

Ecologically Suitable Species Guideline

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About the Regulator

The British Columbia Energy Regulator (Regulator) oversees the full life cycle of energy resource activities in B.C., from site planning to restoration. The Regulator ensures activities are undertaken in a manner that protects public safety and the environment, supports reconciliation with Indigenous peoples, conserves energy resources and fosters a sound economy and social well-being. We work collaboratively across government and industry sharing policy and technical expertise in support of B.C.'s transition to low-carbon energy and helping meet future global energy needs.



Vision, Mission and Values

Vision

A resilient energy future where B.C.'s energy resource activities are safe, environmentally leading and socially responsible.

Mission

We regulate the life cycle of energy resource activities in B.C., from site planning to restoration, ensuring activities are undertaken in a manner that:



Protects
public safety and the
environment



Supports reconciliation
with Indigenous peoples
and the transition to
low-carbon energy



Conserves
energy
resources



Fosters a sound
economy and social
well-being



Values

Respect is our commitment to listen, accept and value diverse perspectives.

Integrity is our commitment to the principles of fairness, trust and accountability.

Transparency is our commitment to be open and provide clear information on decisions, operations and actions.

Innovation is our commitment to learn, adapt, act and grow.

Responsiveness is our commitment to listening and timely and meaningful action.

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Purpose

This document is intended to outline expectations for meeting the intent of [Section 19](#) of the Environmental Protection Management Regulation (EPMR) as part of the Certificate of Restoration (COR) Part 2 application process. It provides the energy sector reclamation guidance related to planning, implementing, and performance reporting of soil and vegetation metrics for Crown forested land in northeast British Columbia (NEBC).

The Ecological Suitable Species Guideline (ESSG) is a guideline for reclamation practitioners to consider when evaluating reclamation options to apply within a specific restoration area, supporting site preparation and revegetation techniques that support a minimum threshold of established ecologically suitable species. The guideline clarifies the British Columbia Energy Regulator's (Regulator) minimum expectations around achieving short term reclamation objectives (e.g., performance metrics) intended to relate to longer term ecological restoration outcomes.

In summary, the objectives of the ESSG are to:

- Promote reclamation practices that support the establishment of ecologically suitable species and appropriate ecological trajectories being achieved.
- Develop clear, short-term (two+ years) reclamation objectives (performance metrics) that increase the likelihood of achieving longer-term (15+ years) ecological objectives.
- Provide clarity for assessing and reporting performance metrics for site closure to comply with the intent of EPMR 19 in the context of COR Part 2 applications on Crown forested land.
- Provide strategic level engagement avenues to support the integration of Indigenous Knowledge and continuous practice improvements into this guideline.

Introduction

The ESSG provides clarity for assessing and reporting performance metrics for site closure to comply with the intent of EPMR Section 19 in the context of COR Part 2 applications on Crown forested land. Ongoing considerations are to be given to the requirements of the [Oil and Gas Activities Act](#) and applicable regulations (Government of B.C. 2008; Government of B.C. 2010) throughout the reclamation planning and implementation process. It also supports the requirements of the [Site Remediation and Reclamation Manual - Version 1.6](#): June 2022 (BCER 2022).

The establishment of ecologically suitable species is a crucial element to promote desirable ecological processes and is an energy sector regulatory requirement on Crown forested land in B.C. Permit holders are reminded that reclamation of all oil and gas surface disturbance complies with the intent of Section 19, which is to restore the former operating areas through a series of activities. Site construction and soil salvage practices, operational phase (interim) reclamation, site reclamation preparation techniques, and revegetation techniques can all influence the successful establishment of ecologically suitable species.

The term *ecologically suitable species* is defined as those vegetation species which are ecologically relevant to the surrounding conditions and do not hinder the benefits of natural revegetation processes.

Successful reclamation of an oil and gas disturbance is considered the establishment of a suitably diverse plant community that can develop a self-sustaining successional trajectory that is ecologically appropriate to existing and future site conditions, surrounding ecological conditions and land uses. In the longer term, a successfully reclaimed site is expected to support a climax vegetation community (i.e., ecological restoration) consistent within the range of variability expected in each biogeoclimatic subzone.

This document provides Qualified Reclamation Specialists (QRS) and Qualified Reclamation Technicians [collectively referred to as Qualified Reclamation Practitioners] with reclamation guidance, including key considerations to support the establishment of ecologically suitable species, a self-sustaining successional trajectory, and promoting the restoration of wildlife habitat and use.

Reclamation typically includes bulk soil-focused activities such as decompaction, soil redistribution and initial activities to establish ecologically suitable vegetative species within a restoration area, occurring within a relatively short timescale. Applied cumulatively at large enough scales, simultaneous benefits can include an improved relationship with the land in the context of social and cultural values. Conversely, ecological restoration occurs over a much longer temporal timescale and can be evaluated at the much larger landscape scale involving the evaluation of metrics such as cultural continuity or wildlife use.

The performance metrics are intended to measure whether appropriate ecological trajectories are being achieved in the short-term which can subsequently support natural successional processes meeting longer term ecological objectives (15+ years). Given this time lag, it is important to acknowledge that short-term objectives will often be less complex or structurally diverse than the pre-disturbed conditions or longer-term restoration outcomes.

This document will be updated and improved over time as knowledge, research, and performance reporting progresses. The relationship between short-term reclamation objectives and longer-term ecological objectives will be tested through time from information collected from combined COR Part 2 reporting, on-going inspection and monitoring programs, supporting evidence-based adaptive management and continuous engagement opportunities. Having measurable and attainable objectives (i.e., performance metrics) to consistently quantify reclamation performance along with repeatable and consistent assessment and reporting requirements are paramount.

Additional Guidance

As with all Regulator documents, this manual does not take the place of applicable legislation. Readers are encouraged to become familiar with the acts and regulations and seek direction from Regulator staff for clarification.

The Regulator publishes both application and operations manuals and guides. The application manual provides guidance to applicants in preparing and applying for permits and the regulatory requirements in the planning and application stages. The operation manual details the reporting, compliance and regulatory obligations of the

permit holder. Regulator manuals focus on requirements and processes associated with the Regulator's legislative authorities. Some activities may require additional requirements and approvals from other regulators or create obligations under other statutes. It is the applicant and permit holder's responsibility to know and uphold all legal obligations and responsibilities. For example, Federal Fisheries Act, Transportation Act, Highway Act, Workers Compensation Act and Wildlife Act.

Throughout the manual there are references to guides, forms, tables and definitions to assist in creating and submitting all required information. Additional resources include:

- [Glossary and acronym listing](#) on the Regulator website.
- [Documentation and guidelines](#) on the Regulator website.
- [Frequently asked questions](#) on the Regulator website.
- [Advisories, bulletins, reports and directives](#) on the Regulator website.
- [Regulations and Acts](#) listed on the Regulator website.

In addition, this manual references some application types and forms to be submitted outside of the Application Management System but made available on the Regulator's website. Application types and forms include:

- Heritage Conservation Act, Section 12
- Road use permits
- Water licences
- Master licence to cut
- Certificate of restoration
- Waste discharge permit
- Experimental scheme application
- Permit extension application

Manual Revisions

The Regulator is committed to the continuous improvement of its documentation. Revisions to the documentation are highlighted in this section and are posted to the [Energy Professionals](#) section of the Regulator's website. Stakeholders are invited to provide input or feedback on Regulator documentation to Systems@bc-er.ca or submit feedback using the [feedback form](#).

Version Number	Posted Date	Effective Date	Chapter Section	Summary of Revision(s)
1.0	May 11, 2023	May 12, 2023	Various	<p>This is a new document.</p> <p>Users are encouraged to review this document in full and refer to Technical Update 2023-05 on the BC Energy Regulators website.</p>
1.0	Mar.12, 2024	Mar.12, 2024	Ch.7	New definition for Crown Forested Land; republished

Chapter 1: Treaty 8 And the Role of Indigenous Knowledge

Treaty 8 Context

It is acknowledged that history not only plays a significant role in enhancing technical knowledge through research but can help to define the social and cultural values of restoration outcomes during a time of rapidly changing cultural and ecological conditions resulting from climate change and other global pressures (E. Higgs et al. 2014).

Aligning ecological restoration objectives with cultural interests and promoting the conservation and protection of treaty rights is a crucial premise of this guideline, aimed at supporting on-going reconciliation and the implementation of the [Action Plan](#) under development as part of the [Declaration Act](#). When these complementary restoration objectives are applied at large spatial scales, cumulative landscape-level benefits may be realized with respect to wildlife populations, habitat connectivity, and cultural continuity in the context of the exercise of treaty rights by Indigenous communities.

Indigenous Nations have been caring for the land since time immemorial and will continue the relationship with the land into the future. The Regulator has partnered with Treaty 8 Nations through the Collaborative Restoration Advisory Committee (T8RAC) to incorporate cultural interests and perspectives throughout this guideline. The Committee has defined the overall objective of oil and gas restoration as:

“Landscape restoration that meets levels of ecological health necessary to support and sustain the restoration of treaty rights, including the ability to carry out Indigenous ways of life in the territories traditionally relied upon, as well as ensuring that restored ecological health is protected for our future generations to ensure cultural continuity” (contributed by BRFN, supported by the T8RAC).

Indigenous Knowledge

Indigenous Knowledge (IK) is a unique way of knowing, held by Indigenous Knowledge holders, which includes information around community practices, language, teachings, laws, and relationships between the natural environment and people. The knowledge of Indigenous Peoples may take many forms and dimensions (Natcher et al., 2005). Often, the knowledge held by Indigenous Nations is broad, holistic, place-based, relational, intergenerational, and can be embodied through tangible or less tangible forms. Indigenous Knowledge is not limited to traditional ecological knowledge (Berkes, 1999; Castleden, Garvin, and Huu-ay-aht First Nation, 2009; Lertzman, 1999; Turner, Ignace, and Innace, 2000), and may be embedded in a governance context including information around community practices, language, teachings, laws, relationships, and rituals. Each Indigenous Nation will define Indigenous Knowledge for themselves and how it is to be applied when working with external groups, such as industrial proponents and government agencies.

Indigenous Knowledge may be specific, direct observations and experiences about the biophysical world, as do scientific data. The concept of Etuaptmumk, Two-Eyed Seeing, “refers to learning to see from one eye with the strengths of Indigenous Knowledges and ways of knowing, and from the other eye with the strengths of Western knowledges and ways of knowing and learning to use both these eyes together, for the benefit of all” (Bartlett, Marshall, & Marshall, 2012). Similar to the concept of two-eye seeing, the UN’s Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) has established the “Multiple Evidence Based Approaches (MEB) framework, which “braids Indigenous and scientific knowledge systems together to support and enhance decision-making and ultimately the resilience of interlinked social and ecological systems” (Raygorodetsky, Gleb, 2017). The process of braiding knowledge systems together will create opportunities to develop a deeper understanding of observed events and their outcomes, whether in the context of restoration or otherwise.

Federal, provincial, and territorial governments have recognized, and legislated, the importance of integrating Indigenous Knowledge into planning, decision and policy-making processes in the pursuit of effective natural resource management, reconciliation with Indigenous peoples, and meeting the commitments of the United Nations Declaration on the Rights of Indigenous Peoples (IK, cultural practice, participation, learning and language are linked to 13 of United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) articles: 3, 5, 8, 11, 12-1, 14-1, 15-1, 18, 19, 27, 31, 32, 34), the Declaration on the Rights of Indigenous Peoples Act and the Regulator’s Strategic Plan in our Areas of Focus and Operating Principles.

Protecting Indigenous Knowledge

Indigenous Knowledge should be protected and only used with appropriate permission and according to the governance, laws, policies, and practices of the Indigenous Nation.

Many Indigenous Nations in B.C. maintain in-house datasets or records of Indigenous Knowledge or have knowledge holders who hold knowledge regarding a particular subject or area. Permit holders and/or Qualified Reclamation Practitioners and Indigenous Nations should discuss how to best handle and maintain the confidentiality of Indigenous Knowledge during engagement (see pre-engagement section).

Information sharing agreements between the proponent and Indigenous Nation may be required, and proponents should use existing community protocols with respect to Indigenous Knowledge. The [First Nations Information Governance Centre through the First Nations Principles of ownership, control, access, and permission](#) (OCAP) provides guidance on how to protect Indigenous Knowledge.

In British Columbia, the [Freedom of Information and Protection of Privacy Act](#) (FOIPPA) provides discretionary protection from disclosure in freedom of information requests for several reasons, including if public disclosure of the information could reasonably be expected to:

- Harm the conduct by the Province of relations between the Province and Indigenous governments (FOIPPA Section 16). This protection is valid for 15 years from the time of disclosure;

- Result in damage to or interfere with the conservation of:
 - Natural sites or sites that have an anthropological or heritage value;
 - An endangered, threatened, or vulnerable species or subspecies; or
 - Any other rare or endangered living resource (FOIPPA, Section 18).

Chapter 2: Scope

The scope of the Ecological Suitable Species Guideline is applicable to all operating areas where oil and gas activities (including ancillary sites) have been permitted (for example: wellsite, facility site, decking site, access road, remote sump, etc.) on forested Crown land. Reclamation criteria and objectives related to other sectors and land cover types are outside the scope of this document.

The Delegation Agreement between the Provincial Agricultural Land Commission and the Regulator remains in place for oil and gas sites located on lands within the ALR. Permit holders are reminded that Schedule B requirements remain in effect for these sites and are in place to “ensure that the soil, topography, and vegetation of surface leases are restored to an equivalent condition and capability.” When the Delegation Agreement and ESSG are applied together in these situations, there is sufficient information provided between the two documents for appropriate revegetation planning.

This guideline is anchored to results-based targets and leverages professional reliance through the expertise of Qualified Reclamation Specialists and Technicians. Establishing landscape scale restoration objectives are complemented by this guideline but fall outside the scope of this document.

Engagement Expectations

One of the Regulator’s roles is to provide for ongoing engagement opportunities at the strategic level (e.g., guideline, policy, regulation). It is the responsibility of the Regulator to ensure strategic level outcomes are being collaboratively investigated, communicated, and engaged upon with industry and Indigenous communities on an ongoing basis; there are multiple engagement avenues for the Regulator, industry proponents and Indigenous Nations to collaborate on restoration practices and outcomes, within the context of the ESSG and for initiatives otherwise focused.

This guideline is premised on ongoing strategic level engagement with all parties (Treaty 8 Indigenous Nations, Industry, Practitioners, other government agencies) in its development, implementation, and commitment to continuous improvement to address the complementary environmental co-benefits of improving ecological function and cultural practices.

At the site level, the ESSG provides for ongoing engagement opportunities with consideration of the relationship between performance metrics (e.g., desired outcomes) and longer-term ecological restoration outcomes.

The revised CoR Part 2 application form will require a permit holder to provide the following information:

- Whether local Indigenous Knowledge was invited during site level reclamation planning; and if provided, how it was incorporated into the project; and

- Detailed records for each affected Indigenous Nation engaged, outlining any objections or concerns raised during reclamation focused discussions and whether local Indigenous Knowledge was kept confidential from the permit holder, or not shared.

Detailed records of discussions are best tracked in an Engagement Record for each Indigenous Nation.

The Dormancy and Shutdown Regulation (DSR) requires notification of work pertaining to Annual Work Plans to be provided to interested parties and allows for interested parties to respond to that notification to request further information or a meeting to discuss topics and concerns. The permit holder is obligated to consider any written or discussed topics and concerns. The scope of an Annual Work Plan is very succinct, outlining the number and status of dormant sites and the planned stage of site closure work to be completed (abandon, decommission, assess, remediate, restore).

In comparison, the ESSG is focused on the quality of the restoration stage of site closure, which is tested for compliance through performance metrics, rather than the required number of sites entering a particular stage which the DSR measures as compliance. Both aspects for the quality and quantity of site closure are complementary, with compliance to the DSR and this guideline being independently assessed given the time required between restoration activity being completed (e.g., DSR compliance) and the COR Part 2 performance metrics being achieved (e.g., EPMR 19 compliance).

The Regulator, in partnership with the representatives of the T8RAC expects proponents to discuss restoration objectives with Treaty 8 Indigenous Nations through meaningful engagement in discussions associated with the DSR, ESSG, and any restoration related activities.

Note: the processes and interests of Nations may vary, as such it is imperative to take a distinctions-based approach, which means collaboration is conducted in a manner that acknowledges the specific rights, interests, priorities, and concerns of each Nation, while respecting and acknowledging their unique cultures, histories, rights and laws. Overall, through dialogue and partnership, oil and gas restoration can have a positive impact on the well-being of Indigenous Nations.

Examples of Indigenous Involvement and Participation

Indigenous engagement and participation are encouraged when planning and carrying out restoration projects. Early engagement is a way in which Indigenous knowledge can be incorporated into restoration projects to avoid/minimize impacts, effect desired future conditions, and more. The degree of a Nation's participation may vary depending on their unique interests and preferences. It is important to have these conversations early with the Indigenous Nation to gain an understanding of what their community's participation might look like.

The following is a list of examples (non-exhaustive) of what might be requested from a Nation you are engaging with. These are a means for learning more about Indigenous interests, increasing trust, supporting increased capacity, and enhancing the overall relationship with the Nation:

- Planning conversation(s) to set goals, objectives what the Nation's preferences are for restoration.
- Joint site visits for the purpose of planning.
- Host community open house to include knowledge holders that may not be at planning meeting. This might include topics such as restoration timelines, desired future conditions, etc.
- Family group meeting(s).
- Create opportunities for member training via mentoring and working in concert with contractors on sites as requested by the Nation.
- Develop site-specific restoration plans using feedback from the Nation in collaboration with Lands staff.
- Include Indigenous Monitors for work on site.
- Implement short and long-term monitoring program with Lands staff and the Nation's members.
- Willingness to alter plans.

Historically Reclaimed Sites

Operators should be aware the Regulator views historically reclaimed sites as those restoration area(s) reclaimed prior to 2024, and where surface compaction is not limiting, all retrievable soils have been redistributed, onsite surface drainage conditions are comparable to the surrounding patterns, ecologically suitable vegetation has been established across the site, and slopes are stabilized. Historically reclaimed sites are not expected to meet the performance metrics outlined in this document. For more information about reclamation requirements, refer to section the [Site Remediation and Reclamation Manual](#).

Consideration of sites where operational reclamation was completed in the interim of end-of-life site closure reclamation, typically utilizing an agronomic forestry seed mix to provide soil cover is described further under the section Operational Phase Reclamation Practices (below).

Implementation Periods

Sites where all restoration obligations were completed during the 2023 calendar year are deemed *transitory sites*. *Transitory sites* will not be evaluated against the performance criteria outlined in this guideline when included as part of the COR Part 2 application, but supporting documentation is expected to be maintained by the operator for audit purposes in support of this transition to the new performance criteria. Operators are expected to maintain documentation outlining any site-specific preparation and revegetation techniques used to establish ecologically suitable species where applicable.

For those sites where restoration obligations were completed in 2024, the performance metrics outlined in this guideline are expected to be achieved and reported on in an application for a Certificate of Restoration Part 2. Assessments supporting the application for a COR Part 2 are expected to be completed after at least two (2) full growing seasons. Therefore, performance assessment against the performance metrics included in the ESSG will begin in the 2026 assessment season as part of the COR Part 2 Application process.

Where sites are planted with seedlings, assessments are to be completed after three full growing seasons are complete to ensure seedling success are not masked by nutrients persisting in the seedling plug. In the event where a site is vegetated but there remains other outstanding reclamation work to be completed, operators should discuss these site-specific situations with the appropriate Regulator personnel before proceeding.

Table 1, below, illustrates the parameters to which reclaimed sites will be evaluated against according to their reclamation date and the required associated deliverables.

Table 1: Required Documentation for COR Part 2 Application

Reclamation Year	ESSG Applicable	Documentation required for Certificate of Restoration Part 2 Application ¹			
		Engagement Record	Pre-reclamation Assessment	Performance Assessment	Spatial Data Reporting
Prior to January 1, 2023	No	No	No	Yes ²	No
January 1- December 31, 2023	Yes	Complete and keep in permit holder file	Complete and keep in permit holder file	Complete and keep in permit holder file	Complete and keep in permit holder file
January 1, 2024 and beyond	Yes	Yes	Yes - keep in permit holder file	Yes	Yes

Note:

1- This table does not cover any information and/or documentation required by the Delegation Agreement.

2 – An assessment of restored areas is currently required for a Certificate of Restoration Part 2, but not to the specifications of the ESSG.

Chapter 3: Key Reclamation Considerations

Reclamation Planning

Depending on an operator's risk tolerance of site failure to achieve a COR Part 2 approval and site closure, combined with the regional knowledge and expertise held by a Practitioner, a site-specific pre-reclamation assessment may be justified. A site-specific pre-reclamation assessment can provide information to identify existing site conditions, historical and cultural land use, site risks and limitations for successful closure. Knowledge of existing conditions, surrounding conditions, and the risks and limitations of a restoration area are required by a Practitioner to develop suitable approaches for site preparation and species selection. As regional knowledge and expertise in oil and gas reclamation continues to mature, it is expected area-based reclamation practices are fostered that achieve the performance metrics for a successful COR Part 2 application.

When conducted, pre-reclamation assessments are completed during snow-free conditions, during the active growing season, and assumes subsurface risks have been previously identified and remediated to the satisfaction of the Regulator (CoR Part 1; BCER 2022).

Site Preparation

Site preparation is a critical aspect of reclamation to promote enhanced revegetation (Macadam & Bedford 1998; Roy et al. 1999; Osko & Glasgow 2010). Site preparation increases the integration of a restoration area with the surrounding landscape, adds microsite and mesosite diversity that increases biodiversity and vegetation survival, and can provide a more effective growth medium to encourage revegetation success. A microsite is a portion of a site that is uniform in microtopography and surface soil characteristics. Microsites can range in size from 1-5 m² and can change suddenly. Mesosites can be defined by site and soil differences between ecosystems belonging to the same site series. They can occur at scales of 100-5,000 m² and have a bearing on establishment and regeneration success (B.C. Ministry of Forests 2000).

Structural and compositional diversity needs to be introduced into restoration areas to encourage the emergence of ecological function and processes. Habitat value is optimized by building landforms and re-establishing vegetation to provide movement corridors, refugia, forage, and breeding opportunities within and between restoration areas. Structural and compositional diversity provides a restoration area the ability to respond to seasonal and annual climatic variations, such as a lack or abundance of precipitation or extreme temperatures.

Surface roughing is a preferred decompaction technique that supports structural and compositional diversity. Surface roughing, through discing or rip plowing, will create microsites to enhance seed capture, germination, and growth, can improve the survival and growth of new seedlings, and can be useful on steep slopes prone to erosion (Polster, 2013). Surface roughing coupled with the application of coarse woody material (CWM) enhances structural and

compositional diversity, improving the probability of successful habitat restoration by introducing mycorrhizae and encouraging nutrient cycling in the long term. CWM plays an important role in improving forest productivity in terms of soil function and tree growth, and ecosystem productivity in terms of habitat. (Macadam and Bedford 1998, Roy et al. 1999, BC Forest Service 1998).

These techniques can also control continued access and associated risks related to on-going disturbance (e.g., soil compaction) that can hinder both natural and assisted regeneration. Where linear disturbances (e.g., legacy geophysical lines) intersect with polygonal disturbances (e.g., well sites) undergoing reclamation and restoration, considerations to impeded access to these linear disturbances may be required to dissuade off road vehicle staging and/or crossings of the site. Ultimately, this may benefit several interconnected linear disturbances through the reduction or elimination of persistent off-road vehicle access that hinders natural regeneration. Over time, these supplementary benefits may help to address alterations in predator-prey dynamics resulting from increased predator efficiency along linear corridors and/or because of apparent competition (Mumma et. al. 2018).

The [Center for Boreal Research](#) has been advancing boreal reclamation and peatland reforestation through applied research. The Center has several technical notes, publications, and field guides available showcasing reclamation techniques and procedures along with peer-reviewed papers specific to boreal forest reclamation.

Establishing Ecologically Appropriate Species

Ecological Basis for Species Selection

An ecological approach to species selection has been adopted in this guideline, founded on the regional field guides of the [Biogeoclimatic Ecosystem Classification Program](#) developed in British Columbia to describe and interpret ecosystems at various scales. This program recognizes that species have adapted to a specific range of environmental conditions, and their growth and behaviour depend on the ecosystem and biogeoclimatic conditions in which it grows. In an unfavourable environment, species growth potential is often restricted and its susceptibility to damaging agents will increase.

Using the biogeoclimatic framework as reference, we can begin to understand which plant species may be favorable given a particular range of moisture and nutrient regimes. This relationship can be described using edatopic grids that relate a range of moisture and nutrient regimes that a species may be found within specific biogeoclimatic subzones. The Land Management Handbooks (e.g., LMH 46 - DeLong et al. 1999) are important references for ecosystem identification in the Boreal White and Black Spruce subzone.

In determining ecologically appropriate species, a Practitioner is to consider the ecological site conditions and risks that are anticipated to persist on a restoration area once site preparation is completed. Important considerations include:

- Site limitations posing risks to vegetation establishment
- Site preparation techniques to mitigate site risks

- Soil moisture and nutrient regimes
- Ecological characteristics of pioneer and early seral species suited to the site
- Surrounding landscape and wildlife habitat
- Traditional knowledge
- Desired land use in the context of EPMR section 19
- Potential for natural regeneration and the role of reclamation intervention
- Short to medium term risks and hazards, such as erosion, noxious, problematic, or invasive species
- Longer term climate change influences
- Species competition and the combination of complementary species on the site
- Maintenance of biological diversity

Subzones and variants with similar biogeoclimatic conditions can provide for an ecological reference for selecting species. Reference sites directly adjacent to the restoration area may have been influenced by edge effects or other disturbances in the area. Care is needed when confirming the subzone and variants expected on the restoration area(s) as a basis for early phase ecologically appropriate species selection.

When selecting species, the Practitioner should identify locally common trees, shrubs, forbs, and grasses. Grasses often serve short-term functions, such as outcompeting invasive plants or establishing a cover to mitigate erosion risk. Certain grass species can pose a long-term risk to restoration efforts if they take over a site and limit the growth and natural ingress of naturally occurring trees, shrubs, and forbs (Gómez-Aparicio 2009). If grass seed is used to achieve a short-term function, they should be used strategically and with a plan for control and/or replacement over time.

A Practitioner should account for limiting factors to vegetation establishment, such as disturbance type, site stability and erosion risk, invasive species potential, the reference subzone, and the associated exiting vegetation present. Predicting the range of biogeoclimatic conditions expected on the restoration area(s) once site preparations are complete is important, as the conditions (e.g., nutrient and moisture regimes) resulting from site preparation activities may not be equivalent to adjacent areas. The basis for selecting ecologically appropriate species is to be described and reported as part of the COR Part 2 application.

Species Compatibility

When designing a seed mix, species compatibility is an important consideration. Factors affecting species compatibility include:

- The rate and level of natural ingress of all species on the specific site
- The relative growth rates of all species on the specific site
- The relative protection requirements and shade tolerance of the species

- The spatial requirements and branching habit of the crowns for the species
- The nutritional effects of the species or combination of species on the soil and each other
- The pathological and biological (morphological) seral stage of each species

For example, planting and promoting pioneer woody species can help initiate early successional processes by providing micro-climatic conditions for later seral species, improving soil process and function, and helping control soil erosion (Polster 2011, 2017; Walker and del Moral 2003). A Practitioner's careful consideration of how a restoration area may progress through succession is important and should be ecologically based in the context of the site's relationship to surrounding BEC subzone conditions.

Creating Vegetation Refugia

Vegetation refugia, at the site level and in the context of oil and gas focused reclamation initiatives, are intentionally placed, spatially localized clusters of densely revegetated islands of varying vegetation types or features that can support enhanced microsite establishment, or are wildlife habitat and areas of refuge, and can build resilience for a site to shifting climate conditions.

As a reclamation practice, the Regulator does not require vegetation refugia to be established, however, during the development of a reclamation plan, a QRS should consider how the presence of refugia can influence both short-term and long-term reclamation success and overall restoration objectives as the presence of vegetative refugia is viewed as an indicator of natural ecosystem processes returning to the site. This consideration may be of value where soil salvage was inadequate and subsequent soil redistribution across a restoration area would not establish an effective seed bed.

Noxious Weeds and Invasive Plants

A QRS should consider historical site-specific factors and influences of the reference site and the restoration area when managing for noxious plants and invasive weeds that may be observed.

Noxious weeds and invasive plants are to be managed according to existing provincial legislation and/or regional district guidance, as applicable and where required. For management purposes, the Regulator supports the use of the provincial reporting [Invasive Alien Plant Program](#) (IAPP) database and requires documentation regarding noxious and invasive plant type, prevalence, coverage, and management to form part of the COR Part 2 application. Further guidance for managing invasive plants, including a list of invasive plants, can be found in this [Best Practices](#) document.

In those situations where herbicides were not used during the post-reclamation and/or monitoring timeframe, there may be instances where coverage of weeds (or problematic species, below) are established beyond the allowances of the performance metric is evident. During a performance assessment, the QRS will apply their professional judgment regarding whether the performance metric for problematic species will be achieved over the longer term.

Problematic Species

In the context of the ESSG, problematic species are considered those that hinder natural regeneration processes. In NEBC, these species are often agronomic, sod-forming grasses, or other undesirable vegetation that will outcompete early seral pioneer forbs and shrubs that provide the conditions necessary to promote a successional trajectory relevant to the adjacent vegetation communities that have been naturally adapted to the surrounding biogeoclimatic conditions. Many of these problematic species may have been established during the operational phases of reclamation.

The use of competitive and persistent, agronomic perennial forage species for reclamation on forested Crown land is not acceptable practice. Perennial forage species have been purposefully bred and cultivated to enhance forage production and to invade and persist in native plant communities. Problematic forage species such as crested wheatgrass, sweet-clover, timothy, smooth brome, creeping red fescue, and reed canary grass (among others) can reduce plant community diversity and hinder natural revegetation processes.

Exceptions may include:

- Temporary use of annual cover species (such as fall rye and winter wheat) to assist with soil stabilization and reduce erosion potential in the short term.
- Restoration areas on or immediately adjacent to land that is cultivated for agricultural purposes.
- Restoration areas located within range developments that are improved pasture, cultivated, seeded, or otherwise improved for forage production and the revegetation species are consistent with those improvements.
- Extenuating conditions preventing the successful replacement of topsoil or the establishment of ecologically suitable species. (The BCER encourages the permit holder to discuss site specific situations with the appropriate BCER staff during the development of a reclamation plan).

Operational Phase Reclamation Practices

Operational phase restoration (and reclamation) clauses are found in many activities specific to oil and gas regulations in B.C. (e.g., [Drilling and Production Regulation s28](#); [Pipeline Regulation s5](#); [Oil and Gas Road Regulation s11.1, etc.](#)). The need for operational phase reclamation is to ensure soil function is restored as soon as possible after initial disturbance. Historically, a forestry seed mix has been used for operational phase reclamation, thereby creating an established seed bank of agronomic species in the soil. The Regulator reminds permit holders of this [Information Bulletin](#) which clarifies the planned use of agronomic seeds mixes as a long-term solution is no longer acceptable. Where an agronomic seed mixture was used during operational phase reclamation, an interim period of agronomic presence during site closure is expected as a result, but the longevity and persistence of them are expected to be addressed, as is reflected in the performance metrics for problematic species.

Existing Reclamation Plans

Whereas existing reclamation plans exist, as in some situations where they were submitted as part of a project application, the permit holder will ensure the reclamation plan, which is applied at the time of reclamation, within a specified restoration area, meets the current regulatory requirements and expectations of the ESSG for reclamation.

Completing Land Use Reclamation Objectives

Where there appears to be competing land use objectives as it relates to reclamation (example: Section 17 Map Reserves, Range Use Tenures, Muskwa-Kechika boundaries, etc.), the Regulator encourages the permit holder to discuss site-specific situations with the appropriate Regulator staff during the development of a reclamation plan.

Additional Considerations

Available for download at the link below is a non-exhaustive example list of species as they relate to biogeoclimatic zones, subzones, and site conditions. The relationship between site moisture and nutrient regimes and site series needs to be considered when choosing species on a site-by-site basis.

Example list: [App A Species List](#).

Additional references for species selection include [Land Management Handbook \(LMH\) 46](#) (B.C. Ministry of Forests Research Program, 1999), which provides the ecological distribution of forest-dwelling plants in northern B.C. based on the biogeoclimatic framework. While field information supporting the LMH 46 was primarily collected from mature and old forests, species distribution in pioneer and young seral forests is presented, providing a unique reference for a Practitioner to select ecologically appropriate species for a restoration area(s).

As well, the Oil Sands Research and Information Network has developed *Revegetation Species Profiles* and can be found online here: [Revegetation Species Profiles | ERA \(ualberta.ca\)](#) (Smreciu et al. 2013).

Permitting

Adjacent, Offsite Materials Collection

Operators are required to either amend their existing permit or apply for a stand-alone OGAA permit authorization through AMS as it relates to their Land Act tenure where additional lands are required to use mechanized equipment to collect (dig) small vegetation mounds of soil and vegetation, collect offsite coarse woody debris, etc. to support re-

vegetation efforts. For example, a 10-to-15-metre perimeter expansion around a restoration area's boundary would follow this process. Amendments to existing permits, or new authorization requests, are to be submitted via the regular permitting process in [AMS](#).

Hand gathering, or wildcrafting, of reclamation material on Crown land does not require an amendment to existing site tenure, while mechanical collection often does depend on disturbance anticipated. Where site-specific questions arise in the context of utilizing this method, please contact the Regulator to discuss.

Changes In and About a Stream

An operator will need to remain cognizant whether the reclamation plan for a site triggers the requirement to acquire an authorization for changes in about a stream as defined under the [Water Sustainability Act](#). These authorizations are also completed through AMS with application support contained within the [AMS application manual](#).

Other Approvals or Notifications

The guidance offered in the ESSG does not replace any other approvals, permits, notifications, or authorizations (example: Special Use Permits, DFO notifications, etc.) that may be required by other regulatory agencies to facilitate reclamation works.

It remains the permit holder's responsibility to ensure all regulatory requirements have been addressed prior to starting reclamation within restoration areas.

Chapter 4: Performance Assessment and Reporting

The following section outlines the information informing and minimum reporting requirements the Regulator requires from a permit holder to satisfy a COR Part 2 Application.

Restoration Areas

A restoration area is defined as an area of disturbance that may include one disturbance type (e.g., a wellsite) or a combination of disturbance types where reclamation activities are targeted. A restoration area may be limited to a wellsite and its associated access road or may be more complex and include ancillary features such as decking sites, a remote sump, borrow pits, trailer sites, campsites, flare blackened areas, etc.

It is important to note restoration areas may not be commensurate with those areas depicted on a survey plan but may also include areas which have been historically connected to the site either through review of a well file, construction records and/or field visit, or the COR Part 1 application. This may frequently be the case on older survey plans where well locations are depicted using a single point or where ancillary sites are noted on a survey plan in table format (not spatially shown) but are reasonably obvious as connected to a wellsite when completing field-based scouts or assessments. Typically, an operator will refer to the Certificate of Restoration Part 1 application to ensure the parts of a restoration area are identified and addressed into this process.

In the case of common remote sumps, operators should ensure a common remote sump forms a (or part of a) restoration area if the common remote sump was included with the original well authorization.

Defining the restoration area is an important aspect of building a detailed restoration ledger for oil and gas activities which has been an important, yet absent, aspect of understanding landscape level disturbance to date. Spatially based, this ledger will inform future cumulative effects assessments when combined with disturbance data for the province. Documenting where, when, and how restoration efforts on various oil and gas activity types have performed through time not only provide the basis for a restoration ledger, but directly supports evidence-based adaptive management of this guideline.

Restoration areas will be spatially collected and reported by the reclamation practitioner as part of the application for Certificate of Restoration Part 2. A shapefile is to be submitted to delineate all corners and boundaries of the restoration area(s). If existing spatial data that accurately represents the restoration area is not available, the practitioner will still be required to create a shapefile through imagery review using desktop software, or in the field with a handheld GPS. This data will be required as part of the COR Part 2 application. Additional guidance on the process for gathering this information will be shared in future updates of the guidance.

Performance Metrics

The criteria and indicators chosen for reporting and determining success are adapted from various guidelines and technical documents. Criteria, also known as performance metrics, were chosen that are appropriate for the ecological conditions and disturbance types in northeast B.C. The list of applicable criteria and indicators may be adapted as guidelines change, regulatory guideline documents are updated, new information is gathered, and experience is gained.

Performance metrics are to be collected after all species have leafed out (May through October), and after the restoration area has experienced at least two (2) or three (3 – where seedlings are planted) full growing seasons. For example, if the reclamation activity was completed in spring of 2024, the performance assessment should take place no earlier than the summer of 2026, depending on species used for re-vegetation.

The following performance metric categories are expected to be reported on as part of the COR Part 2 application. Further details about the level of detail required for each heading for reporting and confirmation of achieved targets are included in Appendix A.

- Site Description
- Landscape Form and Function
- Soil
- Vegetation
- Wildlife

Assessment Grids and Plots

Sampling intensity may require adjustment for restoration area(s) inside or outside of the ALR, different sized and shaped lease areas, and on sites where higher than average variability is anticipated or observed, more assessment plots (i.e., a smaller assessment grid) may be required. Assessment plots are then to be established for each grid on a site. Professional judgement by the Practitioner, based on site variability, may dictate smaller (more variability) or larger (less variability) assessment grids being required.

For sites located outside of the ALR, to ensure that small anomalous conditions are not inadvertently weighted when assessing and describing a restoration area, a square assessment grid is to be delineated evenly across a polygonal restoration area, with each grid having an equal area of no more than 30m x 30m (900 m²). For example, on a 120m x 120m well site this equates to at least sixteen (16) assessment grids being established evenly across the site (Figure 1). On a 90m x 100m well site, the assessment grids may be slightly adjusted to 25m x 30m, resulting in a total of twelve (12) assessment grids onsite. For areas where there was no soil disturbance (existing seismic lines frozen in as access roads) or small areas with prior soil disturbance such as 30m x 40m sized remote sumps or

ancillary areas which were scrubbed of vegetation but where no soil disturbance occurred (i.e., such as temporary workspaces or some decking sites), should have a minimum of three (3) grids with at least one (1) reference site.

For sites located within the ALR, requirements for a Schedule B Assessment remain in place.

Depending on the feature being assessed and variability observed, more or less plots may be considered necessary at the discretion of the QRS based on feature size and/or number of land cover types affected. The number of assessment grids established should ensure adequate data is collected to accurately illustrate performance variability across the restoration area for a COR Part 2 application.

The number of offsite control plots is to be at least 20 per cent of the number of onsite grids, with no less than one (1) reference plot corresponding to each boundary on polygonal disturbances greater than 1 ha in size. For example, a wellsite will have at least four (4) control plots and a 30m x 40m sized decking site would typically have two (2), control plots.

Within each grid, the standard hybrid assessment plot is a circular plot of a 1.78 metre radius (10 m²) for all non-woody vegetation metrics, and then stepped out to a circular plot of a 3.99 metre radius (50 m²) to assess woody vegetation metrics. Assessment plots are to be located within each grid, with the plot placed to be as representative as possible of the entire grid area, not necessarily in the center of the grid. For linear features, assessment plots are to be established no greater than 100m apart and be placed to capture landscape feature variability observed along the length of the feature (Figure 2). On access roads longer than 2 kilometers in length and where there was soil disturbance, pre-approval from the appropriate Regulator staff of an alternate assessment point plan prepared by a QRS can be requested.

Figure 1: Assessment Grids and Plots – polygonal feature

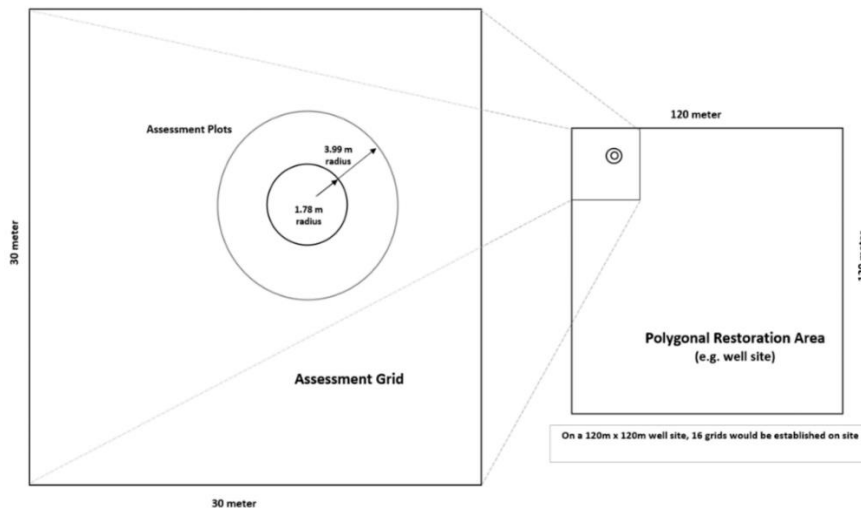
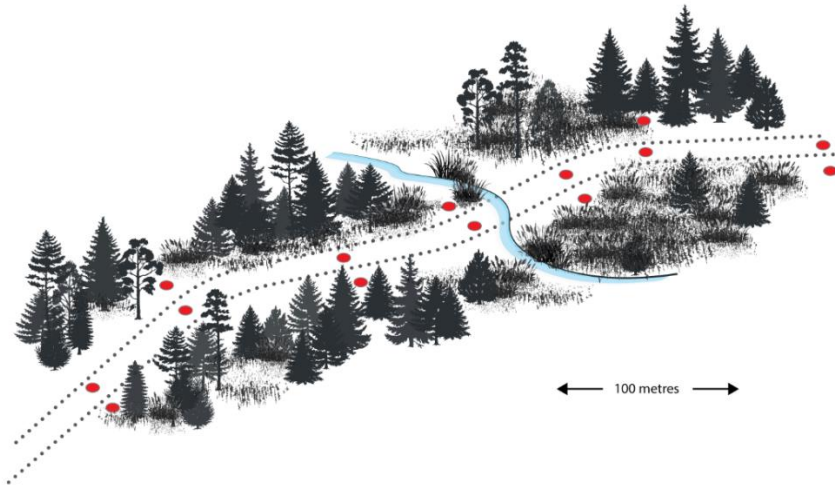


Figure 2: Assessment Grids and Plots – linear features



Polygonal and linear-specific grid spacing, and sizing distribution requirements are further explained below:

Table 1: Assessment Grid Requirements for Performance Assessments outside the ALR

Spatial feature type:	Examples of:	Assessment grid size:	Minimum # assessment plots per feature:	Minimum # of control plots:	Assessment plot size – woody species performance metrics:	Assessment plot size – non-woody species performance metrics:
Polygonal features	Well site, remote sump, decking site	30 metres (m) x 30m	3	<ul style="list-style-type: none"> - 20% of the total of onsite assessment grids - Minimum of 1 per boundary of a feature exceeding 1 hectare in size 	3.99m radius (50 m ²)	1.78m radius (10 m ²)
Linear features	On access roads or linear workspaces where soil	Establish an assessment plot at least every 100 m for <u>all</u>	2	Paired with onsite assessment points	3.99m radius (50 m ²)	1.78m radius (10 m ²)

	disturbance occurred	performance metrics				
	On access roads or linear workspaces where soil disturbance did not occur	Establish assessment plots at least every 100 m for all performance metrics, excluding soil-based parameters	2	Paired with onsite assessment points	3.99m radius (50 m ²)	1.78m radius (10 m ²)

Reference Conditions

While an understanding of the biogeoclimatic subzone of the restoration area(s) helps to determine appropriate ecological species that would be best suited to those conditions, the conditions anticipated on the reclaimed restoration area are of critical consideration to a QRS.

In general, areas adjacent to a restoration area should be used as reference conditions to confirm the biogeoclimatic subzone and site series to help anticipate post-reclamation site conditions and to inform site preparation and revegetation techniques. Where areas adjacent to the restoration site have experienced other disturbances, have been significantly influenced by edge effects, or may not be representative of anticipated post-reclamation site conditions, adjacent reference conditions may not be appropriate to guide species reclamation planning. In such cases, alternative offsite reference areas may be better suited to inform reclamation planning.

Extenuating Conditions

Where extenuating conditions, or limiting factors, exist that may prohibit the attainment of an appropriate ecological trajectory, the QRS will justify how mitigation was explored and exhausted in the COR Part 2 application.

Extenuating conditions may be physical or chemical related (as in the case of compaction or pH related soil issues), vegetation related (as in the case of persistent and widespread problematic or invasive species due to herbicide free vegetation management programs), inadequate reclamation practices (lack of soil salvage or lack of suitable soils), or external pressures (such as browsing pressures from wildlife on newly established vegetation), for example. There are mitigations available to most extenuating conditions, however there may be some sites that are unable to fulfill all the short-term performance metrics, and in the opinion of the QRS, further reclamation and mitigative efforts on the restoration area(s) are likely not to result in further net benefit towards expediting longer-term ecological outcomes. For these locations, the QRS must stipulate what criteria are deficient, which values are being managed and the alternate performance assessment criteria (if appropriate) and provide justification for accepting the site as being

sufficiently reclaimed where extenuating conditions, limiting factors, or performance assessment criteria are not effectively mitigated.

The QRS will provide professional sign off to confirm the site has been adequately reclaimed in the context of the alternate outcomes.

Please note that it is not expected that these situations will be common and early discussion with the appropriate Regulator staff is recommended in the event a permit holder wishes to provide alternative performance criteria for a final site assessment. A permit holder should expect that the Regulator may require a detailed ecological assessment by an appropriate QRS to support the rationale and values for any alternate outcomes they wish the Regulator to consider.

Corrective Actions

An application for a COR Part 2 will require information to justify where site limitations or constraints are preventing ecological vegetation success metrics from being achieved. It is understood that where site-specific risks and limitations were not identified prior to reclaiming a restoration area, a performance assessment may be unsuccessful at meeting the performance targets within the usual timeframe.

Where site limitations are not identified until attempting to assess for performance as part of the COR Part 2 application, the QRS should ensure that a record of *corrective action* is included in the application. Assessment results derived through *corrective actions* should enable the QRS to rationalize how site concerns have been alleviated. Where corrective actions and mitigation have been exhausted, modifications to performance targets and thresholds outlined in this Guideline require justification by the QRS.

COR Part 2 Application

A COR Part 2 application is required that assesses reclamation success and indicates how regulatory requirements and performance metrics were achieved. Where known, the QRS will confirm site preparation and revegetation techniques in consideration of reference sites, identified risks, and associated mitigation as part of the documentation.

The immediate goal of assessing performance is to gather, manage, and provide information required to support a successful CoR Part 2 Application in the context of EPMR Section 19. The performance metrics are intended to support an assessment of whether reclamation activities have succeeded in establishing a suitable ecological trajectory to support ongoing natural regeneration and long-term ecological restoration outcomes.

This information will be collated and analysed by the Regulator to identify success and continuous improvement opportunities at multiple scales, including performance within specific BEC subzones, differences between species mix designs, site reclamation techniques, revegetation practices, common site limitations, etc. This information will be supplemented with a longer-term inspection program and audit process administered by the Regulator.

This approach to reporting maintains the emphasis on result-based outcomes and aligns with the objective of supporting evidence-based continuous improvement and allows for adaptive management.

COR Part 2 Application Reporting

Field Application and eSubmission Module

To be developed prior to 2024.

Professional Declaration

The Regulator expects all reclamation planning, implementation, and performance assessment reporting to be overseen by a Qualified Reclamation Specialist or by a suitable field professional who works under the direct supervision of a Qualified Reclamation Specialist and requires a professional statement to be signed and dated by a Qualified Reclamation Specialist.

The QRS will provide professional sign off to confirm the restoration area(s) is/are adequately reclaimed and satisfy all applicable criteria for surface reclamation (landform, soil, and vegetation metrics).

The Regulator requires Qualified Reclamation Specialists to sign off on any reports related to a COR Part 2 application and attest to the following statements:

- The performance assessment(s) of the activity(ies) referred to in this report have been conducted in accordance with the recommendations outlined and overseen by the Qualified Reclamation Specialist.
- The reported information is true based on the signatory's current knowledge as of the date completed. Where data gaps exist in this report, the judgment of the Qualified Reclamation Specialist has been used.
- The signatory has demonstrable experience with surface reclamation planning, management, and assessment activity for which the statement applies and is familiar with the reclamation carried out on the site.

Under the PGA, it remains the duty of the applicable regulatory body to govern its registrants according to the PGA, their regulations and their bylaws. Any reports submitted to the Regulator which are deemed inconsistent with the standards and practices of the professional organization or outside the professional's field of study, will be addressed following the appropriate regulatory bodies bylaws under whom the Qualified Reclamation Specialist is registered.

Chapter 5: Adaptive Management

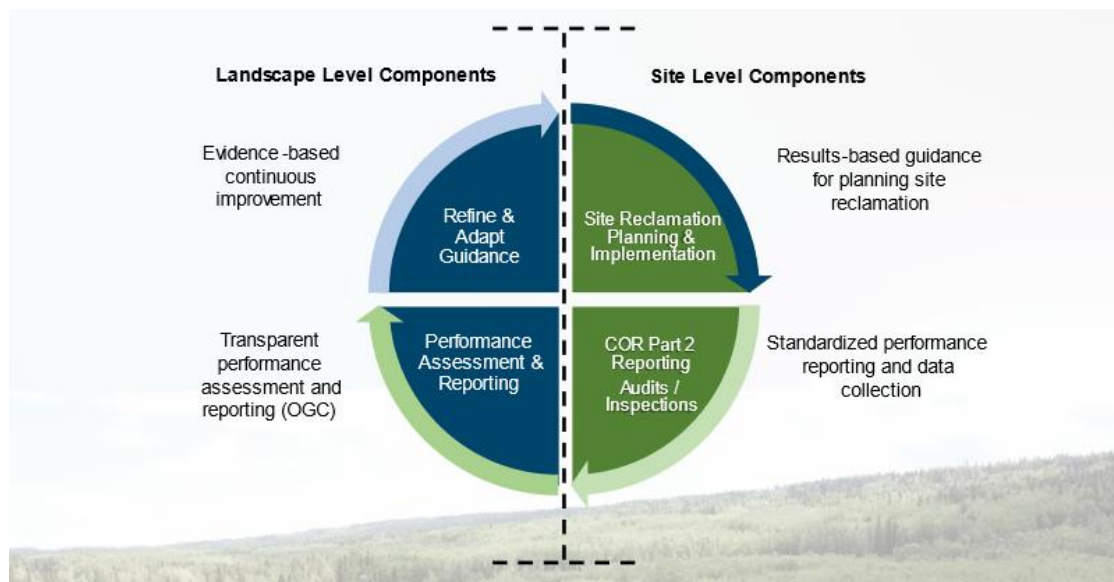
Recognizing that supporting, implementing, and measuring ecological restoration is an area of ongoing research, a key objective for the Regulator is to develop a consistent and measurable reporting and tracking platform to gather reclamation planning and performance monitoring information to support evidence-based continuous improvement.

Risks and limitations to successful reclamation and restoration can be partially mitigated through adaptive planning and decision making. The underlying strategy for overall restoration is founded on an iterative management approach based on reporting results, along with ongoing engagement with industry, government, academia, and Indigenous partners. New research will continue to shed light on the fields of reclamation and restoration, unfolding into best practices and updated guidelines, as knowledge and practice in these fields continues to mature. This Guideline is intended to be revised and continually updated in adaptive response.

Overall, continuous improvements to the ESSG will be based on evidence collected as part of the updated COR Part 2 process. Combined, the metrics are intended to identify when a site is on an acceptable successional trajectory to support natural processes and ecological function, such as regeneration and ingress of native vegetation, nutrient cycling through decomposition and microorganism activity. Results are expected to indicate aspects of restoration that are working well to mitigate site risks and limitations in a specific region or subregion, and where reclamation practices are building evidence towards expedited restoration outcomes and are promoting natural regeneration processes to become re-established.

In addition to the evidence built through the COR Part 2 process, annual inspections, and audit programs can provide other avenues for engagement on testing the efficacy of restoration practices and performance metrics to further inform continuous improvement.

Figure 3: The Adaptive Management Cycle



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Chapter 7: Definitions

Term	Definition
Biogeoclimatic Ecosystem Classification	Biogeoclimatic ecosystem classification (BEC) is an ecological classification framework used in British Columbia to define, describe, and map ecosystem-based units at various scales, from broad, ecologically based climatic regions down to local ecosystems or sites.
Crown Forested Land	A general term used to denote all areas not covered under the Agricultural Land Reserve (ALR). Crown Forested Land includes upland, wetland, low land and peat/ muskeg areas.
Cultural Continuity	In the context of this guideline and on-going discussion with Treaty 8 First Nations, this is a developing concept related to the ongoing and consistent expression of cultural practices through time and space because of generational knowledge transfer. For many Indigenous communities in Canada, this transfer of knowledge is often through teaching of skills and practices (e.g., hunting, fishing, trapping) historically exercised and connected to a given place. Teachings are hands-on participation and cultural storytelling, and often relate to community driven spiritual connections to the land.
Ecological Equilibrium	Biological theory surrounding the interactions, regulation, and balances between various organisms in an ecological community. Ecological equilibrium is thought to be achieved when population dynamics such as predation and disease, along with site habitat dynamics that influence forage and shelter quality (e.g., forest seral stage distribution) are maintaining the homeostasis and stability of an ecosystem efficiently. Non-equilibrium states occur when ecosystems experience disturbances (natural or anthropogenic) of differing interaction strengths (e.g., magnitudes, frequencies, durations) than naturally adapted to in the past.
Ecological Restoration	Returning a restoration area to self-sustaining successional trajectory with suitable ecological function, integrity, and biodiversity in consideration of regional and landscape level ecological equilibrium.

Term	Definition
Ecologically Suitable Species	Are considered those vegetation species which are ecologically relevant to the surrounding conditions and do not hinder the benefits of natural revegetation processes.
Goal	The result, or outcome, of successfully achieving an objective or set of objectives.
Historically reclaimed site(s)	Applicable sites captured by the ESSG that were reclaimed prior to 2024 where slopes, surface compaction, soil redistribution, surface drainage conditions, and vegetation has been addressed within the site boundaries.
Indigenous Knowledge	Indigenous knowledge (IK) is a unique way of knowing, held by Indigenous knowledge holders, which includes information around community practices, language, teachings, laws, and relationships between the natural environment and people.
Invasive plants	Means the same as defined in the Peace River Regional District Invasive Plant Program Strategic Plan and Profile 2022.
Metric or Measure	A qualitative or quantitative aspect of an indicator; a variable that can be measured (quantified) or described (qualitatively) and demonstrates either a trend in an indicator or whether a specific threshold was met.
Noxious plants	Means the same as defined in the Weed Control Act as a <i>noxious weed</i> .
Objective	A purpose toward which a reclamation effort is directed. Objectives should be SMART: specific, measurable, attainable, reasonable, and time bound.
Problematic species	Problematic species are considered those vegetative species that hinder natural regeneration processes. Often these are sod-forming grasses that outcompete early seral pioneer forbs and shrubs.
Qualified Reclamation Practitioner	A generic term referring to an individual engaged in the practice of reclamation and includes both Qualified Reclamation Specialists and Reclamation Technicians.

Term	Definition
Qualified Reclamation Specialist (QRS)	<p>A Qualified Reclamation Specialist (QRS) is considered a qualified professional or technologist with the following attributes:</p> <ol style="list-style-type: none"> 1. Is an individual who is registered with a regulatory body as a qualified professional or technologist (e.g., agrologist, applied science technologist, certified technician, applied technology technician, professional biologist, professional forester, registered forest technologist) as defined in Schedule 1 of the Professional Governance Act (PGA). This means that the individual is subject to their organization's Code of Ethics and disciplinary action. 2. Possesses an appropriate combination of formal education, knowledge, skills, and experience to conduct a reasonably sound technical assessment that informs reclamation planning and assess for reclamation performance. 3. Is familiar with applicable federal, provincial, and municipal legislation, regulation, policies, protocols, and guidelines used to evaluate site conditions, risks, and limitations, develop measure(s) to mitigate the risks, and assess the performance of reclamation activity on a property; and 4. Is familiar with upstream oil and gas operations.
Reclamation	<p>Specific to this guideline, it is considered the final activity in the restoration process to achieve the performance metrics outlined in this guideline. These performance metrics are intended to promote the longer-term Ecological Restoration expectations outlined in Section 19 of the Environmental Protection and Management Regulation.</p>
Reclamation Technician	<p>A Reclamation Technician is considered an individual who, with the appropriate oversight by a Qualified Reclamation Specialist, supports the development and implementation of reclamation plans, along with assessing performance for the purposes of compliance to the applicable regulatory requirements, permit conditions, and guideline expectations.</p>
Restoration	<p>The process of returning an area disturbed by oil and gas activity to an achievable and functioning condition relative to its pre-disturbance condition. The process includes the activities of deactivation,</p>

Term	Definition
	abandonment, decommissioning, site investigation, remediation, and reclamation as required.
Restoration Area	A disturbance area that may include one disturbance type (e.g., a well pad) or a combination of disturbance types (e.g., well pads, roads, laydown areas or other oil and gas related activities) where the reclamation efforts are deployed in conjunction.
Target	The desired outcome for a specific metric or measure.
Transitory sites	Applicable sites captured by the ESSG where restoration was completed after Jan. 1, 2023.
Woody species	<p>[1] Defined as plants whose stems/trunks survive above ground during the winter season. This is unlike herbaceous plants that might still be alive in the soil but the top of the plants dies back in the winter and must re-grow branches and stems each spring.</p> <p>[2] For ESSG purposes, when counting number of woody stems within a plot, a multi-stemmed shrub (example: willow) should be counted as one (1) stem to avoid over-estimating the number of woody stemmed plants within a restoration area.</p>

Chapter 8: Performance Assessment Metrics – Crown Forested Lands¹

Required Reporting Category And Metric		Site Measure	Unit of Measure and Target	Plot Scale	Objective	Comments / Reference
Site Description	Permit / WA Number(s)	-	Identify applicable permit numbers for all restoration areas.	Restoration Area(s)	Regulatory	<ul style="list-style-type: none">BCER 2022
	BEC Subzone(s)	Establish biogeoclimatic subzone for the restoration area(s)	Unit of measure: BEC subzone(s) Target: not applicable	Restoration Area(s)	Establish the regional climate and identify geographic considerations affecting the restoration area(s).	<ul style="list-style-type: none">NEWBiogeoclimatic Ecosystem Classification and Ecology Research program
	Slope	Record percent slope(s) and gradient(s) using a clinometer	Unit of measure: degrees or percentage Target: adequately comparable to reference condition	Restoration Area(s)	Document post-reclamation onsite baseline conditions	<ul style="list-style-type: none">NEWBC MoFR and BC MoE 2010 (Section 1, page 25)
	Aspect	Record orientation of slope(s), using a compass	Unit of measure: relative to true north Target: not applicable	Restoration Area(s)	Establish post-reclamation onsite baseline conditions	<ul style="list-style-type: none">NEWBC MoFR and BC MoE 2010 (Section 1, page 25)
	Mesoslope Position	Record the position(s) of restoration area relative to localized catchment area using codes	Unit of measure/codes to be used: <ul style="list-style-type: none">• CR = crest• UP = upper slope• MB = middle slope• LW = lower slope• TO = toe• DP = depression• LV = level• GU = gully Target: adequately comparable to reference site	Restoration Area(s)	Establish post-reclamation onsite baseline conditions	<ul style="list-style-type: none">NEWBC MoFR and BC MoE 2010 (Figure 1.3, Section 1, page 25-26)
	Elevation	Determined in the field using an altimeter or GPS	Unit of measure: recorded in metres Target: not applicable	Assessment Plot	Establish post-reclamation onsite baseline conditions.	<ul style="list-style-type: none">NEW
	Site Specific Landscape Conditions	Record the overall site condition, presence of key landscape features (e.g., slopes, drainages)	Unit of measure: site sketch and site photographs Target: not applicable	Restoration Area(s)	Establish post-reclamation onsite baseline conditions.	<ul style="list-style-type: none">NEW
	Limiting Factors	Describe quantity and quality (degree of pressure) of site factor(s) that pose a risk or limitation to be mitigated or	Unit of measure: identification of site-specific risk factors to achieving vegetative success, a description of mitigation applied, and anticipated success of alleviating risk. Identify where mitigation	Restoration Area(s)	Document risks that may not have achievable mitigation, promoting professional reliance to build evidence supporting mitigation development and adaptative management.	<ul style="list-style-type: none">NEW

¹ Notes: For additional reporting requirements specific to sites located within the Agricultural Land Reserve, please reference the Delegation Agreement

Required Reporting Category And Metric		Site Measure	Unit of Measure and Target	Plot Scale	Objective	Comments / Reference
		that may influence successful restoration outcomes	has been exhausted and rationalize any alternative closure targets where applicable. Target: effective mitigation of risk to overall site success.			

Required Reporting Category And Metric		Site Measure	Unit of Measure and Target	Plot Scale	Objective	Comments / Reference
Landscape Form and Function	Site stability, subsidence, erosion, deposition of sediment	80% of plots onsite must be acceptable, with no 2 adjacent plots ranked as unacceptable	Unit of measure: presence or absence. Target: amount of incidence is consistent with levels found in surrounding offsite area; no signs of slope movement, slumping, subsidence, or tension cracks. Risk of future onsite stability issues are not identified.	Assessment Grid	PASS/FAIL	<ul style="list-style-type: none">NEW
	Landform shape, slopes, drainage patterns.	At least 80% of plots onsite must be acceptable, with no 2 adjacent plots ranked as unacceptable.	Unit of measure: cut and fill has been replaced, available subsoil replaced, boundaries are tied in, and original drainage patterns restored and stable Target: landform shape, slopes, and drainage are consistent and integrated with surrounding patterns and conditions. Onsite ponding, gullyng, rilling or slumping, including bank stability around watercourses and waterbodies, ponding is consistent with expectations.	Assessment Grid	PASS/FAIL	<ul style="list-style-type: none">NEW
	Industrial / domestic waste and debris	No industrial or domestic debris should remain within restored area(s).	Unit of measure: record presence / absence for all assessment grids Target: no industrial or domestic debris.	Restoration Area(s)	PASS/FAIL	<ul style="list-style-type: none">NEW
	Coarse Woody Material (CWM)	Describe the site preparation techniques and measures employed to utilize CWM.	Unit of measure: presence / absence and record the range of estimated CWM application rate in m3/ha for each assessment grid: Light: 25 m³/ha – 50 m³/ha Medium: 60 m³/ha – 100 m³/ha High: > 100 m³/ha Target: if coarse woody material (CWM) is applied, 60 to 100 m3 per hectare is recommended.	Assessment Grid	The addition of CWM at the time of reclamation is encouraged to promote microsite establishment and diversity.	<ul style="list-style-type: none">NEWSee Pyper, M. and T. Vinge, 2012 for a visual guide.
	Surface Roughness	Describe the site preparation techniques and measures employed to mitigate site risks and limitations.	Unit of measure: description only. Target: confirm presence / absence of surface roughness and method employed (track packing, roughened micro-topography, etc.).	Restoration Area(s)	The creation of surface roughness at the time of reclamation is encouraged to promote microsite site diversity.	<ul style="list-style-type: none">NEW

Required Reporting Category And Metric		Site Measure	Unit of Measure and Target		Plot Scale	Objective	Comments / Reference
Soil	Organic Matter: Litter, Fibric, Humic		Describe relative proportion of LFH within the soil pit profile	Unit of measure: record the depth of L, F, and H layers (in centimeters) within each assessment and control plot. Target: record the average depth of each layer.	3.99m	Surrogate indicator of the redevelopment of nutrient cycling processes.	<ul style="list-style-type: none">NEWThe Canadian System of Soil Classification
	Surface Soil Depth	Soil disturbance onsite	All available surface soils have been replaced across the surface of the restoration area.	Unit of measure: record the depth of surface soil horizons in centimeters within each assessment and control plot. Target: No soil stockpiles remain. All available soils have been redistributed across the restoration area(s) and depths are reasonably justifiable against the average control plot depths, identifying whether soil quantity / quality limitations exist.	1.78m radius	PASS/FAIL	<ul style="list-style-type: none">NEWThe Canadian System of Soil Classification
		No soil disturbance onsite	Not applicable (N/A)	N/A			
	Soil Moisture Regime		Record the range of moisture regime classes across the restoration area(s) and reference sites based on environmental factors, soil properties, indicator plants, etc.	Unit of measure/codes to be used: <ul style="list-style-type: none">• 0 = very xeric• 1 = xeric• 2 = subxeric• 3 = submesic• 4 = mesic• 5 = subhygric• 6 = hygric• 7 = subhydric• 8 = hydric Target: adequately comparable to reference site	Restoration Area(s)	Information to inform the ability of the reclaimed area(s) to mimic reference conditions and to predict early seral and pioneer species expected for ecologically appropriate successional trajectories.	<ul style="list-style-type: none">NEWBC MoFR and BC MoE 2010 (Table 1.1., Section 1 page 13)
	Soil Nutrient Regime		Record the range of nutrient regimes across the restoration area(s) and reference sites based on environmental factors, soil properties, indicator plants, etc.	Unit of measure/codes to be used: <ul style="list-style-type: none">• A = very poor• B = poor• C = medium• D = rich• E = very rich• F = saline Target: adequately comparable to reference site.	Restoration Area(s)	Information to inform the ability of the reclaimed area(s) to mimic reference conditions and to predict early seral and pioneer species expected for ecologically appropriate successional trajectories.	<ul style="list-style-type: none">NEWBC MoFR and BC MoE 2010 (Table 1.2, Section 1 page 15)
	Admixing	Soil disturbance onsite	Site-specific restoration objectives are not negatively affected by admixing.	Unit of measure: approximate the % amount of admixing present at each assessment plot. Target: confirmation that vegetation establishment is not irreparably affected by admixing is required.	1.78m radius	Information to inform the success of the reclaimed area(s) to establish an appropriate ecological trajectory towards restoration	<ul style="list-style-type: none">NEWThe Canadian System of Soil Classification
		No soil disturbance onsite	N/A	N/A			

Required Reporting Category And Metric		Site Measure	Unit of Measure and Target	Plot Scale	Objective	Comments / Reference
Soil – continued	Soil Drainage	Common indicators for soil drainage concerns are absent, or limited	Unit of measure: record the drainage class for all assessment and control plots. (Very Poor to Very Rapid). Note any common indicators for water permeability restrictions. Target: common indicators for soil drainage concerns are comparable to reference site conditions, absent, or limited, or have been mitigated.	1.78 m radius	Information to inform the success of the reclaimed area(s) to establish an appropriate ecological trajectory towards restoration.	<ul style="list-style-type: none">NEWBC MFR and BC MoE 2010
	Compaction	Site-specific restoration objectives are not negatively affected by compaction	Unit of measure: qualitative assessment based on professional judgement using manual compaction observations (e.g., shovel test) and/or rooting zone conditions. Target: common indicators for compaction concerns are comparable to reference site conditions, absent, or limited, or have been mitigated.	1.78 m radius	PASS/FAIL - Compaction issues have been addressed and are not hindering the establishment of an appropriate ecological vegetation trajectory.	<ul style="list-style-type: none">NEW
	Rooting Zone Conditions	Common indicators for root restrictions are absent, or limited	Unit of measure: describe rooting zone by noting root abundance and size classes and codes, and any rooting zone restriction codes. Note any common indicators for root restrictions. Target: common indicators for compaction and soil drainage concerns are comparable to reference site conditions, absent, or limited, or have been mitigated.	1.78m and 3.99m	Information to inform the success of the reclaimed area(s) to establish an appropriate ecological trajectory towards restoration.	<ul style="list-style-type: none">NEW

Required Reporting Category And Metric		Site Measure	Unit of Measure and Target	Plot Scale	Objective	Comments / Reference
Vegetation	Noxious Weeds and Invasive Plants		Unit of measure: record presence/absence, % cover and distribution for all noxious weeds and invasive plants for each plot. Target: absence of any noxious weeds and invasive plants as designated by an Act, Regulation, or regional district.	3.99m	PASS/FAIL – Absence and if present, confirm that the risk posed from Noxious Weeds or Invasive Plants outcompeting ecological suitable species is low.	<ul style="list-style-type: none">NEWBC Weed Control ActWeed Control RegulationProfile of Invasive Plant Species Within the PRRDFort Nelson Invasive Plant Management Area Steering Committee
	Problematic Species		Unit of measure: record presence, % cover and distribution for all problematic species in each plot. Target: confirmation that problematic species within a reclamation area are absent or their coverage is unlikely to hinder natural regeneration in the longer term.	3.99m	Ecologically suitable species are expected to outcompete problematic species.	<ul style="list-style-type: none">NEW
	Plant Community Composition		Unit of measure: record species, % cover, and distribution of all desirable species for each plot. Identify suitability of species relative to BEC subzone and/or relative to surrounding control plots. Indicate vegetation layer (trees, shrubs, forbs, and grasses) and whether species was seeded, planted, or naturally regenerating, if known. Target: Average of 80% cover across all plots, with each plot having at least 60% cover having at least 2 desirable species.	1.78m and 3.99m	PASS/FAIL - Ecologically suitable species are expected to be predominate and persistent.	<ul style="list-style-type: none">NEWBC MFR and BC MoE 2010
	Woody Species Density	Where tree planting techniques were implemented	Unit of measure: record the % cover, species type, number of woody species for each plot, identifying whether planted, seeded, or naturally regenerating (where possible), and inter-tree distances (spacing). Target: 1. Average of 3 stems / plot across all plots (800 stems / ha). 2. Evidence of natural regeneration of woody species present in at least 25% of all assessment grids.	3.99m radius and Assessment Grid	PASS/FAIL – Planted woody species have are sufficiently indicating the return of natural ecological process.	<ul style="list-style-type: none">NEWBC MoFR and BC MoE 2010 (Section 3 page 8 -10; Figure 3.2)
		Where no tree planting has occurred	Unit of measure: record the % cover, species type, number of woody species for each plot located around the perimeter of the restoration area, identifying whether planted, seeded, or possible natural regeneration. Target: 1. Average of 5 stems / plot across all applicable plots (1,000 stems / ha) 2. Evidence of natural regeneration of woody species present in at least 50% of all permitter assessment grids.	3.99m radius and Assessment Grid	PASS/FAIL - Natural ingress of woody species is an indicator of returning natural ecological process.	

Required Reporting Category And Metric			Site Measure	Unit of Measure and Target	Plot Scale	Objective	Comments / Reference
Vegetation – continued	Vegetation refugia		Optional or supplemental technique to support natural regeneration from island planting where limitations due to soil salvage and redistribution may be present.	Unit of measure: Applicable only where this technique is deployed, describe the number and distribution of refugia / islands across the restoration area, and record plant community composition and woody species density metrics as described above. Targets for % cover and woody species density with a refugia are to be recommended by the QRS and are expected to be at least 80% desirable species cover across the restoration area and greater than 1.25 stems per refugia plot (> 1,000 stems per hectare). Identify evidence of natural regeneration around the perimeter of the refugia.	Restoration Area(s), 1.78m and 3.99m	Provides flexibility to allow for refugia establishment on sites where soil salvage may have been inefficient to allow adequate soil / seed bed distribution across the entire restoration area. Alleviates the Woody Species Density metric for all plots by focusing this metric on the refugia only.	<ul style="list-style-type: none">NEW
	Survival	For sites that were planted, only	N/A	Unit of measure: where seedlings have been transplanted or planted, record the number of live and dead seedlings within the plot, where live = “trees have enough foliage to keep them alive (live cambium is present), and are rooted into the ground” and dead = “trees are obviously dead, or roots are separated from the ground”. Target: At least 70% of planted or transplanted woody seedlings are surviving for at least 3 years. Deciduous trees are at least 20 cm tall after 3 years; coniferous trees have a well-defined stem.	3.99m	PASS/FAIL - A potential site series surrogate indicator of possible climatic shifts or other widespread issues influencing restoration success. Alternatively, where widespread survival is poor, may also indicate limiting soil conditions.	<ul style="list-style-type: none">NEWBC FLNRO 2015a (Table 4.2)

Required Reporting Category And Metric		Site Measure	Unit of Measure and Target		Plot Scale	Objective	Comments / Reference
Restoration Area Use	Signs of wildlife (e.g., tracks, scat, markings, incidental sightings).	Determine whether wildlife appear to be using the restored area(s).	Unit of measure: record type of wildlife use evidence observed within each grid. No target established.		Assessment Grid	Surrogate indicator that the restoration area is desirable for wildlife use. While lack of evidence is not necessarily evidence of failure, wildlife use indirectly supports the goal of promoting the re-establishment of wildlife habitat.	<ul style="list-style-type: none">NEW
	Signs of human use	Is there evidence of sustained anthropogenic use within the restored area(s)?	Unit of measure: record type of anthropogenic use evidence observed within the restoration areas (example: hunting, off-road vehicles, campsite, etc.) No target established.		Restoration Area(s)	Indicator data regarding the restoration area(s) ability to naturally regenerate.	<ul style="list-style-type: none">NEW