

Issues and Recommendations
Arising from the
BCTS Adaptive Management Planning Pilot Study
(AM 04b)

prepared for
Ecosystem Based Management Working Group

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Disclaimer

This report was commissioned by the Ecosystem-Based Management Working Group (EBM WG) to provide information to support full implementation of EBM. The conclusions and recommendations in this report are exclusively the authors', and may not reflect the values and opinions of EBM WG members.

Preface

This report resulted from a pilot project, with BC Timber Sales and the EBM Working Group, that explored how best to develop adaptive management plans for the purposes of obtaining flexibility under land use objectives. It discusses challenges to implementing adaptive management and provides guidance on planning adaptive management studies. It is based on interviews with First Nations representatives, researchers, and BCTS foresters, and on a workshop (Appendix 1). Part of this project developed a pilot adaptive management plan, described in the companion document:

Daust, D. 2009. Adaptive Management Plan: Estimating Windthrow Damage in Riparian Areas in the North Coast. Report for the EBM Working Group.

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1 Introduction

1.1 How is adaptive management being implemented in coastal BC?

Ecosystem-based management in the North and Central coast calls for an adaptive management approach¹. Consequently, two significant steps have been taken to facilitate implementation of adaptive management. First, the Land Use Objectives (LUOs) found in relevant Ministerial Orders² contain provisions that allow management flexibility (i.e., deviation from the target specified in the LUO) in combination with an adaptive management plan (AMP)³. Flexibility typically increases access to timber. Second, an Adaptive Management Framework (AMF) is being developed to guide implementation of adaptive management. Among other things, the Framework outlines a process for identifying high priority research topics and includes a document providing guidance to those wishing to undertake adaptive management projects.

1.2 What are the implementation challenges?

Currently, it is not clear how best to mesh opportunities for adaptive management created under Ministerial Orders with approaches recommended under the AMF. Several challenges must be addressed. First the Ministerial Orders and related guidance documents⁴ are unusually silent on the intention, or even the definition, of an adaptive management plan⁵. This leads to the significant question of whether flexibility is intended to facilitate adaptive management experiments or whether adaptive management is intended to monitor and perhaps allow mitigation of any negative impacts associated with an alternative practice, or both. Second, flexibility allowed with an AMP is limited and may constrain desired research manipulations. Third, while foresters can best assess the management-related benefits and costs of flexibility at the site scale, researchers often wish to plan research over larger areas, perhaps assessing many sites and selecting ones that are not operationally ideal. Fourth, AMF research priorities do not consider constraints on research associated with Ministerial Orders and standard operating procedures.

Adding an additional complication, Ministerial Orders only require that AMPs be developed where practicable. *Practicable* means "capable of being carried out in action"⁶. In general, a test for practicability asks if there is a feasible action that meets government objectives to balance social, economic and environmental values and is commercially viable. In the case of AMPs, tests for practicability would have to weigh the benefit of the research to society against additional environmental risks and increased operating costs.

1.3 What is the purpose of this report?

To address uncertainty related to the above challenges, this report evaluates the current approach to undertaking flexibility and adaptive management in coastal BC and recommends steps to

¹ Provincial Government – First Nation Agreements.

² This document is based on the Central and North Coast Order, December 19, 2007; a draft amended order (December 19, 2008) includes some different provisions related to adaptive management.

³ In this document, “adaptive management plan” refers specifically to adaptive management plans required by MOs.

⁴ Background and intent document for the South Central Coast and Central and North Coast Land Use Objectives Orders, April 18, 2008.

⁵ The 2008 draft amended order includes a definition of an adaptive management plan.

⁶ FRPA General Bulletin Number 3. Use of the term “practicable” under the Forest and Range Practices Act and Regulations. June 9, 2005.

improve the effectiveness and efficiency of adaptive management. This remainder of this report is divided into five distinct sections, each addressing a different issue related to adaptive management and making recommendations; the sixth and final section summarizes the main recommendations:

- Test of the Prioritization Procedure and list of adaptive management questions
- Policy-related barriers to adaptive management
- Capacity-related barriers to adaptive management
- Recommended approach to involving First Nations in adaptive management
- Recommended approach to preparing an adaptive management plan
- Summary of main recommendations

This report is accompanied by an example adaptive management plan⁷ and a workshop summary (Appendix 1). Findings in this report are based on a “pilot project” to develop an adaptive management plan with BC Timber Sales.

2 Test of the Prioritization Procedure and list of adaptive management questions

2.1 Introduction

The Knowledge Summary and Prioritization Procedure being developed for coastal BC aim to identify high-priority research topics. They aim to ensure that research questions are relevant to management objectives, that priorities have considered the broad scope of possible questions and that priorities address larger uncertainties and more influential management strategies first. They do this by using a structured approach to assess the probability that strategies will be successful in achieving objectives.

The Knowledge Summary and Prioritization Procedure provide advice, not direction. People using the knowledge summary and prioritization procedure must have sufficient background in specific topic areas to evaluate the “advice” of the Prioritization Procedure, considering any context and details not included in the Knowledge Summary. The Knowledge Summary brings together current understanding (including knowledge gaps) about how strategies influence the achievement of objectives. It focuses on the big picture, rather than details. It is not intended to be an encyclopaedia.

2.2 Methods

To test the prioritization procedure, we

- prepared a list of high priority research questions using the Knowledge Summary and Prioritization Procedure
- asked researchers and practitioners⁸ to identify important research questions
- compared researcher questions to Prioritization Procedure questions

⁷See companion document: Daust, D. 2009. Adaptive Management Plan: Estimating Windthrow Damage in Riparian Areas in the North Coast. Report for the EBM Working Group.

⁸ Researchers provided questions before and during the workshop; practitioners provided questions during the workshop, but had thought of questions earlier.

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- determined reasons why the Prioritization Procedure did not identify some researcher questions
- asked researchers and practitioners for their general impressions on the usefulness of the Knowledge Summary and Prioritization Procedure.
- matched research questions to specific land use objectives.

2.3 Results

The Prioritization Procedure identified seven implementation monitoring questions (Table 3, below) and twelve effectiveness/validation monitoring questions (Table 4, below) as having high or medium priority. Of the latter twelve questions, eight similar questions were identified by one or more researchers or practitioners; four questions were unique to the Prioritization Procedure.

Researchers posed fourteen questions that were not identified by the Prioritization Procedure (Table 5, below). According to the Knowledge Summary, five of these questions are low priority issues and four questions are not directly relevant (outside of the scope of the Knowledge Summary, which is based on existing land use plans; Table 1). Two relate to sections of the Knowledge Summary that are not yet complete and two are broad questions that may cover several topics in the Knowledge Summary. One question identified an error in the Knowledge Summary—an unrecorded uncertainty.

Table 1. Reasons why questions identified by researchers were not identified by the prioritization procedure.

Code*	Reason	Number
LP	Prioritization procedure indicates Low Priority	4
WS	Knowledge summary indicates that the question is Well Studied and will be difficult to resolve.	1
S	The questions relates to a goal or objective that is not included within the Scope of the Knowledge Summary	4
I	Question relates to section of Knowledge Summary that is currently Incomplete	2
B	The question is Broad and encompasses several questions that exist in the Knowledge Summary.	2
E	An Error in the Knowledge Summary exists: missing uncertainty.	1
		14

* matches codes in list of questions in Tables 3 to 5.

When asked to give their general impressions about the Knowledge Summary and Prioritization Procedure, both practitioners and researcher thought the knowledge summary and prioritization procedure seemed to be useful. In particular, they liked the structured approach to identifying questions and the ability to filter out questions that are not easily answered. They noted that topic experts still need to participate.

Only two of the 27 effectiveness/validation monitoring questions identified by the Prioritization Procedure and by researchers were related to LUOs (Table 2), but none of these questions can be adequately addressed within current policy. All three questions require relatively large and structured retrospective or experimental studies that are not supported by current policy (see next section).

Table 2. Research questions that addressed LUOs.

LUO	Topical Questions
• S1 to S3 streams, lakes, marshes, fens;	How does stream morphology change over

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<ul style="list-style-type: none"> • Active fluvial units. These LUOs address stream morphology.	time, in response to harvesting?
<ul style="list-style-type: none"> • ECA in important fisheries watersheds; • Upland streams These LUOs address hydrological and fluvial processes.	How can ECA be refined for coastal BC?

2.4 Discussion

Based on general feedback, the Knowledge Summary and Prioritization Procedure seem to be a useful tool to help guide discussions of research priorities. They broaden the scope of issues considered. The Prioritization Procedure identified four effectiveness/validation monitoring questions and seven implementation monitoring questions not identified by researchers and managers. The Knowledge Summary indicated that nine of the questions identified by researchers should be reconsidered because they may be low priority, may not be directly relevant to management or may be very difficult to study (Table 1, above).

Together, the Prioritization Procedure and researchers identified 27 potential high priority research questions. These questions should be further evaluated. Then a suite of adaptive management projects can be initiated.

For the most part, identified research questions do not match LUOs that have provisions for adaptive management. To better understand this discrepancy, it would be useful for the research advisors that supported policy development to clarify their rationale for focussing adaptive management on specific LUOs.

Importantly, the Knowledge Summary is a “permanent work in progress”. Thus the missing uncertainty identified by one of the research questions will be added to the Knowledge Summary and will remind researchers in the future to consider this topic.

2.5 Recommendations

R1) Use the Prioritization Procedure to help identify research questions.

The test indicates that the prioritization procedure is able support the process of identifying research priorities related to ecological integrity.

R2) Complete the Knowledge Summary.

Several sections of the Knowledge Summary are currently incomplete.

R3) Test the prioritization procedure with human well-being.

The Prioritization Procedure should be tested with human well-being issues, because these research questions may be more difficult to identify.

2.6 List of research questions

Table 3. Implementation Monitoring Questions identified by the Prioritization Procedure.

	Question
1	How much of each rare ecosystem—by site series—is there?
2	How much in-stand retention has been left historically?
3	How much “excellent” in-stand retention has been left historically?
4	How much activity occurs on karst ecosystems, next to small steep streams and in other ecosystems without a target?
5	What is the historic level of cut in small watersheds?
6	How much activity occurs on Class IV terrain and around small steep streams with high potential for debris transport?
7	How many connected streams are there in watersheds with different levels of activity?

Table 4. Effectiveness and validation monitoring questions identified by the Prioritization Procedure and similar questions identified by researchers and workshop participants.

	Question	Agreement*
1	What ecosystems—based on site series—are at risk? What are the ecological impacts of using SSS instead of TEM.	1
2	How do ancient forests differ from old forests? How quickly do ecosystem components (trees, understory, epiphytes, structure, CWD, etc.) and functions recover from disturbance? <i>Note this question is broader than the first.</i>	3
3	How do sensitive species respond to low levels of retention? What is the minimum amount of forest needed in a landscape by different groups of organisms? How much old forest retention is enough?	2
4	What are the impacts of development activities on Class IV terrain? What are the general impacts of forestry on soil productivity? Note that this is a broader question <i>Note that foresters at the workshop did not believe this topic was a high priority because they use risk assessments to support development decisions and generally avoid road construction on Class IV terrain.</i>	1
5	How does stream morphology change over time, in response to harvesting? What are the general impacts of forestry on water quality and quantity? Note that this question is broader.	1
6	What is the actual extent of the hydroriparian ecosystem (around different aquatic ecosystems)? How much does topography influence the extent of the functional riparian zone?	1
7	How do activities in, and adjacent to, buffers affect the organisms that use these buffers? What are the consequences of exposing part of a reach? Note that this question also considers aquatic impacts. How does riparian buffer width and content affect riparian biodiversity?	2
8	How can ECA be refined for coastal BC? How much functional riparian forest is needed in the upland stream portion of the watershed to sustain natural hydrological and fluvial processes?	1
9	How does natural disturbance change over time (due to climate change)?	0
10	What is the impact of activities on unbuffered fluvial units?	0
11	How much blowdown occurs in buffers?	0
12	Are there habitats that have high value for fish that are not included in the definition?	0

*Number of researchers posing similar questions.

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Table 5. Questions identified by researchers (and during workshop) that were not identified by the prioritization procedure, and reasons: I = incomplete section of KS; LP = low priority; S = beyond scope of KS; WS = already well studied; B = too broad or general; E = error in the Knowledge Summary.

	Question	Reason
1	How can western redcedar and yellow cedar be maintained on the landscape? <i>The Knowledge Summary was missing information related to the tree species diversity objective so could not identify this question.</i>	I
2	What is the natural disturbance history of the coast? <i>The knowledge summary did not think this question caused significant uncertainty.</i>	LP
3	What types of bog forests can be regenerated/converted to higher productivity ecosystems (for trees)? <i>The Knowledge Summary does not yet include a section related to timber so could not identify this question.</i>	I
4	What is the trade-off between landscape and stand-level retention? <i>The knowledge summary erroneously omitted landscape context as an uncertainty related to stand-level retention.</i>	E
5	Do ecological changes match climate model predictions? <i>This is a broad question that is beyond the scope of the Knowledge Summary.</i>	S
6	How do forestry activities influence carbon storage? <i>This question is beyond the scope to the Knowledge Summary (i.e., no objective), although clearly relevant to HWB and EI.</i>	S
7	How much edge is created by different forestry practices and what are the ecological consequences? <i>The Knowledge Summary considered edge influences in riparian areas, but uncertainty is low, given the strategy. The Knowledge Summary did not consider edge influence related to old growth or stand level retention to be a significant uncertainty.</i>	LP
8	How does forest pattern (stand and landscape scale) affect ecological function? <i>The Knowledge summary discusses this issue and gives it a low priority because amount is more important than pattern.</i>	LP
9	How do different levels of stand-level retention affect structure and ecological function? <i>The Knowledge Summary notes that although uncertainty remains, this topic is better studied than most.</i>	WS
10	How does riparian buffer width and content affect stream characteristics? <i>The Knowledge Summary indicates that current strategies are sufficient to protect ecological integrity.</i>	LP
11	How well will representation work as the climate changes? <i>The Knowledge Summary describes uncertainty about future moisture and nutrient regimes that influences the ecological integrity goal, but this issue was considered too broad to study under the coast AM process and was not listed. It should be, however.</i>	B
12	How can watershed planning be improved? <i>This question is not covered by the Knowledge Summary because it relates to planning and because timber objectives are not yet included in the Knowledge Summary.</i>	S
13	How can BCTS demonstrate to DFO that proposed log dumps should be approved? <i>Marine ecosystems are not included in the Knowledge Summary.</i>	S
14	Did the forest practices code work? <i>This question has many parts and is too broad to be generated by the Knowledge Summary.</i>	B

3 Policy-related barriers to adaptive management

3.1 Background

Coastal agreements encourage adaptive management. Adaptive management can improve management, by enabling learning.

3.2 Barriers

The current way of including adaptive management within LUOs⁹ is unlikely to lead to useful research and monitoring—it is unlikely to improve management—for the following reasons:

1) LUOs hinder adequate study design¹⁰:

Spatial limitations: LUOs only require studies to focus on a single site/watershed.

Consequence:

- prevents replication that is necessary for generalizing results.
- does not allow for retrospective studies, often the cheapest and fastest way to gather information

Temporal limitations: LUOs only require that studies occur during the period of primary forest activity (e.g., road construction, harvesting, silviculture).

Consequence:

- studies will be unable to detect ecological responses that can take years or decades to manifest (e.g., stream morphology may only be affected during very wet years; extirpation can take generations); primary activity may only last a few weeks.

Limited range of treatments: LUOs only allow treatments (alternative practices) within a narrowly-defined range (e.g., 70-90% retention).

Consequence:

- detecting effects will require an unrealistically large number of samples.

2) Adaptive management is limited to six LUOs¹¹

There is no clear rationale for selecting these particular LUOs as being most in need of adaptive management. In a recent workshop, none of the adaptive management topics identified by researchers and practitioners matched any of the six LUOs well.

Consequence:

- even if adaptive management is undertaken and studies are designed well, the most pressing questions will not be addressed.

3) LUOs only require adaptive management to the extent practicable

Well-designed studies are unlikely to be practicable for any single company.

Consequence:

- the only studies likely to be completed will likely be weak in design

⁹ i.e., land use objectives specified in ministerial orders.

¹⁰ The 2008 draft amended order reduces this barrier somewhat.

¹¹ Adaptive management addresses seven LUOs in the 2008 draft amended order.

4) LUOs do not specify criteria for adaptive management studies

There is no requirement for good study design (e.g., sufficient power to detect an important effect).

Consequence:

- company efforts to maximize profit will tend to minimize investment in adaptive management and prevent well-designed studies (volume-based tenures exacerbate the problem, because timber benefits are less certain).

5) LUOs disconnect research from management decision-making.

The very point of adaptive management is to create a strong linkage between management decisions and research: management uncertainty guides research needs and new information arising from research informs management. The Province of BC has the primary motivation, as steward of public resources, to learn about LUOs and has the primary decision-making authority. As currently structured, LUOs allow licensees to determine information needs and do not provide a clear feedback mechanism to the province.

Not only is this structure bad for provincial managers, it is not necessarily useful for licensees. While licensees have some (limited) discretion associated with flexibility, and therefore some interest in LUOs, they have more pressing issues that they would like to learn about. Essentially, LUOs ask licensees to become paid research project managers, addressing topics that they are not necessarily interested in, in return for access to timber.

3.3 Recommendations

R4) De-couple adaptive management from specific LUOs.

The current policy approach of linking adaptive management to specific flexibilities fails because it does not promote the study of important research questions and because it does not promote well-designed studies.

R5) Instead, establish adaptive management teams (including researchers and practitioners) to identify topics and design studies.

This recommendation is similar to R15. Resource managers and practitioners, representing licensees, Forest Districts and First Nations, should work with researchers to identify potential study topics that have research merit and management relevance. They should use existing knowledge summaries to help identify key questions and may need to consult the literature and/or topic experts to clarify the specific study needed and its design.

Note that maintaining requirements for adaptive management within specific LUOs and allowing unrelated adaptive management projects in return for flexibility does not solve the problem and raises an additional problem—taking additional risk does not aid learning about the risky practice. Under EBM, adaptive management takes increased ecological risks in order to provide an opportunity to learn. Increasing risk to an objective without learning about that objective does not constitute adaptive management.

R6) Develop an alternative mechanism to fund adaptive management.

Under flexibility, the apparent intention was to trade timber for information from adaptive management studies. Because this policy will not work, an alternative source of funding for

adaptive management needs to be found. Funds may come from existing or new levies on timber harvested (or just from timber harvested under flexibility). For example, the Forest Investment Account Land Base Investment Program already includes adaptive management work as a new category. Such an approach allows funds to be pooled in order to create well-designed studies and does not limit the scope of topics to specific LUOs.

R7) Establish forest management advisory groups to make policy and practice recommendations.

Adaptive management results need to feed back to management policy and practice. Some results will be most appropriate for government policy-makers and others for forestry practitioners. A group of knowledgeable practitioners from government and industry, First Nations and ENGOs should work with researchers to interpret the relevance of study findings and make management recommendations. They should be different people than those who participate in the adaptive management teams.

4 Capacity-related barriers to adaptive management

There are two types of barriers to adaptive management: those related to the current capacity of licensees to plan and implement adaptive management (discussed here) and those related to policy (discussed in section 3). Under LUOs, adaptive management occurs within the context of flexibility in practices, so the capacity to undertake adaptive management depends also on the capacity to complete the additional requirements associated with flexibility.

4.1 Capacity to undertake EBM

In general, feedback from practitioners indicates that EBM has made planning considerably more difficult. Watershed development is made complex by sites that cannot be harvested, particularly red-listed site series and grizzly bear habitat. Lack of site-series inventories further complicate planning.

4.2 Capacity to take advantage of flexibility options

Ministerial Orders contain LUOs which prescribe specific results (standard practice). Many LUOs allow “flexibility” (non-standard, alternative practice). Choosing alternative practices shifts the burden of responsibility for maintaining the resource integrity to the forest professional and in some cases requires specific assessments (Table 6). Most alternative practices require “adaptive management plans, where practicable¹². Also, alternative practices and adaptive management plans must be discussed with First Nations (see section 5).

Table 6. Assessments and responsibilities associated with flexibility that includes adaptive management plans.

LUO topic	Assessment	Professional Responsibility to meet specific ecological objectives
ECA in important fisheries watersheds	coastal watershed assessment or similar	maintaining an amount, type and distribution of forest cover that is sufficient to sustain natural hydrological and fluvial processes, based on the assessment
S1 to S3 streams, lakes, marsh, fen		ascertaining and retaining the amount of functional riparian forest sufficient to maintain stream bank stability and stream channel integrity
Forested swamps		ascertain and retain the amount of functional riparian forest sufficient to maintain the integrity of the forested swamp; flexibility allowed for road

¹² “to the extent practicable, an adaptive management plan is developed and implemented to monitor environmental impacts during any primary forest activity¹²,”

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LUO topic	Assessment	Professional Responsibility to meet specific ecological objectives
		access, safety or economic viability
Upland streams	coastal watershed assessment or similar	maintaining an amount, type and distribution of forest cover that is sufficient to sustain natural hydrological and fluvial processes, based on the assessment
Active fluvial units		ascertain and retain the amount of functional riparian forest sufficient to maintain bank stability and channel integrity on the active fluvial unit;
Grizzly bears		obtain from a registered professional biologist confirmation that the disturbance will not cause a material adverse impact to the suitability of the critical grizzly bear habitat

Undertaking alternative practices requires the knowledge and experience necessary to make assessments, to judge whether ecological objectives will be met, and to plan and conduct adaptive management studies. Although LUOs do not specify assessment procedures for four of the six flexibilities, some form of site assessment will be necessary to support professional judgement. BCTS staff are familiar with watershed assessments and do not see them as a barrier to flexibility. Assessments of grizzly bear habitat are also relatively straight forward, but require qualified bear biologists who may be in short supply. The remaining assessments focus on bank stability and channel integrity, and on forested swamp integrity. No standard assessment procedures are specified; probably none exist. Thus, BCTS will be cautious about making judgements with regard to bank, channel and swamp integrity. Note, however, that the scope of flexibility related to riparian objectives is relatively limited (Table 7).

Table 7. Harvesting restrictions under LUO standards and under flexibility.

LUO topic	Standard	Flexibility
ECA in important fisheries WS	<20% ECA	based on assessment
S1 to S3 streams, lakes, marsh, fen	> 90% of functional riparian forest in RMZ (1.5 tree buffer for streams and large water bodies; 1 tree for smaller bodies)	> 70%
Forested swamps	> 70% of functional riparian forest in RMZ (1.5 tree buffer)	> 60%
Upland streams	> 70% of upland forest as functional riparian forest	based on assessment
Active fluvial units	> 90% of functional riparian forest in RMZ (1.5 tree buffer)	> 80%
Grizzly bears	100% Class I and > 50% Class II	based on RPBio

4.3 Capacity to plan and implement adaptive management

Although BCTS staff have relatively limited experience, planning and implementing adaptive management should not be too onerous, given sufficient incentive and support. Adaptive management typically recognizes that a team approach is needed. If licensees need help planning studies, support should be available from local researchers who are hoping to participate in the project or from a regional (or perhaps district) adaptive management body (currently under development).

4.4 Financial capacity

BCTS does not think that the benefits of information from adaptive management studies justify investment. Revenue from additional timber accessed under alternative practices must exceed the costs of assessments and adaptive management related to flexibility. The degree of flexibility and the consequent timber benefit is limited under stand-scale LUOs (Table 8). A positive net benefit is more likely for watershed-scale flexibilities and where site-scale flexibility provides

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access to a portion of the watershed (e.g., putting road through grizzly bear habitat). Because, however, BCTS has a volume-based tenure, they have no certainty that they will be able to harvest the timber made available by flexibility at the watershed scale. This additional financial risk reduces BCTS’s willingness to undertake flexibilities with marginal or less immediate financial benefits.

Less obvious costs include the additional responsibility taken on by professionals, including any related upgrading of knowledge and skills and documentation of judgements.

In the north coast, accessing sites tends to be difficult and costly. Repeated visits to the field to plan a site-scale flexibility is probably not cost effective. Such flexibilities need to be planned at the FSP scale. Adaptive management projects face similar logistical challenges and expenses.

Table 8. Estimated Proportion of North Coast TSA eligible for each different flexibility and comments on the likelihood of undertaking flexibility (based on Central and North Coast Order, December 19, 2007).

LUO topic	Applicable area*	Comments on likelihood of undertaking flexibility
ECA in important fisheries WS	1%	Likely limited opportunity to use this flexibility. One important fisheries watershed (Red Bluff Lake) is currently undeveloped; no plans to develop within next five years; development potential is limited so ECA limit is unlikely to be constraining
S1 to S3 streams, lakes, marsh, fen	< 10%	Limited interest in this flexibility due to likely negative net benefit . Only modest flexibility allowed—probably not sufficient extra timber revenue (benefit) relative to flexibility process requirements (cost)
Forested swamps	< 10%	Likely limited interest in this flexibility due to economics— negative net benefit . Note that forested swamps are common in parts of the NC TSA, thus, AM that leads to increased harvesting in buffers could be important in the long term.
Upland streams	< 5%	Some opportunities exist: Most watersheds have limited operability so the standard LUO threshold is not approached, however this flexibility appears applicable in some more operable watersheds. Net benefit of flexibility may be positive because larger volume of timber is made available. This topic area has much broader importance in the business area that falls outside of Ministerial Orders, due to the generally higher degree of operability and potential to develop at a rate that may approach or exceed the threshold.
Active fluvial units	<5%	Likely limited opportunity to use this flexibility. Active fluvial sites tend to overlap with other resource values (e.g., red and blue listed ecosystems and grizzly bear habitat). Also, net benefit may be negative . However high value timber occurs in these units so some cases with positive net benefit may arise, depending on magnitude of increased costs associated with flexibility.
Grizzly bears	<10%	Estimate rough due to lack of habitat maps—in Douglas Channel, 15%-20% of area is habitat, but bear population also particularly high in Douglas Channel. This flexibility is also of interest because habitat tends to be in major access corridors and can block access to significant volumes (at back end or up tributaries)— net benefit may be positive

*percent of harvestable area in NCTSA; note that although a flexibility may be an option in an area, the standard threshold in the LUO may not be approached so the flexibility is not needed.

4.5 Practicability of adaptive management

With respect to adaptive management, tests for practicability would have to weigh the benefit of the research to society against additional environmental risks and increased operating costs. If adaptive management places a unreasonable financial burden on the licensee, it will likely be considered impracticable. Thus, the issue of practicability is closely tied to the issue of net

benefit from flexibility discussed above. If the financial costs of an adaptive management project are shared by multiple licensees, the cost per licensee is more likely to be reasonable and adaptive management is more likely to be practicable.

4.6 Summary of capacity issues

In general, implementation of EBM is hampered by poor ecological inventories, a more complex planning process and, to a lesser extent, lack of established practices (Table 9).

Taking advantage of opportunities for flexibility brings specific challenges in the form of assessments, information sharing and adaptive management (Table 9). While BCTS staff may not be comfortable undertaking certain assessments or planning adaptive management independently, the necessary skill sets exist locally. Assessments of the impacts of riparian management on stream morphology and forested swamp integrity may be the most challenging, because they are the least well understood. Information-sharing related to flexibility and adaptive management can likely build on existing communication processes (e.g., related to forest stewardship planning) without much difficulty.

Overall, the largest barriers to flexibility and adaptive management are policy limitation (discussed below) and financial limitations (Table 9). Revenue derived from flexibility (e.g., from increased timber harvesting), must exceed the costs of assessments and adaptive management. Without collaboration among licensees, the costs of adaptive management projects will be too large in most cases.

Table 9. Barriers related to EBM implementation and flexibility.

Potential barrier	Description of barrier
All LUOs	
Poor ecological inventories	Identification of critical bear habitat and of red- and blue-listed ecosystems requires site series to be identified (site series may also be required for planning ecosystem representation). Lack of site series information limits the ability of forest practitioners to plan development of watersheds without significant field work.
More complex planning.	Planning watershed development (e.g., finding feasible road locations and sufficiently concentrated volumes of timber) is more difficult because more areas are set aside for conservation purposes. Planning is made more difficult by poor inventories.
Lack of established best practices	LUOs introduce the concept of functional riparian forest; the number of large trees to leave adjacent to the stream is left to the discretion of the professional.
Flexibility	
Assessments	Flexibility must be supported by assessments to show that risk to forest values is acceptable. In general three types of assessments are needed: watershed assessments, bear habitat assessments and riparian assessments. Coastal Watershed Assessment Procedures and grizzly bear habitat assessments are generally well-established. Licensees will need to find qualified biologists to conduct the bear habitat assessments. Most foresters, however, will not be comfortable assessing the impacts of riparian management on stream morphology or on the integrity of forested swamps. Experienced hydrologists will probably need to do these assessments, at least until standard assessments are developed.
Additional responsibility	Responsibility is tied to assessments by qualified professionals. Foresters may be extra cautious accepting responsibility for riparian flexibility because of the lack of standard assessment procedures.
Information-sharing with First	Flexibility must be supported by information-sharing with First Nations. This process should not be too challenging because it can use existing communication channels.

Issues and recommendations arising from the BCTS AMP pilot study.

Potential barrier	Description of barrier
Nations	
Adaptive management	While forestry practitioners do not have the skills necessary to implement adaptive management studies independently, support should be available (e.g., similar to specialized support required for some assessments).
Net benefit	Revenue from additional timber accessed under flexibility must exceed the costs of assessments and adaptive management related to flexibility. The degree of flexibility and the consequent timber benefit is limited under stand-scale LUOs. A positive net benefit is more likely for watershed-scale flexibilities and where site-scale flexibility provides access to a portion of the watershed (e.g., grizzly bear habitat).
Logistics	Transportation on the coast is very expensive. Altering logistics to accommodate assessments, information-sharing with First Nations, and/or adaptive management may be prohibitively expensive.
Lack of collaboration	Research studies must be well designed in order to return useful results. Many such designs tend to be too large in scope for individual licensees. The current approach to adaptive management is not coordinated among licensees, but there are no significant barriers to collaboration.

4.7 Recommendations

4.7.1 *Efficient use of licensee resources*

Licensees should:

R8) Collaborate with (or hire) researchers to plan and implement adaptive management projects.

Different parties bring different perspectives, different knowledge and different skills.

Researchers know how to plan studies so they produce reliable results. Practitioners add realism: they can describe the forest and they understand logistical challenges.

R9) Collaborate with other licensees on topics of mutual interest.

R10) Only undertake studies that are likely to generate useful results.

R11) Track the costs and benefits of flexibility.

R12) Discuss adaptive management with First Nations as part of ongoing information-sharing related to development.

4.7.2 *Recommend guidance material or background work*

The Province of BC and licensees should:

R13) Prepare a riparian assessment procedure to support judgements about impacts on bank stability and stream morphology and about impacts on forested swamps.

R14) Prepare a guidebook describing best practices in riparian areas (e.g., how to create functional riparian forest).

4.7.3 *Recommended support for forest practitioners*

The Province of BC and licensees should:

R15) Establish adaptive management teams (practitioners and researchers) focussed on forestry.

This recommendation is similar to the R5. These teams, likely operating at the regional or district scale bring three benefits: they promote efficient use of licensee time and resources because project planning and management is shared; they provide a forum for collaboration with researchers; they pool the resources necessary for well-designed studies. These teams may be partially supported as part of the Adaptive Management Framework and/or a stumpage levy. Other teams could focus on non-forestry issues.

R16) Establish District-scale EBM implementation teams.

This group will identify studies (e.g., inventories, pilot projects, research to develop best practices, assessing feasibility of watershed development under EBM) that address the pressing issues of licensees. Licensees have more pressing issues than LUOs. This team should be connected or overlap with the adaptive management teams.

R17) Initiate small adaptive management pilot projects with licensees to develop competence in adaptive management.

R18) Provide adaptive management advice for licensees who wish to implement adaptive management within their own companies.

Current policy, and the team approach recommended, support adaptive management projects but do not install an adaptive management approach in BCTS. Consider supporting a pilot project with BCTS that funds some staff time (e.g., 1/2 time position) to develop adaptive management within the BCTS organisation. This person would work to document and clarify BCTS objectives and strategies, create a knowledge summary or reference library of relevant information for management, liaise with local researchers to discuss topics of interest and participate in District-scale adaptive management and EBM implementation teams. The overall goal would be to attempt to create an adaptive management “culture” or a culture of learning within BCTS.

5 Recommended approach to involving First Nations

Forestry operations take place within First Nations’ territories. The legal rights of First Nations on their territories have been clarified in recent decades and will continue to evolve. Of relevance to adaptive management, ministerial orders require licensees to share information with First Nations regarding flexibility and adaptive management. The ability of licensees to undertake flexibility will in part depend on the good relationship they have developed with First Nations.

5.1 Timing of communication

Discussions with First Nations regarding flexibility and adaptive management can be built on existing communication processes that address forestry development. First Nations representatives recommended three key points of contact:

- 1) **Prior to preparation of forest stewardship plans.** These discussions should be relatively general, but should describe overall intentions regarding flexibility and adaptive management. They should specify the desired schedule for future discussion.

Issues and recommendations arising from the BCTS AMP pilot study.

- 2) **During preparation of multi-year watershed development plans¹³.** At this stage licensees have more concrete plans for flexibility and adaptive management and have a better understanding of values being affected.
- 3) **During site assessments.** Site assessments may identify traditional forest resources and/or traditional heritage features that may alter adaptive management plans.

5.2 Topics for discussion

First Nations interests can be divided into benefit-sharing and stewardship interests. Benefits include revenue, training, employment, contracting opportunities, etc. Stewardship interests include management of traditional forest resources or traditional heritage features, and tend to focus on management of cedar and fish.

5.2.1 *Benefit-sharing*

- 1) **Do not discuss benefit-sharing related to flexibility.** The BC government and First Nations have negotiated Forest and Range Agreements. These agreements either provide forest tenures to First Nations or share forestry-related revenues (i.e., stumpage) with First Nations. In general, licensees can also share benefits with First Nations. BCTS doesn't, however, share revenue in return for flexibility, in part, because the province has negotiated Forest and Range Agreements to address forestry revenue. BCTS also has difficulty providing employment (including small contracts) and training opportunities because their harvesting and silviculture work is handled by contractors. Benefit-sharing related to forestry operations, including flexibility, should be addressed in broader-scale negotiations.
- 2) **Discuss benefit-sharing related to adaptive management studies.** Adaptive management projects can provide opportunities for training and employment. Factors such as seasonality of work, specialized skills and possibility for related future employment should be considered.

5.2.2 *Stewardship*

- 1) **Discuss risks related to flexibility and provide assessments for review.** Flexibility can increase risk to specific ecosystems (e.g., high-value-fisheries watersheds) and also leads to increased timber harvesting. Increased harvesting may lead to secondary risks (e.g., extra cedar harvest) of interest to First Nations.
- 2) **Discuss appropriate topics for adaptive management studies.** Adaptive management under LUOs addresses specific hydrological and ecological values. First Nations may have specific ideas about how best to study impacts on these values.
- 3) **Discuss degree of First Nations participation.** First Nations may be interested in undertaking joint studies related to LUOs of particular interest. They may have ideas for additional studies to address some of their specific stewardship interests.
- 4) **Discuss the appropriate approach for sharing results and data.**

¹³ Five year development plans are no longer required by legislation, but licensees typically prepare multi-year development plans for their own purposes.

5.3 Additional recommendations

R19) Study the relationship between forestry and human well-being under the Adaptive Management Framework.

First Nation communities are interested in improving human well-being. Forestry development is one potential means of doing this, but outcomes are not clear. Thus, effects on human well-being are an important topic for adaptive management. Unfortunately, they do not fit within the LUOs, which focus on ecological integrity. The Adaptive Management Framework provides a more appropriate avenue for studying human well-being.

R20) Prepare a research protocol.

Researchers have a poor track record of working with First Nations communities. Results of studies have not been shared in an appropriate way, if at all. Confidentiality of information has not always been respected. In general, First Nations have benefited little from research. A protocol could cover appropriate procedures for presenting and discussing research ideas, for sharing information and data and for determining training and employment opportunities. The research protocol could apply to other research, as well as to adaptive management. The protocol is not meant to be onerous to either party. It is meant to provide guidance about how to develop a good working relationship.

6 Recommended approach to preparing an adaptive management plan

This section recommends an approach for developing an adaptive management plan. First it describes the purpose of an adaptive management plan; second, it describes who should participate in the planning process; third, it outlines the planning steps; and finally, it provides an adaptive management plan template.

6.1 Purpose of an adaptive management plan

An adaptive management plan describes a management related problem, identifies specific questions related to the problem, outlines an approach for answering one or more of these questions and describes a process for translating study results into management practice.

An adaptive management plan is intended to focus research and monitoring efforts within the context of an adaptive management process that has already developed robust conceptual models of management effectiveness. It can, however, be applied in any management context, provided sufficient efforts are made first to characterize current knowledge. In preparing LUOs, significant efforts have been made to synthesize knowledge. This knowledge should be used to support planning adaptive management.

Adaptive management studies differ from “standard” research studies in two key ways. They use formal conceptual models to help identify knowledge gaps and key study questions and then update conceptual models to reflect study results. They establish a formal process to adjust management to reflect study results and engage researchers/practitioners in the learning process.

6.2 Participation in adaptive management planning

Legally, the responsibility for developing adaptive management plans rests with licensees, however, adaptive management requires a team approach.

First Nations should be involved from the outset (see section 5). Initial discussions should address First Nations interest in adaptive management issues and outline a process for future involvement. Topics for discussion may include how to share results, collaboration on topics of mutual interest and potential employment and training opportunities.

BCTS already has a process in place to discuss forest management with First Nations, starting before Forest Stewardship Plans are developed. Discussion of adaptive management can be added to the existing process.

Researchers and forest practitioners (and First Nations where appropriate) should develop and undertake adaptive management plans collaboratively. This does not mean that everyone does everything, rather that good communication is established so that everyone has an opportunity to review each step, make comments and track progress. In particular, research plans can be greatly improved by feedback from practitioners and from other researchers. And shared opportunities to interpret and learn from studies are a good way to build collaboration and mutual benefit.

If multiple parties (e.g., several companies) participate in the same study, then efforts must be made to ensure consistency of results (e.g., use same forms and protocols).

Periodic (at least annual) meetings should be arranged to ensure that research is still on track (e.g., field conditions may limit planned data collection or the researcher may have become side-tracked).

6.3 Steps for planning and conducting adaptive management studies

1. Practitioners initiate a discussion with First Nations regarding their participation¹⁴; First Nations participate in the same way as practitioners (subject to interest)¹⁵.
2. Practitioners and researchers identify management issues.
3. Researchers and practitioners prepare an adaptive management plan.
4. Field research crews (mainly) conduct the adaptive management study:
 - a. Work collaboratively with forestry crews to implement any treatments;
 - b. Consider potential for forestry crews to collect data.
5. Researchers (mainly) analyse results and write report.
6. Practitioners and researchers evaluate relevance of findings to management:
 - a. Consult with topic experts;
 - b. Integrate new knowledge with pre-existing knowledge (i.e., update conceptual models).
7. Practitioners (mainly) adjust management:
 - a. Standard operating procedures and best management practices;
 - b. Policy recommendations.
8. Researchers and practitioners prepare extension products for other practitioners:

¹⁴ Practitioners should have a general idea of adaptive management issues prior to meeting to help focus discussion.

¹⁵ i.e., when practitioners are referred to in subsequent steps, they include First Nations representatives to the extent of First Nations interest.

Issues and recommendations arising from the BCTS AMP pilot study.

- a. Workshops (particularly field-based courses);
 - b. Extension notes.
9. Researchers (mainly) prepare extension products for the research community:
- a. Conference presentations;
 - b. Journal articles.

6.4 Template for adaptive management plan

1. Project Title
2. Project leader
 - name and contact information.
3. Management problem
 - Provide an overview of the general management problem.
 - Present a synopsis of current knowledge relevant to the problem, highlighting key management uncertainties.
 - List the research questions that need to be answered to reduce uncertainty.
 - Identify one or more questions that seem most relevant and tractable to be the focus of the study; note rationale for choice.
4. Research problem
 - Describe the specific question to be studied.
 - Present a synopsis of current knowledge relevant to the specific research question.
 - Refer to any other studies that are underway.
5. Project objectives
 - Describe the objective of the study. Note whether the study will test hypotheses or simply describe resource condition.
6. Potential benefits to management
 - Discuss the likely reliability of the study results.
 - Describe how study results might influence management, including the potential magnitude of change.
 - Discuss limits of management response due to economic and other constraints, including management uncertainties.
 - Describe how results will influence standard operating procedures, influence best practices or lead to policy recommendations.
7. Target Audience
 - List which government agencies, First Nations and licensees will benefit most from results.
 - Identify people/positions who will have the responsibility to modify management based on the results of the study (i.e., decision makers).
8. Geographic scope
 - Describe the location of the study and the region where results will be applicable.

Issues and recommendations arising from the BCTS AMP pilot study.

9. Study Design and Methods

- Demonstrate that the study design is capable of answering the question.
- Describe the study design including treatments, controls, stratification, sample size, replication and response variables.
- Describe the sampling protocol (reference existing protocols where applicable): Because studies can take several years, meta-data forms should be used to describe the design of each project, the sample locations and the data collection protocol. The contents of the field forms need to be described well enough to allow anyone to interpret data.
- Describe the analysis procedure (should match study design)

10. Evaluation of Management Implications

- Describe how findings will be meshed with pre-existing knowledge.
- List topic experts who will participate in this process

11. Management Feedback

- Describe the process for updating standard operating procedures or best practices.
- Describe the process for making policy recommendations.

12. Academic products

- Describe the type of product and the target audience (e.g., internal research report, journal publication, conference presentation)

13. Extension products

- Prepare appropriate material/forums to convey results to those who will make decisions based on those results.
- Describe the type of extension materials: extension notes, workshops, policy recommendations, web-based information.
- Describe the target audience (e.g., other licensees, forest practitioners)

14. Budget

- Provide a detailed plan for the first year
- Describe the in-kind and funding contributions of the various partners

15. Multi-year Funding Commitments

- Describe arrangements to support multi-year projects, specifying the commitments of various partners.

16. Schedule

- Describe the timing of any treatments
- Describe the timing of data collection
- Describe expected timing of results (if study is multi-year, indicate likely confidence in results after 1 year versus after 5 years, for example)

17. Project Team

- List the core team members, their skills, roles and time commitments.
- List contact information.

18. Partners

- List partners providing funds or in-kind contributions that are not part of the project team and their contact information.

7 Summary of recommendations

A complete list of recommendations follows:

For anyone planning adaptive management:

- R1) Use the Prioritization Procedure to help identify research questions
- R2) Complete the Knowledge Summary
- R3) Test the prioritization procedure with human well-being.

For the provincial government:

- R4) De-couple adaptive management from specific LUOs (so it can focus relevant questions).
- R5) Instead, establish adaptive management teams (including researchers and practitioners) to identify topics and design studies.
- R6) Develop an alternative mechanism to fund adaptive management
- R7) Establish forest management advisory groups to make policy and practice recommendations

For licensees:

- R8) Collaborate with (or hire) researchers to plan and implement adaptive management projects.
- R9) Collaborate with other licensees on topics of mutual interest.
- R10) Only undertake studies that are likely to generate useful results.
- R11) Track the costs and benefits of flexibility.
- R12) Discuss adaptive management with First Nations as part of ongoing information-sharing related to development.

For the provincial government and/or licensees:

- R13) Prepare a riparian assessment procedure to support judgements about impacts on bank stability and stream morphology and about impacts on forested swamps.
- R14) Prepare a guidebook describing best practices in riparian areas (e.g., how to create functional riparian forest).
- R15) Establish adaptive management teams (practitioners and researchers) focussed on forestry.
- R16) Establish District-scale EBM implementation teams.
- R17) Initiate small adaptive management pilot projects with licensees to develop competence in adaptive management.
- R18) Provide adaptive management advice for licensees who wish to implement adaptive management within their own companies.
- R19) Study the relationship between forestry and human well-being under the Adaptive Management Framework.
- R20) Prepare a research protocol.

Issues and recommendations arising from the BCTS AMP pilot study.

In logical sequence, the main recommendations necessary to enable adaptive management follow:

- 1) De-couple adaptive management from specific LUOs (R4).
- 2) Develop an alternative mechanism to fund adaptive management (R6).
- 3) Follow the recommended approach for involving First Nations (Section 5).
- 4) Establish adaptive management teams (practitioners and researchers) to plan studies related to forestry (R5, R15)
- 5) Follow the recommended approach to develop adaptive management plans. (Section 6)
- 6) Establish District-scale EBM implementation teams (R16).
- 7) Establish forest management advisory groups to make policy and practice recommendations (R7).
- 8) Initiate small adaptive management pilot projects with licensees to develop competence in adaptive management and to test adaptive management policy (R17).

8 Appendix 1. Summary of Workshop to Develop an Adaptive Management Plan (December 2, 2008)

prepared by Dave Daust, December 4, 2008; revised Dec 16, 2008

8.1 Attending

Ian Smith, BC Timber Sales, Terrace
Mike Viveiros, BC Timber Sales, Terrace
Dave Nicholson, BC Timber Sales, Terrace
Les Pawlak, BC Timber Sales, Terrace
Allen Banner, Coast Region Research Team, MFR, Smithers
Laurie Kremsater, ecological consultant, Abbotsford
Karen Price, ecological consultant, Telkwa
Dave Daust, forestry consultant, Telkwa

8.2 Purposes of Workshop

1. To develop an adaptive management plan:
 - useful, reliable information;
 - operationally feasible.
2. To outline the steps necessary to plan and implement adaptive management.
3. To assess current policy support for adaptive management and to recommend changes that will encourage adaptive management.

The workshop covered several topics, presented in sections below (not in the same order as discussed in the workshop).

8.3 Introduction to adaptive management

Dave D. gave a presentation, followed by discussion.

8.4 General procedure for developing an Adaptive Management Plan

Workshop participants discussed this topic in a single group.

8.4.1 A team approach is needed.

First Nations should be involved from the outset. Initial discussions should address First Nations interest in the adaptive management issues and outline a process for future involvement. Topics for discussion may include how to share results, collaboration on topics of mutual interest and potential employment and training opportunities.

BCTS already has a process in place to discuss forest management with First Nations, starting before Forest Stewardship Plans are developed. Discussion of adaptive management could be added to the existing process.

Researchers and forest managers (and First Nations where appropriate) should develop and undertake adaptive management plans collaboratively. This does not mean that

Issues and recommendations arising from the BCTS AMP pilot study.

everyone does everything, rather than good communication is established so that everyone has an opportunity to review each step, make comments and track progress. In particular, research plans can be greatly improved by feedback from managers and from other researchers.

Periodic (at least annual) meetings should be arranged to ensure that research is still on track (e.g., field conditions may limit planned data collection or the researcher may have become side-tracked)

If multiple parties (e.g., several companies) participate in the same study, then efforts must be made to ensure consistency of results (e.g., use same forms and protocols)

8.4.2 Steps to develop an adaptive management plan

Steps include

- identifying issues and questions: a single question may lead to more than one study.
- planning studies (appropriate experimental or sample design, roles responsibilities, deliverables, budgets, etc, see details below)
- collecting data: the contents of the field forms need to be clearly described. Because studies can take several years, meta-data forms should be used to describe the design of each project, the sample locations and the data collection protocol.
- analysing results and writing reports
- interpreting management relevance
- developing extension for decision-makers; at the beginning of the project, identify decision makers responsible for using results to change management.

8.4.3 Content of an AM Plan

1. Problem description

Describe the management problem that leads to questions. Select questions that seem most important and most tractable and provide supporting rationale. Explain how management will change in response to answers. What are the limits of change?

For each question, develop a project plan based on the remaining steps

2. Project Objectives

- Describe the specific hypothesis to be tested.

3. Summary of pertinent knowledge

- Synthesizing the latest information is a necessary first step. Consult topic experts, researchers and recent literature. Often other licensees will face similar issues and some may have begun studies.

4. Methods

- Study design including replication, stratification, controls and sample size
- Sampling protocol (reference existing protocols where applicable)
- Analysis procedure

5. Budget, roles, responsibilities

6. Schedule, deliverables

7. Evaluation process (i.e., how are results to be interpreted; who needs to be involved)

Issues and recommendations arising from the BCTS AMP pilot study.

8. Extension plan in particular to decision makers that can use results to change management direction or policy

8.5 Operational limitations to adaptive management

Workshop participants identified several operational limitations over the course of the day's discussion:

The financial costs of the adaptive management project and of securing the flexibility provided within the Land Use Order objective cannot exceed the expected benefit. Flexibilities require staff time and potentially costly assessments; they delay the planning process. Timber benefits are uncertain: there is no guarantee that timber benefits will accrue to BCTS because of their volume-based tenure.

Timber benefits resulting from flexibility associated with riparian LUOs do not seem to warrant costs of adaptive management, unless study can plug into a "master plan" so that no (or very little) extra time is necessary to lay out blocks.

Managers may only want to study options that they think are economically realistic. For example, when Weyerhaeuser studied variable retention, they did not examine operationally-expensive, high retention strategies. Limiting scope, however, reduces the ability of studies to find meaningful differences. For example, a study of retention levels between 10% and 30% cannot detect a threshold response at 40% retention and may not be large enough differences to even discern trends.

8.6 Potential topics to address with adaptive management plans

Workshop participants split into two groups, each with managers and researchers, to list potential management questions. Each of the following questions may generate several more specific research questions and each of the research questions can be tackled with different approaches and levels of rigour.

How can watershed scale planning be improved?

This is an important issue for BCTS. It does not address a LUO that requires an adaptive management plan. It is not technically an adaptive management question.

Reserves for different purposes do not seem to have been planned in a coordinated manner (i.e., they do not seem to minimize timber impacts). Related to this concern, hard and fast conservation rules may be a poor way of planning to meet both conservation and timber goals in the same watershed. These observations lead to several related questions:

- Based on current conservation targets, can a conservation plan be developed that allows more timber to be harvested?
- Can conservation and timber development experts collaborate to make a better plan (one that meets conservation objectives and provides more timber) than is made by applying hard and fast conservation rules and is the cost worthwhile?
- How much do errors in conservation-related inventories, particularly grizzly bear habitat maps, compromise a) access to timber and b) conservation objectives?

Issues and recommendations arising from the BCTS AMP pilot study.

A related issue: conservation planning often tries to place reserves outside the THLB to minimize timber impact. Quite a bit of harvesting occurs outside the THLB (e.g., up to 70% in some watersheds). Is there a more rationale way to plan if the THLB is not well correlated with actual harvesting?

Watershed development planning is currently very difficult for several reasons:

- Red-listed site series occur frequently in some watersheds.
- Site series surrogates (SSS) do not do a good job of predicting site series, thus, red-listed sites (in particular the 08 site series) occur in mapped “operable” areas; conversely areas mapped as potentially red-listed may not be and need to be checked.
- No harvesting is allowed in some entirely undeveloped watersheds because of landscape-unit targets (this challenge reflects current rules).

Two key questions emerge:

- Is the 08 site series really rare? This question could be explored by surveying forestry practitioners.
- How accurate are site series surrogates?

How much functional riparian forest is needed in the upland stream portion of the watershed to sustain natural hydrological and fluvial processes?

This question addresses an LUO that requires adaptive management. Reducing upland forest targets can significantly increase the volume of timber available for harvest in the short to medium term. BCTS feels that this issue may one of the few flexibilities that warrants investing in adaptive management.

It may be possible to conduct a retrospective study, examining watersheds with different levels of upland forest retention. It may be possible to assess changes in stream morphology by examining remotely sensed images. The first step should be to conduct a feasibility study to determine if appropriate watersheds exist and to determine if remote sensing can adequately detect changes in stream morphology.

A related question is how does the type of watershed (e.g., drainage basin size, presence of headwater lake, steepness) affect the necessary retention level?

How can BCTS demonstrate to DFO that proposed log dumps should be approved?

This is a significant current issue for BCTS. It is also an issue for other licensees and collaboration may be possible. BCTS has several log dump sites and is already planning to send a diver down next year to assess impacts on the ocean floor, thus with a bit more planning, this project may be relatively easily translated into an adaptive management project. This question does not address a LUO that requires an adaptive management plan, however.

Log dumps require approval by DFO. The approval process is currently time consuming. The overall research question is how to develop a log dump with acceptable impacts, in particular, acceptable to DFO.

Issues and recommendations arising from the BCTS AMP pilot study.

Log dumps impact near-shore habitat by covering the ocean floor with bark from logs. Impacts may vary by site (e.g., if ocean current differs), by period of operation (some dumps work for a few months, others are in place for more than a decade) and with mitigation and rehabilitation practices.

Because DFO holds management power, it will be important to involve them in the study so that they trust any findings. As well as identifying best practices for log dumps, one aim of the study would be to identify situations that DFO and BCTS agree are low risk and should be relatively easy to approve. DFO staff turnover makes collaboration more difficult.

A related question to log dump management is how effective is creation of additional fish habitat? DFO policy allows no net loss of habitat, thus, installing a log dump usually requires measures to create habitat. The effectiveness of these measures and the impacts on the ecosystems that are changed to “create habitat” should be examined.

How does riparian buffer width and the content of the buffers affect stream characteristics and riparian biodiversity?

This question addresses a LUO that requires adaptive management. This question interests researchers. It is also of some interest to BCTS, because forest managers have some discretion over the content of riparian management areas.

Riparian buffer width is flexible within limits in the LUOs in order to allow buffer design to try and capture the “actual” riparian forest. An initial question might be how much is this current flexibility used and/or how much “actual” riparian forest (and non-riparian) is captured in the buffer. A second question might be how effective are different buffer widths at maintaining stream characteristics and riparian biodiversity. This second question is very difficult to answer.

LUOs specify that functional riparian forest be maintained in management areas. Functional riparian forest means “forest that has reached hydrologically effective greenup and that also contains some large trees adjacent to streams to provide for large organic debris”. The exact content (e.g., number, size and species of trees and snags) of the management areas is left to the discretion of forest practitioners, and information that could be used to develop “best practices” would be useful. Specifically, how does the content of the buffer affect stream characteristics and riparian biodiversity? This question is also difficult to answer.

How rapidly do different ecological functions recover following different types of disturbances and in different ecosystems?

This question is more important to researchers than to BCTS. It does not fit within a LUO that requires adaptive management.

Different-aged forests function differently and support different communities. Retaining old forest at stand and landscape scales aims to retain ecological processes and communities associated with old forest. Our understanding of when functions and

communities recover is still quite rudimentary. This project aims to examine how ecological functions and communities change with forest age and can provide a better basis for setting representation targets. It could also characterize differences between site series: currently ecological recovery is assumed to be the same across site series, even though site series vary substantially in productivity and development of structure that correlates with function. This information is relevant to planning because the definition of old forest affects reserve targets and ability to reach those targets. Presently, the definition of old forest on the south coast is 180 years while on the mid and north coast it is 250 years. The ecological rationale for the different ages and where they apply is not based on sound knowledge of attributes of forests of different ages.

This is a relatively large project, but can be completed in several phases. Allen Banner is already undertaking this research and has already published a set of results.

How much old forest representation is enough?

This issue is of interest to both researchers and BCTS. In its general form, this question does not address a LUO that requires an adaptive management plan. By focussing on specific site series, this study could be framed to fit within riparian LUOs or upland forest LUOs.

Old forest representation aims to maintain ecological functions and communities associated with old forest. As the proportion of old forest in a watershed declines, the probability of losing species or functions increases. This relationship has not been well tested in coastal forests. Studying this topic experimentally would require a very large expensive study that harvested different proportions of similar watersheds. Alternatively, a retrospective study may be undertaken at less expense, however, multiple functions and communities would still need to be sampled.

What is the ecological tradeoff between Old growth areas (large landscape-level patches) and variable retention in stands?

This question is of interest to both researchers and BCTS. It does not address a LUO that requires adaptive management.

To restate the question in an example: am I better off protecting 100 hectares of old forest or applying 20% variable retention to 500 ha? Each option protects approximately the same amount of timber, but ecological consequences may be quite different.

Problematically, the answer likely varies depending on the landscape context: variable retention may be better when large patches of old forest create the background forest matrix; old forest patches may be better when variable retention cutblocks dominate the matrix.

Studying this question will be very challenging and very, very expensive. It requires creating (or finding) a range of combinations of large old patches and variable retention cutblocks. It also requires studying the response of many different groups of organisms. The answer to the question however could also be very important economically.

How can we better manage cedar?

This question is relevant to both BCTS and researchers. It does not address a LUO that requires adaptive management.

Cedar are characteristic trees species of coastal forests, but their numbers are declining (mainly western redcedar but also yellow cedar).

Recently, high market values have increased selection harvesting of cedar using helicopter. Cedar does not regenerate well in the gaps left by harvesting; even if cedar is planted, it does not compete well. Current reforestation rules do not prevent this practice (harvesting cedar without ensuring regeneration) because other species are acceptable for reforestation.

Also, cedar does not compete well in larger plantations and becomes a relatively minor component of the stand as it matures. Cedar prefers disturbed seed beds, but current forestry practices aim to limit disturbance.

Several questions arise from this broad issue:

- How does removing cedar from old forests affect old forest function?
- How can cedar be established under selection harvesting?
- How can cedar be established in larger harvest units?
- Would burning improve cedar regeneration?

Did the Forest Practices Code work?

This question was raised by BCTS, but is not as pressing as some of the other questions raised. It does not address a LUO that requires adaptive management.

In about 1995 the Forest Practices Code introduced practices that were substantially different from previous practices. Can the differences between the code-practices and previous practices be detected?

How well will representation work as the climate changes?

This question is of more interest to researchers than to BCTS. It does not address a LUO that requires adaptive management.

This is a difficult question to answer, but very important from a long term conservation perspective.

8.7 Further development of Adaptive Management Plans

The group chose three topics having most interest to BCTS and potential for a reasonably sized project:

- How can watershed scale conservation planning be improved?
- How can we better manage cedar?
- How can BCTS demonstrate to DFO that proposed log dumps should be approved?

As part of this project, a full adaptive management plan will be developed for one or more of these topics.

8.8 Barriers to adaptive management

Workshop participants discussed challenges related to flexibility following the introductory presentation and then returned to the topic to make tentative recommendations near the end of the day. Issues related to the definition of adaptive management were discussed during the introductory presentation and during the process of identifying adaptive management questions.

8.8.1 Challenges related to the definition of adaptive management

Many information needs and related studies cannot really be classified as adaptive management. For example, attempts to improve the planning process in watersheds do not meet the criteria of providing feedback about effectiveness. Such issues still need to be addressed and should not fall through the cracks because of definitions. The concern about definition relates to the artificial pools of responsibility and funding that exist within the BC forest industry. For example, planning is technically the responsibility of government agencies and licensees. Similarly, inventory-related projects are funded largely by FIA. The adaptive management process is capable of including planning and inventory issues, but may not be the best place. If an adaptive management program is adequately funded, the concern about who should pay becomes relatively trivial.

8.8.2 Challenges related to flexibility

Flexibility brings the benefit of increased access to timber and costs of assessment and adaptive management. In order to maximize profit, it is logical for companies to limit investment in adaptive management.

BCTS has a volume-based license, thus they have no certainty that watershed scale timber benefits created by flexibility will accrue to them, but they must invest in assessments and adaptive management needed for flexibility.

There is no guidance about how to interpret LUOs.

LUOs have some specific problems that make related AM research difficult if not impossible:

- 1) The time frame is constrained to the time of primary forest activities (road construction and logging)—hard to know for sure, but for stand-scale studies this might limit data collection to a couple months; watershed-scale studies (ECA and upland forest LUOs) will not be so constrained, but some studies will need more time.
- 2) Adaptive management plans are enabled (where practicable) by only six LUOs. This dramatically limits the scope of study topics if we assume that the adaptive management plan needs to be relevant to the LUO.
- 3) LUOs limit flexibility and thus limit the range of treatments within studies.

Issues and recommendations arising from the BCTS AMP pilot study.

Researchers at the workshop felt that the range of treatment options allowed by flexibility (e.g., 90% vs. 70% retention of functional riparian forest) is not sufficient to detect a responses.

4) LUOs apply to specific sites or watersheds

Flexibility is uncoordinated. Each company decides where and when to apply flexibility. Studies, however, need replicates and randomization—they need to be coordinated. Also, many studies are too big for a single licensee to tackle.

5) Retrospective studies do not fit well within the LUO flexibility approach, yet they are the fastest and cheapest.

Some of the above problems could be solved if we assume that any topic of study is acceptable under an LUO, however this assumption is problematic. If we make this assumption, then the LUOs are not very transparent, because adaptive management plans are referred to within the context of specific LUOs. Also, some LUOs say quite specifically that the “adaptive management plan is developed and implemented to monitor environmental impacts during any primary forest activity”.

Working through the various management issues and related information needs, we attempted to identify how well studies would fit within existing LUOs. Most studies are not related to LUOs. Some could be reframed to fit within LUOs, but these were not the ones of most interest to researchers or managers.

8.9 Tentative recommendations to improve adaptive management policy

If leaders are serious about making adaptive management work, they need to restructure the approach to adaptive management. The current approach to adaptive management (adaptive management plans within specific LUOs) won't work.

There needs to be clear guidance and probably a “champion” to make adaptive management work.

Options to improve adaptive management include:

1) Keep adaptive management within LUOs and develop master plans to coordinate activities

For some issues, a team could create district scale study plans that licensees can agree to participate in. For example, when licensees come to lay out cutblocks with riparian areas, they can refer to an adaptive management plan that tells them how many large trees to leave in the riparian management area. This avoids the need for managers to plan adaptive management for each site and coordinates different practices into an overall plan that increases that chance of learning.

A team (e.g., licensees and researchers) could plan the study, develop a range of standard “treatments”, design sampling forms, manage data and share results.

2) Remove adaptive management from LUOs and Create a District-scale¹⁶ AM Team

- This approach removes all constraints associated with LUOs and plans studies based on input from researchers, managers and First Nations (and possibly other stakeholders).
- Company scale probably too small, because licensees face similar issues and should avoid redundancy.
- Regional scale may be too large for adequate participation and may lose touch with operational concerns.
- District Teams could coordinate across the Region to undertake large studies.

District-scale adaptive management will require funding. The idea of a “logging tax” on volume accessed through flexibility brought a mixed response. This approach would be one way to maintain the principle that riskier strategies should be coupled with efforts to learn about the effects of those strategies without forcing unnecessary restrictions associated with LUOs. Conversely, it reduces benefits of flexibility and may make them less desirable.

¹⁶ District and Regional scale refer to the areas covered by MFR Forest Districts and Regions