Integrated Pest Management Act](#), whereby herbicide use on public lands must occur under a

service license, Pesticide Use Plan or Pest Management Plan; and applicators must be licensed. The Ministry of Forests, Lands and Natural Resource Operations, a regional invasive plant committee, or the Regional District's weed inspector may be able to provide the names of licensed pesticide applicators in the local area.

Biological control

Biological control is the use of a specific agent (for example, insect or pathogen) to reduce the plant's population to a more preferred level. It is best suited to large dense infestations where other methods are not cost effective or desirable.

Biological control is managed and administered at the landscape scale in B.C. by the Ministry of Forests, Lands and Natural Resource Operations.

Oil and gas applicants and permit holders should be aware of biological control activities in their area of operations in order to avoid conflicting or counter-productive invasive plant management activities.

Monitoring

Monitoring is required to manage invasive weeds. The frequency depends on the presence of invasive weeds in the operating area and the treatment approach being used.

Additional Guidance

Ministry of Transportation and Infrastructure has recently published [Best Practices for Managing Invasive Plants on Roadsides](#). It is available as a pocket guide and has a section on best practices for roadside workers that are equally applicable to road contractors in the oil and gas sector.

Re-vegetation

When selecting native plant material (or agronomic seeds if native seeds are not available) to compete with invasive plants—where either sources are close by or there are large volumes of undesirable seeds in the seed bank—applicants should follow these guidelines:

- Use a cover crop the first year (or longer if needed) to compete with invasive plant species. Where invasive plants are persistent, mow and remove the cut plant material prior to seed set.

- Seed native species known to be more competitive (for example wheat grasses).
- Design seed mix with species that have differing growth forms to enable plants to occupy niches that may otherwise be occupied by invasive plants. Where competition from invasive plants is a concern, increase seeding rates of native species.

It is expected that companies will use their own best practices and consult qualified professionals to achieve Invasive Plant Objectives. Additional guidance and references will be added as time and need warrants.

8 Forest Health

All oil and gas activities must be carried out in accordance with Section 16 of the EPMR.

Applicants and permit holders can assist in the reduction of forest health agents through careful planning and undertaking of oil and gas activities.

In some cases, certain measures must be implemented in order to ensure forest health agent populations do not increase. Often, forest health agents are tree species specific and different practices will be required for different species.

The main forest health agents concerning oil and gas activities are mountain pine beetle (*Dendroctonus ponderosae*) and spruce bark beetle (*Dendroctonus rufipennis*).

Both species of beetle are present in endemic populations in many stands. Both can increase to epidemic levels. Currently in the central part of the province, a Mountain Pine Beetle (MPB) epidemic is sweeping eastward. Mountain Pine Beetle have moved into northeast B.C. and now affect pine stands over extensive areas in the Peace Forest District. Areas have been designated as aggressive action, containment and salvage control areas by the Ministry of Forests, Lands and Natural Resource Operations. Refer to the [MNRO Emergency Bark Beetle Management Areas for MPB](#) for the location of and specific operating procedures that will apply in these areas.

Endemic spruce beetle populations usually live in windthrown trees. When populations increase to high levels in downed trees, beetles may enter susceptible, large-diameter standing trees. Most outbreaks in standing timber originate from windthrown trees.

Best management practices for oil and gas activities in forest stands within the Peace Forest District are as follows:

Mountain Pine Beetle

Educate crew members on how to detect Mountain Pine Beetle attacked trees and be able to differentiate between the various stages of attack:

- Grey
- Red
- Green

Green attack trees should not be burned or buried on site, but bucked to a maximum of 18 inch lengths and scattered on the ground.

All infested wood being hauled must be clearly identified and the mill must be made aware that the wood is infested to ensure proper and immediate handling.

Where a qualified person confirms that there is no Mountain Pine Beetle infestation in trees, the trees can be marketed and delivered to a milling facility.

Spruce Bark Beetle

Some of the treatments for spruce beetle differ from other bark beetles, and timing of activities differ due to variations in the life cycle. Mid-summer through autumn (July 25 through November) is the best time to detect spruce beetle infestations and sanitation harvesting is most effective in late winter (February 1 through March 15) with trees removed from the site prior to May.

After detection, treatment options to consider are sanitation harvesting and prevention of spread, including hauling restrictions during the beetle emergence period.

9 Conserving Soil

There are strong interrelationships between soil conservation, invasive plants and final restoration success that require soil handling / management and vegetation management consideration during most phases of oil and gas activities. For this reason soil productivity measures and practices are included in this section.

To meet the objectives of Section 19 of the EPMR for restoring site productivity, the Commission recommends that topsoil be salvaged when the activity requires surface disturbance. Guidance for topsoil stripping is included in this section.

Soil conservation practices will focus on maintaining slope stability, soil productivity and natural drainage patterns, while minimizing erosion. It is expected that companies will consult qualified professionals, where appropriate, to achieve soil conservation objectives.

Minimize New Soil Disturbance

A variety of techniques are available to minimize soil disturbance and reduce restoration costs. Some examples include:

- Utilize the minimum area for the activity.
- Choose previously disturbed sites.
- Operate in frozen conditions.
- Use matting or overburden and geotextiles in muskeg.

Companies should document and retain on their files evidence that they considered utilizing existing disturbances and their rationale for not following them. Existing disturbances include seismic lines that are not regenerated, existing roads or trails and previously cleared areas.

Plantations and cutblocks with established “sufficiently restocked” regeneration are not considered to be existing disturbances.

It may be acceptable to not follow the new soil disturbance guidance if a better environmental outcome can be achieved for the required development. Where new soil disturbance guidance is not followed, a rationale and where appropriate a mitigation strategy must be attached to the activity application as part of the additional information requirements.

Soil Productivity

Compaction

Soil compaction severely affects productivity by:

- Restricting root penetration.
- Decreasing soil porosity and water infiltration.
- Reducing workability and depleting seedbed.
- Increasing erosion by increasing surface water runoff.

Soil compaction is minimized by limiting the times soil is moved, limiting heavy vehicular traffic, and avoiding soil handling or vehicular traffic when soils are either saturated or very dry. Minimizing compaction is a consideration in all phases of oil and gas activities.

Erosion

Minimizing soil erosion by wind or water to reduce soil displacement or deposition is required to maintain topsoil productivity. The length, grade, and shape of slopes; soil characteristics; and vegetative cover are the main factors that need to be managed for during all phases of oil and gas activities. Both short-term and long-term measures are required. The most common methods to control erosion are:

- Reduce the grade and length of cut-slopes.
- Avoid having bare soil exposed; re-establish a vegetative cover as soon as practicable.
- Add structures to manage surface water flow.
- Don't work in wet conditions.

Erosion management is a consideration during all phases of oil and gas activities.

Soil Stability

Permit holders are responsible for soil stability under Section 17 of the EPMR and should carry out and maintain records of assessments and monitoring where there is the potential for instability.

Soil stability hazard is a consideration during all phases of oil and gas operations. At a minimum the Commission recommends that companies carry out field assessments and mitigation measures for locations with a high likelihood of landslides; or, unstable soils, before initiating field operations that disturb soils.

Northeast B.C. is susceptible to soil instability, mainly due to landslide-prone surficial material. Some landscape features in northeast B.C. susceptible to landslide hazards include:

- Glaciolacustrine surficial geology units.
- Exposed Shaftsbury formation bedrock or valleys and gullies with shallow surficial material overlying Shaftsbury formation bedrock.
- Areas of degrading permafrost that contribute to differential settlement.

Topsoil conservation

Topsoil is defined as the uppermost mineral/organic material as a growing medium. It generally includes the LFH and All A horizons in forest mineral soils, and the Ap, Ahe and Ae horizon in mineral cultivated soils. Information regarding the various layers of topsoil and how to identify them is available from the [University of BC Faculty of Land and Food Systems SoilWeb](#). Topsoil in muskeg (organic) soils is considered the top 15 to 70 centimetres.

Topsoil is key to providing nutrients, water availability, and a growth medium for plant development. It is the foundation for re-establishing ecosystem function after site disturbance and for meeting the restoration objectives.

Where topsoil needs to be disturbed for oil and gas activities such as access, wellsites, facilities and pipelines; it should be selectively stripped, stored, and replaced last when the site is no longer needed for the oil and gas activity. Where the activity can occur without disturbing topsoil (for example, ice roads, frozen ground and pads); topsoil stripping should not occur.

In most cases oil and gas activities are a temporary use and permit holders must, to the extent practicable, maintain the

quality and quantity of topsoil to quickly restore land productivity after the oil and gas activity.

Topsoil salvage

Topsoil salvage requires that the surface soil horizons be selectively stripped from the subsoil. One, two, and three lift salvage methods are practiced.

The key principle for stripping is to not dilute or bury the nutrient-rich LFH or Ap, Ah, Ahe or Ae horizons. The two-lift method is preferred on soils with relatively deep topsoil, (greater than 30 centimetres). Generally in the two-lift method the topsoil is segregated into two lifts to reduce topsoil admixing with subsoil during replacement.

A three-lift salvage is used in agricultural soils where there is a distinct quality difference between the upper and lower subsoils. One-lift soil salvage is used primarily in shallow forest soils and organic (muskeg) soils. Even in very shallow soils a less than 10-15 centimetre topsoil salvage will greatly enhance restoration success and reduce cost.

Prescribing topsoil salvage depths requires a soil survey and prescriptions by a qualified reclamation specialist, which should be completed during the planning phase of an oil and gas activity. Within the ALR, this is part of the [Schedule A](#), and is required for submission with the activity application.

A qualified reclamation specialist is a “qualified specialist” in the practice of reclamation with a minimum of 2 years related experience.

Soil storage

Salvaged topsoil and subsoil must be stockpiled in an identified location with a minimum separation of one meter. The location of salvaged topsoil should be determined during the planning phase.

In the short-term piles should be seeded with an erosion seed mix. In the longer term, store stripped soils in a manner that maximizes surface area and minimizes depth.

During operations the storage piles should be contoured, and revegetated to an appropriate cover to maintain productivity and manage invasive plants and erosion. An example is tear-dropping around production wells in agricultural fields.

The location of stored topsoil must be mapped and readily available to company field staff, contractors and the Commission. The purpose of mapping the stored topsoil is to minimize unintended admixing during activities and to

accurately locate topsoil for replacement during restoration. The as-built plan for the operating area may be useful to document the location of stored topsoil.

Natural Surface Drainage Patterns

To maintain natural drainage patterns and minimize erosion and potential off-site contamination, utilize the following measures:

- During operations - surface water flow originating off-site should be maintained but directed around the operating area (wellsites and facilities) to their pre-existing pattern.
- During operations - water originating from the operating area must be managed to prevent impacting adjacent off-site land.
- After operations - the pre-existing natural drainage pattern must be restored.

Measures to manage surface water during construction, operations and abandonment should be considered during the planning phase and included in the Schedule A for applications within the ALR.

Pre –Construction Site Assessment (PCSA)

Where topsoil needs to be disturbed for oil and gas activity, a site assessment and development plan can ensure that an applicant is able to effectively and efficiently meet many requirements of the EPMR. This is particularly so for direction around soil conservation, invasive plants, and restoration.

Within the ALR, a [Schedule A](#) Site Assessment is required at the time of application submission. In other areas where surface soil disturbance is expected, a Pre –Construction Site Assessment or equivalent is not required for submission to the Commission but should be available for use by companies, operational staff and contractors during construction and operations to minimize environmental risk, and meet restoration goals.

The primary goal of the Pre –Construction Site Assessment is to assess the current site and landscape characteristics to provide baseline conditions for developing site construction procedures and a preliminary restoration plan and identify potential

environmental risks that require mitigation measures during all phases of oil and gas activities.

The following are suggested components of a Pre –Construction Site Assessment:

- Current site and landscape conditions
 - At a minimum the baseline landscape, vegetation, and soil criteria used for Certificate of Restoration acceptance should be documented (see the Commission’s Waste Management and Reclamation Guideline, currently in development). The vegetation assessment should include documenting the presence of invasive plants.
- Current and expected end land use
 - Baseline goal for site restoration; there may be implications for soil handling during construction and operations.
- Soil handling
 - Top soil stripping specifications and storage during construction and operations.
- Soil and vegetation management measures to be taken during operations to minimize erosion, noxious weeds/invasive plants, and maintain soil productivity to more easily achieve final restoration success.
- Surface water management
 - Measures to manage surface water during construction and operations.
- Preliminary Reclamation Plan
 - Preliminary prescription for site restoration.

10 Seismic Lines

Geophysical programs must be carried out in accordance with Section 18 of the EPMR. Furthermore, it is expected the permit holders carrying out geophysical operations in B.C. will use Low Impact Seismic (LIS) techniques, where feasible.

Enhanced geophysical guidance may be developed as part of the Commission's basin management directive (for example, the Horn River Basin Geophysical Project Requirements) that exceeds the standards put forth in the EPMR. In these cases, companies must adhere to the Commission's additional standards.

Additional information concerning geophysical activities can be found in the Geophysical Exploration Regulation and associated [Geophysical Exploration Application Manual](#).

11 Areas to be Restored

A permit holder must carry out oil and gas activities in accordance with Section 19 of the EPMR. This section outlines the steps that must be taken to restore an operating area upon completion of oil and gas activities.

In addition to meeting the requirements of the EPMR, permit holders must meet the decommissioning, abandonment and/or restoration requirements of the individual activity regulations.

Restoration Practices

Restoration practices for areas of disturbed soils should focus on:

- Stabilizing any cut and fill slopes, and re-contouring if required to return pre-disturbance drainage patterns and minimize erosion potential.
- Restoring surface soil to similar to pre-disturbance productivity.
- Establishing a healthy, self-sustaining, and ecologically appropriate vegetative cover.

Progressive reclamation should be practiced on portions of operating areas that are no longer required for the oil and gas activity.

There are different reclamation requirements within the Muskwa Kechika Management Area (M-KMA) that were developed through Pre-tenure Planning. Pre-tenure plans are legislative requirement and must be followed. Pre-tenure Plans and M-KMA guidelines are available on the Ministry of Forests, Lands and Natural Resource Operations [M-KMA website](#).

Final Restoration Planning

The planned end land use for restoration will affect restoration activities but most particularly revegetation.

[Land Resource Management Plans and Sustainable Resource Management Plans](#) developed for various areas of the province provide some guidance for end land use goals, and can be referenced at <http://www.ilmb.gov.bc.ca/category/subject-area/land-marine-planning>.

For northeast B.C., the most specific revegetation direction is for native plant species within Major River Corridor RMZs, the M-KMA and several RMZ's adjacent to the eastern boundary of the M-KMA. A map showing the location of these areas is in Appendix 7 of [Peace –Liard Re-vegetation Manual](#), NEIPC, April 2010.

The specific end land use for the site should be consistent with general LRMP direction and immediately adjacent land.

Site Visit

A qualified reclamation specialist should conduct a site visit to determine the current site conditions and what restoration activities are warranted. They should have access to the permit holder's pre-construction reclamation plan or Schedule A on ALR land, in order to review and assess the pre-existing site conditions and the preliminary reclamation prescription.

If a preliminary reclamation plan is not available or no longer appropriate for the site conditions, then a detailed final restoration plan to stabilize and re-contour, replace topsoil and revegetate should be developed. The immediately adjacent site conditions should be used as the baseline if a pre-construction plan is not available.

Where surface soil disturbance has occurred it's recommended that a qualified reclamation specialist monitor the soil handling and revegetation activities to restore the site.

Final Reclamation Activities

Soil Handling

Soil handling during reclamation, as during initial construction, should focus on re-establishing long-term slope stability, soil productivity and natural drainage patterns, while minimizing erosion. Consideration of erosion and compaction during reclamation operations is required to ensure stable and productive soils.

Do not work in wet conditions and minimize heavy equipment use.

Well sites, facilities, ancillary oil and gas activities

The final reclamation plan should include soil handling specifications. The following is a generalized sequence for site reclamation of a well site that applies to all oil and gas activities where soil stripping and land contouring occurred during

construction (for example, access roads, facilities, camps, borrow sites, remote sumps, etc):

- 1) Clean the site of any structures or debris.
- 2) Address removal of any surface gravel or other material brought in for access or equipment padding.
- 3) Replace any cuts and fills to reduce the grade and contour the site to the alignment of adjacent land. Shape and grade any slopes to minimize erosion. Consider packing to stabilize soil.
- 4) Restore any natural drainage patterns to their original alignment.
- 5) Disk or rip the surface of the subsoil to breakup any compaction that may have occurred.
- 6) Replace any salvaged topsoil in the reverse order of stripping during construction. See the Conserving Soil section of this manual for more information regarding topsoil handling and replacement.

Where no topsoil has been salvaged then a substitute soil may need to be created from a mixture of subsoil material and available organic material (for example, straw, roots, duff material), to create suitable topsoil conditions for revegetation. Supplementation using off-site soil may be required. A qualified reclamation specialist should be consulted in these situations.

Pipelines

During pipeline construction clearing, soil stripping, trenching, pipe-laying, soil replacement, and revegetation generally occurs in one sequence of activities over several weeks to a month at any one site. Final revegetation activities may be delayed a season to allow soil settling in the trench.

The same soil conservation and restoration outcomes are required for pipelines as other oil and gas activities. Within the ALR, restoration of pipelines is required within 24 months of installation. The restoration standards are specified in [Schedule B](#) from the OGC-ALC Delegation Agreement.

Revegetation

The long-term goal of revegetation should be to re-establish a native self-sustaining plant community that is compatible with surrounding land uses. Native species are recognized for their ecological function and wildlife habitat values and should be used where they can be sourced at reasonable cost.

The [Peace-Liard Re-Vegetation Manual](#) is a good reference for revegetation in northeast B.C. It includes information on revegetation planning, sourcing native plant material, revegetating with shrubs, seedbed preparation, seed mixes, seeding equipment, and timing and rates for planting.

There are situations where natural revegetation is the preferred option and seeding is not required. Examples include muskeg (organic) or moist mineral soil sites (not susceptible to invasive plants) with suitable replaced topsoil and both viable seeds and living plant material.

The one caution is that most severely disturbed sites with bare soil are susceptible to erosion and require considerable effort and time delay to establish a suitable self-sustaining plant community without initial seeding. A qualified reclamation specialist should be consulted when planning natural revegetation on mineral soils.

Short, medium, and long term revegetation goals should be established within the context of the identified end land use. For general revegetation (seeding and planting), northeast B.C. can be divided into the following end land use categories:

- Cultivated agricultural land (inside and outside ALR).
- Crown land (forest land).
- Active range tenures.
- LRMP Special Management RMZ's (require native revegetation).
- M-KMA.
- Erosion control.

Cultivated Land

Revegetate cultivated lands with the same forage species or crops as in the immediately adjacent area. Private land should be revegetated to the specifications of the landowner.

General Crown Land

Permit holders are expected to follow the recommended native forage seed mixes outlined in Peace-Liard Re-vegetation Manual. Where native species cannot be sourced then an acceptable alternative forage mix is also provided.

Active Range Tenures

Permit holders are expected to follow the recommended forage mix in Peace-Liard Re-Vegetation Manual in areas where increasing and enhancing the forage producing capabilities for wild and domestic animals is desirable.

If the operating area is within a range development such as a pasture then choose plant materials that match the surrounding pasture to enable use of the revegetated area at the same time of year and by the same species. Range staff at the appropriate District Ministry of Forests, Lands and Natural Resource Operations office can confirm whether revegetation plans are compatible with range use. Do not include plants (native or otherwise) in the mix that are known to be toxic to livestock. Protect the revegetating area from use by animals in the first year or until the plants are well established.

LRMP Special Management RMZs

Permit holders are expected to follow the recommended native forage seed mixes in Peace-Liard Re-vegetation Manual. Extra efforts are expected to replant with native species including shrubs where practicable. Where it is not practicable, permit holders must use a recognized seed mix compatible with the surrounding area.

M-KMA

The long term objective in the M-KMA is to return lands to their natural state as much as possible after resource development. Pre-tenure Plans have higher objectives for returning ecosystems to their natural vegetative state as much as possible over time. See the Ministry of Forests, Lands and Natural Resource Operations [M-KMA website](#) for further guidance.

Erosion Control

The Peace-Liard Re-vegetation Manual has identified acceptable seed mixes for use in areas with high erosion hazard. Preventing soil erosion and an increase in the distribution of invasive plants should be the main criteria when choosing an erosion seed mixture. Use effective erosion control measures in combination with revegetation for the most effective erosion control.

Site Preparation

Site preparation is one of the most important factors in determining the success of revegetation projects. Inadequate preparation is one of the most common reasons for seeding failure. The following measures will help to enhance any revegetation project:

Use of nitrogen fertilizer is NOT recommended for most native revegetation projects. Fertilizer tends to promote weed growth and can slow succession.

- Topsoil and subsoil should be conserved and replaced. Newly constructed landforms require topsoil and subsoil suitable for the type of vegetation chosen.
- Eliminate any compaction that could inhibit root growth prior to seedbed preparation.
- Control persistent weeds/problem plants.
- Where needed, use equipment that produces ridges and hollows to create microsites to enhance diversity and plant survival.
- Regulate seed depth and enhance germination by ensuring good soil to seed contact by preparing a firm seedbed when drill seeding.

Guidelines for Seeding

Choice of seeding and planting methods will vary according to project goals, end land use, previous experience and specific requirements of the species being used.

Drill Seeding

Use drill seeding where possible (rather than broadcast seeding) to make more efficient use of seed and ensure seed is placed in direct contact with soil.

Broadcast Seeding

Use broadcast seeding in areas where access for drill seeders is poor; or for small seeded species or those that require light to germinate.

Additional Guidance for Revegetation

The following are selected guidelines from [Native Revegetation Guidelines for Alberta \(2001\)](#)

General Guidelines for Native Plant Selection

- Select native species based on their consistency and compatibility with pre-disturbance plant communities within the biogeoclimatic subzone.
- Select native species based on known performance.
- Seed only species that will not regenerate naturally from the soil seedbank (e.g. wetland areas generally have a large seedbank and will not require seeding).
- In areas where late successional species may be difficult to establish, consider the use of early successional

species or native plant species that can survive in altered conditions.

- Use a range of native plant materials (e.g. multiple species, varieties and/or age classes)
- Salvage the seedbank for replacement and plant materials such as seed or sod that might otherwise not be available.

Guidelines for Selecting Plant Material for Enhancement of Wildlife Habitat

- Use a holistic approach to revegetation to provide food and habitat for identified animal species.
- Use native plant materials that fulfill the life-cycle requirements of key wildlife species.
- Use species similar to those found in the adjacent offsite plant communities.
- Plant species in patterns that simulate offsite conditions.

Guidelines for Ordering Seed

- Always ask for preferred species first. When unavailable, be prepared with alternate choices or to revise the revegetation plan.
- Use scientific names when ordering seed.
- Ensure the genetic seed source is from a similar region to prevent performance issues
- Request a Seed Analysis Certificate from the supplier. Check certificates for species of concern.
- All seed must meet Certified #1 standards for purity and germination. None of the prohibited invasive plant seeds shall be present.
- Legume seed must be inoculated with the correct strain of Rhizobium.
- Order early to ensure availability of seed.

Monitoring and Final Restoration Assessment

The length of time necessary to monitor restored sites varies by situation. The Certificate of Restoration (COR) process is predicated on a minimum of one full growing season following revegetation. Plan to assess restored operating areas early the following growing season to ensure the land is stable (that is, no subsidence or slumping) and the vegetation growth is vigorous

with the desired species. Any soil stability, vegetation productivity, or noxious weed issues should be immediately addressed. The site should also be assessed at the end of the establishment period which varies by species. In many cases it will take several growing seasons for evidence that a sustainable desired plant community is achieved.

Within the ALR, when sites are no longer required for oil and gas activities, then a Schedule B assessment is required before a COR can be issued.

Appendix A – Definitions

Bog	Wetland that has organic soils with a water table at or near the surface. Soils are predominantly poorly to moderately decomposed sphagnum moss peats. The bog surface is usually unaffected by groundwater and thus waters are generally acid and low in nutrients. Bogs are usually carpeted by sphagnum mosses and ericaceous shrubs. They may be treed or treeless. Bogs with an open growth of scrubby trees are commonly referred to as muskeg.
Bore	Trenchless stream crossing method by which a hole is drilled horizontally from bell hole to bell hole (with or without casing) to allow the installation of a pipeline.
Clean snow	Snow that is free of mineral soil, silt, coarse woody debris, or deleterious substances. When snow is bladed for snowfill construction it is not uncommon that small amounts of grass and other vegetative matter, that have fallen on the snowpack as it accumulated, will be included in the gathered material. Grass is often present as it extends well up into the snowpack and may be cut off by the cat blade.
Clearspan bridge	A channel spanning structure that requires no in-stream support abutments, footings or pilings. Clearspan structures include native timber bridges and fabricated wood, metal and concrete construction mediums.
Closed bottom structure	Tunnelled drainage structure for the passage of water. Typically constructed of metal or concrete and may be box or cylindrical in shape. Closed bottom structures involve in-stream disturbance of stream channel bed and/or banks.

Critical fish habitat	Habitat that is critical in sustaining subsistence, commercial, or recreational fishery or species at risk because of its relative rareness, productivity and sensitivity. Habitat indicators include the presence of high-value spawning or rearing habitat (that is, locations with an abundance of suitably sized spawning gravels, deep pools, undercut banks, or stable debris, which are critical to the fish population present).
Deleterious substance	A substance that is likely to have a negative impact on water, as defined in Section 34 of the Fisheries Act.
Directional drill	Trenchless crossing method that utilizes a slant drill to install a pipeline under a watercourse.
Environmental monitor	May be qualified professionals or technologists who have an appropriate background relevant to the species, feature or value being addressed and a comprehensive working knowledge and understanding of the principles and requirements of Provincial and Federal regulatory compliance. The impacts of construction activities can be either continually monitored or periodically inspected, depending on the sensitivity of the site to disturbance and the nature of construction. The environmental monitor should be given authority by the permit holder to stop operations in the case of non-compliance with approved conditions, or where it is anticipated that unforeseen circumstances are likely to cause environmental problems.
Fen	Wetland that has organic soils and a water table at or above the surface. Soils are primarily moderately to well-decomposed sedge and non-sphagnum moss peats. Waters are mainly nutrient rich with a near neutral to slightly acid pH. The vegetation consists primarily of sedges, grasses, reeds, mosses, and some shrubs. Scattered trees may be present.

Fish stream identification tool	A risk management tool that has been developed based on existing fish and fish habitat information, which allows a limited number of Peace watersheds to be defaulted to either fish bearing or non-fish bearing. This tool was developed based on the early LAA works undertaken by Diversified Environmental Services.
Fish salvage	Capture of fish species present in an isolated worksite or dewatered area.
Grounding	With respect to waterbody crossing structures, a structure that depressing and making contact with the substrate layer while the structure is in use.
HADD	An undertaking that results in the harmful alteration, disruption or destruction of fish habitat, under Section 35 of the Fisheries Act.
High water mark	Point on a stream bank usually indicated by a clearly visible change in vegetation and sediment texture. This border is sometimes shown by the edges of rooted terrestrial vegetation. Above this border, the soils and terrestrial plants appear undisturbed by recent stream erosion. Below this border, the banks typically show signs of both scouring and sediment deposition.
Ice bridge	Stream crossing constructed on the frozen surface of a stream or waterbody, where snow is removed and water added to strengthen and reinforce the ice surface.
Important fish habitat	Habitat that is used by fish for feeding, growth, and migration, but is not deemed to be critical. This category of habitat usually contains a large amount of similar habitat that is readily available to the stock. Habitat indicators include: important migration corridors, the presence of suitable spawning habitat, and habitat with moderate rearing potential for fish species present.

Isolated crossing	Water crossing methods by which stream flow is diverted around a work site. These methods include: dam and flume, dam and pump, coffer dams and pump bypass.
Marginal fish habitat	<p>Habitat that has low productive capacity and contributes marginally to fish production. Habitat indicators include the absence of suitable spawning habitat, and habitat with low rearing potential (that is, locations with a distinct absence of deep pools, undercut banks, or stable debris, and with little or no suitably sized spawning gravels for the fish species present).</p> <p>Fisheries and Oceans Canada, Habitat Enhancement Branch, Interior North Office further defines marginal habitat as habitat that is:</p> <ul style="list-style-type: none">• Not available to fish due to natural permanent barriers, or• Available to fish, but is documented as supporting only very limited fish use, for purposes other than spawning, rearing or overwintering.
Marsh	Wetland that has mineral or sometimes well-decomposed peat soils. When peat soils are present they are often enriched with mineral materials. Waters are nutrient rich with near-neutral to basic pH. Surface water levels typically fluctuate seasonally, with declining levels exposing matted vegetation or mudflats. Emergent vegetation includes grasses, cattails, sedges, rushes, and reeds which cover more than 25 per cent of the wetland surface.
Material adverse effect	Information regarding “material adverse effect” can be found in the Forest and Range Practices Act CEPS Bulletin 40, December 2009 , “Guidance to CE Program staff and delegated decision makers on interpreting the words “material adverse effect” and “material adverse impact”, available on the Ministry of Forests, Lands and Natural Resource Operations Website.

Non-classified drainage (NCD)	Watercourses which do not satisfy the definition of reach provided below, and therefore, do not meet the criteria for the definition of stream in Section 1 of the EPMR are to be designated as non-classified drainages (NCD's).
Open bottom structure	Stream crossing structures that generally span the entire streambed, and minimize impacts to the natural stream channel.
Open cut	Water crossing methods (primarily for pipeline applications) by which an in-stream work site is exposed to stream flow.
Permanent crossing	A stream crossing that will be constructed and remain in place for longer than one year or over at least one spring freshet period.
Practicable	Capable of being effected, done or put into practice; feasible. This term refers to the fact that an applicant or permit holder has reviewed and considered the full range of options available in the context of social, economical and environmental implications. Where it is feasible to use one of the options in the range then the requirements apply; however, if a practicable option does not exist then the requirements may not apply. Where it is not practicable to meet the requirements of the EPMR , it is important for applicants and permit holders to document considerations, rationale, process followed, experts and information consulted to demonstrate due diligence.
Qualified Specialist	A qualified specialist is a member in good standing of a profession regulated in British Columbia and who is recognized by that profession as being qualified to work in an area of practice for which an opinion or advice is required. This person possesses an appropriate combination of formal education, knowledge, skills and experience to conduct a technically sound and rational assessment for the area of practice, and is familiar with applicable provincial regulation, policies, protocols and guidelines.
Reach	A relatively homogeneous section of a stream having a sequence of repeating structural

characteristics (or processes) and fish habitat types. The key physical factors used to determine reaches in the field are channel pattern, channel confinement, gradient, and streambed and bank materials. Stream reaches generally show uniformity in those characteristics and in discharge.

Replacement structures	Proposed stream crossing structures that occupy the same riparian management area and crossing location as the original stream crossing structure.
Shallow open water wetland	Wetland that is intermittently or permanently flooded with open expanses of standing or moving water up to 2 meters deep. Open water with no emergent vegetation covers 75 per cent or more of the wetland surface. These wetlands are commonly termed ponds or pools.
Spring freshet	The annual spring rise of streams in cold climates as a result of snowmelt; freshet also refers to a flood caused by rain or melting snow.
Snow blown ice bridge	Stream crossing constructed on the frozen surface of a waterbody where water has been added to strengthen and reinforce the ice surface, over top of which man-made snow is blown in or placed until an appropriate bank height is achieved. These crossing structures offer the structural integrity of ice bridges but do not require streambank cutting to construct the approaches.
Snowfill	Winter stream crossing constructed by depositing clean snow within the stream channel and compacting it.
Streambank	Most streams also have definable, visibly continuous banks. However, the banks of some smaller streams may be discontinuous. In these cases, the banks and channel bed of short segments of stream may not be visible due to the presence of bridging or overhanging vegetation, or the stream has scoured a channel underneath rooted mats of soil. In other cases, segments of the channel might be filled to the crest of the banks with colluvial deposits as a result of debris jams. However, in all cases, the channel should be detectable throughout the length of the stream being defined such that flow will also be continuous.

Stream channel width	The horizontal distance between the streambanks on opposite sides of the stream, measured at right angles to the general orientation of the banks. The point on each bank from which width is measured is the high water mark.
Swamp	Wetland that has mineral or occasionally peat soils with a water table at or near the surface. There is pronounced internal water movement from adjacent mineral areas, making the waters nutrient-rich. If peat is present, it is mainly well-decomposed wood and occasionally sedges. The vegetation is typically dominated by coniferous or deciduous trees or dense shrubs and herbaceous species.
Timing windows	Periods of time when oil and gas activities can be conducted with reduced risk to fish and wildlife, and fish and wildlife habitat. They are also referred to as “windows of least risk”, and define the period of time when activities may be permitted to occur. Timing windows are specific to fish and wildlife species and the geographic area within which the work is conducted.
Temporary crossing	A stream crossing that will be in place for no more than one year and will not be in place over a spring freshet period.
Trenchless crossing	Stream crossing methods that do not require an open trench in order to lay a pipeline. Examples include bore, directional drill, and others.
Windthrow risk	The risk that standing timber will succumb to damage from wind events.

Appendix B – Deviations and Mitigation

The Commission will consider deviation from the practices outlined in this document, if an application is accompanied by a rationale and, if appropriate, a mitigation strategy outlining how potential adverse impacts to the feature, species or value will be minimized.

Mitigation Strategy Requirements

Mitigation strategies must be completed by an individual or organization, hired by the applicant, with an appropriate background relevant to the species, feature or value being addressed by the mitigation strategy. All mitigation strategies submitted to the Commission must include the following six key components:

- 1) **Value** – identify the species, feature or value that may potentially be impacted by the proposed activity. Habitat values for specific species have been summarized in Appendix A. Please note that this list is a summary of critical habitat likely to be encountered in northeast B.C.; it is not exhaustive. For more detailed information for any species listed or habitat values specific to species not listed in this appendix, please refer to specific species accounts available from the Ministry of Environment [Identified Wildlife Management Strategy](#).

A mitigation strategy may include measures to address more than one species or value if multiple species or values must be addressed within the overall application. Include relevant information for each species and/or value identified.

- 2) **Rationale** – provide a rationale for operations that may impact this species or value. Include an explanation of why activities outside of the established Commission guidelines are unavoidable.
- 3) **Site Specific Information** – as it directly relates to the project. Include photos and any information that may help to justify the activity.
- 4) **Operational Modifications** – explain what strategies the applicant will use to reduce impacts or the risk of impacts to the species, feature or value identified. Include an explanation of how the modifications are expected to minimize impacts or reduce risk.

- 5) **Project Monitoring Plan** – outline how the effectiveness of the proposed operational modifications will be measured. How will the applicant know whether the imposed mitigation is successful?
- 6) **Other Relevant Information** – include any other information that may assist the decision maker in rendering a decision on the application.

If any of the above components is not applicable to the specific mitigation strategy, indicate so, and an explanation of why it is not applicable, within the strategy. If any of the above components are not appropriately addressed within the mitigation plan, it will not be approved by the Commission.