Canadian Terrestrial Ecological Framework Update Project

Status Report and Strategic Plan

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1. Introduction

This strategic plan is a blueprint for a 4-year project to update and revise Canada's national ecological framework – coined the Canadian Terrestrial Ecological Classification (CTEF). This report also serves as a status update for year 1 of the project and milestones planned for year 2.

The CTEF is an ecological land classification that describes and maps regionalized landscape expressions of climate, soil, topographic factors. An updated and revised CTEF offers each jurisdiction the opportunity to work from a common ecological classification dataset, across the country. Cross-border information sharing will be facilitated, as will reporting to the federal government. The federal government will have a system for reporting on relevant aspects of natural resource management in Canada, especially biodiversity conservation and climate change. This strategic blueprint for this project follows from recommendations made in the 2021-2022 Scoping Report, which provided a comprehensive analysis of the goals and expected outcomes of an updated and revised framework.

NatureServe Canada has been contracted to lead the CTEF project from 2023 to 2027 due to their experience working effectively on multi-agency projects, as well as their extensive experience in developing and managing ecological data. Their role includes project management, coordinating an Internal Science Team, data integration and coordination with federal and jurisdictional partners, and the development of GIS and IT infrastructure necessary for the CTEF. NatureServe's expertise ensures the project is scientifically robust and meets the diverse needs of federal, provincial, and territorial stakeholders.

1.1. Vision

To support national and intra-jurisdictional environmental and conservation reporting and fostering knowledge about Canada's ecological diversity nationally and internationally.

1.2. Mission

Create a conceptually and technically updated CTEF that classifies, describes, and maps an improved terrestrial ecological framework for Canada. NatureServe Canada will focus on a four-year project that develops in three key areas:

Area 1: Develop CTEF hierarchy and methods	Area 2: Develop and manage IT/GIS infrastructure	Area 3: Make CTEF Data Available to the Public
Establish and maintain provincial and territorial partnerships through virtual and in-person meetings to collaboratively develop conceptual and mapped framework, inspired from previous versions of CTEF; identify delineation and description attributes; and conduct a cross-jurisdictional policy scan for CTEF use needs	Build database and GIS infrastructure, develop online GIS tools for interactive maps and peer review, and develop spatial modeling tools to delineate, assess and attribute mapped elements. Support CTEF foundational data that is accessible, technically sound, and can be effectively utilized and maintained across all jurisdictions.	Develop communications for public releases in collaboration with ECCC, ensure federal bilingualism and accessibility requirements are met, and scope project website and open science data requirements with ECCC. Provide CTEF data that is transparently shared, easily accessible to the public, and meets federal standards for open data and communication.

2. Strategic Context

This section outlines the historical developments leading to this project and provides context for the strategy to update the Canadian Terrestrial Ecosystem Framework (CTEF).

2.1. Program History

The detailed program history and additional specifics can be found in Appendix 1. Here are the main steps of the CTEF development.

2.1.1. Original National Ecological Framework of Canada (1996)

The original framework, developed in 1996, established a nested hierarchy of ecological units (ecozones, ecoregions, and ecodistricts) to provide a common ground for reporting on the state of the environment and the sustainability of ecosystems in Canada. This framework was based on enduring features such as topography, geology, and elevation, with climatic information included at the ecodistrict level, and it is still used with modifications by several provinces and territories.

2.1.2. National Revisions (2010 to 2019)

In 2010, a short-term modification called "Ecozones+" was introduced[1], providing an updated framework for the Canadian Biodiversity: Ecosystem Status and Trends 2010 report (Environment Canada 2012). Subsequent efforts included an updated ecozones map produced in 2014 through collaboration between provinces and territories, and the development of a seamless ecoregion layer between 2017 and 2019 to meet Aichi Target 11 commitments, although the approval process for this map was not fully completed.

2.2. Demand

The demand for an updated Canadian Terrestrial Ecological Framework (CTEF) is driven by several key factors identified through the 2021-22 scoping project and broader environmental needs across Canada. The scoping project highlighted the necessity for a consistent and scientifically robust ecological framework to support national, provincial and territorial environmental and conservation reporting.

In 2021, Environment Canada tasked NatureServe Canada with reviewing the 2019 project and proposing a way forward. The project aimed to document provincial and territorial methods, review and propose solutions to problems identified in the 2019 outcome, outline methods for consistent national mapping, and propose a work plan for a full CTEF update. The scoping project confirmed provincial and territorial support for an official update, highlighting the need for proper resourcing, current data, and consistent methods.

The scoping project identified several key needs:

[1] The Ecozone+ framework merged the Arctic Cordillera, Southern Arctic, and Northern Arctic into one Arctic unit. A new Western Interior Basin unit was added. Newfoundland was recognized as its own unit. The Great Lakes and Lake Winnipeg were identified as distinct freshwater units. Some jurisdictions, like the Government of Northwest Territories and the Government of Ontario, made specific revisions to the ecozone boundaries to reflect new data and considerations.

- Proper resourcing and guidance from Environment and Climate Change Canada (ECCC).
- Consistent approaches across provinces and territories in delineating and describing the mapped levels of the hierarchy
- Nationally consistent representation of abiotic and biotic factors.
- At least two national meetings for comprehensive discussions.

2.3. Resources

The budget for the Canadian Terrestrial Ecological Framework (CTEF) Update Project is $1.8 million over four years. This funding is allocated as $350,000 for the first year, $650,000 for each of the next two years, and $300,000 in the final year. This budget reflects the significant investment required to update and maintain a comprehensive ecological framework that meets the needs of federal, provincial, and territorial stakeholders.

To ensure that all Canadian provinces and territories can be actively involved and adequately supported, a portion of the budget has been earmarked specifically for the jurisdictions. In years two and three of the project, $30,000 will be allocated annually to each of Canada's ten provinces and three territories. This amounts to $390,000 each year (if all funds accepted annually, by all jurisdictions), dedicated to funding jurisdictional representatives' participation in national meetings and providing seed funding to support work on their ecoregional frameworks, including staff or contractor support.

The provided funds will be directed to support development of spatial modeling tools to integrate technological advancements since then. These tools will be used to delineate, assess, and attribute mapped elements. We also anticipate that some jurisdictions will allocate their funds towards regional improvements, supported by additional contributions through staff and/or contractor knowledge and time, ultimately contributing to an improved national CTEF.

We also anticipate that funding can be assigned to capacity-building initiatives to assist jurisdictions that may lack the technical expertise required for advanced GIS and spatial analysis. By identifying and addressing these gaps, the project will ensure that all regions of Canada have the opportunity to participate fully in the CTEF update process.

Funds that are not requested by the jurisdictions will be reinvested back into the project and reassigned to other priority areas. This approach ensures that the project can adapt to changing needs and opportunities, maximizing the impact of the available resources.

2.4. Inputs

Since the 1990s, significant advancements have been made in the availability and quality of spatial ecological data, as well as in GIS technology and tools for spatial analysis. Advancements in machine learning and faster computing have revolutionized the way ecological data is processed and analyzed. Machine learning algorithms can identify patterns and relationships within large datasets, improving the accuracy of ecological classifications. Faster computing and advanced modeling environments enable the efficient processing of complex spatial data, supporting the development of detailed and accurate ecological maps.

Additionally, new datasets have been developed, offering more detailed and comprehensive information on various ecological attributes that can be used to delineate and/or describe levels of the framework. Online GIS applications facilitate collaboration among stakeholders, allowing for real-time data sharing and feedback.

While funding resources for this project are not sufficient to delineate eco-levels below the ecoregion level as undertaken in the 1990s, the provided funds will support the creation of tools to delineate, assess, and attribute mapped elements. This integration of new technologies ensures that the updated CTEF is scientifically robust and reflects the latest advancements in ecological science.

2.4.1. GIS and Technical Specifications

The technical infrastructure for this project includes a cloud-based platform equipped with high-performance virtual machines (VMs), extensive storage solutions, and advanced data integration tools. This setup will support the spatial analysis and modeling required for the CTEF project, enabling the team to handle large datasets and perform complex analyses efficiently as well as sharing data and GIS tools with the P/Ts.

Key components include:

- Cloud-based Platform: Utilizing Azure services for high-performance computing, scalable storage, and secure data management.
- GIS Software: Tools such as ArcGIS Pro, Python, and R will be used for spatial analysis and data visualization.
- Data Management: A robust GIS repository optimized for compatibility with multiple spatial analysis tools, ensuring efficient management of geospatial data.

2.5. Existing products

Over time, provinces and territories of Canada have independently maintained versions of a regionalized framework for their jurisdictions. The existing products and frameworks used by various jurisdictions provide a strong foundation for the updated CTEF. While there are differences in scale, inputs, and delineating factors, these existing products highlight the extensive work done at the regional level and underscore the importance of collaboration and integration in developing a cohesive national framework. Particularly to resolve cross-jurisdictional differences in delineated boundaries, and recognition of common delineating factors. This section provides an overview of the existing ecological frameworks used by various jurisdictions, highlighting their contributions and current state.

2.5.1. BC and Territories

- **British Columbia** introduced its ecoregion classification in 1985, with the latest major documentation in 2011. The system has undergone five major revisions to incorporate updated information and better remote sensing data and integration with mapped elements of the Biogeoclimatic Ecosystem Classification system.
- The **Northwest Territories** revised its ecoregion framework between 2005-2012, aligning with the continental system and adopting a four-level classification. Extensive aerial and ground surveys supported this revision. The system includes 167 Level IV ecoregions that are considered ecodistricts in the 1996 CEF hierarchy.
- **Nunavut** follows the 1996 federal framework, with additional classification in the Kivalliq region based on satellite data from 2012. There is a 1:1 correspondence between the federal and Nunavut's classifications.
- **Yukon** adopted the national 1996 Ecozones and Ecoregions concept, with delineation revisions and refined ecoregion units are detailed in a 2014 publication. The revised system still corresponds to the 1996 federal classification hierarchy and framework.

2.5.2. Prairie Provinces

- **Alberta's** ecological framework began with the "Ecoregions of Alberta" classification in 1981, which was used for regional resource planning. The current system, established in 2006, merged the Natural Regions/Subregions and Ecoregions frameworks, describing six natural regions and 21 natural subregions. There is not a 1:1 correspondence between the national CTEF and Alberta's system, but there are similarities.
- **Manitoba's** ecological framework developed from biophysical land classification work in the 1960s and 1970s. The publication "Terrestrial Ecozones, Ecoregions, and Ecodistricts of Manitoba" in 1998 was a significant step in its development. Manitoba's current framework aligns with both the 1996 and 2014 national classifications.
- **Saskatchewan's** framework was detailed in the 1998 publication "The Ecoregions of Saskatchewan" and follows a similar structure to the national framework. Saskatchewan's system aligns closely with the national framework but includes local refinements.

2.5.3. Eastern Provinces

- **New Brunswick's** system, established in the mid-1990s, aligns with the CTEF but has some provincial differences. The system is a refinement and expansion of earlier ecosystem mapping projects from the 1960s to 1990s.
- **Newfoundland and Labrador's** system aligns with the 1996 CTEF. The classification for Labrador was extensively revised in 2013, while Newfoundland uses an unofficial system from 1990. There is a 1:1 correspondence between the national CTEF and Newfoundland and Labrador's ecoregions.
- **Nova Scotia's** system aligns with the CTEF but includes some provincial differences. The system was first approximated in 2000 and has undergone several revisions, with the latest in 2015.
- **Ontario's** ecological land classification was detailed in the 2009 publication "The Ecosystems of Ontario: Ecozones and Ecoregions" by the Ministry of Natural Resources. Ontario's system integrates ecoclimatic variables and physiography.
- **Prince Edward Island** has a single ecoregion encompassing five ecodistricts.
- **Quebec** employs an ecological reference framework that aligns with the national Ecozones and Ecoregions. The framework was detailed in a 2019 publication by the Ministry of Environment. Quebec's framework includes finer-scale divisions and focuses on geological/physiographic attribute.

3. Strategic Direction

The goals for this project are similar in context and content to the goals established for the 1996 CTEF and subsequent revisions.

Goal 1	Create a revised CTEF that supports: • Canada's commitments (i.e., 2030 Targets) under the Kunming-Montreal Global Biodiversity Framework; • monitoring of the geographic distribution of climate change effects; • provincial, territorial, and federal government initiatives; and • education about the ecosystems and biogeography of Canada.
Objective 1.1	Develop a rigorous and explicit framework and methods to guide the delineation and description of ecological land units, using a consistent set of biophysical criteria for effective classification across all eco-levels of Canada.
Objective 1.2	Structure the new CTEF to provide an ecologically sound national spatial framework for climate change modelling, biodiversity conservation and other natural resource management applications.
Goal 2	Achieve the endorsement of the revised CTEF by the federal government and the provinces and territories.
Objective 2.1	Collaborate with our partners to find solutions to the challenges (as identified in the 2022 Scoping Report) encountered in updating the CTEF.
Goal 3	Facilitate accessible and transparent sharing of the products of the new CTEF amongst our working provincial and territorial governmental partners.
Objective 3.1	Produce GIS and website components that facilitate both update and public viewing of the CTEF product,
Objective 3.2	Document the revised CTEF in reports, maps, and database and website products.

3.1. Approach to the Project

The project will evolve through a collaborative approach led by NatureServe Canada's CTEF Internal Science Team, incorporating the participation and inputs of the Provinces and Territories, as well as key federal agencies that are end-users of the CTEF.

3.2. Project Team and Coordination

NatureServe Canada has formed the CTEF Internal Science Team (IST), responsible for the development and implementation of the Canadian Terrestrial Ecological Framework (CTEF) update. A key role for the IST is to foster active input and guidance from provincial and territorial (P/T) representatives, ensuring that the framework is developed with regional expertise and practical needs of end-users in mind. Key liaisons and stakeholders within Environment and Climate Change Canada (ECCC) will also be integral to this process.

CTEF Internal Science Team (IST): The IST will coordinate and implement the CTEF update by managing national GIS repository, developing advanced spatial tools, and ensuring methodological consistency across regions. Their support will include providing technical expertise, integrating diverse data sources, and overseeing comprehensive project management to maintain progress and alignment with project objectives. **Members of the IST are provided in Appendix 3.**

Provincial/Territorial Collaborators: P/T representatives will provide essential regional input to ensure the CTEF meets jurisdictional needs. Their feedback will be integrated into the framework to align with diverse ecological contexts across Canada. P/T representatives may contribute as technical experts in developing the framework or as end-users who will utilize it. This collaboration aims for the eventual endorsement of the national framework, refining goals and objectives as needed with the IST. P/T partners will also validate and refine the ecological framework, ensuring its accuracy and applicability through their local expertise. **Provincial and Territorial contacted agencies are provided in Appendix 3.**

ECCC and Federal Government: The federal government, through ECCC, will offer strategic direction and establish broad project goals, ensuring that the CTEF aligns with national reporting and conservation priorities. This partnership will help create a cohesive national product that supports Canada's commitments to biodiversity conservation and climate change monitoring, reflecting a unified effort across all levels of government. **ECCC representatives are provided in Appendix 3.**

4. Project Roadmap (Action Plan)

4.1. Project Update

The Canadian Terrestrial Ecological Framework (CTEF) project is structured into three phases. The project's blueprint (also known as the logic model) was developed based on the recommendations from the NatureServe Canada 2021-2022 Scoping Report, which provided a comprehensive analysis of the project's goals, processes, and expected outcomes. This blueprint has been instrumental in guiding the project team to develop its budget, allocate resources, and formulate annual work plans. Details about the project's strategic blueprint are outlined in Appendix 2.

4.2. Phase I – Framework Development (March 2025)

Currently, we are in the latter half of Phase I. The initial part of Phase I (2023-2024), which began in earnest in November 2023, achieved significant milestones, including the formation of the CTEF Internal Science Team (IST), development of the strategic blueprint, framework hierarchy and concepts, compilation of key biophysical attributes and data layers, and IT and GIS infrastructure development. We also focused on partner engagement, holding initial meetings with provincial, territorial, and federal partners to gauge interest and establish funding mechanisms.

We have planned several key milestones to be achieved by April 2025 (Figure 1). The most significant of which is holding a national meeting of all the P/T representatives to review progress, gather feedback, and finalize the strategic directions for the next phase. Additionally, the development of a cross-jurisdictional scan report and database will help assess what changes to the CTEF will improve its utility.

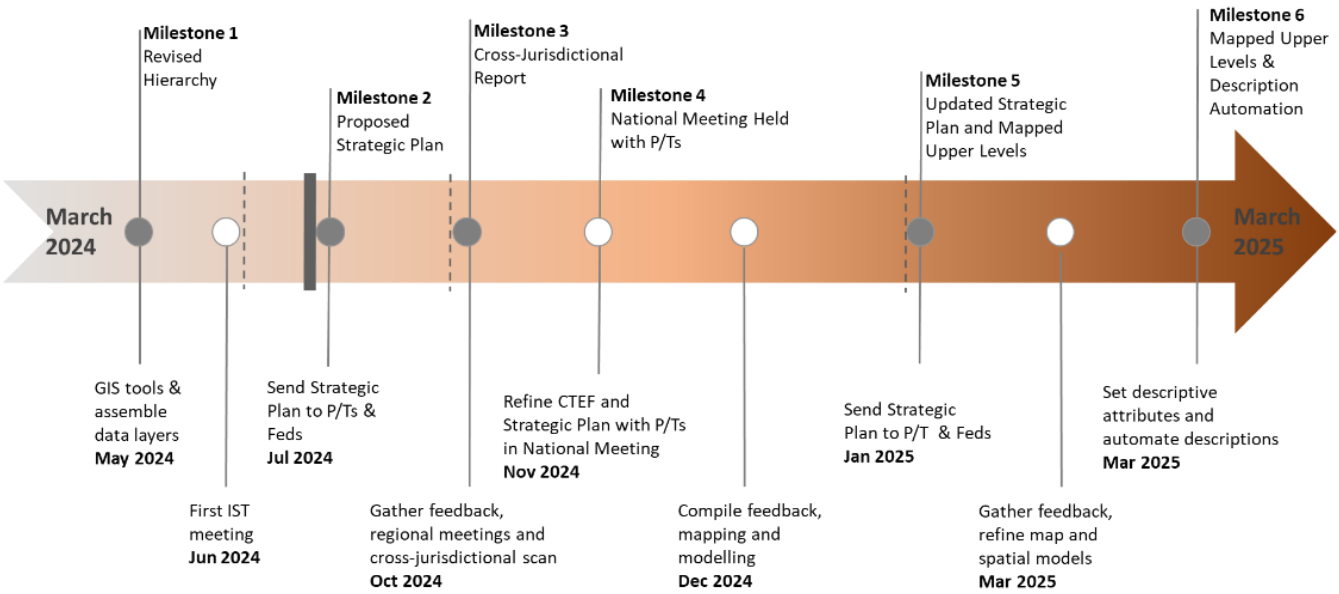

Figure 1 Timeline of Key Milestones for the Canadian Terrestrial Ecological Framework (CTEF) Project (March 2024 - March 2025)

Desired Outcomes:

1. Formation of the IST and establishment of a collaborative framework.
2. Initial development of the CTEF hierarchy and framework concepts.
3. Engagement with provincial, territorial, and federal partners to gauge interest and gather initial feedback.
4. Establishment of a robust IT and GIS infrastructure for data management.

Specific Deliverables:

1. Strategic Plan Document.
2. Initial Database: Key biophysical attributes and data layers.
3. Cross-jurisdictional scale report and database
4. National Workshop

4.2.1. National Workshop and Funding

The first national workshop is planned for November 2024. The format will be designed to facilitate collaboration among provincial and territorial representatives, federal stakeholders, and the Internal Science Team (IST) on the Canadian Terrestrial Ecological Framework (CTEF) project. The primary purpose of these workshops is to review progress, gather feedback, and finalize strategic directions for the CTEF update. The workshops will also provide a platform for discussing challenges and developing solutions collaboratively.

Workshop Structure and Outcomes

The workshops will be structured to include plenary sessions, breakout discussions, and hands-on activities. Each session will focus on key themes identified in the scoping report, such as eco-level naming conventions, attributes for delineating eco-levels, and integrating climate and vegetation data.

The outcomes of these workshops are expected to include:

1. Enhanced alignment and consensus on the eco-level definitions and attributes.
2. Identification of best practices and methodologies for eco-level delineation and description.
3. Development of a collaborative framework for continuous engagement and feedback among all stakeholders.

Proposed Location and Dates

The first national workshop is proposed to be held in Calgary, with potential dates being **November 5-6**, **November 6-7**, **November 19-20,** or **November 20-21.** A poll will be conducted to determine the most convenient dates for the majority of participants. The city of Calgary offers a central location with adequate facilities to host the diverse group of attendees expected at the workshop.

Funding for Participation

To ensure robust participation, funding is available to support provincial and territorial representatives. Each jurisdiction can receive $30,000 annually in the first and second years of the project to cover travel and accommodation expenses, as well as to support their involvement in the CTEF update process (e.g., support work by their government staff and/or hire external contractors to work on their behalf). It is recommended that representatives clear their travel arrangements as early as possible to facilitate smooth planning and participation.

4.3. Phase II – Framework Implementation (March 2026)

This phase involves implementing the developed framework, conducting detailed spatial analysis, integrating partner feedback, and refining the CTEF hierarchy and methodologies.

Desired Outcomes:

1. Implementation of the CTEF hierarchy across jurisdictions.
2. Detailed spatial analysis and partner feedback integration.

Specific Deliverables:

1. Spatial Analysis Reports and Maps for each eco-level.
2. CTEF Framework: Incorporating partner feedback and refined methodologies.
3. Functional IT and GIS Infrastructure: Supporting ongoing data management and analysis.

4.4. Phase III – Finalize and Distribute (April 2027)

The final phase involves completing and distributing the updated CTEF. Activities include quality assurance, stakeholder review, and developing public-facing materials and platforms for broad accessibility.

Desired Outcomes:

1. Development of public-facing materials and platforms for broad accessibility.
2. Official endorsement of the CTEF by federal, provincial, and territorial stakeholders.

Specific Deliverables:

1. Final CTEF Geospatial Database and Maps
2. Peer-reviewed publications
3. Public-facing Website and GIS Web Tools
4. Final Report: Summarizing project outcomes and methods

5. Proposed methodology

5.1. Conceptual framework

A structured ecological land classification, or typology, captures ecosystems from global to local scales and represents both ecosystem function and biodiversity. A systematic typology is essential for organizing ecological knowledge, as it organizes ecosystems into hierarchical levels based on their distinguishing characteristics and functions, capturing their spatial and aspatial attributes. At the top of this classification are realms (terrestrial, subterranean, freshwater, marine, and atmospheric environments). Subsequent levels are nested within each other and characterized by both biotic and abiotic elements.

The following table outlines eco-levels from global to local scales proposed for the CTEF update. The proposed system largely honors the hierarchy established in the 1996 CEF system. We have listed the primary and secondary driving processes emphasized at each level of the hierarchy. These processes can also be thought of as the delineating factors. We have started to build a repository of spatial datasets that best represent these factors. In addition to delineating datasets, we have also identifying attributes that could be used to describe the mapped eco-levels. For now, we have opted not to adhere to any specific nomenclature for each eco-level, referring to them in numerical order, as terms for each eco-level are not universally used by Canada's jurisdictions, and the same term could describe different levels of the hierarchy in different jurisdictions.

We propose to include global and continental ecological systems in the first two levels of the hierarchy, largely incorporating concepts described by Bailey (1998). Below this, four eco-levels of national and regional significance are detailed. Eco-levels 1 to 6 will be mapped elements of the revised CTEF and are nested, meaning the mapped units share delineated boundaries. Eco-levels 7 to 9 are mappable repeating features, non-nested elements, meaning their delineated boundaries do not need to match those of the higher eco-level.

5.2. Summary of alignment across jurisdictions

The 2021-22 CTEF scoping project report provides a comprehensive summary of the similarities and differences between provinces and territories (P/T). This section offers an overview of the major themes from the report. These themes could be used as topics for discussion during the national workshop with the IST, P/Ts, and federal representatives proposed in November. For specific details, readers should refer to the original report.

5.2.1. Eco-level Naming

Provinces and territories that adopted and maintained the 1996 national framework retained the labels ecozone, ecoregion, and ecodistrict. However, variations exist:

1. Ecozones: Labeled as ecodivisions in British Columbia (BC), Level II ecoregions in the Northwest Territories (NT), and Natural Regions (partially) in Alberta (AB).
2. Ecoregions: Labeled as Ecoprovinces in BC, Level III-IV Ecoregions in NT, Natural Subregions in AB, Natural Ecological Regions and Land Regions in Manitoba (MB), and Provinces naturelles in Quebec (QC).
3. Ecodistricts: Not recognized as units in BC, and labeled as Level IV Ecoregions in NT, Landscape Areas in Saskatchewan (SK), Land Districts in MB, and Région naturelle in QC.

5.2.2. Attributes Used to Delineate and Describe Ecoregions

The most frequently used attributes for delineating ecoregions include climate, bedrock geology, surficial geography, soil, and vegetation. Table 1, Section 4.a.iv of the 2022 Scoping Report (Wright et al., 2022) provides detailed information on the attributes used by each P/T. The key points are summarized below:

1. Climate and soil are used by 11 of the 13 jurisdictions.
2. Bedrock/surficial geology and vegetation are used by 8 of the 13 jurisdictions.
3. Specific variables, such as permafrost form, are used in areas where they occur (NT, Yukon (YK), and Nunavut (NU)).
4. Some P/T use detailed climatic variables (raw and derived) to describe ecoregion climates after delineation using other criteria.

5.2.3. Line work Adopted for the 2019 CTEF Pathways Project

Provincial and territorial ecoregion and ecozone delineations were adopted as the framework within which ecoregion mapping was conducted. The 2014 Canadian Council on Ecological Areas (CCEA) ecozones were adopted as the larger framework within which the ecoregions were nested. The following points highlight the key outcomes and challenges encountered:

1. The 2019 map illustrates the variability in ecoregion shapes and sizes across Canada, reflecting high physiographic variability (e.g., the mountains and valleys of BC, YK, NU, and AB; Atlantic, Pacific, and Arctic coastlines; and some Maritime and QC highlands).
2. Detailed representations can result when GIS rules are used to generate boundaries (e.g., the Alpine Natural Subregion in AB).
3. Discordance between provincial lines often results from different mapping perspectives (e.g., QC-NL, QC-ON, MB-ON, AB-NT).
4. P/T worked together to reduce discordance for the 2019 map and were mostly successful.

5.3. Analysis approach to define the new CTEF

The IST's initial approach for key spatial analysis and tools for the project is outlined below. This is just the initial list and will be dependent on additional input and delineation work conducted by the PTs.

5.3.1. Homogeneity tests on eco-levels

To assess internal consistency and differentiate of eco-levels and mapped units, homogeneity assessments will be conducted. These tests will evaluate the uniformity of ecological characteristics within each level and help identify any anomalies or inconsistencies. By applying statistical analyses and spatial metrics, we will ensure that the eco-levels are scientifically robust and accurately reflect the ecological variations across Canada. The characteristics of the mapped elements of the hierarchy may be developed using the lowest eco-levels available across Canada. Additionally, machine learning tools could be developed to build up eco-level units using framework criteria and to help identify delineating boundaries where needed.

5.3.2. Concepts of ecodomains and ecodivisions

The framework will integrate the concepts of ecodomains and ecodivisions as outlined by Bailey (1998). Ecodomains will represent broad climatic zones, while ecodivisions will denote finer climatic subdivisions within these zones. This hierarchical structure will allow for a detailed and scalable classification system that can accommodate various ecological processes and landscape characteristics at different scales.

5.3.3. Climate variability on ecolevels

Climate data will play a role in defining and differentiating eco-levels. The analysis will incorporate both current and historical climate data to understand the variability and trends over time. Detailed climate grids and downscaling models will be used to capture regional climatic differences, particularly in areas with significant topographic diversity. This approach will help in assessing how climate influences ecological patterns and processes, and how it can be used to delineate eco-levels.

5.3.4. Incorporation of vegetation information

Mapped components of the Canadian National Vegetation Classification (CNVC) and known range and extent will be integrated into the CTEF. This involves using detailed vegetation maps and datasets to inform the classification of eco-levels. The goal is to reflect the diverse vegetation patterns across Canada as a reflection of climatic drivers on vegetation patterns. The integration process will ensure that the ecological framework captures both biotic (vegetation) and abiotic (climatic, geological) factors.

Table 1 Proposed Canadian Terrestrial Ecological Framework: Hierarchy levels and drivers

Eco-level	Primary Drivers	Secondary Drivers	Related framework	Scale of Ecological Processes [1]
1	Global climate (precipitation, temperature, humidity, wind). From Köppen's or Thornthwaite's Climatic Classification)	Delineating factor is predominant biome of the IUCN Global Ecosystem Typology (GET) within the Terrestrial realm	Bailey's Domain	1,000 to 10,000 km
2	Continental climate as represented by predominant subbiome/ formation vegetation patterns.	Continental physiography – influence on continental, maritime, or altitudinal influence on macroclimate.	Bailey's Division	500 to 1,000 km
3	Macroclimate (e.g., precipitation, temperature, humidity, wind) as represented by broad physiognomic vegetation types (CNVC division/macrogroup on zonal sites)	Broad landforms	CTEF 1996 Ecozone	200 to 500 km
4	Regional climate as expressed by the pattern of zonal vegetation types at the group level (the group level is a higher-level aggregation of plant associations developed by the Canadian National Vegetation Classification (CNVC).	Characteristic range and pattern in climatic variables including temperature, precipitation and humidity. Reflective of climatic variability within the ecozone.	CEC North American Omernik Framework	100 to 200 km
5	Regional climate as expressed by the pattern of zonal and azonal vegetation types at the group level (CNVC).	Regional landforms, quaternary geology; Soil great group; Bedrock geology (acidic, neutral, alkaline)	CTEF 1996 Ecoregion	50 to 100 km
6	Physiographic features (topography, bedrock and/or relief and surficial geology)	Soil type (local characteristics) and drainage complex; mesoclimate as modified by landscape position and/or elevation (as in mountain regions)	CTEF 1996 Ecodistrict	10 to 50 km
7	Enduring features of the ecodistrict such as soil drainage, topography, and soil texture.		CTEF 1996 Ecosection	1 to 10 km; [2]
8	Ecosites as local segments of the landscape systems of vegetation, soils, site shape and orientation, slope gradient and position, and moisture and nutrient regimes (i.e., ecosystems at the site level.)		CTEF 1996 Ecosite	100 m to 1 km; [2]
9	Uniform observed vegetation (local expression of association or subassociation and disturbance phases) or substrate of an ecosite.		CTEF 1996 Ecoelement	10 to 100 m; [2]

[1] Spatial dimensions over which ecological processes (drivers) operate and interact
[2] Repeating feature, non-nested in the previous level

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Appendix 1: CTEF Origins and History

Original National Ecological Framework of Canada (1996)

1. Full information for this summary is at: https://sis.agr.gc.ca/cansis/nsdb/ecostrat/1999report/index.html
2. A nested hierarchy of ecolevels (Ecozones, ecoregions, ecodistricts) was defined; ecoprovinces were added in 1998 to assist in correlation of North American ecosystems (Commission for Environmental Cooperation (CEC)). The approach was based on concepts developed in the 1970's-'80's.
3. The delineation of ecoprovinces was not an initial goal of the Ecological Stratification Working Group (1996). The development of ecoprovinces in Canada's National Ecological Framework is closely tied to the formation of the Commission for Environmental Cooperation (CEC) in 1994 under the North American Agreement on Environmental Cooperation (NAAEC), a side agreement to NAFTA. This led to an ecological framework addressing environmental concerns shared by Canada, Mexico, and the United States. The Canadian contribution was based on the work of the Ecological Stratification Working Group (1996), with some members also part of the CEC's North American Ecosystem Working Group. The ecoprovinces in Canada reflect the need for a subdivision of ecozones for broad conservation and resource purposes and to correlate ecoregion delineation across the Canada-United States boundary (Commission for Environmental Cooperation 1997). This generalization level, situated between ecozones and ecoregions, was developed for the Canadian framework by Marshall et al. in 1998. A revised attribute database in 1999 included data for this new level of generalization.
4. Goal – "a common ground to report on the state of the environment and the sustainability of ecosystems in Canada"
5. Ecolevel units were based on enduring features (topography, geology, elevation) that determine vegetation and soil patterns. For the 1996 classification, climatic information was included at the ecodistrict level. Unit delineation and description was (and still is) determined by available information and subjective judgement exercised by ecologists.
6. Boundaries are based on recognizable differences between ecolevels units; delineation focuses on causal factors like physiography, but also relies on effects like regional vegetation and soil patterns that reflect climate-topography-geology interplay.
7. Currently, British Columbia, Yukon, Nunavut, Saskatchewan, Manitoba, Nova Scotia and Newfoundland/Labrador use all or parts of the 1996 framework with modifications.

National Revisions (2010 to 2019)

1. A short-term modification to the 1996 ecozone using better information called "Ecozones +" was developed in 2010; it provided the framework for the federal Canadian Biodiversity: Ecosystem Status and Trends 2010 report.
2. The Canadian Council on Ecological Areas subsequently produced an updated ecozones map in 2014 that was produced through collaboration between the provinces and territories (Ecozones Introduction | CCEA-CCAE). Three additional terrestrial ecozones were recognized to facilitate the integration of Canadian and US units within the North American framework (CEC). Marine and terrestrial ecozones were displayed together.
3. In 2017, a national advisory panel developed 38 recommendations to reach Aichi Target 11 protected areas commitments. Two recommendations called for an update of the national ecological framework at the ecoregion scale. Subsequently, a "Pathway" report defining four related priorities specific to Canada was

produced. One of these (Maximize conservation outcomes") called for an updated map of Canada's ecoregions to ensure that the full range of landforms, species, ecosystems and processes are represented by protected areas that would be nested within the 2014 ecozones. This became a goal for subsequent work (2017-19).

4. Between 2017 and 2019, provinces and territories provided their most recent ecological mapping at the ecoregion scale. A seamless layer was created; considerable effort was invested by most adjacent provinces and territories to reach compromises; where this was not possible, the jurisdictional boundary formed the ecoregion boundary.
    - The process was done with the understanding that a national compilation of regional datasets does not influence how individual provinces or territories manage and report based on their own ecological framework.
    - Many, but not all, of the provinces and territories conditionally approved the revised ecoregion map for the explicit purpose of meeting Aichi Target 11 requirements.
    - The approval process was not completed; some jurisdictions did not receive the final report and map. The unofficial updated map and attributes was used by "Pathway" to report on Canada's commitments to Aichi Target 11.

Scoping project 2021-22

In 2021, Environment Canada asked NatureServe Canada to review the 2019 project and propose a way forward. Results were detailed in the report "Canadian Terrestrial Ecological Framework Scoping Project 2021-22" (Wright et al. 2022). The project's main objectives were to:

1. Thoroughly document methods and guidelines used by each province and territory to establish their ecological classifications;
2. Review the 2019 outcome, identify problems with the approach, and propose solutions;
3. Outline methods that could be used to guide consistent mapping, revision and description of Canada-wide ecolevel units; and
4. Propose a work plan for a full national CTEF update.

Important outcomes of the 2021-22 scoping project

1. The provinces and territories (P/T) support an official update, but it must be properly resourced, based on current data, and analyzed using expert knowledge together with current best practices (e.g. GIS and other spatial analysis technology).
2. Environment and Climate Change Canada (ECCC) needs to provide guidance, funding and follow-through for a national update to succeed, as P/T lack the financial resources and often the in-house expertise to examine and revise existing delineations and descriptions.
3. P/T approaches are often inconsistent: ecolevel unit delineation using different attributes, methods, and names; unit description; database management; level of detail; and management applications. Collaboration is necessary to reach an agreement on the best methods and attributes to define a national terrestrial ecosystem framework.
4. The P/T collectively want to go further than line matching across boundaries.
5. A more comprehensive and nationally consistent representation of interacting abiotic factors (hydrology, topography, geology, climate, latitude and proximity to oceans and large freshwater lakes) is needed to delineate terrestrial ecolevel units that are internally consistent but different from their neighbours. These factors control local to global variations in light, water, temperature and nutrients that in turn control the

distribution and abundance of soil, vegetation, microbial and faunal communities that integrate and indicate environmental conditions and are valuable unit attributes.

- The combination of abiotic attributes and their associated biotic communities are recognizable at local to global scales and can be delineated and described.
- Physiographic features and their associated biota characterize units that can be considered as elements of protected area assessments. Ecological characteristics within and between units also provide insights into other resource management issues including for example cumulative change detection due to human and natural disturbances, species at risk mapping, soil carbon changes and shifts over time in native upland and wetland vegetation.

6. At least two national meetings of (ideally) all P/T are needed, where discussions can be held around these concepts.

Appendix 2: Canadian Terrestrial Ecosystem Classification Project Logic Model

Resources/Inputs	Activities	Outputs	Target Audience	Phase I – April 2025 Short Term Outcomes	Phase II – April 2026 Medium Term Outcomes	Phase III – March 2027 Long Term Outcomes
Team Roles • Internal Science Team (IST) and liaison roles to jurisdictions • Dedicated IST coordinator and spatial analyst • NatureServe Canada/US support **Partners** • Jurisdictional representatives • Federal agencies **Funding** • Stable budget for all phases **Data Inputs and Support** • National geospatial layers • North America Ecodomain and Ecodivision layers • Climate surfaces (current and future) • Digital Elevation Model • Jurisdictional regionalization layers and reports **GIS Infrastructure** • Cloud computing infrastructure • Machine learning capabilities • ESRI Online Apps/Hubs **Collaboration and Training** • Microsoft Teams, ClickUp • Capacity building via national meetings	**Activity 1: Develop CTEF hierarchy and methods** • Establish and maintain partnerships through virtual and in-person meetings with IST and partners • Identify delineation and description attributes • Establish regionalization driving factors and processes • Conduct cross-jurisdictional policy scan for CTEF uses • Collaborate with partners to establish reporting needs, peer-review CTEF update, and assess utility • Develop analytic and modelling methods to implement the CTEF conceptual model **Activity 2: Develop and manage IT/GIS infrastructure** • Build database and GIS infrastructure • Develop online GIS App and Hubs for interactive maps and peer review • Create environment to model and assess regionalization hierarchy • Establish process for embedding biophysical attribute data • Identify and support jurisdictions needing technical skill development **Activity 3: Make CTEF Data Available to the Public** • Develop project communications for public releases with ECCC • Ensure federal bilingualism and accessibility requirements (open data) • Scope project website and open science data requirements with ECCC **Monitor and evaluate**: Regularly review progress with partners – adjusting methods and GIS tools based on feedback. Incorporate partner input on public releases, communication strategies, and website features in collaboration with ECCC.	**Primary** • CTEF nested hierarchy mapped from the Ecodomain to Ecoregion (with partial ecodistricts[1]) • Suite of descriptive attributes for the Ecodomain to Ecodistrict levels and summary descriptions from Ecodomain to Ecoregion • Table of uniform naming conventions across levels of the hierarchy cross-walked to jurisdictional names • Final report detailing CTEF framework and methods • Cross-jurisdictional scan report and database • Publications [1]Partial ecodistrict mapping across Canada where it exists or can be developed by jurisdictions **Secondary** • Database and GIS infrastructure • Online GIS Apps and Hubs for interactive maps • IT infrastructure setup documentation • Accessible project website compliant with federal bilingualism requirements • Model and assessment reports for regionalization hierarchy • Process documentation for embedding biophysical attribute data • Communications material	**Federal government** • ECCC (CWS): Reporting and accounting under the Natural Climate Solutions Fund (NCSF) and Canadian Protected and Conserved Areas Database (CPCAD); Bird Conservation Regions • ECCC (CESI): Reporting on CPCAD, Wetlands, and other ecological indicators. • ECCC (STB): National Inventory Report on Greenhouse Gas Sources and Sinks • StatsCan (Economic Statistics Field): Incorporation into the Census of Environment work. • NRCan (Canadian Forestry Service): Accounting for the Natural Climate Solutions Fund (Two Billion Trees); Forest management reports. • AAFC (Science and Technology): Incorporating soil science; historic role in CTEF • IAAC (Strategic Policy and Programs): Reporting on Impact Assessment (IA) and Cumulative Effects (CE), and inclusion in Impact Statements. **Provinces and Territories** • Regional resource management, conservation planning, and aligning with national ecological frameworks. • Conservation Data Centres: Reporting statistics on biodiversity conservation and species at risk management. Used in EBAR. **General Public** • Researchers and Academics: ecological and environmental research, modeling, and analysis. • Conservation Organizations: planning and implementing national and cross-border conservation projects. • Public and Community Stakeholders • Engage with CTEF data through accessible platforms for education, awareness, and participation in conservation efforts.	**Activity 1: Develop CTEF Hierarchy and Methods** • Collaboration: Strong partnerships and communication channels established among partners, facilitating effective collaboration and information sharing. • Clear Framework: A refined conceptual framework, analytical methods, and documented use/policy scenarios, providing a solid foundation for future phases. • Initial Data Collection: Compilation of key biophysical attributes and spatial layers completed. • Alignment and Support: Initial alignment on the methodology and key attributes among partners, with strong support for the project's objectives and method and 2-day national workshop. **Activity 2: Develop and Manage IT/GIS Infrastructure** • Technical Foundation: IT and GIS infrastructure established and data is accessible to partners. • Capacity Building: Identification and enhancement of technical skills and capabilities within jurisdictions, facilitating their active engagement in the project. **Activity 3: Make CTEF Data Available to the Public** • Awareness and Visibility: Increased awareness of the CTEF project and its goals among partners, through initial communications and discussions.	**Activity 1: Develop CTEF Hierarchy and Methods** • Final Approval and Distribution: Distribute the proposed final version of the CTEF framework and map to provincial and territorial governments for review and endorsement • Collaborative Workshop: 2-day workshop with partners to discuss and confirm the CTEF framework using scenarios. • International Advisory Connections: Established connections with U.S. and Mexican colleagues for cross-border alignment. **Activity 2: Develop and Manage IT/GIS Infrastructure** • Data Integration: Integration of ecological land classification and descriptive data from all jurisdictions into the project database. • Dynamic Attribution Development: Initial development of dynamic CTEF data attribution with ECCC for public use. • Technical Support and Training: Funding and support to ensure all jurisdictions can effectively use CTEF tools and data. **Activity 3: Make CTEF Data Available to the Public** • Partner Feedback: Collection and incorporation of feedback from partners on CTEF data and website functionality. • Visibility and Communication: Enhanced public visibility and understanding through targeted communications and outreach.	**Activity 1: Develop CTEF Hierarchy and Methods** • Final Approval and Distribution: Distribute the final version of the CTEF geospatial database to ECCC review and approval. • Completion of Final Report: Finalize and disseminate the approved reports. • **Activity 2: Develop and Manage IT/GIS** Infrastructure • Quality Assurance and Control: Conduct QA/QC of public-facing CTEF geospatial database (s) • Public Data Access: Coordinate with ECCC to make CTEF data and products available on public platforms **Activity 3: Make CTEF Data Available to the Public** • Enhanced Public Access: Launch version 2 of the project website with improved functionality and additional final data products. • Publications and Outreach: Produce publications with IST and partners and coordinate to disseminate information about CTEF applications and promotion of use. • Compliance with Federal Requirements: Ensure all public-facing CTEF data and information meet federal bilingualism and accessibility standards, with support from ECCC for translation and technical implementation.

Appendix 3: CTEF Team and project partners

Internal Science Team

Nadele Flynn is the CTEF Project Team Coordinator and Science Team Co-Lead with Jean-Pierre. She is the primary contact for BC, Yukon, NWT, and Nunavut partners, coordinating funding, logistics, and participation in the project as needed.

Based in Whitehorse, Yukon, Nadele is a landscape ecologist with over two decades of experience in ecological classification and mapping, supported by her background in spatial analysis and ecological modelling. From 2010 to 2024, she led the Yukon government's ecosystem and landscape classification (ELC) and mapping program. Nadele has coordinated several multidisciplinary teams and co-authored reports on vegetation classifications for forested, wetland, and non-forested ecosystems. She led the update of Yukon's ecoregional framework in 2014, which was incorporated into the national Canadian Ecological Framework updates in 2014 and 2019. She has overseen various mapping programs, including mapping Yukon bioclimatic zones and subzones, predictive ecosystem mapping in Yukon's arctic, and developing wetland mapping and classification standards for the Yukon government. Nadele also serves as co-chair of the Canadian National Vegetation Classification Technical Working Group. She is currently pursuing a PhD in dendroecology, focusing on how climate-induced changes affect the resiliency of boreal forest communities.

Jean-Pierre Saucier is the Science Team Co-Lead with Nadele Flynn. He is the primary contact for Ontario, Quebec, Nova Scotia, Newfoundland, New-Brunswick and Prince Edwards Island partners, coordinating funding, logistics, and participation in the project as needed.

Based in Quebec city, Jean-Pierre is a forest engineer graduated from Laval University (Quebec) in forest management and silviculture (B.Sc. 1984 and M.Sc. 1992) and holds a doctorate in forestry sciences from the École Nationale du Génie Rural des Eaux et des Forêts of Nancy in France (Dr.Sc. 1997). He worked for the Quebec government from 1985 to 2021, first in the Forest Inventory Directorate then, in 2008, in the Forest Research Directorate. He contributed to the development of the Ecological Forest and land Classification System of Quebec and was interested in modeling forest growth and yield. He also participates in national and international initiatives in vegetation classification and ecological mapping such as the CNVC, the IVC and the CBVM. Until the end of June 2021, he held the position of Director of Forestry Research and coordinated the many facets of the sustainable forest management research program. His work experience covers the fields of ecological land classification, forest ecology applied to silviculture and modeling of forest growth and yield. He now works as a consultant in national and international ecology and forestry.

Dave Downing is a member of the IST and coordinates the Prairie Provinces (Alberta, Saskatchewan, Manitoba) and works with the IST in the development and refinement of the CTEF, collaborating closely with provincial and territorial representatives to integrate their input.

Based in Spruce Grove, AB, Dave has about four decades of experience with ecological land classification. He has a master's degree (M.E.Des. U of Calgary 1983), specializing in vegetation ecology, soil assessment and geology. He worked with the Alberta government in the 1980's-'90's as a team member on mapping projects (ecodistrict, ecosection, ecosite) mainly in boreal Alberta. From 1996-2015 Dave worked as a consultant and managed teams of up to 25 people conducting detailed ecological surveys (ecosite level) of forest management areas in west-central Alberta and elsewhere. From 2004-2013, he was the lead investigator on an expert team that revised the 1996 national ecozone and ecoregion classification of the NWT and co-authored the Natural

Regions of Alberta report to document similar efforts by an expert team in Alberta. Since 2021, he has assisted NatureServe Canada with a review of the 2019 ECCC CTEF project and with initiatives related to the Canadian National Vegetation Classification.

Kevin B. Knight is a member of the IST and is the project's modeling and spatial ecology lead. He is responsible for developing and managing databases, software, platforms, and tools required for securely working with and storing project CTEF data and derived products. He collaborates closely with IST to identify needed GIS products and to participate in designing appropriate IT infrastructure and processes. Additionally, Kevin Knight has led the creation of communication, project management tools, and file storage infrastructure for the project team.

Kevin brings over two decades of experience in ecology, biodiversity data science, and ecological modeling. His rich career is marked by significant contributions to global species extinction risk modeling, national-scale habitat assessment, developing a monarch butterfly recovery plan, and creating systems for evaluating environmental mitigation programs. Equipped with a PhD in Ecology and Evolutionary Biology from The University of Colorado, an MBA in Sustainable Business from Presidio Graduate School, and a Bachelor's in Ecology and Evolution from the University of California, Santa Barbara. Kevin is passionate about combining datasets, and disciplines, to solve tricky conservation problems. Living in Boulder, CO, his love for the natural world extends beyond work as he enjoys mountain biking and hiking in the Rocky Mountains and around the world.

Don Faber-Langendoen is a member of the IST as well as Senior Ecologist and Conservation Methods Coordinator for NatureServe and provides ecology support for NatureServe Canada: He Serves as a key member of the CTEF Science Team and in this capacity, he advises on ecological land classification and vegetation ecology to support the development of a scientifically robust framework. His role also involves providing input on integration of Canadian National Vegetation Classification system into CTEF.

Based in Syracuse, New York, Don has focused much of his career on the development of ecological classifications, including developing the EcoVeg approach that is the foundation for the International Vegetation Classification, and various national classifications, including the CNVC. He also participated in the development of and publication of the Global Ecosystem Typology. He supports the NatureServe Network in Canada and the U.S. in developing methods for assessing and mapping the condition (ecological integrity) and at-risk status of ecosystems across North America.

Patrick Henry is the Executive Director of NatureServe Canada. He oversees the CTEF project's strategic direction, ensuring alignment with federal, provincial and territorial objectives, as well as managing the funding agreements with ECCC and the subcontracts between NatureServe Canada and its numerous subcontractors (provinces, territories, Conservation Data Centres, independent contractors etc.).

Based in Chelsea, QC, Patrick has over two decades of project management experience working on environmental projects within government and NGOs. He has a bachelor's degree (B.A. Environmental Studies, Trent University 1997) specializing in environmental policy and legislation. Patrick served as Acting Co-Chair of the National General Status Working Group (2009-2010) within ECCC's Canadian Wildlife Service, working with provincial, territorial and federal members to implement that national biodiversity assessment program's work plan. He joined NatureServe Canada in late 2010, serving as Director of Projects, becoming Executive Director in 2013.

Project Partners

Effective collaboration with provincial, territorial, and federal partners is needed for the successful update of the Canadian Terrestrial Ecological Framework (CTEF). This section outlines the process of engaging with key stakeholders and provides a summary of the main contacts involved in the project.

Engagement Process with Provinces and Territories

Engaging with provincial and territorial partners was identified in the scoping report throughout the update process. Initial contacts were made through formal communications, inviting key representatives from each jurisdiction to participate in the process. This collaborative approach aims to incorporate regional expertise and address the specific ecological needs of each province and territory. Below is a list of the primary contacts from each jurisdiction who have been invited to contribute to the CTEF update.

Table 2 List of provincial and territorial partners by position within the jurisdiction identified as key contacts for the CTEF update 2023-2027

Jurisdiction	Position within the Provincial/Territorial Government Agency
G\vernment of Alberta	Manager Crown Land Policy, Conservation and Recreation; Public Lands Policy Section; Environment and Protected Areas
	Environment and Protected Areas; Public Lands Policy Section; Director Public Land Policy
Government of British Columbia	Ministry of Environment & Climate Change Strategy; Environmental Sustainability and Strategic Policy Division; Knowledge Management Branch; Ecosystem Information Services; Provincial Bioterrain Specialist; Section Head
	Ministry of Forests, Lands, Natural Resource Operations and Rural Development; Research Branch; Provincial Research Ecologist
Government of Manitoba	Department of Economic Development, Investment, Trade and Natural Resources; Stewardship and Resource Development Division; Inventory and Analysis; Section Manager
	Department of Agriculture and Resource Development; Land Use and Ecosystems Resilience Branch; Soil Survey Specialist
Government of New Brunswick	Natural Resources and Energy Development; Renewable Resources Inventory Section; Coordinator
Government of Newfoundland and Labrador	Department of Environment and Climate Change; Policy, Planning and Natural Areas Division; Natural Areas Manager
Government of Northwest Territories	Environment and Natural Resources; Climate Change Adaptation Ecologist
	Department of Environment and Climate; Wildlife Biologist (Biodiversity)
Government of Nova Scotia	Natural Resources and Renewables; Provincial Ecosystem Scientist
Government of Nunavut	Department of Environment; Land Use Environmental Assessment Advisor
	Department of Environment; Director Environmental Protection
Government of Ontario	Ministry of Natural Resources and Forestry; Science and Research Branch; Natural Heritage Information Centre (CDC) Coordinator
Government of Prince Edward Island	Environment, Energy and Climate Action; Fish and Wildlife; Conservation Biologist
Government of Quebec	Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs (MELCCFP); Direction générale de la conservation de la biodiversité; Direction de la connaissance écologique; Écologue (Ministry of the Environment, Climate Change, Wildlife and Parks; General Directorate of Biodiversity Conservation; Directorate of Ecological Knowledge; Ecologist)
Government of Saskatchewan	Ministry of Environment; Fish and Wildlife Branch; Conservation Data Centre Manager
Government of Yukon	Department of Environment; Fish and Wildlife Branch; Manager Habitat Programs
	Department of Environment; Parks Branch; Park Planner

Collaboration with Federal Partners and Stakeholders

In addition to provincial and territorial partners, we are working closely with Environment and Climate Change Canada (ECCC) to identify relevant federal agencies and stakeholders. These federal partners are essential end-users of the CTEF, and their involvement ensures that the framework aligns with national reporting and conservation priorities. The following table lists the federal agencies, along with their respective departments, branches, and directorates that are involved in the CTEF project.

Table 3 List of federal government agencies that are end-users of the CTEF

Department	Branch	Directorate	Division
Environment and Climate Change Canada **(ECCC)**	Canadian Environmental Sustainability Indicators (CESI)	Sustainability Directorate	Information and Indicators Division
	Canadian Wildlife Service (CWS)	Strategic Priorities	Priority Species / Priority Places
		Protected Areas	Protected Areas Program
		Wildlife Management	Wildlife Management and Regulatory Affairs
	Science and Technology Branch (STB)	Science Reporting and Assessment	Pollutant Inventories and Reporting Division / Substance Prioritization, Assessment and Coordination Division
Statistics Canada **(StatsCan)**	Economic Statistics Field	Agriculture, Energy and Environment Statistics Branch	Environment Accounts and Statistics Division (Census of Environment)
Natural Resources Canada **(NRCan)**	Canadian Forestry Service	Science Policy Integration Branch	Strategic Science Policy and Engagement Division / Research Coordination and Integration Division
		Trade, Economics and Industry Branch	Natural Climate Solutions Division
		Pacific Forestry Centre	Forest Information
	Lands and Minerals Sector	Geological Survey of Canada	Central division
	Strategic Policy and Innovation Sector	Canada Centre for Mapping and Earth Observation	Canada Centre for Remote Sensing
	Climate Change Impacts and Adaptation Division		
Agriculture and Agri-Food Canada **(AAFC)**	Science and Technology	Partnerships and Planning Directorate	Integrated Planning and Reporting Division / Science Partnerships Division / Science and Policy Integration Division
Impact Assessment Agency of Canada **(IAAC)**	Strategic Policy and Programs	National Programs	Operational Policy