Mainstreaming the Yukon Ecological and Landscape Classification Program

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2 EXECUTIVE SUMMARY

2.1 INTRODUCTION

Ecological and Landscape Classification (ELC) is an approach to describing and mapping landscapes based on the integration of vegetation, climate, and soil information. This information can support a range of applications including land use planning, environmental assessment, forest management, land and resource development, habitat management, and risk assessments, as it provides an understanding of ecosystem interactions. ELC has a long history of use across Canada, but is a fairly new development in Yukon.

This research supports the Yukon Government's ELC Program by providing insight into resource managers' perceptions about ELC, and determining whether the current program is satisfying their needs. It offers recommendations for encouraging the use of ELC products by resource managers, a process referred to as mainstreaming.

Broadly speaking, the research addresses whether the ELC Program is meeting the strategic goals set out in Yukon Environment's 2013 document, *Yukon Ecological and Landscape Classification (ELC) Program: Five-Year Strategic Plan*. To make this determination, the specific questions addressed in this research are:

- To what extent and in what way do resource managers use the ELC products offered by the Yukon Government (see Appendix A)?
- Do resource managers see additional or future uses for ELC products in their field?
- What do resource managers need in order to integrate (or further integrate) ELC products into their practice or policy?
- Are there ways for the ELC Program to encourage the adoption of ELC products by resource managers?

2.2 METHODS

A literature review of three areas—program evaluation, ELC use across Canada, and marketing—and interviews of Yukon resource managers provide information to answer the above research objectives. Program evaluation, i.e. methods to determine if a program is meeting the needs of its users, supports the broad intention of this research to see whether the ELC Program is meeting its strategic goals (Appendix B). Examining how ELC is integrated in other Canadian jurisdictions provides a comparison for the approach that Yukon's ELC Program has taken. It can help to identify potential areas to integrate ELC products into policy or practice. Finally, reviewing marketing techniques for ecological products can identify ways to encourage the adoption of ELC products by resource managers.

Key Yukon resource managers were interviewed in a semi-structured manner to provide opportunities for the interviewees to influence the course of the interview towards areas they feel are more important. Participants with experience and knowledge of ELC and who represent a varied and balanced perspective on the ELC Program were recruited. The ELC Coordinator played a valued part in this process by identifying 48 key stakeholders in a range of management areas and introducing the research to them. The ELC Supervisory Committee reviewed the selected interview participants and recommended further additions to ensure a varied, unbiased, and representative group.

Of the 48 individuals that the ELC Coordinator contacted, 24 participated with 58% from Yukon Government, 21% from non-governmental organisations, 13% from First Nations governments, and 8% from industrial consulting firms. To maintain confidentiality, the interviewee data were coded for the analysis. The researcher used an excel sheet to track and group interview responses into categories or themes that emerged from the interviews.

This research used an ecosystem approach to management model developed by Gray and Davidson (2000) and expanded upon by Gray (2012) as a conceptual framework. The framework allows an evaluation of the ELC Program through a sustainability lens, and focuses on three themes: place-based and time-based perspectives, community-empowered conditions, and knowledge-driven programs. Throughout this research paper, the three themes provide a structure for the discussion of ELC programming.

2.3 FINDINGS

The 24 semi-structured interviews with Yukon resource managers were developed to answer the main objective of this research: to determine if the ELC Program is meeting the strategic goals set out in Yukon Environment's 2013 document, *Yukon Ecological and Landscape Classification (ELC) Program: Five-Year Strategic Plan*. Generally, interviewees reported three different categories of use for ELC resources: planning activities, environmental assessments, and research. Additionally, some interviewees identified that they were current or potential contributors to ELC data. Variations between common views of interviewees occurred along management areas and the categories of use that interview participants had for the ELC Program and its resources. The key findings under each of the three themes from Gray's (2012) ecosystem approach to management are presented below.

Place-based and time-based perspectives:

- The conceptual delineation of the ecoregion (the unit of ELC classification) is not necessarily meaningful for the management activities of the interview participants.
- 14 of 24 interviewees wished to incorporate ELC into their own spatial delineations such as planning regions or traditional territories.
- Although ELC products are available on a local or regional scale, 10 out of the 24 interviewees reported that they require information at a territorial scale. All of the interview participants stated that it is ideal to have ELC products available across the territory.
- There is uncertainty among respondents about where ELC products are available.

Community-empowered conditions:

- There was consensus that ELC provides an opportunity to work across management areas; 12 interview participants stated that ELC provides a common language for resource managers.
- The institutional context of the ELC program could have an effect on its uptake in different management areas; three interviewees suggested moving the program from Environment Yukon.
- Eight participants who represented every recruitment group noted that the program would benefit from top-down direction requiring its use in management and land-use planning.

Knowledge-driven programs:

- Interviewees are concerned about the ability of the ELC Program to be knowledge-driven due to a lack of ecological data across the territory.

- 75% of interview participants cited knowledge of ELC or ability to interpret ELC information as a barrier to its implementation in the territory.
- There is high correlation between those with a high level of training and current integration of ELC into practice; however, 10 of 24 interviewees reported low or moderate training.
- Contributors to ELC data are concerned with effectiveness (the time and money it takes to collect information), while users reported that accessibility, interpretation, and regulation of ELC are their main issues.
- Despite its barriers, 23 of the 24 interviewees stated that they are interested in using ELC products if they do not already.

The findings under each theme are related to outcomes from the *Five-Year Strategic Plan* (see Appendix B). While there is progress towards most outcomes, the ELC program has not met target dates for achieving these outcomes.

2.4 OPTIONS FOR CONSIDERATION

This research determined that a marketing approach and a policy/best practice integration approach could help to mainstream ELC into research management. These options could be implemented simultaneously, in sequence, or individually, depending on the clients' needs.

1. **Focus on Accessibility and Interpretation**
   A focus on accessibility and interpretation is an approach that uses marketing techniques to develop a strategy that reduces barriers to the behaviour to be promoted, while simultaneously increasing the behaviour's perceived benefits. It addresses the fact that 96% of the interviewees in this research were interested in using ELC, but had difficulty accessing and understanding the information. By creating clarity in language and information on the ELC Program's websites and publications, integrating ELC into popular data sites, and offering further training in concepts and application, the ELC Program can increase its mainstreaming potential.

2. **Focus on Policy or Best Practice Development**
   A focus on policy or best practice development could establish ELC as a 'Yukon way of doing business'. Some of the interviewees identified strategic documents and programming in their areas that could immediately integrate ELC. These areas could be a starting place for mainstreaming the ELC program, because, as stated in the literature and throughout the interviews, the more that the program is used, the more it will be used. This strategy has the potential to advance all of the outcomes under goals three and four of the *Five-Year Strategic Plan*.

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5 INTRODUCTION

Ecological and Landscape Classification (ELC) is an approach to describing and mapping landscapes based on an integration of vegetation, climate, and soil information. It can support a range of applications including land use planning, environmental assessment, forest management, land and resource development, habitat management, and risk assessments (Yukon Environment, 2013, p. 4). ELC has a long history of use across Canada, but is a fairly new development in Yukon. Formal introduction of the program into the Yukon government occurred in 2002 with dedication of resources to the program in 2009; there is ongoing development of ELC information and resources (Yukon Environment, 2013, p. 7). This research serves to support the ELC Program by providing insight into the views that resource managers hold about ELC in general, and determining whether the current program is satisfying their needs. This research also offers recommendations for encouraging the use of ELC products by resource managers, a process referred to as mainstreaming.

Broadly speaking, this research intends to address whether the ELC Program is meeting the strategic goals set out in Yukon Environment's 2013 document, *Yukon Ecological and Landscape Classification (ELC) Program: Five-Year Strategic Plan* (see Appendix B). In order to reach that broad goal, the specific questions addressed in this research are:

- To what extent and in what way do resource managers use the ELC products offered by the Yukon Government (see Appendix A)?
- Do resource managers see additional or future uses for ELC products in their field?
- What do resource managers need in order to integrate (or further integrate) ELC products into their practice or policy?
- Are there ways for the ELC Program to encourage the adoption of ELC products by resource managers?

The remainder of this report consists of the following seven sections: background, conceptual framework, methodology, literature review, interview findings and discussion, options for consideration and conclusion. The background section describes the project client, provides an overview of ELC in Yukon, and reviews the decision makers and main processes for resource management in Yukon. The conceptual framework describes Gray and Davidson's (2010) and Gray's (2012) idea of an ecosystem approach to management—a framework that provides a foundation for this research. The methodology section discusses this research's method of conducting a literature review and the choice and process of semi-structured interviewing. The literature review reviews program evaluation, describes mainstreaming of ELC across Canada, and describes marketing for ecological products. The findings and discussion section analyses the results of the interviews and the findings from the literature review using the themes from the conceptual framework. The final sections of this research are a set of options for encouraging the uptake of the ELC Program by resource managers and a conclusion.

6 BACKGROUND

This section describes the project client and why the research is important and relevant to the client. It also provides a brief overview of the concepts of ELC and a history of its adoption across Canada and in Yukon. This section concludes with a review of the decision makers who have jurisdiction over resource management, and an overview of the land-use planning and environmental assessment processes in Yukon.

6.1 PROJECT CLIENT AND PROBLEM

The client for this project is the Coordinator of the Yukon Government's ELC Program. The ELC Program is in the Policy and Planning Branch of Environment Yukon and works to lead, manage, and implement ELC with support from the Fish and Wildlife Branch, the Information Management and Technology Branch, and the Department of Energy, Mines and Resources. The ELC Program has four goals (below) and multiple objectives, written out in full in Appendix B.

The goals of the program are to:

1. Input high quality, well-managed and accessible data.
2. Establish a classification and mapping framework and standards for Yukon landscapes.
3. Support and inform sustainable and integrated resource management.
4. Deliver a strong, supported program with the capacity to meet demands (Yukon Environment, 2013, pp. 14-17).

The ELC Program strives to meet its goals while continuing to collect baseline input data needed for the creation of its resources;[1] an ELC Technical Working group provides technical expertise to the Program in developing its products. Additionally, an ELC Supervisory Committee manages the program in cooperation between Environment Yukon and the Department of Energy, Mines and Resources (Yukon Environment, 2013, p. 12). The ELC Program Coordinator is looking to determine whether the Program is delivering ELC services and support in a manner consistent with its goals.

This research is an independent study of the how well the ELC Program is meeting its third and fourth goals and how it can better meet them. It provides insight into the views of the targeted user groups in order to better position the ELC Program to deliver services and support. This research can also inform the ELC Coordinator's annual report to the ELC Supervisory Committee on whether the program is meeting its goals.

6.2 OVERVIEW OF ECOLOGICAL AND LANDSCAPE CLASSIFICATION IN YUKON

Depending on the jurisdiction and academic background of the practitioner, Ecological and Landscape Classification (ELC) can refer to different classification techniques. At a broad level, the Government of Canada supported a national initiative to develop and map ecoregions across the country (Jones et al., 2008, ch. 3, p. 4). They used Ontario's Hierarchical Eco-regional Framework as the basis for the National Ecological Framework of Canada, which continues to provide high-level maps for strategic planning purposes (Flynn, 2014, p. 22). At the largest and most basic scale, Figure 1**Error! Reference source not found.** illustrates the ecozones of Canada. Because of the National Ecological Framework of Canada, all provinces and territories across Canada have some level of ELC system, but they use different

[1] Appendix A provides descriptions of the resources and their current state of development.

classification methods to maintain ecological mapping. In the Yukon context, the ELC Program utilizes bioclimate and ecoregion classification methods.

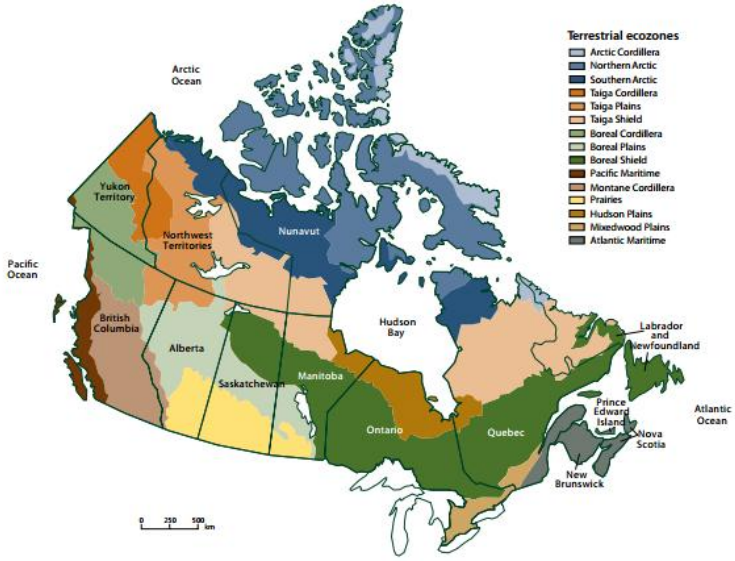

Figure 1. The 15 ecozones of Canada. Reprinted from *Adapting sustainable forest management to climate change: a systemic approach for exploring organizational readiness* (p. 5). by P.A. Gray, 2012, Ottawa, Ontario: Canadian Council of Forest Minsters.

Bioclimate classification can be considered a bottom-up method that relies on a good understanding of ecology at a local scale, i.e. it requires detailed site-specific information (100m to 1km scale). The information is gathered at the most specific level first (ecosite level), which then feeds up the classification as it is generalized to regional scales, see Figure 2 (Flynn, 2014, p. 12-14). These vegetation associations (the relationship between the climate conditions, site characteristics, and vegetation) take time to build and represent in map form and therefore may not be suited for managers working under pressing timelines (N. Flynn, personal communication, February 27, 2015).

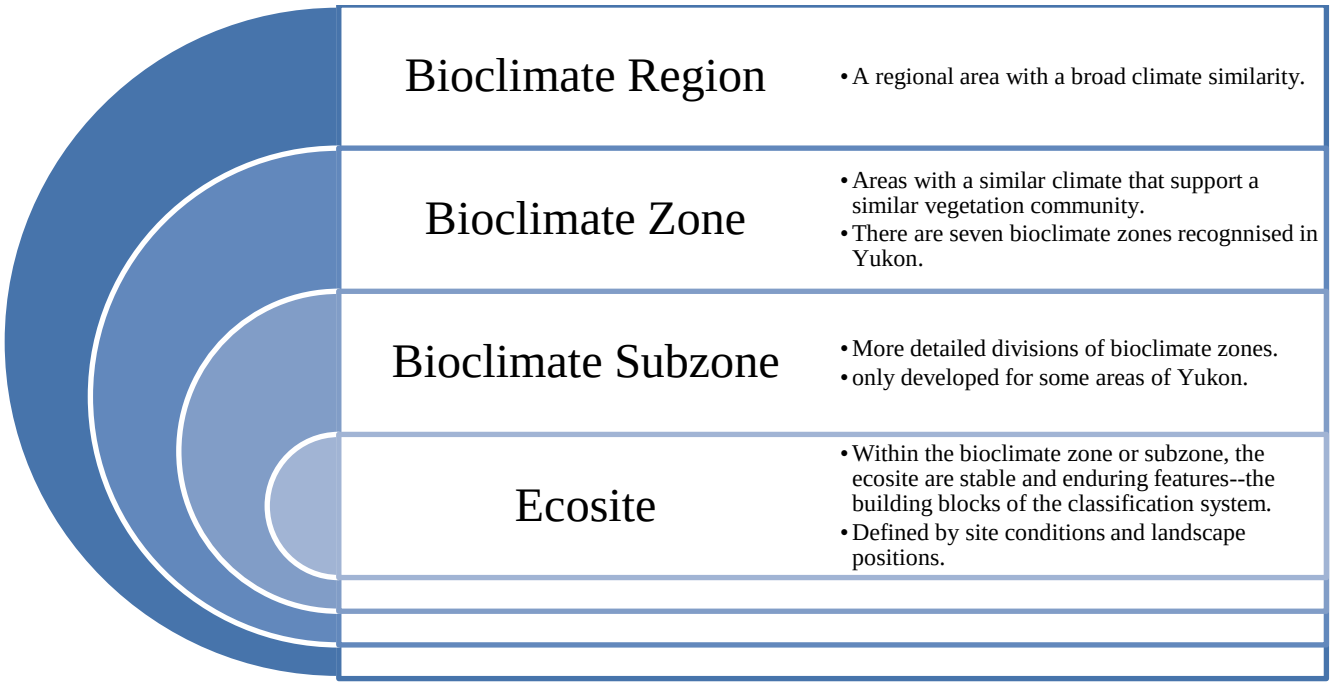

Figure 2. The framework of bioclimate classification. Adapted from *Yukon Ecological and Landscape Classification Guidelines.* (pp. 12-14). By N. Flynn. 2014, unpublished manuscript.

Ecoregion classification is top-down; its focus is on broad physiographic and general vegetation patterns that are observable at a landscape scale (Figure 3). Generally, the top-down classification maps and documents ecological relationships at a regional scale (10-100km) and is relatively quick to produce (N. Flynn, personal communication, February 27, 2015). Even at the most specific level, one would not be likely to notice a marked change from one ecosection to the next while walking through the landscape. Although this may not support the detailed mapping requirements of some sectors, this level of detail may meet the needs of strategic management (Flynn, 2014, p. 11).

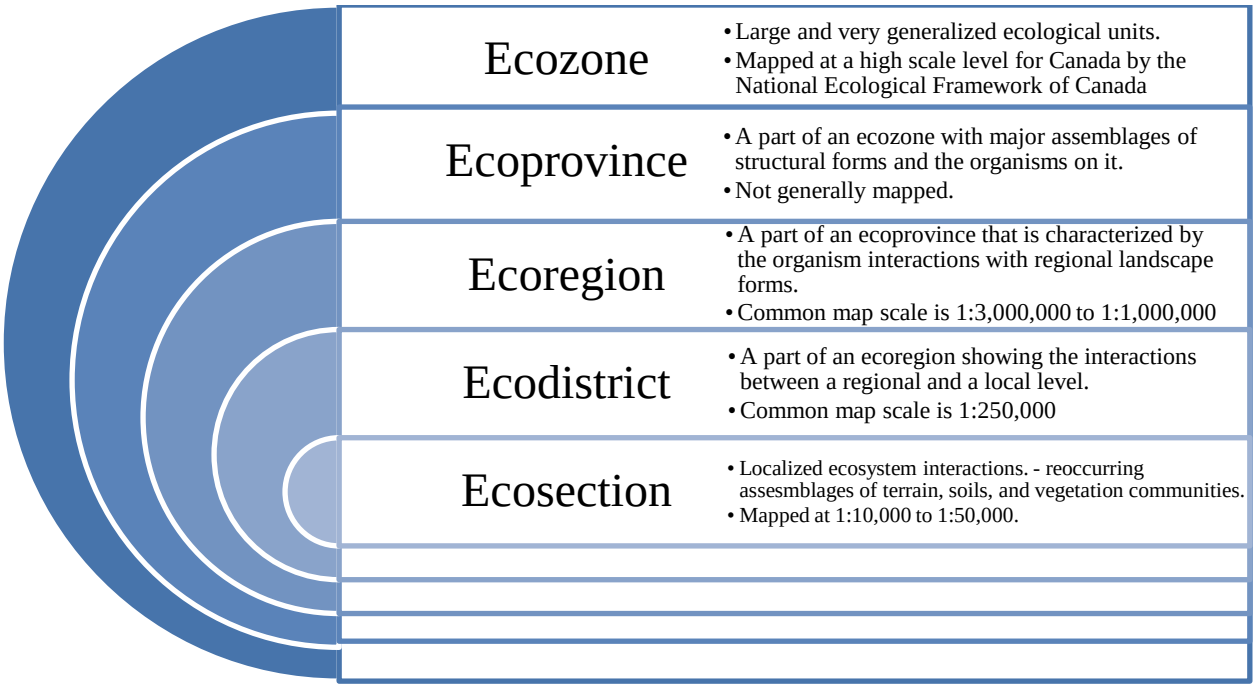

Figure 3. The hierarchical framework of ecoregion classification. Adapted from *Ecoregions of the Yukon Territory: Biophysical properties of Yukon landscapes* (p. 5). By C.A. Smith, J.C. Meikle, & C.F. Roots (editors). 2004, British Columbia: Agriculture and Agri-Foods Canada.

The Yukon ELC program employs both methods of ecosystem classification to provide an understanding of the dynamic interactions of organisms with the physical environment. Both ecoregion and bioclimate approaches integrate vegetation, site, and climatic conditions into a classification framework but the systems have different data requirements and timeframes for development (N. Flynn, personal communication, February 27, 2015). Using both approaches in a complementary manner corresponds with many authors' suggestions for using ecological (bioclimate) classification for detailed on-the-ground determination of the ecology of an area and landscapeological (ecoregion) classification for strategic level needs (Jones, Albricht, Rosie, & McKenna, 2008, ch. 4, p. 3; Sims, Corns, & Klinka, 1996, p. 1; Flynn & Francis, 2011, p. 7).

In order to oversee the ELC progression in Yukon, the territorial government established a multi-agency biophysical mapping technical working group in 2002. This group worked with other stakeholders in developing mapping products and resource planning documents over a 10-year period, finally developing the Yukon ELC Framework (Flynn & Francis, 2011). The Framework guides classification of Yukon's ecosystems with consideration of unique factors affecting the north (e.g., permafrost and extreme temperature variations) (Flynn & Francis, 2011, p. 16). For a map of the ecoregions in Yukon, see Appendix C. The Yukon Government is committed to the continuation of ELC coordination in Yukon according to the ELC Program's *Five-Year Strategic Plan* (Yukon Environment, 2013, p. 7).

With this commitment in mind, the ELC Program is developing a *Yukon ELC Guidelines* document to inform resource managers about the availability and use of the different ELC products that are available (Flynn, 2014, p. 9). This document is the first ELC standards for Yukon and includes technical mapping guidelines (Flynn, 2014, p. 10). The National Ecological Framework of Canada's map (Figure 1) is at too large a scale to be useful for resource managers' decision-making needs at a local scale; the Yukon ELC Program classification of local ecosystems can be mapped for management at scales ranging from

1:10,000 to 1:50,000 scale (Flynn, 2014, p. 19). Appendix A lists the ELC products that the Yukon Government is developing or has available for use by resource managers.

There are many opportunities for integration of ELC into resource management in Yukon. To date, managers have primarily used the ELC in Yukon protected area systems, regional planning and specific community management planning projects (Flynn, 2014). However, there is ongoing land-use planning throughout Yukon. As seen in **Error! Reference source not found.**, the 2014 report on environmental indicators shows that 43 areas in Yukon currently have land-use and resource management plans in place, while 12 more are underway (Environment Yukon, 2014, p. 2).

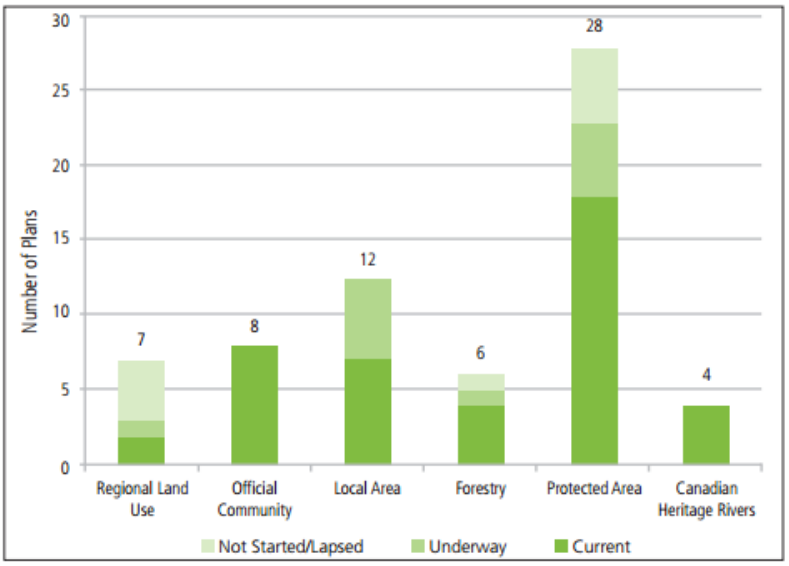

Figure 4. Status of land-use, forest resources, and official community planning processes in Yukon. Reprinted from *Yukon State of the Environment: A Report on Environmental Indicators – 2014* by Environment Yukon, 2014. Retrieved from http://www.env.gov.yk.ca/publications-maps/documents/SOE_2014_Web.pdf

To support and inform sustainable and integrated resource management and deliver a high quality program, the Yukon Government is interested in the views of resource managers' who have a need for/basis in ecological and landscape classification.

6.3 Resource Management Decision-Makers

In order to examine the needs of resource managers in Yukon, it is important to first understand the division of jurisdiction over resources in the territory. As a whole, Yukon has obtained jurisdictional powers similar to those of a province through the process of devolution; in 1998, the process initiated with the territory taking over control of oil and gas. The April 1, 2003 *Devolution Transfer Agreement* implemented the transfer of responsibility for public lands, forests, water and minerals, and gas and coal from the federal government to the Yukon Government. The territorial government is now responsible for all resource management except for international and interprovincial pipelines and offshore management, which are controlled federally (Energy, Mines and Resources, 2014).

In Yukon, 11 of the 14 First Nations have concluded land claim agreements giving them ownership and jurisdiction over resources (for a map of the traditional territories of Yukon First Nations, see Appendix D). The management situation for First Nations who have concluded agreements is very different from

those who have not. For this research, the discussion only consider resource management for First Nations who have concluded land claim agreements, as all of the First Nations governments that were involved in this research have done so.

Land claim agreements in Yukon agreements all occur through the Umbrella Final Agreement (UFA), a framework agreement for all Yukon land claim negotiations and settlements. Individual First Nations agreements include all of the provisions of the UFA as well as specific provisions for that First Nation. There are three types of settlement land in the agreements:

- **Category A settlement land**
  The Yukon First Nation has complete ownership of the surface and sub-surface of the land.
- **Category B settlement land**
  The Yukon First Nation has rights to only the surface of the land. There is no right to mines and minerals on this land, but there can be Specified Substances Rights, which is the right of a Yukon First Nation to take and use designated substances without paying royalties.
- **Fee simple settlement land**
  The land is owned under the same type of title as is commonly held by any individual who owns land (Council of Yukon First Nations, 2013, p. 11-12).

Any lands within First Nation traditional territory that are not one of the three types of settlement land above do not have Aboriginal title (Council of Yukon First Nations, 2013, p. 11-12).

Table 1 summarizes the jurisdictional division between the three levels of government in Yukon (excluding municipal governance as they are not largely involved in resource management). It describes the primary role and responsibility of each government body for each resource that is managed.

Table 1
Roles and responsibilities for resources of three levels of Yukon governance.

	Government of Yukon	Yukon First Nations	Government of Canada
Fish and wildlife (Council of Yukon First Nations, 2013; Yukon Water, 2013)	• Yukon Government has the final authority for management of fish and wildlife, but they must consider all recommendations and decisions made by the Yukon Fish and Wildlife Management Board (nominated half from government and half from First Nations) and the Renewable Resources Councils (created through the UFA).	• Yukon First Nations have the right to harvest fish and wildlife within traditional territory, on settlement land, and on vacant crown land. • The UFA set up the Yukon Fish and Wildlife Management Board as the primary management body for fish and wildlife management, laws, research, policies, and programs. • For each First Nation under the UFA there is a Renewable Resources Council responsible for management of fish and wildlife in the traditional territory.	• Fisheries and Oceans Canada reviews any project that might affect fish or fish habitat.
Forest resources (Energy, Mines and Resources, 2015; Council of Yukon First	• The 2011 *Forest Resources Act* sets out how forest resources management planning takes place, how forest resources and tenure	• Chapter 17 of the UFA states that each Yukon Forest Nation shall own, manage, allocate, and protect the forest resources on its settlement lands.	• N/A

Nations, 2013)	are allocated, and the procedure for licencing and permitting. • Any project that involves clearing trees must submit a YESAB application; recommendations for whether the project proceeds or not are submitted by YESAB to Yukon Government Forestry.	• First Nations are involved in strategic planning for Forest Management Plans when their territory is concerned. • First Nations have opportunity to comment on Timber Harvest Plans, Woodlot Plans, and harvesting licences through the YESAB process.	
Non-renewable resources (Energy, Mines and Resources, 2014; Council of Yukon First Nations, 2013)	• Owns oil and gas resources on Yukon public lands and has legislative authority over them. • Responsible for surface access and permitting. • Developing a common regime for oil and gas in cooperation with Yukon First Nations.	• With settled land claims, own oil and gas resources on their Category A Settlement Lands; • With settled land claims, have jurisdiction and legislative authority over their resources – implemented when they enact their own laws; • With settled land claims, are responsible for authorizing surface access on Category A and B Settlement Lands; • Developing a common oil and gas regime in cooperation with the Yukon Government.	• Has jurisdiction over the Beaufort offshore. • Has jurisdiction over international and interprovincial pipelines. • Has responsibility for authorizations when federal laws apply.
Special management areas such as national wildlife areas, parks, heritage sites, etc. (Council of Yukon First Nations, 2013)	• Management plans for special areas are develop jointly by Yukon Government and First Nations. • All national parks are planned, established, and managed according to the *National Parks Act.*	• Management plans for special areas are develop jointly by Yukon Government and First Nations. • A special management area may not include settlement land without the consent of the affected First Nation.	• N/A
Water (Yukon Water, 2013)	• Environment Yukon's Water Resources Branch develops plans and policies for water management and enforces the *Water Act.* Water Resources Branch also issues water licences and ensures compliance with them. • Energy, Mines and Resources protect water resources with regard to mining. • Community Services manage water for Yukon unincorporated communities	• As set out in the UFA and individual provisions, Yukon First Nations have rights for the use and protection of water on settlement lands. They have a right to use water for trapping, non-commercial harvesting, and traditional heritage, cultural, and spiritual purposes. • One third of the members on the Yukon Water board are nominated by the Council of Yukon First Nations.	• Environment Canada monitors environmental contaminants in water and is responsible for environmental emergency response (i.e. flooding). • Aboriginal Affairs and Northern Development Canada provides training for/deliver of safe water and effective wastewater systems for First Nations.

	and provides advice to municipalities and First Nations. • The Executive Council Office administers the water licensing process and supports the Yukon Water Board (which advises government and First Nations).

The roles and responsibilities described in the above table feed into two important processes in resource management: land-use planning and environmental assessment.

6.4 Land-Use Planning and Environmental Assessment in Yukon

Chapter 11 of the Umbrella Final Agreement dictates the land-use planning process for Yukon. It also describes the involvement of different agencies including the First Nations groups whose traditional territory is concerned, the Land Use Planning Council, the region's Land Use Planning Commission, and the Government of Yukon (Council of Yukon First Nations, 2013).

The Land Use Planning Council is a neutral body responsible for bringing concerned parties together in a land-use planning process. In most cases, the two concerned parties are the Yukon Government and the affected Yukon First Nation. The Council makes recommendations about land-use planning to both parties, but is not responsible for making the decisions. The Council also helps to form the Regional Planning Commissions, which are non-government bodies that develop a land use plan for a specific region. The Council and Commission review information about the ecology, fish and wildlife, and socio-economic values in a region to make planning recommendations (Yukon Land Use Planning Council, 2014).

For planning purposes, there are eight planning regions in Yukon with different boundaries than those previously defined in the ecological context (Appendix E); they are based on the traditional territories of First Nations (Appendix D). Thus far in Yukon, only the North Yukon has an approved regional land-use plan. The Peel region developed a plan but it is not approved and the Dawson region is in the early stages of the planning process (Yukon Land Use Planning Council, 2014). The Yukon Land Use Planning Council commonly uses ecoregion and broad ecosystem mapping to characterize planning areas, but none of the guidelines for the planning process detail how to gather or present information about the landscape and ecology of an area (N. Flynn, personal communication, February 27, 2015).

Overall, the Regional Land-Use Plans guide resource management in Yukon, aided by the expertise of the natural resource managers in each jurisdiction (outlined in Section 5.2.5 above). Depending on the scale and disturbance level of a proposed development, the proponent of a project might need to submit an application for an environmental assessment to the Yukon Environmental and Socio-Economic Assessment Board (YESAB). Schedule 1 of the *Yukon Environmental and Socio-Economic Assessment Act* (2009) describes the types of activities that must go through an environmental assessment including: the development of any industrial activity, projects that disturb the land and/or encounter wildlife or water, and projects that clear trees.

There are three levels of environmental assessment in Yukon: assessment by a Designated Office, assessment by the Executive Committee, and a Panel of the Board review. There are six community-

based Designated Offices that handle the majority of environmental assessment reviews; these are located in Dawson City, Haines Junction, Mayo, Teslin, Watson Lake, and Whitehorse. An Executive Committee evaluates larger projects that have the potential for greater impacts. Flow charts for both of these processes are included in Appendix F. If a project has potential to cause significant adverse effects, create significant public concern or if it uses controversial technology, the YESAB assessors may establish a Panel of the Board to take over the assessment (Yukon Environmental and Socio-economic Assessment Board [YESAB], 2014).

When a project proposal is submitted to YESAB, the assessors must ensure that it contains sufficient information on which to base their decision. The information required is on a case-by-case basis; however, there are some guidelines for proponents. The proponent's guide for submissions to a designated office states that accurately describing the project's location is "the starting point for trying to understand the kinds of effects your project may have" (Yukon Environmental and Socio-economic Assessment Board, 2013, p. 9). Projects reviewed by the Executive Committee must have topographic maps of 1:30,000 to 1:50,000 scale showing the project boundaries, a summary of the relevant conditions of the area, and information about the impacted ecoregion (YESAB, 2005). However, neither the guidelines for the Executive Committee review, nor the guidelines for submissions to a designated office give specifications about how to gather or present information about the landscape and ecology of an area.

YESAB maintains an online registry and mapping tool that spatially represents present and past project information. The registry allows a streamlined process for project proponents to upload their information and see the status of their application in context of the local environment. Proponents and assessors use a mapping tool, called the Geolocator, to look at layers of information about the land in relation to the project assessment. They are able to overlay wildlife key habitats, climate, watersheds, and other land values using this geographical information system (GIS). Currently, ELC information is not represented on the Geolocator, but there are vegetation and terrain layers available (YESAB, 2014a).

6.5 SUMMARY

The background information is intended to ground the research analysis and findings in a firm understanding of the project client, the development of ELC in Yukon, and the processes and stakeholders involved in Yukon resource management. The following section describes the conceptual framework, which is used throughout this paper as a guide for discussion and analysis. The conceptual framework is followed by the methodology, literature review, interview findings and discussion, and the options put forward to the ELC Program.

7 CONCEPTUAL FRAMEWORK

The idea that familiarizing resource managers with ELC program tools will enable them to better understand and value ecosystem interactions in their area underlies the idea of incorporating ELC into the policy and practice of resource managers. This understanding and valuing can lead towards more informed management decisions. Gray and Davidson describe this as an ecosystem approach to management and state that:

> If humans subscribe to and apply an appropriate set of values and are equipped with the required knowledge and tools, they can protect and maintain ecosystems, derive a quality existence from them, and simultaneously ensure that opportunities for future generations are retained. (2000, p. 60)

Gray and Davidson (2000) originally developed their model of an ecosystem approach to management for wilderness protection programs; Gray later expanded on the idea for a discussion of forest management's ability to adapt to climate change.

The ecosystem approach to management can be a path for any organization or program towards achieving a sustainable future. Gray and Davidson argue that sustainable living, rather than sustainable development, is the premise of this approach. In their view sustainable development, defined by the World Commission on Environment and Development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (1987, p. 41), is anthropocentric and based on ideas of perpetual economic growth. Instead, they embrace sustainable living as their overarching principle and define it as "a condition or state of ecospheric-human balance that society predicts can be attained and maintained" (2000, pp. 59-60). They feel that sustainable living necessarily includes thinking ahead to challenges presented by a changing climate, and including these as considerations for the decisions made in the organization. Yukon's ELC Program can contribute towards sustainable living by providing an information basis for resource managers to keep informed of how their decisions may affect the ecospheric-human balance.

Gray depicts the ecosystem approach to management in the model depicted in Figure 5, which forms the conceptual framework of this research. It is comprised of three themes and nine interrelated modules, summarized below.

Theme 1: **Place-based and time-based perspectives.** Each manager makes decisions with reference to the specific ecosystems used to access ecological resources, and with reference to the communities that rely on those ecosystems. Their personal timeframe for decision-making and their perspectives of the spatial landscape give context and scale to management discussions. ELC resources can be used both in a spatial analysis (as a map) and in a temporal analysis (a changing climate shifts bioclimate zones over time) to provide context in place and time.

Theme 2: **Community-empowered conditions.** Originally called *Enablers* in Gray and Davidson's (2000) work, these conditions include the philosophy and societal values affecting the mindset of resource managers and the institutional culture, organization, and leadership that affect the decision-making process. Resource managers' decisions are affected by the dynamic between all of the stakeholders in an area—federal, territorial, and First Nation governments, the local community, and any interest groups in that region.

Theme 3: **Knowledge-driven programs.** Thinking and planning strategically for the long term, using programs that are knowledge-based, and employed those programs through every aspect of a system are three way to attain an ecological approach to management. Important aspects (modules) of a knowledge-driven program are data maintenance and dissemination of knowledge as well as adoption of appropriate policy and legislation.

The themes of the ecosystem approach to management are intrinsically linked, and the modules from Figure 5 can be employed in unison to deliver ecologically based programs. Gray (2012, p. 3) suggests that organizations delivering programs that are place-based and time-based, community-empowered, and knowledge-driven are better able to make decisions in an ever-changing environment.

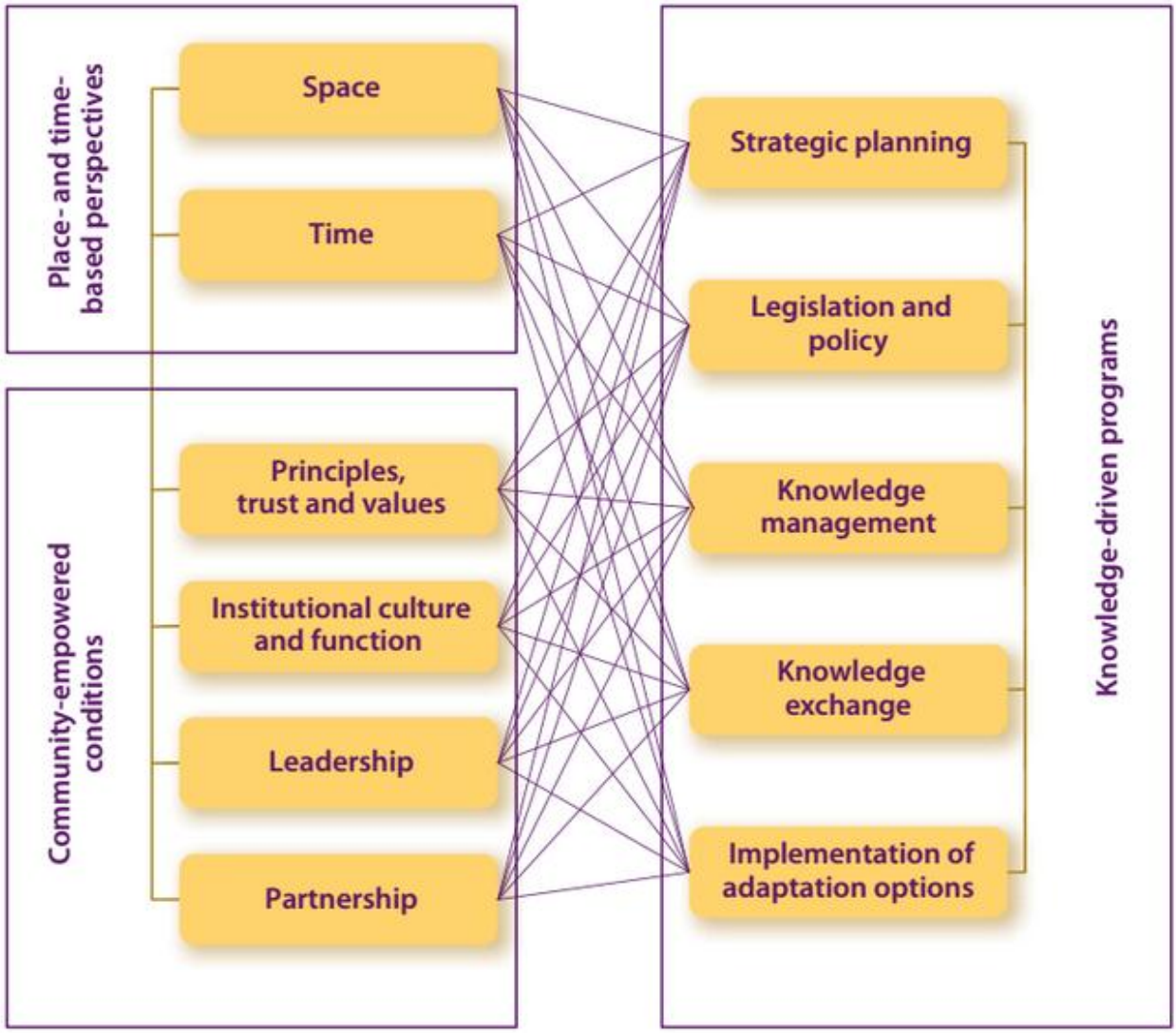

Figure 5. An ecosystem approach to management framework. Reprinted from *Adapting sustainable forest management to climate change: a systemic approach for exploring organizational readiness* (p. 4). by P.A. Gray, 2012, Ottawa, Ontario: Canadian Council of Forest Minsters.

8 METHODOLOGY

The methodology for this research is designed to best answer the four research questions first identified in Section 5.1, and repeated here:

- To what extent and in what way do resource managers use the ELC products offered by the Yukon Government (see Appendix A)?
- Do resource managers see additional or future uses for ELC products in their field?
- What do resource managers need to be able to integrate (or further integrate) ELC products into their policy or practice?
- Are there ways for the ELC Program to encourage the adoption of ELC products by resource managers?

This research begins with a literature review of three main areas: program evaluation, mainstreaming ELC across Canada, and ecological marketing techniques. The review of program evaluation, methods to determining if a program is meeting the needs of its users, supports the broad intention of this research to see whether the ELC Program is meeting its strategic goals (Appendix B). Examining how ELC is integrated in other Canadian jurisdictions provides a comparison for the approach that Yukon's ELC Program has taken; it can help to identify potential areas to integrate ELC products into policy or practice. Finally, reviewing marketing techniques for ecological products can identify ways to encourage the adoption of ELC products by resource managers.

Semi-structured interviews form the foundation of this research and were conducted with individuals that are familiar with ELC. The ELC coordinator identified 48 individuals for this purpose and 24 took part in an interview. The interviewees were from a range of management areas: 14 (58%) from Yukon Government, five (21%) from non-governmental organisations, three (13%) from First Nations governments, and two (8%) were consultants for industrial companies. Semi-structured interviews allow interview participants to give their opinion on the four interview questions. This method allows them to influence the course of the interview and go in-depth in areas they feel are more important. For this reason, interviews are the chosen methodology for this research.

This section first describes the method used to conduct the literature review; it then describes semi-structured interviewing including recruitment strategy, interview process, and analysis. Finally, Section 7.5 discusses limitations and delimitations of this research strategy.

7.1 LITERATURE REVIEW

The Evidence for Policy and Practice Information and Coordinating Centre (EPPI) (2010, p.7) recommends basing a literature review on a combination of electronic database searching, hand searching of key journals, searching of specialist websites, using general search engines on the internet, and gathering information through connections with experts. The review for this research follows EPPI's method.

Three areas of focus form the literature review: program evaluation, the mainstreaming of ELC information, and marketing for ecological products. The methodology for these reviews is the same for each, and spans multiple disciplines—policy, science, and social sciences. Because of the cross-disciplinary nature of the research, general databases form the focus for the literature search. The University of Victoria's 'Summon' service provides a search of the full extent of the library's content, while Academic Search Complete and JSTOR gave exclusively journal sources. In addition to the general

databases, two key journals provided a focus on the use of ecological information in planning: *Environmental Monitoring and Assessment* and *Landscape Planning*.

In addition to databases and journals, Google and Google Scholar provided access to publicly available resources. As Ontario and British Columbia have strong ELC programs, much of the information found through general search engines emerged from these provinces' online resources. Their ELC resource pages served as the 'specialist websites' that EPPI (2010, p.7) recommend for an in-depth review. The final sources for literature were the Coordinator of the ELC Program and the Director of the Policy and Planning Branch, who both suggested articles of interest for the research. The ELC Coordinator shared draft documents with up-to-date information about Yukon-specific ELC topics and internal unpublished material. The Director of the Policy and Planning Branch, an expert in resource management, suggested Gray's (2012) work on the ecosystem approach to management, which formed the basis of this research's conceptual framework.

The keywords used to search for literature were:

- Ecological and Landscape Classification / ELC;
- Ecological Land Classification;
- Biogeoclimatic Ecosystem Classification / BEC;
- Resource management planning;
- Resource management evaluation;
- Ecology and Landscapes;
- Program Evaluation;
- Process Evaluation;
- Social Marketing;
- Ecological Marketing;
- Ecology and marketing.

After completion of the literature search, the identified documents were screened against a set of criteria to ensure that they fit the scope of the research. The criteria include a preference for more recent articles (after 1990, unless used for a historical context), relevancy to one of the three topic areas, and pertinence to the research questions. The screening was applied to all information included in the review. The use of inclusion criteria makes review processes more efficient and helps avoid bias (EPPI, 2010, pp.10-11).

7.2 SEMI-STRUCTURED INTERVIEWING

The ELC Program has only recently been established in Yukon; therefore, relatively few individuals in the Yukon are familiar with ELC concepts and the program. Interviewing key stakeholders for in-depth information has more value to the project client than surveying or interviewing a large number of individuals with little knowledge of the program. Yukon's resource managers deal with issues specific to the north, ruling out a methodology based on a jurisdictional scan because findings from programs employed elsewhere may not apply. Moreover, jurisdictional information was previously obtained when the ELC Program researched approaches to data gathering and tool design. Now that technical processes are set, the client is more interested in their users' views of the processes (N. Flynn, personal communication, September 20, 2014).

The resource managers interviewed have specific knowledge and experience. Consequently, this research follows a semi-structured interviewing method to allow opportunity for the interviewee to have influence over the course of the interview. Most interview questions in this method are open-ended, allowing

participants to go into more depth or to pursue a subject that was not brought up by the researcher. On the other hand, the use of a predetermined guide for the interviewer ensures that the researcher covers questions that will contribute to a full understanding of the research objectives (Ayres, 2008, p. 811; Brinkmann & Kvale, 2014, p. 14; Longhurst, 2009, p. 580).

Interview preparation included developing questions that correspond to the research objectives. Various researchers (Crotty, 1998; Brinkmann & Kvale, 2014; Rubin & Rubin, 2005) agree that the anticipated analysis should guide the method preparation. With this in mind, Table 1 in Appendix H outlines the relation between the research questions, the research objectives, and the ELC Program goals. Additionally, preparation involved researching the participant's professional background to become more knowledgeable about their areas of specialization. This is a standard protocol when seeking expert opinion so that the line of questioning and follow-up is appropriate (Rubin & Rubin, 2005, pp. 137-140; Willis, 2005, pp. 67-78). Finally, interview questions were tested; both Willis (2005) and Rubin and Rubin (2005, p. 62) suggest that this is a necessary step to ensure quality information emerges from an interview. Two test interviews, one with the ELC Coordinator and another with a representative from Environment Yukon, identified issues with flow, appropriateness, clarity, or focus. The test interviews informed question revision based on both the researcher's and the mock interview participants' experiences.

Interviews began with direct factual questions followed by open-ended questions (see Appendix H for a list of all interview questions). This structure was intended to ease the interviewee into a level of trust with the interview process and to give the interviewer an understanding of their level of familiarity with the basic concepts of the ELC Program. Even though all of the interview participants are professionals in their field, they have different knowledge backgrounds and experience.

7.3 Recruitment Strategy

This research aims to identify a variety of participants who have experience and knowledge of ELC and who represent a varied and balanced perspective on the ELC Program. Rubin and Rubin (2005, p. 70) suggest that interviewees who fit these criteria will provide the most useful data. Recruitment was restricted to resource managers in the Southern Lakes Ecoregion because of the large distances between management centres in Yukon. ELC support and services are more available in this region as the program centre is in Whitehorse, so it is likely that managers in this region will have had exposure to ELC. The Southern Lakes Ecoregion has a higher population density, more managerial expertise, and relatively more information available than the rest of the territory. Results of this research can provide guidance for further outreach of ELC resources into regions with less capacity.

The ELC Program identified target audiences in Yukon Government, First Nation governments, communities, and the public in their strategic plan (Yukon Environment, 2013, p. 26). The researcher developed four groups of interest from these target audiences in order to achieve an experienced, knowledgeable, and varied interview group:

Group 1 Resource managers in the Yukon Government:
This group has responsibility and legislative authority on Yukon public lands for oil and gas resources, surface access and permitting, and water rights and permitting. Forestry, agriculture, mining, wildlife habitat, rangeland management, and parks are represented. Yukon Government employees are not generally focused on a specific region, but are involved in resource management across the territory.

Group 2 First Nations resource managers:
Representatives from each of the Ta'an Kwach'an Council, the Kwanlin Dun First Nation, the Champagne & Aishihik First Nations, the Carcross/Tagish First Nation, and the Teslin Tlingit Council were invited to participate in the research. Yukon First Nations have jurisdiction of their settlement lands, as set out in the Umbrella Final Agreement. Yukon First Nations own the oil and gas resources in their Category A settlement land and are responsible for authorizing surface access. They have legislative authority over all other resources.

Group 3 Consultants:
These individuals are experts in their field and often work for industry to compile ecological information for environmental assessments.

Group 4 Non-governmental organizations:
These are representatives from the Yukon Environmental and Socio-Economic Assessment Board, Yukon Land Use Planning Council, and the Wildlife Conservation Society who are not directly involved in resource management but have an interest in the management of one or more aspects of the process and have some familiarity with ELC.

The ELC Coordinator identified key stakeholders in each group based on their position in their organizations and their level of familiarity with ELC. As a colleague, the ELC Coordinator was best suited to introduce this research to the expert interviewee. According to Rubin and Rubin (2005, pp. 93-94) experts will be more likely to be interested in participating in research if it is referred to them by a professional colleague or friend. The ELC Supervisory Committee reviewed the selected interview participants and recommended further additions to ensure a varied, unbiased, and representative group.

In total, the Coordinator contacted 48 potential interview participants by email to introduce the research aims and its connection to Environment Yukon. The researcher followed up with those willing to participate with an email soliciting an interview. This email included the consent form and a two-page document outlining the Yukon Government's ELC products (Appendix I.iii and A, respectively). For individuals who did not respond to the first email, the researcher emailed them once more, five days later. Appendix I contains all of the documents for the recruitment process.

7.4 Interview Process and Analysis

Of the 48 individuals that the ELC Coordinator contacted, 29 agreed to participate. Of those, 24 were available to schedule an interview between October 15th and December 1st, 2014. The interviews were held either at the participants' office or in an interview room at Environment Yukon.

To maintain confidentiality, interviewee data documents were coded numerically in correspondence with the schedule of interviews; that is, the first interview participant was coded "1", and so on. Interviews were digitally recorded using an Olympus WS-500M Digital Voice Recorder to assist in data collection and analysis. An Excel sheet was used to code interviews according to the following categories:

- Recruitment group and area of focus;
- Scale of ecological and/or landscape information required;
- Way in which they would access the ELC Program;
- Level of training in ELC;
- Use of ELC to date;

- Barriers to using ELC;
- Opportunities presented by the use of ELC;
- Key points; and
- Uncommon responses.

The Excel analysis tool facilitated creation of the graphs presented in Section 9 of this research. To increase the faithfulness of interview reporting and analysis, quotes are included in the Interview Findings and Discussion Section.

7.5 LIMITATIONS AND DELIMITATIONS

The small sample size of resource managers with knowledge of the ELC Program is a limitation of this research. As Bamberger, Rugh, and Mabry (2006) confirm, purposeful sampling often displays a weakness as the sample size is not "random or large enough for reliability or generalizability" (p. 276). Additionally, a disproportionate number of interview participants (almost 60% of the sample), are Yukon Government employees. This is partly due to the fact that the Yukon Government has a significant amount of jurisdiction over resource management, but also because the ELC Program is housed at Environment Yukon and government employees are the most likely to be familiar with the products. Only three of the First Nation government representatives contacted were available for an interview; therefore, there is poor representation of factors affecting traditional territories or settlement lands of the other Nations.

The small sample size limits confidentiality for the participants, as does the fact that the pool of resource management in Yukon is relatively small. Participants were informed of these limitations, and the researcher attempted to maintain the anonymity of interview participants by coding data. Other methods of research (for example, surveying a larger population of Yukon resource managers, interviewing ELC experts outside of Yukon, etc.) were not pursued due to time, funding, and the limited applicability of those methods to the research objectives. Bamberger et al. (2006, pp. 291-292) suggest using triangulation methods such as confirming results with multiple data collection methods, evaluators, or repeated observations over time to validate interview data. This research did not include any of these triangulation methods due to time and resource constraints, limiting the validity of the data.

9 LITERATURE REVIEW

The literature review for this research consists of three main areas. The first area is a review of program evaluation literature. The review of program evaluation literature supports the broad intention of this research, to see whether the ELC Program is meeting its strategic goals (Appendix B). The second and third areas consist of an examination mainstreaming ELC across Canada and a review of marketing techniques for ecological products; these serve to identify ways for the ELC Program to encourage the adoption of ELC products by resource managers; which is one of the objectives of this research.

8.1 PROGRAM EVALUATION

Program evaluation, at its most basic, should demonstrate whether the program in question is doing what it is intended to do (Fonseca-Becker & Boore, 2008; Bryner, 2007; Rossi, Lipsey, & Freeman, 2004; Berk & Rossi, 1999; Folz & Tonn, 2012) and generally reflects the information needs of those commissioning the evaluation (Rossi, Lipsey, & Freeman, 2004, p. 24). There are many different kinds of program evaluations, but evaluators are generally interested in one or more of the following program domains:

(a) The need for the program;
(b) The design of the program;
(c) The program implementation and service delivery;
(d) The program impact or outcomes; and
(e) The cost-effectiveness of the program (Rossi, Lipsey, & Freeman, 2004, p. 23).

This research is interested in the third domain (c): determining whether the ELC unit's program implementation and service delivery have met the needs of their users. Interview participants may naturally address the domains (a) through (d) in their responses. However, the intent of the research is to focus on the third domain, which coincides with Rossi, Lipsey, and Freeman's (2004, p. 45) and Berk and Rossi's (1999, p. 66) arguments against evaluating all five program domains before a program is mature. According to Rossi, Lipsey, and Freeman (2004, p. 45), it is not realistic to expect a determination of efficiency or effectiveness in a program's formative years and that the evaluation of new programs should focus on clarifying needs and improving operations and service delivery. Berk and Rossi (1999, p. 66) state that it takes time for programs to establish the baseline information or resources required, to make contact with their target population, and to develop their services.

Many researchers agree (Bamberger, Rugh & Mabry, 2006; Folz & Tonn, 2012; Rossi, Lipsey & Freeman, 2004) that evaluations operate under a number of constraints. Evaluators often face time, budget, and resource constraints that affect the data collection or results of the evaluation. Bamberger, Rugh and Mabry (2006) recommend considering the "RealWorld" constraints at the beginning of an evaluation and adapting the evaluation methodology accordingly. Considering research constraints is another argument for focusing a program evaluation on a single program domain.

Five common methodological evaluation frameworks mirror the five program domains above. Of interest to this research is process evaluation, which focuses on how a program works towards its goals—its operations, implementation, and service delivery (Rossi, Lipsey, & Freeman, 2004, p. 63). Process evaluation assesses the program against a set of indicators or criteria. These may be either a "blueprint" of the program design detailing the functions, activities, and outputs that the program is supposed to accomplish, or they may be specific objectives or program goals (Rossi, Lipsey, & Freeman, 2004, p. 67). Yukon's ELC Program created clear strategic goals and objectives (Appendix B) and a logic model for their *Yukon Ecological and Landscape Classification Program Five-Year Strategic Plan* (Yukon

Environment, 2013). These goals and objectives and the logic model can be used to develop the process evaluation indicators because, as Berk and Rossi (1999, p. 70) point out, the goals of a program help to understand what constitutes the program and how its content can be measured.

Another important dimension of process evaluation is determining whether the program reaches the appropriate and intended audience. Reaching a different audience than intended might be a positive outcome, broadening the reach of the program; it may also be negative, meaning that the program is ineffective (Sullivan, 2009). Either way, it is important to determine a program's reach. This can be accomplished by examining program usage records and/or reaching out to likely members of the target population to see if they are accessing the program (Berk and Rossi, 1999, p. 69).

A synthesis of the reviewed literature on program evaluation reveals three preliminary steps to any evaluation (Fonseca-Becker & Boore, 2008; Bryner, 2007; Rossi, Lipsey, & Freeman, 2004; Berk & Rossi, 1999; Folz & Tonn, 2012; Bamberger, Rugh & Mabry, 2006):

1. Determine the intention of the evaluation, and the program's stage of development.
2. Determine any constraints to the evaluation.
3. Determine the project domain in which the evaluators have an interest, and from that, the methodological framework.

From there, each methodological framework will require a different path. For process evaluation many researchers (Sullivan, 2009; Fonseca-Becker & Boore, 2008; Rossi, Lipsey, & Freeman, 2004; Berk & Rossi, 1999), agree that the method should continue with the following steps:

4. Determine indicators or criteria from the program goals or functional plan.
5. Determine the population the program reaches and the population it intends to reach.
6. Perform either a qualitative or a quantitative evaluation to measure the program's operation, implementation, and service delivery against the determined indicators.
7. Communicate evaluation results.

In addition to the standard methods of program evaluation discussed above, evaluations may be conducted under a particular perspective. For example, Gray (2012) expanded his ecosystem approach to management into a tool for assessing an organization's capability of "responding to the challenges of climate change and other cumulative effects" (p. xi). Gray's tool is intended to evaluate an organization's capacity for incorporating ecological principles into their institution, so that they are evaluated through a sustainability lens. This can be seen as an application of process evaluation using a particular context. As described in the Conceptual Framework section of this report, Gray's three themes form the basis of this evaluation: place-based and time-based perspectives, community-empowered conditions, and knowledge-driven programming. Section 8.2 follows Gray's framework in reviewing how different Canadian jurisdictions have mainstreamed ELC products.

8.2 MAINSTREAMING ELC PROGRAMS

ELC programs exist across Canada and there is a large body of available information about the technical aspects of ELC data collection and presentation. The Silvatech Group (Jones et al., 2008) synthesized much of this information in a report for the Yukon Government. Their research included detailed information about the principles of ecosystem classification, a technical comparison of ELC systems across Canada and Alaska, a review of the work performed to date in Yukon, and a draft framework and standards for the Yukon ELC Program. However, this synthesis did not include information about how jurisdictions incorporate ELC into their policy and practice. Moreover, there is little academic research

about mainstreaming ecological programs into a resource manager's suite of tools. This section reviews key examples of mainstreaming ecological information in Canadian jurisdictions under Gray's three themes of an ecosystem approach to management.

8.2.1 Theme 1: Place-Based and Time-Based Perspectives

The context and scale of a program is an important consideration for the management of resources as it affects their frames of reference and focus. According to Gray:

> Given that all ecosystems are distinctive, each organization in each province and territory uses a particular suite of spatial and temporal perspectives to catalogue assets, prepare management plans, and make decisions about the use of some of the ecological goods and services. (2012, p. 5)

ELC is a hierarchical system describing "ecosystems within ecosystems" (Agriculture Canada, 2013) and is most often maintained at the national, provincial, and territorial levels. The Government of Canada established the National Ecological Framework of Canada; their Ecological Stratification Working Group released descriptions of all of the ecozones and ecoregions across Canada in 1995. In updating ELC information, every province and territory chooses the level of ecosystem information[2] to maintain.

Some jurisdictions have developed information levels beyond standard ecological classification systems[3]. British Columbia, for one, describes a vegetation's stage of development (regenerating, immature, or mature) for each bio-climate zone, in addition to describing the climate and vegetation association(MacKinnon, Meidinger, & Klinka, 1992, p. 101). This chronological classification system is an example of a time-based perspective. The responsiveness of ELC program information to changes is another element of a time-based perspective. Many researchers (Haeussler, 2011; Cowell, 1998; Müller, Baessler, Schubert, & Klotz, 2010; Gray, 2012) emphasize the need to regularly update ELC program information to systematically reflect on and consider the challenges emerging from a changing climate.

In Yukon, there is already an effort to develop climate models to predict the impact of changing climate. Yukon is a vast territory with large non-forested portions and many of its ecosystems are changing due to permafrost thawing or other climate change factors (Jones et al., 2008, p. xxii). The ELC coordinator is studying "bioclimate envelopes, which are the climate variables that influence ecosystem change within a particular landscape" (N. Flynn, personal communication, June 9, 2014). Managers are required to deal with uncertain factors such as climate change impacts (IPCC, 2014, p. 9); therefore, encouraging Yukon resource managers to use ELC products that incorporate changing conditions can provide a sound basis for land use decisions.

8.2.2 Theme 2: Community-Empowered Conditions

The institutional support for and leadership of a program is a community-empowered condition that dictates the program's infiltration into practice. Gray, who writes about adapting sustainable forestry to climate change, believes that community-empowered adaptive resource management is:

> [A]s much about adopting a set of principles, establishing and maintaining trust, ensuring meaningful engagement, and fully valuing natural assets as it is about applying a set of planning and management tools and techniques to guide human activities. (2012, p. 9)

[2] ELC information levels are described in Figure 1 and Figure 2.
[3] Appendix J contains a comparison of the standard ecological classification systems across Canada.

Institutional support and leadership are aspects of the community-empowered conditions described by Gray (2012, pp. 10-12); academic, international, and national support for ELC programs is already prevalent. Many researchers agree that ELC is a prerequisite for land and resource management, stating that ecosystems need to be described, characterized, and spatially located before they can be managed (Sims et al., 1996; Moores & Pittman, 1996; Pojar, Klinka, & Meidinger, 1987; Smith et al., 2004). Internationally, the United Nations Convention on Biological Diversity expects its members to be able to monitor ecological diversity and to develop "national strategies and action plans to conserve and use sustainably the biological diversity within its jurisdiction" (Secretariat of the Convention on Biological Diversity, 2001, p. 129). The Convention, signed in 1992, demonstrates that countries have an obligation and responsibility for the conservation of biodiversity under international law (Ponomarenko & Alvo, 2001, p. 6). Canada, as a signatory to the convention, demonstrates its ecological monitoring and national strategy through the National Ecological Framework (Agriculture and Agri-Food Canada and Environment Canada, 1995).

However, Gray also discusses the importance of high-level support from managers and institutions through the adoption of a mindset that can practically mainstream ecological thinking (2012, p. 12). An organisation cannot work in a silo if the intention is to manage with ecosystems in mind; they must adopt partnerships and a community focus. Gray states that "sponsorship of cross-sectional, cross-disciplinary, and cross-thematic development of policy, strategies, and plans" encourages adaptive management within an ecosystem (2012, p. 12). Although there is some effort for ELC programs in Canada to be in a position allowing greater community-empowerment, the majority of programs are applied in a single management area.

MacKinnon et al. (1992, pp. 104-111) list four major management areas where an ELC system should be employed: silviculture, range, recreation, and wildlife habitat. Smith et al. (2004, p. 3) add that mineral exploration activities, tourism, and land development should all use ecological knowledge in their planning processes. The National Ecological Framework is co-led by Environment Canada and Agriculture and Agri-Foods Canada, an organizational position that allowed its application across many management fields. A baseline amount of data was established across Canada and made available for all management areas but it is left up to individual jurisdictions to maintain ELC information from that time.

Although it may be ideal to mainstream ELC into all management areas, the reality is that most jurisdictions in Canada have developed it for a single management area: forestry. Ontario (Ontario Ministry of Natural Resources, 2001), B.C. (Biogeoclimatic Ecosystem Classification Program., n.d.), Alberta (Government of Alberta, 2014), Saskatchewan (McLaughlan et al., 2010), Nova Scotia (Stewart & Neily, 2008, Neily, Quigley, Benjamin, Stewart, & Duke, 2003), Manitoba (Smith et al., 1998), Quebec (Gouvernernent du Québec, 2003), Newfoundland (Bajzak & Roberts, 1996), and New Brunswick (Matson & Power, 1996) all have forest management systems that are linked to an ELC system.

There are ELC programs that extend other management areas – wildlife and conservation (Province of Nova Scotia, 2013), agriculture (Government of Alberta, 2014), and project review (Minaskuat Inc., 2008), for example. Some jurisdictions, such as B.C. have applied the management framework developed for one resource area across most aspects of resource management (N. Flynn, personal communication, February 27, 2015). However, this review did not uncover an example of a community-empowered ELC program that worked in partnerships across management areas.

8.2.3 Theme 3: Knowledge-Driven Programs

Gray and Davidson (2000, p. 61) identify data maintenance and dissemination of knowledge as two important tools in their framework for an ecosystem approach to management. Data maintenance is important because "the usefulness of [an] ecosystem framework will increase as more ecological data are collected and incorporated" (Mah, Thomson, & Demarchi, 1996, p. 123). However, mainstreaming an ELC program also requires that knowledge be disseminated with "accessible and current" educational programming (Gray & Davidson, 2000, p. 61).

Haeussler (2011) agrees that data maintenance and knowledge dissemination are two major aspects of a knowledge-driven program. She goes on to further divide knowledge dissemination into two categories: process-based and content-based. A process-based delivery system uses methods to "excite and enlighten a new generation of scientists and resource professionals" (p. 270). Haeussler suggests using training materials, interactive media, providing internships for technology students, funding graduate scholarships, and mentoring as process-based deliver methods. A content-based program delivery ensures that program materials are not static, thereby encouraging continuous discovery of a growing knowledge base. Program materials must be constantly updated and re-imagined in this delivery system. However, as Cowell (1998) notes, jurisdictions have varied capabilities to implement programming. He believes that "strengthening of government, corporate, and public institutions may be as critical to implementation as the design of the plan" (p. 76).

It is beyond the scope of this research to contact each department responsible for delivering ELC programming to determine the exact methods used by each Canadian jurisdiction. Therefore, the following is not a comprehensive description of the available training programs. Examples from B.C. and Ontario are presented as there is readily available information in these jurisdictions; B.C. and Ontario were both founding provinces of ELC systems so their knowledge dissemination programs are further advanced than those in other jurisdictions. The B.C. and Ontario description is followed by a description of ELC knowledge development in Yukon.

It took ten years for British Columbia to fully implement their ELC programming (MacKinnon et al., 1992). Krajina initially founded B.C.'s ELC Program through a variety of marketing strategies—he hosted symposiums, wrote articles and reports, mentored graduate students in his methods, and liaised with the provincial government and forestry industry (Drabek, 2012, p. 131). With "systematic training of the government and industrial field staff in identification and interpretation of ecosystems" (MacKinnon et al., 1992, p. 116), ELC became integrated into forestry practice. The Ministry of Forests and Range maintains an internet portal with information, updates, resource links, and training guides (British Columbia Ministry of Forests and Range, n.d.). At this time, nine different colleges or universities carry ELC related courses and training in B.C., ensuring the continued practice of the system (British Columbia Ministry of Forests and Range, n.d.). However, there are challenges to B.C.'s ELC Program due to funding cuts in the past five years that have reduced program support. Haeussler (2011) cites the dismantling of B.C.'s Forest Service Research Program as a challenge to the continued maintenance of their ELC system, but states it may be an opportunity to adapt and renew the program (2011, p. 270).

Ontario is a large province with different management needs from north to south. Starting in the early 2000's, they developed two separate ELC courses: one for southern Ontario directed towards preserving natural heritage and biodiversity, and one for northern Ontario focused on resource management (Conservation Ontario, 2009). Their training course and manual provides training on the standard methods for air-photo interpretation, soil description and classification, vegetation sampling, ELC application, mapping, and data management (Ontario Ministry of Natural Resources, 2001; Forestry Research Partnership, 2010). They also extend invitations for their participants to register for in-depth

training specific to their management areas in forestry and/or land-use planning (Conservation Ontario, 2009).

In Yukon's pilot year for programming, the Government delivered a one-day course for government resource managers. Three two-day courses were offered in the second year of the program and 36 students attended from the Yukon Government, First Nation governments, and private companies. During its third year, the ELC Program offered interested individuals an opportunity to shadow a field ecologist to learn more in-depth techniques specific to their management area. Currently, courses and mentoring are available upon request for the following topics: protocols for data collection to describe ecosystems in the field; map scale and classification frameworks and hierarchy; disturbance dynamics; permafrost influence; plant identification; and soil classification. (Flynn, N., personal communication, October 28, 2014). This research examines whether resource managers in Yukon feel that the training is readily available and effective to the standards proposed by Haeussler (2011) and Gray and Davidson (2000).

8.3 MARKETING

A review of marketing literature provides information to support this research's intent to identify ways to encourage the adoption of ELC products by resource managers. Marketing has two aims: to attract and to retain customers or clients. The basic marketing concept is that the supplier determines the needs of their user group and offers a product that meets those needs (Moore & Pareek, 2006; Fifield, 2007). Marketing strategies are widely understood to revolve around 'the five Ps' of a marketing mix: product, place, price, promotion, and people (Figure 6).

Basic marketing techniques and strategies are applied beyond a supplier/consumer model. Social marketing, for example, applies marketing techniques to change the behaviour of a targeted group. The end goal is no longer profit, as in standard marketing, but the betterment of society. Governments and non-profit organizations often adopt social marketing techniques (Moore & Pareek, 2006).The essence of social marketing is "understanding the audience, tailoring the intervention to their preferences, removing barriers and following up the intervention with opportunities for feedback and evaluation" (Corner & Randall, 2011, p. 1007). The 'marketing mix' (Figure 6) is also employed in social marketing (National Social Marketing Centre, 2011, pp. 8-10; Olson, 2014, p. 311).

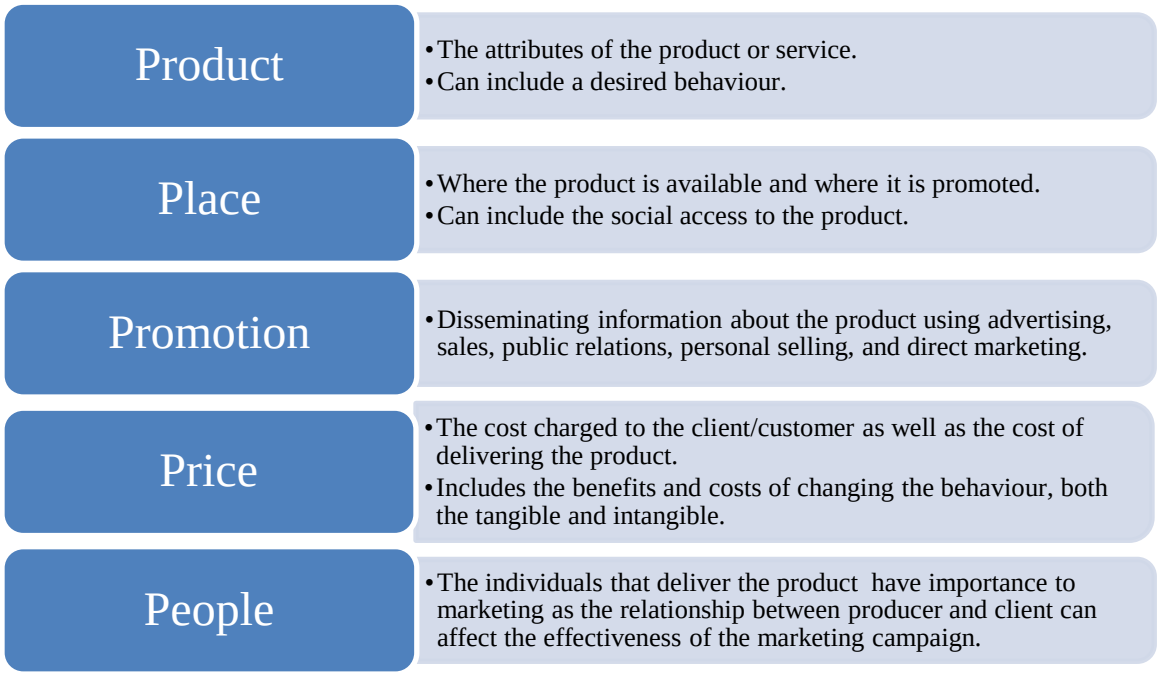

Figure 6. The Marketing Mix. If the social marketing mix differs from the general definition, the second bullet explains the difference. Adapted from *Marketing: The Basics*, by Moore & Pareek, 2006, London: Routledge and from *Social marketing and social change: Strategies and tools for heath, well-being, and the environment*, by Olson, 2014.

Social marketing emerged from the social sciences and is used to address social problems (National Social Marketing Centre, 2011; Stutts, 2010) and it is also used in environmental campaigns (Peattie & Peattie, 2011; McKenzie-Mohr, Lee, Schulz, & Kotler, 2012; Corner & Randall, 2011). Ecosystem services are beneficial to society: they "protect our well-being by regulating climate and temperature, preventing flooding and diseases, and managing water quality and waste" (Peattie & Peattie, 2011, p. 4). Using social marketing principles to influence the way that individuals and organizations act towards the environment is effective because "the cornerstone of sustainability is behaviour change" (McKenzie-Mohr et al., 2012, p. 3).

McKenzie-Mohr et al. (2012) offer five marketing steps to foster behaviour change for environmental purposes:

1. Selecting which behaviour to target;
2. Identifying the barriers and benefits to the selected behaviour;
3. Developing a strategy that reduces barriers to the behaviour to be promoted, while simultaneously increasing the behaviour's perceived benefits;
4. Piloting the strategy;
5. Evaluating broad-scale implementation and ongoing evaluation once the strategy has been broadly implemented. (pp. 4-5).

McKenzie-Mohr et al. (2012, p. 6) suggest a standard comparison for selecting the targeted behaviour: determining how impactful changing the behaviour could be; determining how many people are currently undertaking the behaviour; and determining how likely is it that people will adopt the behaviour. A behaviour change that rates highly with regard to all three aspects is a more likely candidate for the

emerging strategy. It is important to identify the specific behaviours that should be targeted in order to mainstream ELC information into the decision making process.

Barrier and benefit identification is highly dependent on the type of behaviour targeted as well as the stakeholder group. McKenzie-Mohr et al.'s (2012) review of 24 case studies found that residential and commercial sectors had unique barriers and benefits to changing a targeted behaviour (2012, pp. 5-6). The ELC Program will need to evaluate the specific barriers and benefits to all of its stakeholders: different management sectors within the territorial government, First Nations governments, consultants, and non-governmental organisations.

Once the stakeholder's unique situation is identified, step three involves the use of varied strategies to reduce barriers and promote benefits. One example is Toke's (2011) examination of renewable energy policies. He suggests focusing on encouraging the perception that economic development and environmental protection can occur simultaneously with a result that is greater than the sum of its parts. Toke (2011, p. 22; 62) states that renewable energy became a successful industry because it maintains an identity that attracts popular support. People are inclined to invest in renewable energy because they associate it with ecologically minded behaviour. His review shows that the identity for renewables was achieved through political economic incentives and under pressure created by social movements for sustainability. Renewable energy's 'identity' (or brand) has been useful in breaking down barriers (such as high initial investment costs) to its adoption (2012, p. 41). Similarly, the intent of the ELC Program is to mainstream ELC products so that they become deeply incorporated in the toolbox of resource managers (the consumers of this product). In this manner, ecological principles can underlie their decision-making processes.

Using social marketing to address sustainability issues requires:

> transformative changes to the norms, attitudes, lifestyles and behaviours of individuals and organizations worldwide… Process will require a mix of regulation, investment and innovation being applied to policy, technology and education in the search for transformative change. (Peattie & Peattie, 2011, p. 29)

Corner & Randall (2011) question the ability of social marketing strategies to target large-scale sustainability issues such as climate change. They feel that social marketing does not include enough of a strategic oversight. They do not downplay the success that individual governmental and non-governmental environmental social marketing programs have had, but find them 'piecemeal' and insufficient to address large-scale behaviour change (p. 1012-1013). In the context of Yukon's ELC Program, encouraging the use of ecological products is simply one part of a government-wide sustainability strategy.

8.4 SUMMARY

The literature review looked at program evaluation, mainstreaming ELC across Canada, and ecological marketing to provide a context for this research's discussion and recommendations. The review of program evaluation literature in Section 8.1 focuses on one common method—process evaluation—to look at ways of determining if a program is meeting the needs of its users. Process evaluation may be applied through a particular perspective, such as Gray's (2012) ecosystem approach to management, which is used throughout this research. Section 8.2 reviewed the mainstreaming of ELC information in the policy and practice of Canadian jurisdictions. It is clear from this review that jurisdictions choose to maintain different levels of ecosystem information through different leadership models and standards of data maintenance and dissemination of knowledge. The review of marketing literature in Section 8.3

demonstrates that an understanding of the ‘marketing mix’ can be used to foster behaviour change through McKenzie-Mohr et al.’s (2012) five steps to foster behaviour change for environmental purposes. The following section discusses the interview findings and integrates it with the information from the literature review.

10 INTERVIEW FINDINGS AND DISCUSSION

This research consisted of interviews with Yukon resource managers in order to meet the broad goal of this research: to determine if the ELC Program is meeting the strategic goals set out in Yukon Environment's 2013 document, *Yukon Ecological and Landscape Classification (ELC) Program: Five-Year Strategic Plan*. Three of the four specific research questions were addressed through the interview questions: whether and to what extent the interviewees use the available ELC Products (Appendix A); whether they see additional or future uses for ELC products in their field; and what they need in order to integrate ELC products into their practice or policy.

Gray's ecosystem approach to management (2012), the conceptual framework of this research, provides a basis for discussing the findings from the 24 interviews. Mirroring the format of Section 8.2, this section evaluates interviewee perceptions of ELC's integration into resource management in Yukon in terms of Gray's (2012) themes. This form of program assessment evaluates the ELC Program's mainstreaming potential through a sustainability lens.

Specific outcomes from the ELC Program's *Five-Year Strategic Plan* (Yukon Environment, 2013, pp. 26-27) are associated with Gray's themes and listed at the beginning of each section. Only the short and medium term outcomes are addressed as the long term outcomes are not measurable. To summarize the research findings, this section culminates with a table of the progress on each specific outcome organized by the researcher under the ELC Program's goals.

The Interview Findings and Discussion start with Section 9.1 describing general information gained from the interview participants. Sections 9.2 through 9.4 describe findings that correspond to the three themes of an ecosystem approach to management. Where appropriate, the interviewees own words are used to validate the findings. Related outcomes from the ELC's *Five-Year Strategic Plan* (Yukon Environment, 2013, p. 27) are listed at the beginning of Sections 9.2, 9.3, and 9.4.[4] The final section, 9.5, presents a more formal process evaluation, in which the researcher evaluates the ELC Program against the outcome indicators from the 5-Year Strategic Plan (Yukon Environment, 2013).

9.1 GENERAL INFORMATION

This research attempted to include an experienced, knowledgeable, and varied interview group. Of the 32 Yukon Government employees invited to participate, 14 (44%) were interviewed. Of the seven representatives of non-governmental organizations invited to participate, five (71%) were interviewed. Of the three consultants invited to participate, two (67%) were interviewed. Finally, of the six First Nation government representatives invited to participate, three (50%) were interviewed. The management area that these interviewees represented cover an area of approximately 93,000 km^2, which is about the size of Portugal (Figure 7). In addition to this area, 11 of the participants noted that their work often encompasses the entire Yukon.

[4] The numbers associated with each outcome correspond to those in Table 2 (Section 9.5).

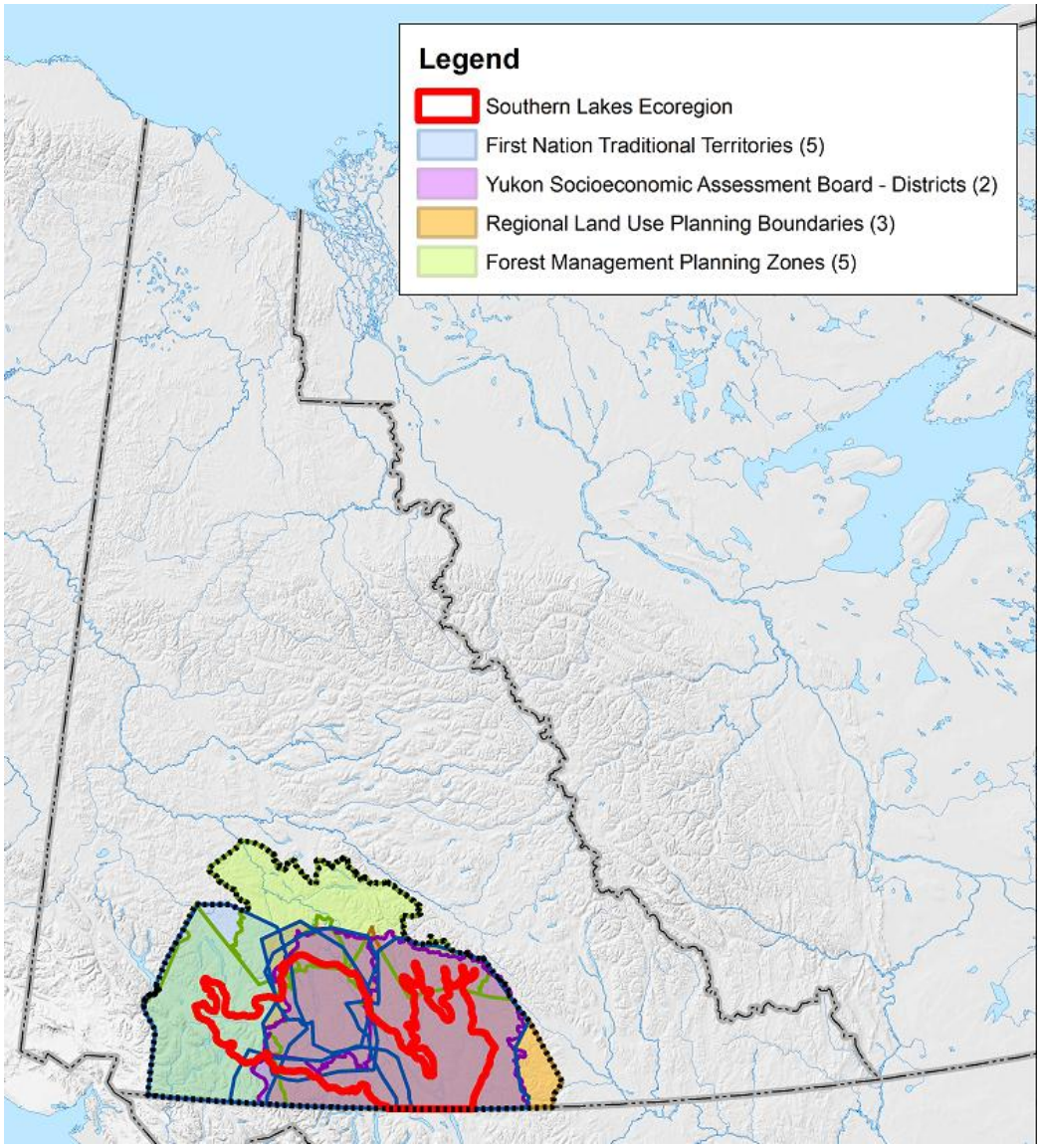

Figure 7. Management area of the interview participants. In addition to the areas shown on the map, 11 participants mentioned that their work can include the entire Yukon. Reprinted from N. Flynn, personal communication, March 2, 2015.

Figure 8 shows the number of participants interviewed from each recruitment group. Although most interviewees were employees of the Yukon Government, they represent a diverse field of expertise. Figure 9 provides a breakdown of their expertise areas. Participants in the non-governmental organization category also represent different fields of expertise as they were from the Yukon Environmental and Socio-economic Assessment Board (YESAB), the Land-Use Planning Council, and the Wildlife Conservation Society.

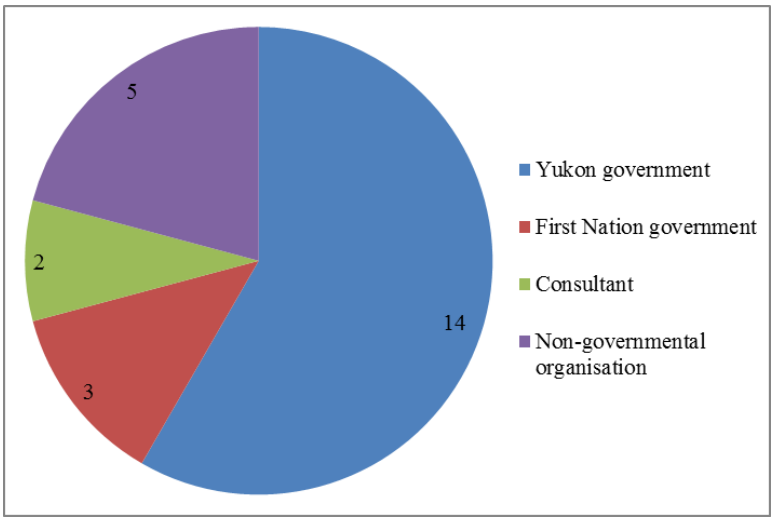

Figure 8. Number of participants interviewed from each recruitment group.

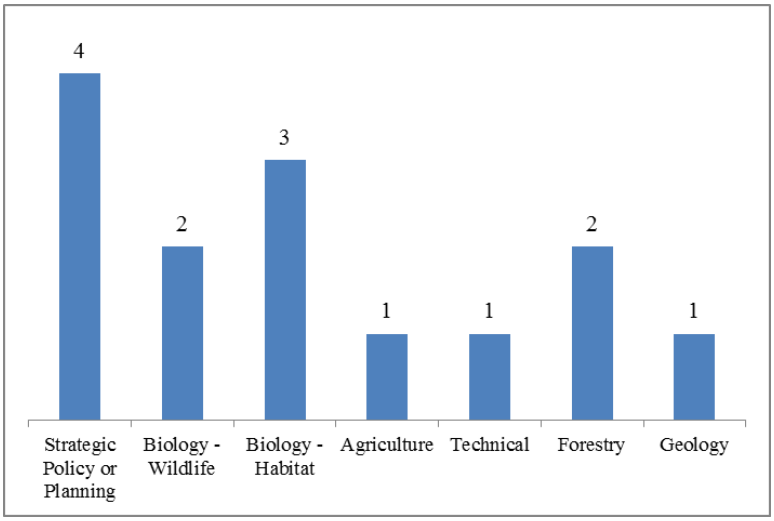

Figure 9. Area of expertise of the interview participants from the Yukon Government.

During the course of the research, it became clear that variations between common views did not always correlate with recruitment groupings; variations in views were also apparent between the type of use that interview participants had for the ELC Program and its resources. Interviewees reported three different categories of use for ELC resources: planning activities, environmental assessments, and research. Additionally, some interviewees identified that they were current or potential contributors to ELC data. Contributor and resource use categories were not mutually exclusive as several interviewees reported contributing to ELC data and/or using the data for more than one category of use, as shown in the Venn diagram below (Figure 10). One participant reported being purely a contributor for ELC data, six reported one use only, and the remainder reported combinations of contributions and/or multiple uses.

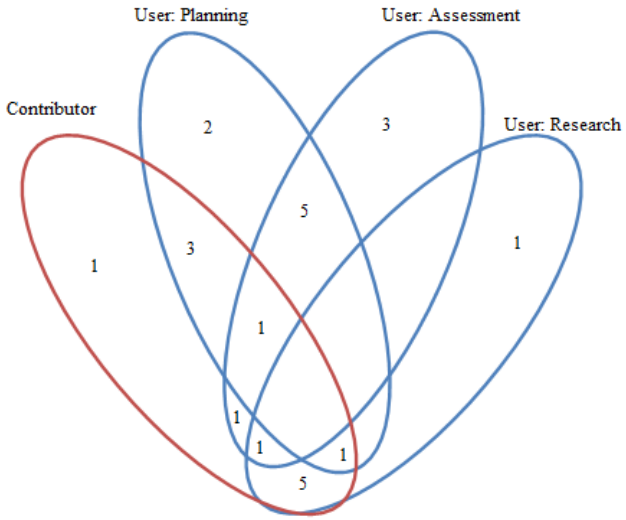

Figure 10. Venn diagram illustrating how interviewees reported they interact with ELC resources. The blue ellipses represent the interviewee ELC resource user categories and the red ellipsis represents contributions to ELC data.

Yukon Government, First Nations governments, and non-governmental organizations interviewees were represented in every category of interaction with ELC resources. Neither of the consultants stated that they would have a need for ELC resources for planning purposes. This is likely because these consultants' primary responsibilities lie in gathering information for their industrial clients' environmental assessments; they do not have jurisdiction over resource areas themselves, so are unlikely to need ELC products for their operational planning.

Of the 24 interviewees, all but one stated that they either already use ELC products or they are interested in trying the products (Figure 11). From the breadth of program areas of the interview participants, this indicates that the ELC Program has the potential to meet its basic premise:

> ELC provides information to support a range of applications including land-use planning, environmental assessment, forest management, land and resource development, best management practices, habitat management and climate change risk assessment and adaptation. (Yukon Environment, 2013, p. 4)

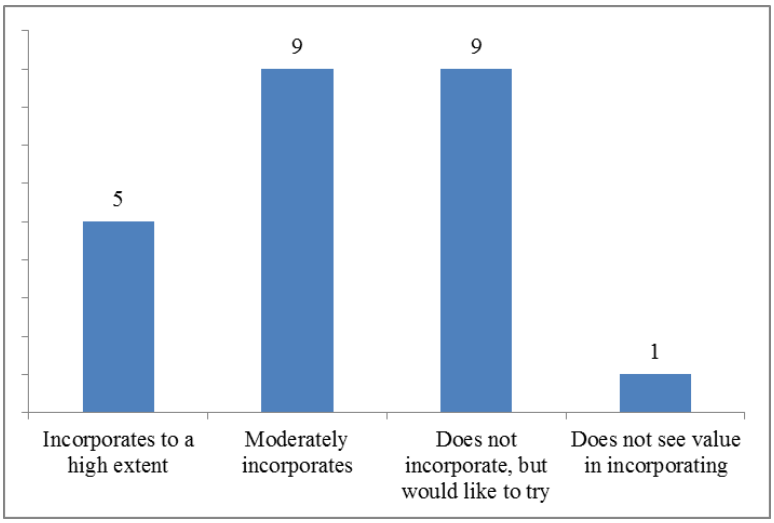

Figure 11. Current incorporation of ELC resources of the 24 interview participants.

9.2 Theme 1: Place-Based and Time-Based Perspectives

Related outcomes from the *Five-Year Strategic Plan* (Yukon Environment, 2013, p. 27):

1. Improve accessibility of existing ecosystem plot data. (April 2013)
12. The Yukon ELC Unit is functioning and producing high quality products (April 2013)

The conceptual delineation of the ecoregion is not necessarily meaningful for the management activities of the interview participants. As stated by Gray (2012, p. 6), there may be numerous spatial contexts to an area including ecosystem, administrative, jurisdictional, and thematic units. For the interviewees of this research the context includes First Nations traditional territories and settlement lands (Appendix D) and the eight land-use planning areas. Additionally, the forest sector manages within landscape-level forest districts, develops timber harvest plans according to watershed drainage areas, and forms site plans for specific stands of trees (Energy, Mines and Resources, 2011). For the agricultural sector there is no defined spatial context and they evaluate each application for agricultural land development or grazing independently (Energy, Mines and Resources, 2013). Interview participants may use none, one, or many spatial boundaries in their activities. More than half of the interviewees (14 of 24) expressed desire for a method to incorporate different spatial contexts. They noted three potential methods for incorporating the different spatial layers they are interested in: developing specialized ELC products; making ELC data layers available for download; and uploading ELC information to existing on-line applications.

Six interviewees noted that it would be useful to have ELC products developed for the spatial context that they are most familiar with, for example: a map of the ecological and landscape units in a traditional territory. Additionally, 11 participants stated they would like to see ELC data layers available for download from the Geomatics Yukon website (2014), the Government of Yukon's corporate spatial warehouse. These participants would like the ability to manipulate ELC layers for their own research purposes and to integrate ELC data layers into their geographic information systems (GIS). Yukon Government manages a host of GIS applications through Geomatics Yukon (2014); GIS sites mentioned by interviewees are the Yukon Lands Viewer (Energy, Mines and Resources, n.d.) and YESAB's Geolocator (YESAB, n.d.). Five interview participants specified that it would be useful to display ELC information alongside the administrative boundaries, management areas, and project development plans

layers already present on both the Lands Viewer and the Geolocator. Interviewees suggested that these sites would help to develop their spatial concept of ELC as they would be able to layer it alongside boundaries that they are familiar with.

There was a great deal of confusion among interview participants about where ELC products are currently available. The following wordcloud (Figure 12) shows where participants stated ELC maps were available; the size of the text represents the number of participants who responded in that manner.

Figure 12. Wordcloud illustrating where interview participants believe ELC resources are available. Out of the 17 participants who specifically mentioned this topic, nine were not sure where information was available, five said Dawson, four said The Peel, four said North Yukon, and one each stated Southern Lakes, Southern Lakes Low, and Kluane. Generated using Davies, J. *Wordcloud Generator*. Retrieved from http://www.jasondavies.com/wordcloud/

As seen above, more than half of the 17 participants who responded stated that they were unsure where ELC products were available. An examination of the ELC website reveals further uncertainty. On the *Yukon Ecological & Landscape Classification (ELC) projects & initiatives* (2014) page, there are links under the heading *Ecological Classification and Mapping (local to regional scale)* that bring up reports and/or maps for the following locations:

- West-Central Yukon (Dawson planning region),
- Peel Watershed,
- North Yukon Planning Region,
- Watson Lake area, and
- Yukon Southern Lakes and Pelly Mountains Ecoregions.

However, discussion with the ELC Coordinator revealed that these reports and maps contain inconsistent methodologies. She stated that acceptable ELC products are available for Dawson, the Peel, North Yukon, and Ross River. The methodology from *The Yukon Ecosystem and Landscape Classification (ELC) Framework: Overview and Concepts* (the Framework document) (Flynn & Francis, 2011) was only employed in creating the product for the Dawson planning region. For this reason, it is the most relevant information and is the only biophysical layer available through the Geomatics Yukon (2014), "GeoYukon", a new platform for Yukon spatial data (Flynn, N., personal communication, December 2, 2014). In spite of this information's availability, it is not communicated to the stakeholder group; none of the participants knew that the Dawson region ELC is on Geomatics Yukon. One participant mentioned a particular interest in Dawson products and was sure that there was nothing available.

All of the available ELC resources are on a local or regional scale, which are appropriate scales for the majority of interview participants. However, all of the participants reported that there would ideally be ELC products available across the territory. Just under half of the interviewees stated that they require territorial scale information for their work (Figure 13).

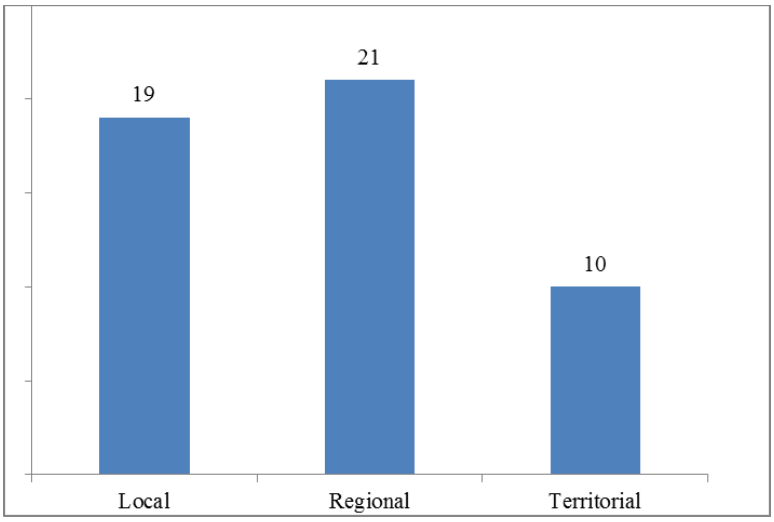

Figure 13. The scale of map information required by interview participants.

Interview participants stated:

> *Coverage is the biggest issue – if it isn't available for the full range [of the wildlife I am studying], then it is not useful.*
>
> *ELC is excellent for higher planning, but it isn't always at the right scale for project-level work.*
>
> *I would have loved to have total access to biophysical information before I went in to help me to define my study sites, and then help me to understand what I was seeing without having to do so much on the ground work. Even if it isn't on the scale that I'm using, it would still be super useful.*

From the information gained through the interviews, it seems that the ELC Program is not yet meeting its second goal: to complete bioclimate mapping for all three scales (Yukon Environment, 2013, p. 15).

9.3 THEME 2: COMMUNITY-EMPOWERED CONDITIONS

Related outcomes from the *Five-Year Strategic Plan* (Yukon Environment, 2013, p. 27):

4. Ecology staff with extensive field experience and expertise, including the Technical Working Group and Supervisory Committee. (April 2012)
5. Technical Working Group provides guidance to the program. (April 2012)
6. Strategic planning lays out the path for program development with clear methods to achieve end goals. (April 2012)
8. The Yukon ELC Management Committee provides high-level direction for government-wide initiatives for ELC application. (April 2013)
9. Strong relationships with stakeholders, industry – all those who are interested in using and applying ELC standards. (April 2013)
10. The Yukon ELC program and existing interim ELC products gain profile and recognition. (April 2012)
13. Interdepartmental Planning Committee mandate includes planning for ecosystem and land classification initiatives. (April 2012)

Gray (2012, pp. 9-13) identifies four modules under the theme of community-empowered conditions: sustainability principles, trust, and values; institutional culture and function; leadership; and partnership. As discussed in the literature review (Section 8.2.2), there is nation-wide support for ELC. The principle that the program is based upon, providing a sound ecological basis for decision-making, resounded with all of the interview participants. Even the individual who stated that they did not see the value in incorporating ELC products into their practice stated that they agreed with the values behind this type of product.

Interview participants had differing opinions about the institutional context for ELC. The ELC Program unit is in Environment Yukon's Policy and Planning Branch, and its Supervisory Committee includes representatives from Environment Yukon and Energy, Mines and Resources (Yukon Environment, 2013, p. 13). One participant felt that the ELC Program should be in the Fish and Wildlife Branch of Environment Yukon, while two others suggested it should be dislocated from Environment Yukon to inspire further uptake by different management areas.

> *If it is seen too much of being a creature of one department, that will be a barrier. People will just not be aware of it.*

As for leadership, eight participants noted that the ELC Program would benefit from top-down direction requiring it to be used in management and land-use planning. These eight participants were representative of every recruitment group, and identified themselves either as users of ELC for planning or as contributors to ELC data. Gray states that programs require leadership to ensure that there are processes in place that "guarantee meaningful and ongoing involvement by organizational staff, partners, and the general public" (2012, p. 12), and leadership can come in the form of regulations.

> *At the end of the day, it kind of has to be a little more of a top down direction. We say, in a united way as Yukon Government, we have a Yukon ELC and our expectation is that this is where people are directed to when they need to find out about something, and when they are going to collect information.*

We need to develop a regulatory approach to bringing ELC into the planning and assessment processes. Right now there are no standards in Yukon that requires us to use this type of information in planning, but it would certainly help the decision support.

That is an outstanding question to me, the degree to which we are willing and able to take this and call this a Yukon way of doing business. Kind of like when you do business in BC, you use the BC system, but no one has decided that here. This results in confusion.

There is no legal requirement to use it. In BC, they have all those standards and new development has to satisfy certain criteria based on whatever is valued through ELC. We don't have any of that here. So, there is a lot of work to do: standards, project review, and planning for how they use an ELC. And, the policy/regulatory side has hardly been touched.

Some of the participants noted that other jurisdictions' standards are employed in Yukon because of the lack of a regulatory structure, and because the practitioners are more familiar with the standard.

When I go into the field, the default is still that you should use the BC guidebook.

I gather information wherever I can. The ELC would be a really good point to go out there with a guidebook once you've got your plant associations figured out. I rely on my prior training [from Alberta] and basically make up the associations for Yukon – in a very scientific way.

Despite the information barriers, there was consensus by interview participants that ELC provided an opportunity to work across management areas. Twelve interview participants specifically stated that ELC provided a common language for resource managers, demonstrating the partnership potential for the ELC Program.

There are benefits to speaking the same language. If different experts use different classification systems, we have to go to each one and figure out how they compare for ourselves. Having one system would be a lot more beneficial, for sure.

It provides a tool so that we are speaking the same language. When we move forward and are discussing things with Environment Yukon, YESAB, First Nations, etcetera it is a way for us to compare apples to apples. As opposed to "we have a spruce forest with Labrador tea underneath," which might mean different things to different people; it provides us a framework to have those types of discussions.

We need to get ELC so that Environment is using it, forestry is using it, fire is using it, different groups are all using it so that we are talking the same language.

As having ELC available to "support and inform sustainable and integrated resource management" (Yukon Environment, 2013, p. 16) is the third strategic goal of the ELC Program, gaining community-empowerment is an important consideration.

9.4 THEME 3: KNOWLEDGE-DRIVEN PROGRAMS

Related outcomes from the *Five-Year Strategic Plan* (Yukon Environment, 2013, pp. 26-27):

1. Improve accessibility of existing ecosystem plot data. (April 2013)
2. A field and research program that rigorously tests and verifies ecological classification, mapping methods, models, and input data. (April 2013)
3. Yukon Biophysical Inventory System (YBIS) has effective data management. (April 2012)
7. Framework terminology and concepts are used in Yukon land and resource management. (April 2012)
8. The Yukon ELC Management Committee provides high-level direction for government-wide initiatives for ELC application. (April 2013)
9. Strong relationships with stakeholders, industry – all those who are interested in using and applying ELC standards. (April 2013)
10. The Yukon ELC program and existing interim ELC products gain profile and recognition. (April 2012)
11. Website and newsletter effectively communicate program information to the general public and stakeholders. (April 2012)
12. The Yukon ELC Unit is functioning and producing high quality products. (April 2013)
13. Interdepartmental Planning Committee mandate includes planning for ecosystem and land classification initiatives. (April 2012)

Interview participants echoed Mah, Thomson, and Demarchi's (1996, p. 126) previously quoted sentiment that the usefulness of the ELC Program grows as more data is added and as it is has more uptake by professionals in the field.

> *The sooner that you start using a tool, the sooner it starts be become the culture of resource management.*
>
> *Right now, it is only specialty people who are using it; it is not ubiquitous across. The product has to be out in order to be used, and it can't be integrated until it is widely available.*
>
> *The more we take ELC up, the more momentum we will gain. People in my profession are dying for this tool.*

These sentiments speak to the importance of both data maintenance and knowledge dissemination in delivering a knowledge-driven program, which are the basic components suggested by Gray (2012). For a newly established program that is continually adding primary data while simultaneously delivering services, these two aspects are intrinsically linked. As previously mentioned, 23 of the 24 interview participants are keen to incorporate ELC information into their programming; however, their level of training and knowledge of the resources may present barriers.

Only three of the interview participants were involved in the training sessions held by the Yukon Government during the past two years. The majority of interviewees reported low or moderate training, and did not feel confident to be able to perform data collection or apply ELC for programming. However, among those with high training there was high correlation with those integrating ELC into their practice (Figure 14). Most (six of the seven) of the participants who were highly trained in ELC had obtained their knowledge in jurisdictions other than Yukon; two were from British Columbia, three from Alberta, and one from Ontario.

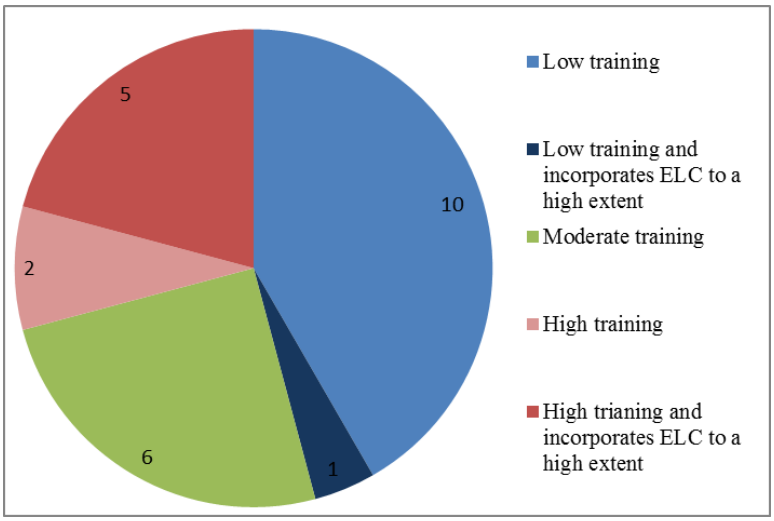

Figure 14. Level of training in ELC correlated with those reporting that they incorporate ELC to a high extent.

There is a great deal of missing data that is needed to create and maintain ELC products. 15 interviewee participants representative of all recruitment groupings and user groups were concerned about missing data. Despite this issue, some interview participants noted that the opportunity to be a part of gathering data to fill information gaps across the territory can be an incentive to follow ELC classification. Most resource managers in Yukon are accustomed to operating under data constraints and these interviewees stated that benefits of employing ELC techniques included knowing the information flowed into a central repository. All of the interviewees who work most closely with industry (the two YESAB interviewees and the two consultants) shared this view.

> *Industry would feel good to understand and know the structure they are entering into and that they are contributing to the system across Yukon. In addition our confidence level would probably go up if we had information that was supported by the ELC structure. Having only one system to learn would be beneficial, but it has to be practically applicable.*

As mentioned in section 9.3, data is collected using other jurisdictions' methods, which some interviewees perceived as disruptive to the data maintenance of the ELC Program. Data plots are added to the Yukon Biophysical Inventory System (the system used to classify local level ecological units and vegetation associations) by the information specialists at Environment Yukon. One contributor to ELC was concerned that the collection methods specified by the Framework document might restrict people from submitting their information.

> *People who are in the field anyway should be able to collect relevant information without having to collect every single piece of information for ELC. I think that we are losing access to valuable data by being picky that only four out of 10 variables are being collected. Well, then those four should be collected properly and recorded and submitted and… I think we need to be more open to that kind of information. I would hate to see that information discounted.*

Even those interviewees who felt they had a good understanding of Yukon's ELC Program confused details in the interviews. One participant was sure that the wildlife habitat maps used for the regional planning processes were created using ELC, while in fact they were created with a different technology (forest cover maps). In fact, 75% of interview participants cited knowledge of ELC or ability to interpret ELC information as a barrier to its implementation in the territory.

I got the sense that people were a little bit confused about what exactly it was and what it meant to them. What could they take home and use in their jobs.

Does the classification make practical sense? The levels and the types and so on. If it doesn't resonate with someone like me who is in the industry and knows some of the terminology, you may be losing your audience.

I don't think that we sell it properly in a non-technical way and really market it. Because it is such technical work, it is easy to get involved in the technical parts and miss the big picture.

The technical nature of interview resources was another barrier. Nine interview participants specifically reported that the technical content of ELC resources was difficult for them. In addition, most interview participants confused the language around the classification levels at some point during their interview. As Yukon's ELC Program combines both ecological and landscapeological classification methods it requires a complex series of "nested relationships" (Flynn & Francis, 2011, p. 17) of the two classifications; therefore, the terminology is not always self-evident. Figure 15 is taken from the ELC Framework document (2011) and is intended to clarify the relationships between the classification methods used by the ELC Program. However, three interview respondents reported this this figure created more confusion for them.

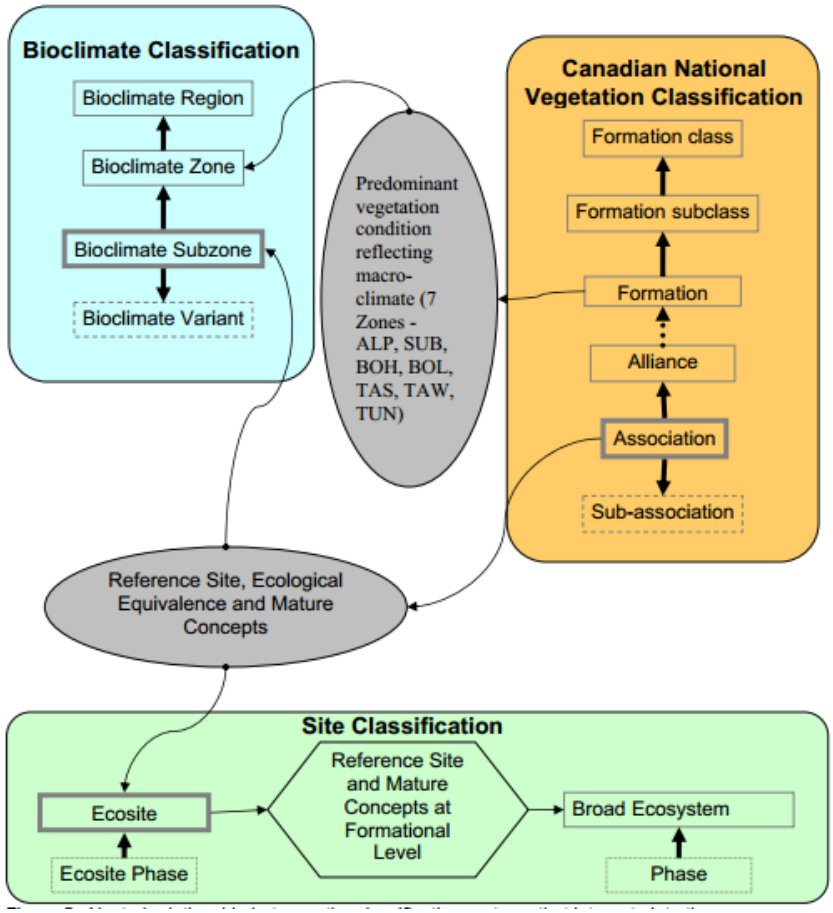

Figure 15. Nested relationships between the classification systems that are integrated into the Yukon ELC. Reprinted from *The Yukon Ecological and Landscape Classification (ELC) Framework: Overview and Concepts* (p. 18). [Interim draft for review] by N. Flynn & S. Francis, 2011.

A few participants were involved in formally reviewing the ELC Framework document as a part of the Technical Working Group (Flynn & Francis, 2011) and provided the following constructive criticism of this document:

> *I think there needs to be a front end, more simplified description and approach to ELC that would then lead people to the technical specification. If you start at the technical, you are just going to lose people.*
>
> *I think for some people it was a bit dense, it could have been more concise with better breakdowns. They have some diagrams, but more would be helpful.*
>
> *It took a couple times to see how it was flowing. There were no tabs, there was no flow through, it was just information. It did include all of the things I would need, but it was a matter of knowing what you needed and where to go to, to get that information.*
>
> *A little more streamlined would be nice and broken into sections. The language is pretty technical as well, some people might not have that great of grasp of the concepts. It's a bit difficult to navigate through and it isn't that approachable.*

There was also some concern that detailed classification might not be practical for implementation into programming. One YESAB employee stated that Smith et al.'s (2004) *Ecoregions of the Yukon Territory* was a standard go-to reference for their work (out of the nine participants who reported using this book, two-thirds of them were from the environmental assessment user group). The YESAB employee felt that Smith et al.'s reference was not always detailed enough to give them an accurate sense of a project's environment, but that they did not require as much detail as the broad level ecoregion maps.

It is apparent from the interviews that users of ELC resources and contributors to ELC data have different needs from the program in terms of data maintenance and knowledge dissemination. A contributor-specific barrier is the time and money it takes to compile ELC data. Of the 13 current or potential contributors to ELC data, nine stated that time and money is a factor in the compilation of data. All of the interview respondents (nine people) who specifically mentioned the need for ecoregion specific classification field guides were contributors.

> *It has to be really efficient. The time it takes to do a classification/plot can't be longer than 15-20 minutes. Otherwise, if our foresters are spending too much time, their productivity level just drops. We have large areas and we have very few people managing it.*

Contributors were concerned with effectiveness, while users reported that accessibility, interpretation, and regulation of ELC were their main issues. Both users and contributors stated that they prefer information to be available on-line. ELC resources are available on Environment Yukon's website, but they could receive more attention if they were integrated into more well-known resources. Figure 16 shows that all three of the ELC Program's webpages have less than 8% of the page views on average per month than does Energy, Mines and Resources' Lands Viewer.

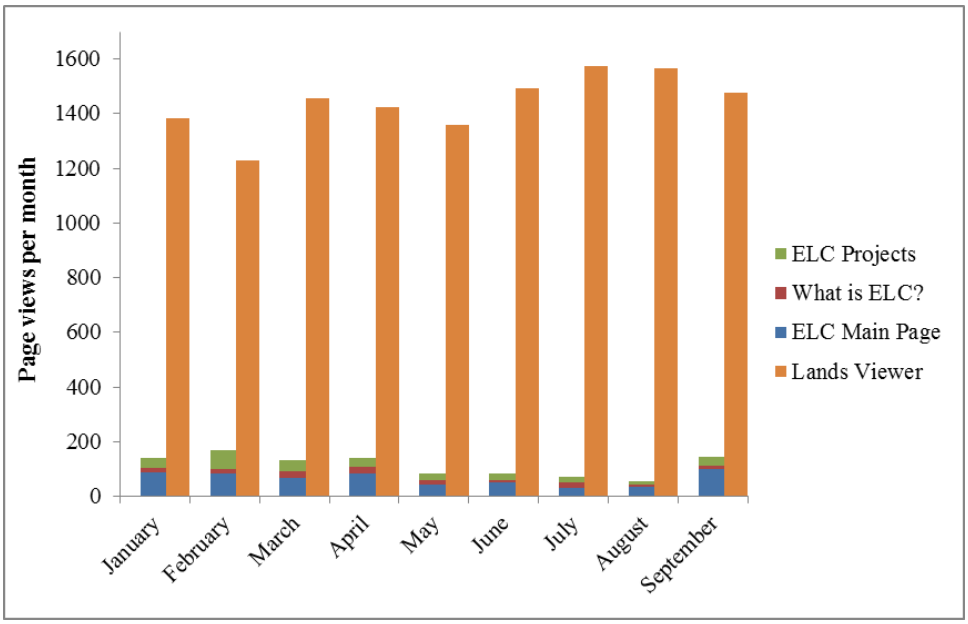

Figure 16. Web site statistics for the three ELC webpages and Energy, Mines and Resources Lands Viewer.

Although page view statistics are not available for YESAB's Geolocator site, interview respondents stated that it is their sole source for spatial information.

> *I can tell you that the forest cover maps, unless they are on our Geolocator we aren't digging for them. ELC is probably going to be online and useable in that way. If it isn't, suddenly you take 30 assessors who can view assessments on the Geolocator and you create a piece of information that won't be used and won't resonate with people.*

Despite the barriers to mainstreaming ELC as a knowledge-driven program, interview respondents were overwhelmingly supportive of the initiative.

> *There is a whole variety of resource management questions that could be answered with an ELC type product, both for planning and development.*

> *We have a lot of information from elders to show this is how we lived and these are the important areas. We need to be able to map those better. We need to manage and make recommendations on land and resource management, and to secure areas for traditional pursuits. Those opportunities are disappearing in the Southern Lakes with more roadedness and habitat fragmentation and so on. We can do it through planning and through the environmental assessment process. We need an objective ecological interpretation to add to what we can bring with traditional knowledge to those tables.*

9.5 Findings Summary

The above three sections used Gray's ecosystem approach to management as a process evaluation guide to examine the ELC Program's progress towards mainstreaming ELC. The ELC Program's strategic goals (two through four) can measure program success. Under these goals, the ELC Program developed short- and medium-term outcomes in the logic model of their *Five-Year Strategic Plan* (Yukon Environment,

2013, pp. 26-27). Rossi, Lipsey, and Freeman (2004, p. 67) state that good indicators detail the functions, activities, and outputs that the program is intended to accomplish. Thus, the ELC Program's logic model outcomes can be effective process evaluation indicators.

Table 2 classifies the ELC Program's short-term and medium-term outcomes under the four strategic goals. Long-term outcomes are not included in the table as they are projected for 2016, and could not be evaluated. This Table is intended as a summary of the process evaluation against the indicators of success outlined in the ELC's strategic plan (Yukon Environment, 2013, pp. 26-27).

Table 2
Program evaluation summary against the ELC Program's strategic goals and short- and medium-term outcomes

	Goal 1 – High quality, well-managed and accessible input data	Comments
1	Improve accessibility of existing ecosystem plot data. (April 2013)	• Members of the public can access the Yukon Biophysical Inventory System (YBIS) by contacting the ELC Program. • Interviewees noted that plot data is scattered, and is not always available for the areas they need.
2	A field and research program that rigorously tests and verifies ecological classification, mapping methods, models, and input data. (April 2013)	• The program is still gathering primary data, therefore, tests and verification of this data and methodologies is not complete.
3	Yukon Biophysical Inventory System (YBIS) has effective data management. (April 2012)	• The ELC coordinator effectively mentors a student in the upkeep and maintenance of the YBIS system. • One consultant mentioned that YBIS is a useful management system as she accesses the plot data to ensure consistency with her findings.
4	Ecology staff with extensive field experience and expertise, including the Technical Working Group and Supervisory Committee. (April 2012)	• The ELC Coordinator networked across management areas to bring together people with extensive field experience for the Technical Working Group and Supervisory Committee.
	Goal 2 – Classification and mapping framework and standards established for Yukon landscapes	Comments
5	Technical Working Group provides guidance to the program. (April 2012)	• The ELC program distributes all of the products developed by the ELC Program to the Technical Working Group for their comments and suggestions. • Two members of the Technical Working Group interviewed indicated that they would like more meetings to share knowledge and explore opportunities for mainstreaming the program.
6	Strategic planning lays out the path for program development with clear methods to achieve end goals. (April 2012)	• The *Yukon Ecological and Landscape Classification Program Five-Year Strategic Plan* (Yukon Environment, 2013) is a clear document that plans the program development with clear methods, such as the ones in this table.
	Goal 3 – ELC is used to support and inform sustainable and integrated resource management	Comments
7	Framework terminology and concepts are used in Yukon land and resource management. (April 2012)	• There is a great deal of confusion regarding the framework terminology and concepts among resource managers. • It is not yet used in Yukon land and resource management.
8	The Yukon ELC Management Committee provides high-level direction for government-wide initiatives for ELC	• Three interviewees from different departments within the Yukon Government expressed that departments can act as silos, and it can be difficult to access information or plan in a whole-of-

	application. (April 2013)	government approach. • Interviewees noted a desire for high-level direction.
9	Strong relationships with stakeholders, industry – all those who are interested in using and applying ELC standards. (April 2013)	• Progress has been made as relationships are forged in all of the recruitment groups identified for this research. • There are ongoing opportunities for collaboration.
10	The Yukon ELC Program and existing interim ELC products gain profile and recognition. (April 2012)	• ELC products are used in the regional land-use planning process, but further application has not yet been recognised. • Forestry recognises ELC's use for developing silvicultural standards, and plans to integrate them. However, their standards are not yet developed. • There seems to be a broad recognition amongst the resource managers interviewed, that ELC is a useful tool to adopt, but confusion around what it is, how to use it, and where it is available.
11	Website and newsletter effectively communicate program information to the general public and stakeholders. (April 2012)	• The website is updated continuously, but some of the information presented leads to confusion (such as where ELC information is available). • A newsletter was produced, but may not have reached its intended targets as no interviewee mentioned receiving it.
	Goal 4 – A strong, supported program with the capacity to meet demands	Comments
12	The Yukon ELC Unit is functioning and producing high quality products. (April 2013)	• There are discrepancies in the methodologies of the North Yukon, Peel, Ross River, and Dawson ELC map products. • Moving forward, discrepancies should not occur because the Framework document is complete (Flynn & Francis, 2011). • The Southern Lakes Guidebook will soon be published.
13	Interdepartmental Planning Committee mandate includes planning for ecosystem and land classification initiatives. (April 2012)	• No interview participant mentioned an Interdepartmental Planning Committee.

Note: The researcher organized the outcomes of the logic model under the ELC strategic goals and added the numbering. The table is colour-coded with green indicating outcomes that are complete, yellow indicating progress has been made toward the outcome, and orange indicating that little progress has been made.

As seen from the above table, while there is progress towards most outcomes, the ELC program has not met target dates for achieving these outcomes. The next section offers options for the ELC Program to consider in meeting the third and fourth strategic goals and the outcomes that support them. The options are based on (1) a marketing approach to increase the profile of the ELC Program, and (2) a policy/best practice approach to ensure ELC's integration into resource management.

11 OPTIONS FOR CONSIDERATION

The following options provide different approaches to overcoming the barriers to mainstreaming the ELC Program. Interviews and analysis in this research revealed that there are three major barriers to ELC mainstreaming; these are the lack of availability of ELC information for a specific area, inaccessibility and inability to interpret ELC information, and the lack of a structure enforcing its implementation.

The options that this research presents do not address the first barrier, the fact that ELC products are not available for all areas across the territory at this time. The ELC Program staff are already working on an implementation plan to make all of the products (Appendix A) available. This means that the options do not address meeting the specific outcomes under goals one and two of the ELC Program's strategic plan outlined in Section 9.5. Instead, the options presented focus on the second two barriers and suggest how to mainstream the products as they come available. These are options to work towards successful attainment of the ELC Program's strategic goals three and four (see Appendix B for the full listing of the strategic goals and objectives).

The options can be implemented simultaneously, in sequence, or individually, depending on the client's needs and capacity.

11.1 FOCUS ON ACCESSIBILITY AND INTERPRETATION

Reflecting back on McKenzie-Mohr et al.'s (2012) five marketing steps to foster behaviour change for environmental purposes, it is apparent that the ELC Program is at step three. The first two steps (selecting which behaviour to target, and identifying the barriers and benefits to the selected behaviour) were completed through the course of this research. Step three is developing a strategy that reduces barriers to the behaviour to be promoted, while simultaneously increasing the behaviour's perceived benefits. The first option addresses barriers and benefits by focusing on accessibility and interpretation of ELC.

A focus on accessibility and interpretation will allow interested resource managers the ability to start integrating ELC products into their practice as soon as they are available. It is a strategy that will raise the profile of the program, and highlight the Yukon Government's dedication to support sustainable and integrated resource management.

Ninety-six per cent of the interviewees in this research were interested in using ELC, but this research revealed that they had difficulty accessing and understanding the information. The following are steps that may assist the ease of access and comprehension of ELC resources.

1. **CLARITY IN LANGUAGE**
   As ELC is a complex topic and has many interlinking levels of information from both ecological and landscapeological methods of classification, a simple and clear reference would be helpful for users. A simplified table of terminology presented on the ELC webpage and at the beginning of every document and report that the ELC produces would help familiarize new users with the technical language. Such a table would also help those experienced in other jurisdictions' systems of ELC to become familiar with Yukon's standard.

2. **CLARITY OF AVAILABLE INFORMATION**
   There is a great deal of confusion about where ELC information is available (see Figure 12). One method to illustrate the availability of ELC resources is to present it in a visual format. Figure 17 provides an example of a suggested method to illustrate to users the available spatial information.

This figure could be presented on the ELC webpage, so that users looking for spatial layers (11 of the 24 interviewees expressed an interest in spatial layers for download) would know exactly where they were available, and where to go to obtain them.

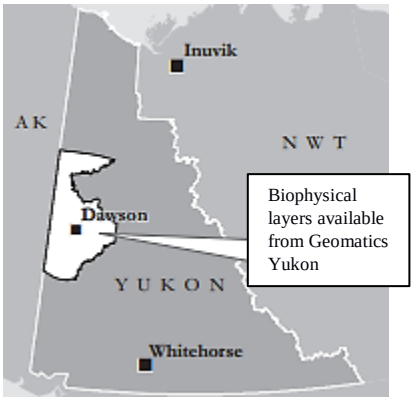

Figure 17. Example of a potential web icon to show the availability of ELC products in Yukon. Text box added. Adapted from *Dawson Planning Region* by Dawson Regional Land Use Planning Commission, n.d. Retrieved from http://dawson.planyukon.ca/

Archiving the reports and information that do not comply with the most up-to-date methodology would also reduce confusion. Currently, all of the reports produced by the ELC Program are available on their website, listed in chronological order. This creates an impression that all of the reports are to the same standard, and can be relied upon for ELC information in Yukon, which is not the case. If these reports are to be available to the public, this research suggests separating them from the up-to-date information with a heading explaining the methodological differences.

The ELC program could integrate the interviewee feedback into their Framework document (Flynn & Francis, 2011) and any further documents produced. Users are better served by concise information that is pertinent to their roles in data collection or interpretation. Users prefer ample headings so they can quickly skip to the sections that they need and they appreciate diagrams. For clarity's sake, technical information could be located in appendices.

3. INTEGRATION INTO POPULAR DATA SITES

Participants mentioned two spatial information sites many times during the interviews. First, Yukon Government and First Nations Government representatives strongly advocated for the Energy, Mines and Resources Lands Viewer. These individuals feel that the Lands Viewer is an approachable method to find information and that it is widely used across the Yukon. As Figure 16 shows, this website receives over 1,200 visits every month. Representation of ELC information on this site could serve two purposes. First, it could raise the public profile of ELC. Second, it could help encourage the view that ELC is a 'common language' approach that is used Yukon-wide.

YESAB's Geolocator was the second site that received specific mention in the interviews. Incorporation of ELC information on the Geolocator would assist the program in reaching a strategic audience. Industrial partners looking to go through an environmental assessment engage with the Geolocator. It is also the first (and sometimes only) source of information for YESAB assessors. Making ELC information compatible with this site could increase its use in environmental assessments. The ELC information would need to be coupled with training or an

interpretation guide, so that both industry and YESAB assessors would understand the value of different ecoregions, and what they mean for project development.

Yukon Geomatic's (2014) GeoYukon is a new site to display Yukon spatial data; the ELC Program has already made information available through this platform. As it gains popularity with resource managers, the ELC Program's efforts to upload their imagery will likely increase awareness of ecosystem mapping. A recommendation could be to include a brief description of what biophysical information means on the site so that users will understand how to interpret the information they access.

4. TRAINING

A strong relationship was evident between the level of training in ELC interviewees had and those that already integrate ELC into their practice (Figure 14). However, training can take a great deal of resources, so a strategic approach could be implemented. From the information provided by interviewees for this research, the following is suggested:

- Run lunch-hour information sessions for Yukon Government resource managers. Interviewees suggested that they would be best served by practical demonstrations of ELC applications for resource management, rather than any technical background.
- Field training with potential contributors of ELC data (especially in the consultant field) could be beneficial. The ELC Program's field training was highly valued by those participants who had attended.
- Training for GIS modellers who work for consulting firms could help them to realize the potential of the tool. This was suggested by one interviewee.

The more training that is delivered through the ELC Program, the more likely it is that resource managers will adopt ecological information into their decision-making and programming.

11.2 FOCUS ON POLICY OR BEST PRACTICE DEVELOPMENT

The second option is to focus on a top-down approach that will establish ELC as a 'Yukon way of doing business'. Through the ELC Program's *Five-Year Strategic Plan* (ELCSC, 2013), the Framework document (Flynn & Francis, 2011) and this research, a good basis for developing policy or best practices is established. The stakeholders are identified, the values and guiding principles established, and the policy goal—to mainstream ELC as a basis for sustainable and integrated resource management—is clear. Developing ELC across jurisdictions positions Yukon as a leader in the field as most jurisdictions utilize ELC in a single management area. This can take place in two steps: first, integrate ELC considerations into documents currently being developed by different management areas; second, develop a communication strategy for the guidebooks and best practice documents produced by the ELC Program.

The first step continues the momentum gained through the interview process. Three different management areas are currently establishing guidelines or undertaking reviews of their program documents. Instead of approaching policy to integrate ELC independently, there may be an opportunity to align with the following:

- YESAB recently completed a *Draft Geohazards Guide* (2014b) which is available for review on their website. This guide underlines a methodology to develop risk analysis for proponents who are developing linear infrastructure, including gathering spatial data. There are references in the document to methods of mapping important values that need to be considered in projects of this

scale. There may be room to reference the ELC Program as a resource for ecological and landscape mapping.

- YESAB's Executive Committee is updating a *Proponent's Guide to Information Requirements for Executive Committee Project Proposal Submissions*. There may be potential to integrate ELC considerations into this document, as executive committee projects are the most likely YESAB submissions to be required to include ecosystem information.
- Yukon's Department of Energy, Mines and Resources, Forest Management Branch is developing a silviculture program. There are clear areas of alignment with the ELC Program, and Forestry is committed to integrating ELC into their regeneration plans.
- Regional land-use planning is an area in which the ELC Program can continue to be involved. The people involved in regional planning who were interviewed greatly appreciated the ELC products they had received. One participant mentioned the value of the products in communicating ecosystem importance to higher political powers.
- Local level land-use planners at the Yukon Government expressed desire for the ELC Program to help them develop a terms of reference for the consultants who develop land-use maps.

The second step is to develop a communications strategy for the guidebooks and best practice documents produced by the ELC Program. One guidance document, the Framework document (Flynn & Francis, 2011), is already available and a guidebook for the Southern Lakes Ecoregion is scheduled to be released in 2015. A communications strategy that incorporates the suggestions from Section 10.1 can help to mainstream these documents. This strategy has the potential to progress all of the outcomes under goals three and four of the *Five-Year Strategic Plan*.

Demonstrating integration across government departments and between agencies in Yukon will strengthen the ELC Programs standing. As stated in the literature and throughout the interviews, the more that the program is used, the more it will be used.

12 CONCLUSION

Ecological and Landscape Classification (ELC) is an approach to spatially represent the terrain, vegetation, climate, and soil aspects of ecosystems. The ELC Program is four years old, and has developed a framework and standards in this short time. They are now turning their attention to ensuring they meet the needs of resource managers in Yukon, who, according to their feedback in this research's semi-structured interviews, are eager to incorporate ELC into their activities. Barriers to resource managers incorporating ELC into their work were largely due to a lack of availability and accessibility of the products and an inability to interpret the information. Overcoming these barriers through training, marketing, and policy approaches can mainstream the products into resource management. The more ELC products are used in Yukon, the more they can enhance sustainable and integrated resource management, which is a goal of Environment Yukon.

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APPENDICES

Please see separate document.

APPENDICES

A. YUKON ENVIRONMENT'S ECOLOGICAL AND LANDSCAPE CLASSIFICATION PRODUCTS

Title	Availability	Description	Management Applications
Guideline Document	In preparation.	A document that will describe the standards and guidelines for ecological and landscape classification mapping. This document will ensure consistency in how ecological and landscape classification and mapping are developed and used.	• Transportation and infrastructure planning (transportation corridors and other industrial infrastructure); • Municipal and local area planning (urban and rural residential); • Project-level environmental impact assessment (e.g. fish and wildlife values, environmental sensitivity); • Sensitive or rare ecosystem mapping; • Mineral development planning (mine sites); • Oil and gas exploration and development; • Land reclamation (e.g. mining, gravel pits); • Forest management.
Yukon Bioclimatic Framework Classification and Mapping products: Bioclimate level	In preparation, available on request.	These products will describe the major ecological patterns on large areas with similar climatic conditions at a scale of 1:100,000 to 1:1,000,000.	• Forest Management; • Conservation area planning and representation; • Regional land-use planning; • State of Environment reporting.
Yukon Bioclimatic Framework Classification and Mapping products: Broad Ecosystem Level	Completed for 50% of Yukon, however, not available for Southern Lakes Ecoregion at this time.	Provides information about generalized ecosites at a 1:50,000 to 1:250,000 scale. Usually mapped with predictive ecosystem mapping methods and includes both Broad Ecosystem Unit 'site' and	• Wildlife and habitat management; • Cumulative effects assessment and management; • Regional land-use planning; • Conservation area planning and representation; • Mineral exploration planning; • Oil and gas exploration and development; • Sensitive or rare ecosystem mapping; • Land capability (e.g. agriculture, aggregate); • Cultural use.

		‘phase’ components.	
Yukon Bioclimatic Framework Classification and Mapping products: Local Ecosystem Level	In preparation – ecosite classification only	Local ecosystem level products will be completed using manual methods to deliver detailed mapping products. They will be at large scales of 1:10,000 to 1:50,000 and can consists of both ecosite and ecosite phase mapping. Currently, only ecosite classification is available.	• Transportation and infrastructure planning (transportation corridors and other industrial infrastructure); • Municipal and local area planning (urban and rural residential); • Project-level environmental impact assessment (e.g. fish and wildlife values, environmental sensitivity); • Sensitive or rare ecosystem mapping; • Watershed planning and effects modeling; • Mineral development planning (mine sites); • Oil and gas exploration and development; • Land reclamation (e.g. mining, gravel pits); • Forest management.
Ecoregions of Yukon by Smith et al. (2004)	Available.	Provides generalized descriptions and maps of the regional and biophysical landscapes of the Yukon.	When used in tandem with local, site-specific data: • Forest management; • Conservation area planning and representation; • Regional land-use planning; • Mineral, oil, and gas exploration planning.
National Ecological Framework of Canada (NEF) mapping products at ecoregion and ecodistrict levels.	Available.	NEF has mapped Yukon ecoregions and districts at a 1:100,000 scale. Current updates will increase the scale to 1:250,000. The maps of ecoregions and districts identify ecologically distinctive areas of Yukon.	• Conservation area planning and representation; • Regional land use planning; • State of Environment reporting; • Inputs to predictive ecosystem mapping; • Cultural use.

B. Strategic Goals and Objectives of the ELC Program

Goal 1: High quality, well-managed and accessible input data

A variety of data types that come from multiple sources are required for ELC. The utility of end products depends on the quality of data used to build them.

Objective 1.1: Improve the quality and consistency of ecological products and maps at scales meaningful to resource managers.

- Determine/track availability of input data, identify gaps to ELC and develop a plan to fill critical/priority areas.
- Work with committees and stakeholders to confirm priority areas for input generation as well as ecosystem fieldwork, classification and/or mapping.
- Create and maintain consistent standards for ecological classification inputs.
- Provide advice to other Yukon government ELC users to promote quality and consistency of ELC-related products.

Objective 1.2: Adopt a data management system and methods to collect, store and retrieve ecosystem data.

- Clarify the roles related to a biophysical data management system. Clarity is needed as to who will oversee ecosystem plot data within the system and facilitate data sharing.
- Document and develop as required data standards, criteria, access and use of biophysical plot databases.
- Review and consider adopting Environment Yukon's field sampling protocol for ELC program use.

Objective 1.3: Provide key map layer inputs and guidance to enable other agencies to produce ELC map products.

- Develop base inputs such as soil moisture model, terrain models and wetland ecosystems.
- Provide other agencies with advice on the application and use of these base inputs.

Goal 2: Classification and mapping framework and standards established for Yukon landscapes

Objective 2.1: Uniform approach to classifying and identifying ecosystem communities.

- Complete data and mapping standards for bioclimatatic zones and subzones, and broad and local ecosystems.
- Document the scientific basis and principles for Yukon's ecological and landscape classification program.
- Develop ecoregion descriptions and delineations.
- Complete consistent broad and local-scale ecological classification systems for Yukon that integrate terrestrial and aquatic systems.
- Develop ecosystem (ecosite) guidebooks and manuals for priority/pilot areas.

- Complete bioclimatic mapping in order to frame context of regional and local scale classification and mapping.
- Provide high-level landscape classification based on climatic regions and ecological associations.

GOAL 3: ELC IS USED TO SUPPORT AND INFORM SUSTAINABLE AND INTEGRATED RESOURCE MANAGEMENT

Objective 3.1: Support effective resource planning and assessment by providing the tools to identify ecological information.

- Develop ecosystem (ecosite) guidebooks and manuals as required.
- Develop digital standards (scale, accuracy) for the application of ELC products.

Objective 3.2: Coordinate interpretation of ELC products to inform land and resource decision-making.

- Inform planners, proponents, assessors and decision makers with respect to the interpretation and application of different ecological units.

Objective 3.3: Promote products and services to clients and position the ELC program as the leading source of ELC information.

- Develop a website as a part of Yukon government's public website.
- Develop and distribute a newsletter to communicate program activities/updates.
- Communicate (in person, email, poster, and presentations) with our stakeholders.
- Provide access to ELC data.

Objective 3.4: Develop policy related to application of ELC in land management and regulatory processes.

- Seek opportunities for Yukon government to apply and promote ecological classification and mapping products.
- Work with YESAB, First Nation governments, Federal Departments and Yukon government departments to integrate ecological classification, mapping and resource management applications within planning, environmental assessment, development and regulatory processes.
- Develop quality assessment and quality control standards for ELC products used in environmental assessment criteria and mitigation measures.

GOAL 4: A STRONG, SUPPORTED PROGRAM WITH THE CAPACITY TO MEET DEMANDS

Objective 4.1: Develop and maintain collaborative working relationships with clients and domain experts to exchange and integrate knowledge.

- Engage and promote the ELC program with potential project partners.

Objective 4.2: Pursue funding and program resources.

- Work with other agencies to prepare funding proposals, to classify and map ecosystem.
- Identify skill areas that are currently under-resourced and address how this need may be met.

Objective 4.3: Develop and formalize relationships with partner agencies and to facilitate understanding of roles and mandate.

- Develop Terms of Reference for ELC program committees and working groups. Develop policy related to application of ELC in land management and regulatory processes.

Objective 4.4: Provide essential support, training and services to our clients and committees.

- Strengthen knowledge of ecological classification methods for ELC products.
- Provide training opportunities to clients in field techniques, framework concepts and mapping techniques.
- Provide support and training on development and application of ELC products.

C. ECOREGIONS OF YUKON

Figure 1: Ecoregions of Yukon. The Southern Lakes Ecoregion is outlined in black. Reprinted from *Ecoregions of the Yukon Territory: Biophysical Properties of Yukon Landscapes* by C.A.S. Smith, J.C. Meikle, & C.F. Roots (Eds), 2004, PARC Technical Bulletin No. 04-01. Summerland. British Columbia: Agriculture and Agri-Foods Canada.

D. TRADITIONAL TERRITORIES OF YUKON FIRST NATIONS

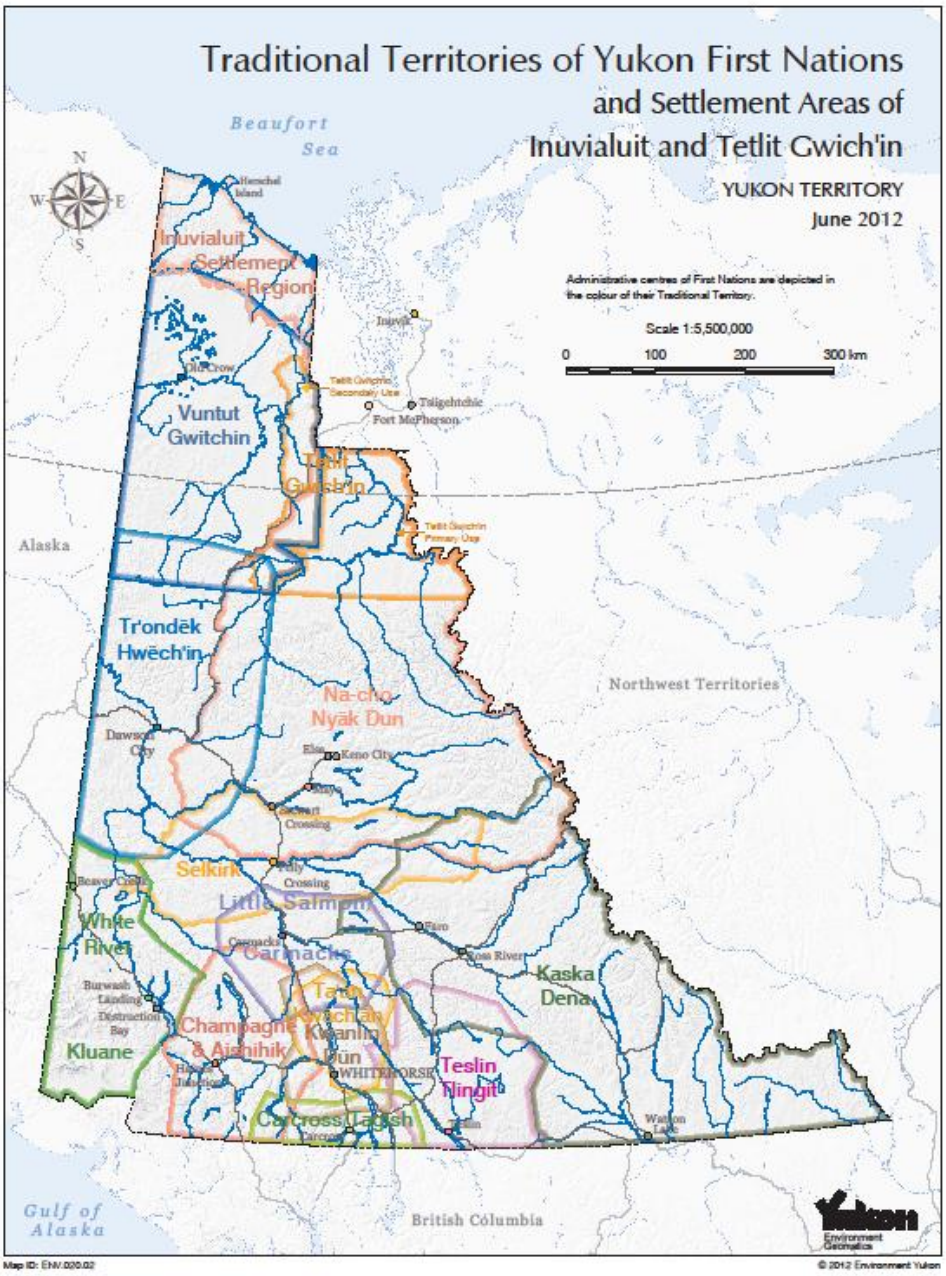

Figure 1: First Nations Traditional Territories. The Southern Lakes Ecoregion is on Champagne & Aishihik, Ta'an Kwachan, Kwanlin Dun, Carcross Tagish, and Teslin Tlingit Traditional Territories. Reprinted from *Yukon Enviornment Maps: Traditional Territories* by Yukon Environment, 2014, retrieved from http://www.environmentyukon.ca/maps/view/nav/3/28/

E. LAND-USE PLANNING REGIONS OF YUKON

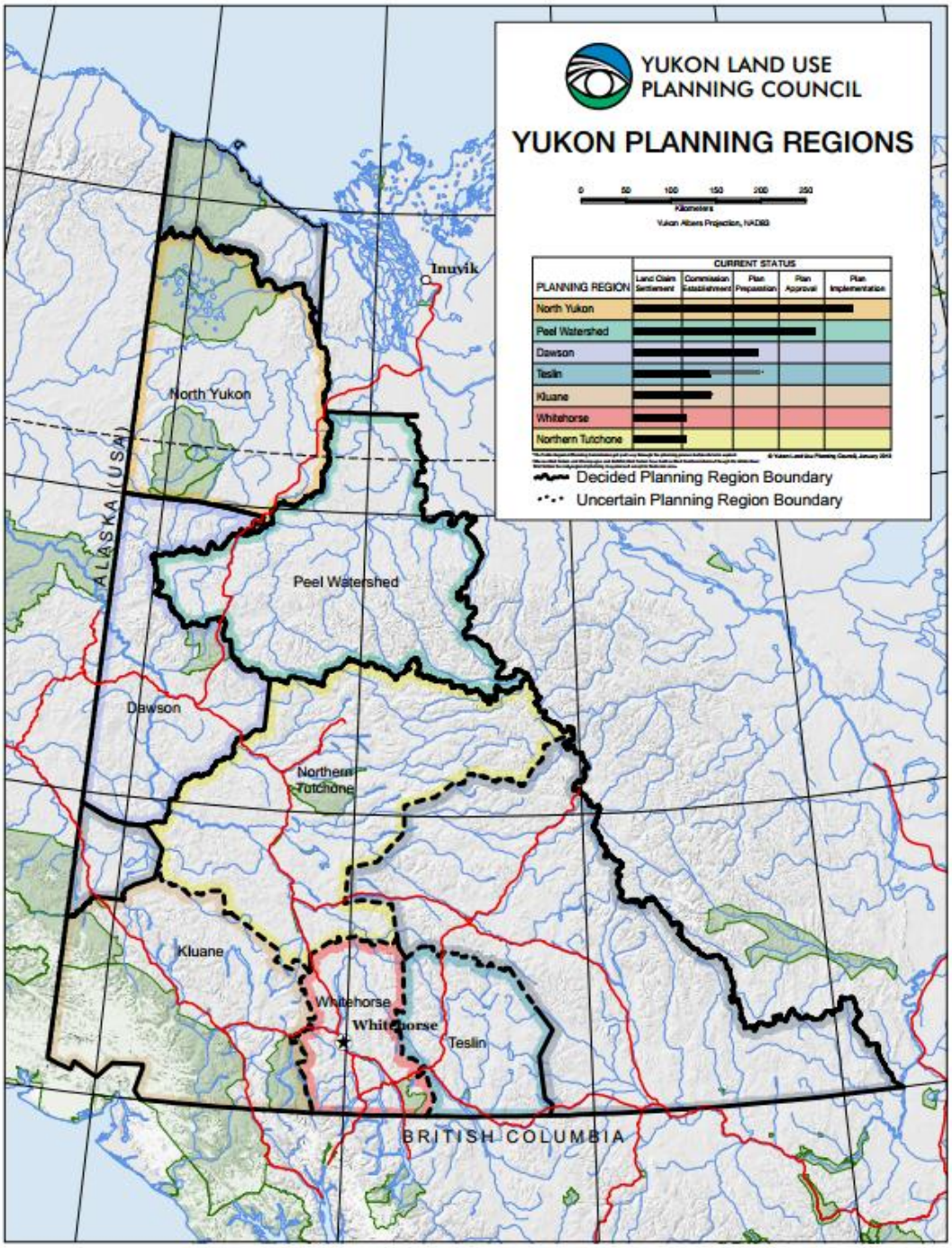

Figure 1: Land-use planning regions of Yukon. The Southern Lakes Ecoregion loosely corresponds to the Whitehorse and Teslin planning regions. Reprinted from *Planning Regions* by Yukon Land Use Planning Council, n.d., retrieved from http://www.planyukon.ca/index.php/planning-regions.html

F. ENVIRONMENTAL ASSESSMENT FLOW CHARTS

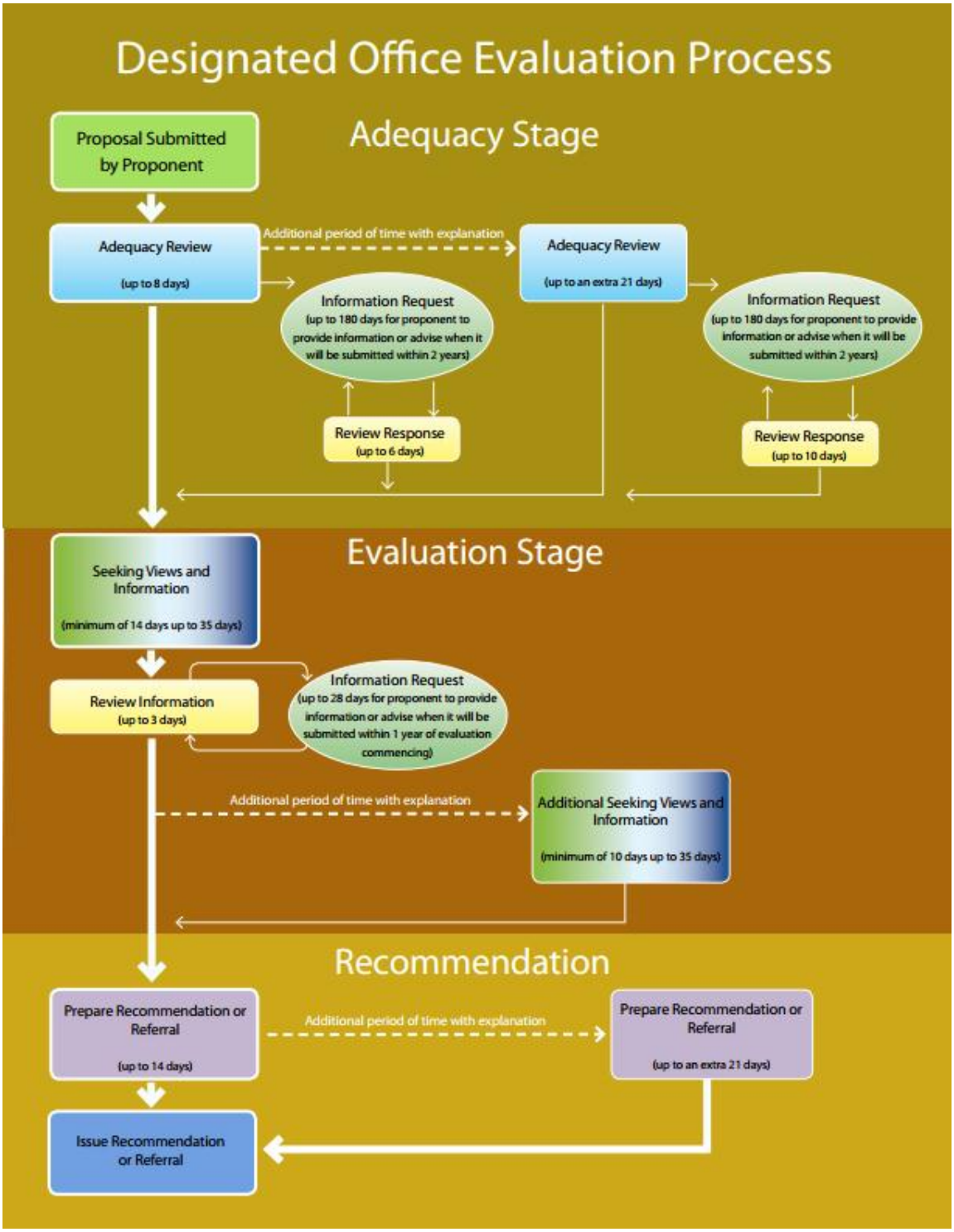

Figure 1: Flow chart for the environmental assessment process by a designated office. Reprinted from *Designated Office Evaluation Process* by YESAB, 2012, retrieved from http://www.yesab.ca/wp/wp-content/uploads/2013/04/DO-Process-Flow-Chart-2012.pdf.

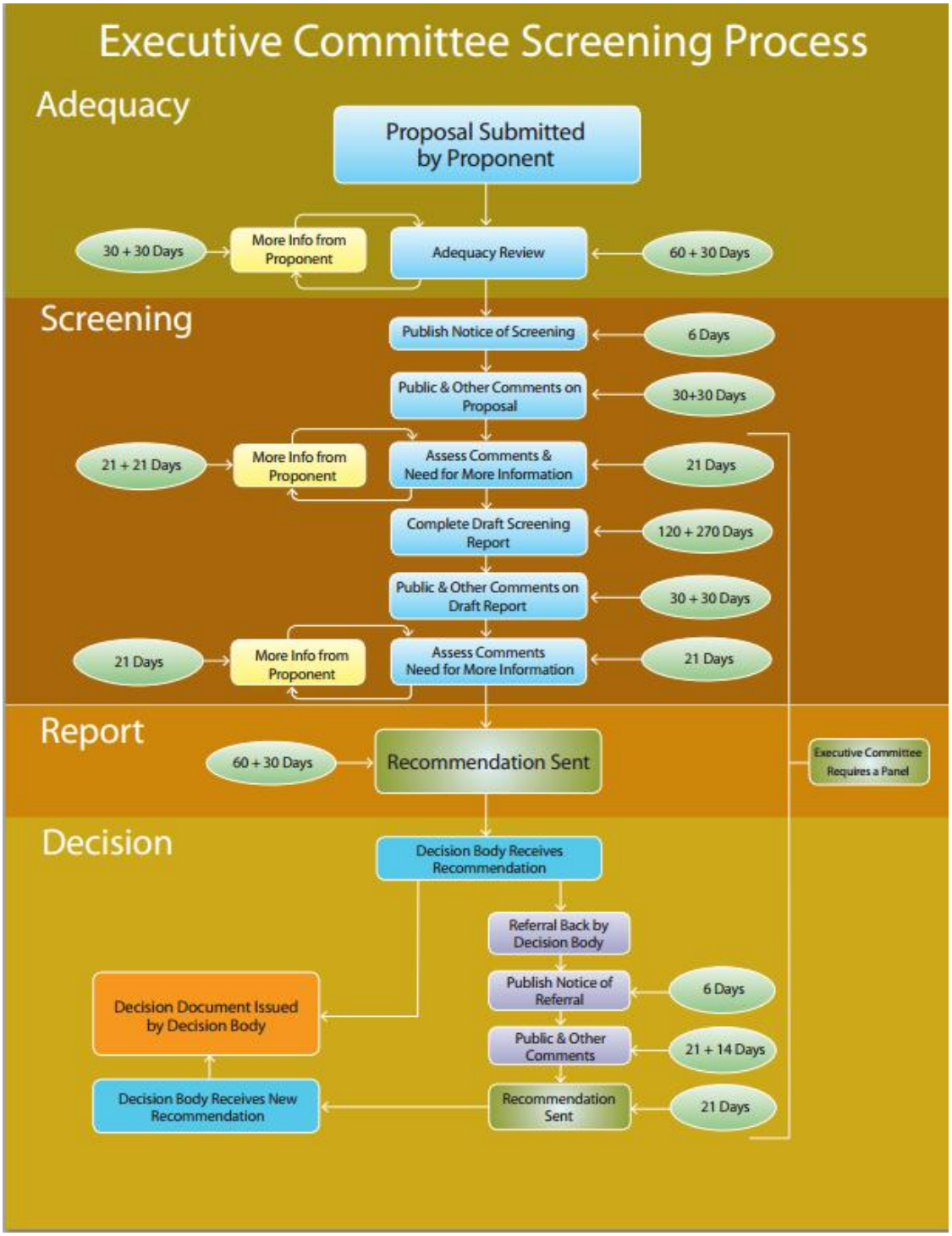

Figure 2: Flow chart for the environmental assessment process by the Executive Committee. Reprinted from *Executive Committee Screening Process* by YESAB, 2014, retrieved from http://www.yesab.ca/wp/wp-content/uploads/2014/04/Excomm-Screen-Process-Chart-April-25_-2014.pdf.

G. THE SOUTHERN LAKES REGION'S ECO-DISTRICTS AND BIO-CLIMATE ZONES.

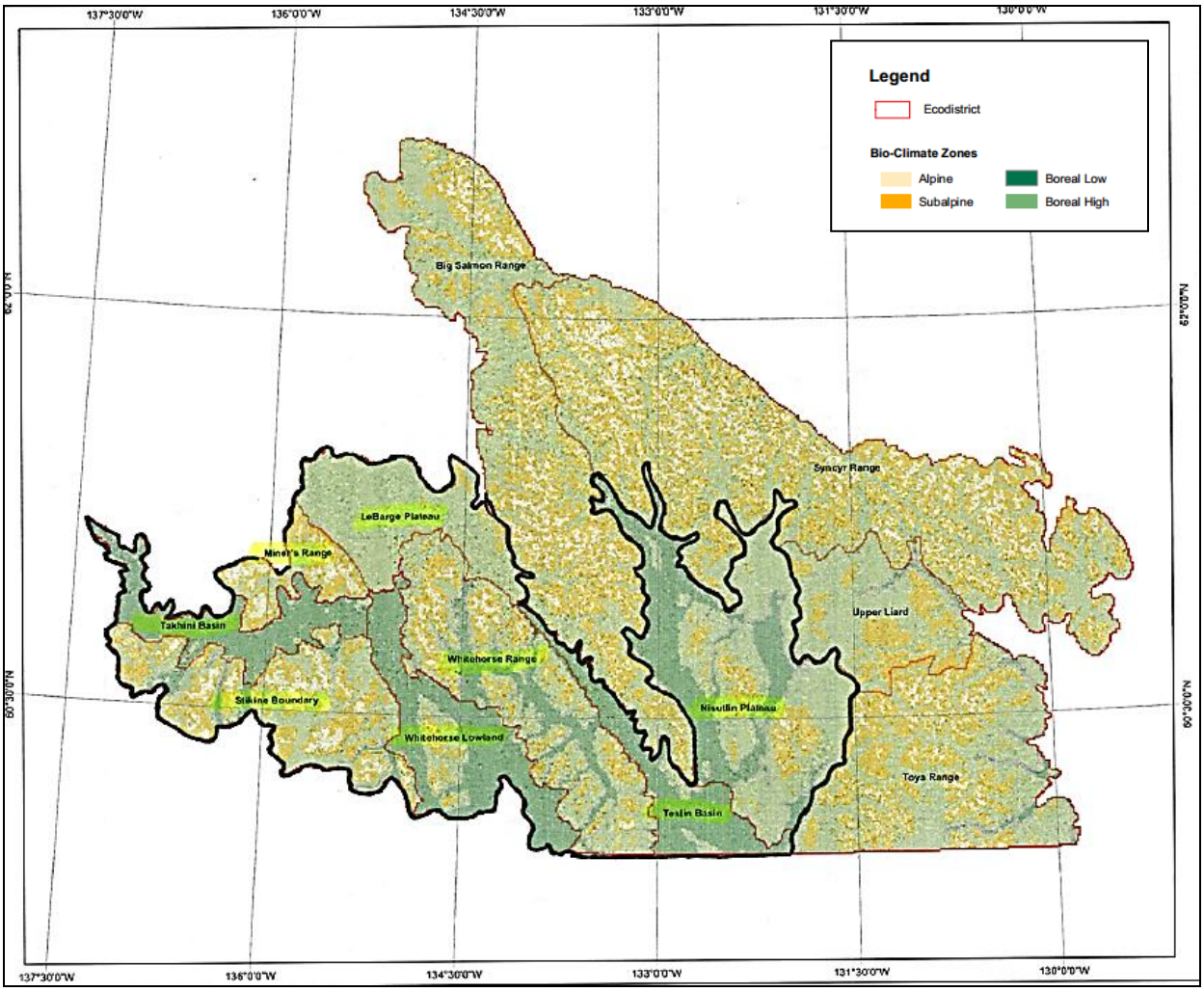

Figure 1: Map of Yukon Southern Lakes and Pelly Mountains Ecoregions. Bold black outline denotes Yukon Southern Lakes Region. A red outline designates the perimeter of the ecodistricts, and those ecodistricts that belong to the Southern Lakes Region are highlighted. Adapted from *Regional Ecosystem Classification and Mapping of the Yukon Southern Lakes and Pelly Mountain Ecoregions*, EBA Engineering Consultants, Ltd., 2003). (EBA File No: 0805-5800131). Retrieved from Environment Yukon's website: www.env.gov.yk.ca/animals-habitats/elcprogram_projects.php

Table 1
Southern Lakes Region Bio-Climate Zone Description

Bio-Climate Zone Name	Bio-Climate Zone Description	Approximate Elevation Range (m)
Boreal Low	Continuously forested areas at low to middle elevations, below the Boreal High of all mountain valley and plateau Ecoregions of southern and central Yukon. Landscapes are generally wide valleys. There are long cool winters and short, cool and moist summers. Forests are mostly mixed wood conditions with well-developed understories. Wetlands are common	300-1150
Boreal High	Middle to upper elevations of forested areas at all mountain valley and plateau Ecoregions of southern and central Yukon. Found above the Boreal Low in large valleys. Characterized by steep slopes in the Yukon Southern Lakes Ecoregion. Summers are brief, cool and moist, with long cold winters. Forests are mostly dominated by white spruce and subalpine fir.	1000-1350
Subalpine	Sparsely forested areas at moderate to higher elevations on steep slopes above the Boreal High. Subalpine areas form a transitional zone between forested Boreal and non-forested Alpine Bio-Climate Zones. Open canopy conifer forests (tree cover <20%) and tall shrub communities are characteristic vegetation conditions. Subalpine fir is a dominant tree species. Winters are long and cold, while summers are short and cool.	1300-1700
Alpine	Higher elevations associated with mountainous conditions. Dwarf shrubs, herb/cryptograms and low-growing and scattered krummholtz trees are the dominant vegetation condition. In high elevation areas, large areas may include bare rock, colluvium or snow/ice.	1600+

Note: Adapted from EBA Engineering Consultants, Ltd. 2003. *Regional Ecosystem Classification and Mapping of the Yukon Southern Lakes and Pelly Mountai*n Ecoregions. (EBA File No: 0805-5800131). Retrieved from Environment Yukon's website: www.env.gov.yk.ca/animals-habitats/elcprogram_projects.php

H. INTERVIEW QUESTIONS

1. Did you have a chance to review the document about ELC products that I sent you? Is there anything that you would like clarified before we begin the interview?

2. What is your job position? How long have you worked in this position?

3. How have you been involved in resource management or land-use planning in the Yukon?

4. Would you say that you are working on a community, local, regional, territorial, or national level? (note: keep Southern Lakes Region in mind when asking questions if they work on a larger scale)

5. Do you have any training or education in ecological and landscape classification products or resource management?
    a. If yes and in the Yukon, was it offered by the ELC program?
    b. If yes, how long was your training?

6. I'm interested in your opinion of ecological and landscape classification products in general. Do you feel that information about vegetation communities and their site associations is important for the work that you do?
    a. If so, how would (or how do) you integrate them into your work (e.g. formalized in policy or best practices, on an ad hoc basis)?

7. Where do you generally look to for information or resources about ecosystems and landscapes if you need it?

8. What would you describe as your level of familiarity with Yukon government's ELC program?
    a. Have you accessed any of Yukon government's ELC tools? Which tools and how often?
    b. What other type of contact (if any) have you had with the ELC program?

9. Do you have any thoughts on the quality, consistency, or accessibility of ELC products?

10. What are the current barriers (if any) to using ELC products in your work?

11. Outside of the tools and resources that you currently use, is there any ecological product that you feel could be very useful for your work?

12. Do you have any other comments or suggestions?

Table 1 shows the relationship between my research objectives, the ELC program goals or objectives, and the research questions. Questions 1 through 6 are not included, as they are intended to contextualize the individual's position and experience for the sake of analysis.

Table 1

Relationship between the research objective, ELC program goals or objectives, and the research questions.

Research Objective	**ELC Program Goal/Objective (Appendix B)**	**Research Questions**
Determine how and how much resource managers in the Southern Lakes Region are using Yukon government's ELC products	• Goal 3, Objective 3.1 and 3.3	• Question 8 • Question 9
Determine what resource managers need from an ELC program	• Goal 3, Objective 3.2 • Goal 4	• Question 7 • Question 12 • Question 13
Assess resource managers' experience with currently available products	• Goal 1, Objective 1.1 • Goal 2, Objective 2.1	• Question 9 • Question 10
Determine how Yukon government can encourage the uptake of their products	• Goal 3, Objectives 3.3 and 3.4	• Question 7 • Question 9 • Question 11 • Question 13

I. RECRUITMENT DOCUMENTS

i. Introductory email from Yukon government's ELC program

Dear XXXXX,

Yukon Environment's Ecological and Landscape Classification program is the client for a graduate report by Amy Law, Master of Public Administration candidate. She is completing an inquiry of how we can encourage the uptake of our ecological and landscape classification products.

The role of the ELC program in this research is to provide information about the ecological and landscape products and to provide potential contact for Amy's interviews. We will not directly participate in the research and will not have access to the original data. Amy will disseminate her results to us in order to inform the future development of our products.

I wanted to introduce Amy and her project to you, as you have information that may prove valuable to her research. If you wish to participate in this research, please contact Amy directly at amy.c.law@gmail.com or 778-350-6633. Interviews will take place between October 15th and December 15th, 2014.

Amy may contact you by email in the upcoming weeks to invite you to voluntarily participate in her study.

Thank you,

Nadele Flynn
Ecological and Landscape Classification (ELC) Coordinator ph. (867) 667-3081
www.env.gov.yk.ca/elc

ii. Email script to set interview times by researcher

Dear XXXXX,

Thank you for your interest in participating in my study entitled Mainstreaming Yukon Government's Ecological and Landscape Classification Products.

As a graduate student in the school of Public Administration at the University of Victoria, I am undertaking this research for my client, the Ecological and Landscape Classification (ELC) Unit of the Department of Environment, Yukon government. The final results will be presented to them, but data gathered will be kept anonymous and confidential.

The purpose of this research project is to determine how and how much (if at all) resource managers in the Southern Lakes region are using the ELC products offered by Environment Yukon. It will also help to identify if resource managers feel that ELC products can be useful for them, and any additional information that resource managers may need to facilitate uptake of the products.

If you consent to voluntarily participate in this research, it will include reviewing a document detailing the ecological landscape classification products (attached) offered by Environment Yukon's ELC Unit and answering a series of questions in a semi-structured interview. The time commitment for taking part in this process will not exceed 1.5 hours. The interview itself will take approximately half an hour.

Is there a convenient time this month for you to participate in the interview? I have availability:

Mondays - all day;

Tuesday - Friday after 3 pm.

We can meet either at your workplace, or in an interview room at the Department of Environment in Whitehorse. If Whitehorse is not a convenient location, we can schedule a telephone interview.

If you agree to participate, please contact me at amy.c.law@gmail.com or (778) 350-6633 to schedule a meeting at your convenience.

The consent form is attached for your review. If you do decide to participate, you may withdraw at any time without consequences or any explanation. If you do withdraw from the study your data will not be used, and will be immediately destroyed.

Please do not hesitate to contact me if you would like further information.

Thank you,

Amy Law
(778) 350 6633
amy.c.law@gmail.com

iii. Consent form

Mainstreaming Yukon Government's Ecological Land Classification Program

You are invited to participate in a study entitled *Mainstreaming Yukon Government's Ecological and Landscape Classification Program* that is being conducted by Amy Law. I am a graduate student in the department of Human Resources and Social Development at the University of Victoria and you may contact me if you have further questions at (778) 350 6633.

As a graduate student, I am required to conduct research as part of the requirements for a degree in Public Administration. It is being conducted under the supervision of Dr. Lynda Gagne, CGA (CPA). You may contact my supervisor at (250) 721 8063.

The client for this research is the Ecological and Landscape Classification (ELC) Unit of Environment Yukon. Nadele Flynn, coordinator of the unit, is my departmental contact and has provided me with information about ELC products. The results of this research will be presented to my client, but all primary data will be kept confidential and anonymous.

The ELC Unit is funding four hours per week of this research from November 13, 2014 to January 7, 2015.

Purpose and Objectives

The purpose of this research is to determine how and how much resource managers in the Southern Lakes region are using Yukon Government's ELC products and to identify additional information the ELC unit could provide to facilitate the uptake of ELC products. The objective is to answer the following:

- To what extent and in what way are ELC products offered by Yukon government currently used?
- Do the resource managers see additional or future uses for ELC products in their field?
- What is necessary to integrate (or further integrate) ELC products into practice or policy?
- Are there ways for the ELC program to encouraging the adoption of ELC products by resource managers?

Importance of this Research

This research can help the Yukon Government to measure how well they are supporting and informing sustainable and integrated resource management in the Yukon. Providing recommendations about how to encourage the adoption of ecological products can help the Environment Yukon to meet the goals of their five-year strategic plan. Additionally, it will raise the profile of their products with resource managers in the Southern Lakes Ecoregion and help to determine if the program is meeting manager's needs.

Participants Selection

You are being asked to participate in this study because you are involved in resource management in the Southern Lakes ecoregion.

What is involved

If you consent to voluntarily participate in this research, it will include participating in an interview conducted by Amy Law at a place and time of your convenience. The interview consists of providing your opinion of the accessibility and usefulness of the Yukon Government's ecological and landscape classification products. I will provide a document that details the various ELC products currently available, or that will soon be available. The time commitment for this interview should not exceed 1.5 hours, both to review the provided materials and to participate in the interview. I will use audio recording and written notes during the interview and will write a transcription afterwards to aid in the research process. These notes will be destroyed after I use them as a memory aid.

Inconvenience

Participation in this study may cause some inconvenience to you, including a time contribution to review Yukon Government's ELC products and to take part in the interview to provide your opinion of Yukon's ELC program.

Risks

There are no known or anticipated risks to you by participating in this research.

The research will serve to inform Yukon Environment about how their ELC products can be encouraged for use by resource managers in the Southern Lakes Region. Please note that the ELC unit has no funding authority for resource managers.

Benefits

The potential benefits of your participation in this research include gaining more knowledge of Yukon government's ELC products. Additionally, your participation can provide direction as to how accessible and usable the products are for your needs, which will feed into recommendations to the Yukon Government.

Voluntary Participation

Your participation in this research must be completely voluntary. If you do decide to participate, you may withdraw at any time without any consequences or any explanation. If you do withdraw from the study your data will not be used, and will be immediately destroyed.

Anonymity

As the pool of resource managers in the Southern Lakes ecoregion is small, your anonymity may be naturally limited in the data gathering stage. However, in the dissemination of this research, your anonymity will be protected.

Confidentiality

Your confidentiality will be protected by coding the information provided numerically (e.g. participant 1 from group X, etc.). The confidentiality of the data will be protected by carefully storing the information during use in password protected computer files.

Dissemination of Results

It is anticipated that the results of this study will be shared in a thesis dissertation as well as directly to the Ecological and Landscape Classification Program at Environment Yukon in an information session. The final report will be available to you and your organization, as well as the other participants in the research.

Disposal of Data

Data from this study will be disposed of after the defense of the thesis by erasing electronic data and shredding and recycling paper copies.

Contacts

Individuals that may be contacted regarding this study include the researcher and supervisor:

Amy Law, researcher	Dr. Lynda Gagne, supervisor
(778) 350 6633	(250) 721 8849
amyclaw@gmail.com	lgagne@uvic.ca

In addition, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Human Research Ethics Office at the University of Victoria (250-472-4545 or ethics@uvic.ca).

Your signature below or verbal consent indicates that you understand the above conditions of participation in this study, that you have had the opportunity to have your questions answered by the researchers, and that you consent to participate in this research project.

_____	_____	_____
Name of Participant	*Signature*	*Date*

iv. Email script for follow up

Hello XXXXX,

You indicated an interest in taking part in my research on Mainstreaming Yukon Government's Ecological and Landscape Classification Products. I'm sorry to bother you again, but I am hoping to set up an interview with you to learn your views on Ecological and Landscape Classification for Yukon. The interview itself should take approximately 30-45 minutes.

Would you have time to meet on:

Detailed list of available interview slots.

Thank you,

Amy

J.

Table 1

Comparison of Ecosystem Classification Systems across Canada.

National ELC Framework (1989, 1995)	NWT (2006), Alaska (2000)	Yukon (2003 &'06) & Manitoba – '98	British Columbia (1996)	Alberta (2006)	Saskatchewan (1998)	Ontario - 2000 Nfld & Lab-'95	Quebec (1998)	New Brunswick (2003 & 06)
Name of the Regional Classification System								
National Biophysical Classification	Continental Ecosystem Classification	National Biophysical Classification	Biophysical Classification	Natural Regions	Ecological Land Classification	Ecological Land Classification	Regional Ecosystem Classification	Ecological Land Classification
Ecoclimatic Province	Level I Ecoregion		Ecodomain	Ecoclimatic Province				
Ecozone	Level II Ecoregion	Ecozone	Ecodivision	Natural Regions	Ecozone	Ecozone	Vegetation Zone	Ecozone
Ecoprovince	Level III Ecoregion		Ecoprovince					
Ecoregion	Level IV Ecoregion	Ecoregion	Ecoregion	Natural SubRegions	Ecoregion	Ecoregion	Vegetation SubZone	Ecoregion
Ecodistrict		Bioclimate (Yk) Ecodistrict (Man)	Shift to BGC Zone			Ecodistrict	Bioclimatic Domain	Ecodistrict
Ecosection			Ecosection & BGC SubZone				Bioclimatic SubDomain	
			BGC SubZone Variant		Landscape Area		Ecological Region	
							Ecological SubRegion	
			Site Association	Ecosite	Ecosite		Vegetation Potential	Ecosite (complexes)
Ecosite	Ecotype (Alaska only)	Vegetation & Soil Type	Site Series	Ecosite Phase	Ecosite Phase	Ecosite	Ecological Type	Ecoelement
Ecoelement			Site Series phase	Plant Community	Plant Community	Vegetation & Soil Type	Forest Type	Vegetation & Soil Type

Note: Reprinted from *Yukon Ecological Land Classification and Mapping Program: Concepts Towards a Strategic Plan* by Jones, Albricht, Rosie, & McKenna, 2008, ch. 3, p. 8. Unpublished Report, Silvatech Group.