

EBM Working Group Focal Species Project

**Part 6:
Summary of Peer Reviewer Comments
and Responses**

Prepared by Hannah Horn

June 2009

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.

Table of Contents

1. Introduction	1
1.1 The Purpose of this Document	1
1.2 Background.....	1
1.2.1 Preparation of Project Reports	1
1.2.2 Peer Review Process	2
1.3 Document outline	3
2.0 American Black bear (<i>Ursus americanus</i>)	4
2.1 Alvin Cober comments.....	4
2.2 Wayne McCrory comments	5
3.0 Coastal Black-tailed Deer (<i>Odocoileus hemionus</i>)	7
3.1 Scott McNay comments.....	7
3.2 Dave Person comments	9
4.0 Grizzly bear (<i>Ursus arctos</i>)	12
4.1 Clayton Apps comments	12
4.2 Rod Flynn comments.....	14
4.3 Debra Wellwood comments	16
5.0 Marbled Murrelet (<i>Brachyramphus marmoratus</i>)	20
5.1 Anne Harfenist comments	20
5.2 Kim Nelson comments	22
5.3 Wayne Wall comments	25
6.0 Mountain goat (<i>Oreamnos americanus</i>).....	27
6.1 Doug Janz comments	27
6.2 Troy Larden comments	30
6.3 Wayne Wall comments.....	32
7.0 Northern Goshawk (<i>Accipiter gentilis laingi</i>).....	36
7.1 Steve Brockmann comments	36
7.2 John Deal comments.....	38
7.3 Richard Reynolds comments	41
8.0 Coastal Tailed Frog (<i>Ascaphus truei</i>).....	46
8.1 Linda Dupuis comments.....	46

1. Introduction

1.1 The Purpose of this Document

Peer review is a fundamental component of all projects coordinated by the Ecosystem-Based Management (EBM) Working Group, to ensure that all products are based on best available science and knowledge. This document summarizes the key substantive points raised during peer review of the products of the EBM Working Focal Species Project in February 2009.

This report is Part 6 of six reports prepared as part of the EBM Working Focal Species Project. The suite of reports includes:

Part 1: Assessment of Co-location Outcomes and Implications for Focal Species Management under EBM

Part 2: Methods for Strategic Co-Location of Habitats within Old Growth Retention Areas

Part 3: Knowledge Base for Focal Species and their Habitats in Coastal B.C.

Part 4: Summary of Habitat Mapping to Support EBM Implementation

Part 5: Review of Phase 2 Co-Location Scenario Outputs

Part 6: Summary of Peer Reviewer Comments and Responses

1.2 Background

The purpose of the Focal Species Project was to develop recommendations for addressing the habitat requirements for focal species as part of the implementation of ecosystem-based management (EBM) in coastal BC. The specific focus of the project was to

- define the habitat requirements for each species, in terms of quality of habitat and sufficiency of habitat supply with the EBM definition of “seeking to achieve a low risk to ecological integrity”;
- seek to co-locate habitats within reserves identified for old growth representation (called ‘old growth retention areas’ or OGRAs), to the extent possible, and assess gaps in what can be achieved through co-location; and
- update and improve the quality of existing habitat models.

Seven focal species were considered during the project: grizzly bear, black bear, mountain goat, black-tailed deer, marbled murrelet, northern goshawk and tailed frog. Black bears and black-tailed deer are not specified in the Coastal Land Use Orders as a focal species, but were added to the project because they represent habitats that are not addressed by the other focal species and both are important to the ecology, economy and culture of the coastal planning areas.

1.2.1 Preparation of Project Reports

The products of the Focal Species Project were developed based on contributions from a number of biologists with expertise in the ecology and management of habitats for each of the seven focal species in a coastal environment (Table 1). The steps in the preparation of project reports are as follows:

1. Each domain expert provided information about habitat quality, quantity, spatial configuration and distribution, and connectivity. They also provided a list of key literature references relevant to the species in a coastal context.
2. The combined interview notes for each focal species were assembled into chapters describing the knowledge base to support the co-location exercise.

3. Domain experts, working in teams, reviewed and edited the chapter for their focal species.
4. The chapters were sent to multiple peer reviewers, selected for their own expertise in the focal species (Table 2).
5. Domain experts, working in their focal species teams, reviewed all peer review comments in detail and provided a response, either as an amendment to the reports or as a response to the comment.

Table 1. Domain experts for the EBM Working Group Focal Species Project

Name	Affiliation	Topic area
Helen Davis	Artemis Wildlife Consultants	Black bears
Tony Hamilton	Ministry of Environment	Black and grizzly bears
Grant MacHutchon	A Grant MacHutchon Consulting	Black and grizzly bears
Kim Brunt	Ministry of Environment	Black-tailed deer
Ken Dunsworth	Ministry of Environment	Black-tailed deer
Peter Arcese	University of British Columbia	Marbled murrelet
Alan Burger	Alan Burger Consulting	Marbled murrelet
Stephanie Hazlitt	University of British Columbia	Marbled murrelet
Louise Waterhouse	Ministry of Forests and Range	Marbled murrelet
Frank Doyle	Wildlife Dynamics Consulting	Northern goshawk
Todd Mahon	Wildfor Consultants	Northern goshawk
Erica McClaren	Ministry of Environment	Northern goshawk
Pierre Friele	Cordilleran Geoscience	Tailed frog
Volker Michelfelder	Ministry of Environment	Tailed frog
Glenn Sutherland	Cortex Consultants	Tailed frog
Steve Gordon	Integrated Land Management Bureau	Mountain goat
Brad Pollard	McElhanney Consulting Services	Mountain goat
Shawn Taylor	Goat Mountain Resources	Mountain goat

1.2.2 Peer Review Process

The purpose of this peer review was to:

1. Ensure that the information used to guide the co-location of habitats in old growth retention areas (OGRAs) is accurate and complete and reflects the best available science and knowledge about habitat management for the species.
2. Ensure that the recommendations for the strategic co-location of habitats within OGRAs reasonably reflect the current knowledge of the species.
3. Advise as to whether these recommendations adequately and appropriately address the issues of habitat sufficiency, as it pertains to the quality, quantity and location of habitats retained in OGRAs.

The following biologists provided expert peer review of the Focal Species Project reports. The set of instructions to peer reviewers is provided in Appendix 1.

Table 2. Peer reviewers of products of the Focal Species Project

Name	Affiliation	Species expertise
Alvin Cober	Ministry of Environment	Black bear
Wayne McCrory	McCrory Wildlife Services	Black bear
Scott McNay	Wildlife Infometrics	Coastal black-tailed deer
Dave Person	Alaska Dept of Fish and Game	Coastal black-tailed deer
Clayton Apps	Aspen Wildlife Research	Grizzly bear
Rod Flynn	Alaska Dept of Fish and Game	Grizzly bear
Debra Wellwood	Raven Ecological Services	Grizzly bear
Anne Harfenist	Harfenist Environmental Consulting	Marbled murrelet
Kim Nelson	University of Oregon	Marbled murrelet
Wayne Wall	International Forest Products	Marbled murrelet
Doug Janz	Consulting biologist	Mountain goat
Troy Larden	Ministry of Environment	Mountain goat
Wayne Wall	International Forest Products	Mountain goat
Steve Brockman	US Fish and Wildlife Service	Northern goshawk
John Deal	Western Forest Products	Northern goshawk
Richard Reynolds	Rocky Mountain Research Station	Northern goshawk
Linda Dupuis	Consulting biologist	Tailed frog

1.3 Document outline

This document presents the key substantive comments of each peer reviewer, by focal species, with domain expert responses shown for each.

- Where a summary of comments was provided by the reviewer, it is included here verbatim with domain expert responses noted after each key point.
- Where a summary was not provided by the reviewer, or the summary was very long, this document provides a synopsis of the substantive comments, with domain expert responses to each.

Editorial comments and corrections or minor clarifications of biological facts were directly incorporated into the final reports, where appropriate, and are not summarized here.

All peer reviewer comments have been archived with the Integrated Land Management Bureau on behalf of the EBM Working Group.

2.0 American Black bear (*Ursus americanus*)

Peer Reviewers:

Alvin Cober, Ministry of Environment, Queen Charlotte City

Wayne McCrory, McCrory Wildlife Services

Domain Experts:

Helen Davis, Artemis Wildlife Consultants

Tony Hamilton, B.C. Ministry of Environment

Grant MacHutchon, A. Grant MacHutchon Consulting

H. Davis and T. Hamilton responded to peer review comments; G. MacHutchon reviewed the final peer reviewed report.

2.1 Alvin Cober comments

Peer reviewer information:

Alvin Cober

Ecosystems Biologist, Ministry of Environment

Environmental Stewardship Division

P.O. Box 39, 1229 Oceanview Drive

Queen Charlotte, B.C. V0T 1S0

PH: (250) 559-6247 E-mail To: Alvin.Cober@gov.bc.ca

Submitted: February 16 2009

2.1.1 Peer Reviewer Comments and Response

The following summary was submitted by the peer reviewer. The responses by domain experts are noted at the end of this section.

1. Recommendations section (section 4.4):

- The author's recommendations generally reflect my understanding of the science of black bears. I am not as familiar with the relationship between black and grizzly bears where their ranges overlap – the authors summarized this to a reasonable degree.
- Given the variation in the extent of harvest related impacts on black bear habitat within the areas covered by the Land Use Orders the level of risk to the species has a broad range from low to very high and applies at all spatial scales. Sub-regional protected areas have not been uniformly distributed within the area covered by the Coast Orders. Lack of larger regional protections places greater emphasis on OGRA design and management outside of OGRAs through application of the suite of EBM objectives should be used to prioritize habitat mapping.
- Stronger emphasis on countering the effects of human activities (road closures). No mention of provisioning of areas completely free of bear viewing activities.

2. Sections on Species Overview, Knowledge Base, and Managing Outside of OGRAs (sections 4.1 and 4.2 and 4.5):

- The summary of information provided in these sections is comprehensive.

3. Mapping and Information (section 4.3):

- The existing mapping of bear habitat relies in large part on work done for grizzly bears. Mapping tailored to identification of black bear habitats is warranted.

Response from domain experts:

- **Agree with peer reviewer comments in general.**
- **The concern with roads is related to mortality risk and displacement. This concern is mentioned in the reports, but not in detail as the focus of the report is on old forest retention.**
- **Also agree with the concern re bear viewing but have not discussed this issue in detail in the report.**
- **Agree with the need to create maps of black bear habitat and use these as inputs to MARXAN. This was added to the recommendations and is also consistent with the input from the other peer reviewer, Wayne McCrory.**
- **Responses to detailed comments have been incorporated into the text of the final document.**

2.2 Wayne McCrory comments

Peer reviewer information:

McCrory Wildlife Services Ltd.

Box 479,

New Denver, British Columbia V0G 1S0

Phone: 250-358-7796; e-mail: mccrorywildlife@xplore.net.com

Submitted: February 13, 2009

2.2.1 Peer Reviewer Comments and Response

The following key points were raised by the peer reviewer. These points are a synopsis of the larger summary provided by the reviewer.

- The reviewer is pleased that black bears have been included as a focal species. He feels that greater emphasis is needed on coastal black bears being old growth dependent with respect to hibernation and birthing/early rearing habitat.
- The key issue for the reviewer is the supply of denning habitat. He disagrees with domain experts that the current provisions under EBM will adequately address habitats for black bears.

I do not agree with professional biologists accepting just this process as it is a prescription for extinction with economic interests of the timber industry dictating the model. Why are we not looking at an alternative model that optimizes and truly protects biodiversity/species values with alternative low key harvesting (the real underpinnings of so-called EBM) as well?

I do not believe, based on the evidence presented in this EBM document and that available from the literature, that what is proposed here is ecologically and ethically defensible over the long term.

- He is concerned that OGRAs will not adequately protect den supply in the long term. Also, he is concerned that loss of denning habitat is potentially irreversible. Near-shore islands with high timber values and high black bear values are more vulnerable.

- He recommends including a layer of modelled denning potential as an input to MARXAN.
- He assumes that OGRAs will be too small to be effective and recommends, instead, a partial cutting regime that leaves small openings in the forested matrix (as opposed to small reserves in a harvested matrix).
- He is concerned with the policy of meeting old growth targets in the Coastal Orders in existing reserves to the extent possible and feels that this will result in further issues with regard to sufficiency of habitat supply.
- He recommends wider leave strips (150m) along salmon-bearing streams.
- Concern that the vh2 is not represented correctly as good habitat.
- The reviewer had several comments regarding the adequacy of the land use objectives themselves, including Kermode Stewardship Areas that are not included here as they are outside of the terms of reference for the review.
- His concluding statement is as follows:

*Adding up all these concerns, I professionally consider the **low risk option** present still a **high risk** one for black bears in the absence of adequate protection of old-growth den habitat, esp. for near-shore islands. Also high risk for evolutionary process i.e., even with some of the good and some of the weak reserves mentioned, irreversible changes will occur to the species and this does not meet the criteria for the precautionary principle.*

Response from domain experts:

- **Concur that denning habitat is a key concern. Have added a recommendation to include a denning model for black bears as an input to MARXAN.**
- **Do not concur that amount of old growth overall is an issue, rather that old growth structure re denning habitat is the concern and that this can be addressed through combined objectives for within stand retention as well as other EBM objectives such as landscape level reserves, including riparian areas.**
- **Concur that denning habitat will decay over several rotations and will be lost unless recruitment trees are retained. However, disagree that the proportion of the forested landbase harvested under an EBM regime will create landscape level deficits for denning habitat.**
- **Disagree with the suggestion regarding many small openings, particularly in the Mid and North Coast, because small, shaded openings regenerate to high cover of Western hemlock that suppresses bear forage production early in the rotation.**
- **Domain experts concur that 150m streamside reserves along spawning reaches would provide increased protection over current hydroriparian objectives. The existing regime is a negotiated outcome that takes into consideration social, economic and cultural values as well as ecological values.**
- **Amended the text to note that there is good habitat in the vh2, but there are fewer of them.**
- **Responses to detailed comments have been incorporated into the text of the final document. Domain experts did not concur with some comments.**

3.0 Coastal Black-tailed Deer (*Odocoileus hemionus*)

Peer reviewers:

Scott McNay, Wildlife Infometrics

Dave Person, Alaska Department of Fish and Game

Domain experts:

Kim Brunt, Ministry of Environment, Nanaimo

Ken Dunsworth, Ministry of Environment, Hagensborg

3.1 Scott McNay comments

Peer reviewer information:

R. Scott McNay, RPF, RPBio, Phd

Wildlife Infometrics Inc

#3-220 Mackenzie Blvd.,

PO Box 308,

Mackenzie, B.C. V0J 2C0

Phone: 250-997-5700; Email: scott.mcnay@wildlifeinfometrics.com

Submitted: February 8 2009

3.1.1 Peer Reviewer Comments and Response

The following concluding comments were submitted by the peer reviewer. Responses by domain experts are noted at the end of the main summary and following subsequent key points.

1. Recommendations section (section x.5).

1.1. Do these recommendations reflect your understanding of the science of the focal species?

For the most part yes – but see comments below regarding reference sources for the information, organization of the material, and lack of emphasis in some areas.

1.2. What is your opinion of the approximation of low and (where relevant) high levels of risk for this species within the context of OGRA design and overall EBM objectives set out in the Coast Orders (see section 3.0 below)? Are these a reasonable reflection of the science on the species? If you were to change these definitions of low and high risk, how would you do so and why?

See my general comment number 6.

1.3. Are the recommendations an appropriate reflection of the available information and outcomes of the scenario reviews?

I believe so.

1.4. What might you suggest for:

1.4.1. Improvements to the effectiveness of the recommendations themselves?

See specific comments 12, 15, 33, 36, 42, 43, and 51.

The low- and high-risk targets are social objectives that are very far removed (due to a long list of modeling assumptions and lack of functional relationships in the modeling) from any ecology. As such it is difficult to comment on them. Put another way – this is essentially a correlation exercise not “ecological cause and effect” and the satisfaction in the result will not be based on a statistical parameter but on social acceptance. As a manager (not a researcher), I could look at the

mapped output from Marxan and give you an opinion (based on gut feel) whether I thought the targets were right (i.e., fit the risk category) or not. But I can't provide any other valid assessment from just reading the text. Weren't given enough resources to do a full analysis – identified gaps about how much is enough and implications if habitat is reduced by x amount.

1.4.2. Further experiments to improve the recommendations?

I've never used Marxan so I'm not sure the extent to which management outside the focal polygons can be worked into the solution (if at all). [Note that I didn't have enough time to look long at the pdf on the approach – wish I had]. I worry there is too much focus on the old forest polygons without considering the context of the adjacent landscape. For black-tails this will be important in access to spring range and predation. It was not clear to me how these things factor into the solution – either not enough time for my slow brain to get it or it might not be documented well enough.

2. Sections on Species Overview, Knowledge Base, and Managing Outside of OGRAs (sections x.1 and x.2 and x.6):

2.1. Is the information provided in these sections accurate and comprehensive?

I think the accuracy is there but it's poorly presented and somewhat scattered. Once organized into one place I think it'll be comprehensive as well.

2.2. Can you suggest any additional information about habitat management and habitat supply assessment that would be relevant to the co-location work?

Predation risk needs to be worked into the solution.

2.3. Note: section x.6 (Managing the Landbase Outside of OGRAs) is intended to fill out the information in the overall chapter, in recognition that what happens with OGRA design will only be effective in the context of overall management for the species. This section is not intended to provide a comprehensive description of management direction within the working forest.

OK, so maybe disregard my comment about predation.

3. Mapping and Information (section x.3):

3.1. In general, is the mapping, as described, optimally suited to strategic co-location? If not, what would you suggest to improve the inputs to the Marxan?

This is a very coarse model. The way I read it, forest type was not taken into consideration and, although the importance varies from south to north, I think it's still important enough to include in the model.

3.2. If you have a knowledge of mapping and inventory for the coastal planning area, is there other mapping and inventory that we need to be made aware of?

NA

Domain expert response:

- **The focus of this project was on the old forest polygons and not on spring range and predation (except to the extent that the location and configuration of old growth affects these). Critical winter habitat was modelled. Other life requisites are discussed in general but are not modelled. Critical winter range was considered the most appropriate life requisite for OG reserves but not spring forage, summer forage, and security cover.**
- **Forest type and age was taken into consideration in the habitat model.**
- **Concur with comments on low and high risk. The document acknowledges that the risk 'targets' are based on domain expert opinion and are not a result of research showing ecological cause and effect. Domain experts were not given enough**

resources to do a full analysis – they identified gaps about how much is enough and implications if habitat is reduced by x amount.

- **Detailed editorial comments were much appreciated, including links to technical literature. Most were incorporated into the final text of the document as well as recommendations to improve the structure and flow of the deer report.**

Some specific comments:

- What ever happened to the whole snow zone thing? I understand that hyper-maritime climates can dump a lot of snow and even though it only stays for a short while, deer still must develop a way of dealing with it. However, from a nutritional budget standpoint the fact remains that the hyper-maritime is still a low snow zone situation. At this point, the management directions are varying from the handbook which, as far as I can tell, has the most science based recommendations that are available. It doesn't really matter if the mapped zones don't reflect reality – that can all be determined locally. But the concept of apportioning the kind and amount of retention by snow zone (i.e., spatial distribution) is a solid rationale that should persist (or dominate) any land use strategy. Now I see that later in the report (mapping section) that BEC is used as a proxy but I think this will not be a very comprehensive approach.

Response: Yes, BEC was used as a proxy for snow zone

- Testing a range “suitability” model would require consideration of the interactions between the extent and location of historical logging and it's likely effect on deer behaviour patterns, the severity of winter weather during the period of sampling and it's likely effect on deer behaviour patterns and input data error (in this case the only one to really worry about would be the BEC lines). Since the model is fairly coarse (i.e., no use of forest or vegetation data) then I'd be expecting a lot of variance in the sample results meaning that, to have any power, you'd need extremely large sample sizes. And all this discussion is assuming that you would modify the model to include at least forest age thereby generating an expression of suitability. I don't think the model you have at the moment (capability) is even testable.

Response: The model is based on suitability, not capability. This is made clear in the text. Concur with comments on the model testing.

3.2 Dave Person comments

Peer reviewer information:

Dave Person

Alaska Department of Fish and Game

2030 Sea Level Drive, Suite 205

Ketchikan

Alaska 99901 USA

E-mail: dave.person@alaska.gov

Submitted: February 13 2009

3.2.1 Peer reviewer Comments and Response

The following key points were raised by the peer reviewer. These points are a synopsis of comments embedded by the reviewer into the draft report. Responses by domain experts are noted below each key point.

- Although young clearcuts may provide abundant forage it is often of poorer nutritional quality (see Hanley et al. 1989, and Hanley and McKendrick 1985). Particularly, digestible protein may be low per kg of forage which could influence reproduction and lactation in females. In addition, it isn't just the loss of OG for winter habitat that matters but the fragmentation of landscapes and the isolation of forest patches that may facilitate greater

risk of predation. We may be creating landscapes that put deer at high risk of predation while simultaneously reducing resilience of habitat to support deer. That is a recipe for chronically low densities of deer and perpetual demand for predator control.

Response: Issue noted in the report but not in detail since the focus of the report is on retention of old growth habitat

- 150 year old forests will be multi-cohort or single aged wind prone stands on southerly exposures. Those stands have characteristics of old second growth. It would be best if logging in coastal forests focused on those windprone stands and avoided true uneven-aged old growth. You are absolutely correct that they are a problem because of little forage.

Response: Incorporated this information into the report

- During our telemetry studies of deer we have never observed stem exclusion forest limiting movements of deer. Deer were always at low density within those forests but they could move through them. Also, we have never noticed that logging roads present barriers in SE AK.

Response: This concern was raised by others and the item been removed from the text

- During a winter with snow >50cm in SE Alaska, almost all deer activity is below 250m

Response: Winter deer activity increases in elevation to the south

- This [critical winter range in hypermaritime forests] is a fertile area for research. We don't know much about deer in these less productive forests. We see them overwintering in those stands even when snow is significant. It appears that the scattered large cedars and sometimes hemlocks offer cover and the snow free well surrounding the boles of large trees enable them to bed down and find forage. Selective logging of those big cedars may limit the value of these stands for deer.

Response: Validates existing text

- [Maximum spacing of reserve areas of 4 – 5 km] unlikely to be adequate. The spacing is too far apart and does not consider resident deer that do not migrate to winter range. The average HR for resident deer in SE Alaska (N = 216 deer) is about 250 ha. That implies a radius of about 800m. Your spacing is going to create a lot of gaps, concentrate deer on very limited winter range and increase risk of predation. In our mule deer habitat guidelines, we recommend preserving patches of OG >70ha. Spacing between those patches probably should be no more than 1km. I guess the difference here is whether you are trying to establish guidelines for areas about to be logged or trying to salvage watersheds that have already been impacted by logging. If the former, why are you establishing minimums that are likely to be marginal rather than supporting guidelines that preserve options and maintain landscape resilience?

Response: 4 -5 km is based on observed average distances of deer movements between spring and winter ranges in coastal BC (Nyberg and Janz 1990).

- There is so much variation in habitats that it is impossible to capture that variation on GIS layers. For example, productive old growth is really a fine grain matrix of small openings, perhaps a few open canopy patches sitting on hydric soils etc. There is so much variation and that needs to be captured by ground sampling.

Response: Agreed – validates existing text

- One problem with indices of solar radiation is that they usually do not take into account shading by neighboring hills. The best solution is to use a flashlight-like moving window

approach that specifies an average seasonal angle above the horizon of the sun and shines a beacon of light on the landscape.

Response: Noted, although this is more complicated an approach than we have the resources for in this project. The report acknowledges the coarseness of the model and associated limitations.

- [20 – 25 retention of deer winter range within UWR polygons in the Mid Coast will almost assuredly be too little. I would recommend 50% or more retention based on our observations in SE Alaska. That level is about the minimum retention that we have observed capable of sustaining deer at levels able to support hunting and predation, and be resilient to hard winters. Less retention is usually associated with watersheds that chronically have fewer deer.

Response: This is a misinterpretation of the general wildlife measures, which call for 25% within very large polygons, not 25% retention within a polygon as a whole. Clarified in the text.

4.0 Grizzly bear (*Ursus arctos*)

Peer Reviewers:

Clayton Apps, Aspen Wildlife Research

Debra Wellwood, Raven Ecological Services

Domain experts:

Tony Hamilton, B.C. Ministry of Environment provided responses to peer reviewer comments

Grant MacHutchon, A. Grant MacHutchon Consulting, reviewed the final peer reviewed draft of the report

4.1 Clayton Apps comments

Peer reviewer information:

Clayton Apps, PhD, RPBio

Aspen Wildlife Research Inc.

2708 Cochrane Road NW

Calgary, AB T2M 4H9

Ph: 403-270-8663; E-mail: clayton.apps@telus.net

Submitted: February 8 2009

4.1.1 Peer Reviewer Comments and Response

The following summary was provided by the peer reviewer. Domain expert response is shown below each key point:

- Thanks for the opportunity to review and comment. I have made suggested edits and comments throughout the document. I wasn't able to do major editing but in general, I suggest some word-smithing to tighten up and enhance clarity in several sections as noted. Also, language and style could be better formalized in a number of areas. A few general comments here, but specific comments are in the document.

Response: Suggested detailed edits incorporated, where appropriate

- I noted that statements are supported by citations in some places but not others. With the exception of the Introduction (pg 1, half of pg 2), the use of supporting references is inconsistent. A critical reader may assume that unsupported statements are in fact unsupported. One remedy for a document like this is to refrain from citing literature at all but still include a list of supporting publications and recommended reading at the end. Not to nitpick but if you do decide to cite consistently in the document, I suggest that you not mix primary and grey literature, especially in supporting a single statement. Citing unpublished docs that provide summaries or reviews can prevent the need to cite strings of papers, but it is usually not appropriate to cite such docs in conjunction with peer-reviewed pubs.

Response: In general in this document, there is a mixture of grey and primary literature and while that may not be the convention that is what we chose to do. However, there is a priority placed on primary literature. This is consistent with EBM, which looks to all forms of knowledge to guide management.

- Related to the above, I would be careful with language to ensure that certain sensitive or debatable statements cannot be construed as personal opinion, especially where they are not supported by cited research.

Response: Addressed in the document edits

- In my opinion, there is some imprecision and overstatement regarding the value of grizzly bears as indicators (see embedded comments). However, one aspect that is missing but I believe worth mentioning in the support of griz as a focal species is public perception and value of the species. In my opinion, societal value is a legitimate (though not sole) reason for directing focus on a species as it is the tie between most public interest and land-use/habitat management. Obviously this value influences resource allocation to study and manage the species in the same way that you have outlined that population goals are ultimately driven by social uses and values.

Response: Added important of grizzly bears re public perception into the section on focal species. Indicator comments addressed through editing

- Sec. 3.2.1.1, 3.2.1.3 (pgs 4-8) I think there are bear biologists who would disagree with the strong theme and associated statements about the associative and dependent relationship between grizzly bears and forest of any age. I would select language carefully in this regard to ensure accuracy and that your meaning cannot be misconstrued. I would also state what has been demonstrated empirically vs what is based on inference from natural history observations. In fact, there are a couple of papers out there that surmise and provide circumstantial evidence for detrimental popn-level influence on grizzly bears from exploitative competition by black bears as mediated by the landscape distribution and domination of forest. Not many trees on Kodiak Island after all.

Response: Generalizing from coastal Alaskan bear research (Kodiak Island) to coastal B.C. may not be valid (see R. Flynn – peer review comments 2009). Flynn’s more recent mainland study (Flynn et al 2008) is more closely aligned with results from coastal B.C.

- Also, in a multivariate context, our work in the interior generally has not found active selection for forest overstorey at any scale (of course there are limitations to what we can infer from designs that are typically inductive). I think it fine to state what we expect bears are using forest for. I would just be careful with language that can be interpreted in terms of a critical need or requirement. Obviously, among forested stands, those associated with old-growth structure will provide for greater forage value than earlier seral stages, and I think this is a more important point than, for example, the need for forested buffers. That is, within naturally forested landscapes and habitats, we can assume that sites will be managed for near perpetual forest cover over time (given timber values, ecosystem management objectives and the needs of other species). The structural attributes within those stands will likely make a big difference to bears.

Response:

Disagree with the statement that “among forested stands, those associated with old-growth structure will provide for greater forage value than earlier seral stages”. Pioneer and shrub seral stages for many coastal ecosystems may not only meet but exceed old growth understory forage production by enabling growth and productivity of shade-intolerant and important bear forage species).

Re the importance of forested buffers: there is a considerable body of published and unpublished research demonstrating the use of forested buffers by coastal grizzly bears (e.g., MacHutchon et al 1993, Flynn et al. 2008). The debate centers on whether this use is a preference or a requirement. Regardless of which this is, and we argue it the latter,

maintaining a forested buffer not only meets the demonstrated use but is also designed to maintain the ecological integrity of the non-forested feeding unit. The logging of buffers also increases the shrub understory, limiting their value as movement/ travel corridors. This is specific to the ecology of the Coast which has extremely high primary ecosystem production.

One of the principles of EBM management is to manage according to the precautionary principle; proving requirement is extremely difficult and typically has to be done through experimentation. To manage for low risk, it may be inadequate and is contrary to EBM to limit management approaches habitat requirements proven through research.

- Although spatial/landscape factors and considerations are touched on in the background, the only way I see that they have been addressed is through stratification by BEC and LU. I agree with this approach given the alternatives, the habitat suitability products available and our level of knowledge. But it is still rather crude, and I suggest better acknowledgement of the limitation in our understanding and/or ability to account for and model landscape factors (such as interspersion, dispersion, seasonal juxtaposition, configuration and connectivity) influencing site specific value.

Response: Agreed. Hope and trust that landscape level reserve design to meet the full suite of EBM objectives will address these critically important landscape metrics, even though they are not contained in the bear habitat objectives and mapping in the land use orders. To address this adequately from a science base would require GPS collar data across a wide range of coastal conditions.

- I do I agree with the general criteria about the configuration of OGRAs.
- I have no disagreement with the Recommendations (sec 3.5). Although I am sure you could expand on it quite a bit, I am not clear whether this is warranted.

4.2 Rod Flynn comments

Peer reviewer information:

Rodney W. Flynn
Research Wildlife Biologist
Alaska Department of Fish and Game
PO Box 11024
Juneau, Alaska 99811 USA
Email: rod.flynn@alaska.gov

Submitted: February 10 2009

4.2.1 Peer Reviewer Comments and Response

The following summary was provided by the peer reviewer. Domain expert responses are shown at the end of each section.

a. Species Overview

3.2.1.1 I agree completely that forested buffers around important habitat features/habitats create important habitat complexes for all the reasons given. Much of my work has involved evaluating the importance of forested buffers, especially around salmon-spawning streams and estuaries. From this report, I was not able to determine exactly how forested buffers were applied around critical habitats, so I was not able to evaluate this aspect of grizzly bear habitat. At the end of this section, the statement is made that “forested buffers are defined by their ability to maintain functional integrity ...”. I would like to know the specifics on how and when forested buffers are applied. I encourage substantial forested buffers (150 - 300 m) along all salmon-spawning streams and estuaries. Buffers along riparian areas and beaches also provide good travel corridors.

3.2.1.2 Important concept “bears will actively select highest quality habitats in each season”. Also important, some bears may be excluded from the highest quality habitats because of social

interactions. We have found strong sexual segregation during some seasons when food resources are limited.

3.1 The Species Overview contains an excellent review of the pertinent information on grizzly bear ecology and appeared written by knowledgeable people. At times though, I did struggle to follow all of the acronyms and BC-specific terminology. I would have benefited from a glossary of terms including a list of all acronyms. For example, a definition or description of “Coast” (pg. 1) would be useful. Was the entire study area considered “Coast”? Also, I’m not adequately familiar with your specific habitat classification system, so I was not able to clearly visualize the habitat types.

Response:

- **Agree with spatial considerations – these are discussed in the text but incorporating block size and contiguity of OGRAs was outside of the scope of the MARXAN model at this time.**
- **RE. 150m forested buffer along salmon-spawning streams – this was also mentioned by W. McCrory for black bears. Concur that larger buffers would provide increased protection over current hydriparian objectives. The existing regime is a negotiated outcome that takes into consideration social, economic and cultural values as well as ecological values.**

Hydroparian management would be important component to bear habitat management. Do hydroparian buffers adequately maintain bear values? We found that forested buffers for fish management purposes in Southeast Alaska were inadequate to maintain brown bear habitat values.

3.4.4 Marxan Inputs

The habitat inputs for the Marxan Model appear reasonable based on the species report and rationales provided. Key factors should be habitat quality, quantity, and spatial distribution. Priority should be given to the most important habitat complexes. I would be concerned that insufficient grizzly bear habitats are being protected by only including Class 1 and 2 habitats. Habitat block size might be an additional consideration along with position of habitat block in the watershed. I would assume that larger, continuous blocks of habitat in the lower reaches of watersheds had more value. More intact watersheds may provide better long-term habitat.

I would be sure to include at least a 150-m, forested buffer along all known salmon-spawning streams and estuaries. Besides protecting important grizzly bear habitats, riparian zones provide important corridors for other species.

I didn’t see roads and human developments as model inputs. In our analysis on the Tongass, we discounted habitats with roads and near human developments. A rule here may be useful in separating Class 2 habitats.

- **With respect to discounting roads, habitat effectiveness mapping was not available coast-wide, so was not used for this exercise. While, roads are recognized as an important consideration in overall habitat effectiveness, the majority of BC coastal watersheds managed under the EBM regime are disconnected roads with only periodic traffic during irregular windows of harvesting in any one watershed. There are very few road networks with public motorized access e.g., Bella Coola and the Yellowhead Highway.**

1. Recommendations

- a) Generally, recommendations reflect my understanding of the science of grizzly bears. See specific comments above;
- b) In the absence of a better understanding of the system, an analysis of risk is difficult. Given the constraints, the approach taken seems reasonable that the protection of the most valuable habitats results in lowest risk. By definition, anything less would be higher risk. I'm not sure whether "risk" is the right term in this context. Risk to the bear population can only be assessed in the context of the entire management program at the landscape scale. Protecting only high value habitat complexes will not necessarily provide for a healthy grizzly bear population;
- c) The scenario reviews followed a logical progression by looking at how different scenarios captured Class 2 grizzly bear habitats. Although the amount of habitat captured is instructive, the actual spatial distribution would be important for a complete understanding.
- d) I have no specific suggestions on improvements to the recommendations, except as previously provided comments on aspects of the inputs and analyses.
- e) As commented earlier, I would examine discounting habitats by human development factors, particularly roads. Also, incorporate habitat block size as a factor.

Response: Domain expert concurs with comments on risk. Responses to comments on spatial distribution and discounting of roads are provided above.

4.3 Debra Wellwood comments

Peer reviewer information:

Debra Wellwood

Raven Ecological Consulting

Box 3217

Smithers, BC, V0J 2N0

Submitted: February 13 2009

4.3.1 Peer Reviewer Comments and Response

The following summary was provided by the peer reviewer in addition to comments embedded in the text of the report. Domain expert responses are shown below key points. Detailed editorial comments were reviewed and incorporated, where appropriate.

1. Project Purpose – “The purpose of the focal species project is to develop recommendations for addressing the habitat requirements for focal species...”. Who will be responsible for applying the recommendations provided in this report?
2. Audience - Who will be the target audience for this document? In the following comments, I have assumed that the target audience will have a diverse range of knowledge and interests (e.g., EBM Working Group, EBM Council).
3. Species Overview and Knowledge Base for Co-location of Grizzly Bears – I think that the strategic co-location of grizzly bear habitats would be more solidly supported if these sections were re-organized and expanded upon in the format of a Resource Standards Information Committee Species Account that also includes a section on human impacts on grizzly bears specific to coastal BC. Has Grant or anyone else done a species account specific to coastal areas that would be applicable to this work? If so, to save repetition

of work would it be possible to review and if appropriate append the report to this document.

Response: While there are reports about specific locations within the Coast that include species accounts e.g., G. MacHutchon's reports on the Khutzemateen, there is no comprehensive species account for coastal grizzly bears at this time

4. Literature – There were several places in the document that were missing key references or references were not provided where I thought they would be appropriate.
5. Mid Coast/Central Coast - In this document South Central Coast and Central Coast and North Coast are discussed. There are several places where Mid Coast is also referred to. Are Mid Coast and Central Coast referring to the same places?

Response: this is a confusing legacy of the strategic planning history on the coast – we have tried to be consistent in using the term Mid and South Coast with respect to the co-location work.

6. Females with Cubs and Less Dominant Bears – I think that a major limitation specific to the strategic co-location process is that some important habitat requirements, for females with cubs, in particular cubs-of-the-year, and less dominant bears will likely be missed. I think there are two issues to consider here. We have relatively little information about the security requirements of these cohorts and the trade-off that they may make with respect to habitat selection for foraging versus security to appropriately address these issues. What assumptions and recommendations can be made to reduce the uncertainty and risk to these cohorts?

Response: In the food rich environment on the Coast, there is less concern about habitat segregation. In dysfunctional landscapes (modified through development), there is a need to worry about it and provide for females with cubs and sub-dominants by ensuring they have access to Class 2 habitats while ensuring landscape recovery and restoration. Have added this into the report. Social pressure increases as landscapes are modified; habitats that are available are narrowed.

7. Denning – similar to point as above. Habitat requirements for denning are not considered in this report. What assumptions and recommendations can be made to reduce the uncertainty and risk to these cohorts?

Response: The biological requirement is that grizzly bears need an old growth structure to (a) dig under the roots of a big tree or (b) to den inside the tree itself. There is strong evidence that, when there are extremely late salmon runs, some gb that stay out and fish those runs need dens at fairly low elevation, although the majority of dens are at the CWH-MH boundary. Can't use frozen soil for a roof (like in the Interior). Have added this information into the report.

8. Low versus High Elevation Ecosystem Emphasis and Priority – The emphasis in the report is clearly on low elevation habitats for co-location. Although not clearly stated, I got the impression that there are two reasons for this; high value habitats at low elevation are considered a higher priority, in general, from an ecological perspective; and they are considered a higher priority from the perspective of the relative level of human impacts that are occurring. Specifically, the urgency for conserving low elevation old growth forest is greater because their economic resource value is greater. If this is the case, then I think this should be more clearly stated so that the relative value of higher elevation habitats are not inappropriately undervalued. I think the clarification

will be important, if and when human impacts to higher elevations become issues to be considered.

Response: > 75% of use is at low elevations but bears need avalanche chutes and denning habitats at higher elevations. These are requisites – amended the report to make this clear.

9. Terminology - high-value grizzly bear habitats, important, critical and sensitive. There is inconsistency in the use of these terms in this document and in supporting literature. Suggest providing definitions as they have been applied in mapping and orders and how they will be used in this report. Suggest using terminology consistent with bear literature.

Response: Will use the terms ‘essential habitats’ or ‘life requisites’

10. Domain Expert Input – there are a few places in the report that specify input from domain experts. I suspect there are points in the report that were also provided by domain experts but their input was not specifically identified. Does this report include all of their input? I also sense that they were constrained in several aspects. I would suggest greater emphasis on their specific input and clearly defining where the constraints come in. For example, a summary of key points provided by domain experts or “Domain Expert Recommendations” would help to clarify. Again, a solid species account and habitat suitability model, in the RIC Standard, would be highly beneficial. All of the details could be in this report. They can be briefly and concisely be summarized in this report and then if a decision maker does not understand or appreciate why or how constraints or trade-offs may affect decisions related to grizzly bears they can quickly get to the answer or at a minimum understand the limitations, risks and uncertainty.

11. Feeding versus Foraging – There are several places where forage or foraging was used when food or feeding would be more appropriate.

12. Habitat Restoration – I am not sure how this could be further highlighted in this report but I think that habitat restoration is severely needed in some areas. The trade-off is that these areas are generally near communities where bears are more likely to die. If we could successfully reduce this risk, I would say that habitat restoration in some areas should be a high priority. I would like to see more discussion in this document or another document of the “big picture” for bears, habitat requirements, human impacts and prevention, mitigation and compensation for impacts. How do all of these things fit together so that we still have bears “while minimizing impacts to timber supply” and all of the other uses and activities that are occurring?

Response: Not relevant to the co-location exercise but will add to the section on habitat recruitment

13. Assumption “fall habitats adequately addressed through management of hydriparian areas”. Is there a way of testing this using MacHutchon’s North Coast work?

Response: This will be tested during co-location experiments for the North Coast. There is a concern that there are places where bears fish where they get up steep slopes above spawning areas feed on fish and rest – steep areas are not protected by the hydriparian objectives. Don’t have a modeling tool to assess that, except where caught during air photo mapping. May identify this as a research/ inventory gap once the results for the North Coast are reviewed.

14. MH not mapped on South-Central and Mid Coasts – How will this affect the identification of OGRA?

Response: This is an acknowledged limitation

15. Mapping scale, assumptions, limitations and verification – Suggest including a section regarding the appropriate application of mapping given the scale, limitations etc. Will mapping be improved before OGRA are identified? It sounds like for some areas it should be.

Response: Agreed, but this is a strategic, not operational exercise

16. Habitat suitability ratings – specify what ratings are relative to. One bench mark for the entire coastal planning areas? If so what does the decision maker need to know about how this affects decisions related to local populations?

Response: Ratings are based on RISC standards

17. Reference is made to salmon spawning areas where I think that areas where salmon are available to bears would be more appropriate.

18. Climate Change – There are significant unknown risks associated with climate change but we know big changes are coming. I think there would be considerable benefits to hedge our bets by contributing some major effort and high level expertise to expand on this section including input from vegetation ecologists that are working with and thinking about climate change. This could be a section that applies to all species with subsection for each species.

Response: This is outside of the ToR for the project, although it is important

5.0 Marbled Murrelet (*Brachyramphus marmoratus*)

Peer reviewers:

Anne Harfenist, Consulting biologist

Kim Nelson, University of Oregon

Wayne Wall, International Forest Products

Domain experts¹:

Louise Waterhouse, B.C. Ministry of Forests and Range

Alan Burger, Alan Burger Consulting and University of Victoria

Peter Arcese, University of British Columbia

5.1 Anne Harfenist comments

Peer reviewer information:

Anne Harfenist

Harfenist Environmental Consulting

P.O. Box 2498

Smithers, B.C. V0J 2N0

Ph: (250) 847-1730; E-mail anne2harfenist@telus.net

Submitted: February 6 2009

5.1.1 Peer Reviewer Comments and Response

The following summary was provided by the peer reviewer. Responses by domain experts are shown below each key point:

I have read thoroughly all sections of the MaMu chapter. Lack of comment on a section indicates that I think that the information provided is accurate and presented in sufficient detail and that relevant data sources have been considered. It also indicates that I have no suggestions for improvements to that section.

The peer review process, by its nature, tends to focus on perceived negatives such as clarifications needed. I will begin this review by noting that overall the information presented is accurate and comprehensive and does reflect the best available science for MaMu. The best mapping layers were used and decisions appropriate to the stated goal made. The domain experts' depth of knowledge is clearly evident in the recommendations and discussion sections.

According to the background information supplied to reviewers, full implementation of EBM is defined as "Conservation measures...that seek to achieve a low level of ecological risk overall...over time". The management intent is to develop "precautionary" targets; the risk across all landscapes within a subregion is to be low risk. It is the issue of low risk for MaMu that I address below.

The MaMu domain experts take as their foundation the approach of the Canadian Marbled Murrelet Recovery Team (CMMRT): to limit the population decline for MaMu in B.C. to less than 30% over 30 years. The 30% figure is based on COSEWIC's criterion for down-listing a species and there has been much discussion about the appropriateness of that goal that I won't

¹ Stephanie Hazlitt, University of British Columbia, also provided input into the review and response to peer reviewer comments

revisit here. However, I will take issue with the transition from an allowable 30% decline across the province to the low risk scenario outlined in the MaMu chapter.

The allowable 30% population decline of the CMMRT is associated with an allowable 30% loss in MaMu nesting habitat across B.C.; i.e. 70% of available suitable habitat should be retained in order to support 70% of the current breeding population. However, the habitat retention targets across regions are uneven: targets for regions with higher populations of MaMu (including the mid and north coasts) are 69%, i.e. lower than the 70% considered as a critical minimum necessary to remove the population from being considered “threatened” on a province-wide basis. I cannot reconcile a 69% retention goal for the mid and north coasts with the management intent that risk across all landscapes within the subregion be low. The CMMRT needs to balance increased habitat retention targets in southern regions with decreases further north; the EBM Working Group Focal Species Project targets should not be similarly constrained. Furthermore, the MaMu chapter notes concerns that marine quality in the Georgia Basin may have declined to the point that MaMu can no longer breed at rates needed to recover the population. If such a situation exists, then the CMMRT approach which biases habitat retention in favour of regions with low probability of successful breeding seems imprudent and high risk.

Thus, I suggest that 70% be used as the baseline for MaMu habitat retention in the mid and north coasts rather than the 69% value used for this exercise.

Response: The MM team made a decision to be consistent with the CMMRT recommendations at the scale of the conservation regions. Provided more explanation in the report about the rationale for the 30% decline.

Additional considerations presented below relate to decisions made that seem to increase the risk of not achieving the CMMRT goal. I use the word “seem” because in some cases data may exist to support the decisions. I am also certain that the MaMu domain experts, who are all extremely knowledgeable and astute, have considered the points that I bring up below. So I am probably arguing for better documentation of the decisions made rather than a change to those decisions.

1) In this exercise, there is a further net down of the 69% baseline to reflect the nesting of MaMu in lower quality habitat. The figure of 10% is used as representative of the proportion of nests found in poor quality habitat. The 10% figure has a large impact on the total amount of land assigned to MaMu and, thus, requires more documentation than is presented in the text. Some indication of the range of values reported from different regions should be presented and the rationale for choosing 10% outlined. Perhaps the low risk scenario in this exercise should consider using a value at the lower end of the range found in B.C., resulting in a smaller net down from the baseline; use of too high a figure will result in increased risk that the goal will not be met.

Response: Made clear in the report that the 10% is an assumption based on observations in the field.

2) Rationale for the decision not to exclude areas within 500m of the ocean should be provided. As noted in the text, habitat in the coastal fringe along the exposed west coast of Vancouver Island does not have the attributes preferred by MaMu. Without further evidence, a low risk scenario should exclude the coastal fringe. There are nest location data from Desolation Sound, Toba Inlet, Clayoquot, and Haida Gwaii and, although I was unable to find summary information about distance from the shoreline in recent reviews, such information must exist. Are nests found within the 500m zone only along protected inlets or are they also found on the outer shores? If there is a difference, can it be accommodated in Marxan?

Response: The suitability of habitats is variable within 500m of the ocean; in some areas it is suitable, in others it is not. Validation work was undertaken by MoE (VI Region) along the mainland coast in the summer of 2009 to assess the habitat quality within the coastal fringe. The outcomes of this assessment will be held to guide classification of habitat suitability in the hypermaritime. In the meantime, the MM team decided to proceed on the assumption that habitats within 500m of the ocean were suitable. At the same time, they recommend that hypermaritime areas should not be over-emphasized in the reserve solution due to the uncertainties about habitat suitability (to be assessed post hoc).

3) The CMMRT goal is to limit population decline from the baseline year of 2002. How is the year being incorporated into the modelling if there has been forest harvesting between 2002 and the year of the air photos or aerial surveys used to define suitable habitat? If the mapping uses post-2002 data in areas where logging has occurred without some corresponding compensation, then the risk of not attaining the goal increases.

Response: Concur. This has been acknowledged as a limitation in the final reports. As part of post hoc analysis, one could calculate what has been harvested since 2002 re RT goal and note the effect on attaining the CMMRT goal.

4) This question may reflect my admittedly superficial understanding of how Marxan works. According to EBMWG DS04 Co-Location Project Purpose and Methods DRAFT December 8 200, existing reserves are locked in during the exercise. Those reserves include conservation areas, WHAs, riparian areas, grizzly critical habitat and ungulate winter range. If those areas are locked in and contain a lot of class 3 MaMu habitat, how does that affect the outcome for the low-risk scenario, i.e. does MaMu area ever not include all Class 1 + 2 available because of constrained Class 3 contribution to the total. If so, then the risk of not attaining the goal increases.

Response: The rule in MARXAN was to capture 100% of Class 1 and 2 and make the remainder up to 62% with Class 3. Therefore the amount of Class 1 and 2 captured should not be constrained by the amount of Class 3 in existing reserves. This is evident in the results for Mid Coast in which more than 62% of Classes 1 – 3 are captured in the solution. However, in the Co-Located LUO scenario, 100% of Class 1 and 2 are not captured. This is because of limits on the amount of old growth that can be captured under the ‘budget’ in the coastal orders.

5.2 Kim Nelson comments

Peer reviewer information:

Kim Nelson

Oregon State University Dept. of Fisheries and Wildlife

104 Nash Hall

Corvallis, OR 97331

Ph: (541)737-1962; E-mail kim.nelson@oregonstate.edu

Submitted: February 8 2009

5.2.1 Peer Reviewer Comments and Response

The following summary was provided by the peer reviewer. Responses from domain experts are provided below each key point.

Overall Comments: This document is well written and includes a comprehensive discussion for the co-location projects. I included comments/edits in text and summary comments at the end of each section.

My main concern with this effort has to do with the 1:1 assumption of number of murrelets with amount of nesting habitat, and the assumption that if the habitat is there the birds will successfully reproduce and populations will be maintained. In order for me to feel fully comfortable with this plan the following is suggested: (1) conduct surveys adjacent to watersheds with a lot of habitat and those with little habitat to verify the 1:1 relationship of bird numbers with habitat; (2) look at nest success rates in these areas; and (3) make certain sink habitat is not counted as reserves. This will really be the only way to know that you are going to be able maintain 70% of the current population over time.

Response: Acknowledge the critical nature of the '1:1 assumption'. Domain experts recommended more clearly identifying these assumptions as uncertainties in the report and proposing adaptive management and monitoring to keep track of the success of the management prescription (see below).

The peer reviewer is recommending a hugely expensive, multi-year study. We have to make the best of the information we have, which in many cases is fairly robust, and base decisions on the most likely outcome. Existing radar data supports the 1:1 relationship of bird numbers with habitat and it is possible that correlative studies using radar and terrestrial habitat metrics will help clarify this relationship in the future through long term management and monitoring. SFU has done analyses of nest success vs habitat quality.

You will not want to be cutting habitat in areas with high nest success and saving habitat in areas that are sinks. If you want to maintain MAMU distribution you may need to consider growing back habitat in watersheds with small amounts of habitat or that are sinks. I understand the difficulty of collecting these data but they are really necessary to make certain you will maintain effective populations in each region.

Response: It would take years of research to determine what constitutes sink habitat.

In my opinion it is risky to plan for a 30% population decline given that populations are declining with current habitat conditions. Planning to harvest an additional 38% of potential nesting habitat could have significant consequences for this species. It is important you know that you are really going to maintain 70% of the current population and build in back-up plans in case it turns out you are not maintaining this target.

Response:

There is no discussion of adaptive management. What if fires wipe out areas that are saved as reserves? Will you re-grow replacement habitat or save more in other areas? The same could be asked about extensive blowdown or increases in predator numbers or dramatic changes in the marine environment. It would be good to include a section on how the plan will change or be modified if significant changes occur in the assumptions, reserves, or with murrelet populations.

Response: This is an important point. Added the following recommendation to the Research Questions: "Arcese et al (2008) have designed an adaptive monitoring program to test hypotheses associated with the effect of timber harvesting on populations of marbled murrelets using radar surveys. This program has been endorsed by the CMMRT and could be applied in the coastal planning area. The program recommends experimental areas to be intensively managed and monitored. Suitable watersheds have been identified through simulation modelling using SELES (Spatially Explicit Landscape Events Simulator) (Contact: P. Arcese, University of B.C.)."

This being said, this is one of the most comprehensive efforts for managing murrelet habitat. Those involved deserve credit for a job well done.

Species Overview Section Comments: The information presented [in this section] is accurate and comprehensive. See my edits and comments for any changes that are recommended. I do not see a need to add any details in this section for this effort.

Knowledge Base Section Comments: The information presented [in this section] is accurate and comprehensive. See my edits and comments for any changes that are recommended. I do not see a need to add any details in this section for this effort.

Mapping Section Comments: The aerial photo interpretation mapping is definitely the way to provide the most accurate assessment of murrelet habitat. The other methods will be less accurate and tend to overestimate habitat suitability. I can not think of a better way to represent murrelet habitat except with extensive on the ground surveys which would be cost prohibitive. For your information see the satellite habitat mapping we created for murrelets in WA, OR, and CA which definitely overestimated the amount of suitable habitat in the region (http://www.fs.fed.us/pnw/pubs/pnw_gtr650.pdf).

Response: That is the experience in the U.S., but they have never really applied helicopter surveys and intensive use of air photo interpretation as we have in BC. US researchers tend to rely heavily on ground surveys – is a culture; it is easier to get into sites.

Recommendations Section Comments: These recommendations seem straightforward given the target of 30% decline of MAMU populations over time. The approximation of the low and high risk levels seem appropriate given the context of the design and objectives. My only concern, which is great, is the 1:1 assumption of number of birds related to amount of habitat (also see comments at the beginning of this document). More research needs to be conducted to verify that this is the case as the whole strategy of saving 70% of the MAMU population depends on this assumption. What if the birds are more concentrated in the watersheds with more habitat? What if birds have been largely extirpated from the very cut over areas or visa versa? It would seem that in addition to saving habitat that habitat will need to be re-grown in areas where there is little habitat but a lot of birds to maintain distribution throughout the region. You do not want to be creating or maintaining sink situations as this will result in larger population declines in the future.

Response: See above response to summary comments

More research is required to look at the distribution of suitable nesting habitat related to the distribution and abundance of birds at sea.

Response: The information we have is what we are stuck with, at this time. We don't know where the birds are at sea and therefore don't know if using the habitat.

Section on Management Outside of Reserves: This section could include a few more details to inform the reader. If not here, then include some references or other places where one could do to get this information. This does not provide me with a picture of what will go on outside the reserves.

Response: Added a bit more description and references

5.3 Wayne Wall comments

Peer reviewer information:

Wayne Wall

Habitat Specialist

International Forest Products Limited

wayne.wall@interfor.com

Submitted: February 5 2009

Submitted: February 9 2009

5.3.1 Peer Reviewer Comments and Response

The following summary report was provided by the peer reviewer. Responses by domain experts are shown below each key point.

General Comments

Authorship should be stated at the beginning of the section. It is not clear if domain experts authored or co-authored the document. If it was authored or co-authored by domain experts they should not be cited as pers com within the document.

Response: addressed authorship in the final reports to the EBM Working Group

Section topics cover off the range of information required for this project.

Please review all comments inserted directly into the document.

5.1 Species Overview

Well written and well referenced. Is current with science and best knowledge.

5.2 Knowledge Base for Co-location of Marbled Murrelets

Well written and well referenced. Is current with science and best knowledge.

Please see document for specific comments.

Response: Detailed comments incorporated into the report, as appropriate

5.3 Summary of Mapping and Information

Well written and clearly explains how the project was approached and how the project used available information.

Please see document for specific comments.

Response: Detailed comments incorporated into the report, as appropriate.

5.4 Recommendation for strategic co-location of marbled murrelet habitats in Marxan

Well written and clearly describes approach taken. Reader can clearly understand how inputs were used.

5.4.2 Existing management designations and objectives and 5.4.4.1 Map inputs: The use of established and proposed WHA's is discussed in this section. It should be clear for what species. If they were established or proposed for MaMu they should not be used in that this might bias co-location as they were established or proposed before this exercise. If it was determined that they would not bias the co-location exercise then it should be clearly stated why. Please see comment inserted into document.

Response: Made suggested clarification

5.5.4.2 Targets for habitat retention: The term risk has been used. In this context it seems as if a technical risk assessment has been done (Risk= exposure x consequence x probability). If it has not been done, you should change the phrase “risk target” to management scenario. If a technical risk assessment has been done include it in the report. The document eludes to the risk targets as scenarios.

Response: Concur that we need to be clear with how the term ‘risk’ is being used. Have added text to the reports for all focal species to clarify that the risk targets outlined in the report reflect the risk to marbled murrelets if the stated objectives are not achieved i.e., .

- **To achieve the CCMRT goal of 69% retention of suitable habitat within each sub-region.**
- **To provide a preferred distribution of Class 1 - 3 habitats.**

I thought CMMRT only set the 69% goal by conservation region and did not set target at the finer resolution of landscape units. It is easier to report by LU for administrative and data management reasons but as a management direction it should balance at conservation target by conservation reason.

Response: Agreed – removed reference to a goal of 69% by landscape use; only for the sub-region

Is there indication where this 10% occurs on the landscape? Is there a threat to this 10%. The adjust is seems reasonable.

Response: There is no guaranteed protection for anything outside of OGRAs. This is a strategic planning exercise focused on habitats within old growth reserves. The 10% outside of reserves is an operational planning thing.

5.4.4.3 Spatial configuration: Please see comments in the document.

5.5 Management of the land base outside of spatial reserves

Second growth areas will likely not become old enough to function as MaMu habitat so why is this needed. If they are in areas that are reserved, this will have to be a stand alone project with the soul intention of a species specific silviculture manipulation.

Response: Agreed – amended this section completely rather than quoting the original IWMS document.

5.6 Research and Inventory gaps

List seems inclusive and covers off most questions around the species.

Appendix 2

Inclusion of *4.1 Description of experimental scenarios* and *4.2 Findings from a review of the scenario outputs* was very useful in understanding results. It is clear and concise.

6.0 Mountain goat (*Oreamnos americanus*)

Peer Reviewers:

Doug Janz, Consulting biologist

Troy Larden, Ministry of Environment, Skeena Region

Wayne Wall, International Forest Products

Domain experts:

Steve Gordon, Ministry of Environment

Shawn Taylor, Goat Mountain Resources

Brad Pollard, McElhanney Consulting Services, Ltd.

Kim Brunt, Ministry of Environment, Nanaimo

Ken Dunsworth, Ministry of Environment, Hagensborg

6.1 Doug Janz comments

Peer reviewer information:

Doug Janz

Consulting Biologist

ddjanz@shaw.ca

Submitted: January 26 2009

6.1.1 Peer Reviewer Comments and Response

The following summary of comments was provided by the peer reviewer. Responses by domain experts are shown below individual comments

1. Recommendations section (section 8.4).

- *Do these recommendations reflect your understanding of the science of the focal species?*

I have a few comments in my revisions, but overall I feel comfortable with the recommendations. The input models have been refined and given the overall knowledge base they appear to reflect reality as evidenced by validation with actual occupancy and/or habitat use research projects.

- *What is your opinion of the approximation of low and (where relevant) high levels of risk for this species within the context of OGRA design and overall EBM objectives set out in the Coast Orders (see section 3.0 below)? Are these a reasonable reflection of the science on the species? If you were to change these definitions of low and high risk, how would you do so and why?*

Given the paucity of empirical information on the whole question of how much is enough, risk assessment is pretty much reliant on expert opinion. The rationale for low risk, maintenance of the best habitat based on goat ecology (limiting factors, site fidelity, etc), is defensible. The definition of what constitutes high risk is more subjective and I cannot argue against the “considered opinion” of 40% loss. Visual assessment by the domain experts of various Marxan runs (ie. for areas with good information on occupancy) may refine the high risk level, but as stated any significant revision waits for additional information on animal response to habitat loss.

While the objectives and reporting metrics are based on a Landscape Unit level, it would have more biological meaning to assess risk on a meta-population basis. In addition to reporting suitable/high value habitat in total and in OGRAs, the proportion that falls within the NC land base vs. the THLB would be another valuable indicator of risk

Response:

a. Re analysis on a meta-population basis, domain experts agree however this analysis was not undertaken due to constraints on time and resources. It is noted as a consideration. The groundwork has been completed for the North Coast sub-region.

b. Re. analyzing THLB vs NTHLB, this analysis was undertaken in Phase 3 of the project. However, domain experts are cautious about treating the NTHLB as unavailable to logging, since considerable harvesting is known to occur outside of the THLB and the attributes that make good winter range also make stands attractive for timber harvesting.

- *Are the recommendations an appropriate reflection of the available information (yes) and outcomes of the scenario reviews?*

Have to rely on domain experts as there is little info in the report on scenario reviews (Appendix 2). Without actually looking at map outputs, I cannot comment on the appropriateness of recommendations vs scenario outcomes. There are so many possible scenarios it boggles the mind. However I do have a question as it relates to sec 6.2.2 of the Appendix: as the key driver of the conservation goals is forest representation, the contribution of goat habitat may be somewhat diminished by the nature of its rather narrow use of the forest types/SSS; or conversely OGRAs based solely on goat reserves would result in overrepresentation of those forest types (??). But because a high % (?) of goat habitat is located in the NC, the inclusion of these areas comes at zero cost? It does appear evident that the final decision on the representation goal (30, 50, 70% RONV) could have major implications on protection of focal species habitat.

Response: The co-location is driven by targets for multiple species, so is intended to distribute representation across species' habitats. Domain experts recognize that mtn goats have a narrow use of forest types, and that this increases the importance of capturing high value forested habitats, esp where these are at risk of being modified through logging, in particular, lower elevation habitats within the THLB. Concur that the representation goal can have big implications for protection of focal species habitat, as old growth reserves must meet habitat goals for multiple species.

- *What might you suggest for:*
 - *Improvements to the effectiveness of the recommendations themselves?*

Any improvements will likely be based on the iterative process of tweaking input variables and reviewing scenario outputs.
 - *Further experiments to improve the recommendations?*

See comments below on sec 8.6

2. *Sections on Species Overview, Knowledge Base, and Managing Outside of OGRAs (sec 8.5). Section 6 is Research and Inventory Gaps (sections x.1 and x.2 and x.6):*

- *Is the information provided in these sections accurate and comprehensive?*

As evident in my suggested revisions, I found the first 2 sections in particular contained much confusion and /or duplication of concepts. I have tried to delete much of the duplication, but the document is in need of a good grammar edit (which should have been done prior to peer-review as it was quite time-consuming). Better use of the literature is also identified in some areas.

Response: Accepted most of Doug's helpful and thorough edits

- *Can you suggest any additional information about habitat management and habitat supply assessment that would be relevant to the co-location work?*

No

Note: section x.8.5 (Managing the Landbase Outside of OGRAs) is intended to fill out the information in the overall chapter, in recognition that what happens with OGRA design will only be effective in the context of overall management for the species. This section is not intended to provide a comprehensive description of management direction within the working forest.

You are right, there is not much here (I expect this section to be very important to other "non-mountain" focal species). But there are some aspects in sec. 8.4.8 that are applicable within the forest matrix as well i.e. need for long-term planning of harvest location and timing, and access management planning.

Response: Agreed – is dealt with in the text

Section 8.2.2 Scales of Planning provides opportunity to integrate the animal scale as well, based on the metapopulation concept, i.e.:

Sub-region or Landscape = distinct mountain complex = metapopulation = an assemblage of discrete/local populations (or sometimes referred as subpopulations);

Watershed level = local population = a collection of herds

Stand level = winter range polygon = herd(s)

Response: Agreed, added to text

- *Section 8.6 Research and Inventory Gaps*

As indicated in the report there is a huge need for experimental research to address the response of critters to habitat alteration/removal. However the suggestion "There may be opportunity for adaptive management experiments where limited amounts of forest are removed on the periphery of selected goat ranges" will not tell us much. The high risk threshold of 40% needs to be tested, although I cannot see this being feasible at the landscape level. However, some version of it should be doable at the watershed level. Select an occupied tributary that contains a number of winter range polygons; monitor habitat use (GPS collars) over 2 winters; then alter the habitats and monitor animal response. One of 3, or 2 of 5, or some % of winter range polygons would be removed/harvested. If the position remains that "Removal of forest within identified winter range habitats is considered high-risk and is not being promoted" then spend the research dollars elsewhere.

Response: Adjusted the text to be clear that domain experts are not suggesting manipulation of winter ranges to avoid ambiguity

3. *Mapping and Information (section x.3):*

- *In general, is the mapping, as described, optimally suited to strategic co-location? If not, what would you suggest to improve the inputs to the Marxan?*

As indicated, the models have been improved (phase 2) and continue to be fine-tuned by review of model output; ie the domain experts recently identified the need to adjust the habitat rating values. I expect further iterations will be reviewed until there is confidence in the model output.

- *If you have a knowledge of mapping and inventory for the coastal planning area, is there other mapping and inventory that we need to be made aware of?*

I have one additional reference that should be included in the report (although their work has now been superseded with the revised SC model):

Taylor, S. and K. Brunt. 2007. Winter habitat use by mountain goats in the Kingcome River drainage of coastal British Columbia . BC Journal of Ecosystems and Management 8(1): 32–49. url: <http://www.forrex.org/publications/jem/>

Response: Added

6.2 Troy Larden comments

Peer reviewer information:

Troy Larden
Senior Ecosystem Biologist
Ministry of Environment, Skeena Region
Smithers, B.C.
Troy.Larden@gov.bc.ca
Submitted: 28 January 2009

6.2.1 Peer Reviewer Comments and Response

With the exception of the summary statement, the points shown below were taken from comments embedded into the draft report. Domain expert responses are shown below each key point.

The following summary statement was provided by the peer reviewer:

I have completed a review of the document and offered several edits and comments. Feel free to use or delete as it serves the purpose of the document. I hope they make it stronger. What I failed to get out of the document because it was focused on ORAM was how the selection fits into the hierarchy. Recall that Vanderstar submitted an approach that prioritized our species that I support fully.

Response: The issue of setting priorities among focal species is recognized as an important consideration but it has not yet been resolved. The co-location exercise treated all species as equal in MARXAN although their targets for habitat were different. Skeena Region's comments on species' priorities have been noted.

Section 8.1: Cultural, ceremonial and sustenance harvest by First Nations is a legal harvest which is not included in these numbers. May consider rewording this to reflect this as it is substantial. May also want to change the word hunted to harvested.

Response: Agreed. We do not want to imply that FN harvest is inappropriate. Most goat hunts are closed in winter but not in the Skeena canyon on the coast – still have a winter harvest. Clarified in the text.

Establishment of WHAs for the protection of goat habitat has also proven successful in the Peace. May be an option to pursue if the natal ranges do not overlap with UWR.

Response: Do not agree. WHAs established for natal ranges are small parcels. They address site specific known birthing areas but are generally small and do address other life requisites. Do not want to promote this as an approach to habitat retention.

Section 8.1.1: In response to text: *They depend on the value of old growth forests. Old forests provide snow interception, particularly during winters of heavy snowfall. Declines in goat population appear to be associated with heavier snowfall years (Joslin 1986) and the maintenance of old growth forest within their winter range is thought to play an important role in survival. They are therefore good candidates for modeling specific old growth reserves.*

Comment: I do not understand the linkage here. What are you modelling?

Response: Reworded to emphasize the importance of including winter range for goats in old growth reserves

Section 8.1.2: Text: *Due to their high fidelity to their natal ranges, the loss of effective winter habitat will have a direct effect on the population.*

Comment: This suggests that there is a correlation between natal and winter ranges. In the North Coast it is found that due to the type and amount of snowfall, natal ranges are, in most instances, the same as the winter ranges and as such, measures for the UWR's have been included to include the natal period (harvesting windows as an example.)

Response: Agreed - changed text to say that goats show fidelity to winter range (we don't know as much about fidelity to natal ranges). Field observations show a link btw winter range and natal ranges (a subset of winter range), therefore loss of effective winter range habitat may result in reduced population recruitment.

Text: *This is a significant issue on the coast where helicopter logging is increasing and narrow valleys preclude setting adequate timing restrictions or physical setbacks.*

Comment: Physical geography has nothing to do with the establishment or adherence of timing restrictions

Response: Agreed. Physical setbacks is difficult but not timing. Deleted the last half of the sentence.

Section 8.2.1.2 Spatial Configuration: Text: *In studies in the South Coast, the average area of mature and old forest within the average goat winter home range was 30 ha in size (Taylor et al 2004), however, based on the topographic characteristics of a site, the size of individual winter ranges may be much larger (S. Gordon, pers comm)*

Comment: It may be much smaller as well given the criteria and availability for selection.

Response: Agreed. Reworded to "the size of individual winter ranges may vary"

Text: *Manage helicopter activity adjacent to occupied mountain goat habitats, particularly winter range. Precautionary best estimates are for flights to be 1500 – 2000m from occupied habitats, particularly during vulnerable kidding periods.*

Comment: Critical Ungulate Winter Range was defined earlier in the document as that occupied by nanny and or kid groups.

Response: As above –changed definition to include winter range as well as natal range

6.3 Wayne Wall comments

Peer reviewer information:

Wayne Wall

Habitat Specialist

International Forest Products Limited

wayne.wall@interfor.com

Submitted: February 5 2009

6.3.1 Peer Reviewer Comments and Response

The following summary of general comments was provided by the peer reviewer. Responses by domain experts are shown below key points.

General Comments

Authorship should be stated at the beginning of the section. It is not clear if domain experts authored or co-authored the document. If it was authored or co-authored by domain experts they should not be cited as pers com within the document.

Response: Addressed authorship in the final reports to the EBM Working Group

Section topics cover off the range of information required for this project.

8.1 Species Overview

Generally ok, please see document for specific comments.

Response: Detailed comments reviewed and incorporated, as appropriate

8.2 Knowledge Base for Co-location on Mountain Goat

There are two main telemetry studies that have recently been conducted on the mainland coast. Information in this section is not supported by the findings of those two studies. Specific comments can be found in the report

Example: When looking at Taylor and Brunt, Douglas fir is not a common species in their study area yet there seems to be an emphasis on this tree species (Fd). In telemetry studies where Fd was present, (Taylor et al) there was not a selection.

Response: The Taylor et al study was not a good one to look at Fd stands as little fir was found in study area and it was in an area with relatively low abundances of goats, so not conclusive. Added to the text that, where Douglas-fir is not common, use by mountain goats is more a function of what forest is available adjacent to the escape terrain rather than the type of forest. Goats will pick the warmest and driest available. Fd does provide better snow interception.

8.2.1.3 Connectivity

This relationship is very poorly understood. There is some interesting work being conducted in the Prince George area by the Williston Lake Compensation Fund biologist that relates to this topic. Although it is not a coastal example, it might worth while contacting them to discuss the initial findings (final report not yet completed).

Response: Tried to get info on connectivity work in PG area, but the report was not ready for release (Contact: Mari Woods, Peace Williston Fish and Wildlife Compensation Program)

The document mainly focuses on forested connectivity but there is no mention of topography. As a personal observation when flying mountain goat winter habitat, I have speculated that portions of good winter habitat are not occupied because they are topographically isolated

(meaning it is surrounded by ground that is too steep for the goats to navigate). This is extremely difficult and likely impossible to model but warrants a mention in the text.

Response: Comment noted. This issue is addressed though connectivity requirements discussed in the text . Concur that it would be difficult to model.

8.3 Summary of Mapping and Information

The document recognizes that there are differences on how habitat has been mapped in the three sub-regions. As there are differences between sub-regions, the modeling criteria should be explicit within the document.

Response: The different models are described in the mapping section. Amended text to clarify differences

8.3.2 Limitations and uncertainties associated with goat habitat mapping

The biggest question is whether the habitat is occupied. Bullet 3 in the section attempts to make that point but there should be a statement that is more explicit. Modeling is a good way to stratify candidate areas but these areas should be confirmed for occupancy.

Response: The resource selection function model for the South Coast was developed for female goats based on research using GPS collars from an adjacent area. The model output was assessed against known occurrences in two landscape units. The resource probability selection function for the North Coast was verified through field surveys over a number of years. Almost all designated ungulate winter ranges for goats have been field verified for occupancy.

8.3.3 Recommendations to improve mapping

Age class is a very broad category (age class 8 = 140-250 years; age class 9 = 250 years plus). Should be age specific, as this will allow for a finer resolution.

Response: Agree with this comment, however, the data does not exist at the scale of this exercise to provide finer resolution.

8.4 Recommendation for strategic co-location of mountain habitat within old growth retention area

This section is the crux of the document. It should be expanded so the reader has a clearer idea of what has been done.

Not having the report for the RSF component makes it difficult to review.

Response: Added details on the RSF component into the final document as well as the reference to the original paper describing the model (Taylor et al 2004).

The term risk has been used. In this context it seems as if a technical risk assessment has been done (Risk= exposure x consequence x probability). If it has not been done, you should change the phrase “risk target” to management scenario. If a technical risk assessment has been done include it in the report.

Response: Added the following phrase into all chapters to clarify how the term “risk” is used in the documents: “The risk targets outlined below reflect the risk of not achieving the stated population objective. These targets are based on expert opinion and were not derived through a formal risk assessment.”

Re discussion of forested buffers within habitat complexes (section 8.2.1.2), the reviewer comments: This is edge effect. The effect on edge can be found in many hydrology journals. Basically this is an increase in snow depth for about one half of tree length from an edge when compared to the opening

Response: This is referring not to edge effect but the amount of interception cover needed for goats. Adjusted the text to clarify the meaning of the paragraphs

Please see comments in report regarding energy requirements and forage.

As a general rule of thumb forest harvesting does not occur on slopes over 45 degrees. The statement “Legally designated goat habitats are primarily located outside of the timber harvesting landbase and, in some areas, many of the best habitats at lower elevations have already been logged” contradicts habitat attributes stated in this document

Response: Can have steep escape terrain adjacent to a forest buffer that is not so steep. Also, steeper slopes may be harvested where there is not conventional harvesting. In some specific areas, habitat within 400m of escape terrain has been removed.

Because of goats [being site-]specific, habitat distribution should be based on known winter locations.....might be a better way of addressing this factor.

Response: added text to “Manage habitats where goats are known to occur or within a high probability of occurring”.

In response to the statement: “The presence of females with kids (nursery groups) turns high value habitat into critical habitat. Any loss of winter range habitat used by nursery groups is considered a high risk. Removal of more than 10% of winter range cover is considered a high risk to localized populations of goats”. , the peer reviewer comments: *Any means one tree, this should be quantified. This is very subjective. As well refer to previous statement on risk and risk assessment. This will develop your risk scenario’s as well as substantiate your risk statements.*

Response: Agreed. Amended text to “The presence of females with kids (nursery groups) turns high value habitat into critical habitat. Any loss of winter range habitat is considered a risk – the amount of risk increases with the amount of alteration. “

8.5 Management of the land base outside of spatial reserves

The content and statements didn’t seem to fit into report. Please see comments.

Response: The peer reviewed report was subsequently divided into separate reports. This section is more fitting in its location in the final reports.

8.6 Research and Inventory gaps

Bullet 3 should discuss the spectrum of climate shift. What about issues like shorter duration of winter, increase in elevation of snow pack. Marine environment in most of the area is the major climatic influence....will an increase in ocean temperature moderate climate. There are a number of potential scenarios with climate change as it relates to critical winter habitat, it would be better to just to say that with regards to climate change there could have either beneficial or negative influences on critical habitat and identify a few aspects on both sides of the coin. To pick one aspect is not a good idea as is done is in this section.

Response: The report provides a very general overview of expected climate change related effects and possible responses. However, there are generalizations re expected trends that domain experts felt could be commented on with respect to building resiliency into reserve design.

8.6.2 Inventory Gaps

What is really needed is a long term inventory program so we can begin to determine things like productivity, recruitment and population trend. This information will likely direct research gaps. Total population is just a snapshot.

Response: Suggestion incorporated into the report.

7.0 Northern Goshawk (*Accipiter gentilis laingi*)

The following summary of responses was prepared by Erica McClaren, Ministry of Environment, in consultation with Todd Mahon and Frank Doyle.

Peer reviewers:

Steve Brockmann, US Fish and Wildlife Service

John Deal, Western Forest Products

Richard Reynolds, Rocky Mountain Research Station, Colorado

Domain experts:

Erica McClaren, Ministry of Environment

Todd Mahon, Wildfor Consultants

Frank Doyle, Wildlife Dynamics Consulting

7.1 Steve Brockmann comments

Peer reviewer information:

Steve Brockmann

Deputy Field Supervisor

Juneau Fish and Wildlife Field Office

3000 Vintage Blvd, Suite 201

Steve_Brockmann@fws.gov

Date of submission: February 16, 2009

7.1.1 Response to Cover Letter

Many of my comments are related to the goshawk targets. It is not clear to me if the nesting habitat and foraging habitat targets identify quantities of habitat to be protected, or if they are only criteria for composition of habitat within reserves (of whatever size is necessary to meet other needs). Some re-drafting at the indicated places should clear this up.

The other major concern I have is that although the authors discuss territorial spacing of goshawk nest areas, there does not seem to be a mechanism to incorporate reserves systematically spaced at an appropriate interval across the landscape, to protect nesting habitat. If there is such a mechanism, it should be more clearly articulated, as I did not see it.

If not, I recommend working with the models to develop a method of spreading reserves across the forested habitat to match the territorial nature of goshawk nesting pairs.

Thank you for the opportunity to provide this review. If you or others have questions, or if I can help in some other way, please contact me again.

Response: We have worked to clarify what the goshawk scenario runs mean. Targets are set for site series surrogates (SSS) within each landscape type and this co-location exercise uses Marxan to try to direct the composition of forest selected to meet overall amounts set by SSS targets while maximizing composition to capture as much other focal species habitats as possible. We have set amounts and quality of habitats in each scenario run evaluated.

Although there is no explicit mechanism to incorporate territorial spacing of goshawks into the reserve design (because as stated, the territory model was not run), we have tried to apply this “lens” when reviewing scenario outputs.

7.1.2 Response to Comments on the Focal Species Chapter

Page 8: Page: 37

Goshawks are indeed mobile, so connectivity among old growth patches is likely not a major concern for them directly, at least at the landscape unit scale. Connectivity may be critical for their prey, though, especially within the logged matrix. Corridors should be protected or restored to ensure healthy populations of squirrels, grouse, and other prey species, both within reserves and the matrix.

At the sub-regional scale, connectivity limitations associated with isolation on Haida Gwaii appear to affect genetic interchange and probably population survival for goshawks. We do not know the maximum distance that goshawks may be able to travel between adjacent habitat patches, but Haida Gwaii is apparently too far from adjacent habitat for effective immigration.

Response: We have added a sentence around the unknown importance of connectivity for goshawk prey species. We're not sure how reserve design, in the context of this project, could consider genetic isolation in Haida Gwaii. We have elaborated on this genetic isolation though.

Page 9: Page: 37

It isn't clear to me why you wouldn't use the territory model. Perhaps some explanation of why it doesn't meet the needs of the co-location project would help.

Response: We have added that the territory model was not used in this project because of limited time and funding.

Page 10: Page: 37

Perhaps a list of relevant licensees (in an appendix/) would be helpful to those who wish to use the model, and need to obtain data-sharing agreements.

Response: We believe providing a list of licensees is outside the scope of this project. There are several licensees in coastal BC and licensees change over time.

Page 11: Page: 37

I understand that there are several WHAs for goshawks on Vancouver Island and Haida Gwaii. Are these islands outside what you are defining as "the rest of coastal B.C."? Perhaps a sentence clarifying this would help.

Response: We have clarified that our reference is to coastal mainland BC.

Page 12: Page: 37

Can you add some text describing, briefly, how N1, N2, F1 and F2 are defined? How does N1 differ from N2, and how does F1 differ from F2? How is nesting habitat different from foraging habitat? Does the N1/N2 variable include a spatial element, that discounts or reduces its value if it is within 7 km or beyond 12 km of another (known or suspected) nesting area? (this may be one way to ensure reserves are appropriately spaced across the landscape.)

Response: We have added some text to clarify differences between N1/N2/F1/F2 for scenarios. The main body of the text provides habitat characteristics of nesting and foraging for goshawks and these were used as inputs to generate habitat suitability models. As well, we have explained why the territory model was not employed in this co-location exercise (time and funding constraints). We have added this as a "future analysis" that should occur.

7.2 John Deal comments

Peer reviewer information:

John A. Deal

Western Forest Products

JDEAL@westernforest.com

Submitted: February 10, 2009

7.2.1 *Response to Cover Letter*

Thanks for the opportunity to review this report. I would have liked to explore the model a bit more spatially but, given the time limitations, this is the best that I can do. Overall the report is good and the limitations of the model are outlined very well. My biggest fear is that the model will be used to identify spatial reserves and the accuracy is not at scale to support this. Anyway, this is detailed in my comments within the text.

Response: We would like to re-iterate that currently the goshawk habitat suitability models are being used to strategically examine the amount of co-location among five focal species habitat suitability, site series surrogate targets and cost layers. As well, we are using the models to examine general patterns of habitat distribution captured in different scenarios. We believe that we using the models at scales that it was intended to be used at. However, if old-growth reserve area boundaries are drafted based on these analyses, without ground-verification, then the model will have been incorrectly used. The caveats around model use are explicitly stated in this document.

7.2.2 *Response to Comments on the Focal Species Chapter*

Page 2: What can we state about nest area spacing for south-central coast of B.C.?

Response: We lack enough years of inventory work to determine spacing patterns for south-central B.C. This co-location exercise did not employ the territory model and so nest area spacing did not come into play but for the Specified Area Order we used spacing estimates from Vancouver Island as our “best guess” at potential spacing patterns from this area.

Page 2: I believe Tom also reported Marbled Murrelets were prey item #5.

Response: Tom did report Marbled Murrelets to be a prey item for goshawks on Vancouver Island. However, we wouldn’t expect MAMU to comprise a high biomass of goshawk prey items because of their overall low nesting densities, some differences in habitat types used and general unavailability of MAMU to goshawks outside of the breeding season. Therefore, we did not mention MAMU in the list.

Page 3: One thing that is missing in this section is climatic effects. Todd Manning analyzed climatic data for one of the Canfor reports. Give him a call for the report and include it in this section. We have believed for several years that climate is a significant driver in territory success.

Response: We believe that John Deal has confused the terminology between weather and climate. Annual weather patterns do have a significant influence on goshawk occupancy and breeding success (and likely overwinter survival). However, weather patterns can’t really be considered a “threat” because some years are good and some years are poor for goshawks. Climate change may also pose a threat to goshawks, however, it is difficult to assess the risks posed to goshawks through climate change and this is definitely outside the scope of this report.

Page 5: Some of the most successful territories in TFL 37 would not support that statement. For example, the 2008 John Road nest was 67m from 1 edge (over 30m difference in height) and 175 from <10 year old cut block). Connectivity seems to be a very important factor as well.

Response: The information used to generate the statement in this chapter is based on an analysis of occupied nests used by goshawks on Vancouver Island (including TFL 37 but not John Road 2008). We acknowledge that some nests occur 0-50 and 50-200 m from edges but the majority are > 200 m from our definition of hard edges. See table insert below based on n = 148 nests. We don't provide management recommendations for the few outliers in the population overall.

Edge Distance	No. Nests	% of nests
0-50	4	2.7%
50-100	6	4.1%
100-150	9	6.1%
150-200	12	8.1%
>200	117	79.1%
Total	148	100.0%

Page 7: In reference to the statement,

in the case of marbled murrelets, the extent of high quality murrelet habitat was less than two percent of the extent of high quality goshawk foraging habitat. So although good murrelet habitat was also good goshawk habitat, murrelet habitat failed to cover 98% of goshawk foraging habitat. In the case of deer winter range, the overlap was better in terms of extents but deer range was biased in location by missing foraging habitat on northern aspects and higher elevations,

is this a function of using a model vs air photo interpretation? This surprises me. If DWRs are mapped properly, they should only be incorporating a small proportion of goshawk habitat. I expect this is a function of modelling without ground truthing. If it is anything like TFL 37, the magnitude of the difference between a model and reality may be as high as 5 times.

Response: The small amount of overlap between MAMU nesting habitat suitability and NOGO foraging habitat suitability isn't surprising considering the small total amount of suitable MAMU habitat available (using MAMU model) compared to the total amount of suitable NOGO foraging habitat. There was some overlap but there is much more NOGO foraging habitat available than MAMU nesting habitat. With respect to DWR overlap, our co-location was based on modelled winter habitat suitability for deer, not on established UWRs. Therefore, the characteristics of forests that make them suitable for overwintering deer were also good for goshawk foraging habitat – not a surprise (closed canopy, large dbh forests). As stated though, Northerly aspects and lower slopes that were suitable for NOGO foraging, were not picked up in the deer model.

Page 7: If you compare to the mamu model rather than the air photo interp, I expect you will find a much higher degree of overlap.

Response: We did use the MAMU model for comparisons.

Page 9: How does retention silviculture system play into this? Do retention blocks function differently than clearcut blocks?

Response: Retention blocks can have a variety of looks. We have described nest area and PFA stand qualities and sizes as well as the importance of connectivity among these. Therefore, if retention meets these criteria, it could serve as nesting habitat. We have also described the characteristics of goshawk foraging habitat and prey species and so if retention patches meet these characteristics, they could be used by goshawks for foraging. We don't feel that we need to address specific harvest methodologies within this paper. Refer to Doyle, F. I., 2006. Maintenance of habitat suitability for Northern Goshawks (*Accipiter gentilis laingi*) and Marbled Murrelets using heli-select harvesting on Haida Gwaii: 2-3 years post-harvest. Unpublished Report. Wildlife Dynamics Consulting, Telkwa, B.C.

Page 10: Delete part of caveat that refers to use of territory model if not using the territory model.

Response: We have left this in because there may be future work conducted by the EBMWG that employs the territory model.

Page 10: If the forest cover is very inaccurate and crown closure is important, a mainland Coast wide air photo interpretation similar to mamu may be most appropriate. This would also address the issue of no data for protected areas.

Response: Because sub-canopy flyways and characteristics of the forest and shrub layers below the canopy (lateral branches for nests) are important to goshawk habitat quality, we do not feel that air photo interpretation or aerial surveys can be used to accurately rank goshawk habitat suitability. This methodology could be used to generate crown closure estimates, however. This would be a huge undertaking for the entire coastal BC range. There may be an opportunity in the future to glean information from MAMU air photo interpretation projects to fill this information gap.

Page 10: I think you are referring to tactical level planning when you refer to operational. Stand-level is operational in my mind.

Response: Removed reference to operation level and used stand level only.

Page 13: Without a copy of the model, it is difficult to visualize what this target means. My sense is that at a landscape scale, this number may be too conservative given territory spacing. For nesting habitat, it would seem more appropriate to look for a 150-300 ha patch of N1 (or a very high percentage of N1) every 8-10 km when designing OGRAs for a LU.

Response: We wanted to employ the territory model to analyze the spacing pattern of nesting habitat and the spatial distribution and amounts of foraging habitat, relative to nesting habitat. However, this project ran out of time and budget to carry out this exercise. Therefore, we examined spatial outputs for various scenarios, with this in mind.

Page 13: Why is this medium when most studies suggest that 40-60% will support pairs over time?

Response: we employed the precautionary principle and stated that there was a high likelihood of occupancy given >60% of territories in suitable foraging habitat. As a Recovery Team and Habitat RIG, we are working to refine these estimates.

Page 14: I am not clear how floating reserves serve the purposes of a species that has specific breeding spots (nests) and high fidelity. I suspect you are better to anchor OGRA's on known nests and spend your efforts finding nests rather than modeling.

Response: It is highly unlikely that we would be able to locate all known nest areas for goshawks throughout coastal BC (or this planning unit). Therefore, we believe that providing options for nest/PFA stands throughout landscape units will provide options for goshawks over time. For example, goshawks may have multiple nest/PFA stands within territories and

in dynamic landscapes (windthrow, insect infestations, climate change) goshawks are going to need to have more than one option to use as a nest/PFA stand. This approach still recognizes the high fidelity goshawks have to territories.

Page 16: I am not convinced that this is a cost-effective tool for goshawks. Maybe the issue is the use of the term. Generally, I think of a stand <20 years old as pre-commercial thinning. If we drop the term “precommercial” and just say thinning suitable stands (30-40 years old), then it will work. The other big (and noticeable) factor in Lukwa South on TFL 37 was 2 pruning lifts. Topping a few 30 year old trees ~200m from an edge may be useful as well to develop a long term structure capable of supporting a nest.

Response: We have removed pre-commercial and just reference thinning. We’re not sure about the suggestion to top trees to create nesting trees. I guess this would be a short-term solution as the tree would eventually die or lateral branches may take over as leaders. We would need more experimentation around this to properly assess its utility for goshawk nest tree recruitment.

Page 25: Now my curiosity is up. What was the ‘erroneous implementation’?

Response: In the original workshop, Marxan was incorrectly achieving targets we set for high and moderate nesting and foraging habitat. We were unable to assess the amount of high and moderate nesting and foraging habitat captured in each scenario because high and moderate were lumped together in the second run. This was corrected and comments made within this report reflect these changes.

7.3 Richard Reynolds comments

Peer reviewer information:

Richard T. Reynolds

Rocky Mountain Research Station

2150 Centre Ave., Bldg. A, Suite 350

Fort Collins, CO 80526

Office: 970-295-5972

rreynolds@fs.fed.us

Submitted: 13 February 2009

7.3.1 Response to Cover Letter

I made comments on the chapter in Track Changes. Many of these relate to poorly defined terms such as habitat, nesting habitat, closed canopy, PFA, post-fledging area, centroids.

Response: Addressed in the Chapter.

Overall I had difficulty in fully assessing the chapter due undefined terms, acronyms, and measurement units, a lack of maps and other visual aids, and a poor explanation of the scale for rating habitat values.

Response: Addressed in the Chapter. Outstanding: scale for rating habitat values.

The chapter is based on a very limited understanding not only of the habitat relationships but especially the population ecology of goshawks in coastal British Columbia (this situation is not too much different from just about anywhere else in the goshawk’s range). If the objective is to maintain population viability of the goshawk, clearly a management plan must be initially conservative to avoid crossing some habitat quality/sufficiency threshold resulting in a

catastrophic lowering of goshawk viability. A conservative approach would be to assume that every goshawk breeding pair/territory in coastal British Columbia is important for goshawk viability. This assumption is reasonable given the current estimate of <1,000 adult *A. g. laingi* there. If a reserve approach is used, reserves will likely have to be large enough to include multiple goshawk home ranges and they will also have to be abundant and widely distributed throughout the region. I do not believe that single territory reserves <2,000 ha will successfully maintain goshawk viability.

Response: RTR comments are well accepted, but also indicate a lack of knowledge around the ongoing development of a Recovery Strategy that is designed to address the questions he asks. In the document we have addressed and acknowledge that this project is not a stand alone template for managing goshawks, but rather it is just one tool that will help us address the bird's habitat requirements in relation to maximizing the habitat overlap with other focal species and EBM goals. Sections 6.3.2 – 6.6.2 , outline the focal steps and outstanding questions including “an adaptive management component” that are seen as essential components of a goshawk management strategy.

A non-reserve approach -- one that appears to be the chapter's basis for managing the forest matrix around the 200-ha nesting/PFA reserves -- is to develop “desired forest conditions” for nest areas, PFAs, and foraging areas based on forest structural conditions suited for goshawks and a mix of forest compositions and structures needed to support the suite of prey species. This approach, described in Reynolds et al. (1992) and Reynolds et al. (2006), incorporated active management of forests to maintain the desired conditions through space and time.

Response: At this stage is still unclear if such an active habitat management plan for goshawks is required, and one of the goals in the development of the Recovery Strategy is to establish if and where an “active management of forests to maintain the desired conditions through space and time” is required.

A. *Do the recommendations reflect the science on the goshawk?*

Overall, the chapter is a narrow and seemingly selective review of the literature pertinent to the ecology and habitat use by the northern goshawk. Much literature was missed and several papers cited to support critical assumptions are based on poor quality science (some of these have been recently critiqued in the peer-reviewed literature). The chapter lacks a critical analysis and synthesis of the body of available literature regarding goshawk habitat use and population limiting factors. I am aware of the dearth of information on goshawks in SE Alaska and Coastal British Columbia and difficulty of gathering data on goshawk populations and habitats in these areas. Nevertheless, given the ecologic and economic importance of the Ecosystem-based Management and Co-location Projects in Coastal British Columbia, it is critically important that decisions regarding focal species management and co-location be based on interpretation and synthesis of the best available science. I am not saying that such a review and synthesis would lead to different conclusions than those reached by the domain experts in the chapter. Rather, I find the current review and synthesis insufficient to support some of their conclusions.

An example of an unsupported recommendation is first the lumping of PFAs with the nest areas and then recommending that the combined areas be treated as “reserves.” Assuming that reserves are meant to be management-free areas, this approach is contrary to one used elsewhere for goshawks. The latter defined “desired forest conditions” for both nest areas and PFAs and recommended certain management to maintain the desired conditions. This approach is currently being implemented throughout an entire U.S. Forest Service Region. Without a doubt the ecology and management of Coastal British Columbian forests are different than forests for which this approach was developed. However, since the precedent

now exists, a recommendation to manage nest areas and PFAs as “reserves” requires a review and analysis of existing science and management showing why reserves are preferred in British Columbia. Simply recommending reserves without a literature review and analysis I believe will not stand up to challenges.

Response: Again RTR comments are well accepted, but the intent of this document was not to re-write a comprehensive species review, but rather to bring forward the key habitat and ecological requirements that we the “species experts” have identified as pertinent to the management of the laingi goshawk, in the context of this project. With the help of RJR we have identified the key sources for further reading if reviewers-readers are interested in more information on goshawk ecological knowledge across North America.

B. Knowledge base and habitat sufficiency (quality, quantity, location) for co-location.

The characterization of goshawk foraging habitats as with “closed canopies” (actually undefined in the chapter) is not accurate. A comprehensive literature review will clearly demonstrate that goshawks hunt in forests whose canopies range from open (<40%) to closed (>80%) (closure reflects forest type as much as goshawk preferences), open woodlands, and openings (meadows, shrub/steppe, beach front). Forest-to-opening edges are frequently hunted by goshawks both during the breeding and non-breeding seasons throughout their range. There are several comprehensive and recent reviews available that describe the range of the habitats used by goshawks (Squires and Reynolds 1997, Squires and Kennedy 2006, Reynolds et al 2008).

Response: The context of the information presented is again in relation to the observed “prey” and goshawk foraging habitat observed in the coastal rainforest and this has been clarified in the Chapter.

The chapter often indistinguishably mixes range-wide statements with statements about goshawks in coastal temperate forests. A solution would be to partition range-wide characterizations and British Columbia characterizations under separate subheading within each chapter section.

Response: Where appropriate we will try to ensure the information context is identified.

Goshawks have large home ranges, the size and shape of which are likely related to the area needed to provide the necessary food resources for survival and breeding. Mean maximum distance from nests are typically in the area of 4.0 – 6.0 miles (Kennedy 1991, Good 1998, Moser and Garton, pers. comm.) and Titus’ et al. (1994) work in SE Alaska suggest that the maximum distances are likely to be longer in coastal temperate forest. Given the likelihood of extra large home ranges combined with the goshawk’s preferences for lowland old forest (Titus et al. (1994), I agree with most of the conclusions of the domain experts in their summary of co-locations experiments. Namely, that Marxan will provide better outcomes for goshawks if targets for goshawks are used to find co-location solutions, and that high quality nesting habitat (I am assuming this “nesting habitat” to be inclusive only of 12-ha nest areas) does not total to a large proportion of the forested landscape. However, if “nesting habitat” is defined as the 200-ha nest area/PFA, then this could sum to a significant portion of a landscape depending on the density of breeding territories. Knowing the true density of pairs/territories requires some level of repeated sampling effort over a period of years (see Reynolds et al. 2005).

Response: See below

Without maps of the OGRAs, it is difficult to comment on whether the old-growth reserve areas are likely to adequately meet targets for goshawk habitat and viability. However, I can offer that, in my long-term (18 yrs) mark-recapture study of over 123 breeding pairs of goshawks whose territories are evenly spaced at 3.8 km over the 1,728 km² Arizona Kaibab Plateau study area (Reynolds et al. JRR 39: 274-285), total reproduction has been insufficient to replace

estimated annual mortality (0.25/yr, Reynolds et al. JWM 68: 25-32). In other words, even this relatively large population of breeding goshawks is dependant on immigration from other distant populations at least over the study period. This suggests that every breeding territory throughout the SW is likely to be important in supporting goshawk population viability there (there is no evidence that other SW populations are reproducing or surviving better or worse than my study population).

Response: See below

Given that a 200-ha OGRA represents a rather small fraction of area needed to support a single goshawk pair's reproduction, the success of such OGRAs will depend to a large degree on the quality of habitat outside of the OGRA. In fact, abundant and widely distributed OGRAs as large as 20,000 ha may be needed to maintain goshawk population viability. Despite the uncertainty, I agree with the domain experts that the effectiveness of 200-ha OGRAs will depend on the surrounding matrix and that the abundance and distribution of such OGRAs should be viewed within the context of the entire region.

Response: See below

Answers to questions regarding the effectiveness of the OGRAs require much more information than is currently available. The uncertainty clearly puts a premium on further research into the distribution, density, habitat relationships, demography, and viability of goshawks in coastal British Columbia forests.

Response: Again we accept the comments in the above 4 paragraphs, and stress as above that the development of an effective goshawk management strategy is ongoing and work will continue to ensure that we are managing for goshawks habitat requirements at the appropriate territorial and population scales.

7.3.2 Response to Comments on the Focal Species Chapter

Page 1.

Comment on inclusion of Kenward et al. 1999 regarding goshawk movements between Gotland and the mainland of approx. 90 km in reference to genetic work by S. Talbot around Haida Gwaii.

Response: This is an interesting reference, however, we are not sure how it is relevant to Talbot's genetic findings that Haida Gwaii goshawks are essentially isolated from adjacent populations. Therefore, we have not included the citation recommended.

Page 2.

Comment "Nesting habitats" can include all habitats used during the nesting season (i.e., nest, nest tree, nest site, nest area, PFA, foraging habitat, breeding territory, breeding home range. Throughout this document it is never clear which of the above is being referred to when "nesting habitat" is used.

Response: Agree: Nest Area defined on Page 2 as encompassing Nest trees and post-fledgling area.

Comment on closed canopy forests and Reynolds believes we have made an incorrect statement regarding goshawks using closed canopy forests for nesting.

Response: We are citing data from coastal BC and our definition of closed canopy forests may differ from Reynolds definition. Therefore, we have not changed our reference to closed canopy forests and have provided our definition as >50%.

Page 5.

Comment: Discovering the spacing pattern of alternate requires considerable sampling effort (Reynolds et al. 2005 JRR 30:274-285). For example, in Arizona, an area of 314 ha contains only 95% of alternate nests.

Response: We agree that this effort is required; and considerable time and expense over multiple years of monitoring has been invested in the temperate coastal rainforest to identify the spacing between alternate nest trees.

Page 8.

Comment: See Reynolds et al. 2008 JWM 72:1047-1055) for critical review of all of these citations. There isn't very much science supporting this sentence. I am not arguing that there is no relationship between amount of mature forests and goshawk occupancy but, with the possible exception of Patla and Finn, these citations have not demonstrated the relationship.

Response: Based on the RTR comments we have changed the focus to goshawk prey and prey habitat in the coastal rainforest, and cited the work from this same habitat that links a >40% threshold in mature-old growth at a foraging area scale as a requirement for territory occupancy.

Comment: Why is connectivity among alternate nest stands/areas more important than for foraging habitat? Do you really believe that all alternative nests within a territory are within a single PFA?

Response: We believe that goshawks are very mobile and are able to fly between suitable foraging habitat patches to forage. Whereas goshawk fledglings are not very mobile and are susceptible to predators when traversing unsuitable habitat and so we believe that connectivity between PFAs and nest areas is more important. We agree that proximity of foraging habitat to nest areas is important from an energetic perspective. We have fully acknowledged that there are multiple PFAs and so we are unclear on RTR comment around this.

Page 16.

Comment: Given the potential consequences on goshawk viability of over estimating the actual distances between territories centroids and therefore the provision of nest areas at too low of a density, you need confidence in your estimate of the true density of breeding goshawks. Reynolds et al (2005, JRR) describes sampling efforts, including numbers of years, need to find all territories in an area.

Response: We disagree that our sampling effort has been insufficient to allow us to estimate the likely spacing of territories within similar landscapes. We agree that underestimating the density of goshawk territories may result in insufficient protection. However, we don't believe that this conservation tool alone will provide sufficient protection for all goshawk nesting habitat across the central coast planning units. As well, the suitable habitat model outputs displayed suitable nesting habitat at distances much closer than our density estimates.

8.0 Coastal Tailed Frog (*Ascaphus truei*)

Peer reviewer:

Linda Dupuis, Consulting biologist

Domain experts:

Pierre Friele, Cordilleran Geoscience

Volker Michelfelder, Ministry of Environment

Glenn Sutherland, Cortex Consultants

8.1 Linda Dupuis comments

Peer reviewer information:

Linda Dupuis

Box 663

Garibaldi Highlands, BC V0N 1T0

lindadupuis@shaw.ca

Submitted: 03 February 2009

8.1.1 Peer Reviewer Comments and Response

The following summary was provided by the peer reviewer. Responses by domain experts are provided to below each key point:

I have reviewed the tailed frog document prepared by Pierre Friele, Volker Michelfelder and Glenn Sutherland. Their recommendations reflect my understanding of this species ecology, as it is understood to date, and make good use of the current knowledge base. More detail follows.

I suggest, especially since the Marxan program was unable to link riparian buffers to contributing basins, that the authors consider including the proportion of old-growth and mature forest (stands of 80 to 120 years of age represent good old forest recruitment) as an additional mapping rule after basin size and ruggedness. This would help gage watershed integrity, and prioritize watersheds with more terrestrial habitat and connectivity potential.

Response: This consideration was already included in the MARXAN rules; the program is instructed to pick up old growth within each stream buffer.

Another suggestion is to rank stream networks based on their level of complexity (simple, branched, dendritic). More complex networks are more resilient to local disturbance.

Response: Agree, but this would be too complicated to build into the MARXAN program

I agree with the authors that 80% retention of small basins with moderate ruggedness (30 to 70% overall gradient) implies a low level of risk to the coastal tailed frog population of BC. Protection of small basins with high ruggedness values may be slightly less critical given that tailed frog densities tend to be lower in the higher, steeper headwaters. Perhaps Class 2 and 4 habitat retention for low risk levels, should amount to 60-70%.

Response: To clarify – assume that ‘80% retention’ is the combined targets for Class 1 (50%) + Class 3 (30%) habitats. See below for response to suggestion to reduce target for Class 4 (comment to section 7.4.4.3).

I agree that 20% conservation of Class 1 to 4 habitats would be insufficient to protect this species (i.e., be a high risk level) because: (1) its breeding habitats are too dynamic and

unpredictable, and they lack resiliency in some settings; and (2) it has poor terrestrial dispersal capabilities particularly when the risk of desiccation from sun and wind is high (e.g., in the latter half of their short growing season – especially in the absence of shade and wind screening).

Response: Added supporting reasons from peer reviewer as rationale for the high risk target.

Recommendations are thorough. OGRAs selected from this modeling exercise should be followed up by site-specific evaluations. In particular, it is important to assess stream network complexity: dendritic stream networks and channels with complex long profiles offer a greater re-colonization potential in the event that channel events locally extirpate a segment of the population.

Response: Comments incorporated

Landscape and habitat management outside OGRAs should be emphasized whenever possible, to protect the tailed frog population at large. In my opinion amphibian populations that appear to do well, can disappear rapidly on a regional level once reductions in metapopulation dynamics (e.g., by habitat fragmentation and/or loss of breeding strongholds) reach a certain threshold.

Response: Document includes a section on management outside of OGRAs – is within the scope of this exercise

In the face of climate change, wider riparian buffers are more likely to protect tailed frogs from terrestrial habitat loss and against loss of population fitness (e.g., through reduced feeding opportunities). Recent work by Ledwith (1994) shows that riparian ambient temperature and humidity are influenced by streams to a distance of approximately 80 m, depending on topography, geology and vegetation. Wider buffers provide better microclimate protection to tailed frogs within their home ranges (which extend at least 20 to 30 m from the high water mark) instead of simply protecting the water and shoreline. Wide buffers may also further reduce the risk of flash floods and landslides in winter. As recommended by the authors, placing OGRAs across physiographic and climatic gradients is additional protection against climate change.

Response: Are looking to research in other areas e.g., California to rationalize 50m buffer width as a minimum. The climate change section recommends increased buffer widths.

Additional research should focus on more thorough studies of home range movements and large-scale dispersal using radio telemetry, and/or on inter- and intra-population genetics. Monitoring temperature and flow regimes in small basins (moderately steep and very steep) could shed light on breeding success in relation to weather (climate). Landscape-level modeling studies of tailed frog habitat associations could continue to refine our knowledge of this species' management needs, especially if there is some focus on forest variables (e.g., patch size, frequency and distribution).

Response: Added to recommendations for research and inventory priorities