UNDULY CONSTRAINED: IMPLEMENTING CONSERVATION AREAS UNDER BRITISH COLUMBIA'S FOREST AND RANGE PRACTICES ACT

by

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Abstract

British Columbia’s Forest and Range Practices Act seeks to balance environmental, economic and social interests within Crown forests. In pursuit of this goal, government is able to create conservation areas to protect species at risk habitat, ungulate winter ranges, and old growth forests. There has been concern from both government and non-governmental organizations that the implementation of conservation areas has been slow, and that these areas are inadequate to protect the biodiversity values for which they are designed. This thesis measured the progress of conservation area establishment in the Chilliwack and Squamish forest districts, identified and explained problems occurring during the implementation process, and assessed the extent to which conservation areas for species at risk, ungulates and old forests were protecting these values.

The research found that the most significant barriers to achieving government’s conservation goals were due to economic restrictions built into the regulations themselves. Specifically, limitations on the extent to which conservation areas can impact the timber supply render them inadequate for the protection of most species at risk examined (marbled murrelet, coastal giant salamander, coastal tailed frog, pacific water shrew and grizzly bears); ungulate winter ranges for deer and mountain goat in Chilliwack; and old growth forest ecosystems. The actual establishment process has been challenged by the unwillingness of senior government officials to support reserve implementation when there is substantial resistance from forest licensees, and by unclear direction about the extent and location of conservation areas permitted across the landscape.

The establishment of legally approved conservation areas has been slow due to inadequate government resources, an uncoordinated implementation process, and conflict over particular conservation areas. The only approved conservation areas for species at risk are for grizzly bears, and these have taken up to seven years to establish. Ungulate winter ranges have been approved in Squamish, after taking five to seven years of planning and negotiation; they are still in draft form in Chilliwack, with industry and government in disagreement over their specific boundaries. Lastly, only 60% of landscape units have legally approved conservation areas for old growth, despite this being part of government policy since 1995.
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List of Acronyms

MoE – Ministry of Environment
MoFR – Ministry of Forests and Range
ILMB – Integrated Land Management Bureau
WHA – Wildlife Habitat Area
UWR – Ungulate Winter Range
OGMA – Old Growth Management Area
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1 Introduction

1.1 Context and Issues

One of the principal goals of forest management in British Columbia over the past ten years has been to balance environmental, social and economic factors on the Crown forested land base. Some of the most contentious and complicated aspects of this balancing attempt have been the province’s approaches to biodiversity and wildlife management. Under the Forest Practices Code, in place from 1995 to 2004, government could establish spatially defined conservation areas to protect certain wildlife and biodiversity values, but these were limited by the extent to which they could reduce the provincial timber supply. In 2004 the government adopted the “results-based” Forest and Range Practices Act to replace the Forest Practices Code. Under this act, government has committed to “maintain or exceed BC’s high environmental standards and public acceptance, while at the same time balancing social, environmental and economic interests” (de Jong, 2004). Furthermore, government has assured the public that “[The act] maintains high levels of protection for forest values including watersheds and wildlife habitat” and that “the Act and regulations will contribute to high quality forest management and sustainable environmental values for future generations” (MoFR, 2006a). Concerning wildlife and biodiversity in particular, the Forest and Range Practices Act specifies legal objectives that forest tenure holders must plan for. Additionally, many of the same conservation tools that were available to government under the Forest Practices Code for managing biodiversity and wildlife were transitioned into the new legislation, in addition to their economic limitations.

The implementation of reserves to protect biodiversity and wildlife has been slow. In 2004, the Forest Practices Board (a public watchdog of compliance to provincial forest legislation) released a report that assessed the level of implementation of the components of the province’s biodiversity strategy from 1995 until early 2003. They found that some of the lowest levels of implementation were for the landscape-level components of the strategy, including
areas for conserving old forests, and managing for connectivity across the landscape. They also found that there were significant delays in establishing reserves to protect the habitats of species at risk and ungulate winter ranges (FPB, 2004). This slow pace is troubling as it creates uncertainty from a planning perspective, and often causes conflict in places where conservation area planning is incomplete. The Forest Practices Board has received complaints from environmental non-governmental organizations regarding harvesting in species’ habitat where conservation areas have not yet been established and has investigated several cases dealing with this issue (e.g. FPB, 2005a and FPB, 2005b).

In addition to concerns about the pace of implementation, environmental groups have criticized the effectiveness of the province’s approaches to forest biodiversity and wildlife management. For example, in two recent report cards on provincial species at risk legislation, BC received a failing grade. This was largely due to the absence of “stand-alone” endangered species legislation and to the presence of economic limitations that restrict the extent of conservation area establishment in current policies (an issue that will be discussed further in the thesis; Nature Canada 2004; Environmental Defence Canada, 2004). Other organizations have critiqued the entire Forest and Range Practices Act’s “results-based” framework, accusing government of ceding too much power to industry in forest management and thereby jeopardizing the province’s ability to adequately protect environmental values (WCEL, 2005).

In consideration of all of these issues, this thesis examines the implementation of some of the wildlife and biodiversity reserves available under current policy. The thesis studies both the implementation process and the actual (or potential) impacts of the conservation areas on the protection of wildlife and biodiversity. Specifically, the thesis examines the establishment of conservation areas that protect “old growth” forests, species at risk and ungulates (deer, goats
and moose) in the Chilliwack and Squamish forest districts. It tries to identify what, if any, are the barriers to the timely establishment of conservation areas, and looks at the extent to which these areas are protecting the forest values they are designed for, namely habitat for species at risk, ungulate winter ranges and old growth forests.

These issues were investigated through interviews with representatives from government, the forest industry and environmental non-governmental organizations involved with, or interested in, conservation area establishment. Basic geographic information system (GIS) was used to provide characteristics of some of the conservation areas. Finally, policy and document review was conducted to obtain additional information about implementation and the conservation needs of certain species.

The research found that current implementation challenges include a lack of government resources and co-ordinated conservation planning, unclear legal and policy direction concerning how to balance environmental and economic forest values, and a seeming unwillingness of senior government officials to support conservation areas recommended by government staff in the face of strong opposition from industry. Finally, the conservation areas permitted under current policy will not allow the achievement of government’s environmental goals for the Forest and Range Practices Act due to economic limitations affecting the total amount and location of conservation areas.

1.2 **Thesis Objectives**

The purpose of this research is to examine the implementation of spatially defined conservation areas in British Columbia under the Forest and Range Practices Act. Specifically the project seeks to:

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1 Forest districts are administrative units of the Ministry of Forests and Range. Most forest related planning and management occurs at this level in addition to some aspects of biodiversity and wildlife management.
1. Measure the progress of conservation area implementation.
2. Identify problems with the implementation process.
3. Determine the extent to which conservation areas are protecting the values they are designed for: species at risk habitat, ungulate winter ranges and old growth ecosystems.
4. Explain implementation challenges.

1.3 Involvement with the Forest Practices Board

Around the same time I was planning my Master’s thesis research, the Forest Practices Board was organizing a special investigation. I was interested in many of the same issues as the Forest Practices Board, namely those related to the implementation of conservation areas, so I contacted them and proposed that we work collaboratively on the project. My research interests were broader than theirs in scope. Specifically, given their mandate to investigate the application of legislation, they were mostly concerned with the progress towards meeting government’s conservation targets for conservation areas, whereas I had the additional interest of examining if these targets were sufficient to reach the broader goals of adequately protecting wildlife and biodiversity. Despite this difference in research scope we decided that a partnership would be fruitful and decided to work together. A large component of the research I conducted with the Forest Practices Board for their special investigation contributed to this thesis. Accordingly, components of this thesis may be part of the Forest Practices Board’s final report on the investigation, which will be posted on their website for the public to read.

1.4 Thesis Organization

The following two chapters review the academic literature on the major factors influencing public policy implementation, and relevant concepts about conservation biology and planning. Following this, information related to forest wildlife and biodiversity policy in British Columbia is presented, including an overview of the conservation needs of the wildlife species
examined in the thesis. This is followed by a description of the methodology used to achieve this project’s objectives. The findings from the research are then reported and followed by an explanation of these findings that ties back to the literature reviewed in the second chapter. The thesis concludes with a summary of the major issues identified in the research, and recommends ways to overcome some of the current challenges.
2 Literature Review I – Public Policy Implementation

2.1 Defining Implementation

A common model for studying public policy is the “policy cycle”; it depicts policy progressing from the agenda setting stage, to policy formulation, decision-making, policy implementation and finally to evaluation (Howlett and Ramesh, 2003). Although this approach has been criticized for being overly simplistic, it has been retained in the policy literature with the acknowledgement that the boundaries between these different stages are in fact quite fuzzy and there are opportunities for feedback between different stages. The definition of implementation as it is understood in this research is as follows:

...policy implementation is a process, a series of subfederal decisions and actions directed toward putting a prior authoritative federal decision into effect. The essential characteristic of the implementation process, then, is the timely and satisfactory performance of certain necessary tasks related to carrying out the intent of the law. This means rejecting a dichotomous conceptualization of implementation as simply success or failure. (Emphasis in original text; Lester and Goggin, 1998, p5)

This definition points to the fact that implementation can be considered everything that happens once a statute is passed; it is the carrying out of the intent of the law. It is evident from this focus on implementation as a process that “lower-level” (i.e. not cabinet) rule making, and subsequent actions have the potential to be highly political. Unresolved disagreements and differences in prior stages of the policy cycle often manifest themselves during policy implementation (Howlett and Ramesh, 2003). Accordingly, although the focus of this research is on the implementation stage of the policy cycle, attention will be paid to how previous stages affect implementation.
2.2 **Implementation Research History and Overview**

The general goal of public policy implementation research is to identify factors, or conditions that influence the implementation of a policy. The initial implementation work in the 1960s and 70s dealt primarily with single case studies and identified a host of variables that caused policy to stray from its original goals following approval (Winter, 2003). The so-called “first generation” of implementation research came to largely pessimistic conclusions about government’s ability to implement programs in accordance with statutory goals (Sabatier, 1986). Drawing upon the results of the initial studies in this domain, a “second generation” of implementation research sought to compare and analyze the variation in implementation results across government programs and units (Sabatier, 1986). The results of this type of research include a more nuanced understanding of how and when variables identified in earlier works present challenges to implementation.

One of the major debates in the discipline has been between the so-called “top-down” and “bottom-up” analytical paradigms. The top down approach generally uses statutory goals as a basis for judging successful implementation and identifies factors that facilitate achieving these goals. Prescriptions to improve policy delivery in the “top-down” stream of research tend to emphasize the use of power and legal authority as tools. The most famous work in this research vein is that of Mazmanian and Sabatier (1983) who distilled a long list of 16 causal variables into six conditions for successful implementation. Three of their necessary conditions are quintessentially “top-down” in their focus on the role of the legislation and structures in facilitating implementation:

- The enabling legislation mandates clear and consistent objectives
- The enabling legislation must incorporate an adequate causal theory
- The implementation process is structured to increase the probability that implementing officials and target groups will perform as desired, e.g. through the inclusion of positive and negative incentives.
In contrast to this “top-down” approach, many argue that it is in fact the government employees responsible for carrying out policy, the so-called “street level bureaucrats”, who have the greatest control over the course of implementation. The focus on these actors as the principal agents in policy delivery is a key characteristic of the “bottom-up” stream of implementation research. This approach assumes that because implementers are closer to the source of the problem, they have a greater ability to influence it. Their influence derives largely from the discretion they must exercise in order to execute government programs (Lipsky, 1980). This discretion exists to various degrees because many government actions are complex, demand human judgement to deal with diverse local conditions and may require the co-operation of target groups. Scholars of the bottom-up school hold that research should examine how those actually delivering policy understand it, and what are their skills, practices and access to intellectual implementation resources (defined as any individuals or organizations that can help implementers learn about policy and best practices; Hill, 2003). The focus for improving policy using this approach involves an understanding of the incentives and resources of street level bureaucrats (Elmore, 1979/1980). This approach helps to identify if implementation is suffering for reasons that cannot necessarily be improved by augmenting authority or power alone, and will more likely be improved by increasing, and facilitating access to, implementation resources (Hill, 2003).

Several attempts have been made to specify the particular conditions under which the two models are best suited to explain policy implementation. For example, Matland (1995) argues that the appropriate approach is dependent on the degree of ambiguity in policy means and goals, and the extent of conflict surrounding the policy. When ambiguity and conflict are low, some form of the top down approach is a better model for understanding implementation: levers controlled from the top, such as institutional structure or the provision of adequate resources, better explain implementation outcomes. When ambiguity and conflict are high, both top down
and bottom-up approaches are needed to understand the full picture: “top-down” variables cannot fully explain implementation and more attention must be paid to the attitudes and preferences of those affected by, or directly implementing, the policy (i.e., those at the “bottom”). More recent research acknowledges the importance of variables from both the top-down and bottom-up schools of thought and some have even accused the debate as being “sterile” and “confusing” (Saetren, 2005).

2.3 Major Categories of Variables Identified

The field of implementation research has been marked with an overwhelming number of possible causal variables and there is no accepted, parsimonious theory of implementation (Goggin, 1986). Ryan (1996) compared three models of implementation including those of Mazmanian and Sabatier (1983), Hasenfeld and Brock (1991) and Winter (1990). He found a variety of commonalties between the major categories of variables purported to affect implementation: the role of the policy itself; the structures within which the policy is implemented; relationships between, and commitment of, implementing actors; and external variables. Although not part of Ryan’s (1996) comparison, these categories are similar to those in Hoberg’s (2001a) policy regime framework. The regime approach explains the various stages of the policy cycles (including implementation) as a result of the interaction of actors, institutions and ideas (the regime components), and a host of “background conditions”, such as public opinion and economic conditions. This thesis looked at the role of a variety of factors in influencing implementation, listed below. To a large extent the list is structured using the categories highlighted in Ryan (1996), with further details on specific variables provided by the works of other scholars in the field:
1. Policy Formulation:
   a. **Clear and consistent objectives.** Ryan (1996) lists clarity of policy goals, and congruency between these goals as two principal criteria necessary for successful implementation. However, environmental and social policies with ambiguous and/or conflicting goals are routinely enacted as a result of compromises made between actors with different interests in the policy formulation and decision-making stages of the cycle. Some argue that this in itself does not preclude successful implementation (May, 2003; Sabatier, 1986), but that what is needed are criteria or incentives for resolving goal conflicts, either in the statute or accompanying administrative policy (May, 2003). The thesis will examine how the objectives of the policies under study affect the implementation process.

   b. **Adequate Causal Theory.** For implementation to be successful the policy and its tools must be based on sound ideas and strategies regarding how to achieve the desired policy goals (Winter, 1990; Hoberg, 2001a). Mazmanian and Sabatier (1983) divide this general concept into the following necessary conditions:

      i. The main causal linkages between government action and attainment of objectives is understood; and

      ii. Implementing officials have jurisdiction over a sufficient number of linkages to attain objectives

2. Structures:
   a. **Integrated Policy Delivery System.** Structures are needed to facilitate an integrated implementation process. In many bureaucracies employees work together to achieve goals because they are part of a hierarchical structure that mandates them to do so. In
situations requiring inter-organizational co-ordination, different incentives should be applied. While some authority or agency may oversee the actions of multiple agencies, they generally do not engage with operational-level implementation (O'Toole, 2003). Accordingly, organizations must be structured such that there is some sort of incentive to co-ordinate activities. A few of the approaches suggested in the inter-organizational relations literature include the funding of common interests or projects (essentially creating and supporting venues for agencies to meet and work together); and developing exchange mechanisms between bureaucrats or agencies, such that they are required (or at least have an incentive) to work with those from different agencies in order to achieve their own goals (O'Toole and Montjoy, 1984; O'Toole, 2003). Alternatively, implementation could be assigned to a single agency whose mandate is complementary to the policy's statutory objectives, or a new organization could be created specifically to carry out the new policy (Mazmanian and Sabatier, 1983). However, this latter recommendation is difficult to apply in practice because implementation structures are rarely created from nothing: they are developed from pre-existing organizations and inter-organizational networks (Winter, 1990).
b. **Adequate Resources.** Government bureaucracies are notoriously under-staffed and under-funded for the tasks they are assigned. Early research on street level bureaucrats pointed to the phenomenon whereby the demand for government services always tends to increase to meet the supply, and additional resource allocation is usually accompanied by an expectation of more government services, as opposed to higher quality or quicker services (Lipsky, 1980). While this may be the case (especially more so in the social services sector where human clients can actually demand more services) inadequate resources are nonetheless a major cause of slow implementation, and even policy failure.

3. **Relationships:**

   a. **Conflict between actors.** Conflict between actors needed for policy implementation can result in groups pursuing their own goals. This has the potential to slow, complicate or derail the implementation process altogether (Ryan, 1996).

   b. **Commitment of implementing actors.** Policy will not be implemented well or in a timely fashion unless those who are involved at the operational level support the program’s goals and strategies (McLaughlin, 1987). Additionally, implementation requires the active support of public interest groups who must remain vigilant to ensure that policy goals are achieved (Mazmanian and Sabatier, 1983).²

4. **External variables (i.e. variables that affect the policy, but are not directly related to implementation):**

   a. **Conflicting External Factors.** In the field of environmental policy one of the most important external factors that influences implementation is the economic state of the

   ² Mazmanian and Sabatier (1983) refer to these groups as “constituency groups”.
industry being regulated. Implementation is usually facilitated when the industry is performing well. Industry’s threats that environmental policies will financially harm them and cause them to lay off employees seem less credible when they are prospering (Hoberg, 2001a). Alternately, when economic conditions are not favourable for industry, the threat of job losses seems more legitimate and the public tends to be more concerned with economic issues and is less likely to pressure politicians to enact or implement strong environmental legislation.

b. Disruptions to the Policy Environment. Changes in government, whether they be within or between parties, have the potential to significantly affect policy implementation, both in a positive and negative manner (Hoberg, 2001a). This can occur due to the power that government has over resources, its ability to make new and possibly contradictory laws, and as a result of the oversight it can execute over agencies (Mazmanian and Sabatier (1983).

2.4 Successful Implementation

There is debate surrounding how implementation success should be measured and defined. The two principle approaches are to measure implementation outputs or impacts. The difference between these can be illustrated by way of an example: if a statute’s goal is to conserve biodiversity and wildlife and its primary instruments for achieving this goal are conservation reserves, then implementation can be measured either with respect to how government is establishing reserves (implementation outputs), or the effect these reserves have on biodiversity and wildlife (implementation impacts).

Winter (2003) argues that implementation research should study what implementing bureaucrats actually do with a particular policy, i.e. policy outputs. Research in this vein focuses
on the factors that affect the performance of implementers and it yields results that have relevance beyond the particular policy or domain under study. However, to the extent that one does ultimately want to know the extent to which policies are achieving their overall goals in terms of their effects on the real world, impacts should also be considered. Additionally, attempts should be made to identify the links between outputs and impacts, i.e. what is actually being done with the policy, and what is the effect of this action on the policy problem we wanted to improve (Mazmanian and Sabatier, 1983). A positive link between policy outputs and impacts is dependent on the policy having a sound causal theory.

Both outputs and potential impacts were considered in this thesis. The study looked at government's actions following the approval of the statute and regulations, including the creation of the conservation targets that guide conservation area establishment; and the planning, negotiating, and actual designation of conservation areas. The outputs of planning activities (i.e. the conservation areas) were also examined with respect to the degree to which they protect the forest values for which they were designed: species at risk habitat, ungulate winter ranges and old growth forests. This will be discussed with respect to the intent of the legislation currently governing forest practices in the province, which is to conserve biodiversity and wildlife (explained further in chapter 4).
3 Literature Review II - Forest Biodiversity Conservation

3.1 Management Objectives

Forests are a critical source of biodiversity and much of the threat to biodiversity is due to the reduction and degradation of species habitat caused by forestry practices (Noss, 1999; Fahrig, 2003). Logging often creates gaps in previously contiguous forests, leaving behind patches with decreased value to certain species, and it decreases the complexity of forests at both the landscape and stand scales by creating even-aged, second growth forests with reduced structural complexity (Lindenmayer and Franklin 2002; Lindenmayer and Hobbs, 2004).³

Despite our increasing understanding of forest ecosystems, there is still considerable uncertainty about the specific effects of forest management activities on forest biodiversity. Due to the variety of life forms dependent on forests and the uncertainty about the effects of human intervention in these ecosystems, Lindenmayer and Franklin (2002) advise a risk-spreading approach to forest management. They assert that the overarching objective for managing forest biodiversity should be the maintenance of suitable habitat over multiple spatial scales. This should be achieved by both large scale protected areas and strategies outside of reserves, in the area referred to as the "matrix" (Lindenmayer and Franklin 2002). Effective matrix management is crucial for the maintenance of forest biodiversity because land outside of large protected areas makes up the majority of managed landscapes. The matrix is integral to connectivity between reserves and to species movement in general. The conservation areas

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³ Stand - “A community of trees sufficiently uniform in species composition, age, arrangement, and condition to be distinguishable as a group from the forest or other growth on the adjoining area, and thus forming a silviculture or management entity” (MoFR, 2006b)
examined in this project are matrix conservation tools, which are small to medium protected areas.\(^4\)

A variety of approaches in conservation biology and planning have been developed to assist decisions about the amount and distribution of conservation areas across the landscape. One of the predominant approaches used in forest biodiversity management is the coarse filter—fine filter approach. For example, in a recent review of ten forest management plans in the USA, the coarse filter approach was the most commonly used strategy (Schulte, et al., 2006). As with many jurisdictions across North America, British Columbia has created its protected areas and matrix management strategies based on the “conservation filters” concept. The next sections review the literature on this approach and discuss some of the main considerations regarding its application.

3.2 The Coarse Filter – Fine Filter Approach

Biodiversity is a broad term that encompasses the diversity of all life forms on earth. For the purposes of conservation research and planning, biodiversity is generally organized into three hierarchical categories: ecosystems, species and genes; with the first two being the common focus of conservation efforts (Salafsky et al., 2002). Despite years of natural history and ecological research, we still know little about the complexities of ecosystem function or the majority of species on the planet. The concept of conservation filters emerged as a means to protect biodiversity (at all scales) in the face of such knowledge gaps. The main idea behind this approach is to create a network of conservation reserves across the landscape that contains representative examples of a chosen ecological unit (e.g. ecosystems, communities in a planning area (Hunter, 1991)). This is the coarse filter layer of the conservation strategy. For those

\(^4\) Lindenmayer and Franklin consider landscape-level “special protected areas” for ecological features such as biological hot spots or remnant old growth forests to be part of the matrix because they are outside of the larger protected areas network (Lindenmayer and Franklin, 2002, chapter 7).
species whose habitat requirements are not met by these coarse filter conservation areas, a second, species-specific conservation strategy, the fine filter, is needed. It is thought that, if well designed, the two filters will complement each other to protect the majority of forest biodiversity (Noss, 1987).

3.2.1 Coarse Filter

For any type of coarse filter reserve network, the extent to which it reduces the risk to the particular coarse filter element of interest is dependent on the scale of ecological representation, the abundance of reserves (i.e., their cumulative size) and their distribution ( patterning) across the landscape (Holt and Sutherland, 2003). Usually the coarse filter of a coarse-filter / fine-filter strategy is a network of large ecological reserves (for example, the parks and protected areas networks of many jurisdictions), but it can also be mid-sized reserves at the landscape or watershed scale. Table 1 presents a summary of common scales used in conservation planning.

<table>
<thead>
<tr>
<th>Table 1 Scales Used in Conservation Planning</th>
</tr>
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<tbody>
<tr>
<td>Scale</td>
</tr>
<tr>
<td>Region</td>
</tr>
<tr>
<td>Territory/Subregion</td>
</tr>
<tr>
<td>Landscape</td>
</tr>
<tr>
<td>Watershed</td>
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<tr>
<td>Site/Stand</td>
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(Adapted from CIT, 2004a)

Ecosystem Representation

There are a variety of ecosystem conservation values that can be used to form the basis of coarse filter ecological reserves, such as such as biodiversity “hotspots” (areas with a high concentration of species), different habitat types and critical ecosystem functions (Schwartz, 1999). For example, in BC’s central coast region a conservation planning process used a combination of representative terrestrial and hydoriparian ecosystems, and habitats of several
wide-ranging species of importance to choose locations for coarse filter protected areas (CIT, 2004a).

This thesis focuses, in part, on coarse filter reserves for old growth forest ecosystems. Forest age has been shown to have a significant positive affect on the level of species richness in forest stands (reviewed in Lindenmayer and Hobbs, 2003), and the protection of old forests has emerged as a conservation priority in British Columbia (MoF and MoELP, 1999).

For any given ecosystem conservation feature (old growth, specific ecosystem processes etc.), representation of the value can occur at a variety of spatial scales. In British Columbia, the provincial Biogeoclimatic Classification System organizes the provinces ecological diversity into a hierarchy of zones, subzones, variants and site series, based on climate, vegetation and soil (Figure 1).

Figure 1 A Model of British Columbia's Hierarchical Biogeoclimatic Classification System

N.B. This diagram is meant to demonstrate the hierarchical relationship between the different levels of the province's ecological classification system. It does not accurately depict the number of subordinate levels for any level of the system, e.g. there are more than two sub zones for any given zone.
If the representation of ecological diversity in the coarse filter network is based on a very "high" ecological scale, then reserves might be skewed in terms of their inclusion of ecological diversity defined at lower levels of ecological classification. For example, if reserves were to be selected based on representation at the "sub zone" scale of BC’s classification system, they could, by chance, only include variants of type #1 depicted in figure 1. This would be problematic to the extent that variants of type #2 might include key ecological elements that are at risk to development activities if not protected. However, basing coarse filter reserve selection on a "lower" level of representation, such as the site series level in BC, while advantageous from an ecological perspective, may not be feasible due to a lack of inventory mapping, which is time consuming and expensive (CIT, 2004a).

**How Much Should be Protected?**

One of the predominant tools for determining the risk to ecological integrity of protecting varying levels of each ecosystem in a coarse filter reserve network is the concept of planning within the range of natural variability (Schulte et al., 2006). Natural variability has been defined as the "ecological conditions, and the spatial and temporal variation in these conditions, that are relatively unaffected by people, within a period of time and geographical area appropriate to an expressed goal" (Landres et al. 1999, p1178). The objective of this approach is to identify the range of states that a particular ecosystem has historically endured. It is thought that this range represents the ecosystem’s range of tolerance. As species evolved in these ecosystems over time, it is thought that maintaining the ecosystems within their historic bounds will enable species persistence (Perara and Buse, 2004).

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5 Ecological integrity can be defined as “the state of a natural unmanaged or managed ecosystem in which the natural ecological processes are sustained, with genetic, species and ecosystem diversity assured for the future” (Holt and Sutherland, 2003, p5)
Despite the common definition of the range of natural variability presented above, there is widespread evidence that humans have been modifying their environments for years, and therefore there are few examples of ecosystems that are “relatively unaffected by people”. For example, a growing body of research from the Amazon demonstrates that pre-European indigenous groups extensively modified their environment, creating landscape-scale earthworks that served as fish weirs (Erikson, 2000), rotational agricultural areas and extensive “built” environments, which are now largely covered by tropical rainforests (Heckenberger et al., 2007).

Similarly, in British Columbia, many First Nations groups have practised burning to promote the production of certain species while reducing the prevalence of others. For example, the Gitksan and Wet’suwet’en peoples of North Western BC burned black huckleberry and low-bush blueberry patches to stimulate production and prevent invasion by other species (Gottesfeld, 1994). These practices significantly affected the landscape, evidenced by the fact that the Skeena and Bulkley Valleys are characterized by seral communities (i.e., non-climax) dominated by aspen and birch. These groups also practised (and continue to engage in) burning of grass and shrub areas around village sites to encourage grass production and reduce brush (Gottesfeld, 1994). In other areas of Western Canada, First Nations groups have practised burning for other purposes, such as improving forage for game species (e.g., Lewis and Ferguson, 1988).

The implication of the fact that humans have been interacting with, and affecting their environments for millennia is that current landscape patterns and biodiversity are products of these relationships, and did not develop in isolation of anthropological impacts (Gillson and Willis, 2004). Many applications of the range of “natural”, or historic, variability explicitly recognize the complex relationship between indigenous peoples and the landscape, and include
“traditional” land management practices within their definition of “natural” or “historic” (e.g. FSCC 2005a).

Acknowledging that current ecosystems are a consequence of traditional resource management practices throws into question the common conservation practice of protecting ecological features in protected areas (which often prohibit many human activities) in order to try and sustain some level of historic biodiversity. Despite these complexities, the past can still inform current management by providing knowledge about the historic bounds (caused by both anthropological and “natural” disturbances) that ecosystems have endured and the “thresholds of their resilience” (Gillson and Willis, 2004). To the extent that the goal of conservation planning is to maintain current levels of biodiversity, it is informative to examine the historical characteristics of ecosystems in which species have developed over time. Deviation from these historic bounds is thought to increase the risk to the ecosystem’s integrity.

Current research suggests that as the amount of habitat declines from historic levels, there may be ecological thresholds that, when crossed, “result in a change in rate of loss of biodiversity, or where changes become ecologically significant” (CIT, 2004a, p65). An expert scientific team tasked with providing recommendations for “ecosystem based management” on British Columbia’s central coast reviewed the relevant empirical and theoretical literature, and reported that thresholds were found most frequently between 30% and 70% loss of historical habitat (CIT, 2004a). In order to create a precautionary (i.e., low risk) management strategy, they recommended the maintenance of 50 to 70% of the predicted historic amount of each ecosystem at the landscape level (CIT, 2004b). Similarly, in their report on the ecological integrity of the North Coast of BC, Holt and Sutherland (2003) considered that a deviation of 60% or higher (i.e., protection of less than 40%) from the historic amount of old growth would pose a high risk to ecological integrity (Table 2).
Table 2 Risk Categories of Different Levels of Deviation from the Historic Amount of Old Growth

<table>
<thead>
<tr>
<th>Deviation from mean predicted historic percent of old forest</th>
<th>0-20%</th>
<th>20-40%</th>
<th>40-60%</th>
<th>60-80%</th>
<th>80-100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Class</td>
<td>Very Low</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td>Very High</td>
</tr>
</tbody>
</table>

(Holt and Sutherland, 2003)

Despite the prevalence of the natural variability concept in forest management (Schulte et al., 2006), there are a number of challenges facing its use: difficulty in obtaining data about historical conditions, especially in areas with extensive anthropogenic change; the inclusion of extreme events and ecological states, as the bounds of the planning benchmark; and concerns about the appropriateness (for social or economic reasons) or feasibility of using historical markers as guidelines for current and future environments, as the latter two are often profoundly different than historical states and are continuously changing (Landres et al., 1999; Parsons et al., 1999). The range of natural variability is one of several tools that can be used to guide sustainable forest management regimes; but neither it, nor any other natural model, should be strictly followed (Lyndenmyer and Franklin, 2002).

**Reserve Design**

The distribution of reserves across the landscape can play a significant role in their effectiveness of protecting biodiversity, but the ecological effects of reserve size and connectivity (two of the most important aspects of reserve design) varies among species (Noss and Cooperrider, 1994). Given a fixed amount of land to be protected there is a tradeoff between the size of reserves and the distance between them (their degree of isolation). Depending on the species, either fewer larger (and more isolated) or several smaller (and closer) reserves will have a positive effect on viability (Fahrig, 2003; Simberloff and Abele, 1982; Higgs, 1981).
One of the predominant concerns with reserves that are small, or long and thin, is that they will have little “interior forest” and substantial “edge”. Forests on the perimeter of patches have different microclimates (generally drier, brighter and windier) than those in the interior. These habitat differences change the types of vegetation and overall species composition of edge environments (Noss and Cooperrider, 1994). Secondly, certain species experience higher predation and parasitism in edge environments (Noss and Cooperrider, 1994). The extent to which “edge conditions” are experienced in habitat patches differs between forest types and wildlife species; they have been observed up to 240m into forests (reviewed in Noss and Cooperrider, 1994; CIT, 2004a). As habitat fragmentation increases, and patch sizes decrease, the amount of interior forest decreases and the amount of edge habitat increases.

Given that species respond to “edge” differently (and at varied distances into a reserve), one management approach is to create reserves that protect old forest interior conditions across the landscape within the range of natural variability, i.e., so that the amount of old forest interior conditions imitates historic levels (FSCC, 2005). This approach has been part of British Columbia’s forest biodiversity policy in the past. The policy recommended that either 25% or 50% of the total amount of old growth protected be in interior forest, depending on the natural disturbance regime of the ecosystem (MoF, 1995). These guidelines were based on a 200m definition of “edge”, i.e., forest interior conditions are only experienced in forest that is farther than 200m from the edge of a reserve (Appendix 1 of MoF, 1995).

As many populations will be incapable of surviving in single reserves, it is important to ensure connectivity between reserves across the landscape. This can mean different things for different species, depending on how they disperse and interact with other populations of the

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6 The targets were 25% for ecosystems with frequent or infrequent stand-initiating events; or 50% for ecosystems with rare stand-initiating events or frequent stand-maintaining fires. A “stand-initiating event” could be a small wildfire or insect infestation that causes the death of the entire forest stand. Ecosystems with “rare stand-initiating events” usually have natural disturbances, such as strong wind or landslides, which cause the death of individual trees, or small patches – but generally not entire stands (MoF, 1995).
same species. One approach to improving connectivity between high quality habitats has been through the use of wildlife corridors connecting reserves. Recent research has supported the hypothesis that habitat corridors facilitate the movement of species between connected patches, by demonstrating that bird and plant dispersal increased between patches connected by corridors, but point to the fact that this movement is dependent on how the particular bird species uses “edge” habitats (Damschen et al., 2006; Levy et al., 2005).

As with most tools in conservation, wildlife corridors and “stepping stones” (small patches of protected habitat in the matrix that may facilitate movement between reserves) may benefit some species, but not all (reviewed in Lydenmeyer and Franklin, 2002). For some species, such as the northern spotted owl or cabbage butterfly, functional connectivity is more a product of the suitability of the matrix habitat than the existence of protected conduits between reserves (reviewed in Noss and Copperrider, 1994).

3.2.2 Fine Filter

The role of the fine filter is to “catch” any species that “fall through” the coarse filter. Fine filters are conservation strategies designed to preserve biodiversity at a “finer” scale than coarse filter reserves. Fine filter strategies are usually designed for individual species at risk, but can also be for other types of species, such as those with limited ranges, or for preserving biodiversity at the genetic level. The particular approach varies according to the requirements of the species, but as habitat loss is the primary cause of species decline (e.g., reviewed in Fahrig, 2003), the strategies often include additional conservation reserves and / or management zones.

Determining the extent of habitat protection necessary to ensure a species’ persistence is challenging. In attempting to answer the difficult question of “how much is enough” for species’ habitat, a variety of techniques can be employed, ranging from expert opinion to sophisticated
modelling approaches. A commonly used tool for examining a species' likelihood of survival given the species' characteristics (e.g. reproduction, dispersal) and the state of the ecosystem is population viability analysis. Although there are a range of population viability analysis models in use, a common feature of this tool is that it assesses the risk that a species faces of reaching some determined threshold, such as extinction (Reed et al., 2002). This approach can be combined with the coarse filter reserve design tools to create a network of reserves based on their contribution to multiple species' population viability assessments (Nicholson et al., 2006).

An important element of conservation planning for single species is to consider the entire landscape because the effectiveness of strategies can vary significantly depending on the quality of land outside of reserves (Fahrig, 2001). Ideally the scale of species planning should occur at the scale of relevance to the species, regardless of political or administrative boundaries.

### 3.3 Conservation Planning in Practice

Recommendations for systematic conservation planning can be conceptualized in the six following steps, outlined by Margules and Pressey (2000), with opportunities for feedback and revisions between each step:

1. **Measure and map biodiversity.** Decide what surrogates will be used for biodiversity, such as habitat types or species assemblages, and map where they occur.

2. **Identify conservation goals for the planning region.** Set quantitative targets for the amount and design (size, connectivity etc.) of biodiversity surrogates needed to meet coarse- and fine-filter goals.

3. **Review existing conservation areas.** Determine the extent to which existing reserves contribute to the conservation targets established in step two.

4. **Select additional conservation areas.** Using areas that are already constrained or protected as focal points, implement additional conservation areas to meet conservation targets. When
deciding where to spatially designate areas other socio-economic factors may come into play. Balancing the achievement of coarse- and fine-filter targets with industrial goals can be facilitated with site selection algorithms and other decision support tools (e.g. Sarkar et al., 2006; Gonzales et al., 2003). For example, the land use planning process on BC's central coast used the site selection algorithms SITES and MARXAN to meet a multitude of conservation targets in the least amount of space (CIT, 2004c). Other planning processes have incorporated land values in deciding where to place reserves in order to find the most efficient solutions given a fixed conservation budget (e.g., Wilson et al, 2006).

5. Implement conservation actions. Decide on management needed in reserves.

6. Management and monitoring of reserves. The importance of monitoring has often been overlooked in conservation strategies, but is integral to their success (Possingham, 2001). Monitoring is dependent on having conservation indicators that are clear and measurable, so that they can reveal if important values are being maintained by the chosen conservation strategy in the face of natural and human disturbances (Salafsky et al., 2002).

Despite the wealth of guidance currently available, the domains of conservation biology and planning have been critiqued as being "theory rich and data poor" (Grumbine, 1994, p100); more specifically, there is a paucity of empirical data at the spatial and temporal scales of relevance to many natural resource management activities (Schulte, et al., 2006). Much of this is due to the difficulty, in terms of cost, time and scale of analysis required to generate such empirical results. Nonetheless, the theory in this chapter offers an overview of some of the major ideas currently being used in conservation planning.
4 Current Government Policy and Management

4.1 Provincial Wildlife and Biodiversity Policy

The Forest and Range Practices Act governs forest practices in British Columbia. Unlike its predecessor, the Forest Practices Code, the Act does not contain a clear set of goals within the statute itself. However, ministerial speeches and government communications have indicated that the intent of the Forest and Range and Practices Act is to “balance social, environmental and economic interests” (de Jong, 2004) and to “maintain the high standards established by the Forest Practices Code” (MoF, 2004a, p1). One of the legal goals of the Forest Practices Code was to conserve “biological diversity, soil, water, fish, wildlife, scenic diversity and other forest resources” (FPC, preamble). We can infer that one of the “goals” of the current Forest Range and Practices Act is also to conserve biological diversity and wildlife, as the Act aims to maintain the same level of environmental protection and considerations as the Forest Practices Code.

The pursuit of the Forest and Range Practices Act’s goals is conducted through both planning requirements for companies operating in the provincial forest, and opportunities for government to establish conservation areas to protect elements of wildlife and biodiversity. The vast majority of British Columbia’s forests are provincially owned (96%; NRCan, 2001). Despite this public ownership, forest companies privately develop the forests for timber. Tenures are granted to companies giving them the legal right to harvest a certain volume of timber, subject to a suite of regulations and planning obligations. Such companies are referred to as “tenure-holders” or “licensees”. The approach to wildlife and biodiversity conservation under the Forest and Range Practices Act is two-pronged, involving actions of both licensees and government:
Licensees must specify certain areas that they will reserve from timber harvesting for conservation reasons as part of their forest planning requirements; and Government has the authority to establish legal conservation areas.

The two components of this system are described in further detail below.

4.1.1 Government's Objectives for Wildlife and Biodiversity

The Forest and Range Practices Act enables government to establish objectives for forest values, such as wildlife, biodiversity, soils and timber (FRPA s.149). Tenure holders then specify results and strategies for all of the objectives in their forest stewardship plans (FRPA s.5(b)). The forest District Manager, who works for the Ministry of Forests and Range (MoFR), approves or rejects these forest stewardship plans under the Forest and Range Practices Act. The objectives for wildlife, and biodiversity at the landscape level (herein referred to as the "biodiversity objective") are established in the Forest Planning and Practices Regulation, and the components of relevance to this thesis can be summarized as follows (see Appendix I for exact wording):

- The objective set by government for wildlife is, without unduly reducing the supply of timber from British Columbia's forests, to conserve sufficient wildlife habitat in terms of amount of area, distribution of areas and attributes of those areas, for
  a. the survival of species at risk, and
  b. the winter survival of specified ungulate species.\(^7\)
Licensees only have to specify a result or strategy for this objective if the Minister of Environment has issued a notice indicating the amount, attributes and distribution of wildlife habitat to be protected. (FPPR s.7)

- The objective set by government for biodiversity is, without unduly reducing the supply of timber from British Columbia's forests, to manage areas of old growth forest across the landscape in a manner that resembles natural disturbance patterns. (FPPR s.9 and FPPR Schedule 1, s.(3)(1)(c)).

\(^7\) Ungulates are hoofed mammals, such as deer, mouse, caribou and mountain goats.
Almost all of government’s objectives under the Forest Planning and Practices Regulation include the phrase “without unduly reducing the timber supply from British Columbia’s forests”. According to a Ministry backgrounder document the inclusion of this provision “reflects the balance of social, economic and environmental interests; and sustainability of the province’s timber supply” (MoF, 2004b). The legislation does not contain a definition of what it means to “unduly reduce the supply of timber”. However, shortly following the release of these objectives they were given further clarity by the issuing of conservation targets pursuant to the objective. In the case of wildlife, these came in the form of notices issued by the Ministry of the Environment (MoE), which included the quantitative conservation targets, distribution and attributes of wildlife habitat “required for the survival of...species at risk” or “required for the winter survival of...ungulate species” that have to be protected by licensees in their forest stewardship plans (MWLAP, 2004a, p1; MWLAP, 2004b, p1). The biodiversity objective was further clarified by the release of the Non-Spatial Old Growth Order by the Integrated Land Management Bureau (ILMB) that included quantitative conservation targets for old growth retention, and details on its distribution. The intent of the Old Growth Order is to “help confirm the extent of timber harvesting opportunities, while also taking clear action to conserve biodiversity values and species associated with old growth forests” (emphasis added; ILMB, 2004). Both the notices and the order are non-spatial, and provide attributes of the types of areas that should be protected, but not the specific boundaries. The information in the notices and the non-spatial old growth order is part of the legal interpretation of the objective itself, i.e. licensees must follow the specifics of these documents. The Forest and Range Practices Act’s biodiversity and wildlife goals, objectives and management targets of relevance to this thesis are summarized in table 3

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8 ILMB is a bureau within the Ministry of Agriculture and Lands. ILMB’s predecessor was the Ministry of Sustainable Resources Management. The Ministry of Environment used to be called the Ministry of Water, Land and Air Protection. The Ministry of Forests and Range was previously just the Ministry of Forests. For the sake of simplicity, the names ILMB, MoE and MoFR will be used throughout this thesis even when referring to the past.
Table 3 The Forest and Range Practices Act’s Wildlife and Biodiversity Goals, Objectives and Conservation Targets

<table>
<thead>
<tr>
<th>GOALS / INTENT</th>
<th>Balance environmental, social and economic interests</th>
<th>Conserve biological diversity and wildlife</th>
</tr>
</thead>
<tbody>
<tr>
<td>(FRPA - the statute)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LEGAL OBJECTIVES:</th>
<th>Without unduly reducing the timber supply:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(FPPR – the regulation)</td>
<td>- Conserve sufficient wildlife habitat for the survival of species at risk and the winter survival of ungulates</td>
</tr>
<tr>
<td></td>
<td>- Manage old forest to resemble natural disturbance patterns</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONSERVATION TARGETS:</th>
<th>Quantitative targets specifying the extent of protection required to meet the objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Notices and Old Growth Order – legal interpretation of the regulation)</td>
<td></td>
</tr>
</tbody>
</table>

Licensees must communicate in their forest stewardship plans how they are meeting the wildlife and biodiversity objective by providing details on what land they will protect (although they do not need to spatially identify the exact areas), consistent with the conservation targets. Then they must respect this in their forest practices, i.e., they cannot harvest timber in these areas. The purpose of making licensees designate such areas is to create “legal placeholders” until such time that spatial conservation areas are established by government (MoFR, 2006c).

4.1.2 Conservation Areas for Wildlife and Biodiversity

In addition to planning requirements for licensees, current government legislation enables the establishment of both coarse (multiple species habitat) and fine (single species habitat) filter conservation areas. One of the principal coarse filter tools used at the landscape level, outside of the protected areas network, are old growth management areas (OGMAs). These are spatially explicit reserves designed to conserve old forest. They were first introduced into government policy under the Forest Practices Code in 1995. Under the Forest and Range Practices Act the

9 Riparian management areas and wildlife tree patches are also spatially defined coarse filter conservation tools however this study did not look at their implementation for reasons discussed in the methods chapter.
Minister of Agriculture and Lands (or delegate in ILMB) has the authority to approve these areas under the Land Act (s.93.4). OGMAs are implemented at the landscape unit level and their establishment occurs during landscape unit planning. Species whose habitat is not adequately protected by the coarse filter tools (i.e. those that "fall" through the filter) can be protected by wildlife habitat areas (WHAs) that protect habitat for species at risk, and ungulate winter ranges (UWRs) that protect winter habitat for ungulates, e.g. deer, moose and caribou (Figure 2). OGMAs, WHAs and UWRs will be collectively referred to as "conservation areas" or "reserves" throughout this thesis.  

Figure 2 Coarse- and fine-filter conservation areas

(Adapted from MoF, 1995, Figure 2)

The province manages a coarse filter network of large-scale parks and protected areas, established under the provincial Parks and Protected Areas Act. These protected areas are category one and two protected areas under the World Conservation Union’s protected areas categorization scheme because they are designed for the protection of wilderness, ecosystems, and recreational opportunities, and are managed for these values. The conservation areas examined in this thesis (OGMAs, WHAs and UWRs) are likely to be category four areas under this classification scheme, as they are “habitat / species management areas… managed mainly for conservation through management intervention” (IUCN, 1994). Accordingly, there is a higher level of human intervention in these conservation areas than in the category one and two parks created under the provincial Parks and Protected Areas Act.
Wildlife habitat areas were originally introduced under the Forest Practices Code in 1995 as part of the Identified Wildlife Management Strategy. However, no species were listed as “Identified Wildlife” (species at risk that are affected by forest activities on Crown land) until 1999. The goal of WHAs is “to conserve those habitats considered most limiting to a given Identified Wildlife element” (MWLAP, 2004c, p3). The actual size of individual WHAs vary from species to species, but often consist of inner “core areas” that are protected from “alteration”, and surrounding “management areas” that are intended to “minimize disturbance of the habitat”, and within which a certain amount of harvesting may be permitted (MWLAP, 2004c, p36). Ungulate winter ranges were first introduced to the Forest Practices Code in 1998.

Under The Forest and Range Practices Act the authority to approve WHAs and UWRs rests with the Minister of Environment (or delegate) via the Government Actions Regulation. The regulation allows the Minister to establish WHAs or UWRs if satisfied that “the area is necessary to meet the habitat requirements of a category of species at risk” or “the area contains habitat that is necessary to meet the winter habitat requirements for a category of specified ungulate species” (GAR (10)(1) and 12(1)(a)).

However, the establishment of these fine filter conservation areas is subject to a suite of “tests” set out in section two of the regulation. Before establishing WHAs and UWRs the Minister must be satisfied that:

(a) the order\textsuperscript{11} is consistent with objectives already established in the area,
(b) the order would not unduly reduce the supply of timber from British Columbia's forests, and
(c) the benefits to the public derived from the order would outweigh any

(i) material adverse impact of the order on the delivered wood costs of a holder of any agreement under the Forest Act that would be affected by the order,\textsuperscript{12} and

\textsuperscript{11} For the sake of simplicity, “order” can be interpreted as a WHA or UWR.
\textsuperscript{12} The legal meaning of “material” is “significant or important”; Delivered wood costs are defined as “the costs associated with accessing and harvesting timber and delivering it to a timber processing facility” (FPPR s.1)
(ii) undue constraint on the ability of a holder of an agreement under the Forest Act or the Range Act that would be affected by the order to exercise the holder's rights under the agreement.

(GAR s. 2(1))

Section “b” ensures that the size of the conservation area does not exceed the current timber supply impact policy (discussed further in chapter six). The intent of section “c” is to enable a consideration of localized impacts on one or more licensee’s harvesting operations, and to prevent possible impingements on tenure holders’ rights to harvest the volume of timber granted in their forest tenure agreement (JSC, 2006). While section “b” considers the broader timber supply impacts of establishing conservation areas, section “c” was written to mandate a consideration of localized impacts (JSC, 2006). In practice, section “b” affects the cumulative extent of WHAs and UWRs, whereas section “c” plays a role in determining their specific location. Planners must provide tenure holders who might be affected by the order an opportunity for review and comment, and must consult with tenure holders who might suffer a “material adverse impact” under section “c” (GAR 3(1)(b) and 3(2)).

For all three conservation areas (OGMAs, WHAs and UWRs), quantitative conservation targets guiding their implementation are contained in the information pursuant to the objectives for wildlife and biodiversity. Although the conservation targets only legally relate to planning requirements for licensees, they were developed by the same government employees responsible for implementing conservation areas and, according these employees, can be considered to communicate government’s intentions for future conservation area establishment. The quantitative conservation area targets included in the information pursuant to the objectives (the notices and the non-spatial old growth order) will be hereafter referred to as the “conservation targets” for the particular conservation area type.
WHAs, UWRs and OGMAs “replace” the non-spatial planning objectives for wildlife and biodiversity; once these conservation areas are legally approved (up to the conservation targets) licensees no longer have to plan to protect areas for wildlife, ungulates or old growth, they only have to respect these established areas in their forest practices (Figure 3).
Figure 3 The Relationship Between Government’s Wildlife and Biodiversity Objectives, Forest Planning and Conservation Area Establishment.

Objectives for Wildlife and Biodiversity
(FOREST PLANNING AND PRACTICES REGULATION S. 7 AND 9 RESPECTIVELY)

Non-Spatial Information Pursuant to Objective (Part of legal objective)
- Notices for species at risk and ungulate winter range habitat indicating amounts, attributes and distribution to be protected. (Established by MoE)
- Non-spatial old growth order (Established by ILMB)

Non-spatial objectives “replaced” by spatial conservation areas

Spatial Conservation Areas
- Wildlife Habitat Areas (Approved by MoE under Government Actions Regulation s.10)
- Ungulate Winter Ranges (Approved by MoE under Government Actions Regulation s.12)
- Old growth management areas (Approved by ILMB under Land Amendment Act s.93.4)

Forest Stewardship Plans
- Includes results and strategies consistent with objectives.
- Respects conservation areas.

(Prepared by Licensee, Approved by MoFR)

In many situations the legal conservation areas established by government are coterminous with the areas protected by licensees as part of their planning requirements. However, this is not always the case in situations where there is disagreement between government and licensees about particular conservation area boundaries. This will be discussed further in chapter seven when the implementation of conservation areas is examined.
4.1.3 The Timber Supply

Government’s provisions to protect the habitat of species at risk, winter habitat of ungulates and old growth through both licensee planning obligations and legal conservation area establishment are mitigated by the extent to which they can reduce the timber supply. The "timber supply" is the volume of timber that is projected to be available for forest harvesting over time under a particular management regime. An analysis of the timber supply, combined with professional discretion, leads to the establishment of the level of timber that can be harvested in a forest district (the allowable annual cut).\(^\text{13}\) This determination, conducted by the Chief Forester (MoFR) is called the "timber supply review"; it must occur once every five years (Forest Act, s.8.1). Some of the criteria that the Chief Forester must consider in his / her analysis are "constraints" on the amount of timber available for harvesting. The term "constraints" is used in the province to mean management practices or conservation areas (such as WHAs, UWRS and OGMAs) that reduce the amount of timber that can be harvested, or that affect how and where it can be harvested.

The productive forest managed by MoFR is divided into two categories: the timber harvesting land base, which contributes to the timber supply (it is available for timber harvesting in the long term); and the non-contributing land base, which is considered to be unavailable for harvesting for a number of possible reasons, and therefore does not “contribute” to the timber supply. The measurement of the extent to which conservation areas impact the timber supply is the area of the timber harvesting land base that becomes unavailable for harvest as a result of establishing the reserve(s). Although the "timber supply" is usually measured in cubic metres of timber (a measurement of volume), the timber supply impact of conservation areas is measured

\(^{13}\) The allowable annual cut is determined for timber supply areas, tree farm licences and woodlot licences. For the sake of simplicity, the forest district will be used to describe timber supply area level issues in this thesis. In reality, however, forest districts encompass timber supply areas, tree farm licences and woodlot licences.
in hectares (a measurement of area) for the sake of simplicity and consistency across the province (MWLAP, 2004c).

Two of the principal reasons why forest would be outside of the timber harvesting land base (and therefore not contribute to the timber supply) is that it is either inoperable or reserved for some form of environmental conservation. Operability can be divided into physical and economic operability. The former is dependant on current road building and yarding techniques, while the latter is determined by the difference between timber values and logging costs.\(^{14}\) When technology improves or markets change, so does operability. For example, in recent years helicopter logging has made accessible many areas that were previously considered inoperable. Figure 4 shows the land base composition of the two districts, with the non-contributing land base further divided into what is inoperable and what is reserved for conservation reasons.

Figure 4 The timber harvesting and non-contributing land bases in Chilliwack and Squamish

THLB – timber harvesting land base, NCLB– non-contributing land base. The non-contributing land base “conservation” category includes areas such as riparian reserves, environmentally sensitive areas, long-term spotted owl habitat and wildlife tree patches. Data is from the most recent timber supply analysis for the area: 2003 for Chilliwack and 1999 for Squamish (MoF, 2003; MoF, 1999)

\(^{14}\) Yarding - the hauling of felled timber to the landing or temporary storage site from where trucks (usually) transport it to the mill site (MoFR, 2006b)
The total productive forest managed by the MoFR in Chilliwack is 636,675 ha, but the timber harvesting land base is only 260,918 ha, 41% of this area. The Squamish district has 298,912 ha of productive Crown forest and a timber harvesting land base of 123,392 ha, also 41% of the total.

In order to reduce the economic impacts of implementing WHAs, UWRs and OGMAs, government policy encourages their establishment in the non-contributing land base to the extent possible. This direction complicates implementation because there are timber harvesting opportunities in some of the areas in the non-contributing land base. The lines that demarcate the timber harvesting and non-contributing land bases are not necessarily accurate at the operational scale, i.e. there are areas labelled as inoperable that are actually operable, and vice versa. Moreover, as mentioned above, operability changes over time, so even if areas are accurately labelled as inoperable on a map at a certain point in time, this can quickly change due to shifts in log prices or advancements in harvesting technology. Importantly, the inoperable component of the non-contributing land base is not a legal land designation, i.e. there is no law saying what can and cannot be done in forest labelled as “inoperable”. If forests labelled “inoperable” become operable licensees can, and often do harvest there.\(^\text{15}\) If such timber is harvested, it becomes part of the timber harvesting land base the next time the timber harvesting land base is assessed (e.g., MoF, 2003, p10).

\(^\text{15}\) Licences are still restricted to the total volume allocated to them as part of their tenure agreements, so harvesting in forest labelled as “inoperable” does not increase the total amount of timber to which they have access. However, sometimes there are operational reasons that make harvesting in “inoperable” areas attractive.
4.2 The Federal Species at Risk Act

All of the species that are provincially listed as "Identified Wildlife", and which are therefore "eligible" for protection through WHAs are also listed as species at risk under the federal Species at Risk Act. This act was passed by parliament in December 2002, and it came into full force in June 2004. Species are listed under the act at the discretion of the federal Minister of Environment, based upon recommendations by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). This committee is the national scientific body that "assesses and designates which wild species are in some danger of disappearing in Canada" (COSEWIC, 2006a). The organization ranks species as follows:

- Extinct - A wildlife species that no longer exists.
- Extirpated - A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
- Endangered - A wildlife species facing imminent extirpation or extinction
- Threatened - A wildlife species likely to become endangered if limiting factors are not reversed
- Special Concern - A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
- Data Deficient - A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.
- Not At Risk - A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances. (COSEWIC, 2006b)

If a species is listed under the Species at Risk Act it is protected from direct harm by actions such as killing or harassment, and its "residence" is granted protection from destruction or damage. Furthermore, the Minister must create a recovery strategy and action plan for those species listed as threatened, endangered or extirpated (if feasible). Recovery planning in Canada is overseen by the national Recovery of Nationally Endangered Wildlife (RENEW) program.

16 "Residence" is defined in the federal Species at Risk Act as "a dwelling-place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating" (SARA, s 2.1)
RENEW consists of a multi-jurisdictional advisory committee, the National Recovery Working Group, which develops guidance for species at risk recovery planning and implementation (National Recovery Working Group. 2005). Recovery strategies must outline threats to the species' survival and identify the species' critical habitat (the latter can be identified in either the recovery strategy or action plan that follows it). Once critical habitat is defined for a listed species, is granted automatic protection on federal lands, which comprise around 1% of British Columbia’s forests (NRCan, 2001). Additionally, if the federal Minister of the Environment determines that the provincial or territorial government is not adequately protecting such habitat, he or she has the discretionary power to enforce the protection of critical habitat on provincial or territorial lands (SARA s. 34 and 61).

There is doubt about the extent that SARA will be used on provincial lands (which amount to 95% of the land within British Columbia’s boundaries; MoF, 2004c), given the history of similar provisions in previous federal environmental laws in Canada (Smallwood, 2003). Furthermore, after being identified, there are no clear guidelines specifying by when critical habitat on provincial land has to be protected. The recovery strategies for the first “round” of listed species were scheduled for completion in 2006.

4.3 Species’ Biology and Conservation Needs

This chapter summarizes the biology and conservation requirements (where established) of species at risk and ungulates in Squamish and Chilliwack. It only reviews those species for which WHAs and UWRs are being planned and discusses the role that these conservation areas play in species’ habitat protection.
Grizzly Bears

Grizzly bears are omnivores that require large tracts of suitable habitat for survival. Due to human-induced mortality and impacts on habitat, the range of grizzly bears has been substantially reduced across North America. The species is listed as special concern under the federal Species at Risk Act. The province created a provincial grizzly bear strategy in 1995 to maintain the diversity and abundance of grizzly bears across BC (MoE, 2006a). The strategy divides the range of grizzly bears into 57 Grizzly Bear Population Units, each of which contains individual populations. There are five such units in the Chilliwack and Squamish forest districts: Squamish-Lillooet, Garibaldi-Pitt, Stein-Nahatalatch, North Cascades and South Chilcotin Ranges (Figure 5). All of these populations have been classified under the provincial grizzly bear strategy as threatened (Hamilton et al., 2004).

Figure 5 Grizzly Bear Population Units in Chilliwack and Squamish

(Hamilton et al., 2004) Threatened population units are in medium grey
Only one population unit in the province, the North Cascades, has a provincial recovery team and plan.\textsuperscript{17} It was chosen as a pilot recovery plan as it has one of the most imperilled populations (MoE, 2006a). There are only 25 individual bears remaining in the North Cascades population unit (NCGBRT, 2004). The goal of the recovery plan is to restore the population to viable status through a mixture of ensuring sufficient quality habitat, augmenting the current population size, and public education. Habitat suitability and effectiveness is to be maintained by developing an access plan to restrict road use and creation in key areas, and using conservation areas to protect seasonally important habitat (generally foraging habitat). The plan lists WHAs as an important tool for protecting such habitat and explains that WHAs should be well distributed and accessible to the bears (NCGBRT, 2004). WHAs are not intended to protect grizzly bear habitat at the landscape level; their role is to protect key sites (in this case seasonal foraging areas) at the stand scale for the species. The recovery plan does not specify what amount of seasonally important habitat should be protected to enable species recovery; it only provides quantitative goals for the amount of habitat that should be greater than 500m from roads, which is the minimum distance at which the impacts of roads are eliminated (NCGBRT, 2004). The creation of such areas will be part of access planning, and not attained through WHAs.

The four other grizzly bear population units do not have recovery teams or plans, but WHAs are also supposed to be used to preserve seasonal foraging habitat in these population units.

\textsuperscript{17} This is not a federal recovery team under the Recovery of Nationally Endangered Wildlife (RENEW) program. Such teams are only formed for those species listed as threatened, endangered, or extirpated; grizzly bears are listed as “special concern”.
Marbled Murrelet

The marbled murrelet is a small sea bird that nests on shore in old conifers with large horizontal platforms. The primary threat to its persistence is thought to be the loss of suitable nesting habitat. The species is listed as threatened under the Species at Risk Act. While still abundant provincially, the marbled murrelet is listed under the Act because of the rate of decline of its nesting habitat. Radar surveys have demonstrated that marbled murrelet occurrence is linearly correlated with the amount of suitable nesting habitat in an area. Accordingly, it is thought that marbled murrelet abundance decreases linearly with habitat, i.e., that individuals do not pack into smaller areas of habitat to compensate for habitat loss (Burger, 2004).

The federal recovery team released a conservation assessment for the species in 2003 that included conservation recommendations. The conservation assessment is an advisory document, not government policy. To down-list the species from threatened to special concern, the short-term conservation goal is to ensure that the population and habitat do not decrease by more than 30% from 2002 levels over 30 years (three marbled murrelet generations) (CMMRT, 2003).

The recovery team has divided up the species’ range into six conservation regions and assigned habitat conservation goals ranging from 70% to 90% conservation of suitable habitat according to the level of threat in the region. The southern coastal conservation region is comprised of the Sunshine Coast, Squamish and Chilliwack forest districts. The habitat goal in this region is to not permit a decline of greater than 15% percent by 2032, i.e., retain at least 85% of suitable nesting habitat. Habitat goals are not set at a scale finer than the conservation region and there is no quantitative guidance regarding how habitat protection to attain these regional goals should be distributed among the forest districts encompassed in the region. However, the marbled murrelet recovery teams’ conservation assessment is clear in saying that habitat should
be protected throughout the range of the species to maintain its distribution along the coast (CMMRT, 2003).

The marbled murrelet is negatively affected by “artificial” forest edge (from a recent clearcut or young forest) up to 50m into a habitat patch, and an area of at least 100ha is likely needed to avoid such effects (CMMRT, 2003). However, the species does not seem to be negatively affected by “natural” edges, such as rivers or avalanche chutes next to forests (CMMRT, 2003). The recovery team recommends conserving a range of large (>200 ha), medium (50-200ha), and small (<50ha) habitat patches within managed forests; this is interim management guidance until the effects of patch size are better understood (CMMRT, 2003). Current government policy for marbled murrelet is to use OGMAs and WHAs to protect suitable nesting habitat for the species up to the amounts permitted under government’s timber supply impact policies (discussed further in chapter six; JSC, 2004; JSC, 2005a).

Coastal Giant Salamander

The coastal giant salamander is listed as threatened under the Species at Risk Act. It was designated as such due to its limited distribution in BC and because of threats to its habitat, including logging, road building and urban development, which are causing habitat decline and fragmentation. The species’ range extends down the coast to north-western California and its overall global status is considered to be “secure” due to the state of its American populations (NatureServe Explorer, 2006). There has been very little monitoring of this species’ abundance in British Columbia, so it is difficult to determine what the relationship is between habitat decline and population levels. The species has both an aquatic (larval) and terrestrial (adult) phase. During its aquatic phase it stays in small sections of streams and seeks shelter under rocks. Terrestrial adults are nocturnal and live in refuges in riparian areas on the forest floor. The distribution of this salamander is heavily affected (and limited) by elevation, with the
majority of its habitat occurring below 800m (Johnston, 2004). The complicated life history of this species means that habitat protection through WHAs is required for both its aquatic and terrestrial habitats, and should connect the two. Furthermore, because its distribution is so limited by elevation, it is essential to protect lower-elevation linkages between existing populations so that exchanges can occur.

The recovery team has not yet defined the critical habitat of this species. However, initial goals for habitat protection on Crown land aimed at protecting half of occupied streams (around 80 linear km). It was thought that this amount would allow the species to be down-listed from threatened to special concern, as habitat would no longer be declining at such a high rate. Management of this species is additionally challenged by the fact that part of its habitat is on private land, which is complicated due to the lack of tools and policies the province has for managing species there.

**Pacific Water Shrew**

The pacific water shrew is listed as threatened under the Species at Risk Act. It is a naturally rare species and is a low elevation (usually below 600m), riparian habitat specialist in the most south-western part of the province (Lindgren, 2004). Its range extends down the Pacific coast to northern California and its global status is considered to be “apparently secure”, which means that there is “some cause for long-term concern due to declines or other factors” (NatureServe Explorer, 2006); this is less grave than its Canadian status. Important habitat features for this species are moist, coastal forests (of a variety of ages) adjacent to slow moving streams (Lindgren, 2004). Urbanization, agricultural development, forestry and road building destroy, degrade and fragment its habitat. The critical habitat of the species has not yet been defined, but at a minimum the recovery team wants to protect habitat at all known and historical occurrences.
with WHAs. However, there are very few known occurrences of this species and private land likely makes up the largest share of potential habitat.

Coastal Tailed Frog

The coastal tailed frog lives in fast-flowing, cool mountain streams, and is most suited to streams adjacent to old forests (Mallory, 2004). It is listed as special concern under the Species at Risk Act. Although the species is fairly widespread it is considered to be “at risk” because nearly 75% of its habitat has been at least partially developed, and the quantity and quality of its habitat continues to decline (Environment Canada, 2000). Timber harvesting negatively impacts the species’ habitat in a number of ways, such as increasing sedimentation in streams, which fills the spaces in between rocks that the frogs use for refuge (Mallory, 2004). As it is only listed as special concern under the federal Species at Risk Act, it does not currently have a recovery team or recovery goals. Stream reaches and adjacent terrestrial areas with evidence of coastal tailed frog presence can be protected by WHAs.

Tall Bugbane

Tall bugbane is a large-leafed understory plant. The species grows in moist, mature (70 - 150 years) western red cedar forests, and is usually associated with deciduous trees species, which maintain light conditions needed for the species (Penny, 2004). It is listed as endangered under the Species at Risk Act. Its range extends down through western Washington to Oregon and it is considered globally “vulnerable”, meaning that it is at “moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors” (NatureServ Explorer, 2006). It is threatened by forest harvesting, road construction and a lack of reproductive potential (the seeds are poorly dispersed) (Penny,
2004). It is rare throughout its range in the Pacific Northwest (Penny, 2004). The protection goal for this species is to protect all known and historical occurrences.

**Deer**

The “Deer and Elk in Coastal Forests Handbook” states that up to 10% of the forested land base may be required as the critical range to sustain deer at “historic levels” through severe winters (Nyberg and Janz, 1990 in Freeman, 2001).\(^\text{18}\) This equals approximately 63 600 ha in Chilliwack and almost 30 000 ha in Squamish. Some of the qualities of good deer winter range include mature and old growth forest stands with moderate canopy closure, moderate to steep south-facing slopes, and stands adjacent to terrain enabling escape from predators (Freeman, 2001; Freeman, 2002). The tree canopies intercept snow and prevent it from falling on the ground, which facilitates winter foraging and movement in general.

In 2002 regional MoE staff released a deer winter range plan for Chilliwack. It identified a total of 25 585 ha of important deer winter range, including 13 895 ha in the timber harvesting land base that MoE wanted to be deferred from timber harvesting (Freeman, 2001; Freeman 2002). The report states that this is considered the “minimum area that is necessary for the winter survival of deer” (p58).

**Mountain Goat**

In 2002, the MoE completed a draft goat winter range plan for Chilliwack that included a total of 36 228 ha of winter range, with a total impact of 1645 ha in the timber harvesting land base. The draft plan clearly states that in the MoE’s opinion “the UWR areas identified in [the] package represent the minimum area deemed necessary for the winter survival of Mountain Goats within the currently surveyed portions of the [Chilliwack district]” (Jex, 2002, p3).

\(^{18}\) MoE’s population goal for deer in Chilliwack is 12 000 individuals.
Broadly speaking, mountain goat winter range shares some of the same characteristics as deer winter habitat, such as having a combination of escape terrain, southerly aspect and mature / old forest structure. In fact there is about 2870 ha of overlap between deer and goat winter range in the Fraser timber supply area (Jex, 2002).

Shortly after they were released, Chilliwack's deer and mountain goat winter range plans were used as templates for UWR plans in the Squamish forest district. However, the author was not able to obtain a copy of the original plans for Squamish describing MoE's intentions for the protection of UWR there.
5 Methods

5.1 Case Selection and Scope of Project

This thesis examined the implementation of conservation areas in the Chilliwack and Squamish forest districts. These are the two most south-western mainland forest districts and include some of the most biodiverse areas in the province (Figure 6).

Figure 6 The location of the Squamish and Chilliwack Forest Districts

The Forest Practices Board had decided upon these two forest districts prior to my involvement in the project. The choice of these areas was based on the existence of three
primary factors: high biodiversity and wildlife values, significant areas of forest harvesting, and a history of forest harvesting outside of the traditional timber harvesting land base. The Forest Practices Board chose areas where they thought implementation would be challenging. The two districts were not chosen in order to compare them but only to try and evaluate how implementation was progressing and to identify challenges to conservation area establishment. Due to the selection criteria, problems identified in this region may not exist in other areas of the province where the conflict between biodiversity and timber values may be lower. Factors identified here would need to be tested in different contexts to decide if they are systematic (King et al., 1994). However, to the extent that biodiversity and wildlife policies need to work in those places with the most (and most imperilled) biodiversity and wildlife, findings of this study are important and should be addressed by government.

Of secondary, but not trivial, importance to the forest district selection was the proximity of these areas to the homes of the interviewers; given the project’s budget, their location facilitated conducting in-person interviews.

Within the two districts, the focus of the investigation was limited to three types of conservation areas: OGMAs, WHAs, and UWRs. The province has two other spatially defined conservation tools outside of the protected areas network that may provide benefits to biodiversity: riparian management zones and wildlife tree patches. However, neither of these are conservation areas that must be both spatially delineated and approved by government, which makes the nature of their “implementation” very different. Their establishment occurs more at the forest practices level, with licensees abiding by rules not to harvest beyond a certain distance near some bodies of water, or committing to leave certain trees standing in a cutblock. The focus of this thesis is on conservation tools that require government planning (or at least reviewing) and subsequent legal establishment.
The characteristics of this research are well suited to using case studies. According to Yin (2003), case studies are the preferred approach when research questions are explanatory in nature; the investigator has little control over events; and when the focus of the research is on contemporary phenomenon with real-life context. Additionally, the importance of understanding process-related issues in this investigation makes the case study an appropriate method for the objectives of the study. Although it only looked at two forest districts, the study can be considered to have many cases because each conservation area (or suite of areas) is a separate implementation event.

The species that are researched in this thesis are those for which WHAs or UWRs are being (or will be) planned under current policy. The thesis does not consider the implementation of conservation areas for the Northern Spotted Owl. There are a number of reasons for this decision. Firstly, special resources management zones, not WHAs, are used to protect the species, so that would introduce an entirely new conservation area into the research. The management of this species is now occurring through the Species at Risk Co-ordination Office, so again, looking at how this agency deals with the species would broaden the scope of the thesis. Unlike the conservation areas examined in this research, the special resource management zones have all been established for several years in Chilliwack and Squamish, so there are not the same questions about how the implementation process is working (although there are serious concerns about the adequacy of the conservation areas). Lastly, the species and its management have already been studied extensively elsewhere (e.g. Noon and Blakesley, 2006; Bart, 1995)

Additionally, this thesis does not discuss the issue of why more species are not legally listed despite being identified as scientifically at risk by the province’s scientific assessment body. Neither does it examine whether the province is making good decisions about how to spend its scarce conservation resources in terms of prioritizing between species. Both of these
issues have been researched and the interested reader can refer to Wood and Flahr (2004), Bunnell et al. (2004), and Bunnell et al. (2005) for further information on the subjects.

5.2 Implementation Evaluation Framework

This study begins by walking through the development of government’s conservation targets and accompanying implementation policies that clarify the wildlife and biodiversity objectives in the Forest Planning and Practices Regulation. It then measures the progress of legal conservation area establishment from the time the relevant policy was introduced up until June 2006 (and autumn 2006 in the case of UWRs). The thesis traces through the actual establishment process of conservation areas once their delineation began and identifies any challenges, both specific and general, with this process. The research is primarily focused on the actual delineation and legal designation of conservation areas and does not look at the subsequent management of approved areas. Finally, it also examines how the conservation areas are contributing to the protection of species at risk and ungulate habitat, and old growth ecosystems, as part of current legislation’s goal (or intent) to conserve wildlife and biodiversity. The approach is detailed below:

1. Implementation Status and Timeliness

The number of conservation areas (WHAs, UWRs, and OGMAs) that are legally approved, in draft form, or are still unplanned is compared to government’s conservation targets for the areas. The time for WHA implementation will be measured since the species was first listed as “Identified Wildlife” (either in 1999 or 2004) and therefore eligible for WHAs. For UWRs, time will be counted since 1998. This was the year when provisions for UWRs were introduced into the Forest Practices Code and planning for the legal establishment of all UWRs
began. Progress in OGMA implementation will be measured since the release of the Forest Practices Code in 1995 when OGMAs were first introduced into policy.

2. Establishment Process

For all conservation areas, this thesis will trace through their establishment (planning, negotiating, proposing to Minister, etc.) and identify challenges that have occurred during the process. The focus will be on identifying challenges faced during the actual establishment of conservation areas, as opposed to examining what happened in between the time the relevant policy was passed and planning for the conservation areas actually began. It will also solicit comments from interviewees about how the process of conservation area implementation is occurring overall.

3. Biological Adequacy

The extent of protection granted through WHAs and UWRs will be examined with respect to species' conservation needs, as described in the literature and in interviews with species at risk recovery team members. The focus will be on the quantity of protection afforded by WHAs and UWRs, as opposed to the quality. While habitat quality is clearly integral to conservation efforts there are a number of reasons why it will not be examined in great detail in this thesis. Firstly, the author suspects that there are substantial issues related to habitat quantity as a result of the various economic restrictions on the conservation areas and thinks that this is a priority for investigation. Secondly, due to the restrictions on habitat quantity, the author also assumes that finding sufficient habitat of adequate quality might not be the limiting factor in adequately protecting many of the species. Lastly, evaluating habitat quality is more challenging than evaluating habitat quantity, and would involve a detailed examination of the shape and location of each conservation area. Given the variety of other issues the author wished to
explore with respect to conservation area implementation (e.g. time to establish areas, problems encountered during the implementation process etc), combined with the substantial additional time and complexity of evaluating habitat quality, the author decided not to explore this issue to any large degree. That being said, any concerns about the habitat quality of conservation areas that surface throughout the research will be presented.

The role of OGMAs as an effective coarse filter for old growth ecosystems will be examined by evaluating the total amount of protected old growth required by policy, patch sizes and percent of forest interior, age of forest in OGMAs and OGMA connectivity, using the literature for effective coarse filters. Information will be acquired through the landscape unit reports that describe OGMA establishment, interviews, and GIS - see section 5.3.2 below.

Two aspects of OGMA patch sizes will be examined:

1. Percent of forest in OGMAs with interior conditions. Forest that is farther than 200m from the edge of the OGMA will be considered to be in the “interior” of the OGMA. Using 200m as the cut off point is consistent with the degree that edge conditions penetrate into a patch presented in the literature review (chapter 3) and was the suggested distance under the Forest Practice Codes Biodiversity Guidebook (MoF, 1995). Importantly, the specific shape of each OGMA was not analyzed. This complicates attempts at determining the amount of forest that is 200m from the edge because OGMAs of the same size can have significantly different amounts of interior forest depending on their shape.

In order to examine interior forest conditions without analyzing the actual shape of individual OGMAs, the percent of interior forest will be calculated as though all OGMAs were perfect circles. As circles provide the most interior forest condition for OGMAs of any given size, this analysis will provide an upper bound on the possible extent of interior conditions in actual OGMAs. The extent of forest interior conditions will also be presented
for two other hypothetical shapes: ellipses (ovals) that are two times as long as they are wide; and ellipses that are three times as long as they are wide. This will be calculated to demonstrate how the amounts of interior forest conditions vary if the shape of the OGMA is not a circle. The following examples demonstrate the calculations for a hypothetical 100 ha (1,000,000m$^2$) OGMA that is circular or elliptical:¹⁹

<table>
<thead>
<tr>
<th>OGMA Area</th>
<th>100 ha = π$x^2$</th>
<th>100 ha = π2$x^2$</th>
<th>100 ha = π3$x^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGMA x</td>
<td>$\sqrt{100/\pi}$</td>
<td>$\sqrt{100/2\pi}$</td>
<td>$\sqrt{100/3\pi}$</td>
</tr>
<tr>
<td></td>
<td>564m</td>
<td>339m</td>
<td>326m</td>
</tr>
<tr>
<td>Interior $x_i$</td>
<td>$x - 200m$</td>
<td>$x - 200m$</td>
<td>$x - 200m$</td>
</tr>
<tr>
<td></td>
<td>364m</td>
<td>199m</td>
<td>126</td>
</tr>
<tr>
<td>Interior Area</td>
<td>$\pi x_i^2$</td>
<td>$2\pi x_i^2$</td>
<td>$3\pi x_i^2$</td>
</tr>
<tr>
<td></td>
<td>42 ha</td>
<td>25 ha</td>
<td>15 ha</td>
</tr>
<tr>
<td>% of OGMA with Interior Conditions</td>
<td>42%</td>
<td>25%</td>
<td>15%</td>
</tr>
</tbody>
</table>

2. Percent of OGMAs in different size categories. The number of hectares of OGMAs in six size categories will be presented: <20ha, 21-40ha, 41-60ha, 61-80ha, 81-100ha, and >100ha.

5.3 Research Approaches

The investigation relied primarily upon interviews with people involved in the field of biodiversity and forest management, document and policy review, and GIS analyses of data to achieve its objectives.

¹⁹ 1 hectare = 10,000m$^2$
5.3.1 Interviews

A significant amount of the information collected for this project was obtained through interaction with those working in the field. The purpose of this communication was to gain insight into the following broad topics as they pertained to implementing OGMAS, UWRs and WHAs:

- Policy interpretation and application (including the establishment of conservation targets),
- The implementation of conservation areas (the delineation process, current status of areas with respect to government’s targets and considerations in approving areas),
- Biodiversity and wildlife considerations in forest stewardship planning and plan approval,
- Ecological impacts of current policy implementation, and
- Challenges and positive experiences with implementation and policy in general.

In total, 24 people were interviewed from the MoE, MoFR, ILMB, forest industry, species at risk recovery teams, and environmental non-governmental organizations (The Western Canadian Wilderness Committee, David Suzuki Foundation, and Sierra Legal Defence Fund; Table 4). Ethics approval was granted from the UBC Behavioural Research Board to conduct these interviews (Appendix II)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Number of Interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Environment (regional and headquarters)</td>
<td>5</td>
</tr>
<tr>
<td>Ministry of Forests and Range</td>
<td>4</td>
</tr>
<tr>
<td>Integrated Land Management Bureau</td>
<td>3*</td>
</tr>
<tr>
<td>Forest Licensees</td>
<td>6</td>
</tr>
<tr>
<td>Recovery Team Members</td>
<td>3</td>
</tr>
<tr>
<td>Environmental Non Governmental Organizations</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>24</strong></td>
</tr>
</tbody>
</table>

*Four people were interviewed who have had experience working with ILMB to implement OGMAs, but one interviewee was no longer with ILMB and was counted in another category.

The majority of interviews (18) were carried out with one of two employees of the Forest Practices Board; I lead the interviews and the Forest Practices Board member took notes. After each interview I reviewed the notes taken by the note taker, and added anything I jotted down
during the discussion. Additionally, I engaged in extensive correspondence by email and had several follow up discussions by phone with some of the interviewees. For all verbal communication (original interview or follow up discussion) interviewees were sent the interview notes and asked to review them for accuracy. Often interviewees returned the notes with additional comments about particular issues. Fifteen of the interviews with the Forest Practices Board were conducted in person. Their lengths ranged from 30 minutes to four hours, but were normally around 1.5 hours long.

A semi-structured interview approach was used; general questions about the subjects listed above were asked and these usually lead to discussions about the issues we wanted to cover. At the end of each interview interviewees were asked if there were additional problems with implementation or the overall policy that they wanted to share, or if they wanted to discuss any positive experiences about the process. There was a question set for each type of interviewee and it was ensured that all the items on the list were addressed over the course of the interview (Appendix III)

I conducted six interviews independently from the Forest Practices Board: three with species at risk recovery team members and three with representatives of environmental non-governmental organizations. Half of these were done in person and four of them were tape-recorded.

Participants were identified by government, industry and environmental group websites, government policy and planning documents, and by the Forest Practices Board members who already had many contacts in both government and the forest industry. Participants were selected because of their knowledge or interest in biodiversity and wildlife policies and issues in the province and/or because of their experience planning and implementing biodiversity and wildlife conservation areas in the two forest districts under study.
There are very few people in government working on the implementation of the three conservation areas in the two study districts. The two forest districts chosen for the study are within the same MoE and ILMB region, with some staff working across the whole region irrespective of forest district. This combined with the fact that most Ministries and government employees are only mandated to deal with their particular component of the overall forest and biodiversity management picture meant that there were not many people who could be asked the same questions in order to compare across people’s experiences with particular types of conservation areas. Therefore, the presentation of the results from the interviews largely consists of a summary of what they said, highlighting any issues that were problematic or noteworthy for other reasons. As a tape-recorder was not used for the interviews conducted with the Forest Practices Board, direct quotations from these interviewees will not generally be used in communicating the research findings.

5.3.2 GIS Analyses

A GIS consulting firm was hired by the Forest Practices Board to perform GIS for this project. I planned the analysis, and the consultant executed it. The project used GIS to determine the following items:

- OGMA characteristics: The size and ages of old growth management areas. The OGMAs were overlaid with forest cover data for the area. The forest cover inventory groups forests into various age classes, e.g. 250 years and older, 140-250 years etc. Only OGMAs that were approved as of June 2006 were used in the analyses.

- Cutblocks in the non-contributing land base: The extent of proposed and approved cutblocks in Chilliwack in the non-contributing land base was determined by overlaying the most recent (in February 2006) consolidated forest development plan for the district
with the most recent timber harvesting land base / non-contributing land base lines.\textsuperscript{20} The consolidated forest development plan compiles all the approved and proposed cutblocks of all licensees in the district for the previous six to nine months. It is not necessarily indicative of what will be harvested because amendments can be made. However, it does provide a "snapshot" of how extensively the non-contributing land base is being used during a given period. We performed this analysis to try and get a clearer picture of how these land bases are used in order to judge their appropriateness for use in conservation policy. Unfortunately, the Squamish forest district does not create a digital consolidated forest development plan and it would have been a lengthy process to gather the necessary data from all of the forest companies operating in the area to get their forest development plans. Therefore, we used the opinion of those working in Squamish in order to estimate the extent of harvesting in the non-contributing land base.

- Cutblocks in draft UWR: The extent of overlap of approved and proposed cutblocks in Chilliwack with the areas MoE considers necessary for ungulate winter range protection was examined by overlaying the consolidated forest development plan with MoE's draft UWR polygons from the early 2000s, which accompanied the initial draft plans for the species. These were used to get a sense for the extent of harvesting in UWR and to identify licensees who were harvesting there so that they could be questioned about their practices.

\textsuperscript{20} Forest development plans were operational plans under the Forest Practices Code.
6 Conservation Area Targets and Implementation Policy

Shortly after the Forest and Range Practices Act and its regulations came into force, the government released the conservation targets that clarified government’s wildlife and biodiversity objectives. The interpretation of without “unduly reducing the timber supply” is incorporated into the conservation targets. The particular caps on the cumulative timber supply impacts that each conservation area type can have are the same as the limits that existed under the Forest Practices Code. When the Forest Practices Code was released in 1995 government conducted an analysis of the timber supply impacts of its provisions. It was estimated that the protection of species at risk through WHAs would not affect the timber supply by more than 1%, and landscape level provisions, such as the retention of old growth, would not impact the timber supply by more than 2.3% (in addition to the 1% for species at risk; MoF, 1996). It did not include estimates for ungulate winter ranges, as they were not yet a conservation area type under the Forest Practices Code. In order to reduce concerns about the economic impacts of implementing the Forest Practices Code, government committed to keeping impacts to the estimates in the timber supply analysis. These figures have persisted over time and are included, either explicitly or implicitly, in the interpretation of not “unduly reducing the timber supply” for conservation areas under the Forest and Range Practices Act. The details of the conservation targets and implementation policies for the coarse- and fine-filter tools are described below.

6.1 WHA and UWR Implementation Targets and Policy

A second version of the Identified Wildlife Management Strategy was released in 2004 in order to bring the approach in line with the Forest and Range Practices Act and the federal Species at Risk Act’s list of species. It was accompanied by an updated list of “Identified Wildlife”. As of June 2006, the Strategy included 85 species of animals, plants and plant
communities. These are the only species for which WHAs can be established. Any person or group can propose a WHA. The current timber supply impact policy for WHAs is that they cannot impact the timber harvesting land base by more than 1% (MWLAP, 2004c).

Concerning UWRs, in May 2003 the Joint Steering Committee released a memorandum of understanding to “expedite and facilitate the orderly confirmation and establishment of ungulate winter ranges...in order to support the Forest and Range Practices Act” (JSC, 2003). This memorandum was issued in response to the slow implementation of UWRs and confusion regarding the establishment process. This memorandum established the current timber supply impact policy for UWRs, explaining that UWRs can only impact the timber harvesting land base by the amount that was accounted for in the second timber supply review. This specific number varies between forest districts; there is no generic cap on the extent that UWR can be established in the timber harvesting land base as there is for WHAs.

The MoE released the notices pursuant to the wildlife objective for both WHAs and UWRs in December 2004. The notices include conservation targets, attributes and distribution of habitat that MoE intends to protect with WHAs and UWRs, but do not include their specific locations. The regional MoE staff wrote the draft notices in the fall of 2004. For species at risk, Ministry staff took the 1% timber harvesting land base “budget” and divided it up amongst the priority species in the district. Usually these were species for which there was some inventory information available on Crown land and which were priority conservation concerns. In both districts a number of species were known or expected to exist in the district but were not included in the draft notices because of insufficient timber supply impact “budget” and because

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21 The Joint Steering Committee is comprised of MoE, ILMB and MoF. They work to clarify policy that affects all three ministries.

22 Ungulate winter range has been managed in the province for many years, but until recently (1998) there was not a mechanism to establish it as a legal conservation area. The “accounting” that occurs for ungulate winter ranges during timber supply reviews tries to reflect the fact that some amount (modelled spatially or non-spatially) is not available for harvest because of “historic” and continued ungulate winter range protection across the landscape. The considerations made for ungulate winter range in timber supply reviews and the subsequent derivation of the conservation targets is complex and can be contentious. A full treatment of this issue is well beyond the scope of this thesis.
of a lack of occurrence data. There were six such species: Red-Legged Frog, Badger, Great Blue Heron, Lewis’s Woodpecker, Keen’s Long-Eared Myotis and Pacific Water Shrew (in Squamish) (MWLAP, 2004d; MWLAP 2004e).

The draft notices were sent to MoE headquarters in Victoria for finalization. At this stage the Chilliwack notices underwent some significant changes without input from regional staff. While the draft notices included implementation targets for the timber harvesting land base and total amounts for each species, the final notices only included the timber harvesting land base portion of the conservation targets (i.e. the amount in the non-contributing land base was deleted from the draft notice) for grizzly bears, mountain goat and deer. Additionally, draft provisions to preserve marbled murrelet habitat solely in the non-contributing land base were also deleted. The Squamish notice did not undergo any substantial changes, with both the total habitat and timber harvesting land base amounts remaining in the final notice. In both the Squamish and Chilliwack forest districts the final notices include conservation targets up to the limits under government’s timber supply impact policies i.e. a maximum of 1% of the timber harvesting land base for all WHAs and the timber harvesting land base amount accounted for UWRs in the second timber supply review (Table 5).23

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23 The notices apply to the forest district level for species at risk and to the forest management level (timber supply area or tree farm license) for ungulate winter ranges, as these are the scales of the timber supply impact policies for these conservation areas. For the sake of simplicity only the forest district will be referred to in this thesis, even for those items that are actually managed at the timber supply area or tree farm license level.
All of the species whose non-contributing land base components were deleted from the draft notices originally had extensive habitat protection targets there (starred entries in table 5).

One of the reasons provided for the changes in the Chilliwack notices was that there were concerns about the possible economic impacts of including amounts in the non-contributing land base. Recall that these notices contain the number of hectares of land that licensees must legally plan to protect for each species, and also guide the establishment of conservation areas. The non-contributing land base does not contribute to the timber supply, so protection of habitat there

<table>
<thead>
<tr>
<th>Forest District</th>
<th>Species</th>
<th>Total Area (ha)</th>
<th>Timber harvesting land base (ha)</th>
<th>% of 1% budget</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chilliwack</strong></td>
<td><strong>Species at Risk</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coastal Giant Salamander</td>
<td>850</td>
<td>550</td>
<td>48.9</td>
</tr>
<tr>
<td></td>
<td>Grizzly Bear</td>
<td><em>6,399</em></td>
<td>445</td>
<td>39.5</td>
</tr>
<tr>
<td></td>
<td>Pacific Water Shrew</td>
<td>50</td>
<td>25</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>Tall Bugbane</td>
<td>200</td>
<td>75</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td>Coastal Tailed Frog</td>
<td>60</td>
<td>30</td>
<td>2.7</td>
</tr>
<tr>
<td></td>
<td>Spotted Owl</td>
<td>SOMP</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marbled Murrelet</td>
<td><em>Total habitat in non-contributing land base</em></td>
<td>1125</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Total for Species at Risk</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ungulates</strong></td>
<td>Mountain Goat</td>
<td><em>34,719</em></td>
<td>1500</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Deer</td>
<td><em>35,072</em></td>
<td>3500</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Squamish</strong></td>
<td><strong>Species at Risk</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marbled Murrelet</td>
<td>Total habitat in non-contributing land base</td>
<td>415</td>
<td>50.3</td>
</tr>
<tr>
<td></td>
<td>Grizzly Bear</td>
<td>7,280</td>
<td>385</td>
<td>46.7</td>
</tr>
<tr>
<td></td>
<td>Coastal Tailed Frog</td>
<td>40</td>
<td>25</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>Spotted Owl</td>
<td>SOMP</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total for Species at Risk</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ungulates</strong></td>
<td>****</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* — Removed from final notice

SOMP – Spotted Owl Management Plan – managed by the Species at Risk Co-ordination Office

** No targets were issued for UWR in Squamish because they had they had already been approved there (in the case of mountain goat) or were close to approval (in the case of moose and deer) when the notices were being created.

(MWLAP, 2004a; MWLAP, 2004b; MWLAP, 2004d; MWLAP, 2004e, MoE interviewee, personal communication, January 26, 2006)
cannot “unduly reduce the timber supply” (according to government’s current static definition of the timber supply). However, there are still potential economic opportunity costs for licensees of using land in the non-contributing land base for conservation purposes because there are many areas labelled as inoperable that may actually be operable in practice. These sorts of opportunity costs have to be considered when government seeks to legally establish a WHA or UWR under the Government Actions Regulation. So the MoE decided to leave this issue of how much habitat to protect in the non-contributing land base for grizzly bears, and ungulates in Chilliwack to be addressed and negotiated during the actual conservation area planning stage, as opposed to deciding upfront in the notices how much landbase licensees need to protect and how much land should be included in conservation areas for the species.

Concerning marbled murrelet, in addition to uncertainty about the economic impacts of mandating protection of this species in the non-contributing land base, some interviewees from the MoE said that there was insufficient specific habitat information for the species in Chilliwack to create a conservation target for them. The MoE said that unless they had a clear idea of where a conservation target could be spatially identified, i.e. equivalent to knowing where a future WHA could go, they did not include it in the notice. Additionally, it was mentioned that there was already a considerable amount of potentially suitable marbled murrelet nesting habitat protected in the Greater Vancouver Regional District watersheds. Therefore, the MoE thought that the overall risk to the species at the provincial level would not be greatly affected by not providing additional habitat protection in Chilliwack. In 2002, two years before the notices were created, the MoE commissioned a marbled murrelet radar inventory that included watersheds in both the Squamish and Chilliwack forest districts. The inventory indicated murrelet presence in both districts (Manley and Cullen, 2002). Some interviewees held that in addition to the coastal habitat algorithm created by the recovery team, the radar information was the only recent marbled murrelet information for both districts when the conservation targets were established.
There were differing opinions about whether the Ministry had more detailed habitat information for the marbled murrelet in Squamish than in Chilliwack, in addition to whether this approach (i.e. the need to know of specific habitat locations to create conservation targets for species) was applied consistently to all species. Throughout this research a variety of interviewees were asked about the level of habitat information available to the MoE when they established the conservation targets for marbled murrelet. No evidence was discovered to support the claim that there was more detailed habitat information in Squamish than in Chilliwack, suggesting that the "real" reason the species did not receive conservation targets was some combination of economic concerns regarding the impacts of conservation areas and a belief that the species was already reasonably well protected in the district.

The absence of the non-contributing land base component in the conservation targets for some species does not necessarily mean that conservation areas will not be implemented there in the future. However, it does mean that until WHAs and UWRs are legally established licensees have no legal obligation to protect habitat for these species in the non-contributing land base as part of their forest stewardship planning requirements.

6.2 Old Growth Management Area Conservation Targets and Implementation Policy

Current direction for OGMA implementation is provided by the provincial Non-Spatial Old Growth Order and its accompanying Implementation Policy. In the lower mainland, regional policy was developed to guide the consistent implementation of old growth planning across the region (the "Lower Mainland Landscape Unit Planning Standards"). Although a part of government policy since 1995, old growth retention was established as a priority biodiversity measure when the Landscape Unit Planning Guide was released in 1999. At this point it was thought that it would take a maximum of three years (i.e. until 2002) to complete old growth planning across the province (MoF and MoELP, 1999). The targets and some of the
implementation direction presented in the original Biodiversity Guidebook (1995), and the Landscape Unit Planning Guide 1999) was transitioned into the Non-Spatial Old Growth Order (2004).

The current targets and implementation guidance for OGMAs are supposed to keep impacts to the Forest Practices Code level of 2.3% of the timber supply (MoF, 1996). The targets are set at the variant scale of the province’s ecosystem classification system (recall section 3.2.1, figure 1). The targets were established based on estimates of the mean historic levels of old forest, reduced to account for old growth that was projected to be in the protected areas network, and then further reduced for economic reasons (Appendix 4 of MoF, 1995). For the majority of landscape units, the OGMA targets vary from the protection of 7 to 19 % of the ecosystem (MSRM, 2004a).

In order to further reduce the economic impacts of establishing OGMAs, government policy is to include old forest (usually 250 years and older) in the non-contributing land base first before choosing old forest in the timber harvesting land base. If no old forest is left in the ecosystem in either land base, the next oldest age category of forest in the non-contributing land base should be selected, then the same age category of forest from the timber harvesting land base, and so on until the entire ecosystem targets have been met (MSRM, 2004b; Table 6).

<table>
<thead>
<tr>
<th>Preference for inclusion in OGMAs</th>
<th>Non-Contributing Land Base</th>
<th>Timber Harvesting Land Base</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Old Growth (250 years +)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Old Growth (250 years +)</td>
</tr>
<tr>
<td>3</td>
<td>Mature Forest (140-250 years)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Mature Forest (140-250 years)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Until old growth target is met</td>
</tr>
</tbody>
</table>
Deviations from the selection guidelines can occur if including younger forest in the OGMA would provide "equal or better conservation value" (MSRM, 2004c). The implementation policies do not provide further guidance about how to judge what is "equal or better" in terms of an OGMA's conservation value.

In landscape units determined to be of relatively lower biodiversity concern, only 1/3 of the old growth target has to be met by the oldest forest first, while the remaining 2/3 of the target should only be implemented in the non-contributing land base, and can be comprised of younger forest (MSRM, 2004b). Of the 24 landscape units in Chilliwack, nine are considered of lower biodiversity concern, as are eight of the 20 landscape units in Squamish.24

OGMAs should be placed in a manner that "maximizes" the conservation of biodiversity values within the planning constraints outlined above (e.g. place OGMAs in the non-contributing land base first). The following items should also be considered in OGMA delineation:

- Capture rare old growth site series (ecosystems defined at a finer scale than the "variant");
- Create OGMAs large enough to have interior forest conditions, which current policy considers being greater than 36 hectares and round in shape (MSRM, 2004b).
- Create connectivity between OGMAs where possible
- When appropriate, overlap OGMAs with other constrained areas (e.g. WHAs and UWRs) to reduce the economic impacts of OGMAs.
  (MSRM, 2004b; MSRM, 2004c)

Old forest in protected areas can be counted towards the OGMA targets up to the percentage of the productive forest of a particular ecosystem that occurs in protected areas (MSRM, 2004b). For example, if 30% of the ecosystem is in protected areas than 30% of the

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24 The division into higher and lower biodiversity concern is limited by policy, which restricts the number of landscape units that can be considered higher biodiversity. The reader who is familiar with BC forest policy will recognize these categories as "low and high BEOs".
OGMA target can be met using forests in protected areas. OGMAs must still be placed in a manner that considers their value to biodiversity and be well distributed spatially.

Amendments to OGMA sizes and locations are permitted, so long as the overall old growth targets are still being met, and OGMAs (or parts thereof) are replaced with forests of equal or superior quality in terms of their value to biodiversity. Regional policy in the Lower Mainland says that ILMB should attempt to review major amendments within 120 calendar days, including a 60-day public review and comment period (MSRM, 2003a).  

6.3 Reducing the Economic Impacts of Conservation Area

Current government policy includes a variety of approaches to reduce the economic impacts of conservation areas. As has already been described, the implementation of the different types of reserves (OGMA, WHA or UWR) is limited by the extent that they can impact the timber harvesting land base. The location of conservation areas is further affected by requirements to ensure they do not cause licensees significant localized impacts (in the case of WHAs and UWRs; GAR 2(1)(c)), and to place them in the non-contributing land base first (in the case of OGMAs). Even when conservation areas are being implemented in the non-contributing land base, recent government policy has clarified that planners should be sensitive to future harvesting opportunities there (JSC, 2005b).

In addition to these stipulations, the conservation areas are supposed to be “co-located” i.e., overlapped, wherever possible in order to reduce their cumulative impact:

Government recognizes that the co-location of land use designations is a fundamental principle underlying policy that limits the impact of forest practices legislation on the provincial timber supply. Co-location reduces the cumulative effect of such designations

25 The categorization of an amendment as major or minor depends on how extensive the change is compared to the size of the entire OGMA. For example, if an OGMA is 10 to 50 ha, an amendment is considered to be minor only if it involves a change of less than 5 hectares; all larger changes would require a major amendment. In general, major amendments require public advertising and a review and comment period, whereas minor amendments usually do not.
on the [timber harvesting land base] and in doing so, maintains the provincial allowable annual cut. (JSC, 2005b, p2)

The combination of direction to overlap conservation areas plus the different timber supply impact “budgets” for each type of reserve created confusion amongst implementation actors about how to “account” for the timber supply impacts of the different conservation areas. For example, what is the timber supply impact of a 20 ha WHA established in the timber harvesting land base that has a 40 ha OGMA placed over it? Should the resultant impact to the timber supply be attributed to the OGMA or WHA timber supply impact “budget”? In response to this confusion, government issued several memoranda to clarify the matter. These include complex operational level details about exactly how to account for the timber supply impacts of the conservation areas depending on which conservation area type is implemented first, and in which land base, and provisions for transferring parts of the timber supply impact budget between conservation area types (JSC, 2005a; JSC, 2005b).

As a final measure to ensure that the economic impacts associated with conservation area establishment have been reduced as much as possible, there is a legal requirement that the Minister of the Environment (or delegate) consider how reserves that are already established contribute to meeting the species habitat needs before approving WHAs and UWRs. Under the Government Actions Regulation the Minister (or delegate) must be satisfied that the proposed area requires “special management that has not otherwise been provided for under [the] regulation or [by] another enactment” (GAR s. 10(2) and 12(2)).
7 Progress and Challenges of Conservation Area Establishment

This chapter reports on the implementation of WHAs, UWRs and OGMAs. For each conservation area type the progress towards meeting government's conservation targets is discussed, including the length of time taken since the relevant policy was created; the process of establishing the conservation areas is explored, focusing on any impediments faced along the way; and finally, the biological adequacy of the established (and potential future) conservation areas is examined. The overall comments and problems with implementation reported by interviewees are then summarized in section 7.3. In general, the establishment of conservation areas has been slow; implementation has been uncoordinated, with conservation areas being established incrementally, as opposed to all at the same time. In some situations planning has been marked by disputes over conservation area size and location and government seems unwilling to approve conservation areas if there is strong licensee opposition. Finally, in the majority of cases explored, conservation areas will be insufficient to protect species at risk habitat, ungulate winter range or to conserve old growth ecosystems. These findings are summarized in section 7.4.

7.1 WHAs and UWRs

This section examines the implementation of WHAs and UWRs for all species that have government conservation targets, plus the marbled murrelet in Chilliwack because it was regional MoE's original intention to mandate protection for it there, i.e. to have licensees protect elements of marbled murrelet habitat and for MoE to eventually establish WHAs for the species.
7.1.1 Chilliwack Forest District

Grizzly Bear

There are currently 18 of an anticipated future total of 33 grizzly bear WHAs legally established in Chilliwack. These 18 WHAs were approved in March 2005 and their total area is 3024 ha, with 58 ha in the timber harvesting land base. Government’s conservation target for grizzly bear WHAs in Chilliwack is 445 ha in the timber harvesting land base and an unspecified total amount (table 5). The MoE anticipates creating an additional 15 WHAs in order to bring the area of land protected for grizzly bears up to this conservation target.

The establishment of the 18 grizzly bear WHAs proceeded relatively smoothly, except for two WHAs whose implementation continues to be stalled due to economic concerns about their locations. Originally, MoE drafted a set of 20 WHAs: 14 in the North Cascades grizzly bear population unit, and six in the Stein-Nahatlatch population unit. The WHAs were selected due to the presence of important seasonal foraging habitat (MWLAP, 2004g; MWLAP, 2004h; Gyug, 2003). It took almost two and a half years to legally establish the approved WHAs.

Planning for the original set of 20 WHAs began by MoE in October 2002 and November 2003, and the review and comment process with potentially affected stakeholders commenced in 2004. Most parties did not have any serious issues with the proposed WHAs. However, there were two WHAs that a licensee was concerned about because of the economic impacts of their locations. The inclusion of these WHAs would still be within the timber supply impact “budget” for grizzly bears, i.e. their establishment would not cause the total amount of WHAs for the species to exceed 445 ha in the timber harvesting land base (the conservation target for grizzly bears in Chilliwack; table 5). These two WHAs are located in the southern most occupied grizzly bear habitat of the Stein-Nahatlatch population unit. The MoE holds that these WHAs are vital for grizzly bear recovery because they help to maintain the current grizzly bear distribution.

Changes were made to one of the WHAs to accommodate the licensee; however, the licensee...
still had a conflict with certain parts of it. The MoE asserts that adaptations have already reduced the quality of the WHAs and further changes to satisfy the licensee would jeopardize their biological integrity.

Despite the disagreement over the location of two WHAs, all 20 were forwarded to the Deputy Minister of MoE for his consideration for approval in November 2004. The Deputy decided to forgo a decision on the two WHAs in conflict until the MoE answered several questions posed by the licensee and the Deputy regarding the conservation importance of the WHAs and the degree to which the mitigation of economic impacts had been carried out. Regional Ministry staff responded to these questions but they remained with the MoE in Victoria for a long time due to workload issues. Currently the WHAs are still “on hold” because MoE in Victoria has instructed regional staff to complete UWR planning in the area first (which will be discussed at the end of this section).

One part of the government’s two-pronged approach to wildlife habitat protection requires licensees to make planning commitments to protect a certain amount of land for each species in their forest stewardship plans in order to meet the wildlife objective of the Forest Planning and Practices Regulation (recall section 4.1.1 of this thesis, “Government’s Objectives for Wildlife and Biodiversity”). The licensee who had a problem with the two grizzly bear WHAs submitted its first forest stewardship plan but did not include the exact boundaries of the two proposed WHAs in the plan, leaving out those areas that were in conflict. This is concerning as the habitat quality of the omitted portions could be degraded if harvesting or road construction were to occur, which is a possibility if the areas are not legally protected by WHAs. However, the licensee in question noted that at this point in time the company does not plan on harvesting those areas that are not in agreement with MoE’s draft WHAs.

Regional MoE has 13 additional WHAs in the North Cascades, Stein-Nahatlatch and Garibaldi-Pitt population units that they would like to establish. Once these additional 13
WHAs, and the two currently on hold, are established, the conservation target for grizzly bears will likely have been met in the district.

The majority of WHAs in Chilliwack are (or will be) for the North Cascades Population Unit (20 out of the total 33); these might protect a sufficient amount of important foraging habitat to enable population recovery if WHAs are combined with road management and population augmentation. The North Cascades grizzly bear recovery team does not currently have a quantitative goal for the amount of foraging habitat that should to be protected in the population unit. The current timber supply impact policy for WHAs would not allow the entire seasonal foraging habitat identified in the North Cascades to be protected. However, most of the highest quality sites, which are relatively confined and spatially limited, could likely be protected within the current government policy (North Cascades recovery team interviewee, personal communication, May 16, 2006).

The largest challenge currently facing the recovery of grizzly bears in the North Cascades population unit is a lack of bears, not a lack of habitat (North Cascades recovery team interviewee, personal communication, May 16, 2006). Given that there are only between 17 to 25 remaining individuals spread out over a large area of land, and the fact that the population unit is not contiguous with another healthy population unit, the North Cascades population likely needs augmentation with individuals from other populations (NCGBRT, 2004). WHAs are one part of a multi-faceted recovery strategy and must be accompanied by access (road) management, population augmentation and public education in order to be effective.

Current policy might permit a sufficient amount of WHAs to be created in the North Cascades grizzly bear population unit to enable recovery (if combined with other recovery actions). However, the current conservation target for grizzly bears in Chilliwack (which encompasses several population units) is not likely large enough to enable the adequate protection of important foraging habitat in all of the threatened grizzly bear population units in
the forest district. There are at least a handful of other habitat areas in the Stein-Nahatlatch and Garibaldi-Pitt threatened population units that warrant protection by WHAs, but establishing them all may exceed the timber supply impact "budget" permitted under current policy (MWLAP, 2004d).

Coastal Giant Salamander, Pacific Water Shrew and Tall Bugbane

All WHAs for coastal giant salamander (20), pacific water shrew (3) and tall bugbane (7) are in the draft stage. It is expected that, once finalized, these WHAs will include an amount near to the conservation target for these species (meaning that after these WHAs are approved WHA planning for these species will be completed in Chilliwack - at least for the foreseeable future). 26

The industry representatives of the species' recovery teams and a MoE employee each delineated some of the WHAs for these species, beginning in December 2004. The industry representatives were initially given the task of mapping the WHAs because of their knowledge of both the species and the land base. The coastal giant salamander recovery team provided those planning the salamander WHAs with a set of broad-scale "guiding principles", such as the representation of different habitat types and connectivity between habitat patches. Additionally, a contractor for the recovery team identified a few general priority areas for WHAs that were not already in protected areas. The current coastal giant salamander conservation target was based on protecting around 80 linear km of stream and some forested areas between the occupied streams (MWLAP, 2004d). There are an additional 72 km of stream channel known to support the species, so there was often considerable choice for the industry recovery team members regarding exactly where to place WHAs, which likely facilitated the task. Planning WHAs for

26 The MoE intends to "save" about 50 ha for Coast Giant Salamander, i.e. not establish it right away in a WHA, just in case they should want to use it in the future.
the Pacific water shrew and tall bugbane was relatively straightforward because the conservation target was based on protecting all known occurrences (current or historical) on Crown land, of which there are very few.

Although the initial delineation of the WHAs occurred in late 2004, as of June 2006 MoE had still not begun the review and comment period for the conservation areas. The delineation process was delayed for several months in 2005 because of a conflict regarding a woodlot license that was going to be allocated by MoFR in an important potential WHA location. Eventually MoFR was able to make arrangements for both the woodlot and the WHAs. MoE intended to start the review and comment stage for draft WHAs for all three species in May 2006, but this was delayed because the GIS work necessary for the review and comment period was not completed by May due to other GIS priorities at ILMB (all of MoE’s GIS work is done by ILMB, not “in house”).

It is unlikely that the WHAs, once established, will provide sufficient protection for the long term survival of the coastal giant salamander or Pacific water shrew, and it is not yet known what the long term prospects are for the tall bugbane given the protection afforded through WHAs. Overall, the draft coastal giant salamander WHAs were successfully placed in the priority areas identified by the contractor and met the basic guidelines set out by the recovery team, and they will help to protect an important amount of the species’ habitat (Coastal Giant Salamander recovery team interviewee, personal communication, May 11, 2006). However, these reserves are fragmented across the species’ range; addressing this issue would require the creation of many more WHAs than possible under current government policy in addition to landscape-level planning for the species to ensure that conservation areas are adequately linked (Coastal Giant Salamander recovery team interviewee, personal communication, May 11, 2006). The level of protection that will be afforded to the coastal giant salamander via WHAs (once established) and other conservation areas “might” be sufficient to down list the species from
threatened to special concern because the threat to the population will have decreased by protecting additional habitat, however. However, the dispersal issues identified above may still challenge the long-term viability of the species in BC.

Similarly, the current protection of tall bugbane may be sufficient to down list the species from endangered to threatened (because the risk of extinction will have decreased by protecting all known populations), but it is not yet known what the prospects are for the tall bugbane's long term viability in BC (Tall Bugbane recovery team interviewee, personal communication, May 11, 2006). There are only three known occurrences of the pacific water shrew on Crown land, the protection of which with WHAs will not be sufficient to sustain the species in the long term. One of the major issues with this species is that there is a lack of inventory of pacific water shrew and its habitat (i.e., it is not known where current and historical habitat is for this species), because such inventory is very expensive to conduct. In order to better protect this species, either additional Crown land with potentially suitable habitat (but no known occurrences) will have to be protected, or conservation tools will have to be developed to protect known habitat on private land.

Licensees operating in areas with the three species stated that they were respecting the draft WHAs and including them in their forest stewardship plans as “results” for species at risk.

Coastal Tailed Frogs

Conservation targets were established for the coastal tailed frog, but WHA planning has not yet begun for this species. MoE staff does not feel that it is a wildlife conservation priority at the moment and therefore they have not been putting resources towards establishing WHAs for it. They have made this decision for two reasons. Firstly, the species is not considered as “at risk” as the other species for which WHA planning is currently occurring; the species is still moderately widespread across the province, although population size and trend are unknown
(Environment Canada, 2000). Secondly, the amount of land permitted under government’s timber supply impact policy is insufficient to protect the species’ habitat in Chilliwack or Squamish. In the words of an interviewee from the MoE, “a couple small WHAs won't make much difference” for the coastal tailed frog. In order for a difference to be made in protection for this species a substantial number of well-connected WHAs would have to be created (MoE interviewee, personal communication, January 26, 2007). This is not possible under the current government timber supply impact policy.

Marbled Murrelet

There are no WHAs being planned for marbled murrelet in Chilliwack, as there was no conservation target established for this species. This is concerning as both the provincial government’s own Identified Wildlife Management Strategy species’ description and the marbled murrelet recovery team’s conservation assessment include Chilliwack within the birds’ range, and the district is one of the most at risk (Burger, 2004; CMMRT, 2003). Furthermore, more recent research conducted by an environmental non-governmental organization confirmed marbled murrelet occupancy in several forest stands in Elk Creek (an area in the Chilliwack forest district; Jones et al., 2006).

According to the recovery team’s coast habitat suitability model, there are around 53,530 ha of suitable murrelet habitat in Chilliwack, almost 40% (~21 100 ha) of which is protected by protected areas or approved OGMAs (CMMRT, 2005). This is 45% less than the recovery team’s goal of maintaining 85% of suitable habitat in the southern coast conservation region. The Greater Vancouver Regional District watersheds include around 18,000 ha of suitable marbled murrelet nesting habitat. These watersheds are under the jurisdiction of the regional district, as opposed to the province, and are not officially considered “protected” conservation.

27 Only approved OGMAs as of 2005 were included in the analysis.
areas. However, they may offer a certain degree of de facto protection to forests within their boundaries because they only permit a very restricted degree of logging for fire or pest prevention purposes. When the potential suitable marbled murrelet nesting habitat located in these watersheds is included, the total amount of “protected” habitat in Chilliwack increases to about 73%, which is “only” 12% (~6,380 ha) lower than the recovery team’s goal of 85% habitat protection.

It is important to keep in mind that the habitat and protection figures presented above are only estimates. The marbled murrelet recovery team’s habitat algorithm is based on features that are known to characterize suitable nesting habitat, such as old growth conifers located below 900m above sea level and within 30km of the coast (Burger, 2004). However, the algorithm does not capture all of the important attributes of suitable nesting habitat, such as trees with thick, mossy branches. The only way to actually determine if marbled murrelet are using particular trees for nesting is through “on the ground” investigation. There is a paucity of such work occurring in Chilliwack by government or industry and thus it is difficult to predict the accuracy of the algorithm in estimating both the extent of suitable habitat and the degree to which it is protected (Marbled Murrelet recovery team interviewee, personal communication, May 30, 2006).

Concerning the protection of murrelet nesting habitat afforded through OGMAs, as the majority of these conservation areas quite small (see following section: 7.2.2), they will have considerable “edge” habitat, which might expose marbled murrelets to increased predation, thereby defeating the purpose of habitat protection (Burger et al., 2004). Additionally, OGMAs do not guarantee long-term protection of marbled murrelet nesting habitat, as they can be moved over time.
There are currently draft UWR plans for both deer and mountain goat in Chilliwack. The total extent of MoE’s plans are 17,827 ha for deer and 35,528 ha for mountain goat, with amounts in the timber harvesting land base near the government’s conservation target (Table 7).

Table 7 Distribution of Area in MoE’s Proposed UWRs

<table>
<thead>
<tr>
<th></th>
<th>Timber Harvesting Land Base</th>
<th>Non-Contributing Land Base</th>
<th>Excluded (non-forested) Land Base</th>
<th>Total*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deer</td>
<td>3,539</td>
<td>10,762</td>
<td>2,793</td>
<td>17,827</td>
</tr>
<tr>
<td>Mountain Goat</td>
<td>1,444</td>
<td>8,588</td>
<td>25,019</td>
<td>35,528</td>
</tr>
</tbody>
</table>

*The differences between the total and the sum of the land bases presented in the table are due to UWR in the partially contributing land; this is not of great significance to this thesis. The figures are from MoE’s August 2006 UWR plans.

Ungulate winter range implementation for both deer and mountain goat has been difficult and lengthy in Chilliwack, dating back to its formal beginning in 1998. MoE proposed their completed (and “field-truthed”) deer and mountain goat UWR plans in the early 2000s and since that time there has been disagreement between the Ministry and licensees in the district about UWR creation. From 2002 to 2004 the MoE engaged in consultations with the licensees regarding UWR size and location. There was disagreement about where exactly to place the UWR in the timber harvesting land base, and how much should be established in the non-contributing land base, with MoE wanting a much larger amount than licensees. In November 2004, regional MoE staff had a meeting with the Deputy Minister of MoE to brief him on the mountain goat UWR plans, which regional level MoE felt were ready for approval. Just prior to this meeting the Chilliwack licensees wrote a letter to the Deputy Minister of the Environment expressing their opposition to MoE’s UWR plans. At the meeting between the Deputy Minister of the Environment, and MoFR and MoE regional staff, the Deputy instructed MoE staff to take a week to “clear things up” between the different parties and then bring the UWR plans back for
his consideration. This never occurred because MoFR and licensees were not in support of the MoE’s plans.

During the fall of 2005 the Deputy Minister of the Environment directed regional MoE staff to complete UWR planning in the area by early 2006. The Deputy instructed the region to address a number of issues when preparing the UWR plans, including the following:

- Include an amount in the timber harvesting land base up the limits permitted under government’s timber supply impact for UWRs (i.e. the amounts in the conservation targets for the species; table 5).
- Balance conservation needs and economic opportunities in the non-contributing land base
- To the fullest extent possible, overlap UWR with other constraints (i.e. with other conservation areas)

After working together for several months in 2005 and early 2006, the MoE and licensees resolved some of their differences regarding mountain goat and deer winter range plans. However, by the spring of 2006 the two parties still were not in complete agreement with each other’s vision for UWRs in the district: the licensees’ preferred UWR plans only addressed 65% of the MoE’s priority winter ranges for deer and just under 80% of their priority areas for mountain goats. Concerning deer, whereas the MoE has proposed UWR in the timber harvesting land base in certain priority areas, the licensees wanted the UWRs more distributed across the district (to better spread out the economic impact of implementing UWRs), and placed in areas that have less economic impact. Additionally, the May 2005 version of the licensee deer UWR plan contains 3,450 ha in the non-contributing land base, whereas MoE’s plan includes nearly 11,000 ha in the non-contributing land base (Table 4).

In April 2006 negotiations again came to a halt: the MoE wanted to take their UWR plans forward for consideration by the Deputy Minister of the MoE, but licensees were not in support of MoE’s plan. The licensees in Chilliwack again wrote to the Deputy expressing their
discontent with MoE’s UWR plans and requested a meeting and a third party biologist to help arbitrate between the different plans.

This meeting was scheduled for June 2006, but it was subsequently cancelled because regional staff were instructed by the Deputy to put the UWRs “on hold” pending finalization of adjustments to northern spotted owl conservation areas. Following this, regional MoE again wanted to bring the UWR plans forward to the Deputy. The Chilliwack licensees association was still not in support of MoE’s plans, so in a July 2006 meeting the Deputy agreed to allow the licensees until the beginning of November 2006 to submit an alternative UWR plan for his consideration.

The current conservation targets for UWR are largely inadequate to protect the species in question. For deer in particular, the current government targets are far less than the amount originally specified in MoE’s plans in the early 2000s. Recall that the original plan called for the protection of 13,500 ha in the timber harvesting land base, which its authors considered to be the “minimum area that is necessary for the winter survival of deer”, whereas current government targets allow 3,500 ha in the timber harvesting land base (Freeman 2001; Freeman 2002). Furthermore, the MoE hold that deer require approximately 18,000 ha in the non-contributing land base, which neither the licensee nor the MoE’s current plan includes (MoE interviewee, personal communication, March 21, 2006). Therefore, even if MoE’s current deer UWR plan is accepted as is (which it might not be) it would still be less than what is considered biologically necessary for the species (a deficit of ~9960 ha in the timber harvesting land base and ~7240 ha in the non-contributing land base). Slight differences also exist between the amounts for mountain goat in MoE’s original plans and current government targets (1,644 ha versus 1,500 ha of timber harvesting land base respectively).

Since the MoE released their draft deer and goat UWR plans in 2001-2002 there has been harvesting in some of the areas identified for conservation needs in both the timber harvesting
land base and non-contributing land bases. The GIS analysis performed for this thesis indicated that there was an overlap of approved and proposed cutblocks with 250 ha of goat winter range, and 1648 ha of deer winter range (recall that the cutblock information only included information for around a six to nine month period, so the total extent of cutblocks in UWR originally identified by MoE in 2001 is likely much larger).

Harvesting of habitat is permitted because the areas included in MoE’s original draft plans (from 2001-2002) exceed the amount permitted under government’s current timber supply impact limit for UWR. In approving forest development plans under the Forest Practices Code, the Chilliwack District Manager (MoFR) has allowed harvesting in MoE’s preferred ungulate winter ranges when there was alternate winter range in a neighbouring area. For example, in a recent amendment to a forest development plan that proposed a harvest block in a deer UWR (unit “MA-11”) identified by MoE, the District Manager said the following in his rationale for approving the amendment:

This block overlaps with potential [deer UWR] Unit MA-11. This unit is not approved and is not approved nor supported by the [licensee association in Chilliwack]. MoE has identified potential [deer UWR] Units that exceed the limit of 3500 ha. Potential DWR Units that are being proposed by the licensee are located within 3 km of the proposed block. (Grozier, 2006)

The District Manager is not monitoring the cumulative decline in suitable UWR, and in the past has permitted harvesting in these alternate areas, in approving subsequent forest development plans (MoE interviewee, personal communication, May 1, 2006). This is worrisome because it is reducing the potential for adequate amounts of UWR to be protected in the future should government ever change its timber supply impact policy for UWR.

When licensees with cutblocks in UWR (identified through the GIS analysis) were asked about harvesting in MoE’s original draft UWR areas, they were quite candid in saying that they
did this or would do this in the future because they felt that MoE’s UWR plans were too extensive.

For UWR protection results and strategies in forest stewardship plans, licensees reported that they had agreed amongst themselves to use their own UWR plan in order to meet the wildlife objective. Although the licensees’ preferred UWR areas do not all correspond with the MoE’s priority areas for deer conservation, they may meet the requirements for deer UWR laid out in the information pursuant to government’s wildlife objective (section 4.1.1 of this thesis), and that is the only legal test they have to meet in terms of habitat quality. This has not yet been determined as the forest stewardship plans including these UWR protection results and strategies had not yet been approved as of November 2006.

7.1.2 Squamish Forest District

Grizzly Bear

Thirty-nine out of an anticipated future total of 71 grizzly bear WHAs were approved in May 2006. They include a total area of 11,521 ha, with only 185 ha in the timber harvesting land base (75% of the total WHA area (i.e. ~8640 ha out of the 11,521 ha total) is in the excluded – non-forested – land base; MoE, 2006b).28 The MoE has 32 more grizzly bear WHAs mapped that they would like to establish in the future to meet the conservation target (to bring to district total to 71 WHAs).

From the time that MoE started drafting the 39 established WHAs it took a total of two years before they were legally approved. The process was slowed because licensees wanted to be more involved in WHA planning and MoE had to repeat some of the planning to accommodate this request. MoE first drafted the 39 WHAs in May 2004 and June 2005 in the

28 The 250 ha impact to the timber harvesting land base is an estimate provided by the MoE; a final timber supply impact analysis has not yet been conducted.
Stein-Nahatlatch, Squamish-Lillooet and South Chilcotin threatened grizzly bear population units (figure 4). When MoE first began the review and comment period for these WHAs in the fall of 2004, licensees expressed concern regarding the manner in which WHAs would be established in the district under the new Forest and Range Practices Act. The licensees were dissatisfied because they felt that the MoE was presenting them with WHAs that were already completely planned, and the licensees said they preferred a collaborative process that involved licensees from the beginning. In response to these concerns, the MoE and district licensees created an agreement document laying out the characteristics of how effective collaboration would occur for conservation-area establishment under The Forest and Range Practices Act. The resultant draft industry–MoE partnership agreement emphasized the principles of joint action and joint ownership of products, including conservation areas.

As a result of these discussions the MoE agreed to withdraw the grizzly bear WHA proposals. Throughout 2005 MoE worked with licensees and their consultant biologist to draft a revised set of WHAs that were satisfactory to all parties. Both the Ministry and licensees stated that once they decided to work together delineation of WHAs progressed smoothly.

Throughout the early months of 2006 there was another delay in WHA progress because a licensee was not content with the wording of the rules governing what can and cannot be done in a WHA. After several months of discussion wherein the MoE made it clear that the requested rewording would not be legally possible, regional MoE forwarded the WHAs to the Deputy Minister with no strong objection from the licensee.

There are no recovery teams or recovery plans for any of the threatened grizzly bear population units in Squamish. There is an ongoing strategic land and resource management planning process, the “Sea to Sky” plan that encompasses the district. The land and resource management planning process creates consensus-based resource management decisions for an area. The plans can create alternatives to some government policies, such as the timber supply
impact policies that affect the implementation of conservation areas. Although the Sea to Sky plan has not yet been completed, draft provisions include the mandate to create grizzly bear recovery plans for the four grizzly bear population units within the planning area’s boundaries. The goal for completion of these plans is 2008. It is recognized in the draft agreement that “the implementation of grizzly bear recovery plans may require up to 5% of the productive forest land base” (ILMB, 2006, p67). The 39 established WHAs and the 32 WHAs that the MoE anticipates creating will provide a foundation for future recovery plans.

Marbled Murrelet

There are currently nine “candidate” (pre-draft) WHAs in Squamish, which include a total of 2,030 ha, with 454 ha in the timber harvesting land base. Once established, these WHAs will meet government’s conservation target for the species.

Planning for these WHAs is still in the early stages and MoE has not yet begun the review and comment period with potentially affected stakeholders. In the summer of 2005 a consultant for MoE conducted a low-level aerial inventory of suitable marbled murrelet habitat in six priority landscape units in Squamish and drafted a set of candidate WHAs: East Howe, Lower Squamish, Indian, Mamquam, Upper Squamish, and Elaho. The MoE will be meeting with licensees to discuss boundary refinements of these WHAs and hopes to legally establish them by the end of March 2007. If there is a candidate marbled murrelet WHA in an approved cutblock the MoE said it would avoid placing the WHA there. All licensees contacted who were operating in marbled murrelet habitat said that they were including the boundaries of the candidate WHAs as areas to protect in their forest stewardship plans in order to meet government’s wildlife objective.

An interviewee from MoE explained that the planning group was more comfortable using the term “productive land base”, which they defined as having a site index above nine, than timber harvesting land base, because of concerns that the latter was a “moving target”. Site Index: a measure of site productivity based on site height (metres) at breast height age 50 (MoF, 2006b).
Three of the six priority landscape units for marbled murrelet have approved OGMAs: East Howe, Lower Squamish and Indian. The landscape unit reports for these OGMAs all mention attempts at placing OGMAs in potentially suitable murrelet nesting habitat and establishing larger patches, as per the policy at the time. However, all three-landscape unit reports note, “other [landscape unit] planning requirements (i.e. to place OGMAs in the non-contributing land base, and mitigate timber impacts) precluded successful implementation of effective management options for this species” (e.g. MSRM, 2003b, p6).

According to the recovery team’s coast habitat suitability algorithm there are 27,050 ha of suitable habitat in the six priority landscape units. Approximately 23% (6,280 ha) of this is in protected areas, approved OGMAs and the candidate WHAs (CMMRT, 2005). This is 62% (~16,700 ha) less than the recovery team’s goal of 85%. The draft sea to sky land and resource management planning agreement includes the provision to “implement the results of the marbled murrelet recovery strategy upon its completion” (ILMB, 2006, p73). The federal government has not yet approved the recovery strategy, but a draft is scheduled for release for public comment in June 2007.

*Mountain Goat, Deer and Moose*

All UWR plans in Squamish have been completed. The Squamish mountain goat UWR plan was approved in October 2003. It includes 48,474 ha of goat winter range, with 1,188 ha in the timber harvesting land base. The management objectives for these UWR preclude harvesting, except in rare circumstances. The deer and moose winter range plan was approved in March 2005. It includes a total of 17,833 ha, which is divided into several types of zones for the two species that permit varying levels of harvesting; the timber supply impact analysis has not yet been completed.
The establishment of UWR in Squamish took several years, but generally was a smooth process, i.e., one without considerable conflict. The MoE mapped UWRs in the late 1990s and the District Manager directed licensees to set these areas aside prior to their final approval as legal UWRs (i.e., he granted the draft UWRs de facto interim protection until a final decision was made about their exact boundaries). The MoE was not completely satisfied with the draft UWRs and revisited the deer plan in 2002, this time with a group of licensees who had hired a consultant biologist. The group spent about eight months in 2003 refining the UWR plan until they settled on boundaries and management approaches that met everybody’s satisfaction.

Interviewees from both the MoE and members of the forest industry expressed their content with the collaborative establishment process and the resultant UWRs for deer, moose, and goat. The extent of UWR protection did not change substantially from MoE’s original plans developed in the early 2000s (Rochetta, 2002; Rochetta, 2004), and the approved UWR are likely large enough to enable the long-term survival of mountain goats, deer and moose in Squamish (Rochetta, 2004).

7.1.3 The Potential for Additional WHAs Chilliwack or Squamish

The conservation targets for all species in the Chilliwack and Squamish forest districts add up to 1% of the timber harvesting land base, leaving no room under current policy for WHAs that would have an additional timber supply impact. Further WHAs could theoretically be established in the non-contributing land base (and the “excluded”, non-forested land base). Such conservation areas would not have a timber supply impact because the “timber supply” is not defined by the timber harvesting land base, only the non-contributing land base. However, creating WHAs or UWRs in the non-contributing land base could still have other economic impacts: there are timber-harvesting opportunities in the non-contributing land base in stands that might be easier or less expensive to access than in the timber harvesting land base; and there
are potential operational impacts of establishing conservation areas in the non-contributing land base, e.g., if establishing a conservation area in the non-contributing land base were to block harvesting opportunities in the timber harvesting land base (JSC, 2006).

In order to establish WHAs or UWRs in the non-contributing land base the Government Actions Regulation requires that the benefits of the conservation areas be weighed against the costs, namely against any significant localized operational costs for a licensee, or any impediments of a licensee’s ability to harvest the amount of timber it is entitled to under its tenure agreement (GAR s.2 (1)(c)). Exactly how this “weighing” should occur is not entirely clear, a point that will be revisited in the following chapter.

It would be easier to create additional WHAs for certain species whose habitat needs conflict less often with economically desirable timber. For example, WHAs for grizzly bears are often in alpine meadows and other non-forested areas, which pose less of a conflict with timber harvesting than species dependent on old growth, such as marbled murrelets.

Although government does not have any plans to establish WHAs beyond those discussed in the preceding sections, other parties, such as environmental groups, could propose WHAs. However, this does not seem likely given their current low level of involvement with conservation area implementation (again, an issue that will be discussed in the next chapter).

7.2 OGMAs

This chapter reports on the progress and process of OGMA implementation for all landscape units in Chilliwack and Squamish. It begins by summarizing the number of legally established or draft OGMAs and discusses challenges or delays that have occurred during OGMA implementation. The second section reports on the OGMA delineation and characteristics. These characteristics are compared to the literature on coarse filter reserves to assess their biological adequacy.
7.2.1 OGMA Establishment Process

Currently, 27 out of the total 44 landscape units in Chilliwack and Squamish have legally established OGMA s. These were approved from 2003 onwards (three in 2003, 16 in 2004, seven in 2005, and one in 2006; summarized in table form in section 7.4 below). Seven more landscape units have draft OGMA s and nine are incomplete.

In the initial stages of OGMA planning licensees were asked to take the planning lead in the majority of landscape units in the two districts. Forest licensees initially led planning in all but five landscape units in Squamish and all but nine in Chilliwack. Government asked licensees to take the lead in order to expedite the planning process, which was moving slowly due to limited government resources. Additionally, licensees were not satisfied with the initial OGMA s that government drafted and argued that their economic impacts were too high. The government thought allowing licensees to delineate OGMA s under a set of planning expectations would result in landscape unit plans that met government standards and reduced economic impacts.

In 12 landscape units in the two districts ILMB rejected the licensees' initial drafts and redid the plans from scratch. Some of industry's plans were rejected for the following reasons: OGMA s included too much younger forest; too many OGMA s were placed in protected areas, which created problems with their spatial distribution: they were too clustered in protected areas as opposed to being spread out across the landscape; and in many cases the OGMA s were too small and did not provide forest interior habitat conditions. There was disagreement between some interviewees from MoFR and ILMB regarding the biological adequacy of these rejected OGMA s. Some interviewees from MoFR thought that the plans were, in fact, very comprehensive and used a variety of biological criteria to place OGMA s. Furthermore, they noted that ILMB's approach was "simply" to use old forests as a surrogate for biodiversity and
argued that that was not necessarily the most ecologically sound approach. This thesis did not review the rejected OGMAs so cannot comment on their biological adequacy.

There are eight landscape units in Squamish that do not yet have legally approved OGMAs. Three of these landscape units have draft OGMAs that are being followed by licensees. In certain landscape units (Upper Squamish, Elaho, Whistler and Callaghan) landscape unit planning has been put on hold because of ongoing negotiations with First Nations groups for the Sea to Sky land and resource management planning process, and due to Olympics planning-related issues. ILMB wants more certainty about how these factors will affect landscape unit planning before moving forward with these OGMAs. Licensees have taken the lead with OGMA planning in the Lizzie landscape unit, but have not yet submitted drafts to ILMB for their review.

In Chilliwack, a contractor for ILMB is currently planning eight of the nine landscape units that do not yet have approved OGMAs. Draft OGMAs have been tentatively identified for four of the eight landscape units. Work on the remaining four is pending further discussions with the principal licensee in the area who has asked for more time to provide input into the development of the initial draft plans.

Since OGMAs have been legally established in some landscape units, ILMB is starting to receive requests for amendments to OGMAs. These amendments are being spurred, in part, by the sequential implementation of the different types of conservation areas, and by the desire to reduce economic impacts. For example, one licensee in Squamish would like to shift several OGMAs to better overlap them with UWRs that were not yet established when the OGMAs were first implemented. In another case, a licensee has submitted an OGMA amendment request to access timber in the OGMA that has recently become economically operable due to a change in

30The Similkameen landscape unit is entirely within Manning Park so there is not seen to be a need to identify OGMAs there.
harvest values. Most licensees said that they might consider proposing OGMA amendments in the future to better overlap OGMAs with new conservation areas, in order to reduce economic impacts. Due to staffing issues at ILMB, some major amendments have been waiting for review for over one year (recall that such amendments are supposed to take around four months according to the regional amendment policy).

The requests for amendments to OGMAs is concerning for several reasons. Firstly, one of the goals of landscape level planning was to provide more certainty for all parties. However, this might not be achieved if boundaries are continually shifting to reduce the economic impacts of establishing conservation areas. Secondly, ongoing amendments will mean an ongoing workload for ILMB, and OGMA planning will be more time consuming than first expected. The current incremental approach to conservation area establishment runs counter to the conservation literature’s guidance for conservation planning. The literature recommends establishing conservation goals at the start of a planning process and then implementing all of the conservation areas in a co-ordinated manner at the same time (Margules and Pressey, 2000).

7.2.2 OGMA Characteristics and Biological Adequacy

Total OGMA Area and Age

The amount of old growth conserved in OGMAs is likely insufficient to adequately conserve biodiversity values and old growth dependent species. The old growth targets require the inclusion of 7% to 19% of the landscape unit’s old growth in OGMAs. This equates to protection for 27% to 38% of historic levels of old growth per ecosystem. The OGMA targets were established by subtracting 12% from the “historic” percent of old growth in an ecosystem, then dividing the remaining amount in half (Appendix 4 of MoF, 1995). The extent of historic protection was determined by working backwards from the OGMA targets using this formula.
For example, if the OGMA conservation target is to protect 7% of the old growth in an ecosystem, this equates to 27% of the "historic" extent of old growth as follows:

- 7% (OGMA policy target) x 2 (because the original target was divided by 2) = 14%
- 14% +12% (removed in the original target determination) = 26% (the "historic" percent of the ecosystem that is old in the landscape unit)
- 7% (policy target) / 26 % ("historic" amount of old growth) = 27% (the extent of "historic" levels protected by the OGMA target)

This range of 27% to 38% is below the precautionary range of maintaining 50% to 70% protection of historic levels of old growth; the retention of 30-40% or less of historic old growth is considered to pose a high-risk to ecological integrity "where ecologically significant loss of function occurs" (CIT, 2004a, p66; Holt and Sutherland, 2003).

In all completed landscape units OGMAs have been specified up to, and in some cases, in excess of the ecosystem targets. In certain cases, however, the forest in OGMAs is not actually old growth. In Chilliwack, 91% of OGMA area was mature (age class eight) or old (age class nine) in landscape units considered of higher biodiversity value, and 68% were mature or old in landscape units assigned a lower biodiversity value status. The amounts of mature and old OGMAs in Squamish were similar, with higher biodiversity areas having 92% mature and old forest, and lower biodiversity areas having 93% mature and old (Figure 7). Four of the approved landscape units in Squamish and five in Chilliwack are categorized as "lower biodiversity" landscape units, where policy only requires that 1/3 of the old growth target be met by actual old growth while the remaining 2/3 of the target should only be implemented in the non-contributing land base and can be comprised of younger forest (MSRM, 2004b). The remaining approved landscape units are categorized as "higher biodiversity" value, where the old growth target should be met by old forest.
Figure 7 Squamish and Chilliwack OGMA Age Classes

*H - higher biodiversity areas, L - lower biodiversity area. Usually age class 8 is mature forest (141-250 years) in the forest cover inventory and age class nine is old growth (250+ years). However, due to inaccuracies in the forest cover data and the fact that some species exhibit old growth characteristics at younger ages, old growth can sometimes be found in forest labelled as age class eight. This is why these two age classes are grouped together above. The other age classes are as follows: 6-7 (101-140 years), 4-5 (61-100 years), and 1-3 (0-60 years).

ILMB reported that younger forests were included in OGMA reports in the following situations:

1. When there were deficiencies in old forest caused by past human and natural disturbances. Many of the OGMA reports noted that forested stands on lower elevation productive sites (typically on slopes with low to moderate gradients within the Coastal Western Hemlock and Interior Douglas Fir zones) had relatively low levels of old forest remaining due to past disturbances.

2. In landscape units considered “lower biodiversity” current policy allows up to 2/3 of the OGMA targets to be met by younger forest.

3. When they provided equal or better OGMA in terms of biodiversity value.

4. When they were used to augment OGMA that had primarily old and mature forest. For example, to join patches in order to make a larger contiguous OGMA.

Importantly, the total amount of old growth protected across the entire landscape is dependent on the amount of old growth in OGMA, and how much additional old growth is

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31 Using the Landscape Unit Planning Guide’s terminology, higher biodiversity areas are landscape units with high and intermediate biodiversity emphasis options, whereas lower biodiversity areas have low biodiversity emphasis options.
protected by other conservation areas. As demonstrated above, not all of the forest in OGMAs is old growth, due to a variety of reasons permitted by current policy. There is, no doubt, some additional old growth protected by parts of UWRs, spotted owl special resources management zones and protected areas; however, the guidance to overlap the different conservation areas as much as possible, combined with the fact that a certain percentage of old growth in protected areas can be counted towards meeting the OGMA target (recall section 6.2 above), limits the extent to which these other conservation areas protect old growth in addition to OGMAs.

As this thesis did not analyze the amount of old growth in all of the other conservation areas it cannot comment on the risk to ecological integrity created by the current levels of old growth protected across the entire landscape. Government is also not keeping track of the total amount of old growth protected: this author asked several MoE and MoFR employees for old growth (by ecosystem variant) data in the protected areas network but was told that the government does not have this information readily available, as it is not something they are tracking. This points to a problem that will be revisited in the subsequent chapter: government has a number of conservation tools that are being implemented in pursuit of their own, narrow, goals but government is not monitoring what is the cumulative protection afforded to conservation values, such as old growth or species habitat, through the various tools.

**OGMA Design**

Most OGMAs are small and provide little forest interior conditions. In both Chilliwack and Squamish only a small percentage of the forest in OGMAs was greater than 200m from the edge of the OGMA and could possibly have any interior forest conditions. If the OGMAs were perfect circles, about 35% of the area in the OGMAs would be greater than 200m from the edge in Chilliwack and 30% in Squamish. This is a best-case scenario: the percentage of OGMA area
with forest interior conditions decreases substantially if the shape of the OGMA diverges from a circular shape: for elliptical OGMAs that are two or three times as long as they are wide, the percentage of forest interior area is 22% and 16% in Chilliwack respectively, and 18% and 12% in Squamish (Table 8).

Table 8 OGMA Interior Forest Conditions

<table>
<thead>
<tr>
<th></th>
<th>Total OGMA Area</th>
<th>Circle</th>
<th>Ellipse: 2x by x</th>
<th>Ellipse: 3x by x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chilliwack</td>
<td>56328 ha</td>
<td>19407 ha (35%)</td>
<td>12628 ha (22%)</td>
<td>9184 ha (16%)</td>
</tr>
<tr>
<td>Squamish</td>
<td>26563 ha</td>
<td>8068 ha (30%)</td>
<td>4691 ha (18%)</td>
<td>3073 ha (12%)</td>
</tr>
</tbody>
</table>

The estimates of forest interior conditions based on circles presents an upper bound on the possible extent of interior forest in OGMAs. The majority of OGMAs are neither perfectly circular nor elliptical, but have more complicated shapes, likely resulting in an amount of interior forest conditions much lower than the circular estimates, and possibly even lower than the elliptical ones (e.g., figure 8). Accordingly, the amount of interior forest as a percent of total OGMAs likely falls below the recommended 25% or 50% discussed in the literature review (MoF, 1995). It should be noted that the analysis did not take into consideration the nature of the habitat immediately adjacent to OGMAs (e.g., natural or artificial edge), which would also affect the conservation of old growth dependent species.
The combination of the fact that a portion of the old growth retention targets are being met by younger forests, and that only a small amount of interior forest is actually protected by OGMAs significantly reduces their conservation value; the actual amount of historic old growth levels that are effectively protected by OGMAs is likely much lower than 27%-38%.

The majority of the forest interior conditions reported above were created by the minority of OGMAs that were in larger patches. In both forest districts around 80% of the OGMAs were 40 ha or smaller, and close to two thirds of all OGMAs in both districts were less than 20 ha. There were around 6% of OGMAs in both districts that were greater than 100ha (Figure 9).
Both the Chilliwack and Squamish forest districts have a long harvest history, which has greatly reduced the level of remaining old growth. Although smaller reserves have less interior forest, where remnant patches of old growth are the only old growth remaining in an area it makes biological sense to capture them in OGMAs as these small bits might be able to support (e.g., some smaller taxa, such as arthropods), or contribute to the habitat needs of some old-growth species (Shwartz, 1999; Lindenmayer and Franklin, 2002).

Where sufficient old growth remained within an ecosystem so that options for OGMA placement existed, planners attempted to create OGMAs with forest interior conditions that were well connected and had a good spatial distribution across the landscape. Planners tried to maximize the conservation value of OGMAs within the economic constraints imposed by policy (e.g., to first place OGMAs in the non-contributing land base). One of the approaches used to improve the conservation value of OGMAs was to place them next to conservation areas or
known wildlife habitat; the majority of the landscape unit reports included a statement similar to the following that describes this practice:\textsuperscript{32}:

An important part of the OGMA planning exercise was to ensure that these separate [planning] processes complemented each other. For example, OGMA, where practical, were placed to create larger habitat patches in the vicinity of known spotted owl activity centres. In other cases, OGMA were placed within or adjacent to ungulate winter range to overlap constraints and to increase patch size. These larger patches then allow greater opportunity to improve connectivity between adjacent patches. (MSRM, 2005)

However, it was often the case that when OGMA were being planned, few conservation areas, such as WHAs and UWRs, were legally established, or habitat mapping was not yet available. Again, this is a problem caused by a lack of coordination between the implementation of different types of conservation areas. Additionally, fine scale ecosystem mapping (i.e., site series mapping) was also quite limited, so in the majority of cases OGMA were not placed with a consideration for rare ecosystems (identified by site series mapping), despite OGMA policy to do so.

In order to ensure that economic impacts were mitigated, licensees were given the opportunity to review draft OGMA delineated by government planners (or their consultants) and identify future harvest interests in both the timber harvesting and non-contributing land base. Some planners ignored the timber harvesting land base / non-contributing land base boundaries from the start and worked closely with industry engineers to place OGMA to minimize operational impacts and harvesting conflicts across both the timber harvesting and non-contributing land bases.

\textsuperscript{32} All completed landscape units have landscape unit reports published explaining the factors considered during OGMA delineation. The vast majority of the reports have very similar, and sometimes even identical, wording.
**Representation**

The current scale of representation may not be fine enough to ensure that important aspects of ecosystem diversity are captured in OGMAs. OGMAs are supposed to contain samples of old growth that represent the natural diversity of the landscape. Under current policy the scale of this representation is the variant level of the province’s ecosystem classification scheme. There is still considerable ecological diversity within each variant, measured by a variety of parameters, such as site productivity (essentially how fast trees will grow on a site) or elevation. This diversity within variants means that the OGMA conservation targets could be disproportionately met by old forests that have lower conservation and timber values (Stokland, 1997), such as less productive, higher elevation sites with steeper slopes (CIT, 2004a). Indeed, the evaluation of coarse filter reserve networks in other areas has found that sites with low productivity are over-represented in conservation areas (Stokland, 1997; Huggard, 2001 in Huggard, 2004; Scott et al, 2001)

This issue was mentioned in the public comments of the first three landscape unit reports published in the two districts (the East Howe, Lower Squamish, and Indian landscape units): 33

Biological sufficiency reporting for the East Howe indicates inadequate representation of [sites with higher productivity], and over representation of steep and cool aspects. 34

Lower elevation and valley bottom old growth stands appear to be under represented in the [landscape unit].

Recommendation that OGMA selection from the non-contributing land base focus on [the] most productive area[s] to improve representation.

(MSRM, 2003b, p21)

Additionally, an interviewee from ILMB had the impression that steep slopes were likely over-represented in OGMAs as compared to flatter terrain because these areas were less attractive for

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33 The comments are not attributed to a particular party in the reports.
34 Aspect is “the direction toward which a slope faces” (MoFR, 2006b)
harvesting. ILMB does not keep track of characteristics, such as the elevation or slope of OGMAs, which would permit an analysis of the extent to which OGMAs are representative of the ecological diversity within variants. Furthermore, a lack of accurate site productivity information is not available across the entire landscape to assess the degree to which OGMAs are representative of the varying levels of productivity found across the landscape: in the timber supply analysis packages site productivity data is only presented for the timber harvesting land base (MoF, 1999); and there have been complications with accurately assessing the site productivity of old growth stands in the province (e.g. Nussbaum, 1998).

Unfortunately, the results of the OGMA sizes, locations and age classes were not compared against an old growth inventory in order to assess what OGMA results were due to policy and what were due to available old growth values. When OGMA planning first began ILMB was supposed to produce detailed OGMA attribute reports that included information on the amount of remaining old growth in the ecosystems, however this never occurred (or at least not in the two study districts). Given the information collected in this study it is difficult to discern the strength of the role of policy limitations versus environmental conditions in explaining resultant OGMA attributes, but both factors have clearly played a role.

7.3 Overall Comments on Conservation Area Implementation

Interviewees were asked about their overall experiences and impressions of the conservation area establishment processes and policies in general. The predominant complaint was that implementation was not occurring in a co-ordinated manner. In general, licensees and MoFR thought that reserves were being established as “one offs”, meaning that individual conservation area types were being implemented in pursuit of their own narrow targets, with little regard for how other areas might also contribute to those targets. Several licensees also
commented that a co-ordinated conservation planning approach was needed in order to efficiently (in terms of human and financial resources; and the total area of conservation areas) and effectively (in terms of the value to wildlife and biodiversity) implement conservation areas. Concern was expressed that the economic impacts from all of the conservation areas might be exceeding the amounts originally established under the Forest Practices Code and that there was no cumulative economic impacts monitoring occurring. Licensees and interviewees from MoFR felt that there were insufficient efforts being made to overlap conservation areas with other constraints on the land base in order to reduce economic impacts. There was repeated mention of the fact that considerable land was already placed in spotted owl special resource management zones, and that greater efforts should be made to overlap conservation areas with these zones in particular.

It is important to note, however, that the extent to which reserves were overlapped or other measures employed to reduce the economic impacts of conservation areas was not directly examined in this thesis. Therefore the possibility exists that the various conservation areas are in fact established as efficiently as possible with respect to economic concerns, i.e., they meet conservation goals with the smallest amount of area. The fact that many interviewed complained that conservation areas were not being well integrated may just be a reflection of the disjointed implementation process, and not the actual results.

Some interviewees from MoFR and industry did not see the necessity of additional biodiversity and wildlife reserves when there was already a considerable amount of land in other conservation areas, such as protected areas and spotted owl special resource management zones. For example, several licensees in Chilliwack explained that there was probably enough habitat “locked up” in other constrained areas that there was no need for additional land to be set aside for deer. However, when asked how much habitat deer needed, those asked were unable to provide an estimate. Similarly, several interviewees from the MoFR questioned the overall
purpose and value of OGMAs to conservation efforts, because they were not for any particular species, and argued that considering old growth as a proxy for species habitat was overly simplistic (i.e., from a conservation perspective there might be "better" areas to conserve in younger than old forests). On the other hand, interviewees from the MoE expressed concern that the amount of habitat permitted under government's timber supply impact policies was insufficient to protect the habitats of species at risk and ungulate winter ranges.

For all of the conservation areas examined there was some mention of negotiation over reserve placement in the non-contributing land base as licensees indicated economic opportunities there. Virtually all those interviewed from MoFR, ILMB and industry expressed frustration with the use of the terms "timber harvesting land base" and "non-contributing land base" in conservation policy to guide the location of reserves. Government policy directs planners to prioritize the placement of conservation areas in the non-contributing land base as a means of reducing their economic impacts. In practice this is complicated by the fact that there are significant harvesting opportunities (and actual harvesting) in the non-contributing land base - government planners do not have a carte blanche to implement conservation areas there, and must consult with industry in order to reduce operational impacts across the entire landscape (timber harvesting and non-contributing land bases) (GAR 3(1)(b) and 3(2)).

7.4 Summary of Conservation Area Implementation Findings

This section summarizes the main findings concerning the implementation of conservation areas presented in the previous sections, and is organized according to the evaluation criteria outlined in the methods chapter: status and timeliness of implementation, challenges with the establishment process, and contribution of conservation areas towards protecting wildlife and biodiversity.
7.4.1 Implementation Status and Timeliness

The implementation of conservation areas has been very slow since the release of the policies enabling their creation. Currently there are only approved WHAs for grizzly bears in the two districts and these have taken six to seven years to establish since the species was listed as “Identified Wildlife” in 1999. Furthermore, these grizzly bear WHAs have taken from one to three years after the start of the review and comment period to legally approve the proposed WHAs. The Identified Wildlife Management Strategy procedures manual suggests that it should take around five months (MWLAP, 2004c). The establishment of UWRs has been completed in Squamish, after taking five to seven years of planning and negotiation, and UWRs remain in various draft forms in Chilliwack.

As previously mentioned, except for tall bugbane and coastal giant salamander, which were both listed as Identified Wildlife in 2004, the other species examined in this research were eligible for WHA creation since 1999. Although the majority of conservation areas for wildlife do not have legally approved reserves, most are at least in a draft form (except for conservation areas for coastal tailed frog in both districts and the remaining grizzly bear WHAs in both districts; Table 9).
Table 9 WHA and UWR Implementation Progress

<table>
<thead>
<tr>
<th>Forest District</th>
<th>Species at Risk</th>
<th>Species</th>
<th>Planning Started (# of WHAs)</th>
<th>Begin of review and comment period (# of WHAs)</th>
<th>Legal Approval (# of WHAs)</th>
<th>Remaining WHAs / UWRs to meet government’s conservation targets (in addition to draft)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Coastal Giant Salamander</td>
<td>Fall 2004</td>
<td>June 2006* (20)</td>
<td>X</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pacific Water Shrew</td>
<td>Fall 2004</td>
<td>June 2006* (3)</td>
<td>X</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tall Bugbane</td>
<td>Fall 2004</td>
<td>June 2006* (7)</td>
<td>X</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coastal Tailed Frog</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Ungulates</td>
<td>Mountain Goat</td>
<td>Late 1990s</td>
<td>2002</td>
<td>X</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Kingfisher</td>
<td>Deer</td>
<td>Late 1990s</td>
<td>2001-2002</td>
<td>X</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marbled Murrelet</td>
<td>Summer 2005 (9)</td>
<td>X</td>
<td>X</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coastal Tailed Frog</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ungulates</td>
<td>Mountain Goat</td>
<td>Late 1990s</td>
<td>2002</td>
<td>October 2003</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deer</td>
<td>Late 1990s</td>
<td>2002</td>
<td>March 2005</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

*Review and comment was scheduled to start in June 2006

? - Information not obtained

X - Not yet at this stage

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35 There is also one mountain beaver WHA approved under the first version (1999) of the Identified Wildlife Management Strategy. The mountain beaver is no longer listed as “Identified Wildlife” under the second version (2004) of this strategy.
The establishment of OGMAs has also taken an extremely long time. In Chilliwack and Squamish, 27 of the 44 landscape units (just over 60%) have legal OGMAs, seven have draft and nine are incomplete. The legally approved OGMAs in Chilliwack and Squamish have taken from eight to eleven years since OGMAs were introduced as government policy in 1995. Furthermore, all of the approved OGMAs in the two districts have been established after mid-2003, the year government thought OGMA planning would be completed when it was established as a planning priority in 1999. Table 10 summarizes the current status of OGMAs in all of the landscape units, including the date of completion for those areas that have legally established OGMAs.

Table 10 Status of OGMAs in Chilliwack and Squamish

<table>
<thead>
<tr>
<th>Landscape Unit</th>
<th>Completion Date</th>
<th>Landscape Unit</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ainslie</td>
<td>January-04</td>
<td>East Howe</td>
<td>August-03</td>
</tr>
<tr>
<td>Anderson</td>
<td>January-04</td>
<td>Indian</td>
<td>August-03</td>
</tr>
<tr>
<td>Mehatl</td>
<td>January-04</td>
<td>Lower Squamish</td>
<td>August-03</td>
</tr>
<tr>
<td>Nahatatch</td>
<td>January-04</td>
<td>Rogers</td>
<td>March-04</td>
</tr>
<tr>
<td>Spuzzum</td>
<td>January-04</td>
<td>Billygoat</td>
<td>July-04</td>
</tr>
<tr>
<td>Coquihalla</td>
<td>March-04</td>
<td>Meager</td>
<td>July-04</td>
</tr>
<tr>
<td>Manning</td>
<td>March-04</td>
<td>Railroad</td>
<td>July-04</td>
</tr>
<tr>
<td>Silverhope</td>
<td>March-04</td>
<td>Ryan</td>
<td>July-04</td>
</tr>
<tr>
<td>Yale</td>
<td>March-04</td>
<td>Soo</td>
<td>July-04</td>
</tr>
<tr>
<td>Big Silver*</td>
<td>June-05</td>
<td>Upper Lillooet</td>
<td>July-04</td>
</tr>
<tr>
<td>Chilliwack*</td>
<td>June-05</td>
<td>Birkenhead*</td>
<td>April-05</td>
</tr>
<tr>
<td>East Harrison*</td>
<td>June-05</td>
<td>Gates*</td>
<td>April-05</td>
</tr>
<tr>
<td>Treheway*</td>
<td>June-05</td>
<td>Mamquam</td>
<td>Draft</td>
</tr>
<tr>
<td>West Harrison*</td>
<td>June-05</td>
<td>Sloquet</td>
<td>Draft</td>
</tr>
<tr>
<td>Chehalis</td>
<td>Mar-06</td>
<td>Tuwasus</td>
<td>Draft</td>
</tr>
<tr>
<td>Coquitlam</td>
<td>Draft</td>
<td>Callaghan</td>
<td>Incomplete</td>
</tr>
<tr>
<td>Fraser Valley South*</td>
<td>Draft</td>
<td>Whistler</td>
<td>Incomplete</td>
</tr>
<tr>
<td>Seymour Capilano</td>
<td>Draft</td>
<td>Elaho</td>
<td>Incomplete</td>
</tr>
<tr>
<td>Stave*</td>
<td>Draft</td>
<td>Lizzie</td>
<td>Incomplete</td>
</tr>
<tr>
<td>Similkameen</td>
<td>N/A</td>
<td>Upper Squamish</td>
<td>Incomplete</td>
</tr>
<tr>
<td>Alouette*</td>
<td>Incomplete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hatzic*</td>
<td>Incomplete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pitt*</td>
<td>Incomplete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Widgeon</td>
<td>Incomplete</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Indicates that OGMA planning was originally done by licensees, but was subsequently redone by government.
7.4.2 Establishment Process

There were a variety of challenges affecting (or perceived to be affecting) the establishment of conservation areas. Some common issues across conservation area types and species were challenges related to negotiating how large conservation areas should be (especially in the non-contributing land base where there are no quantitative limits on the size of reserves), where they should be placed, and how they should be managed. The tensions between economic and environmental interests were often central to these negotiations, and were complicated by government policy and legislation to encourage the placement of conservation areas in the non-contributing land base, within which there are timber-harvesting possibilities.

It is difficult to generalize about the overall “smoothness” or level of conflict in conservation area implementation – it varied from process to process. Conflict and delayed implementation seemed to be reduced (i.e., implementation progressed more smoothly) in situations that involved licensees from an early stage. However, even in such situations implementation was characterized by lengthy planning and or negotiations. Forest licensees were involved in a variety of capacities and times in the implementation process, ranging from MoE or ILMB drafting the conservation areas first and consulting with industry later (some OGMAs, grizzly bear WHAs and UWRs in Chilliwack), government and industry working together to delineate the areas from an early stage (grizzly bear WHAs and UWRs in Squamish), and industry taking the lead with government reviewing for acceptability afterwards (coastal giant salamander, pacific water shrew and tall bugbane WHAs; some OGMAs).

7.4.3 Biological Adequacy of Conservation Areas

The conservation areas examined in this thesis will not likely be sufficient to protect their target values (old growth, species at risk and ungulate winter habitat). There may be additional protection afforded to old growth and wildlife habitat through other conservation areas, such as
protected areas and spotted owl special resource management areas, but it is important to note that the specific conservation areas designated for old growth, species at risk and ungulate habitat protection are not adequately protecting these values on their own.

*The Adequacy of WHAs and UWRs*

Aside from deer and mountain goat in Squamish, and possibly the tall bugbane, the other species discussed in this study likely require additional protection in some areas for their long-term survival. For such species, the establishment of areas necessary to meet recovery goals is either not likely given the current economic limitations on policy, or is dependent on further habitat being protected when the Sea to Sky strategic land use planning process is completed in Squamish (Table 11 – It should be noted that the presentation of these results with “No” and “Yes” is an simplification of a complex and uncertain reality; these results should be interpreted as suggestive rather than certain).
As mentioned above, the government purports to have a variety of conservation “tools” in their “toolbox” that could offer habitat protection to many of the species examined in this thesis. For example, in a recent presentation on the subject, a representative of the provincial MoE listed the

Table 11 “Adequacy” of WHAs and UWRs in meeting species’ biological needs

<table>
<thead>
<tr>
<th>Forest District</th>
<th>Species at Risk</th>
<th>Species</th>
<th>Will Species Likely be Adequately Protected by WHAs and UWRs Permitted Under Current Policy?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chilliwack</strong></td>
<td><strong>Species</strong></td>
<td><strong>Will Species Likely be Adequately Protected by WHAs and UWRs Permitted Under Current Policy?</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grizzly Bear</td>
<td>No - In the North Cascades the amount may be OK, but MoE would like more WHAs in the Stein-Nahatlatch and Garibaldi Pitt population units.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marbled Murrelet</td>
<td>No - Approximately 6,380 ha more would be required to meet the recovery team’s goal (if GVRD watersheds are included as areas providing protection for the species)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coastal Giant Salamander</td>
<td>No - More WHAs needed to provide terrestrial linkages between habitat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pacific Water Shrew</td>
<td>No - Insufficient inventory so do not know where to place them and policy only permits protection of known occurrences on Crown land.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coastal Tailed Frog</td>
<td>No – Insufficient amount of habitat provided in conservation targets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tall Bugbane</td>
<td>Maybe – All known occurrences will be protected by WHAs, but this might not be sufficient to ensure the species long term survival</td>
</tr>
<tr>
<td><strong>Ungulates</strong></td>
<td><strong>Species</strong></td>
<td><strong>Will Species Likely be Adequately Protected by WHAs and UWRs Permitted Under Current Policy?</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mountain Goat</td>
<td>No - Approximately 160 ha more in the timber harvesting land base and 700 ha in the non-contributing land base would be required to meet regional MoE’s original UWR plans if MoE’s August ‘06 UWR proposal is accepted.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deer</td>
<td>No - Almost 10,000 ha more in the timber harvesting land base and 7,240 ha in the non-contributing land base would be required to meet regional MoE’s original UWR plans if MoE’s August ‘06 UWR proposal is accepted.</td>
<td></td>
</tr>
<tr>
<td><strong>Squamish</strong></td>
<td><strong>Species at Risk</strong></td>
<td><strong>Species</strong></td>
<td><strong>Will Species Likely be Adequately Protected by WHAs and UWRs Permitted Under Current Policy?</strong></td>
</tr>
<tr>
<td></td>
<td>Grizzly Bear</td>
<td>Maybe - The amount permitted for protection may be expanded by the land and resource management plan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marbled Murrelet</td>
<td>Maybe - Approximately 16,700 ha more would be required to meet the recovery team’s goal. More protection may be granted through the land and resource management plan.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coastal Tailed Frog</td>
<td>No - Insufficient amount of habitat provided in conservation targets</td>
<td></td>
</tr>
<tr>
<td><strong>Ungulates</strong></td>
<td>Mountain Goat</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deer</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>
following as legislative and policy tools available for addressing terrestrial species at risk habitat needs in British Columbia (protected areas enabled by the legislation are in brackets):

- Parks and Protected Areas Act (Parks, Conservancies, Recreation Areas)
- Ecological Reserve Act (Ecological Reserves)
- Forest and Range Practices Act
- Land Act and Land Use Planning (Reserves)
- Wildlife Amendment Act (Wildlife Management Areas)
- Private Managed Forest Land Act
- Environmental Assessment Act
- Mines Act
- Shared Stewardship

(Hoyt, 2005; BC Parks, 2007)

In addition to these areas under provincial jurisdiction, there are also regional parks and regional ecological conservation areas (such as those managed by the Greater Vancouver Regional District). Finally, there are several federal protected areas that might contribute to species habitat protection: national parks and national park reserves established under the National Parks Act; national wildlife areas under the Canada Wildlife Act; and migratory bird sanctuaries under the Migratory Birds Convention Act (CWS, 2007). However, as Wood and Flahr (2004) have already pointed out, the argument that there are a variety of conservation measures beyond WHAs to protect endangered species habitat is problematic because species at risk are listed as such explicitly because the other (coarse filter) conservation tools (under regional, provincial and federal jurisdiction) have failed to protect the species; i.e., if the policy tools above were effectively protecting a species, it would not be listed as a species at risk.

The Adequacy of OGMAs

The current scale, total area and design of OGMAs in Chilliwack and Squamish are likely insufficient to adequately conserve biodiversity values and species associated with old growth forests: OGMAs likely do not conserve a sufficient amount of the historical level of old growth to sustain old growth ecosystems and old growth dependent species across the landscape; OGMAs might not be proportionately representing certain key elements of ecological variability,
such as site productivity and slope, leaving highly valuable (from a conservation perspective) areas susceptible to harvesting; and most OGMAs are small, providing little forest interior conditions and much habitat "edge".

This chapter has reported on the implementation progress, timeliness, challenges with the establishment process, and biological adequacy of WHAs UWRs, and OGMAs in Chilliwack and Squamish. The following chapter attempts to explain these findings using the public policy and conservation planning literature.
8 Explaining Progress and Challenges

In order to explain the degree of progress and challenges experienced during conservation area implementation the factors necessary for successful implementation outlined in the literature review will be examined. The issues discussed here did not necessarily present insurmountable barriers to implementation, but they either slowed down the process or caused confusion or conflict.

8.1 Structures

8.1.1 Integrated Policy Delivery System

Planning is not being conducted in an integrated fashion, creating inefficiencies and delays in conservation area establishment. There was a perceived failure to review existing conservation areas before implementing further areas (steps three and four of Margules and Pressey's (2000) steps for conservation planning) as interviewees felt that targets for WHAs, UWRs and OGMAs were being pursued independently of each other. Many of these problems likely stem from the fact that different agencies are responsible for different planning processes. These agencies have not been adequately coordinating the implementation of the different conservation areas in time or space: OGMAs, WHAs and UWRs were being established at different times, often spanning over a number of years; and there was the impression that they were not being sufficiently overlapped on the ground to decrease economic impacts. The following summarizes the agencies and their responsibilities as they pertain to this study:

- MoE is responsible for implementing and approving WHAs and UWRs.
- ILMB is responsible for OGMA planning and approval.
- The Species at Risk Co-ordination Office (under ILMB) is responsible for spotted owl special resource management zones. While these were not a focus of this study, licensees brought them up on numerous occasions as a major constraint on the land base, and one that should be better integrated with other conservation areas.
- MoFR is responsible for approving forest stewardship plans wherein licensees must communicate how they will protect certain aspects of wildlife habitat and old growth.
It is difficult to implement government’s various conservation tools in a coordinated fashion if different agencies and people have jurisdiction over them and there is no established process to integrate all the areas together (Hasenfeld and Brock, 1991). Separate planning processes occurring at different times and lead by different government staff makes it more challenging to achieve multiple conservation goals in an efficient manner, both in terms of government resources and resultant economic impacts. Considering the disconnect between the agencies and reserves it is perhaps not surprising that licensees perceived a disregard for economic impact mitigation.

This disjointed and incremental approach to establishing conservation reserves has directly delayed the implementation of certain conservation areas as they have been put “on hold” until other areas or processes have been completed. Recall, for example, that there are grizzly bear WHAs in Chilliwack that have been put “on hold” until UWR planning is completed in Chilliwack, which earlier this year was put “on hold” until spotted owl reserves were adjusted. The current approach also sets the stage for ongoing amendments to conservation areas as licensees opt to shift previously established reserves to better overlap with new conservation areas.

There is a joint steering committee comprised of senior officials from the three natural resource ministries, but its actions are largely related to policy clarification regarding issues of contention or confusion that are not resolved at the regional level. They have not been directly involved in implementation coordination in the study area.

8.1.2 Adequate Resources

Low levels of staff and resources have contributed to the slow progress of conservation area implementation. In the first several years following the election of the Liberal government
in 2001 there was a decline in both the staff and budgets of the principle renewable resource ministries. For example, in the MoE the number of full time staff was reduced from 1,298 in 2002 to 924 in 2005 (a reduction of 28%) and the total operating expenses were reduced from $214,266,000 to $143,441,000 (a reduction of 33%) over the same period (GoBC, 2006). This resource trend started to be reversed since the Liberals started their second term in office in early 2005 (Figures 10 and 11).

**Figure 10 Staffing Level Trends in BC Renewable Resource Ministries 2001-2006**

(GoBC, 2006), MSRM – Ministry of Sustainable Resource Management (ILMB’s predecessor up to the 04/05 fiscal year). No staff or budget data is presented for MSRM after the 04/05 fiscal year because it is not directly comparable to data before this date, due to ministry re-organization.
There is currently only one person responsible for the implementation of all WHAs (over 165) in the MoE lower mainland region, which includes the Sunshine Coast, Squamish and Chilliwack forest districts, and this person has other responsibilities under the Forest and Range Practices Act. As demonstrated in the previous chapter, each set of WHAs normally involves extensive correspondence and consultation with potentially affected parties (licensees and First Nations groups). Given the current level of staff resources, it is difficult to plan more than a few areas simultaneously. Capacity in other related positions has also been decreased over the years. For example, in 1996 there were three technical biologists in the Chilliwack forest district and two in Squamish, and now there is only one in both districts.\textsuperscript{36} Additionally, MoE has little to no base budget for species inventory and research. Most funding for forest related research occurs through the Forest Investment Account and much is directed to licensees, who do not always have the same research priorities as MoE. Finally, all GIS work necessary for WHA and UWR planning is done by ILMB, not “in house”, and the MoE has limited funds for this.

\textsuperscript{36}The “technical biologist” position is a different position from the person responsible for implementing WHAs in the region.
Similarly, ILMB has experienced regional staffing issues related to people retiring or transferring offices and not being replaced in a timely manner, or not at all. In 2003 there were three full-time staff working on OGMA planning in the region, and now there is only the equivalent of 1.5 full-time staff. Due to resource limitations in the Bureau, ILMB has sometimes decided to keep OGMAs in the draft stage for longer periods of time while new OGMAs are being delineated as opposed to putting resources towards legalizing draft OGMAs: there is a trade-off in terms of ministry resource use between establishing new, draft OGMAs (which might provide interim protection for old growth); and going through the steps to approve draft OGMAs (which provide legally sanctioned protection for old growth, but involve more consultation and administration).

Although resources were decreased, interviewees claimed that the workload had not decreased proportionately. In certain instances this contributed to government asking industry to take the planning lead, which in the case of certain OGMAs resulted in draft conservation areas that did not meet government policy, and that subsequently had to be redone by government. This obviously slowed down the process towards legal approval of such areas. As a result of low resources, MoE has had to prioritize between species and can only work on a limited number of planning and negotiating processes at any given time. The first set of WHAs to be approved (grizzly bear WHAs in Chilliwack) were those for which planning had started in the early 2000s under the first Identified Wildlife Management Strategy. These were followed by the approval of WHAs in Squamish, for which planning started shortly after those in Chilliwack but were delayed due to consultation issues. Coastal Giant Salamander, Pacific Water Shrew and Tall Bugbane WHAs were mapped by both MoE and industry, which expedited the process somewhat and increased licensee support for the resultant areas. Marbled murrelet WHAs are the most recently drafted WHAs, and a year after their initial delineation are still in a pre-draft "candidate" stage, reportedly due to workload issues within regional MoE.
8.2 Policy Formulation

The legislation itself affected the establishment of government’s conservation targets, the implementation of conservation areas to meet the targets, and the ability of these conservation reserves to adequately protect wildlife habitat and old growth forests.

8.2.1 Clear and Consistent Objectives

The implementation of conservation areas has been complicated by unclear and conflicting objectives in government regulation and policy, and by a lack of a manner to resolve these conflicts. This has created challenges in determining both the amount and location of conservation areas. The inclusion of the “without unduly reducing the timber supply” clause in government’s wildlife and biodiversity objectives, in addition to the suite of “tests” that WHAs and UWRs must pass under the Government Actions Regulation, has created a confusing and contentious implementation environment, starting at the conservation target establishment phase and continuing through to conservation area delineation. It has also resulted in a situation where the “balance” between environmental versus economic concerns sought under the Forest and Range Practices Act is heavily skewed towards the latter, at the expense of the former.

Amount of Conservation Areas Across the Land base

Government’s conflicting objectives for biodiversity and wildlife hamper the current legislation’s ability to meet its goal of conserving wildlife and biodiversity. Due to the conflicting provision in the wildlife and biodiversity objectives that the protection of habitat or old growth should not “unduly reduce the timber supply”, the resultant conservation targets do not allow for enough habitat or old growth forest ecosystems to be protected to ensure their long term survival. As detailed in chapter 7, WHAs and UWRs will not likely enable the long-term
survival of the majority of the species examined, largely because of the timber supply impact caps restricting their implementation. Similarly, the current extent of OGMAs (i.e., the percent of "historic" old growth permitted through the conservation targets) is likely insufficient to serve as an adequate coarse filter for biodiversity dependent on old growth conditions: the level of protection granted through OGMAs deviates too far from the historic extent of old growth forest. This could pose a high risk to the ecological integrity of old growth ecosystems in the two districts if other conservation areas do not adequately protect additional old growth.

Government’s legal objective for wildlife is not clear about the impacts conservation areas can have in the non-contributing land base. This has complicated the creation of the conservation targets, and UWR implementation in Chilliwack. The objectives are limited by the provision to not “unduly reduce the timber supply”, which places a restriction (albeit a vague and un-quantified one) on the extent to which conservation areas can be established in the timber harvesting land base (i.e., the land that contributes to the timber supply); but the objective is silent about the extent of impacts permitted in the non-contributing land base. This created controversy in the creation of government’s conservation targets for several species in Chilliwack that require a large amount of habitat protection in the non-contributing land base: marbled murrelet, grizzly bear and ungulates. The resultant targets restrict the amount that wildlife conservation areas can be implemented in the timber harvesting land base. However, much like the guiding wildlife objective, the conservation targets provide no indication of the amount of conservation areas that can be implemented in the non-contributing landbase for marbled murrelet, grizzly bears and ungulates in Chilliwack. This has created difficulties for UWR establishment, as MoE and industry do not agree on the extent of land that should be protected for ungulates in the non-contributing land base, and there is insufficient legal direction to easily resolve the issue. These sorts of complications were not faced during OGMA
implementation, because the conservation targets were set for the total size of OGMAs, not just an amount in the timber harvesting land base.

Location of Conservation Areas Across the Land Base

The current legislation also includes unclear and conflicting direction for the location of conservation areas across the landscape, and insufficient direction to resolve these conflicts, which in some situations has lead to protracted negotiations about specific conservation area boundaries. The establishment of WHAs and UWRs under the Government Actions Regulation requires that the “public benefits” derived from conservation area establishment outweigh operational level economic impacts or the ability of licensees to harvest the full amount allotted to them in their tenures. This test affects where conservation areas can be established and is applicable across the entire land base, including the non-contributing land base.

Direction for the implementation of all conservation areas (OGMAS, WHAs and UWRs) has been to try to place them in the non-contributing land base first in order to minimize the economic impacts of old growth and wildlife protection. The timber harvesting and non-contributing land bases are not legal land base designations (such as parks) and, accordingly, licensees and MoFR do not distinguish between the different land bases in harvesting decisions. The GIS analysis conducted for this thesis indicated that around 30% of proposed and approved cutblocks in Chilliwack’s most recent consolidated forest development plan are in the non-contributing land base. MoFR employees in Squamish estimated that from 15% to 25% of the harvest comes from the non-contributing land base there. The map work indicating the locations of operable and inoperable forests is ten years old in Chilliwack and seven years old in Squamish. The Chilliwack licensees’ collective has produced an updated operability model, which indicates that around 20% more (when compared to government’s outdated maps) of the timber harvesting land base is in fact operable (TIFC, 2003).
contributing land bases are defined at a broad (strategic) scale, so even at the original time of their definition, there were areas in the non-contributing land base that were actually operable and areas in the timber harvesting land base that were inoperable. The different land bases were not mapped in order to guide operational level planning, but rather to be used as an input into timber supply analysis modelling used to set the allowable annual cut.

The obligation to mitigate the economic impacts of potential conservation areas combined with the inaccuracies and imprecision of the timber harvesting land base mapping means that information about the potential economic impacts of conservation areas (required for WHA or UWR approval) must be obtained through consultation with affected licensees: employees of the MoE and ILMB are not as knowledgeable as licensees about the specific locations of economic opportunities across the landscape. This presented a problem with UWR implementation in Chilliwack, because forest licencees were not particularly forthcoming in offering information about economic opportunities in the non-contributing land base, which stalled the planning process to some degree (MoE interviewee, personal communication, May 4, 2006).

Even if licensees identify economic concerns related to conservation area establishment, neither the regulation nor policies are clear about how to manage the tradeoffs that arise between conservation and economic values. It is not apparent how to apply the third test of the Government Actions Regulation, which requires that the public benefits derived from conservation area establishment outweigh operational economic impacts, or the ability of licensees to harvest the full amount allotted to them. A “reference guide” created to assist the application of the Government Actions Regulation emphasizes that the derived public benefits from conservation area creation must be considered against material adverse impacts on the costs of accessing and harvesting timber, and against undue constraints on licensees to harvest their timber volume allotments, i.e., economic impacts cannot be insignificant to outweigh the
benefits of conservation area (JSC, 2006). The guide is vague about the exact nature and significance of the "public benefits" derived from conservation areas that should be weighed against economic impacts, saying only the following about the matter:

Public benefits, including benefits to First Nations, may be social (including cultural), economic and environmental in nature. These benefits may be quantitatively or qualitatively described. Quantification of benefits may be possible where estimates of use or investment can be reasonably obtained through existing information or reliably attained through review and comment. (JSC, 2006, p18)

In situations where there was a conflict about conservation area location, the MoE provided the relevant information about the "benefits" of establishing the conservation areas (e.g., hunting and wildlife viewing opportunities in the case of ungulates), but industry held that the economic costs were too high.

Senior MoE officials do not seem willing to support proposed conservation areas recommended by operational level MoE staff in the face of strong licensee discontent. This lack of support from higher government officials has been identified in the literature as a significant impediment to implementation (Mazmanian and Sabatier, 1983). In situations where MoE and licensees do not agree on particular conservation areas senior MoE officials have not supported forwarding the proposed conservation areas to the Deputy Minister for his consideration (as has been the case in the past for UWRs in Chilliwack, with operational staff having to repeatedly engage in negotiations with licensees and amend boundaries). Furthermore, even when conservation areas have been forwarded to the Deputy, he has postponed a decision on them, either requesting more information from MoE about the biological necessity and economic impact mitigation efforts undertaken for the proposed areas (in the case of the two grizzly bear WHAs on hold in Chilliwack); or allowing licensees more time to submit alternative conservation areas (which occurred with UWR in Chilliwack, despite the fact that consultations had been ongoing for many years and both MoE and licensees had created many iterations of their own preferred UWR plans). Although licensee support for conservation areas is not an
“official” condition for their establishment, there were differing opinions within the MoE about if it was a de facto requirement: two MoE interviewees suggested that it was essentially needed in practice; whereas another, more senior MoE interviewee explicitly said that licensees did not have veto power over conservation area establishment, and attributed the prolonged attempts to implement UWR in Chilliwack to the fact that MoE needed to show due diligence in consulting with licensees and trying to attain the necessary information to determine if the benefits of the conservation areas outweighed the costs.

In most cases, MoE and ILMB were able to address conflicts over the economic impacts of reserves during the consultation phase of conservation planning (as opposed to leaving it to the Minister to decide) and have usually been able to present the relevant Minster with a package supported by most stakeholders. However, sometimes it has taken the various parties a considerable amount of time to reach agreement about particular amounts and boundaries.

To summarize, the legislation itself provides unclear guidance regarding the size (in the non-contributing land base) and location (in the timber harvesting and non-contributing land bases) of conservation areas, and inadequate direction about how to resolve conflicts over these issues. In the case of WHAs and UWRs, government is legally required to weigh the benefits of conservation establishment against the costs. The information needed to make this decision must be supplied by licensees, in part due to the lack of accuracy and precision in the mapping of the timber harvesting land base. The ultimate decision for conservation area establishment rests with the Deputy Minister, but neither he, nor senior MoE officials have demonstrated a willingness to support operational level staff’s recommendations for conservation areas when there is significant opposition from industry.
The main causal linkages between government action and attainment of objectives is understood. The basic idea that important species habitat or old growth patches should be protected in conservation areas is consistent with the literature on the conservation of biodiversity and wildlife. It is well established that habitat loss is the principle threat to biodiversity at all scales (e.g., reviewed in Fahrig, 2003), but there is still considerable uncertainty regarding how much of a species habitat or ecosystems' historic extent should be reserved in conservation areas to ensure long term survival (Dykstra, 2004). The federal species at risk recovery teams have been assigned with the difficult task of determining conservation measures to recover species populations so that they are no longer in danger of extirpation or extinction; and while there will always be some uncertainty with their final recovery goals and recommendations, they are charged with making the best decisions based on the scientific information available. For all of the species reviewed, habitat protection was a key component of the recovery approaches currently being developed by the species recovery teams. For many of the species, however, the current policies do not allow for adequate protection of species habitat due to the economic limitations in the legislation.

Similarly, the maintenance of a representative network of mid sized protected areas in the matrix is consistent with the current forest biodiversity management literature (Lindenmayer and Franklin, 2002). However, as detailed in section 7.2.2 of this thesis, the current scale, extent and distribution of OGMAs in Chilliwack and Squamish are likely insufficient to serve as an adequate coarse filter for old growth ecosystems. Overall, the failure of the current legislation to adequately protect species at risk and ungulate habitat, and old growth, is not primarily a result

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37 Uncertain future environmental conditions as a result of climate change, natural disturbances or other factors can work to undermine the suitability of spatially fixed conservation areas in the future. A discussion of these issues is beyond the scope of this study.
of a lack of understanding of conservation measures needed for species and old growth protection (although this definitely plays a role) but of self-imposed legal limitations on government actions.

Implementing officials have jurisdiction over a sufficient number of linkages to attain objectives

The MoE and ILMB have the authority to approve conservation areas, which if established in sufficient quantity and adequate distribution could significantly reduce the risk to wildlife and old growth ecosystems. However, these agencies do not have any authority to affect where timber harvesting occurs prior to the establishment of such areas. This difference in jurisdiction over conservation areas, and forest stewardship planning is problematic in situations where there is conflict over particular boundaries for conservation areas, as forest stewardship planning and harvesting could occur while negotiations over specific conservation area boundaries are still occurring (which can take many years).

Under The Forest and Range Practices Act, the MoE does not review forest stewardship plans (they used to do this under the Forest Practices Code). The District Manager (from MoFR) has the sole authority to approve plans. He or she may ask MoE for specific advice or assistance when adjudicating a plan, or MoE may be proactive and let the District Manager know if there is a particular problem area, but the final decision still rests with the District Manager. For all species that have conservation targets, except for the pacific water shrew and tall bugbane, there are more locations across the landscapes that licencees can choose to protect in their forest stewardship plans than that which is required of them to meet the conservation targets (i.e., more suitable habitat existed for the majority of the species than the amounts in the conservation targets). The habitat indicators that accompanied the conservation targets do not provide details about the specific location of habitat that should be protected for wildlife, just its general
attributes, which gives licensees some flexibility in placing these areas where more habitat exists than the amount they are required to protect.

In most situations examined in this thesis, licensees are including draft conservation areas in their forest stewardship plans in order to meet the wildlife objective and create a "placeholder" for the establishment of legal conservation areas in the future. However, there are a few situations in Chilliwack where licensees do not, or have not in the past, supported the MoE's exact boundaries for conservation areas (two grizzly bear WHAs, and UWRs) and have planned to protect different areas in their forest stewardship plans (the differences were relatively minor in the case of grizzly bears, but more significant with ungulate winter range protection). Although the Identified Wildlife Management Strategy procedures manual has provisions for the voluntary protection of draft areas, the Forest and Range Practices Act planning framework does not permit the District Manager to exercise this sort of discretion: in approving forest stewardship plans he or she can only consider adherence to approved conservation areas or consistency with the habitat criteria that accompanies government's conservation targets. The fact that draft conservation areas receive no protection throughout the (often long) establishment phase is not a problem in situations where industry and MoE support the same areas for conservation protection, but could be problematic when there are disagreements over specific boundaries for conservation areas as there are no legal prohibitions from harvesting habitat or old growth before it is legally included in a WHA, UWR or OGMA.

8.3 Relationships

8.3.1 Conflict and Commitment of Implementing Actors

Under current policy both licensees and government officials play important roles in conservation area establishment and therefore both can be considered to be "implementing actors." There was mixed support amongst interviewees for the policies and their specific
targets. Interviewees from MoE and ILMB were generally positive about the policies for conservation areas and seemed to be putting substantial energy and commitment towards their implementation. However, they expressed frustration at the economic limitations built into the policies due to the threat this poses for adequately managing non-timber resources, and because of the challenges this creates for actually delineating the areas (due to the direction to implement them in the non-contributing land base). The MoE is particularly unsupportive of the specific conservation targets permitted for UWR establishment in Chilliwack.

Support from licensees varied between the two districts. Licensees in Chilliwack generally seemed opposed to implementing additional conservation areas in the district, and in particular spoke quite strongly against the way MoE was trying to implement UWRs. Licensees in Squamish, while concerned about certain aspects of conservation area establishment, did not express general disapproval with either the overall policies or their particular targets.

The sentiment expressed by some interviewees from MoFR and industry (in both districts) was that MoE tried to get as much as they could for habitat protection, regardless of how much they actually needed. For example, one MoFR interviewee was irked by the fact that some areas were rejected for inclusion in OGMAs by ILMB planning staff, but then included in UWRs (which also require old, or at least mature, forest). He suggested that the approach was intentional in order to protect as much old growth as possible, as opposed to overlapping the various conservation areas to minimize timber supply impacts, as encouraged by government policy. Similarly, one interviewee from industry said that even though certain wildlife habitat was already protected by OGMAs, the MoE would still use WHAs in the timber harvesting land base to protect more of the same species' habitat just because they had some timber supply impact "budget" (the 1% of the timber harvesting land base) remaining to do so. The same interviewee said that industry hired consultant biologists to keep the MoE "honest" about conservation needs. While this difference in perspective between MoE and licensees did
not always directly interfere with conservation area implementation, it helps to explain why negotiations over areas can be lengthy. Interviewees from industry were not specifically asked what they considered to be necessary habitat protection for particular species, so it is not clear if this sentiment reflects a difference in scientific opinion about conservation needs, or merely a distrust between the various parties.

As has already been mentioned, implementation seemed to be facilitated (i.e., conflict and delays were reduced) in situations that involved licensees from an early stage. Part of this is no doubt due to the fact that licensee involvement is needed to adequately assess and reduce the economic impacts of conservation areas, so involving them form the beginning might facilitate achieving this while still creating conservation areas that meet government policy in terms of biological attributes. For example, one ILBM interviewee delineated OGMAs in close partnership with industry engineers in order to meet the OGMA requirements but at the same time reduce their economic impacts. He said that this was a very effective approach because the engineers knew the landscape intimately. He also reported that the approach provided licensees with a greater understanding of the purpose of OGMAs and worked much better than simply giving licensees OGMAs to review after they were already placed.

Some of the complications and hostilities with conservation area implementation in Chilliwack seemed to stem from a weak licensee-MoE relationship. This relationship appeared to be much stronger in Squamish, and this positive working relationship played a major role in the successful implementation of UWR in the district. The MoFR District Manager also seemed to play a large role in fostering an environment that was either supportive or hostile towards conservation values and policy. The District Manager in Chilliwack was not supportive of MoE's efforts to establish UWR in the past, indicated by the fact that he did not defer harvesting in areas MoE wanted for conservation until the final boundaries for UWRs were decided (which, as of November 2006, had still not occurred). In contrast, the District Manager in Squamish
instructed licensees to respect MoE's draft UWR plans in the late 1990s and onwards, which subsequently facilitated the completion of UWR planning. This direction communicated the support of the MoFR for establishing UWR in Squamish, which likely increased the willingness of licensees to support the process too.

The current Forest and Range Practices Act implementation environment encourages cooperation between licensees and resource management agencies. MoE's new business model has been termed "shared stewardship". In an effort to foster cooperation between MoE and licensees, regional managers and an industry association agreed upon a set of "principles for partnership" regarding The Forest and Range Practices Act implementation projects. The parties to the agreement committed to "jointly prepare and submit [government actions regulation] proposals" where appropriate. When there is conflict about a certain conservation area, parties agreed to "work together to find solutions" and to "refer to differences of opinion as challenges that require joint initiative to seek counsel to arrive at viable solutions" (PoP, 2005). This collaborative approach seems to have taken hold in Squamish, starting with UWR planning and then using the same approach for grizzly bear WHAs (after consultation issues were settled with licensees). However, efforts at collaboration have been less fruitful in Chilliwack. As one MoE employee said, "the government puts a lot of reliance on partnerships, but if you are not working towards the same goal it is not really a partnership."

8.3.2 Support of Environmental Non-Governmental Organizations

There has been a lack of environmental group involvement in OGMA, UWR and WHA implementation in Chilliwack and Squamish. Interviewees from these groups think that these conservation areas are inadequate in terms of size and permanence. Referring to the perceived instability of these areas, the interviewee from Western Canadian Wilderness Committee said, "At the end of the day, I do not trust conservation areas if they don't show up on a gas station
map” (only large scale protected areas with relatively stable boundaries are included in road maps). Both the Sierra Legal Defence Fund and the Western Canadian Wilderness Committee thought WHAs were quite limited as conservation tools due to their size. Speaking specifically about WHAs, the Sierra Legal Defence Fund interviewee provided three main reasons why environmental non-governmental organizations do not put resources towards involvement in the implementation of these areas:

1. Environmental groups do not think the Identified Wildlife Management Strategy (the Strategy that “houses” WHAs) is a good policy, so they do not want to get “sucked into commenting on it, as that would legitimize it”;
2. The media are not interested in the Identified Wildlife Management Strategy at the operational level. It is too technical and the public would not follow it;
3. In general, there has been a decrease in environmental non-governmental organization capacity to monitor forest planning in the province as less money has been going to environmental non-governmental organizations from American and Canadian foundations over the last five years.

All three organizations are involved in the campaign to protect the Northern Spotted Owl and see the campaign as a tool to protect old growth ecosystems in South-western BC. All three groups are also pushing for provincial endangered species legislation that includes both the scientific listing of species and the protection of their habitat. The spotted owl is serving as a focal species for this campaign.

The Western Canadian Wilderness Committee was adamant that there should be no more old growth logging in the region. The interviewee from this group thought that environmental non-governmental organizations should not be involved in the details of where OGMAs are placed because their establishment implicitly allows old growth logging outside of OGMAs. None of the environmental non-governmental organizations interviewed submitted comments during the review and comment period for any of the OGMAs. In fact, the only non-industry
comments received from "the public" during OGMA establishment were from citizens and municipal councils in Whistler and Harrison Hot springs for the Soo and West Harrison landscape units respectively. The groups requested more extensive considerations of biodiversity and "viewscape" values in landscape unit planning (MSRM, 2003c; MSRM, 2004d). The ILMB responded by saying that this request could not be accommodated because it was beyond the "scope" of current landscape unit planning in the two districts (since 1999 landscape unit planning has been focused almost uniquely on establishing OGMAs and wildlife tree retention within stands, as per government policy; MoF and MoELP, 1999).38

The David Suzuki Foundation brought up the need for comprehensive conservation planning in South-western BC in order to prioritize areas for conservation. The interviewee specified that this would assist in the delineation of all the various conservation tools, and help to increase utility of any given conservation area. He provided the example of OGMAs being placed to benefit a suite of old-growth dependent species, consistent with research conducted by an employee of the David Suzuki Foundation (Yezerinac and Moola, 2006). Both the David Suzuki Foundation and the Sierra Legal Defence Fund upheld the conservation planning process for the land and resource management plan on the central coast of BC as a success story that should serve as a model for other regions.

The government considers the implementation of conservation areas to be largely a technical matter. Whereas the strategic level land and resource management planning processes include a variety of stakeholders to make "social decisions" about how public land should be used, "outside" groups are not invited to participate in OGMA, WHA or UWR delineation and there are no requirements to consult with them or actively engage them in the process at all (aside from advertising draft OGMAs for public review and comment). Environmental groups

38 Additional comments were received for the East Howe, Indian and Lower Squamish landscape units questioning the quality of OGMAs in terms of ecosystem representation, as discussed in the OGMA chapter. However, the landscape unit reports do not identify who submitted these comments.
were very active in the early stages of forest practices legislation change in the province (Hoberg, 2001a) but have not maintained an interest in tracing through how the conservation targets of current policy are being established and what the consequences of this are for species at risk, ungulates and old growth. Instead they have chosen to focus on creating new policy (in the case of wildlife) or opposing current policy (in the case of OGMAs), as opposed to engaging in the details of implementation for policies they do not support.

8.4 External Influences: Change in Economic Conditions and Policy Environment

The creation of the Forest Practices Code in the early to mid 1990s occurred during a time of economic prosperity for the provincial forest industry. The conservation areas examined in this study were introduced (at least on paper) to the province during this period. However, even when a “green” administration was in power and there was high environmental concern amongst the public, the extent of possible conservation areas was limited by timber supply impact caps (Hoberg, 2001b). In the later half of the 1990s the industry’s earning’s declined substantially and this was accompanied by a shift in government towards a greater concern for industry in forest practices legislation (Hoberg, 2001a). The NDP was re-elected in 1996 but their focus was less environmental and more sympathetic to labour groups, whose concerns in the forest sector were largely about job availability and security, as opposed to environmental protection.

In the late 1990s there was a scaling back of certain aspects of biodiversity and wildlife management under the Forest Practices Code. For example, in order to restrict the economic impacts of old growth retention, the scale of OGMA implementation was set at a coarser level than that which was originally recommended. A letter from the Chief Forester in 1998 stated

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39 When the Forest Practices Code was originally released in 1995 it was recommended that old growth retention occur at the site series or surrogate scale, a finer scale than variant.
that representation should not be considered at a finer scale than the "variant" because doing so would significantly affect the "immediate and long term economic benefits" created by forest resources in the province (Pederson, 1998).

The continued economic hardships faced by the forest industry in the late 1990s contributed to a decline in the public's concern for environmental issues when compared to economic ones. This shift in public opinion contributed to the election of a party perceived as being more "pro-industry" than their predecessors (Hoberg, 2001a). In 2001, the BC Liberals were elected, decimating the NDP by winning 77 out of 79 seats in the legislature. Shortly after their election they began cutting resources in the ministries responsible for natural resource management (as outlined in section 8.1.2, "adequate resources"), which greatly reduced the capacity of staff to implement the resource intensive conservation areas reviewed in this study.

The newly elected government moved quickly to "streamline" the province's forest practices legislation and started the transition to the Forest and Range Practices Act in 2002. Some of the principal goals of the new legislation were to strengthen the competitiveness of the forest industry, and to bestow more freedom upon forestry professionals to manage resources (de Jong, 2004). Pursuant to these goals there was a substantial readjustment in terms of the process and structure in which forest planning and practices occurred (MoFR, 2005). As a means to cut industry's costs, planning under the Forest Range and Practices Act was designed to be substantially less complex and time consuming than it was under the Forest Practices Code. The act introduced a more legalistic framework for managing forest values, such as wildlife and old growth ecosystems, and it put economic limitations concerning the size and location of conservation areas directly into regulation in an attempt to ensure the "balance" between environmental and economic interests. Accordingly, licensees are not required, and expressly discouraged, from including anything beyond the conservation targets in their forest stewardship
plans, as this may complicate forest stewardship adjudication and “could unreasonably increase 
public and First Nations expectations about habitat conservation” (MoFR, 2006c, p3).

As a result of changes in industry profitability and associated government priorities, the 
current legislation was explicitly designed to boost the beleaguered forest industry through a 
reduction in planning costs and legal restrictions on conservation area implementation. This has 
created an implementation atmosphere that is very sensitive to industry’s economic well being, 
especially on the coast where it is suffering the most. When placed in this historical context, it is 
easier to understand why current legislation and its implementation places a strong concern on 
the economic well-being of the forest industry, and why the upper echelons of government are 
hesitant to support additional “constraints” on the land base when industry claims that they will 
created unwarranted economic hardships and is not in support of them.

8.5 Links Between Issues

Many of the issues revealed in this thesis are interrelated. The current incremental and 
disjointed approach to conservation area implementation would be taxing in any environment, 
but especially so in one where government resources are low. The end result is that government 
agencies are involved in protracted planning and consultation, sometimes with the same 
licensees but for different conservation areas. Given the current implementation structure and 
process, it is not surprising that licensees perceive that conservation areas are not being well 
integrated. The current approach may contribute to conflicts between parties and to the 
existence of varied levels of support for policy: negotiating areas one at a time makes it more 
difficult to make sacrifices and tradeoffs (both environmental and economic) and likely increases 
the perception of all parties that their interests are not being achieved. The challenge of 
weighing economic and conservation concerns is difficult as there are no clear rules for 
balancing these goals. This is further complicated by the fact that the economic impacts that
must be legally considered for conservation area approval are constantly shifting over time as markets or technology changes, which would be less of a concern if all conservation areas were planned at the same time. The current disjointed and staggered implementation of conservation areas creates the possibility for ongoing amendments to conservation areas as opportunity costs associated with reserve locations change over time, which again consumes scarce resources.
9 Conclusion

9.1 Summary of Issues

Three aspects of conservation area implementation were examined in this thesis: the length of time to establish reserves; issues encountered during the establishment process; and the adequacy of conservation areas to protect species at risk habitat, ungulate winter ranges and old growth ecosystems. Above all, the most significant barriers to achieving the conservation goals of the particular reserve types (the protection of habitat required for the survival of species at risk and ungulates, and the conservation of biodiversity values and species associated with old growth forests), are built into the regulations themselves (FPPR s.7&9; GAR s.2(1)). The economic limitations that affect the size and location of conservation areas render them inadequate for the protection of wildlife and old growth in most cases researched: the extent of habitat protection granted under current policy is not sufficient to protect key species at risk and ungulate winter habitat or a sufficient amount of the historic level of old growth; and established OGMAs have little interior forest conditions, may under-represent higher productivity sites at risk of being harvested, and in some instances are not even comprised of old growth forest (although this may be due to a lack of remaining old growth in Chilliwack and Squamish as opposed to a failure to protect remaining old growth patches).

In terms of the actual conservation area planning and approval process, the greatest challenge to the legal establishment of conservation areas has been the reluctance of senior government officials to support reserve implementation when there is substantial resistance from forest licensees. Secondly, the implementation process has been complicated by unclear government policy about how to balance conservation and economic goals. Specifically, there is insufficient guidance about the extent to which conservation areas can be established in the non-contributing land base, and how the benefits and costs of conservation areas should be weighed to determine their location across both the timber harvesting and non-contributing land bases.
Thirdly, the implementation process has been uncoordinated, with different agencies pursuing conservation areas at different times. This has created the perception that established reserves are not well integrated, and in some instances has caused direct delays in conservation area establishment as certain processes are stalled while waiting for other areas to be finalized.

Lastly, the establishment of legally approved conservation areas has been slow due to inadequate government resources that are causing reserves to be implemented sequentially over time, an uncoordinated implementation process between different reserve types, and in some cases, to conflict over particular conservation areas.

The finding that many of the wildlife species examined require additional conservation areas or management considerations beyond those that were analyzed in this thesis is concerning because of the time it might take for additional measures to be implemented or for current policy to be amended to permit more protection. There are not yet any approved federal species at risk recovery strategies or action plans for the species examined here. Once such recovery strategies and action plans are approved they may include legal provisions for additional habitat protection or other conservation measures, but it is not clear if (or when) this will be enforced on provincial land (Smallwood, 2003). The provincial government argues that until habitat amounts needed for species are established in recovery strategies or action plans and it is demonstrated that greater habitat protection than what is currently provided is needed, it does not make sense to reconsider the current timber supply impact policies. However, in the interim species' habitats may be further degraded or fragmented by logging or road construction without any legal protection or provisions to protect potential future conservation areas.
9.2 Recommendations

There are a number of changes that could be made to current government policy that would facilitate the implementation process. As with all policies and processes, however, there will always be advantages and disadvantages of any particular approach.

1. Establish clear, biologically defensible conservation targets first, then balance with economic concerns. Specify a transparent process to settle disputes over the location of reserves.

   Government should first determine how much (or whatever is the best estimate of “how much”) protection is needed for species at risk habitat, ungulate winter ranges, and old growth ecosystems to ensure their long-term survival. Habitat protection targets should be clear, measurable and should apply to the entire land base, not just the timber harvesting land base (Tear et al., 2005; Margules and Pressey, 2000). After these targets are decided, an assessment should be performed to determine their economic impacts. It is only following this step (and not in the creation of the targets themselves, as has been the case in BC where economic limitations have been established prior to conservation goals) that decisions should be made about the tradeoffs of environmental versus economic values. Even if the end result were the same as the status quo, at a minimum this would make the true “costs” of conservation clearer and highlight the necessary trade-offs.

   Considering the publicity and contentions surrounding species at risk and biodiversity protection in the province, it would be worthwhile for the provincial government to lead a frank discussion with a broad range of interested parties from “the public”, industry and government about how (or if) to make the trade offs necessary to protect species habitat. This would include a discussion about the risks (environmental and economic) of various planning scenarios.
Conservation targets must be accompanied with sufficient information about how to delineate reserves across the entire land base (timber harvesting and non-contributing) and how to settle conflicts regarding their particular locations. In situations where the MoE or ILMB feel there are no options to place conservation areas except for in a controversial spot, financial compensation to the affected licensee could be an option if equivalent timber cannot be found elsewhere for the licensee to harvest.

2. **Conduct Integrated Conservation Planning**

Currently, integrated planning only occurs in some areas at the strategic, sub-regional level through the land and resource management planning process. Conservation planning is also required at finer scales than this, such as at the landscape level. As outlined in Margules and Pressey (2000), those responsible for conservation planning should assess how much of the conservation targets are already met by current reserves then implement further reserves to fill in the gaps. Computer planning tools could also be used to assist the delineation of areas so that results are more transparent and repeatable.

The entire notion of coarse- and fine-filters is that they will complement each other to protect biodiversity (Noss, 1987); but this complementarity has to be designed. Reserves need not even be called OGMAs, WHAs or UWRs. If targets for old growth and wildlife habitat were clearly defined across the entire planning area (recommendation number one), general conservation reserves could be implemented to achieve the coarse- and fine-filter targets, avoiding the increasingly complicated policy direction to overlap conservation areas and the associated calculations about how to “account” for overlapped areas in terms of impacts to the timber supply.
Implementing reserves in a concerted fashion allows all parties to better recognize and make the trade-offs necessary to complete planning, and facilitates locating areas to address multiple values. This sort of process would also help to establish a baseline of what is already protected, which would assist the Minister in determining if a proposed WHA or UWR was necessary given the protection afforded to the species through other conservation areas (as per GAR s. 10(2) and 12(2)). This sort of baseline information would also help government in the future as it deals with additional species at risk. In addition to facilitating the efficient establishment of reserves to meet conservation targets, a more integrated approach may have the benefit of fostering positive relationships between parties, which might help other planning endeavours in the future.

The risk to this approach is that there could be no areas implemented at all if planning got stalled or backlogged (witness the current sea to sky strategic level planning initiative that was scheduled to be completed by 2002 and is still not finalized; LUCO, 2001). While implementing resources in an incremental and disjointed manner may be disorganized, inefficient and decrease support for the process and outcomes, at least there is a certain level of slow implementation that is achieved over time. However, the risks associated with integrated planning could be reduced by establishing incentives (positive or negative) to encourage the timely completion of conservation planning processes, such as including joint timelines and moratoria on harvesting in certain areas until agreement on conservation areas is reached.

At a minimum, a process needs to be specified whereby key agencies are forced or induced to work together to achieve common goals at the same time. Given the current resource situation and historical division of responsibilities to various agencies, it might be difficult and unrealistic to attempt to transfer these responsibilities to fewer agencies (Hasenfeld and Brock, 1991); the ministries and bureaus have built up a certain level of capacity with their particular roles, and managers are often reluctant to cede jurisdiction of elements they are responsible for.
to other organizations (Bardach, 1999). Moreover, the majority of government staff that are currently involved in conservation area implementation are also responsible for a myriad of other tasks, so transferring these individuals to a different agency would take expertise away from their former organizations. In the current institutional arrangement ILMB would be the most logical agency to organize and lead integrated conservation planning between the relevant agencies, as this would be within the spirit of their mandate.

3. **Enable Government Employees to be Strong Leaders of Conservation Planning**

The government should lead the integrated conservation area planning process outlined in recommendation number two and involve the forest industry from an early stage. However, government should be able to proceed with legal conservation area establishment that they think is necessary to meet policy goals in the face of industry resistance. The current role of government seems to be more akin to that of a stakeholder in a consensus-based planning exercise. It should be shifted so that government employees are enabled to make balanced decisions in pursuit of public policy goals.

4. **Provide Resources Commensurate with Tasks.**

Implementing actors require both the capacity and will to make implementation successful. While the latter is difficult to mandate, government can improve the former through an appropriate level of staffing and funding within an organization (McLaughlin, 1987). Over the past ten years the province has gained substantial experience with land use and conservation planning at a variety of scales. This, combined with the fact that many of the current ILMB, MoE and MoFR employees have been working for government throughout many of these years, creates a situation where there must be a certain sense of what sort of resources are required to permit (but not guarantee) timely implementation. Increased human and financial resources
would likely increase the pace of legal conservation area establishment in cases where there was little industry opposition to areas. Implementation steps, such as conservation area mapping, field checking, and consultation with affected parties would be sped up and conservation areas would be brought to the Deputy Minister quicker with more resources. Short of equipping agencies with the staff and funding needed to implement policy in a timely manner, government should create tasks commensurate with resources, but be frank about what is being sacrificed.

These recommendations would not solve all problems but they would be an improvement over the current situation. There will always likely be some conflict or haggling over boundaries of conservation areas and broader conflicts about the relative importance of using the forest for timber, or protecting it for non-timber values.

9.3 Wildlife and Biodiversity Management Under the Forest and Range Practices Act

The approach to “balancing” environmental, social and economic interests under the Forest and Range Practices Act is to limit the extent of conservation reserve establishment by arbitrary timber supply impact caps. The particular rules guiding these limitations have created a confusing implementation environment filled with absurd number games and accounting procedures about the impacts of conservation areas in different land base categories. This has obscured the more important issue of what conservation measures are actually required for the long-term survival of species at risk, ungulates and old growth ecosystems. This obfuscation has occurred to some degree for the past ten years as government has changed the packaging and details of conservation area policy, but not its limitations.

Although government consistently refers to its management of environmental and economic concerns as “balanced”, legislation that categorically limits the management of wildlife and old growth through stringent economic restrictions on habitat protection cannot be
considered a balanced approach. Due to the effects of ecological thresholds, going halfway with wildlife and biodiversity protection does not necessarily result in the protection of half of the number of individuals in a population, or half the species in an ecosystem. Habitat protection (and associated species persistence) cannot be negotiated in the same way as other values, because political trades offs can lead to irreversible outcomes, such as extinction. Protecting wildlife and biodiversity to the levels needed to ensure their long-term survival might take a heavy toll on the amount of timber available for harvesting. This is an issue that needs to be discussed both with the public and at the cabinet level as it questions the feasibility of government’s overarching goal for forest management for the past ten years: simultaneously maintaining high environmental, social and economic values in the provincial forest.

Although the scope of this thesis is relatively narrow (the implementation of three conservation area types in two districts), its findings have significance that extends far beyond the cases examined. This research highlights the potential negative ecological consequences of placing economic objectives ahead of environmental ones; and points to the difficulties of both trying to account for economic impacts, and of trying to keep them to pre-determined limits in a dynamic landscape. The experiences of conservation area implementation in Chilliwack and Squamish demonstrate the challenges associated with incremental and uncoordinated conservation planning, including a very inefficient use of government resources, reserves that are likely poorly integrated, and the possibility for ongoing amendments to established conservation areas in the future. Finally, this research points to the need for strong, consistent government leadership, both to pursue conservation actions in the face of resistance from industry, and to design biodiversity policies that focus on biodiversity values, and not primarily on impacts to the timber supply.
10 References


Canadian Marbled Murrelet Recovery Team (CMMRT) 2005. Coast Habitat Suitability Algorithm


Ministry of Water, Land and Air Protection (MWLAP). 2004a. *Notice – Indicators of the Amount, Distribution and Attributes of Wildlife Habitat Required for the Survival of Species at Risk in the Chilliwack Forest District*


Ministry of Water, Land and Air Protection (MWLAP). 2004d. *Information Concerning Wildlife Habitat for the Survival of Species at Risk in the Chilliwack Forest District. Material supporting the notice, but not part of the notice.*


11 Appendices

Appendix I Government’s objectives for wildlife and biodiversity
Forest Planning and Practices Regulation and the Schedule to the Regulation.

Objectives set by government for wildlife
7 (1) The objective set by government for wildlife is, without unduly reducing the supply of timber from British Columbia's forests, to conserve sufficient wildlife habitat in terms of amount of area, distribution of areas and attributes of those areas, for
(a) the survival of species at risk,
(b) the survival of regionally important wildlife, and
(c) the winter survival of specified ungulate species.

(2) A person required to prepare a forest stewardship plan must specify a result or strategy in respect of the objective stated under subsection (1) only if the minister responsible for the Wildlife Act gives notice to the person of the applicable
(a) species referred to in subsection (1), and
(b) indicators of the amount, distribution and attributes of wildlife habitat described in subsection (1).

(3) If satisfied that the objective set out in subsection (1) is addressed, in whole or in part, by an objective in relation to a wildlife habitat area or an ungulate winter range, a general wildlife measure, or a wildlife habitat feature, the minister responsible for the Wildlife Act must exempt a person from the obligation to specify a result or strategy in relation to the objective set out in subsection (1) to the extent that the objective is already addressed.

(4) On or after December 31, 2004, a notice described in subsection (2) must be given at least 4 months before the forest stewardship plan is submitted for approval.

Objectives set by government for wildlife and biodiversity - landscape level
9 The objective set by government for wildlife and biodiversity at the landscape level is, without unduly reducing the supply of timber from British Columbia's forests and to the extent practicable, to design areas on which timber harvesting is to be carried out that resemble, both spatially and temporally, the patterns of natural disturbance that occur within the landscape.

Schedule 1 – Factors
Factors relating to objectives set by government for wildlife and biodiversity
3 (1) The following factors apply to a result or strategy for the objective set out in section 9 [objectives set by government for wildlife and biodiversity - landscape level]:
(a) the size, distribution and salient characteristics of the area being designed for harvesting;
(b) the size, distribution and salient characteristics of other areas within the landscape that have been shaped by, or affected by, natural disturbance;
(c) the extent to which wildlife habitat areas, ungulate winter ranges, riparian management areas, scenic areas and other areas established to manage forest resources complement efforts to resemble natural disturbance patterns in a landscape, including old growth.
Appendix III Examples of Interview Questions

For all Interviewees:

Role & Responsibilities
- What is your position in your organization?
- How long have you been in this position?
- Tell me about your role in the implementation process (In what ways do you contribute to the implementation of biodiversity and wildlife reserves?) OR Please describe your organizations activities regarding wildlife and biodiversity issues (prompt: Has your organization been active regarding particular species or policies? Has your organization ever written letters to government or done any public awareness campaigns about these sorts of issues?)

Appendix III-A Questions for MoE

WHAs
- How were the section seven notices created for species at risk:
  o What were the criteria for including particular species in the notices?
  o What information was used to determine the amounts in the notices (e.g. presence/absence data, habitat models, expert advice)
  o Please, briefly, walk us through the process of notice creation, making clear what groups were involved in the process and at what stage they were involved.
  o How were tradeoffs made between species (alternately put – what was the basis for prioritization of species within the 1% timber supply cap?)
  o Why are the notices a-spatial?
  o How are licensees to know that there is habitat in their are that needs protecting?
  o In situations where there is more suitable habitat than the amount included in the notice, how are WHAs supposed to be allocated among licensees? Who is responsible for this decision?
  o Please describe any challenges you faced in designing or negotiating the section seven notices in Chilliwack and Squamish.
  o If there were challenges, how were these challenges dealt with?
  o Are their plans to update the notices on a regular basis as new information becomes available?
  o If so, when?

- WHA Creation
  o Please walk us through the WHA creation process for each species.
  o Please describe the government’s approach to approving WHAs? What factors are considered?
  o Is the difference between suitable and optimal habitat a consideration for WHA approval?
  o Is the issue of strategic location of WHAs to complement other conservation areas (e.g. OGMAs, protected areas and UWRs) a consideration?
  o Please describe any challenges you face in approving WHAs Chilliwack and Squamish (e.g. unresolved conflicts between involved parties).
  o If there are challenges, how are you dealing with the challenges / conflicts?
Have there been any deadlines set for the establishment of WHAs in the Chilliwack and Squamish forest districts?

UWRs

- How were the section seven notices created for ungulates?
  - Same questions as above for WHAs
  - For the Chilliwack notice, why is there only an amount for the THLB when the ungulate winter plans specify amounts in the non-contributing land base as well?
  - What does this mean for management of ungulate winter range in the non-contributing land base?

- UWR Creation
  - Same questions as for WHAs
  - Were the UWRs accepted exactly as proposed in the UWR plans in Squamish?
  - If not, please describe any differences and why they occurred.

Closing

- Have there been any other issues or challenges to implementation that we have not yet touched upon that you would like to discuss?
- Have there been any positive experiences with conservation planning that you would like to share?
- Do you have anything else you would like to add or clarify?
- Are there any other people who you think we should speak to in order to better understand government’s policies about spatially defined conservation areas?
- If so, what are their positions and responsibilities?

Appendix III-B Questions for Licensees

Notices and Forest Stewardship Plans

- Find out: which companies have advertised & approved Forest Stewardship Plans; which have made spatial commitments in their Forest Stewardship Plans; what species are in their areas.
- How did you determine how much of the s. 7 notices for SAR and Ungulates to propose results and strategies for, i.e. if you had a species in your are how did you determine how much habitat to protect if the species’ range exceeds your are, such as wide ranging species like ungulates and grizzly bears.
- Question catered to licensee and location: How did you determine what particular areas to include in your results and strategies for species at risk / ungulates? Did you use a consultant biologist to do inventory work? Did you use MoE’s UWR maps / habitat models?
- Catered to particular licensee and location: To what extent do your results and strategies reflect MoE’s proposed WHAs or UWRs that occur in your areas? Please describe the reasons behind any differences between these proposed conservation areas and your results and strategies.
- Squamish: How are the notices for MAMU being applied - are you planning to protect ALL suitable MAMU habitat in the NCLB, or just certain habitat classes?
UWRs
• What role has your company played in establishing UWRs in the district?
• Chilliwack forest district:
  o MoE’s deer and mountain goat UWR plans have been proposed for several years now, what have been the challenges to implementing these proposed plans?
  o How have these challenges been dealt with / how are they being dealt with now?
  o Since these plans have been proposed in the early 2000s your company has harvested in the areas identified by MoE as important UWR (in the THLB and / or NCLB). Could you explain the decision to harvest in these areas? What is your company’s current position on harvesting in UWR (in the THLB and / or NCLB; type 1 vs. type 3 UWR)?
  o MoE is currently negotiating UWR plans with licensees. What are your company’s short and long term “goals” for UWR in the district, i.e. what amounts and what land designation (NCLB / THLB).
  o What are the challenges of the current negotiations?
  o Where are the negotiations currently at and when do you expect to reach agreement for deer and mountain goat?
• Squamish forest district:
  o UWR establishment has been relatively successful in the Squamish forest district; did you support the establishment process? Why or why not?
  o Were there any hurdles implementing these areas? If so, how were they overcome?
  o Why do you think UWRs have been implemented here and not in the Chilliwack forest district?

WHAs
• What role has your company played in establishing WHAs in the district?
• Have there been any challenges / delays (from the time of proposal) in establishing WHAs in your area, e.g. any conflicts over WHA boundaries or issues related to the consultation process?
• How were these challenges / delays dealt with? Have they been resolved now? Is your company content with the resolution?

Voluntary Additions
• Are you managing for any species that are not on the s. 7 notices on a voluntary measure?

OGMAs
• Have you submitted (or do you intend to submit) any OGMA amendments? If so, please explain the nature of this amendment
• If it was already submitted was it accepted? If not, what reason did you receive for its rejection?

Overall
• Do you have anything else you would like to add or clarify?
• Is there anything else you would like to add about either the notices / Forest Stewardship Plans or the implementation of conservation areas in Squamish and Chilliwack e.g. particular challenges we have not yet discussed, or particular processes that you think have worked well?
Appendix III-C Questions for Environmental Groups

Conservation Area Establishment
• Has your organization had any involvement with old growth management areas, wildlife habitat areas or ungulate winter ranges? (prompt: Has your organization ever submitted comments on any of these conservation areas during the public review period? Has your organization ever proposed one of these conservation areas to government?)
If yes:
• How did you find that your proposal or comments were treated by the government? (prompt: Did your proposed conservation area get implemented? Did you receive a response back from your comment?)
If no:
• Please explain why this is not an area of involvement of your organization

Biodiversity and Wildlife Management in Chilliwack and Squamish
• What do you think about biodiversity and wildlife management in Chilliwack and Squamish?
• Do you have any concerns about the protection of particular species? If so, please explain.
• Do you have any concerns about biodiversity or wildlife policy? If so, please describe.
• Do you have any concerns about the implementation of conservation areas (old growth management areas, wildlife habitat areas and ungulate winter ranges)?
• Is your organization doing anything to try and change these issues of concern? If so, please describe?
• Are there particular processes or policies for wildlife / biodiversity that you think are working well?

Closing: Do you have anything else you would like to add or clarify? Thank you!