Global Environmental Forest Policies:
Canada as a Constant Case Comparison of Select Forest Practice Regulations

Chapter One:
Introduction

International Forest Resources

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Chapter 1

Introduction

I. The importance of global forest policy comparisons

Increasing evidence that environmental, social, and economic functions of the world's forests are under considerable stress[1] has led a number of interest groups and organizations, championing a diversity of values, to assess the ability of domestic forest policies to address important forest policy problems. Partly as a result of this scrutiny, governments around the world have been experimenting and adapting policy responses in an effort to find potential "win win" solutions (Gunningham, Kagan, and Thornton 2003) that harness economic forces in a way that improves, rather than hinders, environmental and social standards. In this context a complex array of domestic and international policies have emerged aimed at promoting sustainable forestry. Policy scientists have scrambled to analyze these initiatives, which range from traditional "command and control" regulations, to more flexible approaches aimed at encouraging firm-level innovation in "results based" sustainable management.

As scholarly work has developed to assess these responses and innovations, systematic characterizations of policy across a range of countries have taken two general directions: they have either been abstracted to the level of broad comparative studies (Rayner and Howlett 2003; Silva 1997)(McManus 2002; Arnold 2003) or been restricted to single case studies (Tollefson 1998; Cashore et al. 2001; Hoberg 2001; Young 2001; Zhang et al. 2000; Zhang et al. 2000; Merry et al. 2003)(Hyde, Belcher, and Xu 2003; Edmunds and Wollenberg 2003; Tysiachniouk and Reisman 2002; Remigio 1993). While both approaches are important, neither tends to emphasize specific requirements of policy. And when studies do emphasize specific

requirements, they tend to be focused on specially selected comparisons (Hoberg 1993; Cashore 1997; Cashore and Howlett 2004; Rangan and Lane 2001). Key questions remain: just how do forest policy responses *compare* across a wide range of countries? Do different national policy styles emerge? Do policy approaches differ according to the specific issue in question? Do forest policies differ according to political climates and cultural values?

This report is designed to help shed light on these questions through the development of an analytical framework designed to facilitate the comparison of specific forest practice regulations important to environmental protection. We apply this framework across a range of countries in which forest lands or the forest sector are of central environmental, social and economic importance.

The framework developed in this report is not intended to stand alone as an evaluation of the *effectiveness* of the different regulatory approaches towards achieving environmental protection goals. Instead, it lays the necessary groundwork for future, field-based studies designed to test which types of regulatory approaches (and under which conditions) are most effective in addressing environmental policy problems – an issue about which most governments have shown considerable interest, but for which most scholarship remains anecdotal or incomplete.

We develop our framework beginning with Canada, the country from which sponsorship for this study was generated. We apply our framework in a series of comparisons between Canada and 1) the United States, 2) other select Organization for Economic Cooperation and Development (OECD) countries, 3) Eastern European countries in "transition" and 4) developing countries. While systematic comparisons across such a diversity of cases are usually avoided because of the enormous task of synthesizing complex data, we argue such a framework is

needed if we are to better understand the relationship between policy responses, their effects on behavioral change, and the effects of these behavioral changes in addressing the problems for which they were created. Failure to take the first key step of carefully assessing the structure and approach of policy renders concerned interests unable, with any certainty, to understand and explore these important relationships.

The remainder of this introduction proceeds in the following steps. Second II explains the utility in using Canada as a "constant" comparison case. Section III presents the analytical framework designed to compare a range of policies across a range of countries. Section IV introduces the key forest practice criteria selected for comparison. Section V, "Plantation management", describes how our report will also address the differences in policies governing natural forests versus intensively managed forest plantations. Section VI introduces our analysis of "biodiversity" protection, which focuses on the indicators of protection of species at risk and protected areas. Section VII discusses the topic of enforcement and compliance, also addressed in each of the case studies in this report. Section VIII provides a brief overview of forest certification, a non-governmental form of forestry governance that has been playing an increasing role in shaping debates over appropriate forest management. The final section outlines the remainder of the report, and how the following chapters will systematically assess the character of forest regulations across all twenty case study countries.

II. Canada as a Constant Case Comparison

Canada is the *a priori* constant case comparison for this report. Funding support for this study was based on the production of an objective and analytic comparison of Canadian forest practice regulations with those of other countries around the world. The global environmental

and economic significance of Canada's forest, however, also serve to make Canada an ideal constant case comparison for this global-scale study.

Canada's vast forest resource together accounts for 6.3% percent of the world's total forest cover [FAO, 2003 #603]. Canada is also the single largest exporter of forest products [Natural Resources Canada, 2000 #3048]. As a result of its international significance, the Canadian case exemplifies two related phenomena that more countries are beginning to face: opportunities and challenges associated with economic globalization on the one hand, and political pressures associated with increasing international scrutiny of domestic practices, on the other hand (Bernstein and Cashore 2000).

As a country long dependent on foreign markets for the vast majority of its forest products, and as home to a diversity of important forest ecosystems, Canadian forest practices and policies have, in the last 15 years, come under intense scrutiny from a number of domestic (Wilson 1998; Cashore et al. 2001) and international sources (Bernstein and Cashore 2000) including: forest-focused domestic and transnational advocacy groups (Bernstein and Cashore 1999), European governments and purchasers of Canadian forest products, and select US forest companies (Tollefson 1998; Cashore 1997). Canadian policy makers have attempted to walk a policy tightrope in their efforts to maintain and expand market opportunities while encouraging responsible forestry practices.

Canada, in other words, embodies some of the most important challenges governing forest management within a global economy. Furthermore, as a country in the North with the capacity to implement and enforce forestry regulations in ways that developing countries are unable, Canada provides us with "living policies" that can be compared with both functional and dysfunctional regulatory frameworks in other countries world-wide.

III. Analytical and Comparative Framework

1) Policy components (specifications)

This analysis departs from many existing studies on national policy styles and statutory approaches to forest management by focusing on the specific content of key measures of forest practices policies, or what we call policy "specifications"[2] governing forest practices. While existing research has focused on how governments emphasize abstract goals such as environmental protection and economic development, overall approaches to national forest planning (Rayner and Howlett 2003; Howlett, Rayner, and Wellstead 2004), the structure of policy networks (Cashore 1997; Lertzman, Wilson, and Rayner 1996, 1996; Hoberg 1996), policy subsystems (Cashore et al. 2001), and broadbased research on overall forest practices policy (Hoberg 2000), less attention has been placed on understanding and systematically exploring "policy specifications", or the specific requirements of policy.[3]

The figure provided in Appendix C of this report identifies the main emphasis, and contribution, of our approach. Drawing on a range of work on policy classifications in the last ten years (Hall 1993; Howlett 2002; Cashore et al. 2001; Cashore and Howlett 2004), Appendix C identifies where our primary focus on "policy specifications" fits within the different policy levels that contribute to behavioral change. We also buttress our emphasis on policy specifications by reviewing trends at other levels, including "policy tools" or "means" approaches to biodiversity protection, and also by looking at compliance and enforcement, and actual conditions of the forest environment.[4] We do this to provide important contextual factors for understanding policy specifications, but we make no claims to a systematic analysis of these factors, each of which would constitute an important study in its own right.

An overarching theme that emerges from our research is the importance of conducting systematic analyses, and employing standardized frameworks for comparison, whatever the level of comparison being undertaken. We therefore encourage that further systematic research be conducted at all of the policy levels outlined in Appendix C of this report.

2) Policy outside the scope of this review

Our focus on governmental approaches to forest practices regulation, as large a task as this is, means that there are important aspects of forest policy outside the scope of this analysis. We are not exploring the full multitude of policies that impact forestry, such as tax policies, governmental ownership of parts of the forest industry, industry concentration, financial assistance programs, or even direct subsidization. Likewise, with the important exception of a review of support for forest certification, we are not exploring market-based policy instruments, such as carbon trading or trade in environmental services. Likewise, our focus is limited to the regulation of forestry practices aimed at timber production, rather than non-timber products and services. Finally, we do not consider such social factors as public participation in decision-making, the distribution of forest benefits, or recognition of indigenous peoples' rights, all of which may significantly influence the effectiveness of forest practice regulations in protecting the environment and promoting social welfare. Instead, our task is squarely set on the analysis of governmental approaches to forest practices regulation. Despite the diversity of available public policy instruments and/or civil society or market-based governance mechanisms, government regulations still remain the main tool used to address management and practices in most of the world's forests.

3) What Forest Practices Policy Specifications to Compare?

Because forest policy is so complex and multi-faceted, it would take literally thousands of pages to assess and address every related piece of government legislation. Our solution to the issue of policy measurement, therefore, is to identify some of the most controversial and highly debated practices of concern to global forest management including: rules governing riparian zone management, clearcutting, reforestation, annual allowable cut requirements, intensive forest plantation management, and endangered species, including the establishment of protected areas. In addition, we examine the approaches taken towards the enforcement of forest practice regulations, and provide a brief analysis of forest certification as a new non-state, non-governmental approach to forest governance. We expect that the application of our framework to these arenas will facilitate the work of future comparisons into other substantive measures not covered in this analysis.

4) How to Compare: Descriptive and Analytical Approaches

Our decision to zero in on governmental policy specifications still poses important challenges for our comparative task. Many forest policy components are incredibly complex, with some containing volumes of detail. We have decided to address this complexity by carefully delineating a series of precise policy elements or "indicators" to identify and describe for each case study jurisdiction. We then develop an analytical framework for classifying the type of regulatory approach these policy indicators entail.

a) Descriptive approach

We present "raw" data in three ways, which vary in the level of abstraction: qualitative summaries of each of the jurisdictions according to each of the policy criteria under review; quantitative comparisons of management thresholds (i.e. size of required riparian zones, etc.); and the application of our policy framework described below. Where possible, we also construct charts to facilitate this analysis, such as when comparing the size of streamside riparian zones, clearcutting guidelines, or culvert requirements.

b) Analytic Classification System

The analytic framework we have designed for this study draws on Cashore's earlier work (1997), and classifies forest policy according to: 1) Structure: whether policies are worded in a discretionary versus a non-discretionary manner; and 2) Method: whether policies emphasize procedures and/or plans (such polices are often referred to as "systems-based"), or directly address on-the-ground behavior (such policies are often referred to as "performance-based").

Structure

Major policy differences can result from subtle differences in wording – for example, words like "must" and "shall" limit discretion, in contrast to words like "may" or "consider where appropriate" which expand discretion. There may be even more subtle distinctions, where words like "must" are used but a single official is given discretion in deciding whether the "must" action actually happened, or when that official has the authority to grant exemptions. In this regard, a key challenge under this classification system is to categorize the *degree* of discretion involved. As illustrated in Table One below, our classification system primarily distinguishes between policies that involve mandatory legislative direction (i.e. non-discretionary

policies) and policies that allow firms or individual forest managers to exercise discretion (i.e. discretionary or "voluntary" policies).

Method

Policies can be further distinguished by whether they focus on procedural rules, which cover such things as the requirement of written plans and procedures, versus rules detailing specific forest management practices. Forest policy has always been heavily reliant on procedures, especially the approval of harvesting practices via the preparation of forest management plans and/or cutting permits. However procedural requirements, such as addressing riparian zone protection in a management plan, have an indirect and uncertain effect on on-the-ground behavior. In contrast, substantive rules, such as the requirement to establish a 50 meter riparian protection buffer zone, lead to transparent and predictable on-the-ground behavior (assuming adequate enforcement).[5]

Table 1 Forest policy classification system

Structure	**Approach**
1) Discretionary	Rules encourage, but don't require, a course of action
2) Non-discretionary	Rules require a specific course of action.
Method	
1) Substantive	Rules address on-the-ground changes
2) Planning/ procedural	Rules address management systems, rather than on-the-ground actions

Adapted from Cashore (1997)

These distinctions lead to four overall approaches to forest policy regulation identified in Table 2 below. *Procedural flexible* policies are voluntary, and involve the development of processes or plans, rather than prescriptions for on-the-ground practices. Such flexible approaches *could* lead to significant change in forestry practices, however it is difficult to predict their effect without a case-by-case analysis of their implementation (See Appendix A). *Procedural inflexible* policies involve requirements for the development of plans or procedures. An example of such an approach is the US National Environmental Policy Act's (NEPA) requirements that federal projects undergo an environmental assessment. Procedural inflexible policies help to guarantee that planning has taken place, but provide little certainty as to the forest practices that result. *Policy specifications flexible* refers to those cases where specific forest practice rules or guidelines exist, but are voluntary in nature. Finally, the *stringent*[6] policy category refers to mandatory, on-the-ground requirements or restrictions, such as the rule that no timber harvest may occur within *x* meters of a river of *y* width.

We recognize that the sum total of regulations governing a particular policy issue are often so complex as to defy easy classification. We have addressed this challenge in two ways. First, when difficulties arise, we carefully explain just what the policy says, and where it appears to best fit in our "non-discretionary" or "discretionary" or "procedural", or "on the ground" policy categories. Second, we have, where necessary, identified an additional "mixed" category. The "mixed" designation refers to those policy specifications which a) include mandatory substantive requirements without precise, standardized thresholds (i.e. policies that allow for government discretion); and/or which b) apply to only a limited geographic area. "Mixed" policies might include, for example, a policy requiring no harvest buffer zones without the provision of standardized buffer zone widths. Examples of geographically limited policies are

clearcut size limits that apply only to certain forest types (for example alpine forests or native loblolly pine forests).

There is no question that collapsing a complex world into a limited number of categories comes at a cost – as does any effort to reduce complexity. However, the benefits are enormous – the classification system allows us to provide clarity, and hence transparency, to what heretofore have been approaches to policy specifications that are largely inaccessible to anyone but the trained specialist. Our approach also allows us to compare general trends that emerge in how forest policy is developed through out the world.

Exemptions and Exceptions

One of the most important challenges in any analysis is the extent to which exceptions or exemptions can be made to non-discretionary procedural and substantive rules. That is, if those being regulated can easily or systematically be given approved exemptions, then the non-discretionary features loses all practical importance. Exemptions are theoretically possible in almost all the jurisdictions under review. For example, the United States Congress has the ability to introduce "riders" to appropriations bills that can override environmental protection rules. Similarly, British Columbia firms can apply for exemptions from clearcutting requirements. Given the complexity of our current task, our study does not systematically address how common exemptions and exceptions might be – though we highlight this as a crucial area for future research. However, we do take note of those cases where exemptions are clearly defined in forestry legislation, such as occurs with clearcutting restrictions in Oregon in Washington. In both Oregon and Washington, clearcutting limits are 120 acres (48.6 hectares). However, regulations also state that permission may be granted for clearcuts up to *but not exceeding* 240 acres (97.1 hectares). In this sense, these states go further than most places that permit

exemptions, since they limit what the exemptions can do. So, while Washington's and Oregon's maximum limits are 240 acres, it would be misleading not to include the 120 maximum limits, which are the most comparable to policy measures in other regions. Future research is needed to explore how often the 240 acre exemptions are used, compared to exemptions granted in other jurisdictions.

Table 2 Matrix of four policy styles

	Discretionary (not required)	**Non-discretionary (required)**
Procedural (systems-based)	*Procedural flexible*	*Procedural inflexible*
Substantive (performance-based)	*Policy specification flexible*	*Policy specification "stringent" (inflexible)*

Adapted from Cashore (1997)

Recognition of these distinctions is not to argue that one approach is necessarily better than the other, since each have possible advantages and disadvantages. For example, the "stringent" (non-discretionary/substantive) approach provides those not directly involved in forest management with the most certainty regarding the resulting behavior of the forest manager (assuming adequate enforcement capacity, an issue we turn to below). On the other hand, inflexible policies dictated by government leave little room for adaptation to diverse environmental and social conditions on the ground. Furthermore, non-discretionary substantive approaches are generally not receptive to local knowledge or local concerns, and may discourage innovation or creative "win win" solutions on the part of industry and other stakeholders. On the

flip side however, "procedural flexible" approaches (Porter and van der Linde 1995) may allow for innovation, but also permit intransigent forest managers to maintain inadequate environmental standards (Sharma 1998) (see Appendix A).

These distinctions between discretionary and non-discretionary rules, and between procedural versus substantive rules, have been at the heart of environmental-industry conflicts governing environmental policy around the world. For example, conflicts over endangered species protection on federal lands in the US have often centered as much on the appropriateness of different policy approaches to achieve habitat protection, as they have on the end goal of conserving biodiversity (Cashore 1997; Hoberg 1997, 1993; Cashore 1999). US environmental groups have increased their level of influence on forest management by using federal statutes, including the National Environmental Policy Act, the Federal Advisory Committee Act, the Endangered Species Act, the National Forest Management Act, and the Clean Water Act, as a means to increase the number and prescriptiveness of policies governing US national forest lands (Hungerford 1994, 1994; Yaffee 1994; Yaffee 1982; Sher and Stahl 1990).

The command and control approach, while often effective in improving natural habitat (Kohm 1991) and reductions in harvesting on US national forest lands (Hoberg 1993, 1993; Cashore 1997, 1999), has been criticized for being highly bureaucratic, for fostering adversarial relations among government officials and industry leading to "bomb proofing" at the expense of long range planning (United States. Congress. Office of Technology Assessment 1992: 65), for reducing industry innovations that could lead to increased environmental protection (Cashore and Vertinsky 2000), and above all, for burdening industry with increased costs (Northwest Forest Resources Council and Counties 1991; Evergreen 1994; Lippke and Oliver 1993; Flick, Barnes, and Tufts 1995; Flick 1994).

Perceptions of appropriate policy approaches may vary depending on the type of land ownership in question. Some argue that a command and control approach is inappropriate on private lands, given the dangers of creating perverse landowner incentives. For example, prescriptive rules governing endangered species protection could induce forest managers to destroy forested habitats in order to prevent endangered species from inhabiting their property (Zhang 2001; Polasky 1998). These concerns, in the US and elsewhere, have often led to a different type of policy development regulating private forest lands, with fewer mandatory provisions than found among the policies governing public forest lands.

In recent years there has been an increasing interest in "results based" approaches to environmental management in which governments encourage compliance with a desired forest management outcome – such as maintaining a forest in its original condition or ensuring that a stream continues to provide adequate habitat to aquatic flora and fauna. This approach still requires governmental regulation, which makes the previous discussion's emphasis on discretionary/non-discretionary and procedural/substantive highly relevant. We still need to know whether a specific outcome is required or suggested, and we still need to know whether the approach focuses in developing systems (such as telling forests owners to develop a policy), versus requiring adherence to a specific and detailed measure (such as maintaining a specific streamside temperature).

The main difference with a results based approach is that government can be very specific regarding the outcome, and still give *flexibility* in how to achieve this requirement – a significant departure from inflexible "command and control" approaches (see Appendix A). In this sense, this "smart regulation" (Gunningham, Sinclair, and Grabosky 1998; Gunningham and Sinclair 2002; Gunningham, Grabosky, and Sinclair 1998) approach offers the potential of

reversing the usual relationship between specific behavioral requirements and low innovation (Appendix A), permitting a high degree of innovation in terms of how to achieve a particular regulatory objective, but little or no flexibility in shaping the objective itself.

From the perspective of policy analysis, results based approaches need careful review to determine precisely what management behaviors are required, and what degree of discretion, if any, is involved in the determination of adequate compliance. Arguably, for results based codes to deliver on their promise of combining environmental protection with field-based innovation, they require objectives that are particularly clearly defined, with very well-articulated measures of success (verifiers).[7]

Hoberg (2003), drawing on Coglianese and Lazer (2002), has hypothesized that the results based approach can be used best when problems are straightforward and relatively homogenous, but may be less suitable to complex situations:

> When objectives are easily measured, performance-based [results based] regulations are desirable. Since operators usually have superior information about how best to achieve a particular result, performance standards can be more cost-effective. When objectives are not easily measured, however, policy makers are more likely to rely on practices regulations that they believe will adequately protect the value of concern... However, when the problems confronting managers are highly diverse, uniform practices or performances regulations are likely to be ineffective. In this case, compulsory management planning might be the best alternative. It allows operators to tailor forest practices to distinctive local circumstances.

The reality is that a mixture of approaches is often used, and as Hoberg (2003: p. 4) has noted, "The challenge for policy makers is to adopt the most appropriate approach, or mix of approaches, for the conditions they face." Little work has been done yet to subject these hypotheses to rigorous testing. Analysis of such "smart regulation" (Gunningham, Grabosky, and Sinclair 1998; Gunningham, Sinclair, and Grabosky 1998; Gunningham and Young 1997;

Gunningham and Sinclair 2002; Gunningham, Kagan, and Thornton 2003) approaches require careful attention to the identified "results" thresholds to understand whether and how such an approach might be an improvement over traditional behavior-focused regulatory approaches.

Our analysis provides the foundations for such work by carefully identifying just what approaches are used in different jurisdictions according a range of measures, rather than simply assuming a certain approach will be taken.

5) Data collection methods

Data collection consisted of a three-step process. We first developed a template covering a range of policy components and other key background indicators that were deemed important to forestry and forest management (Appendix B). We then chose our case study selection criteria and key environmental forest policy specifications from among these criteria on the basis of their environmental importance as well as significance in current forest management debates. We then used this template to begin our comparison for the four empirical chapters of this report and teased out key indicators for which information was available and easily quantified. Our approach is not meant to address every indicator of importance (a nearly impossible task), rather we hope our approach will challenge others to conduct research on indicators outside the scope of this study.

Once the case studies and policy criteria were selected, we then identified secondary and unpublished literature that might shed light on our research. We gathered as much primary documentation as possible on relevant statutes, regulations and guidelines relating to our forest policy criteria and indicators. Forestry experts were consulted in many of the case study countries as necessary to obtain the required information.

Once a full draft was complete, we conducted a peer review process involving scholarly experts and members of the forest policy community familiar with our different case study jurisdictions. Peer review comments and our responses are summarized in an appendix to this report.

IV. Key Policy Specifications

The following sections describe our five precisely defined forest practice criteria and associated indicators, describing why each is important for forest management, as well as the complex challenges involved in designing appropriate regulations.

1) **Riparian zone management** (Indicator: Riparian buffer zone rules)

Riparian areas play a key role in the maintenance of global biodiversity. Twelve percent of the world's fauna live in fresh water, and scores of terrestrial species are dependent on the waters and biological productivity associated with riparian ecosystems. For example, of the 1,200 species on the US endangered species list, half depend on rivers and streams as critical habitat (WWF 2003). At the same time, the high productivity of riverine areas makes riparian zones greatly valued for timber production, leading to extensive conflicts among forestry stakeholders over the appropriate degree of protection needed to promote sustainable watershed management.

Research scientists have conducted numerous studies examining the impacts of forest management on riparian ecosystems (Williamson, Smith, and Quinn 1992; Semlitsch and Bodie 2003; Parkyn et al. 2003; Quinn et al. 1992; Belsky, Matzke, and Uselman 1999; Kauffman and

Krueger 1984; Tschaplinski 2004). These studies have variously demonstrated the ecological importance of shade, coarse woody debris, nutrient levels and other variables associated with forests and/or other vegetation along streambank channels. While forest practices clearly influence the health of aquatic ecosystems, much remains to be learned about the exact mechanisms by which they do so, and the best means to mitigate the impacts of forestry activities (Parkyn et al. 2003).

The protection of trees in buffer zones has been shown to play an important role in moderating stream temperatures, reducing siltation, and stabilizing stream channels as well as influencing in-stream nutrient cycling (Nilsson and Svedmark 2002). In a study of nine managed riparian zones in New Zealand, Parkyn et al. found that water temperatures were the most significant determinant of macroinvertebrate diversity. These authors concluded that "restoration of in-stream communities would only be achieved after canopy closure, with long buffer lengths, and protection of headwater tributaries (2003)."

While there is considerable evidence to support the need to preserve trees near watercourses, the means for doing so, and the appropriate amount of protection in multiple management contexts remains an open question facing policy-makers worldwide. The difficulties begin with defining the extent of the riparian zone: while its physical structure is defined by vegetation species composition and structural diversity, its functional attributes depend on the integration of the environmental setting with the biotic community (Loftin et al. 2001).

Despite these complexities, the establishment of mandatory buffer zone widths represents a simple quantitative and standardizable regulatory tool for protecting aquatic environments. In other words, the buffer zone concept lends itself well to the creation of "stringent" (non-

discretionary substantive) policy approaches. Reflecting a general preference for mandatory substantive regulations, many environmental groups have supported the expansion of standardized buffer zone widths and the extension of buffers to small fish bearing streams and non-fish bearing streams (Sierra Legal Defence Fund 1997).

For the purposes of this comparison, we have chosen to focus on buffer zone widths and management restrictions within buffer zones as they related to harvest and/or removal of riparian flora. Our analysis is specifically concerned with the presence or absence of "no harvest" zones and special management zones, and the relative sizes of those zones across jurisdictions. We do not, however, engage in-depth comparisons of the various management restrictions imposed within special management zones.

As will become clear in the empirical chapters of this report, the comparison of buffer zone regulations is actually quite a complex challenge. While it is relatively simple to determine whether or not buffer zones are required, the complexity of criteria used to classify streams and determine appropriate buffer sizes serves to defy simple cross-jurisdictional comparisons. Likewise, it is relatively easy to compare cases where streamside buffers involve "no harvest" restrictions, but much more difficult to compare the wide diversity of other restrictions placed on forest management activities in streamside management zones.

Our focus on the establishment of buffer zones is meant to serve as an indicator of policy approach. It is not intended to represent a thorough assessment of the range of regulatory requirements which may influence the viability of terrestrial and aquatic species dependent on riparian habitats. Other factors relevant to streamside protection include management practices abutting the riparian zones (for example, clearcutting or single tree selection, road-building or helicopter logging), the seasonal timing of harvest, terrain variability, climate, and the spatial and

temporal distribution of forest buffers along stream channels and throughout entire watersheds and landscapes (Naiman, Bilby, and Bisson 2000; Parkyn et al. 2003). Again, all of these factors represent important areas for future research.

2) Clearcutting (Indicator: Clearcut size limits or other relevant cutting rules)

One of the most controversial and highly scrutinized forest harvesting practices is that of even-aged management – commonly referred to as "clearcutting"[8] (American Forest and Paper Association 1994). Clearcutting remains the most dominant forest harvesting method in temperate and boreal forests worldwide (Kimmins 1992: Chapter 6, pp. 73, 76), although its application in many countries has been reduced in recent years (Natural Resources Canada 2000)(Adbusters 1998; Lavoie 1994; The Forestry Source 1999; Travers and Dougherty 2000)(Robertson 1992). This decrease may be due to the ongoing concern about clearcutting's negative impacts on forest ecosystems (Franklin and Forman 1987), the visual impacts of clearcutting (Wood 1971),[9] the corresponding societal criticisms (Bliss 2000), and resulting international boycott campaigns (Stanbury, Vertinsky, and Wilson 1995; Bernstein and Cashore 1999).

The argument for clearcutting as a legitimate component of sustainable forestry in certain situations is made by Hamish Kimmins (1992: Chapter 6, p. 72). According to Kimmins, in certain forest types clearcutting "…satisfies most closely the ecological requirements of the young seedlings of the tree species to be grown as the next timber crop" (*ibid*, p. 76). He clarifies, however, that it is not an appropriate method in forests on steep slopes or near water supplies, nor for supporting species that depend on older trees and forests. Kimmins' work points to the need to assess clearcutting regulations in light of the type of forest ecosystem involved.

The argument that clearcutting can be used if it mimics natural disturbances has been made by many researchers and foresters, although opposition to this premise exists. Franklin et al. (Franklin et al. 1999) contend that, compared to fire and wind disturbances, clearcuts have a significantly lower number of snags and woody debris retained, and a higher level of soil disturbance. Some researchers in Scandinavia contend that using clearcutting to mimic the natural disturbance in their region (fire), is not an appropriate approach (Spence 2001). Kimmins states that

> "Further ecological research is required before we can design optimum management-caused disturbance regimes that will emulate the desirable effects of natural disturbance. For many northern forests, existing data suggest that the optimum disturbance is provided by clearcutting, while in others, partial cuts produce the appropriate levels of disturbance (*ibid*)."

As a response to the clearcutting controversy, alternatives have developed. The practice of using smaller clearcuts, known as "checker boarding," can occur when regulations restrict the size of clearcuts. Research has shown that checker boarding can lead to increased road building (Franklin and Forman 1987), and excessive amounts of forest edge (Chen, Franklin, and Spies 1992), which further exacerbate clearcutting's ecological impacts. This has led to management recommendations that small clearcut patches be avoided (Franklin and Forman 1987).

There are other factors besides size that influence the impact of clearcuts. For example, forest practice regulations may include restrictions on forest rotation ages. "Adjacency" requirements are also a common means to regulate clearcutting by restricting harvest in areas adjacent to clearcuts for specified time frames, or until tree regrowth in the clearcut area has reached specified heights. The shaping of a clearcut, and sensitivity to slope contours also are factors that influence the environmental impacts of clearcutting. Even the definitions of the terms

"clearcut", versus "uneven-aged management" are neither standardized nor static. It is becoming increasingly common to require the retention of individual trees and/or snags or groups of snags and seed trees within a cutblock (Jackson 2004). This latter practice can lead to conflicting data on the extent of clearcutting, since there is as yet no universal agreement on the level of tree retention that divides "clearcutting" from "uneven aged management".

Thus scientific evidence, together with the sheer complexity of managing forested ecosystems, has led some forest policy analysts to strongly criticize those calling for a complete end to clearcutting. Clark Binkley, former Dean of the University of British Columbia's School of Forestry and current senior vice president of Hancock Resources Group, has asserted that the "no clearcutting" complaint "reflects an extraordinarily narrow and simplistic view of forest ecology" (Binkley 1999). Other analysts have a different take – arguing that even if scientific evidence reveals that clearcutting can be the most appropriate environmental harvesting method in some cases, clearcutting should nonetheless be ended in order to reflect societal pressures (Bliss 2000).

Our purpose in this study is not to take sides on the debate over clearcutting. Rather, given the knowledge that cutting patterns are a complex issue of environmental importance, we have chosen to include clearcut size limits as an indicator measuring the policy *approach* of our case study governments' regulation of forest practices.

We make an exception to our use of clearcutting as an indicator of policy approach, however, in the case of the tropical case study countries. Clearcutting is not a common method of forest harvest in tropical rainforests. The reasons for this are various. From an economic standpoint, the very high level of tree species diversity in tropical countries has served to preclude the development of markets and processing capacities for many tropical tree species.

This issue of species utilization has also presented challenges for forestry in temperate countries. However, the relatively lower species diversity in temperate and boreal forests, combined with concerns about "highgrading" (i.e. removal of the highest quality timber leading to forest degradation), has promoted the development of markets for most Northern tree species. While highgrading is a concern in the tropics as well, the tremendous diversity of tree species makes the development of markets for lesser valued tropical species particularly problematic.

Tropical forests are also distinct in their reproductive patterns. Many of the most economically valuable tropical tree species require relatively small forest gaps to obtain adequate sunlight for regeneration. The creation of larger forest openings often results in the invasion of pioneer plant species that "out-compete" these more shade tolerant trees. At the same many tropical tree species require specialized pollinators and fruit relatively infrequently. Combined with the relatively low density of any one given species in many tropical forests, it is therefore of critical importance to ensure that enough specimens of a given tree species remain available at all times for the purposes of cross-pollination. Preservation of individual plant species is also critical for the maintenance of beneficial root fungi, as well as for the survival of diverse pollinating and seed dispersing fauna [Sist, 2003 #1439].

As a result of these and other economic and environmental factors, very different prescriptions are found in the regulatory context of managing tropical rainforests than are typical of northern forestry. In Southeast Asia, for example, "minimum diameter cutting limits"[10] are a common form of substantive regulation (Sist et al. 2003). Our response to these contextual differences, is to measure the policy approach of tropical countries in terms of the presence or absence, and the substantive or procedural nature, of "cutting rules" that shape harvest patterns.

6) **Roads** (Indicators: Culvert size at stream crossings, Road decommissioning)

Road building has been described as one of "the main causes (of) the environmental degradation of most forest regions" (Spinelli and Marchi Not dated). The impact of poorly built roads on soil and slope stability, water quality, and landscape productivity can be devastating. The environmental impact of roads can be reduced by using environmentally sensitive road-building methods, as well as by limiting the extent of road networks. The larger the road network, the greater the soil disturbance, decreased permeability, risk of erosion, slope failures and siltation of waterways. The effects of road access vary by region and country. In Idaho, for example, the introduction of roads has been closely correlated with high grizzly bear mortality, due in to such factors as hunting, road kill and human-bear encounters (Boyce and Waller 2003)[Carroll, 2001 #7]. In Amazonia and many other areas in the tropics, forest roads first built for mining or logging, often serve to open forests to migrant farmers, poachers, or drug-runners, leading to further forest degradation (Laurance et al. 2002).

Given the vastly different development histories of our case studies, as well as the difficulties of locating consistent and accurate data, this report does not provide a quantitative comparison of road densities across cases. Instead, this study systematically compares specific standards addressing the environmental impacts of road construction.

Despite the environmental risks that roads engender, roads do provide an important means of access not just for timber harvest, but also for rural populations, as well as for fire protection, forest maintenance, recreation, and other social needs. This study, therefore, examines regulatory means for reducing the negative impacts of road networks.

Clearly the appropriateness of particular road building standards depends in part on local conditions such as soil stability, watershed health, topography and climate. However, we have chosen a set of policy indicators that we believe provides a degree of meaningful comparison somewhat independently of the environmental variability between our case study sights. The two chosen indicators are: culvert design at stream crossings, reflecting the environmental significance of road-stream interactions [Lanes, 2002 #242], and road decommissioning, reflecting the potential impacts of abandoning roads without stabilizing soils and drainage (Lugo and Gucinski 2000).

a) Culvert Design

Our first indicator, culvert capacity, is a critical factor influencing fish passage and soil stability at stream crossings. A key issue is whether culverts are designed, and of adequate diameter, to accommodate stochastic flood events. Regulations and guidelines, therefore, often set the level of acceptable risk by specifying the "peak flow" levels for which the culvert must be designed. Peak flow refers to the maximum flood level likely to occur over a defined period of time. For example, culverts designed for 50 year peak flow would be built to withstand the maximum flooding expected over a 50 year period. A 100 year peak flow requirement would generally result in yet larger-sized culverts designed to accommodate maximum flood levels expected within a 100 year period. Some jurisdictions may establish standardized minimum culvert diameters in addition to, or in place, of peak flow specifications.

b) Road Decommissioning

Roads that are left in place once logging is completed may lead to erosion and stream sedimentation, and facilitate poaching and other human disturbance. The decision of whether or

not to decommission, i.e. permanently close, a road, however, depends on many factors, such as the likelihood of future forest management activities, and/or the importance of the road to local communities, tourism operators, etc. Our study, therefore, does not assess the ways in which different jurisdictions determine which roads should be permanently removed from the transportation network. Instead, we identify whether or not there are standards governing the treatment of roads that will be permanently abandoned.

4) **Reforestation** (Indicator: Requirements for reforestation, including specified time frames and stocking levels)

Without an explicit directive to re-establish forests on areas that have been logged, many previously forested areas are at serious risk of permanent conversion to non-forest use. In the tropics, forests are often logged and then converted to agricultural or ranching uses. In temperate regions the conversion of forests for residential development can be a major obstacle to the maintenance of healthy forest ecosystems.

A less extreme problem is when logged forests are left to regenerate on their own and fail to do so adequately. While natural regeneration is often seen as the "ideal" in many ecosystems – particularly tropical ecosystems where soils tend to be nutrient-poor – forests that are logged do not always regenerate effectively. Reforestation, timed properly and using appropriate species (e.g. shade- or sun-tolerant), can mitigate against this. Reforestation can also offset some of the negative ecological consequences of low levels of biological legacies (such as snags and downed wood) that result from many harvesting practices (Franklin et al. 1999).

Increasing global pressure for wood fiber also has implications for reforestation. Kozlowski (2002) contends that the natural regeneration of harvested stands cannot occur fast

enough to meet these ever-increasing fiber demands, and that artificial regeneration is key. Reforestation is thus key to relieve pressure on previously un-logged, "intact" forests.

In this report, we compare case study jurisdictions in terms of the presence or absence of rules and guidelines aimed at reforestation. In addition, we examine the presence or absence of specified time frames within which reforestation must occur, as well as the presence or absence of quantitative stocking levels (i.e. stems per hectare) used to measure adequate reforestation. Again, the focus is on identifying the policy approach towards reforestation, rather than providing an exhaustive analysis of reforestation policies. We do not, for example, examine regulations governing the mix of tree species that may be planted. Some jurisdictions may expressly require the regeneration of species native to the area and some may allow the planting of economically valuable species only. The section on plantations, described later in this chapter, provides some discussion of regulations governing the use of exotic tree species.

5) **Annual Allowable Cut** (Indicator: Cut limits based on sustained yield)

The annual allowable cut (AAC) is the total volume of timber that may be harvested within one year. In some countries, AACs have been established for public lands only, in others, private lands may also be subject to cut limitations. In yet other cases, there may be no policies regarding AAC at all. The method chosen to calculate the AAC depends on the goal of forest management, which may range from simple profit maximization, to the achievement of long-term "sustainable" timber production, to ecosystem restoration or the maintenance of biodiversity. Establishing the end goals, however, is only the beginning of the challenge. Once such end goals are established, there is clearly room for debate as to how best to achieve those goals (Johnson 1993).

The concept of "sustained yield" underlies many AAC calculations, and can be traced to the "German school" of forest management which emphasizes a rational, scientific, and professional approach to forest management (Aplet et al. 1993; Johnson 1993). The German school of forest management was brought to North America by Gifford Pinchot (Pinchot 1987), a man educated in Nancy, France, who has often been credited as the "founding father" of professional forestry in the United States. Initially, the use of sustained yield calculations in North America and elsewhere was focused on the sustained production of timber. More recently, however, supporters have argued that sustained yield methodologies provide a rational and systematic means for addressing multiple-use goals as well. Regardless of the future direction and scope of sustained yield calculations, the general concept of sustaining timber flow over time has had a profound effect on professional forestry in most Western industrialized countries.

Within current conceptions of "sustained yield", there are two distinctly different approaches commonly employed the world over. These approaches are: 1) maximum sustainable timber production, and 2) "non-declining even flow". Some critics have argued that there are important differences between these two approaches, rooted in the growth patterns of trees and forest stands. Growth rates over the life of a tree approximate an "S-curve", with relatively slow growth at seedling stage, followed by rapid growth during stem exclusion and finally a tapering off as maturation is reached (Nyland 1996). Calculating the AAC to maximize timber production (i.e. the mean annual increment), therefore, requires removing "over-mature" trees and replacing them with younger, faster-growing stands. In the process of old growth conversion, a timber "fall-down" may occur between old growth depletion and the regeneration of new, faster growing "second growth" stands (Wilson 1998; Tindall 1996; Tollefson 1998).

The concept of "non-declining even flow", in contrast, involves the calculation of sustained yield volumes that remove the possibility of temporary harvest "fall-downs". In order to achieve non-declining flow within regions with significant old-growth timber, it is necessary to slow the conversion of old growth and thereby sacrifice a certain percentage of the maximum possible harvest volume. If the "fall down" argument is accepted, those advocating a "non-declining even-flow" approach on forests that contain mostly old growth forests would have to make more significant downward reductions than those places where most of the old growths forests have already been harvested.

The prediction of long-term timber yields is a matter of considerable debate, however. In jurisdictions with large tracts of old growth forests, such as our constant case comparison of Canada, there is little agreement as to the anticipated growth rates of younger stands. Debates abound over the appropriate "weighting" of valued non-timber resources and services, such as species habitats and recreational forest uses. Practitioners, scholars and advocates vary in their tolerance of risk. Environmental risks are implicit in actions based on imperfect calculations of future natural and/or man-made disturbances and catastrophic events. In fact, our limited knowledge of ecosystem structure and function is itself viewed by some as a reason to reduce timber harvest levels, in recognition of our overall uncertainty regarding the long-term sustainability of even so-called "best management practices".

Given the complex and controversial nature of AAC policy, we have chosen to limit our analysis to a few key indicators, leaving ample room for future research and discussion on the topic. The indicators we will systematically explore are: 1) whether case study countries include <u>any</u> limit on timber harvest, and if so, what general factors forest managers are required to consider in calculating those limits; and 2) whether or not AAC determinations are based on the

concept of sustained yield, and, if so, whether the maximum timber production or non-declining even-flow approach is used.

V. **Plantation management** (Indicator: Rules pertaining specifically to intensively managed forest plantations)

The last few decades have seen the rapid growth of intensively managed planted forests, generally referred to as "plantations" in numerous countries worldwide. While the definition of plantations varies significantly among countries and agencies, and often changes from year to year (Carle and Holmgren 2003), the definition provided by the FAO in their Forest Resource Assessment conducted in the year 2000, provides useful guidance. Plantations are defined in this assessment as "forest stands established by planting and/or seeding in the process of afforestation or reforestation. They are either of introduced species (all planted stands), or intensively managed stands of indigenous species, which meet all the following criteria: one or two species at planting, even age class, regular spacing" (FAO 2001).

From both an environmental and a social standpoint, debate is considerable over the pros and cons of plantation forestry. On the one hand, the intensive production of wood fiber "crops" may be viewed as a means to reduce pressures on the world's remaining natural forests (Binkley 1997; Rosoman 2003). On the other hand, plantations are often associated with a lack of biological diversity, a lack of vertical structure, dependence on chemical inputs and, sometimes, the use of genetically modified organisms or exotic species.

Whatever their pros and cons, however, the environmental, social and economic influence of plantations is substantial, and therefore deserving of attention in any analysis of environmental forest policies world-wide. In this report we examine what distinctions, if any, our

case study jurisdictions have made between forest policies addressing natural forest management and policies governing intensively managed tree plantations. We also provide some discussion of regulations governing the use of exotic tree species.

VI. **Biodiversity** (Indicators: Protection of species at risk, Protected areas)

1) Protection of species at risk

The complexity of issues embedded in the concept of "biodiversity", and the matching complexity of policies designed to address it, make it difficult to determine which pieces of legislation should be examined for a comparison among states, provinces and countries. Indeed, all of the rules above - from streamside riparian management to clearcutting sizes - have, as part of their concern, the issue of incorporating species and biodiversity preservation into forest management practices (Cashore 2001). Given that all forest management decisions in some way or another affect the diversity of forest flora and fauna, any boundaries set on this policy analysis are necessarily somewhat arbitrary. We have chosen to focus our analysis on key policies that: 1) address the protection of identified endangered species and their habitat, and 2) govern protected areas. These policy instruments play central roles in biodiversity management, and also serve as indicators of the nature of a given case study's policy approach.

a) Protecting species at risk and their habitats

There are essentially two levels of species at risk policies. At the international level, agreements such as CITES limit the trade of threatened and endangered species, and multi-national agreements such as the Convention on Migratory Species (CMS) facilitate cross-border

cooperation. National-level policies, which are examined in this report, vary broadly in the extent to which they restrict the direct taking of endangered species (e.g. through poaching) and/or the protection of endangered species' habitats. Conservation biologists are in consensus that habitat loss is the single most important cause of species decline. Clearly, a comparison of species at risk protection policies would not be complete without this element.

Our analysis expressly examines both requirements for the listing and protection of species at risk, as well as the presence or absence of requirements aimed at habitat protection. The analysis includes, but is not limited to, the identification of specific endangered species acts. Since the existence of an endangered species act may or may not indicate a strong legal commitment to the protection of species at risk, care is taken to examine the scope of such acts as well as to examine other legislation that may provide equivalent levels of protection.

b) Protected areas

Although biologists have long agreed that protected areas alone will be insufficient to conserve biodiversity (Hansen et al. 1991), protected areas are, at the national level, the cornerstone of biodiversity conservation strategies (WWF 2004). In 1987, the World Commission on Environment and Development (1987) (commonly referred to as the "Bruntland report") issued a report recommending that the then four percent of the world's land base protected from commercial development be tripled. Environmental groups and other parties have pressured governments to follow through on this recommendation (Noss et al. 1998; World Wildlife Fund 1998). The latest survey from the UNEP World Conservation Monitoring Centre reports that over 11 percent of the earth's land surface now has protected area status. Many

biologists and environmental groups suggest that this should be seen as a beginning, not an end, in efforts to address and ameliorate biodiversity protection.

Protected areas have many important functions. They maintain species and ecosystems that require natural or near-natural conditions for survival, provide an "ark" for threatened species whose surrounding habitats have been quickly and drastically disturbed, and provide research opportunities for scientists and conservationists to learn lessons about ecosystems that can be used to promote biodiversity conservation elsewhere (WWF 2004).

The presence of legal protected area status is important for the effectiveness of protected areas in achieving the above functions. A recent WWF study of 200 protected areas in 34 countries found that protected areas with legal protected area status had better ecological and biodiversity conditions than those without legal status. This trend is of particular importance in areas of the development frontier (Bruner et al. 2001).

Our analysis of protection areas in this report focuses on the amount of land placed under high levels of protection, i.e. parks and wilderness areas as defined in the IUCN WCMC database. We rely on the IUCN database in our report because it is currently the only comprehensive global source of information on protected areas to date. Unfortunately, the most recent IUCN data provided on country-level protected areas dates back to 1997. Many countries have actively expanded their protected area networks since this time. We encourage IUCN and other organizations concerned with the establishment of protected areas worldwide to continue their efforts to provide a steady flow of up-to-date information on this important environmental issue.

VII. Enforcement

The issue of enforcement is simultaneously one of the most complex and important arenas of policy analysis. After all, "strictness" of forestry regulations on paper is irrelevant if they are rarely enforced; for example, a "non-discretionary substantive" policy becomes *de facto* discretionary without adequate enforcement. There are two ways of approaching any analysis of enforcement. The first approach would constitute a broad treatment that would address the capacity of governments and non-governmental organizations to monitor and enforce policy specifications, including how their social and institutional structures permit and create hospital arenas that encourage compliance and feedback mechanisms, the history and level of "corruption" that might create disincentives for those charged with enforcing laws (Hobes, Banfield, and Wolfe 2001), and a country's overall approach in implementation of international environmental agreements (Esty and Cornelius 2002). This broad approach would require addressing the important differences in access to resources that separate developing from developed countries (Nagel 2002), and the implications of this for understanding how policy will affect human behavior. The second approach is a more narrow treatment that explores the mechanisms in place for auditing forest operations. Given the enormous task the broad approach would require, we focus our review on the narrower treatment. However, we return to these broader issues in the conclusion, and identify existing and future research on these dynamics that is required to fully assess our comparative task.

With respect to forestry practices or best management practices, two main kinds of monitoring activities exist that governments might undertake. The first kind relates to verifying compliance with or implementation of forestry practices or best management practices. The

second relates to evaluating the effectiveness of the practices in achieving desired outcomes (e.g., enhanced water quality). Overall, most governments have by now recognized the importance of both kinds of monitoring activities and have taken on some sort of formal or informal programs – funds permitting – to implement them.

Because of the expansive nature of the monitoring topic and the focus of this particular report, this section focuses only on the kinds of implementation or compliance monitoring performed by the various jurisdictions being examined, and *does not examine the effectiveness of the practices in achieving the desired outcome* (See Figure One). Such a study is important, but far beyond the scope of this study. We encourage governments, industry, think tanks, and non-governmental organizations to engage their resources to carefully assess this question – a hugely important but underfunded area of anlaysis that is crucial if we are to understand and makes sense of how forest regulations impact and address environmental deterioration of the world's forests. For the purposes of this report, we review how forest practices are audited, and the degree to which forest audit records and decisions are made public. We provide a qualitative discussion of enforcement activities, but the paucity of readily available data meant that current data prevented the systematic collection of such information as annual number of routine inspections and total annual expenditures on enforcement.

VIII. Non-governmental Initiatives: Forest Certification

Any comparison of broad approaches to forest management would be incomplete without devoting some attention to forest certification, which has emerged within North American and globally as an innovative non-state market driven policy instrument with which to promote sustainable forestry. Forest certification policies and approaches are as complex and dynamic as government policy responses, meaning that a complete analysis of certification standards and procedures would require another report as lengthy as this one. The discussion of certification in this report, therefore, is limited to an overview of key trends and differences among forest certification programs, and a comparison of the differing levels of support for forest certification in our specific case study analyses.

Forest Certification as a Non-state Market Driven Approach

The idea of forest certification gained the attention of domestic and global forest policy communities following the creation of the Forest Stewardship Council (FSC) certification program in 1993 (Domask 2003; Meidinger 1997). The FSC was founded and created by an array of environmental groups, led by the World Wide Fund for Nature (WWF), social allies, and some retailers and other businesses, presenting the international stage with an innovative institutional design with which to address global forest deterioration. Forest certification was innovative because it turned to the market's supply chain, rather than governments, for policy making authority, and because it represented a change from traditional "stick" approaches such as boycott campaigns, to a focus on "carrots" in the form of *rewards* to companies who practice corporate environmental and social stewardship (Bass 1997).

The creation of the FSC sparked a number of reactions and trends. The FSC decision making structures, which did not permit direct government involvement and were designed to ensure that industry was not able to dominate policy making processes, were deemed legitimate by many environmental groups, but they were viewed with skepticism and caution on the part of forest owners (Newsom et al. 2002; Auld, Cashore, and Newsom 2002; Vlosky and Granskog 2003). Initial opposition by most industry and forest owners to FSC forest certification split in two directions: some owners came to support the FSC (such as in Sweden and the UK) (Cashore, Auld, and Newsom 2004; Boström 2003), while others helped created alternatives to the FSC.

Among the FSC-alternatives is the US Sustainable Forestry Initiative (SFI) certification program, created by the US forest industry organization, the American Pulp and Paper Association. US non-industrial forest owners have worked on the expansion and formalization of the American Tree Farm System as a means to recognize forest stewardship on private, non-industrial forestlands. The SFI and the American Tree Farm System have since developed mutual recognition of their different certification processes.

In Canada, the Canadian Pulp and Paper Association (now the Forest Products Association of Canada) supported the development of a forest certification program run by Canada's national standards body, the Canadian Standards Association (CSA) program. In Europe, many private woodlot owners support the Program for Environmental Forest Certification (PEFC, originally the Pan European Forest Certification system) (Cashore, Auld, and Newsom 2004, 2003; Raunetsalo et al. 2002; Schwarzbauer and Rametsteiner 2001). Among the remainder of our case study countries, national certification programs can now also be found in Australia, Brazil, Chile, Finland, Indonesia, Germany, Latvia, Poland, Portugal, and Sweden.

Some programs such as Brazil's CERFLOR program are seeking recognition through the PEFC system.

In addition to certification programs aimed expressly at forest practices, the long-standing international standards consortium, the International Organization for Standardization (ISO), has also created an international "Environmental Management System" certification program, entitled ISO 14001. ISO 14001 is applicable to a wide range of natural resource-based industries, including, but not limited to, forestry. According to our comparative policy framework, the ISO certification approach is procedural, or "systems-based", in that it does not set the standards for appropriate resource management but rather assesses whether or not companies have themselves established and effectively implemented their own environmental management systems.

We do not directly address forest industry adoption of ISO 14001 in this report. However, it is important to note that a number of the forest certification systems discussed have incorporated elements of ISO's "systems-based" (procedural) approach. In other words, the push and pull towards procedural versus substantive ("performance-based") approaches is a policy dynamic as relevant to non-governmental certification systems as it is to governmental regulations.

In sum, the emergence of a multitude of certification bodies applying different approaches to forest certification has created complexity in the market place for customers of forest products regarding what is an accepted forest certification system (Cashore, Newsom, and Auld 2003; Cashore, Auld, and Newsom 2004) . Supporters of many industry initiated programs have worked to create "umbrella" agreements, while the PEFC has worked hard to provide a framework for international recognition of national-based certification programs initiated by forest owner associations and others (Pan European Forest Certification. United Kingdom 2002;

Pan European Forest Certification. International 2002). Indeed, the PEFC is actually a mutual recognition of national initiatives that creates rules for membership, but permits a significant degree of national autonomy in determining standards as well as the process through which forests are certified

Some FSC supporters have responded by arguing that non-FSC programs are far too flexible (i.e. discretionary) and that only the FSC has adequate and appropriate, non-discretionary rules governing sustainable forest management (Ozinga 2001; Sierra Club 1999). Such arguments have drawn strong opposition from supporters of other certification systems, such as the small landowner-driven PEFC (PEFC Germany no date). These debates have led to a number of comparisons among programs (Meridian Institute 2001; Fletcher, Adams, and Radosevich 2001; CEPI 2001) in an attempt to identify trends and approaches. Some comparisons have emphasized that differences exist even within a given certification program. These differences may be most pronounced among systems, such as the FSC, that emphasize multi-stakeholder standard-setting processes at the regional level, leading to variation in certification standards within and across countries (Cashore, Auld, and Newsom 2004, 2003; Lawson and Cashore 2001).

Comparing Forest Certification

In this report, we restrict our analysis of certification systems to a comparison of the levels of support and influence different certification systems have achieved in each case study under review. We measure support by the amount of forestland certified under the FSC, SFI, CSA and PEFC systems. This limited and brief review is not meant as a proxy to the sophisticated and indepth research being conducted on forest certification, including, but not

limited to, the literature noted above. Rather, we conduct this brief review to provide a snapshot of what is happening *outside* of governmental regulation. In our "future research" section at the conclusion of this report, we identify how future research must carefully and systematically analyze the intersection of the new non-state forms of authority with the policy comparisons we undertake. What is important to note is that our brief overview of forest certification highlights this phenomenon, rather than providing an exhaustive account. Indeed, our review says little about the impact of certification on forest practices, and, by looking only at land certified, leads to an emphasis on the certification of large-scale industries rather than smaller-scale landowners, since the latter contribute less to "total acreage", but may nevertheless play an important role in certification's policy development. Given these limitations, we therefore encourage future research on certification to analyze certification standards in a manner similar to this report's detailed analyses of governmental forest policies. Such in-depth research on forest certification standards will contribute to an understanding of the intersection of public and private approaches to sustainable forest management.

IX. Remainder of Report

The remainder of the report proceeds as follows: Chapter Two identifies key national level indicators regarding forest management across 68 countries important to global forestry dynamics, justifies our sample of 20 countries to compare policy specifications in depth, and also identifies broad national level trends in forest condition. The remaining chapters present the empirical part of our research. Chapter Three presents the Canada-US comparison, explaining why these two North American countries are subject to the most in-depth treatment of sub-national policy development. Chapter Four compares Canada to OECD countries, Chapter Five

compares Canada to Eastern European emerging economies, and Chapter Six compares Canada to developing countries. Chapter Seven presents a summary of our results and concludes with suggestions for further research.

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[1] A sampling of literature on this topic includes: (Laurance et al. 2002; Roper and Roberts 1999; Mahapatra and Mitchell 1999; Schnitzler and Muller 1998; Myers 1996; Rawat 1995; Mehrotra 1996; Thompson 1993; Hyde, Amacher, and Magrath 1996; Holmes 2000; Curran et al. 2004; Arnold 2003; Speth 2004; Tysiachniouk and Reisman 2002; McMorrow and Talip 2001; Clapp 2001; Associated Press 2003; Environmental Protection Information Center 2001; Associated Press 2000; Curtis 1996; Berlyn and Ashton 1998).

[2] Howlett refers to these as "instrument components" (Howlewtt 2002) a term which is itself an adaptation of Peter Hall's (1993) "policy settings" label. Hall's label was altered because it caused confusion among those who treated "settings" as a synonym for the policy environment.

[3] For important exceptions see: (Hoberg 2003, 1993; Cubbage and Ellefson 1980; Ellefson, Cheng, and Moulton 1995; Salazar and Cubbage 1990).

[4] We also do not address in any systematic way the myriad of procedural approaches that have been the focus of much attention in forestry policy, including dispute resolution mechanisms, planning regulations, etc. For a review of procedural versus substantive policy instruments see (Howlett 2000). For a review of planning and procedural approaches in forest policy see (Wondolleck 1985, 1986; Wondolleck 1988; Crowfoot and Wondolleck 1991) (British Columbia. Commission on Resources and the Environment 1994, 1994; Sahajananthan, Haley, and Nelson 1998; Burrows 2002)

[5] There is a strong literature on this subject. For examples in the British Columbia and US Pacific Northwest context, see (Maulding 1999; Oregon. Department of Land Conservation and Development 1994; Shannon 1992; Forest Planning Canada 1992; Citizen Forester 1992; Vance 1990; Wondolleck 1988; Haddock 1986; Cortner and Schweitzer 1981; Wilson).

[6] For a similar, but slightly different treatment, see Hoberg (2003). Hoberg, drawing on Coglianese classifies policies according to, guidelines that "can be used to identify recommended practices", "technology- or practices-regulations" that "specify particular forest practices that must be used in certain circumstances" and "performance- or results based regulations" that "specify an outcome to be achieved rather than a specific practice."

[7] As the proponents of such an approach in New Jersey found, "Environmental indicators have become the cornerstone of results based management in New Jersey. The use of a goals and indicators system is leading to better informed decision-making in NJDEP, where we believe that if you can't measure it, you can't manage it." (Kaplan and McGeorge 2000).

[8] Kimmins defines clearcut as "an area of forest that has been completely cleared of all trees other than seedlings and occasional saplings" (Kimmins 1992: 73)

[9] The Sierra Club (Devall 1993) issued a coffee table book picturing clearcuts throughout North America. In response, Canadian and US organizations issued their own pictures – often of the same regions years later when regeneration occurred (Moore 1995) (American Forest and Paper Association 1994).

[10] Minimum diameter cutting limits are prohibitions on the harvest of trees below a pre-determined stem size.

Global Environmental Forest Policies:

Canada as a Constant Case Comparison of Select Forest Practice Regulations

Chapter Three:

Forest Policies in the United States and Canada

International Forest Resources

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Chapter 3

Forest Policies in the United States and Canada

I. Introduction

The United States and Canada are two countries with vast forest resources and globally dominant wood products industries. Forest policies in this region, therefore, are undoubtedly of worldwide significance. The total area of forest covering the US and Canada together amounts to about 471 million hectares (divided almost evenly between countries), or over 12 percent of the world's total forest cover (FAO 2003).

Chart 1 Area of non-forest, natural forest, and forest plantation (ha.) in 2000

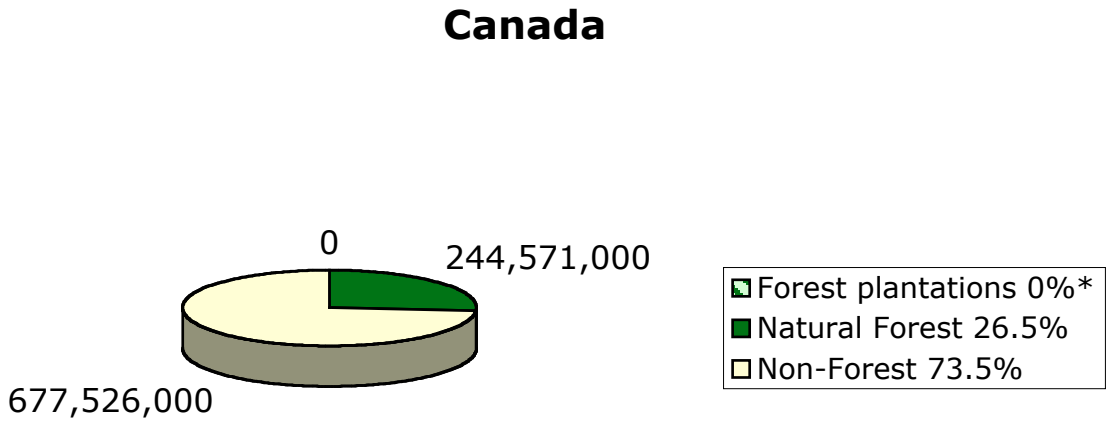
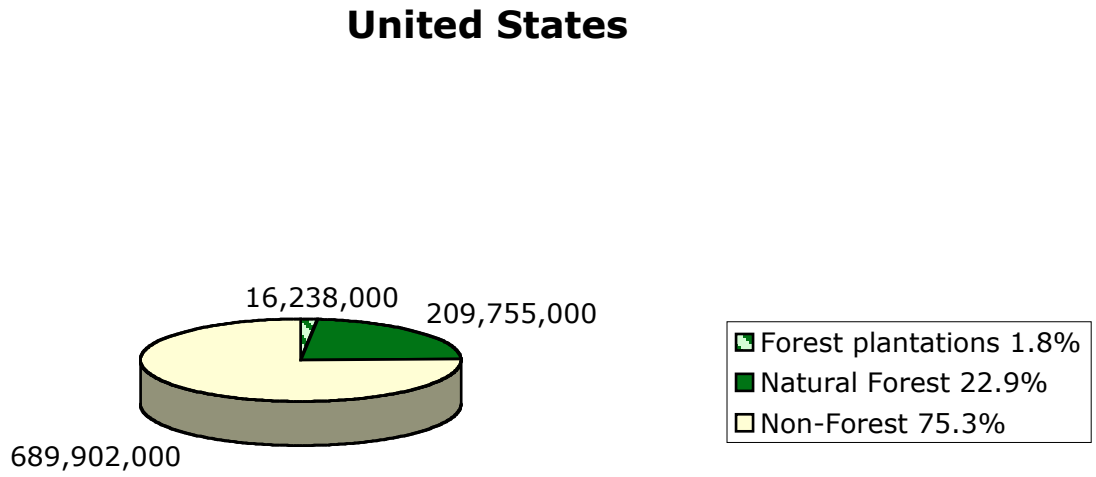


Chart 2 Area of non-forest, natural forest, and forest plantation (ha.) in 2000



Data Source: (FAO 2003)

* Note: The FAO definition of plantation is provided in Chapter 1 of this report. FAO's 2003 State of the World's Forests report claims "0" hectares of plantation in Canada in the year 2000. FAO definitions and data on forest cover differs from definitions used by individual countries. For the purposes of this project, we generally refer to FAO data when identifying global trends, and refer to individual country level data where appropriate.

The US and Canada also rank first and second in the value of their international trade in forest products (i.e. imports plus exports), with the US leading the world at $US 37.2 billion as of the year 2002 (FAO 2002).

Chart 3 International trade in forest products ($US) in 2002

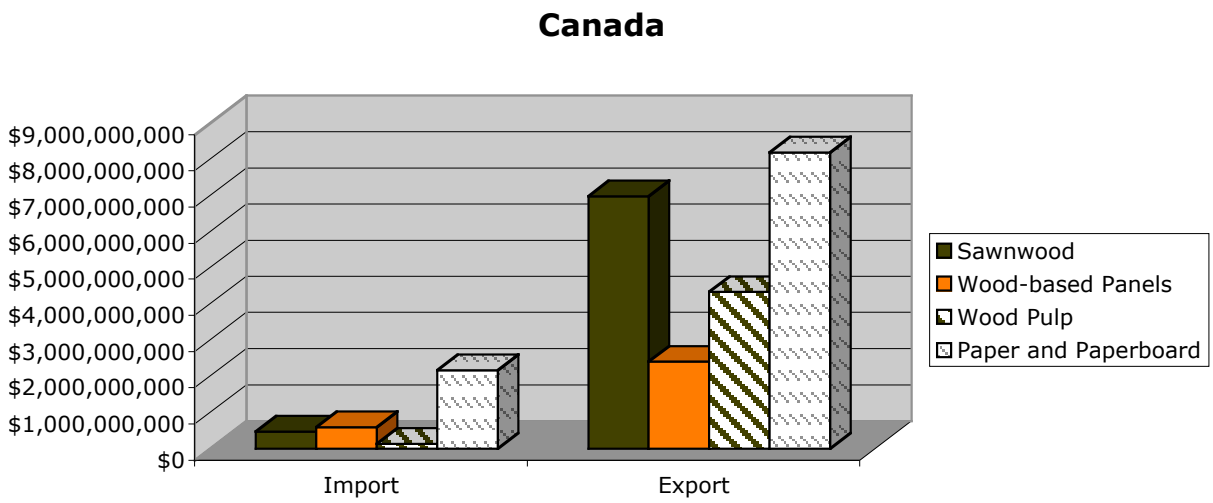
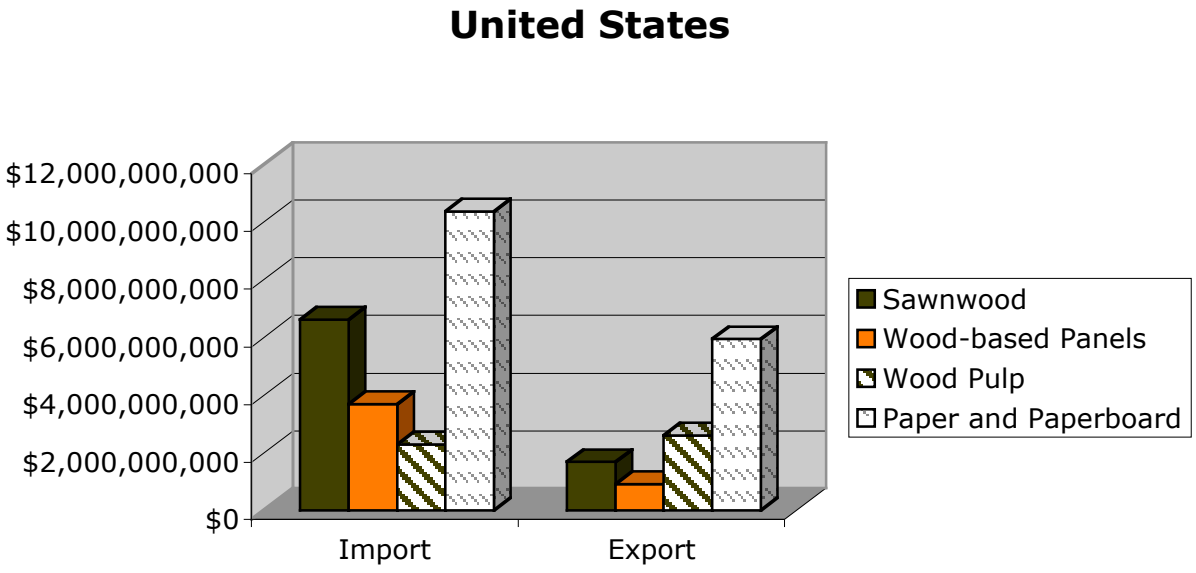


Chart 4 International trade in forest products ($US) in 2002

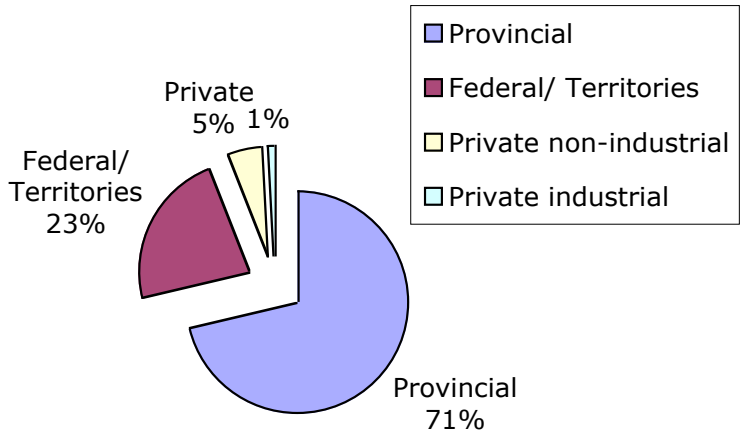


Data source: (FAO 2002)

Concurrent, although perhaps not perfectly correlated, with the environmental and economic impact of North American forestry, forest management in the US and Canada has

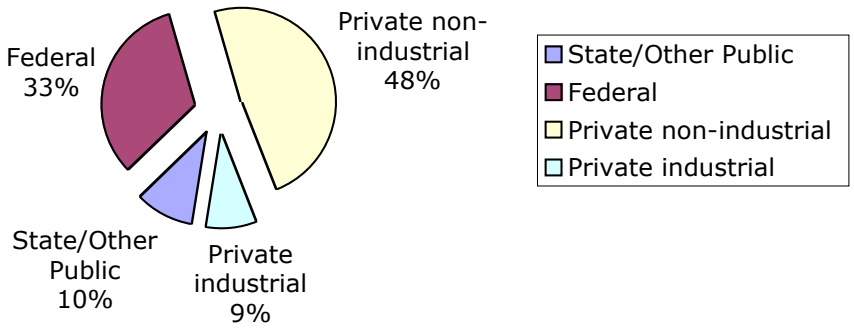
come under increasing domestic and international scrutiny. Environmental conflicts in this region, however, have tended to be unevenly distributed across diverse jurisdictions and ecological zones. For example, analyses of Canada's environmental forestry performance have often focused on industrial forest practices in the western province of British Columbia (Tollefson 1998; Wilson 1998; Cashore et al. 2001). Of the few comparisons with other jurisdictions that have been undertaken, the majority have compared BC with US national forest lands in the Pacific Northwest (Hoberg 1993; Cashore 1997; Haddock 1995). US national forest lands, however, account for only about 20 percent of total forest cover in the United States, and, in 1996, produced a total of about 5 percent of US timber harvest (United States. Department of Agriculture. Forest Service 2000). In contrast, provincial lands cover 71 percent of Canada and, in 2001, accounted for 84 percent of total roundwood production (CCFM 2003). The following charts illustrate the relative extent of all major ownership types in both Canada and the US.

Chart 5 Canadian forestland by ownership type (percent)



Data source: (CCFM 2003)

Chart 6 United States forestland by ownership type (percent)



Data source: (USDA Forest Service 2000)

If the intent of policy comparisons is to examine US and Canadian forestry as a whole, care must be taken to use the same criteria in selecting both Canadian and US case studies. Otherwise, resulting generalizations about Canadian or US forest policy may be significantly skewed. As Hoberg (1997) has noted, for example, "…the [BC/US national forest lands] comparison needs to be placed in context. BC rules are more stringent than the state government rules that regulate private lands… [in most states]… and private lands comprise both more area and a higher percentage of the harvest level than USFS lands. USFS rules would almost certainly not be as stringent if the forest economy in the US northwest was not so reliant on less regulated private lands."[1] Furthermore, failing to examine rules governing major land ownerships types, such as private lands in the US, obscures the possible effects that forest policies under one tenure arrangement may have on other tenures. Illustrating this point, a former US Forest Service Chief

noted over a decade ago that increased forest preservation on US national forest land could simply augment harvesting on private lands (Robertson 1990).[2]

1) Case study selection

For all of the above reasons, the cases studies selected for this analysis were chosen to provide a representation of forest policies governing a range of key forest habitats and timber producing regions. In total, four provinces and fourteen states were chosen as subnational case studies for this analysis. The Canadian provinces that were originally selected for constant comparison are British Columbia, Alberta, Quebec, and Ontario, which together account for 74 percent of Canadian removals and over 58 percent of Canada's forest cover. The selection of these case study provinces was made by the study sponsors. Their importance regarding forest land cover and economic value not only explain why our study sponsors identified them as important, these factors also helped us develop criteria selection for the remaining cases. Together, these four provinces contain the largest area of forest cover (excluding the non-timber-producing boreal forests of the Northwest Territories), and produce the largest volume of commercial roundwood of all of the Canadian provinces.

As described in Chapter 2 of this report, we have limited our review of forestry legislation to those categories of landownership that account for at least 15 percent of the forested landbase and/or account for at least 15 percent of production. About 92 percent of forest land in the Canadian case study provinces is under provincial ownership. In 2001, this provincial land accounted for 86 percent of the production (i.e. of the net merchantable volume of roundwood harvested) within the four provinces (CCFM 2003). Hence the majority of our analysis addresses forest policies on provincial lands only.

The one exception to our exclusive focus on provincial lands, is Quebec. In 2001, the 11 percent of Quebec's forestland under private ownership accounted for 25 percent of the volume of total merchantable roundwood production (CCFM 2003). This report therefore also includes an analysis of Quebec's private forestland regulation. Private forestlands in Quebec are regulated both by the provincial government, and also by Regional County Municipalities (RCMS) and Municipalities (Paquet and Groison 2003). Due to limited time and resources, however we do not cover sub-provincial laws in our analyses either in Quebec or any of the other case studies addressed in this report. In this report, references to "Quebec" refer to provincially owned forestlands except when the text explicitly refers to private lands.

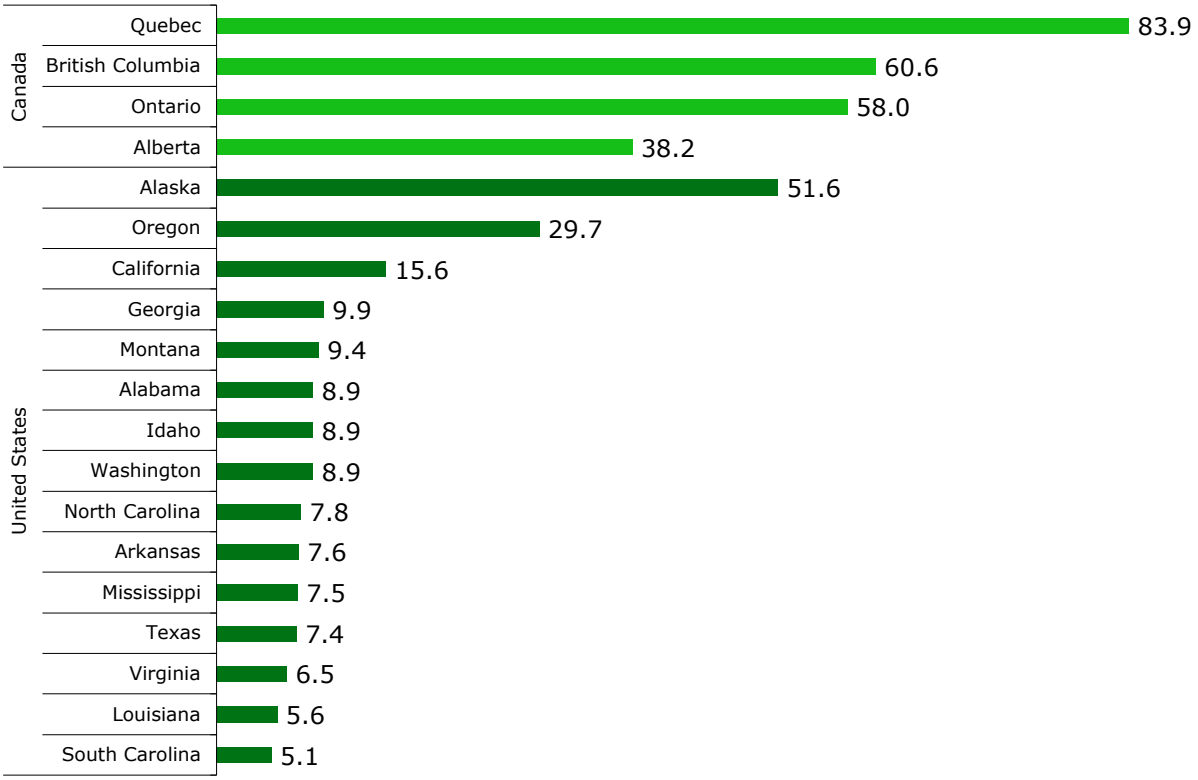
US case study states were selected to match the relative significance of the Canadian provinces in terms of forest cover and timber production. These selection criteria produced the eight top US states in forest cover and the twelve top states in volume of tree removals, yielding fifteen states in total (some states having met both criteria). These states are: Alabama, Alaska, Arkansas, California, Georgia, Idaho, Louisiana, Mississippi, Montana, North Carolina, Oregon, South Carolina, Virginia, Washington, and Texas. Together, these jurisdictions account for 74 percent of US removals and 55 percent of US forest cover. As stated above, both private and federal forestlands are included in our comparisons, since federal forestlands constitute a major ownership type in our Western case study states. In total, federal lands account for 53 percent of total forestlands in Alaska, 44 percent in Washington, 60 percent in Oregon, 54 percent in California, 79 percent in Idaho and 70 percent in Montana. In the southeastern case studies, private forestlands predominate, and account for an average of 89 percent of forest cover in each state. Federal lands in these latter states account for an average of less than 1 percent of the forest cover (United States. Department of Agriculture. Forest Service 2000)

Even though federal lands cover the largest area in the western case study states, private lands currently account for the majority of timber production in the region. In Washington and Oregon, for example, private timber production accounts for 80 percent and 85 percent of timber removals, respectively. Among all of the US case study states taken together, private lands account for 93 percent of total roundwood production (USFS. John S. Vissage 2004).[3] Due to the environmental and/or economic reach of both USFS forest policies and private land management policies in the US, therefore, we focus our analyses of the US case study states on both USFS and private forestland policies. Whenever we refer to policies of the USFS, it should be understood that these policies affect large areas of forest in the western case study states, but very limited areas in the southern states. Whenever we refer to the policies of a given state, unless otherwise noted, we are referring to policies governing private forestlands.

Given the different land ownership patterns in the US and Canada, our selection criteria thus lead us to a comparison of Alberta, BC, Ontario and Quebec *provincial* forest management and Quebec *private* forest management, with US Forest Service *federal* forest management as well as *private* forest management in select US states. We believe such comparisons across land ownership types are appropriate given our goals of comparing the most environmentally and economically significant forest policies within each state, province, and country. This seems to be a logical choice for our comparison, since forest ecosystems, and the flora and fauna that in habitat them, are impervious to who owns them, and since regulations are developed to limit environmental impacts of forestry operations. It is important to emphasize, that we are not attempting to evaluate what differences *should* exist between private and public land management policies. This point is especially important when it is recognized that regulation of private forestlands provides different challenges to governments, such as increased costs for

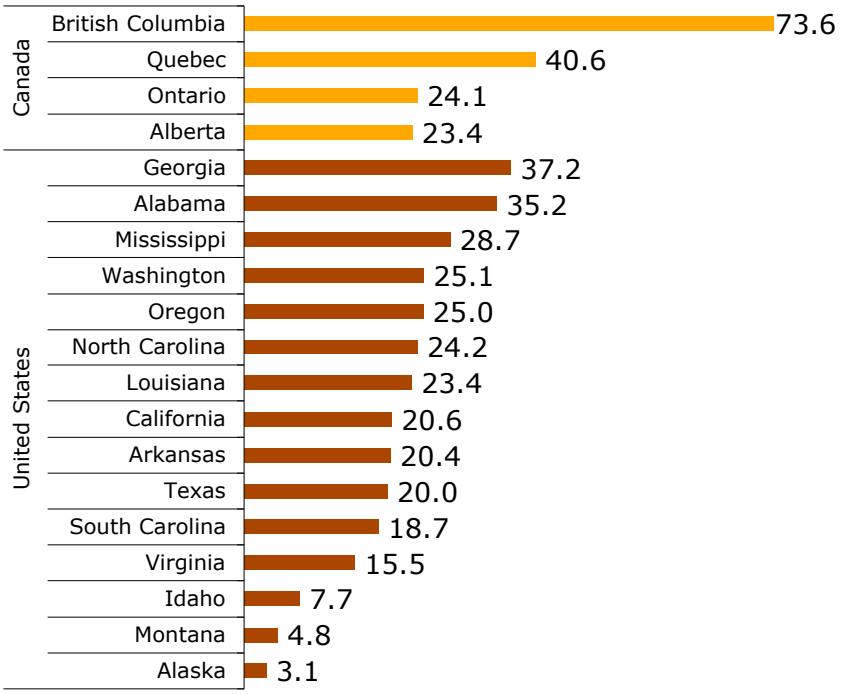
capacity building and enforcement. As a result, governments often turn to non-regulatory forms of governance, such as tax breaks and other incentive programs.

Chart 7 Forest cover of select US states and Canadian provinces (million ha.)



Data sources: (CCFM 2003; USDA Forest Service 2000)

Chart 8 Total roundwood harvest of select US states and Canadian provinces (million cubic meters)*



* The US data provided are part of the USFS' forthcoming "Forest Resources of the United States, 2002.." The data were collected over a period of several years, culminating in 2001. The Canadian data were collected in 2001.

Data sources: (USFS. John S. Vissage 2004; Canadian Council of Forest Ministers. CCFM 2003)

2) Case study comparisons

As explained in Chapter 1, the case study analyses in this and proceeding empirical chapters involve standardized comparisons of key indicators for each of five forest practice criteria. The five criteria are: riparian areas, clearcutting, roads, reforestation, and annual allowable cut. Section III discusses the status and governance of intensively managed forest plantations. Section IV addresses the critical issue of biodiversity, focusing on the indicators of

species at risk legislation and protected areas. Section V then discusses enforcement methods, and Section VI, forest certification.

This chapter concludes with a summary of the findings, incorporating the analysis of specific indicators into our matrix of policy approaches. This matrix identifies the policy approach of each of the case study jurisdictions towards each of the five forest practice criteria according to whether the rules are discretionary (voluntary), or non-discretionary (mandatory), and substantive (performance-based), or procedural (systems-based). The Table below, which was introduced in Chapter 1, defines the terms we use for our policy classification framework.

Table 1 Forest policy classification system

II. Structure	***III. Approach***
1) Discretionary	Rules encourage, but don't require, a course of action
2) Non-discretionary	Rules require a specific course of action.
IV. Method	
1) Substantive	Rules address on-the-ground changes
2) Planning/ procedural	Rules address management systems, rather than on-the-ground actions

II. Forest Practice Regulations

1) **Riparian zone management** (Indicator: Riparian buffer zone rules)

Perhaps nowhere is the debate over riparian management more heated than in the Pacific Northwest of the United States, and in British Columbia, Canada, where wild salmon stocks have undergone dramatic decline (Jankowski 2000; Pacific Fishery Management Council 2000; Washington Forest Protection Association 2000; British Columbia. Fisheries Secretariat Not dated). In the Pacific Northwest, the late 1990s saw a flurry of new rulings listing numerous salmon stocks in Washington, Oregon and California as threatened and endangered under the US Endangered Species Act. For example, in Washington alone, the National Oceanographic and Atmospheric Administration (NOAA) Fisheries, National Marine Fisheries Service in 1999 listed seven state salmon populations as "endangered" or "threatened."

A variety of forest harvest practices have been associated with the serious reductions in Coho and other salmon stock (Ketcham 1993; Northwest Renewable Resources Center 1998). However, there has been little consensus over the precise role and relative impact of forestry versus other land management activities on wild salmon populations. Other human activities that have been correlated with fish habitat declines include urban development, dams, pollution, commercial fishing, and changes in ocean temperatures (Hinch 2003; Tschaplinski 2000, 2004). As we will see in the following analysis, riparian management policies are as complex as the ecosystems they govern.

The charts below reveal several gradations of riparian zone protection that have been legislated in our case study jurisdictions. The most restrictive or "stringent" policy, is the mandatory establishment of "no harvest buffer zones." Specific buffer zone widths within which

timber harvesting is not allowed have been established for some stream classifications in British Columbia, Quebec, US National Forest Lands, Oregon, Washington, and Alaska. The second most restrictive approach is the establishment of mandatory special management streamside buffer zones, where limited harvesting can occur. Required special management zones are found in all of the Canadian provinces, USFS lands, Washington, Oregon, California, Idaho, and Montana.

On private lands in a number of US states and Quebec, state and provincial-level riparian zone protection guidelines are voluntary – what we have classified as a discretionary/substantive policy approach. Many of the streamside voluntary guidelines are referred to as "Best Management Practices" (BMPs), which were designed by state agencies, as well as Quebec, as a statutorily encouraged alternative to direct federal regulation under the Clean Water Act. In a few cases, BMP policies may be mandatory owing to other legislation. However, the implementation of BMPs generally involves agencies not directly responsible for environmental regulation. For example, the Alabama Forestry Commission (1993) states explicitly that as the "lead agency for forestry in Alabama" it is "not an environmental regulatory or enforcement agency" (ibid: 1), but "[avoids] environmental problems through voluntary application of preventative techniques" (ibid).

The following charts illustrate riparian zone rules for each of the Canadian and US case study jurisdictions. These charts reveal the wide variety of criteria used to classify streams for the purposes of establishing buffer zone widths (for example, stream width, bank slope, presence of fish, methods of timber harvest, etc.). There is also much variation in terms of the management restrictions that apply to special management zones. A "special management zone" may entail prescribed levels of tree retention, and/or prohibitions on the use of machinery, or

merely restrictions on chemical use. The charts provided, therefore, represent a simplified summary of riparian rules for the purposes of cross-case comparisons. In jurisdictions such as Washington state where riparian rules are particularly complex, we've provided as much detail as is feasible in graphic form.[4] Readers interested in more in-depth information are encouraged to consult the data sources provided.

Chart 9: Riparian protection on select Canadian provincial lands, Quebec private lands, select US state private lands, and US Forest Service lands

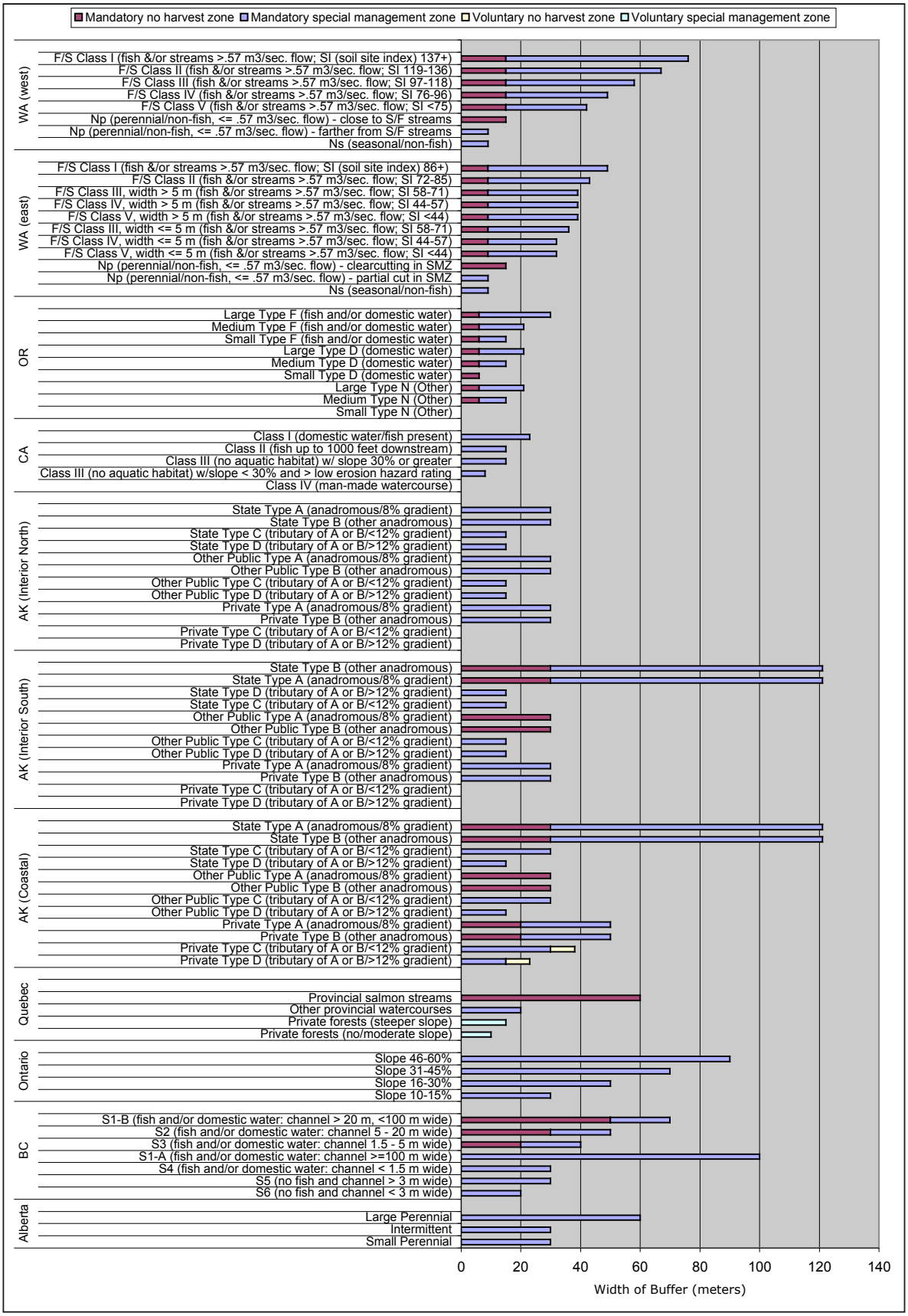
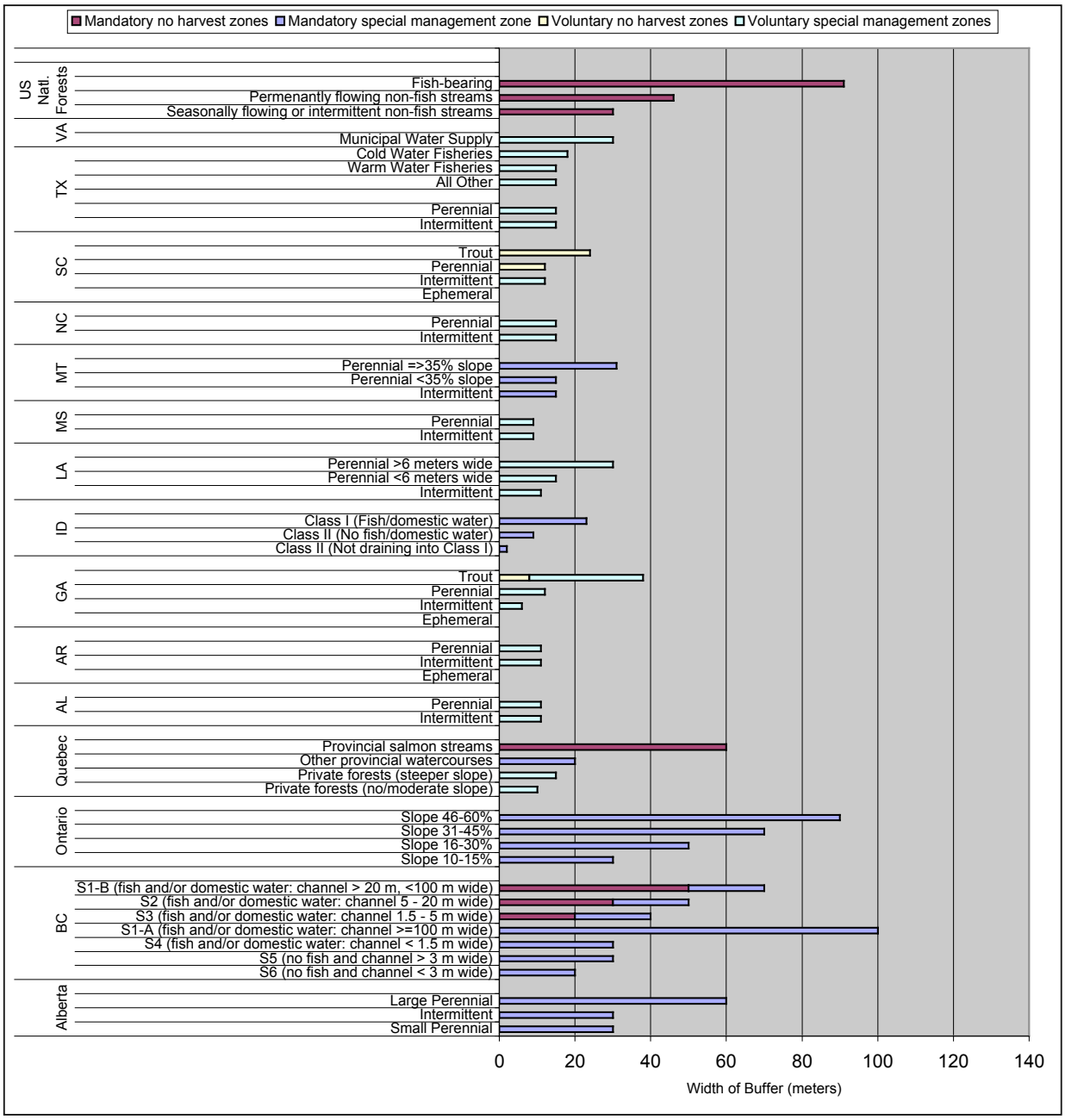


Chart 10: Riparian protection on select Canadian provincial lands, Quebec private lands, and select US state private lands



Data sources: (Alabama Forestry Commission 1993; Alaska 2000; California 2003; Arkansas 2002; Georgia 1999; Idaho 1974; Louisiana 2000; Mississippi 2000; Montana 2001; North Carolina 2003; Oregon updated in 2004, updated in 2004; Quebec 1996; South Carolina 1994; Texas 2000; Virginia 2002; Washington updated 2004, updated 2004; Decker 2003; British Columbia 2004; Ontario 1988; Paquet and Groison 2003)

The most restrictive requirements (i.e. those mandating the widest mandatory no harvest buffer zones) in order of the size of riparian zone are found in: all USFS watercourses, Quebec provincial salmon streams, and British Columbian provincial fish and domestic water channels equal to or greater than 1.5 meters wide. Other jurisdictions with no harvest buffers are Alaska's Interior (public and state lands) and Coastal regions (public, state, and private lands)[5], California, Oregon, and Washington. Washington state, together with the USFS, are the only jurisdictions where no harvest buffer zones are required on streams less than 1.5 meters, including some non fish-bearing streams.[6] In addition to these no harvest zones, all public lands under review, as well as private lands in the states of Idaho and Montana, have also established special management zones.

Private land policies that have voluntary BMPs are located in Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, Quebec, South Carolina, Texas, and Virginia.

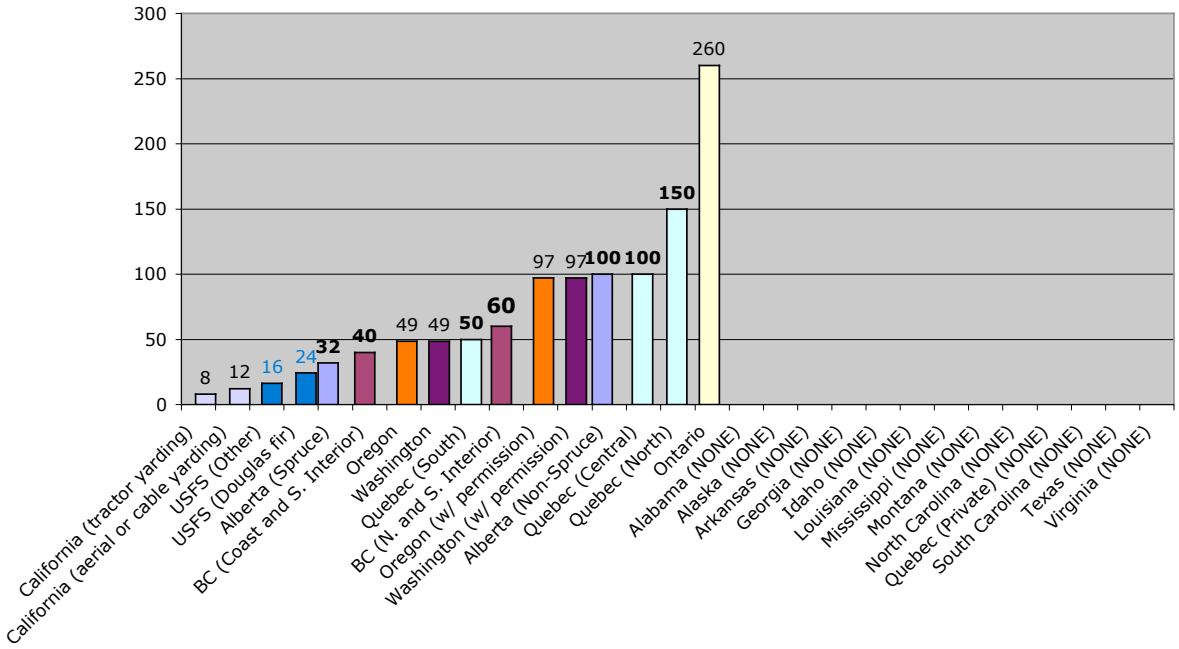
2) Clearcutting (Indicator: Clearcut size limits)

Clearcutting has been a predominate harvesting method in North America since the revolutionary advances in logging technology that occurred in the early twentieth century (Rajala 1998). Clearcutting has fallen into increasing public disfavor, with the most heated controversies centered around the clearcutting of coastal old growth forests of the Pacific Northwest. Chart 6 below reveals that a number of jurisdictions along the west coast of North America have established limits to clearcut size, including the province of British Columbia, the states of Washington, Oregon and California, and the US Forest Service. Likewise, clearcut size limits have been established for provincial lands in Alberta, Ontario and Quebec.

The two different clearcut size limits indicated for Washington and Oregon highlight the important issue of regulatory exemptions, an issue of relevance to all of the case studies and policy indicators included in this report. The Washington and Oregon clearcutting rules list both a 48.6 hectare limit, and the possibility to gain permission for clearcuts up to 97.1 hectares in size *and no larger*. In fact, most states and provinces that regulate clearcut sizes allow forest managers to apply for permission for larger-sized clearcuts, in many cases with no mandatory absolute size limits. We encourage future researchers to conduct detailed cross-jurisdictional comparisons of exemption processes, and the frequency with which exemptions are granted, in order to gain a more nuanced understanding of relative policy stringency.

Outside of Oregon, Washington and California, there are no clearcut limits on private lands in the US case study states, including Alaska, Idaho, Montana, and the Southeastern states. Likewise, no clearcut limits have been established on private lands in Quebec.

Chart 12: Clearcut size limits on Canadian provincial lands, Quebec private lands, select US state private lands, and US Forest Service lands (hectares)



Note: BC (Coast and S. Interior) = Coast Forest Region and Southern Interior Forest Region, including Arrow Boundary Forest District; Cascades Forest District; Columbia Forest District; Headwaters Forest District, except the portion of the forest district that is in the Robson Valley Timber Supply Area; Kamloops Forest District; Kootenay Lake Forest District; Okanogan Shuswap Forest District; Rocky Mountain Forest District

BC (North and S. Interior) = Northern Interior Forest Region and Southern Interior Forest Region, including 100 Mile House Forest District; Central Cariboo Forest District; Chilcotin Forest District; The portion of the Headwaters Forest District that is in the Robson Valley Timber Supply Area; Quesnel Forest District

Data sources: (Cashore and Auld 2003; Decker 2003; British Columbia 2004; Quebec 1996)

The above chart reveals that, among our case study jurisdictions and land ownership types, private lands in California, followed by US national forest lands, then British Columbia

provincial lands and private lands in Washington and Oregon, are subject to the most stringent nominal rules limiting clearcut size. The clearcut size limits on private lands in California range between 8.1 and 12.1 hectares, depending on harvest methods. Limits on US National Forests are 24.3 hectares in Douglas fir forest, and 16.2 hectares in other forest types. BC has a maximum clearcut policy of 40 hectares for the Vancouver, Nelson and Kamloops regions, and 60 hectares for Caribou, Prince George and Prince Rupert regions. As mentioned above, Washington and Oregon set limits of 48.5 hectares, with sizes up to 97 hectares possible with government approval. Alberta's rules compare with those in Oregon and Washington, while Ontario's requirements are the least restrictive of the Canadian provinces. The southeastern US states and Quebec private lands are the least stringent, with no mandatory limits on clearcut size.

3) **Roads** (Indicators: Culvert size at stream crossings, Road abandonment)

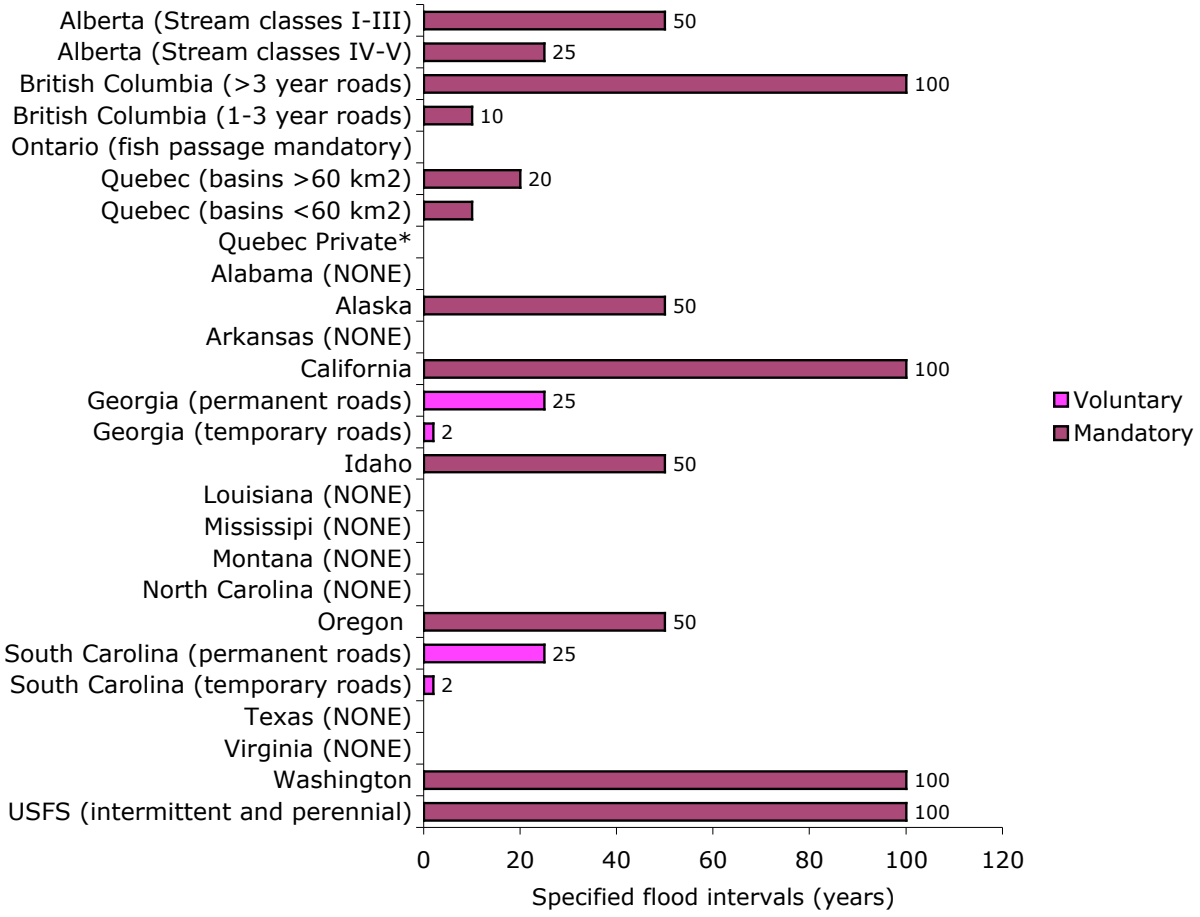
Road building has been on the forest policy agenda in Canada and the United States for some time now. Environmental groups have pressured for increased rules governing road construction and decommissioning, while professional foresters, biologists and other concerned parties have attempted to better understand ways to reduce road impacts on soils and streams. This study looks at two key indicators of the stringency of road management requirements – the regulation of culvert use at stream crossings, and the treatment of roads no longer in use.

A common method for regulating culvert sizes, is the establishment of "peak flow" requirements. Peak flow refers to flood events of specified frequency. For example "50 year" or "100 year" peak flow refers to flood levels that occur on average every 50 or 100 years respectively. Culverts designed for 50 year peak flow levels must have adequate capacity to withstand the maximum flood levels expected in a 50 year time period, whereas 100 year peak

flow requirements generally require larger culverts designed for less common and more severe flooding. The actual culvert width associated with a given peak flow requirement varies by watershed, depending on local water levels and the frequency of flood events.

Two trends were found regarding peak flow requirements in the US and Canada. Many states and provinces include nominal guidelines for culvert diameters based on peak flow. Mandatory requirements have been set by Alberta, BC, Quebec, California, Idaho, Oregon and Washington. Ontario does not have standardized, nominal rules governing culvert widths, but does nevertheless require that culvert size be "adequate for fish passage" (Ontario 1988). The chart below illustrates the presence or absence of standardized peak flow requirements in all of our case study jurisdictions.

Chart 13: Minimum culvert peak flow capacity at stream crossings in select Canadian provincial lands, Quebec private lands, select US state private lands, and US Forest Service lands

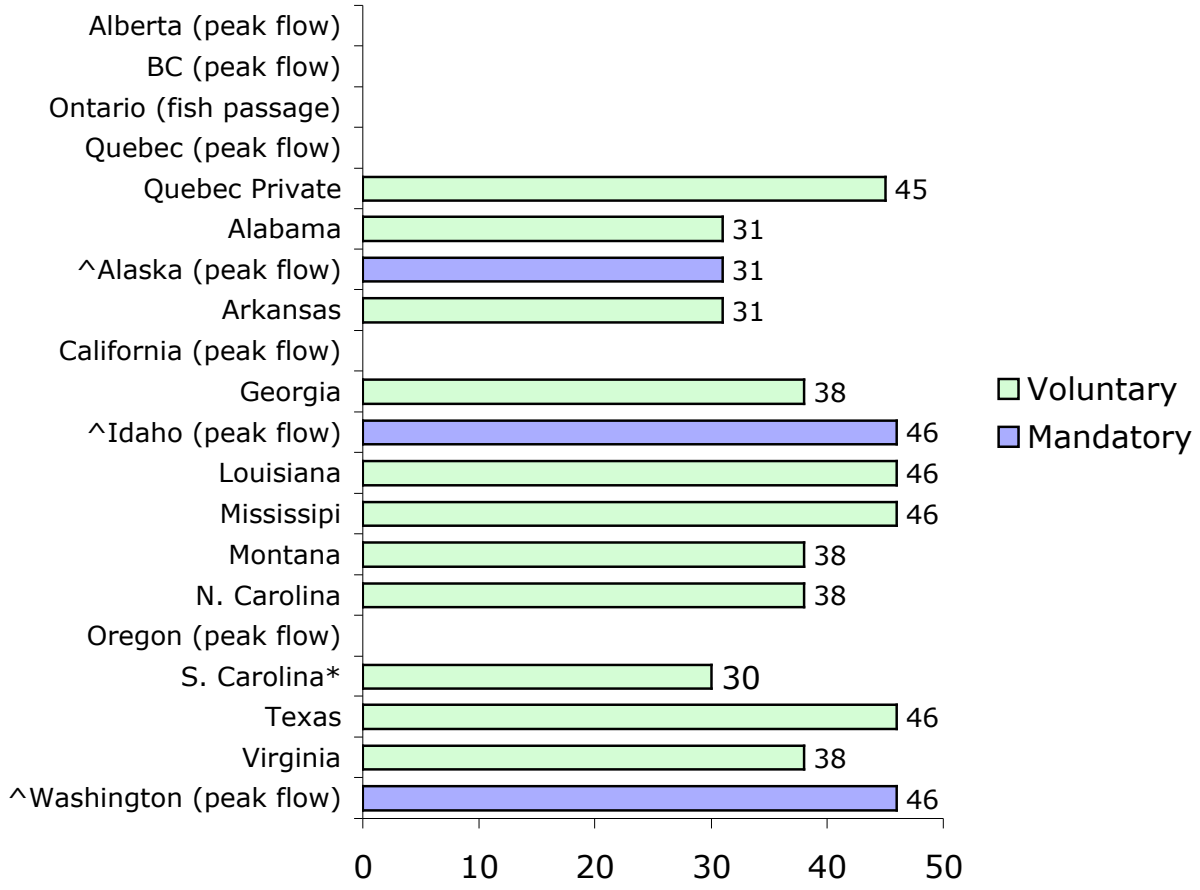


* Quebec private forestland BMPs recommend that culverts not "reduce the width of the watercourse by more than 20 percent, as measured by the natural high water mark (Paquet and Groison 2003)."

In addition to, or in place of, peak flow requirements, many jurisdictions have established "minimum" culvert sizes.[7] In the case of Alaska, Idaho, and Washington, minimum culvert

diameter policies are mandatory, or what we classify as "stringent" (non-discretionary/substantive). In Alabama, Arkansas, Georgia, Louisiana, Mississippi, Montana, North Carolina, Quebec private lands, Texas, and Virginia, diameter minimums are voluntary (discretionary-substantive). The chart below illustrates the minimum culvert sizes established in the case study jurisdictions. In this second chart, the parenthetical phrase (peak flow) is also provided next to those jurisdictions which have established mandatory peak flow requirements, in order to give the reader a sense of the overall stringency of the policy specifications in that state or province. It should be noted that, unlike peak flow requirements, standardized minimum culvert sizes are not linked to local environmental conditions. Hence nominal comparisons between jurisdictions of minimum culvert sizes overlook differences in environmental conditions, and therefore should not be equated with levels of environmental protection. Numeric values for minimum culvert sizes are provided, nevertheless, for the purposes of policy transparency. Further research would be required to determine the extent to which variations in culvert size can be explained by variable environmental conditions.

Chart 14 Minimum culvert diameters for stream crossings on select Canadian provincial lands, Quebec private lands, and select US states (cm.)



^ This symbol denotes those jurisdictions that have established both mandatory peak flow and mandatory minimum diameters for culverts.
* South Carolina BMP's include a chart for determining minimum recommended (voluntary) culvert diameters based on the region of the state, the size of the drainage area, and whether the road is permanent or temporary. Recommended culvert diameters for permanent roads range from 30 cm. to 183 cm., and for temporary roads from 30 cm. to 107 cm.

Data sources: (Quebec 2002; Alabama Forestry Commission 1993; Alaska 2000; California 2003; Arkansas 2002; Georgia 1999; Idaho 1974; Louisiana 2000; Mississippi 2000; Montana 2001; North Carolina 2003; Oregon updated in 2004, updated in 2004; Quebec 1996; South Carolina 1994; Texas 2000; Virginia 2002; Washington updated 2004, updated 2004; Decker 2003; Alberta 2004; British Columbia 2002; Washington 2001; Paquet and Groison 2003; Ontario 1988)

In terms of rules and guidelines for road closure, the Table below reveals that all of the Canadian provinces take a stringent (non-discretionary substantive) approach to road decommissioning on provincial lands, as do Alaska, California, Idaho, Oregon, Washington and the USFS. Only Alberta, British Columbia, California, and Washington, however, have developed road closure policies that provide specific prescriptions for on-the-ground road management requirements (for example, the requirement to remove all drainage structures and re-contour the road). In contrast, policies in Alaska, Idaho, Oregon, USFS lands, Ontario and Quebec involve more generalized requirements, (such as controlling for erosion) that allow room for discretion in determining the precise course of action. In order to distinguish the former, more "stringent", non-discretionary policy from the latter more flexible policy, we have classified the latter as a "mixed" policy approach (indicated in the chart below by the word "mixed" in parentheses).

Road decommissioning standards that are voluntary in nature have been developed in Arkansas, Georgia, Louisiana, Mississippi, Montana, Texas, and Virginia. No rules for treating abandoned roads have been identified in Alabama, North Carolina, and Quebec private lands.

While our standardized coverage of road decommissioning policies in this report focuses on policies specifically addressing the treatment of permanently abandoned roads, it is important to note that some states have Best Management Practices that more generally address erosion control. For example, North Carolina's FPG .0209 "Rehabilitation of project site" is a general rule requiring the stabilization of ground disturbances that "…have the potential for accelerated erosion, resulting in concentrated flow directly entering an intermittent or perennial stream or perennial waterbody… (North Carolina 2003)." Such general rules, where enforced, may result

in the same levels of environmental protection as policies that exclusively address road abandonment.

Table 2 Road decommissioning policies for select US state private lands, USFS lands, Canadian provincial lands, and Quebec private lands

Mandatory Road Decommissioning Standards or Policies	*Voluntary Road Decommissioning Standards or Policies*	*No Road Decommissioning Standards or Policies*
Alberta **British Columbia** Ontario (mixed) Quebec (mixed) Alaska (mixed) **California** Idaho (mixed) Oregon (mixed) USFS (mixed) **Washington**	Arkansas Georgia Louisiana Mississippi Montana South Carolina Texas Virginia	Quebec private Alabama North Carolina

Note: The "mixed" designation has been added to distinguish those policies that include mandatory requirements but do not specify a precise course of action (for example, requirements to treat abandoned roads for erosion, that do not include standardized prescriptions such as the removal of drainage structures or recontouring of roads).

4) **Reforestation** (Indicator: Requirements for reforestation, including specified time frames and stocking levels)

The Table below summarizes our findings regarding the existence of mandatory or voluntary reforestation requirements in each of the case study states and provinces. The level of discretion allowed is further indicated by the presence or absence of specified time frames and stocking levels (number of stems per hectare) that define the precise meaning of "reforestation."

Table 3 Reforestation policies of case study US state private lands, US Forest Service lands, and case study Canadian provincial lands

Mandatory Reforestation Standards or Policies	*Voluntary Reforestation Standards or Policies*	*No Reforestation Standards or Policies*
Alberta * ⇑ British Columbia * ⇑ Ontario * ⇑ Quebec * ⇑ Alaska (mixed) California * ⇑ Idaho * ⇑ Louisiana (procedural rules on commercial forestlands only) (mixed) Oregon * ⇑ Virginia (some forest types) (mixed) Washington * ⇑ USFS * ⇑	Quebec private Arkansas Georgia Montana South Carolina	Alabama Mississippi North Carolina Texas
Mandatory Timeframe * *Mandatory Stocking Levels* ⇑		

The above Table reveals that Canadian provincial lands, along with California, Idaho, Oregon, and Washington private lands and the USFS, are governed by the most stringent policies on reforestation. Reforestation policies in Alaska, Louisiana and Virginia, in contrast, fall under our "mixed" and/or "procedural" categories, due to a lack of standardized time frames and stocking levels and/or to the application of reforestation rules to only a portion of the forestland in question. In Arkansas Louisiana, Montana, and Quebec private forests have more flexible (discretionary/substantive) policies while Alabama, Mississippi, North Carolina and Texas have no policies in place.

It should be mentioned, however, that there are many other approaches to encourage reforestation besides mandatory regulatory requirements or Best Management Practice standards.

In areas where long-term forest management is sufficiently profitable, the market itself may provide ample incentive to maintain land in forest. In addition, tax incentives and other forest development assistance programs that tie reforestation to lower tax rates and/or government subsidies may be effective in promoting reforestation. Continued research on the relative on-the-ground effectiveness of these different approaches is strongly encouraged.

5) **Annual Allowable Cut (AAC)** (Indicator: Cut limits based on maximum sustained yield or non-declining even flow)

This section examines each of the case study jurisdictions for the presence or absence of rules governing annual allowable cut levels. It also compares case studies regarding the existence of "non-declining even-flow" policies, i.e. policies which limit timber harvest to levels that can be sustained without interruption over the long-term.

The AAC policies of the US Forest Service and those governing provincial forestlands in BC are subjected to the most in-depth analysis in this section. The reason for the extra emphasis on these jurisdictions is twofold. Firstly, AAC calculations in these cases have been the subject of particularly high levels of controversy. Secondly, these jurisdictions provide important insights into the ways in which different forest policy specifications interact, while also shedding light on the sometimes tenuous relationship between written policies and their translation into on-the-ground forest management behavior.

Throughout this section, the reader should keep in mind that the extended discussion of USFS and British Columbian governance is meant to provide insight relevant to all case studies. The special focus on these two cases in no way indicates that these jurisdictions stand alone in the challenges they face addressing the environmentally, socially, and economically critical issue of AAC.

The United States

US Forest Service

The National Forest Management Act of the United States outlines a process for determining the "Annual Sale Quantity" (ASQ) (the USFS term for AAC) at the national level, based on requirements for sustaining multiple forest uses and environmental protection over a fifteen-year planning period. The Act requires that ASQs adhere to the policy of "non-declining even flow." This even-flow policy applies at all administrative levels, from nation-wide to the level of individual timber sales. In practice, however, the establishment of ASQs usually occurs through independent calculations made at the level of legally binding individual forest management plans, known as Land and Resource Management Plans (LRMPS) (Wilkinson and Anderson 1985: 90).

The US Senate and House Appropriations Committee set the overall funding for what is called "annual programmed sale level", which must be equal to or less than the ASQs set by national forest plans. The US Forest Service is then empowered with the distribution of this funding among districts.

Beginning in the early 1990s, with the explosion of public battles over the preservation of remaining old growth forests, and the listing of the old-growth dependent Northern Spotted Owl as an endangered species, cut levels on national forest lands declined dramatically. Although procedures for calculating ASQ have remained essentially the same, actual annual timber harvest levels dropped from just under 50 million cubic meters in 1991, to about 10 million cubic meters in 2003 (see chart below).

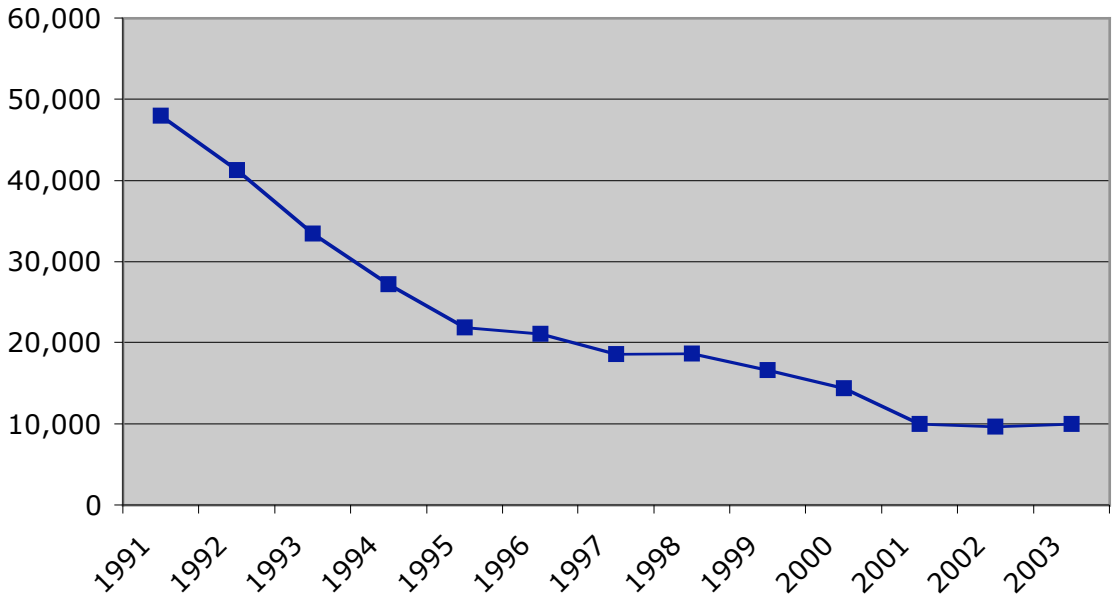
These changes in harvest levels are in part the result of "Option 9", the US interagency plan to save the Northern Spotted Owl and associated species. This interagency plan significantly

reduced the quantities of timber available for harvest. Over and above this planned decline in AAC, however, continued disputes over the protection of endangered species on USFS lands have led to ongoing litigation which has prevented the USFS from reaching even its dramatically reduced AAC targets (Yaffee 1994).

In sum, the controversies over timber harvest on USFS lands serve to highlight the complex relationship between various policy specifications, and between the entire network of specifications and their on-the-ground implementation. Option 9 itself, for example, is the direct result of legal requirements embedded in the US Endangered Species Act and the "species viability" provisions on the National Forest Management Act (Sher 1993), Option 9 also accounts for the USFS' high levels of policy stringency in riparian zone policies and some of the other policy specifications addressed throughout this report. In a more indirect sense, Option 9 may also have played a role in encouraging continued litigation and the resulting further declines in USFS timber harvest.

The chart below, illustrating changes in actual harvest levels on USFS lands, makes clear how the examination of policy specifications in isolation from other related policies, as well as in isolation from their implementation, leaves out important information on their "real" effect on forest management practices. Overall, the interconnectedness of different policy specifications and their implementation highlights the need for in-depth future explanatory work that carefully assesses the interactions of different substantive policy areas and the ways in which they manifest within any given social and political climate.[8]

Chart 15: Actual timber harvest in US National Forests ('000 m3)*



Data source: (2004)

*Note: Throughout the period represented in the above chart, no changes were made to the policy specifications governing the calculation of AAC on USFS lands. Instead, the dramatic decline in timber harvest is due both to reductions in the AAC resulting from legal mandates to increase habitat protection, as well as to litigation preventing the USFS from reaching even its reduced AAC targets.

US Non-federal lands

With one exception, the selected US states under review do not have policies – either mandatory or voluntary – regarding annual allowable cut or similar operational aspects on private lands. The exception is California, whose Forest Practice Rules (Title 14 913.11 for the Coast District, 933.11 for the Northern District, and 953.11 for the Southern Forest District) include provisions concerning Maximum Sustained Production of High Quality Timber Products (MSP). Forest operations in California must demonstrate achievement of MSP through one of several similar approaches (California Department of Forestry and Fire Protection, 2003).

Californian landowners or managers are required to balance growth and harvest over time within an assessment area agreed to by the state forestry agency. [9]

In regards to the two state forests considered in this report - those of Washington and Alaska (where state forests cover over 10 percent of the land base) – mandatory requirements have been established for the calculation of AAC and adherence to cut limits.

The Canadian Provinces

The Land and Forest Division of Alberta Sustainable Resource Development calculates Annual Allowable Cut levels in individual Forest Management Units and Forest Management Areas. These calculations are based on a mix of factors including sustained yield timber management, social considerations, and others. The sum of AAC calculations for local management units and areas is then compiled into a provincial database. Unit-level AAC levels are periodically recalculated at the time of timber license renewals.

In BC, the Chief Forester of the Ministry of Forests, a non-political appointee independent of the Forest Minister, establishes the AAC for provincially owned forest regions. The BC Ministry of Forests annual allowable cut is not a "calculation" as such but a mixture of qualitative and quantitative assessments of the composition and growth of forests, other forest uses, the long and short term implications of alternative harvest rates, mill productive capacities, economic and social objectives "of the Crown" and abnormal disease or pest outbreaks and major salvage programs.

The approach to annual cut calculations in BC has been the subject of intense scrutiny, as official policies and interpretation of the policy have evolved over time (Dellert 1998; Cashore et al. 2001: Chapter Five). The BC Forest Act currently requires that the Chief Forester "must consider" a range of factors including "…the rate of timber harvest that may be sustained on the

area…" and "the social and economic objectives of the government." In other words, sustained yield does not by itself serve as the upper limit of annual allowable cut, and hence BC rules governing AAC do not fit the most "stringent" category of our policy framework. Given the mixture of requirements to consider sustained yield, together with the flexibility granted to the Chief Forester, BC policy is best described as a procedural requirement.

Meanwhile future timber supplies in British Columbia, which provide the foundation for AAC determinations, are a subject of intense debate. BC's approach to AAC regulation is affected by the fact that much of the forest planned for commercial harvesting is still oldgrowth (i.e. never previously logged). This means that long-term timber production necessarily requires addressing what will happen to forest fiber yields when these high volume commercially designated old growth forests are replaced with faster-growing second growth stands. Some researchers and policy analysts expect such an approach to lead to a decline in harvest levels by as much as 15 or 20 percent over the next 60 years (Marchak, Aycock, and Herbert 1999; Pierce 2001). This process is often referred to in British Columbian forestry circles as a "fall-down" (Wilson 1998). Whether a "fall-down" will occur, is disputed. Other forest practitioners and researchers, however, argue that intensive forestry practices and new forest production technologies could result in an increased yield of up to 100 cubic meters over and above current growth calculations (Binkley 1997).

While BC's ability to maintain past levels of timber harvest remain in dispute, the province's AAC determinations have had important implications for other policy specifications we have reviewed. For instance, British Columbia's 1990s Protected Areas Strategy, designed to double the current status of protected areas, and the BC Forest Practices Code did impact the province's AAC.[10] Owing to the uncertainty of the ultimate impacts of these approaches,

however, the industry has received commitments from the government that these rules, and associated biodiversity guidelines, would not reduce the traditional AAC by more than six percent (Cashore et al. 2001: Chapter Three, The Six Percent Solution: The Forest Practices Code). Similarly, BC's Wildlife Conservation strategy includes a requirement that measures taken to protected species at risk must not impact the AAC by more than one percent. As a result, any comprehensive analysis of forest policy must assess the AAC in light of the other policy specifications.

In Ontario, allowable cut levels are established at the management unit level. Under the Crown Forest Sustainability Act (Ontario 1994) and accompanying manuals, sustainable forest license (SFL) holders are required to inventory their licensed areas every 25 years. Allowable cut levels are calculated for each license area, based on the required forest inventories. Twenty years after each license area inventory, SFL holders must prepare re-inventory strategies and document these strategies in forest management plans. The management plans then establish allowable cut levels for the next 25 years. The implementation of re-inventory strategies and management plans are subject to approval by the Ministry of Natural Resources. The Ministry incorporates the information received from SFL management plans into its provincial planning processes.

Ontario introduced legislation in the late 1990s to expand its "sustained yield" approach to "sustainability", in an explicit effort to recognize non-timber aspects of sustainability. This means that timber yields can be set either higher or lower than they would have been under the old policy. Hence we classify Ontario's AAC policies, like those of BC, as essentially procedural.

The Quebec Minister of Natural Resources, Wildlife and Parks uses a "conservation

equation" as the basis for provincial level annual allowable cut determinations. The conservation equation involves the capping of AAC at sustained yield levels, as well as the incorporation of other, non-timber objectives. Annual allowable cut levels on provincial lands are also calculated at the level of the forest management unit, based on forest protection and forest development objectives. Given the lack of an absolute limit on AAC based strictly on the non-declining even flow principle, however, we have categorized Quebec AAC policy as "mixed", i.e. a mandatory substantive policy that still leaves considerable room for government discretion.

There are 17 regional agencies for private forest development in Quebec (Québec 2003). Each of these agencies is responsible for preparing Private Forest Protection and Development Plans. The plans outline regional harvesting and management strategies for private lands, including establishment of allowable cut levels. Observance of regional cut limits is not required at the provincial level (Paquet and Groison 2003). However, some municipalities have exercised their rights to control over-harvesting on private lands (Fédération des producteurs de bois du Québec. Directeur général. Jean-Pierre Dansereau 2004).

Summary

Looking at all of the North American case studies in comparative context, we have seen how annual allowable cut level determinations are required on USFS lands and on provincial lands in all of the Canadian case study provinces. Of the private land areas under review, only California requires AAC determinations.

We have also taken the analysis one step further, and attempted to classify AAC policies by the level of government discretion involved, and the degree to which such policies involve the capping of harvest levels by the most environmentally stringent form of sustained yield, i.e. non-declining even flow. This more refined classification process has proven very challenging, as

well as critical, for understanding differences in policy approach. Our analysis suggests that BC and Ontario policies might best be classified as procedural, while the policies of Alberta, Quebec, and California most closely resemble "mixed" approaches (i.e. the capping of AAC based on a concept of sustained yield that does not strictly constitute a non-declining even flow approach). Only the USFS AAC determination process appears to involve the unequivocal capping of AAC levels by the policy of non-declining even flow.

We encourage others to take this analysis further, and conduct more in-depth studies aimed at refining this initial classification of different approaches to AAC determinations. As is the case throughout the report, our aim is not to provide the final word on the nature of complex and ever-changing environmental policies, but rather to create an analytical comparative framework that will facilitate future global research and dialogue.

Meanwhile, the determination of truly "sustainable" levels of timber production remains one of the most hotly debated topics in North America and beyond. This debate, furthermore, has been focused almost exclusively on public lands in the US and Canada, leaving private lands largely unregulated in this regard. This study serves to highlight, however, that private lands in the US are of major global importance, both in terms of their total forest area, and in terms of their high levels of timber production. Thus a global study of AAC policies would be incomplete without a consideration of both public and private land policy approaches.

III. Plantation management (Indicator: Rules pertaining specifically to intensively managed forest plantations)

Before beginning our comparative analysis of plantation forestry, it is important to remind our readers of how we have defined the term "plantation" in this study. As discussed in Chapter 2 of this report, we have adopted (except where otherwise specified) the FAO's

definition of forest "plantation." This definition is as follows: "plantations are forest stands established by planting and/or seeding in the process of afforestation or reforestation. They are either of introduced species (all planted stands), or intensively managed stands of indigenous species, which meet all the following criteria: one or two species at planting, even age class, regular spacing (FAO 2001)." Many of the planted forests in Canada and the western US do not qualify as plantations under the FAO definition. For example, Chart 1 in this report records "zero" hectares of plantation in Canada, indicating that there are no Canadian forests managed with the intensity necessary to be considered forest plantations. Our use of the term "plantation" is by no means universal within North American forestry circles, or worldwide, however we have adopted the FAO definition for the sake of report consistency.

The United States

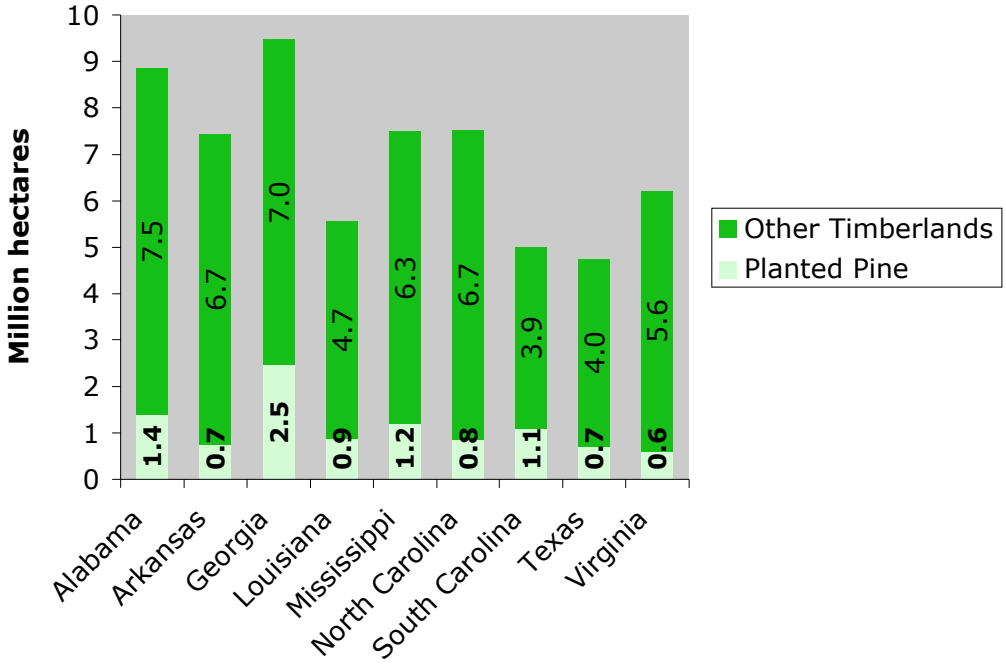
In the US states, as elsewhere, no truly consistent, nationwide system exists for recording the total land area devoted to timber plantations. The plantation figures that are collected are based on different methodologies and different definitions of what constitutes a "plantation." That said, there is enough information available across a range of sources to identify some broad trends in intensive timber management and the use of exotic tree species.

Within the US, plantation management has assumed by far the greatest importance in the Southeast, where favorable climatic conditions allow for globally competitive plantation fiber production. The increase in the area of planted pine – and the intensive management practices associated with it – at the same time comprises perhaps the most controversial forestry issue in the South today (USDA Forest Service Southern Research Station and USDA Forest Service Southern Region 2002). Given the importance of plantations in the region, the US Forest Service has focused a good deal of attention on them within their forestry research in the region,

including within the recent extensive research effort, the Southern Forest Resource Assessment (SFRA) (ibid.). The definition of plantations used in this USFS research, refers to planted pine stands that have been artificially regenerated by planting or direct seeding with species, such as Southern yellow pine and white pine-hemlock.

According to the USFS definition, in 1999 planted pine stands occupied 30 million acres, or about 16 percent of the Southern states' timberlands, representing more than a ten-percent increase over the past few decades (USDA Forest Service Southern Research Station and USDA Forest Service Southern Region 2002). During that same time period, the proportion of all Southern pine accounted for by planted stands increased from 11 to 47 percent (ibid.). The following Table illustrates planted pine as a proportion of total timberlands in the US southeastern states in 1999.

Chart 16 Planted pines and all timberlands in select southern states in 1999



Data Source: (USDA Forest Service Southern Research Station and USDA Forest Service Southern Region 2002)

In terms of the contribution of plantations to wood production, while pine plantations occupied only about 16 percent of the South's timberland area in 1999, they accounted for 43 percent of all softwood growth and 35 percent of all softwood removals (USDA Forest Service Southern Research Station and USDA Forest Service Southern Region 2002).

This new emphasis on the use of planted pine within US Southern forests has raised concerns about its potential environmental impacts, particularly in regards to the issue of decreased biodiversity. US Forest Service data show that the expansion of pine plantations has

been accompanied by a decrease in tree species richness over the past few decades in parts of the South (Rosson 1999).

Due to the challenge of defining exactly when forests become plantations, however, it is hard to measure the extent to which plantations are contributing to this loss of diversity. Even if agreement is reached on the definition of plantation, some would argue that the environmental advantages and disadvantages of more intensive forest management are far from straightforward, given the interaction of a wide variety of environmental, economic and social factors. For example, converting natural forest to plantation may increase the profitability of forest production, thereby preventing owners from selling their property for development (USDA Forest Service Southern Research Station and USDA Forest Service Southern Region 2002). A well-managed plantation forest certainly supports a greater range of forest-dependent species than a shopping mall or housing development.

The western US has also experienced a rise in plantations over the past two decades. Reasons for the expansion of plantation-style management in the western states include the search for alternative energy sources in the 1970s and 1980s, and a need for new fiber sources for paper production following the reduction of federal timber harvests in the 1990s (Zsuffa et al. 1996; Biggs 2003). Currently, there are over 100,000 acres (about 40,500 hectares) being used for poplar (or cottonwood) plantations in Oregon and Washington, with the area split about evenly between the two states (Copestake 2003). About two-thirds of the poplar plantations are located to the east of the Cascades, and one-third are located in the lower Columbia River basin (Stanton et al. 2002; Shock et al. 2002; Moser 2002). These numbers still represent a small proportion of overall timberland acreage, which is over 23 million for Oregon and over 17 million for Washington (USDA Forest Service Forest Inventory and Analysis 2003). For the

most part, the poplar plantations are being established on land that has been previously used as pastures or agricultural crops (Stanton et al. 2002; Biggs 2003). Most of the plantation acreage is owned or leased by paper companies and managed for the production of fiber for paper manufacturing. The market has recently diversified, however, to include other products such as engineered lumber (Stanton et al. 2002).

Generally, the land area under poplar plantations is continuing to expand across all of the western case study states. Current plans exist to double the total area under short rotation hybrid poplar in Washington and Oregon in the next several years (Shock et al. 2002). While not at the same level as that of Washington and Oregon, Idaho also has poplar plantation acreage. Some industry experts believes that in the long term, Washington and Oregon together with Idaho could eventually have as many as one million acres of poplar plantations (Day 1996). Some plantations – of poplar as well as eucalyptus, spruce, and pine – already exist in California, Montana, and Alaska, though these states do not appear to be playing as important a role in western plantation production.

Short-rotation hybrid poplar plantations in the West and Pacific Northwest are characterized by the use of intensive agricultural methods. Environmental concerns associated with them include the necessity of irrigation east of the Cascades and a reliance on herbicides (Biggs 2003; Copestake 2003). However, some argue that the plantations are improvements over the agricultural systems they replace since they may provide better habitat for native bird and mammal communities (Biggs 2003) (Stanton et al. 2002). In addition, the potential exists for further environmental benefits from hybrid poplar plantations in the form of wastewater treatment applications and carbon sequestration (Biggs 2003). Much further research is needed to

learn about the positive and negative environmental impacts of poplar plantations in the US western region (Moser 2002; Biggs 2003).

Just as the environmental implications of plantation management remain uncertain, forest policies governing plantations are in the early stages of evolution. Thus far, plantations have impacted – or at least intersected with – state forestry policies in different ways. A number of states, including Texas, Virginia, North Carolina, Georgia, and Washington, encourage the establishment of plantations – intentionally or not – through tax incentive or other financial incentive programs that reward landowners for establishing new stands on their properties (Noah and Zhang 2001). Washington and Oregon are examples of a few states where the short rotation characteristics of plantation management trigger agricultural Best Management Practices (BMPs) rather than forestry BMPs for land that meets certain criteria (Copestake 2003). Potential ecological outcomes and other implications of the transfer of forestry operations managed as plantations to the jurisdiction of agricultural policy settings remain an important area for research.

Canada

Canada's relatively cold climate and short growing seasons limit the country's ability to compete with short rotation forestry in more southern climates. Nevertheless, Canadian and provincial governments have demonstrated interest in experimenting with the establishment of fast-growing, intensively managed plantation forests. To this end, the Canadian Council of Forest Ministers has established a national-level program entitled "Forest 2020" to promote:

> …greater social and economic prosperity, as well as improved conservation of our forest heritage, by supporting increased wood fibre production through the establishment of plantations of fast-growing, high yield

> tree species, and intensifying siviliculture in previously harvested, or second growth, forest areas….(CCFM 2001).

Hybrid poplar *Populus spp*. is the favored fast-growing plantation species in Canada, having demonstrated the highest growth rates across the country. Contrary to the FAO data that Canada has no plantation forests, the first poplar plantations were established in southern Quebec, and have since been established in eastern Ontario, Saskatchewan, southern British Columbia and Vancouver Island. Other species used in plantations in Canada include Norway spruce *Picea abies*, Red pine *Pinus rositosa*, Larch *Larix spp*., White spruce *Picea glauca*, and Trembling aspen *Populus arunculus* (CCFM 2001).

Provincial governments have instituted a number of different strategies and programs aimed at supporting experimentation in intensive plantation management. In Ontario in 2001, environmental groups, the Ministry of Natural Resources and industry representatives signed the "Ontario Forest Accord" which "calls for the establishment of 378 new parks and protected areas encompassing 2.4 million hectares, in exchange for an agreement that the industry would be allowed to "maintain or expand future production" with increased yield from production forests (OFAAB 2001). The Alberta government has demonstrated a similar trend towards combining increased production and protection, with the 1997 Alberta Forest Conservation strategy, calling for a three-pronged approach to forest management involving extensive use, intensive use and protected areas.

Provincial regulation of plantations in Canada is generally similar to the regulation of "natural" forests. However, in most provinces, forest managers are required to obtain special permission to plant species not native to the site.

In sum, short-rotation, intensively managed forests play a much more dominant role in the US than in Canada. For this reason, the presence or absence of special regulations governing

plantations is likely to have a much larger environmental impact south of the border. Currently, many state governments among our case study states are encouraging the development of fast-growing, short-rotation, even-aged plantation stands. Meanwhile, knowledge regarding the environmental "footprint" of plantations, and rules designed to minimize that footprint, are still quite limited.

IV. Biodiversity (Indicators: Protection of species at risk, Protected areas)

1) Protection of species at risk

The United States

The US Endangered Species Act (ESA) has been heralded as a necessary tool for saving species and maintaining biodiversity. Indeed, the Act constitutes a powerful piece of non-discretionary legislation that, combined with a judicial system that allows citizens to sue for government non-compliance, has had an undeniable impact on forest practices rules. In analyzing the federal ESA policy approach, however, it is of critical importance to recognize that there are actually two US ESAs: a strict non-discretionary ESA affecting federal forestland management, and a much more flexible ESA governing other public lands and private forestland management. State-level legislation protecting endangered species, however, varies considerably and adds yet another necessary layer of analysis in the assessment of the "stringency" of US policies protecting species at risk.

US Federal Lands

The United States federal government has enacted an array of forestry legislation focused on biodiversity protection, from wilderness protection legislation in the 1960s, to procedural requirements for environmental assessments and impacts statements in the early 1970s, to non-discretionary legislation over species preservation. The single most significant piece of legislation in the United States aimed directly at the protection of endangered species, however, is the Endangered Species Act, enacted by Congress in 1973. Administered by the US Fish and Wildlife Service ("USFWS") or the National Marine Fisheries Service ("NMFS"), the ESA *requires* that these agencies list threatened and endangered species and their "critical habitats." The authority to list threatened or endangered species rests in the US Secretary of the Interior (responsible for the US national park system) or the Secretary of Commerce. The Secretary's determination must be based "solely on the best scientific and commercial data available" (section 4(b)(1)(A)), with explicit direction that the economic effects of such a decision not be given consideration. The strong, non-discretionary language of the ESA has proven a powerful tool for public interests to demand strict levels of environmental protection. Under the ESA, environmental groups have sought court injunctions against the US Forest Service, as well as sued private companies allegedly violating principles of the act (Vogel 1993: 256)

The ESA is not an entirely "non-discretionary" piece of legislation, however, in that it creates avenues for legal exceptions. The Act empowers an "Endangered Species Committee," which critics have labeled the "God Squad" (Davis 1992), with the authority to decide whether or not the "economic and social benefits of the proposed action outweigh costs to the listed species." In other words, the Committee holds the authority to create exemptions to the Act (Smith, Moote, and Schwalbe, 1993, p.1039). This committee can only be established, however,

when no "feasible alternatives" exist and there are "considerable" economic or social costs involved in implementing the Act (ibid.: 1038).

Once a species has been listed, it is illegal under the ESA for a public or private landowner to “take” that species. Section 3 (18) of the Act defines the term "take" to mean "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." In addition, the ESA specifically requires that managers of federal properties containing threatened or endangered species habitat create and implement a *recovery* plan for those species.

The case of the Northern Spotted Owl listing provides a dramatic illustration of the Acts potential impact on federal lands. The combination of the Endangered Species Act and an old-growth forest dependent owl led to a complete overhaul of the Forest Service approach to land management. Much of US federal land is no longer considered harvestable even by industry, and provides now only 6 percent of the US national harvest. The story of the Northern Spotted Owl is well known and is often referred to as the model of environmental protection by environmental advocates. What has received less media attention, however, are the effects of the ESA on private land, from which 93 percent of US softwood lumber is currently being harvested.

US Non-federal Lands

While the enforcement of the US Endangered Species Act has resulted in a dramatic reduction in timber harvest across increasingly large areas of federal land, the Act’s impact on private land management has been radically different. The federal-level ESA on private lands could be described as procedural rather than substantive or results-based. Section 10(a)(2) permits landowners to obtain an incidental take “permit” that allows them to conduct management practices that harm threatened and endangered species and habitats, provided that

the landowner also prepares a Habitat Conservation Plan that mitigates and minimizes the impacts of the taking. While public agencies may also apply for take permits, the USFS and other public agencies generally maintain a stricter interpretation of the federal ESA.

Large private industrial landowners, however, have taken considerable advantage of take permits and Habitat Conservation Plans (HCP). Originally intended for "special cases," HCPs now cover millions of acres, and more HCPs continue to be approved. Non-industrial landowners have made much less use of HCPs, since the costs of preparing a Habitat Conservation Plan is often prohibitive (MacCleery 2004).

Whether or not HCPs are effective is a hotly contested issue, highlighting the importance of creating policies that are appropriate within a given management context. HCPs can be characterized as a "results-based" approach in that they allow firms to sidestep what would have been "stringent" (non-discretionary substantive) rules by developing an alternative approach to species protection. But are private forestland HCPs effective? A comprehensive study involving teams of researchers from the National Center for Ecological Analysis and Synthesis and the American Institute of Biological Sciences (Kareiva et al. 2000) found significant limitations in the application of HCPs:

> In many cases, we found that crucial, yet basic information on species is unavailable for the preparers of HCPs. By crucial, we mean information necessary to make determinations about the status of the species, the estimated take under the HCP, and the impact of that take on the species. …For example, in only one-third of the species assessments was there enough information to evaluate what proportion of the population would be affected by a proposed "take." If we do not know whether one-half or one-hundredth of a species' total population is being affected by an action, it is hard to make scientifically justified decisions.

According to the researchers, "our evaluations also indicate that very large and the very small HCPs contain the poorest analysis" and that USFWS and NMFS "do not have the

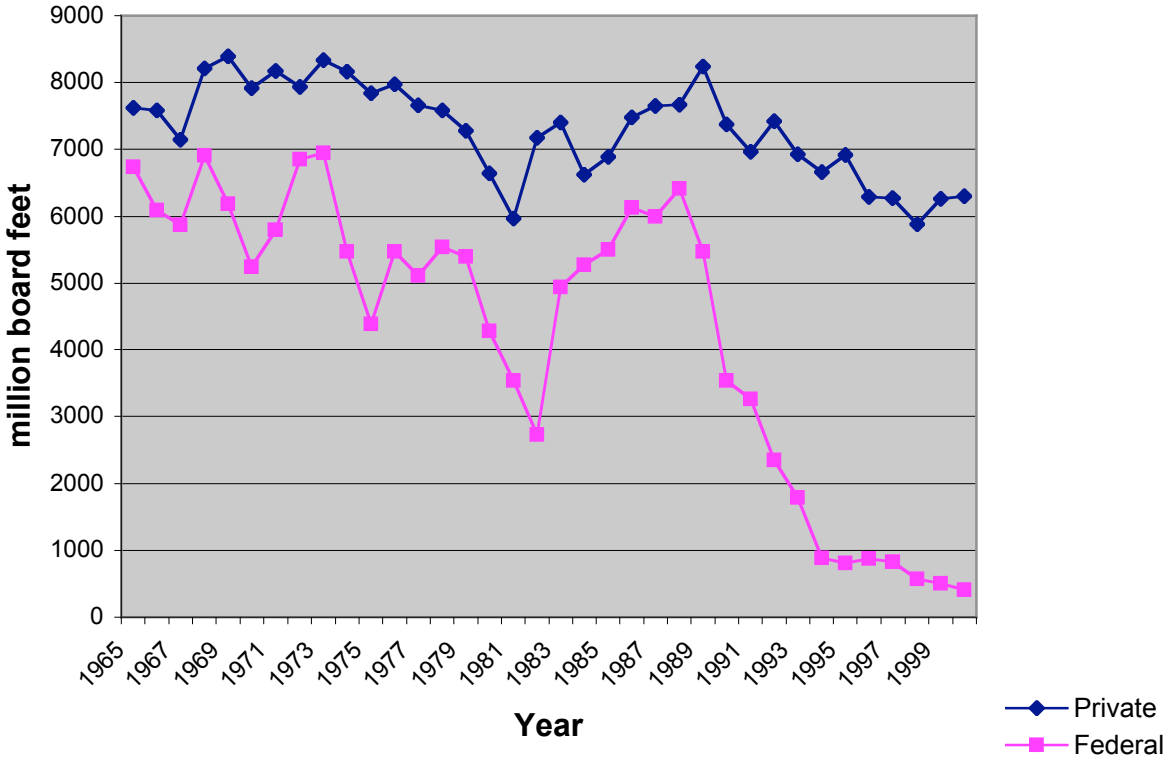
resources to obtain the data that are needed for many of the decisions that must be made." The report additionally found that 84 percent of the time, HCPs failed to provide basic "conservation and mitigation measures, and/or to use important scientific information and analyses."

Individual states vary, in terms of legislation they have provided to protect endangered species within state borders. Case study states with endangered species acts include Alaska (vertebrate species and sub-species), California (plants and animals), Louisiana (animals), Mississippi (animals), Montana (animals), Oregon (state lands only) and Virginia (plants and insects). In addition, California, Montana, Oregon, Virginia and Washington have enacted state legislation (over and above federal regulations) addressing habitat protection for endangered species. Only California's Endangered Species Act includes protection for both plants and animals. However, in 1997, California exhibited a downward trend in the stringency of its species protection legislation by amending the California Endangered Species Act to allow incidental species "takings", in a manner similar to the US ESA.

This review of US ESA rules highlights the very different approaches and rules applied to public versus private land management, as well to considerable variation between US states. It also speaks to the need to assess the ESA in its entirety – to focus on either public or private land rules is to conduct a methodological mistake, exacerbated because of the important public/private interactions in the United States, where protection of private land is often overlooked because of the dominant role private lands play in lumber production. As the Sierra Club itself (Sierra Club 1993: 10) asserted during the spotted owl debate:

> ...spotted owl recovery plans will have little impact upon overall non-federal timber production [in the Pacific Northwest], and that total non-federal output....can *maintain approximately 1980s levels or higher* into future decades (emphasis added).

Chart 17 Washington and Oregon timber harvest on private and federal lands 1965-2001



From: [Cashore, 2004 #1515]

The Table above shows the differing harvest rates in Oregon and Washington on federally owned lands and private lands (other land ownership types are excluded). Still, harvesting rates are complicated. If we look at private timber harvests in the entire Pacific Northwest rates have continued to drop since before the spotted owl recovery plan, from 51.5 million cubic meters in 1977, to 49.6 million in 1987, to 38 million cubic meters in 1997 (USDA Forest Service 2000). Meanwhile, the approach of relegating the majority of the costs of conservation to the federal government and federal land management agencies, has been voiced

as a conscious policy of the US federal government. As former US Secretary of the Interior Babbitt explained:

> In all cases where there is public land, we try to construct plans which say that the *public land is going to carry the burden of the management*. That has been done in the Pacific Northwest spotted owl controversy. The management plan which has come out for the Northwest has stronger provisions for public land, because that enables us to tread a little more lightly on private land owned by individual timber companies. The habitat conservation rules outside the core areas are a little lighter because our emphasis is on public lands.

Canada

The political climate facing Canadian provincial forest management bears both strong similarities and strong differences to that of the US Forest Service. We've seen how public pressures in the US have led to strict rules protecting biodiversity and endangered species on US federal land. In Canada, too, public ownership of the majority of provincial forests likely serves to heighten public scrutiny and concern surrounding harvest practices (Cashore et al. 2001). In contrast to the US forest industry, however, the Canadian forest industry is much more heavily dependent on timber harvests off of public lands. Thus public pressures to dramatically reduce harvest rates are counterbalanced by social and economic pressures that bolster industrial forestry. In this sense, Canadian provincial governments are under greater pressure to balance the often conflicing goals of maintaining high levels of timber production and protecting valued environmental attributes (Amos, Harrison, and Hoberg 2001).

Canadian Federal Legislation

The Canadian federal government has limited jurisdiction over provincial resource management. Still two key initiatives have been undertaken, the most important of which is Canada's recently passed *Species at Risk Act (SARA)*. The Act represented a significant victory

on the part of environmental groups who had long lobbied for such legislation (Sierra Legal Defence Fund 1995; Harrison 2001) , but it also signalled a proactive cooperative approach among industry and environmental groups stakeholders, who together developed policies and proposals for government consideration (Amos, Harrison, and Hoberg 2001). The Act focuses direct measures on federally-owned lands and on federal species (migratory birds and aquatic species), and provides "fall back" policies for habitat protection in the absence of provincial government approaches. SARA also confers legal status on the previously advisory Committee on the Status of Endangered Wildlife in Canada [COSEWIC], which is responsible for preparing a list of threatened and endangered species. SARA leaves the federal government with more discretionary powers than does the US ESA, placing greater emphasis on cooperation between interests in ensuring habitat recovery.

Provincial Lands and Regulations

Alberta handles the listing and protection of endangered species through its Endangered Species Conservation Committee (ESCC), established under the Wildlife Act (2000). The ESCC is strictly advisory in nature, and was created to provide recommendations to the Minister regarding which species should be established as endangered and to develop recovery plans for those species.

British Columbia has developed an "Identified Wildlife Management Strategy" (IWMS). The strategy calls for identifying species at risk, and the extent of that risk, by using information from its conservation data center. Wildlife Habitat Areas may then be designated for species whose protection requires special management measures. For species with very large ranges, the strategy calls for the establishment of Resource Management Zones, to be created through higher level planning processes. Conservation assessments and inventory and monitoring are required to

assess the impact of conservation measures on species recovery. The implementation of BC's species protection strategy is limited, however, by the rule that the IWMS cannot reduce provincial harvest levels by more than one percent.

Ontario, together with Quebec, are the only two of the case study Canadian provinces that have created specific endangered species acts. The Ontario Endangered Species Act calls for the protection of species of fauna or flora declared through regulations to be threatened with extinction. The Act requires that the "Lieutenant Governor in Council may make regulations declaring any species of fauna or flora to be threatened with extinction", and that "no person shall willfully… destroy or interfere with or attempt to destroy or interfere with the habitat of any species of fauna or flora, declared in the regulations to be threatened with extinction (Ontario RSO 1990, 1994)."

Ontario also addresses habitat protection through the Crown Forest Sustainability Act, which calls for managing forests in a manner that maintains ecosystems functions within the "range of natural variation" (RONV). The Act's approach to the maintenance of "natural" habitats is essentially results-based, requiring that forest managers establish measures for monitoring and assessing the degree to which they have met RONV criteria (Ontario RSO 1990).

Quebec enacted the "Act respecting threatened or vulnerable species" in 1989. This Act established procedures for identifying species at risk, and shoulders the provincial government with the responsibility to protect these species and their habitat. The Act requires both species protection and protection of habitat on all lands, public and private. According to the Act, "No person may, in a wildlife habitat, carry on an activity that may alter any biological, physical or chemical component peculiar to the habitat of the animal or fish concerned (Quebec 2003)."

In sum, the US Endangered Species Act as it applies to US federal land management is by far the most non-discretionary piece of legislation governing endangered species protection in the US and Canada. Its application on US private lands, however, is primarily procedural and considerably less stringent.

In Canada, Ontario and Quebec have established provincial-level endangered species acts which include non-discretionary, substantive components protecting endangered species and their habitats. Alberta and British Columbia take a more procedural approach, employing strategies and committees to identify species at risk and ensure habitat protection. Of the latter provinces, BC's legislation is the more detailed and prescriptive.

Despite either US or Canadian efforts to protect endangered species, the Charts below illustrate that grave problems exist in all of the jurisdictions under study. While the major attention of the media has been focused on British Columbia and the Pacific Northwest, the highly biodiverse US southern states also contain many threatened and endangered species. It is beyond the scope of this study to conduct a thorough geographical and historical analysis as to the causes of species decline in our case study jurisdictions. Nevertheless, we encourage the continuation of research into the ways in which forest practices may contribute to, or mitigate, the loss of biodiversity.

Chart 18: Endangered and Threatened Vertebrate Species (Number of Species)

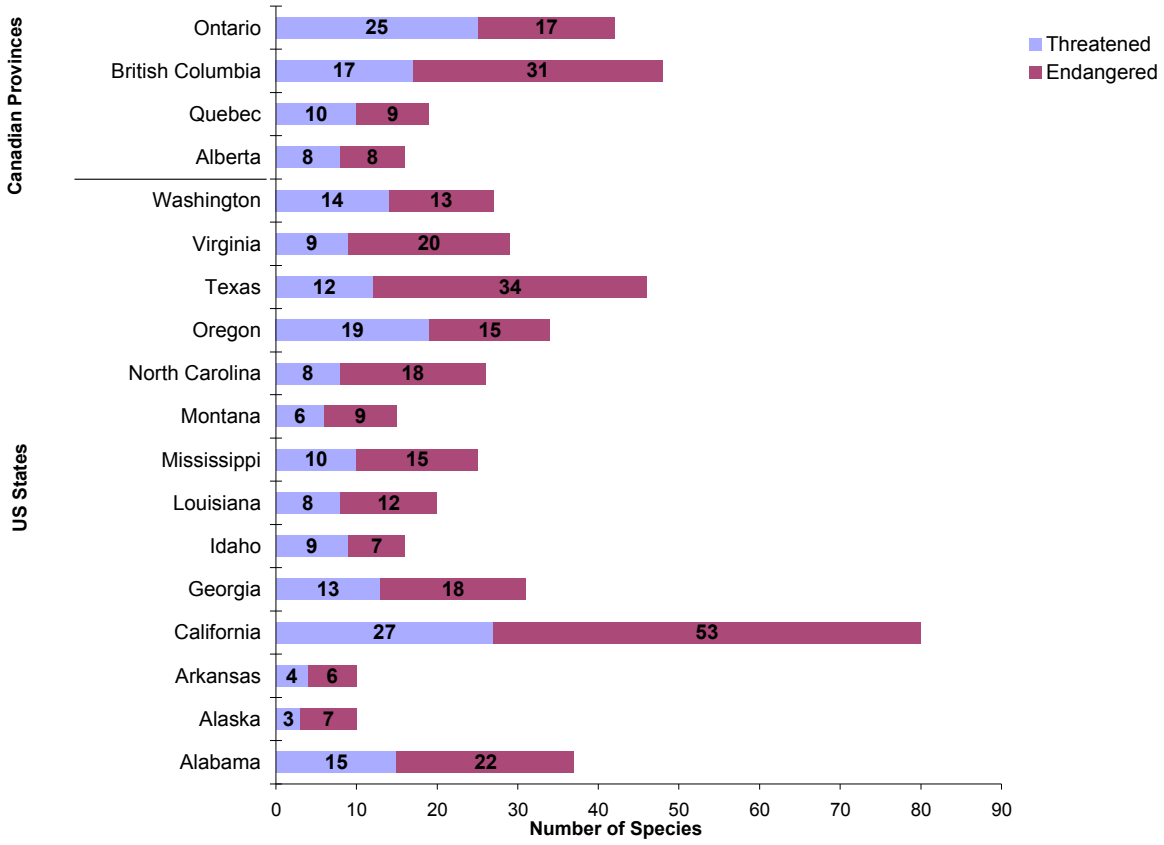
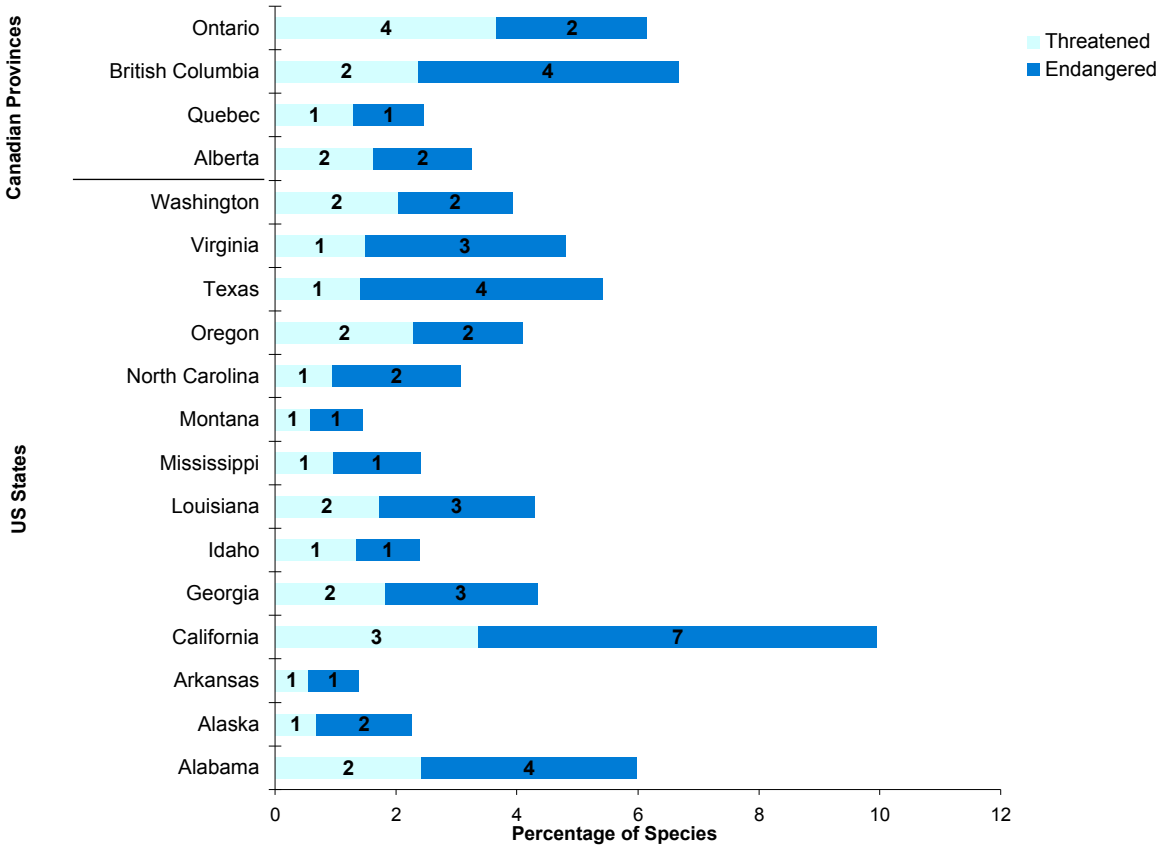


Chart 19: Endangered and Threatened Vertebrate Species (percent)



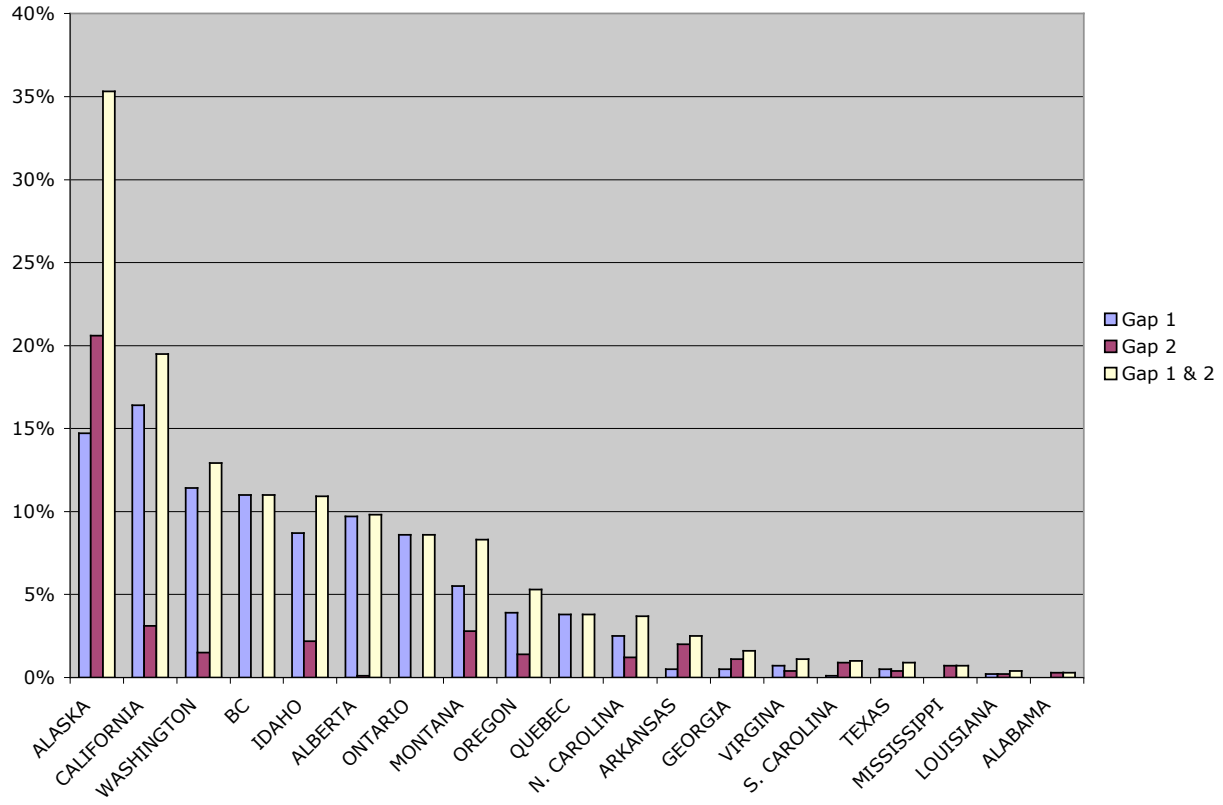
Data sources: (Canada 2003; United States 2003)

2) Protected Areas

The Chart below outlines the percent of total land area in each of the case study provinces and states that meet the WWF/Conservation Biology Institute definition of "GAP I" and "GAP II" protected areas. The GAP (Gap Analysis Project) database was complied using GIS technologies and currently represents the most comprehensive analysis of protected areas in

North America (DellaSala 2000). The GAP classification system recognizes two categories of protection, those that do not allow any industrial economic development (GAP 1), and those where only limited economic development activities may occur (GAP 2).

Chart 20: GAP I & GAP II Protected Areas (percent)



(DellaSala 2000)

The above Chart illustrates stark contrasts between the various province and state case studies at the time of the GAP analysis. Alaska ranks clearly at the top in terms of total land area under GAP I and GAP II protected status, followed by California and then Washington. The Canadian case study provinces and other western states make up the remainder of the top half of

our case study jurisdictions (Appendix D: lists protected areas in all Canadian provinces and US states). Alaska and California stand on their own with 36 percent and 19 percent of their land, respectively, under GAP I and II levels of protection. Washington, British Columbia, Alberta, Idaho and Ontario, are all protecting between 8-13 percent of their lands.[11] All of the southeastern states, in contrast, had protected less than 4 percent of their land area at the time of the GAP assessment. If one considers that the southeastern US states contain the highest levels of biodiversity of any of the North American case study jurisdictions, this would indicate that protected areas are at least as important for biodiversity protection in the south as in the north (assuming, of course, that Southern forestry practices in non-protected areas are not vastly more sensitive to habitat preservation).

IV. Enforcement

The United States

Across the US states, three different monitoring methods are commonly used. The first is routine random and/or scheduled inspections of all or a portion of forest operations according to variable selection criteria (e.g. application for a harvesting permit, completion of harvest). The second type of monitoring comes at the behest of landowners that seek advice from the forest landowner assistance division of their state forestry departments, who then perform "courtesy" visits on their properties. The final monitoring method, which has become increasingly common in the last decade, is compliance surveys. Compliance surveys involve systematic, statistical audits of forest operations which are then compiled to produce average performance rates. Such surveys vary greatly in methodology (e.g. qualitative or strictly quantitative) and are often

performed only sporadically due to the high cost of survey implementation (Ellefson, Cheng, and Moulton 1995).

The majority of states conduct their monitoring with forest agency staff and resources, though a few states employ an interdisciplinary team comprised of different agencies, academics and/or other specialists. In a few cases, a separate agency – such as a council on environmental quality or a water quality protection agency – is in charge of forest practice monitoring. For instance, in Oregon recent legislation directs the Oregon Watershed Enhancement Board (OWEB) to develop and implement a statewide Monitoring Program in coordination with state natural resource agencies for activities conducted under the Oregon Plan for Salmon and Watersheds. California employs a similar approach. Many of the monitoring efforts of states are informal and so no official reports are released (USDA Forest Service Southern Research Station and USDA Forest Service Southern Region 2002).

In some cases, citizen involvement may also trigger monitoring of forest practice standards. For example, in 1990 the Idaho Department of State Lands received 163 citizen complaints about forestry practices, 126 of which resulted in on-site inspections (Ellefson, et al, 1995). Around the same time in Oregon, 89 percent of the complaints that resulted in on-site inspections originated from private citizens (ibid.).

Initial results indicate that for those states with voluntary BMP regimes, monitoring procedures for public lands may be more developed than those for private lands. In South Carolina, for instance, the state's Forestry Commission conducts BMP monitoring annually on state forest lands, covering at least a minimum of ten percent of forestry operations completed during the year (South Carolina Forestry Commission Undated). Thus, even in the US southeast, where our case study states have generally been subject to less stringent regulations, public lands

(in this case owned by the state) are subject to increased scrutiny and perhaps higher performance expectations.

In a few states, including Alaska, California, and Washington, statutes have been enacted (e.g. Alaska Forest Resources and Practices Act, the Washington Forest Practices Act, and the California Public Resource Code Section 4604), which provide specific authority for government agency foresters to access a landowner's property for inspections at agency discretion (ibid.). In other states, government inspectors cannot force landowners to participate in all monitoring efforts. For example, in Arkansas, state forestry agency staff must gain specific permission from landowners to inspect their properties (USDA Forest Service Southern Research Station and USDA Forest Service Southern Region 2002).

In terms of formal compliance survey efforts, the survey methodology employed and the sampling intensity vary considerably. Nevertheless all states show strikingly similar monitoring results, with compliance falling roughly within the range of 80 percent and above, and an average overall compliance or implementation rate of 90 percent. Eight of the states fall in the 90s range, and the other seven fall in the 80s range. Public lands earn the highest compliance or implementation rates, followed by industrial timberland sites and then non-industrial private lands (USDA Forest Service Southern Research Station and USDA Forest Service Southern Region 2002).

In general, state forestry agencies report increasing overall BMP or forest practice implementation or compliance rates, which they attribute to such factors as the value of technical assistance and increased partnerships with the forest industry (Ice et al. 2002; USDA Forest Service Southern Research Station and USDA Forest Service Southern Region 2002).

Written recommendations to improve practices are the most common product of state monitoring of forest practices (Ellefson, Cheng, and Moulton 1995). These recommendations may or may not come in the form of official notice of violations. In some cases, state agencies will issue corrective action orders to address damage done by unsatisfactory forest practices, and landowners will be obligated to cover the financial burden of those activities. In South Carolina, even though the routine monitoring takes place in the form of landowner-initiated "courtesy exam" visits, the Forestry Commission provides a monthly summary of these visits to the state's Department of Health and Environmental Control (SCDHEC). If the exam finds that water quality has been affected by a forest operation, SCDHEC may institute an enforcement action under the South Carolina Pollution Control Act.

States vary in their application of penalties for violations of mandatory forest practices. Most states, however, appear to avoid legal redress. For example, in 1991, 184 civil penalty citations affecting 146 operations were imposed in Oregon, while only one legal action was initiated around the same time period in Idaho (Ellefson, et al, 1995.). Georgia, which has a non-regulatory policy regime, has referred cases of water quality impairment to its Environmental Protection Division for enforcement action only five times between 1998 and 2000 (USDA Forest Service Southern Research Station and USDA Forest Service Southern Region 2002). Arkansas employs a similar process to that of Georgia, and the state's forestry commission has pursued enforcement action about four times on forestry operations between 1998 and 2000 (ibid.). Georgia also has adopted a system for imposing legal sanctions (e.g. penalties, license suspensions) against registered professional foresters found to be contributing to BMP noncompliance (ibid.). Texas has a "bad actor" provision in its water quality law that enables the state to pursue legal action against repeat offenders, but this provision has rarely, if ever, been

utilized with regard to a forestry operation (USDA Forest Service Southern Research Station and USDA Forest Service Southern Region 2002). In Louisiana, no formal process exists for dealing with forestry operations suspected of impairing water quality.

While almost all of the Southern states lack direct regulatory forest practices policies (e.g. a forest practices act), two of the featured states have developed interesting policy variations that are revealed through an examination of their enforcement programs. These states are North Carolina and Virginia. North Carolina has instituted voluntary BMPs to ensure the achievement of nine mandatory forest practice guidelines (FPGs) (White 1992). These nine FPGs are mandatory, however, in the sense that they must be observed if an operation is to be exempt from permitting and other requirements under the Sediment Pollution Control Act passed by the state in the 1970s (ibid.). Therefore, findings of non-compliance with the voluntary BMPS may trigger not legal action, per se, but rather additional regulatory requirements. The state of Virginia has a similar situation in that its BMPs are not regulatory but must be followed in order for forestry operations to maintain exemptions from requirements of the Chesapeake Bay Preservation Act (where applicable) (USDA Forest Service Southern Research Station and USDA Forest Service Southern Region 2002).

All of our case study states, regardless of the regulatory or non-regulatory nature of their forest policies, face similar challenges in finding the resources to monitor compliance or implementation of forest management regulations or BMPs. Nevertheless, in all cases, monitoring in some form has become an increasing priority over the past decade. Based on the monitoring work done so far, all states appear to be fairly satisfied with the compliance or implementation rates they have calculated. However, more systematic approaches and greater independent review of both the monitoring activities and the resulting enforcement actions would

likely increase public confidence in the effectiveness of either voluntary BMPs or forest practice requirements in ensuring environmentally sensitive forestry.

Canada

Alberta's Land and Forest Division (LFD) of the Alberta Sustainable Resource Department (ASRD) conducts random audits of crown licenses. Between 1996 and 2002, audit activities and compliance results were posted on the government web page. Since 2002, systematic, routine audits have been replaced by more informal "field checks" and no formal, systematic reporting system of audit activities is currently in place.

The auditing system in British Columbia is complex and multi-faceted. The Compliance and Enforcement Branch (C&E) of the Ministry of Forests is the government body responsible for ensuring compliance with forestry regulations. C&E conducts random and routine audits, the results of which are compiled in annual reports and posted on the government web page. The latest report released as of March 2004 was the C&E Annual Report 1999-2000. This report lists 824 violation tickets issued between 1995 and 2000, and penalties levied during this same period totaling Cdn $5,071,723 (equivalent to US $3,836,982, as of March 7, 2004).

In addition to the C&E Branch of the Ministry of Forests, a special independent monitoring board, the Forest Practices Board, was established with the enactment of the Forest Practices Code in 1995. The Forest Practices Board (FPB) is charged with monitoring private licensee compliance with forestry legislation, as well as evaluating the adequacy of government monitoring activities. The FPB is required by statute to conduct periodic random audits and to respond to public complaints regarding forest practices. FPB audits range from full assessments to issue-specific monitoring. The FPB prepares detailed reports of all its auditing activities and makes these reports available in hard copy and via the web. The creation of the BC Forest

Practices Board appears to be have had a positive impact on compliance as the Board has noted that "Code compliance in all areas – including riparian management – has increased each year since the Board began auditing forest practices" (British Columbia. Forest Practices Board 2003). [12]

The FPB does not hold the authority to prosecute auditees for non-compliance. Such authority instead, is vested in the Ministry of Forests, the Ministry of Energy and Mines, the Ministry of Sustainable Resource Management, and the Ministry of Water, Land and Air Protection.

In Ontario, the Ministry of Natural Resources (OMNR) is the agency in charge of forest practices compliance monitoring and auditing. "Independent Forest Audits" are conducted every five years of all Crown tenures and Sustainable Forest Licenses to measure compliance with legislation, regulations, policies and forest management plans. OMNR auditing consists of three components: 1) compliance with legislation, regulations, policies, and management plans; 2) an evaluation of the effectiveness of forest practices in meeting audit criteria and management objectives; and 3) compliance with the terms and conditions of a sustainable forest license. As part of their examination of the foregoing components, auditors are required to provide an assessment of forest sustainability in the audit report. Audit reports are prepared after each audit, and OMNR and the forest licensee are required to prepare an "Action Plan" to address issues raised in the report.

In 2001 Independent Forest Audits were carried out on 20 management units and documented in 19 audit reports. Eighteen of the audit reports concluded that forests were being managed in general compliance with legislation and policy, and the principles of sustainable forest management, and one concluded that it was "inadequately managed.." In 2002 nine audits

were completed. The results of these latter audits will be made public when they are tabled in the provincial legislature (MNR 2002; Willick 2004).

In Quebec, the Minister of Natural Resources, Wildlife and Parks is responsible for the enforcement of forestry regulations. The Ministry of Natural Resources Wildlife and Parks (MNRWP, English; MRNFP, French) conducts regular field inspections of licensee forest management operations. In addition to monitoring compliance with its regulations, the Ministry also engages in directly monitoring the environmental impacts of forestry activities, as well as the impacts of external threats such as air pollution and climate change. In addition, the Quebec government also monitors the effectiveness of its forest legislation, such the *Regulation respecting standards of forest management for forests in the public domain,* in achieving environmental protection. For example, it studies the impacts of road building specifications on riparian areas, and the affect of clearcut sizes on wildlife populations (Quebec 2003).

V. Non-governmental Initiatives: Forest Certification

Chart 21

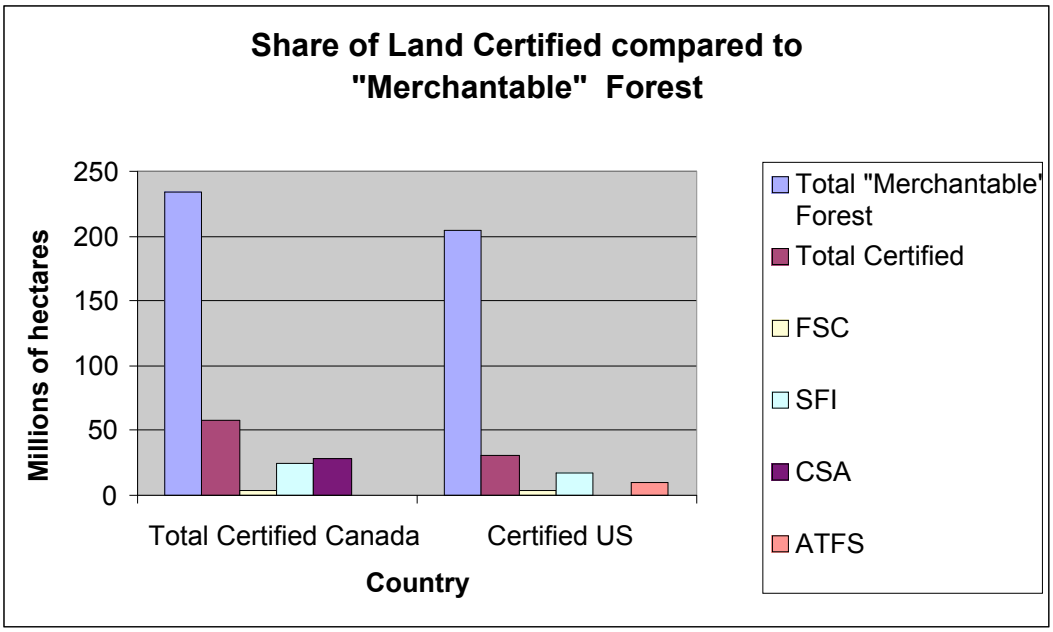


Chart 22

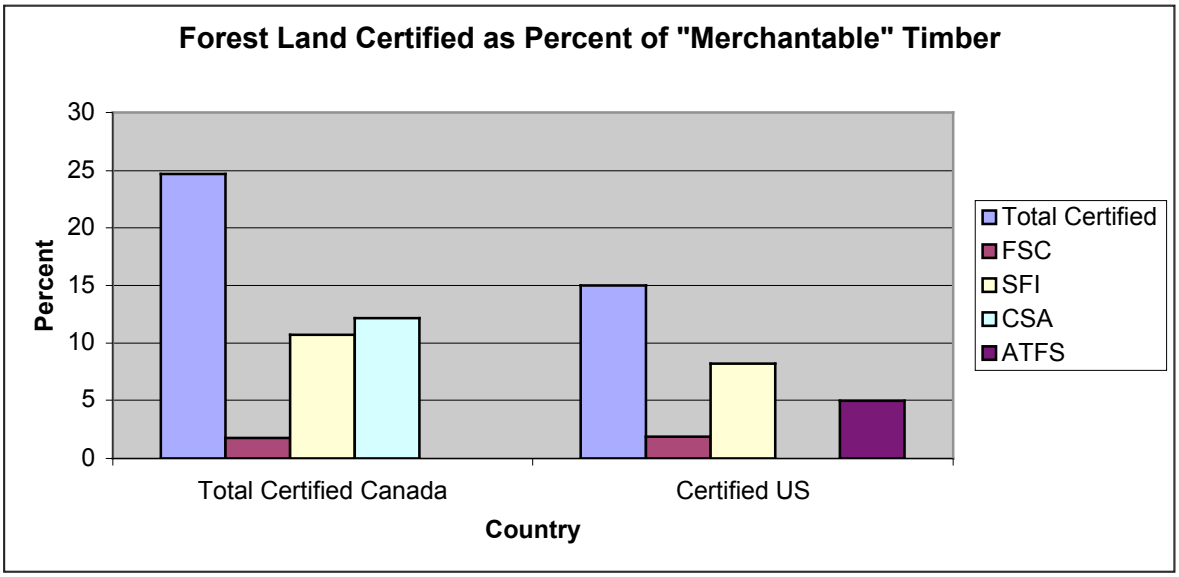


Chart 24

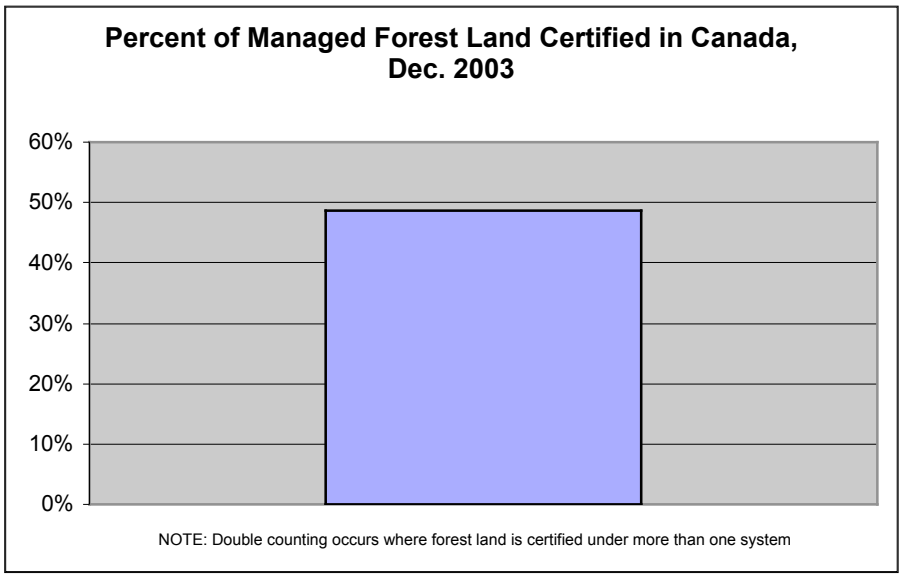
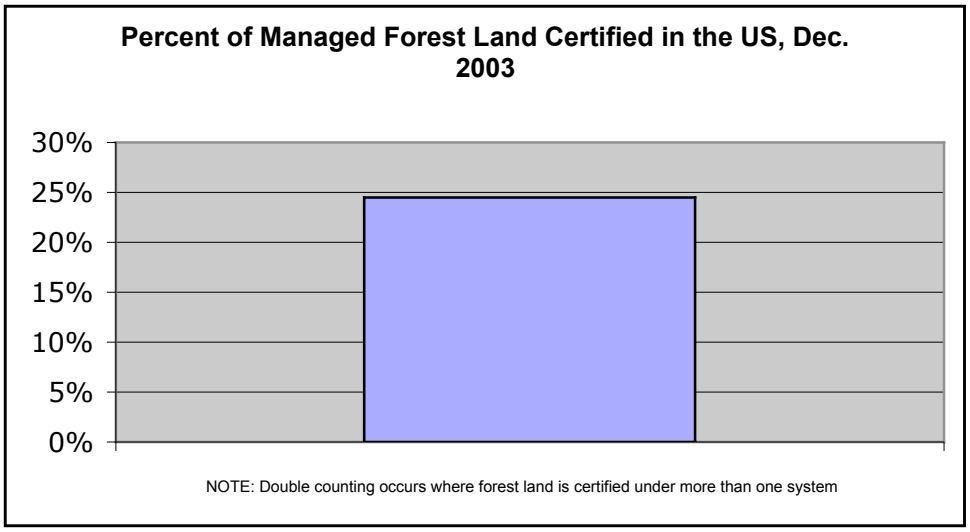


Chart 23



Sources for Certification Charts: FSC. 2004. *Forest Certified by FSC-Accredited Certification Bodies*. http://www.fscoax.org/html/ABU-REP-70-2004-01-05-FSC-Certified-Forest.pdf; CSA. 2003. *Canadian Forest Management Certification Status Report*. http://www.sfms.com/pdfs/csnsco.pdf; AF&PA. 2003. *SFI Program Participants that have completed 3rd Party Certification*. http://www.afandpa.org/Content/NavigationMenu/Environment_and_Recycling/SFI/The_SFI_Standard/SFI_Certification_List_Website.pdf

The highly charged politics of forest certification in North America, which have been the subject of much scholarly and practitioner attention, are beyond the scope of our descriptive presentation of the amount of forest land certified.[13] What we do note, as illustrated in this section's charts is that very similar patterns of support (as measured by forest land certified) for certification exist in the US and Canada. Environmental group supported FSC has certified a relatively limited, but not insignificant, component of forest land in the two countries. The US industry initiated alternative to the FSC, the SFI, covers the majority of certified forest lands in the US and Canada; while the CSA system (initially created with strong support from the forest industry) has certified an extensive share of forestlands in Canada. The larger share of non-industrial forestland ownership in the United States is also reflected in support for the American Tree Farm System, which was created expressly for private forest ownerships, and which works in tandem with the SFI. Today, the American Forest and Paper Association requires adherence to the SFI program, while third party certification is voluntary. On the other hand, the Forest Products Association of Canada *requires* all of its members to become third party certified under the SFI, CSA, or FSC within three years.

VI. Summary

This analysis supports Cashore and his colleagues' existing work (Teeter, Cashore, and Zhang 2003; Cashore 1999, 1997, 1997) identifying important similarities and differences that exist between and within Canada and the United States. Though forest policy is incredibly complex, as illustrated by the wide variety of policy approaches described above, discernible trends have emerged.

The first is that it is a fundamental mistake to make only broad-brush comparisons of regulatory approaches, but rather it is important to examine the specific policy settings that translate these approaches into management decisions. In the past, the governance of US national forest lands has been broadly characterized as litigious, US private lands as more cooperative, and Canadian provinces as emphasizing government discretion (Hoberg 1997; Cashore 1997). However, a more fine-tuned analysis reveals slightly different patterns. In many cases, from riparian rules to clearcutting, the Canadian provinces under review had some of the most stringent policies in place. Furthermore, state governance of private lands varied considerably depending on the state in question (see the Table below).

While US federal lands were under severe harvesting restrictions owing to court battles in the 1990s, state governments who regulate the bulk of US timber production vary greatly in their approach. Key US western states compare most closely with the Canadian case study provinces, while those in the US south emphasize voluntary guidelines or no restrictions at all.

Protected area efforts are also quite different, with Canadian provinces fitting within the top half of case study jurisdictions, and US Southern states rating last, according to the latest GAP 1 (no harvesting) and GAP 2 (limited impact) database of protected areas.

The Table below provides a comparative summary of policy approaches to our five forest practice regulation indicators in each of our case study jurisdictions (the figures for percent forest area and removals/harvest are from yet-to-be-released USFS data tables (USFS. John S. Vissage 2004)). For the purposes of easy comparison, we rate the policies in each jurisdiction according to their level of policy stringency. Two "points" are assigned for mandatory substantive policies that include standardized threshold requirements (such as prescribed riparian buffer zone sizes or clearcut size limits). One "point" is assigned for procedural policies, as well as policies that

either a) lack standardized threshold requirements and hence allow for greater government discretion, and/or b) apply only to a portion of the forest land area in question.

Of the twenty Canadian and US jurisdictions covered, Alberta, BC, California and the US Forest Service lands are subject to the most stringent regulations on average, with an overall score of 9 out of a possible 10. Ontario, Quebec and Washington are the next most stringent, with an overall score of 8. The southeastern US states clearly have the least stringent policies, with overall scores of 1 or 0.

Table 4 Policy Approaches to Key Forestry Issues in Select US States and Canadian Provinces

Stringency Rating (1-10)	Case Study	1) Riparian	2) Clearcuts	3) Roads	4) Reforestation	5) AAC
9	**Alberta** (Public)					
	British Columbia (Public)					
	California (CA private forests = 43% of forest area; 89% of harvest)					
	USFS Lands (Forest Cover = 75% ID; 27% MT; 9% AK; 48% OR; 37% WA; 43% CA. Harvest = 9% ID; 4% MT; 9% AK; 5% OR; 1% WA; 8% CA)					
8	**Ontario** (Public)					
	Quebec (Public)					
	Washington (WA private forests = 45% of forest area; 80% of harvest)					
7	**Oregon** (OR Private forests = 36% of forest area; 85% of harvest)					
5	**Idaho** (ID private forests = 15% of forest area; 75% of harvest)					
4	**Alaska** (AK private forests = 28% of forest area; 86% of harvest)					
2	**Montana** (MT Private forests = 27% of forest area; 82% of harvest)					
1	**Louisiana** (Private)					
	Virginia (Private)					
0	**Alabama** (Private)					
	Arkansas (Private)					
	Georgia (Private)					
	Mississippi (Private)					
	North Carolina (Private)					
	South Carolina (Private)					
	Texas (Private)					

Non-Discretionary/Substantive

Mixed: Government Discretion &/or Limited Forest Area/ Substantive

Mandatory Procedural

Discretionary

This report does not take a position on the "ideal" levels of stringency, nor on the appropriateness or adequacy of policy content, nor does it dismiss the idea that different types of forest conditions may require different types of policies. Indeed, we would point to the need to do further research on the degree to which "smart regulation" and other results-based approaches have the potential to create "win win" solutions in ways that strict command and control policies may not. What we would argue on the basis of our findings, however, is that there is considerable variation in regulatory approaches between regions and between landownership types. In fact the *intra*-country differences of our case study jurisdictions regarding the stringency of approach to key policy indicators are often of greater magnitude than inter country differences between Canada and the US. Thus generalizations about which country has more "stringent" environmental protection policies are clearly misleading. Where there do appear to be the greatest and most consistent differences, however, are between the Canadian provinces, which generally take a stringent (substantive-non-discretionary) approach, and their counterparts in the US South, which follow either more flexible or voluntary policy approaches, or have no policies at all.

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[1] As demonstrated throughout the analyses presented in this report, the stringency of regulations affecting private lands in the US actually varies quite widely.

[2] Environmental groups in the US (Rowland 1994) and others (Cashore 1999) have made the same point.

[3] The majority of private forestlands are held under non-industrial ownership in all of the case study states, with the exception of Washington, Oregon, and California. Information on industrial versus other private forest ownership is not publicly available for Montana, due to potential conflicts with Privacy Law.

[4] The "no harvest zones" listed for Washington, for example, refer only to the width of no harvest buffers within the "core" [riparian] zone area. Harvest may be excluded from the inner and outer riparian zones as well, depending on the type of timber harvest occurring across the entire special management zone.

[5] Riparian zone rules for Alaska include those governing state lands, since state lands account for 19 percent of forestlands. "Public" land rules are also provided, since this category establishes a minimum standard for the 72 percent of Alaska's forestlands that are publicly owned (including federal, state, municipal and other public lands) (Alaska 2000).

[6] Requirements for no harvest buffer zones on small, non fish-bearing streams in Washington are based on such factors as the distance of the stream from the confluence of fish-bearing streams (in western Washington), and harvesting patterns within special management zones (in eastern Washington).

[7] In some cases minimum culvert diameters apply to all culverts, and in some cases only to stream crossings. However, our indicator of policy approach is restricted to stream crossings.

[8] For initial work on this regard in the BC context, see (Rayner et al. 2001)

[9] The projected inventory resulting from harvesting over time shall be capable of sustaining the average annual yield achieved during the last decade of the planning horizon. The average annual projected yield over any rolling ten-year period, or over appropriately longer time periods, shall not exceed the projected long-term sustained yield. Additionally, the projected yield is required to meet minimal stocking and basal area standards; protect soil, air, fish and wildlife, water resources, and any other public trust resources; and give consideration to recreation, range and forage, regional economic vitality, employment and aesthetic enjoyment.

[10] The traditional harvest did not, for the most part, include plans to harvest boreal forest in the North.

[11] The Chart does not distinguish forestland from other types of land. The percentage of protected forest area to total forest area may be either more or less.

[12] This approach appears to be a significant improvement over the "fish/forestry guidelines" approach to forest management used in British Columbia before the introduction of the Forest Practices Code (Tripp, Nixon, and Dunlop 1992)

[13] See for example, (Cashore, Auld, and Newsom 2004, 2004, 2003; Lawson and Cashore 2001; Cashore and Lawson 2003; Gale and Burda 1997; Gale 2002; Meidinger, Elliott, and Oesten 2003; Meidinger 1997; Rickenbach, Fletcher, and Hansen 2000; Hansen and Punches 1999; Anderson and Hansen 2003; Fletcher, Adams, and Radosevich 2001; Fletcher and Hansen 1999; McDermott 2003)