EBM WG Focal Species Project
EI02 Workshop Summary

June 10th, 2008

SFU Harbour Centre, Vancouver

Prepared for the EBM WG

Prepared by Hannah Horn

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.

EBM WG Focal Species Project EI02 Workshop

June 10 2008
Location: Rm 1410 (Segal Rm), SFU Harbour Centre, 515 W Hastings

Purpose of the Focal Species Project: To inform the development of a tool to strategically design old growth reserves in a manner that optimizes retention of habitat supply while minimizing impact to timber supply.

Workshop goal: To develop recommendations regarding what has to be done during and post-Marxan runs to best capture focal species habitats when identifying old seral reserves.

Workshop Participants

Domain experts:

Name	Affiliation	Topic area
Glenn Sutherland	Cortex Consultants	Tailed frog
Volker Michelfelder	Ministry of Environment	Tailed frog
Pierre Friele	Cordilleran Geoscience	Tailed frog
Helen Davis	Artemis Wildlife Consultants	Bears
Grant MacHutchon	A Grant MacHutchon	Bears
Tony Hamilton	Ministry of Environment	Bears
Brad Pollard	McElhanney Consulting Services	Mountain goat
Steve Gordon	Ministry of Environment	Mountain goat
Kim Brunt	Ministry of Environment	Coastal deer
Ken Dunsworth	Ministry of Environment	Coastal deer
Todd Mahon	Wildfor Consultants	Northern goshawk
Alan Burger	Alan Burger Consulting	Marbled murrelet
Peter Arcese	University of BC	Marbled murrelet

Workshop delivery:

Chuck Rumsey	DS04 project manager
Hannah Horn	EI02c project manager
Larianna Brown	EBMWG Project Support

Observers:

Name	Affiliation
Glen Dunsworth	EBMWG – project steering ctte
Audrey Roburn	EBMWG – project steering ctte
Sally Leigh-Spencer	EBMWG – project steering ctte
Tony Wong	Nanwakolas Council Society
Cedar Morton	Simon Fraser University
Dave Donald	Ministry of Environment
Buck Tanner	Ministry of Environment
Dan Cardinall	DSP harmonization
Wally Eamer	DSP harmonization
Dennis Crockford	DSP harmonization

Phone	
Wayne Wall (morning)	Interfor

SUMMARY OF OUTCOMES

Summary of follow-up required to improve habitat mapping and prepare for scale-up

Note: have listed all recommended follow-up; will follow-up with individual teams re short and long-term priorities.

Species	Tasks	Responsibility	Comments
Mountain goat	Mapping of biological layer for the SC	MoE	Kim and Sally to work together on this
	Validation of SC goat mapping against occurrence data	MoE – Hannah to follow-up re what needs to be done and who to do it	This task was identified on call following the workshop
	Tagging of nursery WRs?	Hannah to check with MoE	Is this already done?
Deer	Coastwide mapping of deer winter ranges	MoE	Kim and Sally to work together on algorithms
Marbled murrelet	Reclassify habitat classes in the vh1 and vh2	Hannah to follow-up with Dave Donald	
	Marine forage areas	Discussion needed with MAMU team	Peter A in communication with Alex and Chuck about potential collaboration
	Exclude habitat > 30 km from the ocean	Hannah to check with Alan and Louise	Is this already implicit in the mapping?
	Radar count data from Doug Bertram	Hannah to follow-up with Alan	To support post hoc assessment?
Northern goshawk	Assemble and buffer occurrence data re NOGO nest sites	Todd Mahon to pass on data	Who to buffer?
	Clarification with RT about using RT habitat mapping and data	Todd	
	Identify units for assessing thresholds of habitat amount	Todd	
Grizzly bear	Tag class 1 and 2 polygons with BEC variants or elevational descriptors to allow stratification in Marxan	Hannah to follow-up with bear team	Who to do this work? Is it a priority?
	Tag Class 1 and 2 habitats with	Hannah to follow-up with	May have already been

Species	Tasks	Responsibility	Comments
	season of use	Dave Donald	done
	Comparison of Class 1 and 2 mapping to WHAs in the MC to see if there are gaps	Who to do? Hannah to follow-up with Tony and Ken	
	Stratify Class 2 habitats by rarity and vulnerability	??	Would need to be done to differentially weight Class 2 habits in Marxan
Black bear	Mapping of BB habitat not a priority at this time		
Tailed frog	Assemble TF data and delineate watersheds around known occurrences	Glenn and Pierre to provide TF data Hannah to follow-up with MoE re watershed delineation	
	Mapping of nodes connecting watersheds	Hannah to follow-up with MoE	
	Other map changes – remove excluded areas, overall improved mapping	Hannah to follow-up with Kristy Ciruna re availability of CIT layer	
Elk and moose	Track down habitat capability mapping for NC	Hannah to follow-up with Brad. Ken to look into mapping from LRMP Phase 1	

Chuck, follow-up tasks:

Test sensitivity of using MMRT and air photo layers

Follow-up with Peter A and Glen D re boundary length modifier

Look into application of patch size distribution in Marxan

Talk to Alan B re ideas for post hoc assessment of MAMU and NOGO[1]

[1] Alan has a team doing habitat plots in the Central and North Coasts that might provide a comparison with habitat maps and the MMRT algorithm. Due for completion in late fall 2008.

Summary of goals:

Species	Population objective	Goals for habitat capture in Marxan	Comments
Goats	Maintain existing populations	- 100% of UWR known to be occupied - 100% of nursery WRs -	
Deer	Maintain existing populations	Up to 10% of the total forested landbase in high capability deer habitat within each LU	
Marbled murrelet	As per MMRT – ensure no more than a 10% decline per decade for 30 years (to 2032) and no decline after that	As per MMRT objective of 69% of Class 1 – 3 habitats.	Class 1 and 2 to be weighted equally, Class 3 to be weighted less
Northern goshawk	There is currently no RT goal, but a government policy of protecting all known nest sites.	100% of nest areas senstivity analysis of % of foraging habitat by landscape unit.	20 - 40% = low prob of occurrence 40 - 60% = moderate prob of occurrence > 60% = high prob of occurrence
Grizzly and black bears	MoE: Maintain and restore populations to allow consumptive use	100% of Class 1 and 2 habitats	Can also look at differential weighting of Class 2 habitats by rarity/vulnerability.
Tailed frog	No RT and no population objectives	100% of existing tailed frog basins.	Include additional basins based on occurrence data if available

Summary of issues to be assessed post hoc:

Species	Post hoc assessment
Goats and deer	- Elevational connectivity - Road locations and barriers to movement - Distribution across the hypermaritime, maritime, sub-maritime - Distribution across LUs
Marbled murrelet	- Patch size distribution and isolation of patches - Amount of hard edge (next to roads, clearcuts <40 years old)[2] - Capture of 'core areas' - Heterogeneity of habitat types - Proximity to marine foraging areas - Habitats at the end of long inlets
Northern goshawk	- Amount of good habitat per territory captured in each scenario as defined by seral stage distribution across landscape units - Distribution of habitats - Patch size distribution - Heterogeneity of habitat types
Grizzly and black bears	- Habitat effectiveness and mortality risk - How well lower quality (Class 3 and 4) habitats have been captured - Dispersal of habitats, including elevation - Seasonal habitats captured
Tailed frog	- Connectivity along hydroriparian areas and between watersheds - Distribution of habitats - Road density and density of stream crossings

[2] MMRT distinguishes between 'hard edges' that border roads, clearcuts and regenerating forest < 40 years old and 'soft edges that are natural edges such as avalanche chutes, river edges and forest > 40 years old. MMRT considers soft edges to be neutral.

WORKSHOP PROCEEDINGS

1. WORKSHOP OVERVIEW

Hannah presented the purpose and goals for the workshop.

Key points from the presentation:

- The focus of this workshop and Phase 1 review is primarily to fine tune methods for using Marxan for old seral co-location.
- This is a strategic exercise to expedite old growth reserves coast-wide with the guidance of co-location of conservation values; it will not replace more detailed planning.
- Scenarios to date are a proof of concept: how effective is Marxan at putting these layers together to identify old growth reserves? How can we best make this work?
- The quality of inputs can have a big effect on the quality of outputs, so a focus of this project is to identify ways to improve the habitat mapping used as inputs to Marxan.
- Role of domain experts is to provide expert recommendations, based on ecological information; they are not being asked to make socio-economic trade-offs or negotiate targets.

Follow-up re workshop notes:

- Larianna will take verbatim notes from the workshop. These will be kept as a supporting record of the day.
- Hannah will put together a workshop summary. This summary will be sent to domain experts for review and comment. Observers are welcome to submit comments but these will not be included separate to the final workshop summary.
- Chuck will assess the feasibility of applying the workshop recommendations in the short and longer term, in consultation with domain experts.
- There will be a final Phase 1 report that will include the workshop summary, the outcomes of the feasibility assessment and any comments from observers.

Comments and questions:

The project is looking at all the habitat needs for these focal species, not just old-growth specific needs. This is in keeping with the definition of EBM *to ensure the co-existence of healthy, fully functioning ecosystems and human communities*.

Two key issues needing domain expert input are (a) habitat requirements of individual species; and (b) the measures of sufficiency (how much is enough and what does it look like). We want to focus on the biological/ecological needs and not social choice factors

Q: How is biodiversity being addressed?
A: The project is addressing biodiversity by combining habitat layers of focal species and old forest representation. This approach is provides coarse, high level information that will need to be

accompanied by a bottom up process of identifying old forest reserves and habitat at a more detailed scale.[3]

Q: How were focal species chosen?
A: The project steering committee discussed at length what species should be considered focal. They did not want to be constrained by the list in the legal order. One of the outputs of the overall project will be an assessment of the focal species selected with comment about an ideal suite of focal species given time and resources.

2. OVERVIEW OF CO-LOCATION WORK

Key points:

- Phase 1 of the project looked at the lower third of the coastal plan area (= south central coast). Further discussion needed about whether to scale up to the mid-coast and north coast.
- Pilots are planned to compare top down (strategic) and bottom up (hands on) processes for identifying old growth reserves.
- We have the opportunity to do some experimentation with the scenarios e.g., to identify sensitivities.
- We have to accept the existing data limitations. Domain experts should focus on how to plan strategically for reserves that are typically identified on a finer scale rather than trying to get data inputs 100% right.

Methods

Marxan is a site selection algorithm that seeks to meet representation targets for conservation values using minimum area, minimize offset cost, and adjusted perimeter – clumped vs dispersed.

There are two planning unit layers: locked layers, where all known reserve areas (e.g., parks) are burned right into the layer; and unlocked layers. We can lock in all protected areas and assume that they are always part of the solution or unlock to allow the model to run more freely and create more choice for co-location.

Representation targets were run for different combinations of two spatial scales (sub-region and landscape unit):

- old seral targets subregional scale / wildlife subregional scale;
- old seral targets subregional scale / wildlife landscape scale;
- old seral targets landscape scale / wildlife subregional scale;
- old seral targets landscape scale / wildlife landscape scale

Conservation elements: old forest representation by site series surrogate (SSS) (SSS = BEC x AU class). Recruitment strategy: if you don't have enough old to meet target goals then the model looks to pick up representation from oldest to youngest.

[3] Check Scudder work to look at indicators of biodiversity in BC and others.

Cost Surface – the cost surface is defined by (a) estimated timber volume recoverable over 400 year harvesting period; and (b) distance to existing access (road or ocean). Have discussed the need to build in other values in the cost surface. In the short term, have focused on timber values as these are in direct conflict with old growth reserves.

Two approaches to using habitat data in the co-location project:

1) where habitat models that are robust enough, use as inputs to the model i.e., Marxan explicitly seeks to capture a % of these habitats; and

2) where there is a high level of uncertainly re a habitat model it might nonetheless be considered *post hoc* i.e., look at the scenario outputs and assess how well habitat is captured.

Note: the targets applied in Phase 1 are straw man examples to test the use of the Marxan tool; they are not supposed to represent actual measures of sufficiency

Comments and questions:

Q: Some species may need clumped and other dispersed. Can Marxan deal with this?
A: We would have to do separate Marxan runs for different species

Q: The length of boundary can have an ecological consequence (e.g., edge effect). If you are trying to minimize the boundary length why would you use a boundary modifier?

A: The purpose of the boundary modifier is to draw the 10 ha planning units together to create larger resultant polygons. Running scenarios with the boundary modifier turned off results in more dispersed polygons. With it on the polygons are clumped. Could also test something in between.

Action: Chuck to discuss the use of the boundary length modifier with Glen Dunsworth and Peter Arcese.

Q: How will SELES be used in the co-location project?
A: Marxan is looking at the situation on the ground at t=0. Once we have a final set of scenarios we will put them back into SELES and model to see the degree to which targets for conservation and timber supply are met over time.

Q: How does the model deal with the different commercial values of timber types e.g., cedar is currently worth more than fir?
A: The model does not account for individual species values. CFCI recommended that Marxan use a cost surface that locates reserves away from roads and away from most valuable timber. Also – need to keep in mind that we are doing this at a strategic level.

Q: Concern that the cost surface pushes reserves to the non-contributing landbase.
A: The model is driven to meet representation targets in order of age regardless of whether the landbase is designated as contributing or non-contributing. However, if it can meet the representation targets in the non-contributing it will.

Q: Is it possible to run a scenario without the cost function i.e., that shows a biological solution?
A: You can turn the cost function off and see the results. It is important as a baseline scenario. There is more flexibility by turning off the cost function off but in general the outputs don't look overly different.

Q: What was the rationale for putting black bears on the list of focal species?
A: Black bears were identified to represent habitats needs of some old growth reliant organisms outside of grizzly bear occupied areas. The overall goals for ecological integrity under EBM suggest that we are not limited to species that are on the legal order list. There may be better species or features to use for focal species representation – this will be discussed in the final project report.

Q: How useful is it to have a 30 % goal for MM when the MMRT goal is 69%.
A: A reminder that Chuck's goals in Phase 1 are a straw man. Weare looking for input from the domain experts re goals habitat sufficiency. It can be useful to experiment with goals in Marxan e.g., by running the sufficiency goal and then a half sufficiency goal.

Q: Is it possible to address levels of confidence levels in the model?
A: Three options presented[4]:

a. set targets higher or lower, depending on the level of confidence in the model
b. apply a species penalty factor re weighting species lower where there is lower confidence in the data
c. run the targets that you're most confident in first, lock these down, and then run the remaining targets that you have less confidence in.

Q: Can we rate species differently?
A: Yes, you can using the three options described previously

Q. How do we assess the contribution of conservation areas (protected areas, conservancies) to focal species habitat?
Conservancies and other protected areas do not contribute to a wildlife habitat goal unless there is habitat present in that protected area for the species. It may be that only a portion of a protected area contributes to conservation targets. If you lock in protected areas what you find is that a lot of habitat goals are met by these areasin combination with riparian and grizzly habitat a lot of habitat goals. As a result you may miss out of identifying hot spots. It is useful to run both locked and unlocked scenarios for this reason.

Note: Chuck will not be running models; he will be receiving models. Need to assess what is do-able in our timelines re upgrading data and habitat mapping and there needs to be resources to pay for this.

[4] Note that the options stated here weight against uncertainty. An alternative approach would be to wet higher targets where the level of confidence is lower and thereby increase the confidence in the outcome

3. SMALL GROUP DISCUSSIONS IN FOCAL SPECIES GROUPS

Groups:	
Ungulates:	Kim, Ken, Steve, Brad
MAMU and NOGO:	Alan, Peter, Todd
Bears:	Helen, Grant, Tony
Tailed frog:	Glenn, Pierre, Volker

GROUP A. MOUNTAIN GOATS AND DEER

Domain experts: Kim Brunt, Ken Dunsworth, Steve Gordon, Brad Pollard
Facilitator: Glen Dunsworth facilitator
Observers: Sally Leigh-Spencer

Q1: Data inputs

GAR order UWRs represent a negotiated outcome and are not necessarily the biological layer. Some of the modelled UWRs need verification.

Mountain goats:

Phase 1:

Negotiated UWRs underestimate the actual amount of good habitat, however, there is high confidence re the locations that are captured. A lot of good work was done to identify them.

Phase 2:

- Two options for habitat models to provide a biological goat layer:
    - Shawn Taylor model, developed for the SC
    - Keim NC model.

Deer:

- SCC: No model. There is a small extent of UWR for deer. A model could easily be built. Variables = slope, aspect, elevation, exposure, overstory species and snowpack (based on BEC).
- MC: Have a model for the MC. Legal order = manage $\geq$ 25% of each winter range in forests > 140yrs, smallest patch size = 40 ha. The MC model does not include the hyper maritime.
- NC: No model. Deer are not at risk from forest management and are a low priority for management. Focussed on moose and goats instead. However the MC model could work on the NC.

Recommendations re deer data:

Run a basic model for the SC for Phase 1 based on values in basic algorithms.

Use MC model for MC and NC

Q2: Habitat quality

Goats: Escape terrain is key (steep slope of >60°, untimbered, not colluvial). Connectivity should include escape terrain. UWR is a complex of forest cover adjacent to escape terrain.

Forest cover is a limitation, especially for goats – should also include alpine habitats.

Deer: Snowpack has a key influence on winter habitat requirements:

In areas with a low – mod snow pack, maintain mature and old forest cover

In areas with a heavy snow pack, maintain old forest (250yrs+)

Q3: Habitat quantity

Goats:

Population objective: To maintain existing populations

Goals:

- 100% of nursery winter ranges (these are already inside existing UWRs)
- Goats have high site fidelity – need to maintain 100% in reserves where goat presence is confirmed.
- Another option is to use a resource selection probability function and set goals of 100 % class 1, 80 % class 2 and 50 % of class 3 (note: is still conceptual)
- In the NC and MC stratify the landbase into 'mountain blocks'. Because goats do not re-colonize readily mountain blocks represent a key metapopulation. Capture 100% of winter ranges in each mountain block.

Deer:

Population objective: To maintain existing populations and distribution across the coast

Goals:

Phase 1 - select high capability habitats $\geq$ 40 ha in size and $\leq$ 5 km apart.

Seek to disperse habitats across LUs. Don't want all the deer winter range in some LUs and none in others.

Phase 2 – as per Phase 1

Q4 and Q5: Distribution and Spatial Configuration

Goats:

UWR needs to be adjacent to escape terrain – is a critical habitat feature.

Deer:

- It's critical to have deer winter range equally dispersed across the maritime and sub maritime vs the high maritime and in every LU.
- Adjacency of spring forage and UWR is key. Maintain spring forage within 2 km of UWR.

Q6: Connectivity

Goats:

- Need to connect escape terrains via forest (snow interception) cover across elevations.
- Connection to the alpine is important
- Roads provide access to predators, increasing high risk of predation.
- High density forests (>5000 sph) or young 20 – 50 yr forest can be a barrier to movement.

Deer:

- Cross-elevational connectivity is more important than horizontal. It is more important to be able to go up and down than across the slope.
- Need to have connectivity between winter and spring forage habitats. High density forests (>5000 sph) or young 20 – 50 yr forest are barriers to movement. Also, spring forage should be within 2 km of winter range.
- Roads are also barrier to cross-elevational movement for deer. Roads on steep slopes in UWR are a barrier.

Suggestion to do a post hoc assessment of moose and elk habitats e.g. in the Kliniklini and Apple LUs. Need to add moose and elk as focal species on the mid coast and NC as they are biologically and socially important. Brad has habitat capability layers for the NC.

Q7: Resiliency

Goats:

- Increase forested area adjacent to escape terrain for goats

Comment that goats are naturally resilient to catastrophic disturbance.

Goats and deer:

Can build resiliency into reserves with the following:

- Expand the elevation extent of winter range habitats.
- Maintain distribution of habitats in each LU (including lower class habitat)
- Low elevation habitat becomes more important if climate change results in more snow and rain-on-snow events.

Q8: Recruitment

Goats:

Recruit from oldest forest

Deer:

Recruit from oldest forest with the following conditions:

- Consider managed stands in terms of spacing (variable density)

- Choose high capability habitat over high suitability (current age of stand = suitable – may want to select better habitats for the future that are currently younger)
- Need to be more selective re site specific features for deer than goats.

Q9: Scale up to MC and NC

Described for Phase 1 and 2 in answers to Q 1 – 8.

GROUP B. MARBLED MURRELET and NORTHERN GOSHAWK

Domain experts: Alan Burger and Peter Arcese (MAMU), Todd Mahon (NOGO)
Facilitator: Alex Grzybowski
Observers: Jennifer Psyllakis, Dave Donald

a. MARBLED MURRELET

Q1: Data inputs

- Use the air photo interpreted maps and low-level aerial survey rankings. These methods are more reliable than the MAMU Recovery Team (MMRT) algorithm maps

  Noted by MoE: Air photo interpreted mapping is being undertaken in the MC and NC now that the SC is completed.
- Where have higher resolution mapping, set targets for habitat classes 1-3 (used Classes 1 and 2 in current Marxan runs). Is supported by research and this is what the forest industry is using on the Central Coast to identify suitable habitat.
- Give preference to Classes 1 & 2 (can be weighted equally); give Class 3 a lower weighting
- Concern expressed that the application of the boundary modifier could cause a bias and over-ride the habitat quality modifier (could include a biased higher proportion of Rank 3 if the boundary modifier was forcing habitat to be clumped). The effect of the boundary modifier should be explicit and given less priority than the habitat ranks (Peter Arcese can elaborate if necessary). Don't want to achieve the goals by over-selecting the more common but lower ranks of habitat.

Q2: Habitat quality

- The focus of management should follow the MMRT's stated focuses:
  - maintaining sufficient area of likely suitable habitat (amount of habitat is considered more important than the configuration or location); and
  - reduce fragmentation especially that caused by roads and clearcuts (hard edges).
- Patch size and isolation are of lower concern (see notes on spatial configuration)
- Consider downgrading the hypermaritime (vh, vh1, vh2) subzones i.e., reclassify from Class 2 to a Class 3. These variants are found to be less suitable for MAMU nesting. This may or may not be required depending on whether the lower habitat quality in the hypermaritime is already considered during classification.

- For post hoc analysis the following incomplete data sets should also be considered to compare with the outcome of forest habitat selection:
  - Proximity to known marine foraging concentrations (interim report by Burger). There is no point in selecting habitat if birds can't feed nearby, however there is not good information about at-sea feeding at this time. The problem is that there has been very little marine sampling in the central coast and not all marine concentrations of MAMU are known
  - Consider also other marine habitat indicators such as the resource maps produced for the Central Coast by Geoff Ardren (e.g., marine productivity, upwelling, seafloor substrates, herring spawn etc.)
  - Radar counts at selected watersheds (database maintained by Dr Doug Bertram of Canadian Wildlife Service)

Q3: Habitat quantity

Population objective: to reduce loss of habitat. COSEWIC-based objective: to limit decline to less than 30% of the amount of habitat that existed in 2002 and to have the amount of maintained nesting habitat remain stable after 2032. This equates to a rate of loss of 1% per year to 2032 and no further loss beyond 2032.

Goals:

- Need to recognize and apply the MMRT goals (which are written into the Marbled Murrelet Recovery Strategy about to be released) – i.e., need to maintain 69% of the area of suitable habitat available in 2002 in the Central Coast (same for the North Coast) so that populations and habitat loss levels off at 2032 (3 generations from 2002). Note: % goals vary in different murrelet conservation regions (the Central Coast and North Coast constitute two of the six regions).

  See this document for the background to this concept:

  CMMRT (Canadian Marbled Murrelet Recovery Team). 2003. Marbled Murrelet Conservation Assessment 2003, Part B – Marbled Murrelet Recovery Team advisory document on conservation and management. Canadian Wildlife Service, Delta, BC. Available at: http://www.sfu.ca/biology/wildberg/bertram/MAMUrt/links.htm

  Question during discussion:

  How might the goals for habitat retention change if you tried to set a population objective of maintaining or increasing MAMU habitat instead of stopping the decline. Response that the CC and NC have quite healthy MAMU populations so we don't need to focus on more habitat retention beyond the 69% retention target for the Central Coast.

- In this context "maintaining" habitat need not necessarily require legal protection because some proportion of the habitat will always fall outside areas likely to be logged. At the same time, designations of forest lands may change so that a greater proportion of the non-contributing land base will in future be included in the timber harvest land base to accommodate heli-logging.
- It is recognized that some proportion (perhaps 10-15%) of the murrelet nests are likely to fall outside habitat predicted by algorithms, air photo interpretation and low-level aerial assessments.

Q4 Distribution

- Include habitat within 30 km of saltwater (small proportion <5% within the 30-50 km band is probably OK).
- If possible give lower weighting to habitat in watersheds that are at the heads of long inlets (e.g., Knight Inlet, Dean Channel, Burke Channel). Radar surveys show fewer murrelets using such watersheds compared to those closer to the open coast.
- Try to maintain larger chunks of habitat. The MMRT (see document cited above) recommended having 3 core areas with larger concentrations of nesting habitat within each of the MAMU Conservation regions (the Central Coast and North Coast are 2 of the 6 conservation regions). The intent was to provide source meta-populations in case there were local catastrophes affecting murrelets. This concept has been downplayed in recent years by the MMRT and priority should be given to maximizing habitat area and quality.
- Adaptive management allowing comparisons of highly-impacted vs. less impacted watersheds would be useful to apply radar monitoring to test the effects of habitat change.

Q5: Spatial Configuration

- Patch size – the MMRT (2003) recommends maintaining patches in proportion to their availability in the landscape (i.e., have a mix of large and small patches but do not put a disproportionate amount of habitat within small <200 ha patches).
- Minimize hard edges (bordering roads, recent clearcuts and forest <40 years old).
    - Edge effects at hard edges likely to extend at least 50 m into the old forest.
    - Natural edges (e.g., avalanche chutes, bogs) are considered neutral (no known negative effects).
- Isolation of habitat patches should be avoided (> 10 km from other patches) – evidence from CA & OR shows reduced use of isolated patches.

Q6: Connectivity

This was not considered to be an issue for Marbled Murrelets – they fly over clearcuts and other non-suitable habitat. But see note above about isolation.

Q7: Resiliency

- Maintain a range of habitat elements (heterogeneous within Landscape Units) – e.g., elevation, aspect, BEC sub-zones, in order to accommodate future unpredictable changes in the environment and forests.

Q8: Recruitment

- There is probably sufficient old forest in the Central Coast to meet the needs for MAMU – we don't see the need to put emphasis on recruitment.
- If second-growth stands were to be included for recruitment of future habitat, the following factors are considered important:
    - Select stands with high productivity (site index) – most likely to provide the large trees

and canopy platforms murrelets need.

- If possible select stands where there was selective logging in the past and where there might be some veterans providing suitable habitat.

Q9: Scale up to MC and NC

- Pilot tests - Try to do site-specific assessment/verification of the South Central Coast habitat selected before roll-out in the north. Get a proportion of habitat selection accuracy which can guide future application.
- Apply the new air photo habitat rankings (should be available by mid-December – Dave Donald).
- If there is a mix of air photo (ranked) and MMRT algorithm (non-ranked) input data, should test that there is no bias towards disproportionate inclusion of habitat from one method (e.g., there might be larger areas of habitat predicted by the non-ranked MMRT algorithm).
- Include marine features applicable to Marbled Murrelets if feasible (see point b).

b. NORTHERN GOSHAWK

Q1: Data inputs

Recovery Team model: Suitability mapping of nesting and foraging habitat. The model depicts the amount and distribution of suitable habitat relative to territory sizes. Both the nesting and foraging habitat models are based on forest cover. Therefore the quality of forest cover data is extremely important.

Data inputs to Marxan should include known nest site locations and have these locked in. A nest site map is available. Points should be buffered within a 10 ha polygon to allow for uncertainty.

Use nest sites as a seed to build an area of open old growth reserve around. The WHA recommendation is 200 ha around the nest area. Old growth reserves over nest areas should be $\geq$ 200 ha to be consistent with WHA requirements.

Q2: Habitat quality

Mapping applies a continuous habitat rating based on amount and quality of habitat.

NOGO have strong territoriality and structure within a population. This is reflected in the distribution of territories across the landscape.

To assess the quality of habitats captured in old seral reserves, need to consider seral stage distribution across the landscape in addition to what is in reserves. Need to provide different forest types of a suitable quality for nesting and foraging.

Q3: Habitat quantity

Studies have indicated thresholds of amount of suitable habitat:

> 60% suitable habitat there is no impairment to fitness

< 20% suitable habitat, territories are abandoned.

Within their territory model, the RT has identified three thresholds of:

20 – 40%	low probability of occupancy
40 – 60%	medium probability of occupancy
> 60%	high probability of occupancy

Want to ensure that some of the landscape units have enough suitable habitat.

Clarification that post hoc analysis should look at old growth reserves within the context of the overall landscape and its contribution to NOGO habitat. When SELES runs occur, DEs will be able to assess changes in habitat over time.

Q4 Distribution

Due to territoriality, need to space NOGO habitats across the landbase. Territories are anchored by nest locations. A key component of the NOGO RT model is a territory model that assesses habitat quality and distribution relative to territory sizes and population spacing.

Need enough landscape units to have adequate amounts of habitat to meet thresholds described in Q3.

Q5: Spatial Configuration

For nesting and foraging areas, patches >100 - 200 ha are better than smaller patches. Dispersed patches are better than clumped.

Q6: Connectivity

Connectivity is not really an issue as NOGO will fly over unsuitable habitat to reach suitable habitat. Territories are mainly bounded by major geographic barriers (e.g., large lakes) not by forest condition.

Q7: Resiliency

Maintain a range of habitat elements (heterogeneous within Landscape Units) – e.g., elevation, aspect, BEC sub-zones, in order to accommodate future unpredictable changes in the environment and forests.

Q8: Recruitment

The priority for recruitment are mesic -subhydric sites dominated by hemlock, Douglas-fir, and spruce

Q9: Scale up to MC and NC

Most of these habitat parameters described in Q 1 – Q8 are equally applicable across all regions. The only difference is that distance of spacing between territories may differ from region to region.

GROUP C. GRIZZLY BEAR AND BLACK BEAR

Domain experts: Helen Davis, Grant MacHutchon and Tony Hamilton
Facilitators: Larianna Brown and Hannah Horn

Q1: Data inputs

Important to include salmon-bearing streams and riparian areas in mapping of bear habitats.

The majority of BB and GB habitats are within the non-forested landbase. Need to be able to identify non-forested with adjacent forest cover. The complex of forested and non-forested is what comprises the important bear habitat.

Any bear mapping needs to take habitat effectiveness and mortality risk into account.

Grizzly bear:

Have complete coverage of Class 1 and 2 habitats with the exception of two LUs (Upper and Lower Klinaklini)

Differences in data inputs result in overestimate of habitats in two LUs (Phillips and Fulmore). Is due to TEM mapping.

Have sporadic mapping of Class 3 and 4 habitats – not enough to set goals.

Black bear:

Existing mapping is too coarse for use on this project.

Could create a map using BEC x AU x seral stage and apply a habitat ratings scheme, although such a rating scheme does not exist at this time. Need to capture habitat elements e.g., cedar-leading, old; non-forested habitats such as wetlands, estuaries, foreshore.

In areas of overlap between GB and BB, Class 3 habitat is important to BB. Need to also map habitats outside of GB-occupied areas.

Q2: Habitat quality

For BB, retention of structural elements are important e.g., CWD, downed wood for denning. Silvicultural techniques on the managed landbase can help to increase the quality of bear habitat outside of reserves.

The combined suite of EBM management should adequately address BB e.g., representation, riparian, stand level retention (15%) as well as habitats captured for other species. This is aside from conditions affecting habitat effectiveness and mortality risk.

Would be useful to assess how the application of EBM addresses BB habitat, including in the hyper maritime. Need to consider habitat effectiveness and mortality risk as well.

Q3: Habitat quantity

Population objective (MoE): to maintain and restore population numbers in order to provide for consumptive use. Benchmark – population size under habitat conditions that are within the range of natural variability.

Goals:

To restore populations, need a higher standard of habitat quality and quantity.

Ideally, want 100% capture of Class 1 and 2 GB habitats to address the requirements of GB and BB.

If capturing less than 100% of Class 2, would need to prioritize capture of habitats of higher quality and more vulnerability e.g., floodplains, alluvial fans, lower elevation.

Look at the total supply of Class 1 and 2 habitats by LU and focus on LUs with a scarcity of suitable habitats.

Q4 Distribution

Provide a distribution across elevations by applying a weighting by BEC variant. Note weighting will be different for BB and GB.

1. By ecosection
2. Low to high elevation habitats – low elevation habitats to have the greatest weighting (estuaries, wetlands, beaches).

Habitat distribution is also addressed by EBM re representation, Class 1 bear habitats, riparian, other species' habitats.

Need to consider 'social regulation' i.e., GB vs BB, males vs females, dominant vs subordinate individuals. Need to provide habitat for all – if only conserve the best habitats, there will not be habitats for subordinate or vulnerable bears to use. Class 3 habitats are important for these bears. Also smaller streams with lower escapements; the high escapements streams are well-looked after. This consideration is most important with regard to females with cubs.

It would be useful to study the relative value of mid-quality habitats e.g., Class 3 and 4.

Q5: Spatial Configuration

Re dispersal vs. clumping – want dispersed habitat to provide denning habitats and habitats for females. Need also to provide for elevational dispersal. Want healthy populations of BB and GB distributed across LUs.

Need to consider the influence of roads on location of co-location areas.

Re planning units: the subregion is irrelevant for analysis of habitat distribution and supply. Need to assess the implications for individual LUs post hoc.

Q6: Connectivity

Regional scale connectivity (coast to interior) is addressed through conservancies and other reserves.

There is not a connectivity requisite at the LU scale other than to provide security cover from other bears and people e.g., low elevation to high elevation/ coast to headwaters. Should be addressed through overall EBM but it depends on the condition of the LU Could be assessed post hoc.

Large travel corridors can be an issue re fragmentation of populations. Is not a big issue on the coast other than Highway 16.

Q7: Resiliency

Provide a diversity of well-dispersed habitats over space and time. Includes ecosystem representation, complexes of forested and non-forested habitats, riparian, high value fish habitat.

Major concerns:

- new types of broad landscape change in a short amount of time – bears won't have time to adapt; and
- reduction in specific foods e.g., salmon, vaccinium.

Q8: Recruitment

If can't meet targets in old and mature – place a priority on recruitment from zonal, dryish sites to provide denning habitat; zonal berry-producing sites. Stand level retention of stumps, CWD and logs will also contribute.

In highly disturbed landscapes, recruit with a distribution of habitats in mind i.e., don't have future habitats all clumped in one area. This is important to provide habitat for females as well as males.

Q9: Scale up to MC and NC

Kermode bears are a social concern – people want to know what we are doing about them

NC has a district–wide PEM mapping that could be used to create a BB map.

In the roll-out to MC and NC, sort out data early in the process to avoid the frantic data discussions that occurred for the SCC in the past few weeks.

GROUP D. TAILED FROG

Domain experts: Glenn Sutherland, Pierre Friele, Volker Michelfelder
Facilitator: Tony Wong

Q1: Data inputs

Have an incomplete inventory – existing mapping only covers approx 5% of TF habitats. Tailed frog occur outside of the inventoried area. Need a new map to act as an input to the Marxan runs.

New TF layer needs to:

- Be adjusted to exclude the Hecate Lowlands – have a hard copy map showing area to be excluded.
- Map in 'nodes' linking watersheds across non-barrier (i.e., no cliffs) forested divides to allow TF dispersal.
- Incorporate data re known occurrences and apply watershed boundaries around these.

The existing map isn't fine enough resolution to identify stream segments.

Identify candidate watersheds (basins between 0.3 and 10 km2 in size; streams with gradients of up to 60%).Other factors to consider re candidate watersheds: aspect, apply 'back end' rule

(creeks at the front end of watersheds provide better habitat) and watershed ruggedness. Connect suitable watersheds with nodes of forested cover.

The development of a new tailed frog layer would take about a week to complete. The original CIT mapping used a watershed model.

Comment that tailed frog habitats can also be identified and managed at the more operational scale.

Action: Follow-up with Kristy Ciruna to track down CIT layer and look at application of that data layer with modifications. It would be the most time efficient way to create an improved TF layer.

Q2: Habitat quality

Existing data does not provide fine enough resolution. Ideally want stream segments associated with watersheds 0.3 – 10 km2 in size.

The amount of logging in a watershed can affect the quality of stream habitat. Can look at induced fragmentation as a surrogate to estimate levels of logging disturbance at the watershed scale.

Roads also affect the quality of stream habitat – roads are one of the greatest causes of sedimentation in streams.

Q3: Habitat quantity

Do not have enough data to set a low/ sufficiency threshold.

In general:

Recent publication notes that 70% of upland streams need protection through buffering.

If existing mapping only captures 5% of tailed frog habitat, lock in 100% of it and be transparent in the reporting that this is not adequately addressing tailed frogs.

Approach:

Incorporate known TF occurrences and delineate watershed boundaries around them.

Lock-in 100% of TF habitat that is already mapped and assess the rest post hoc.

Q4 Distribution

Want habitats dispersed rather than clumped (by LU). This will allow recruitment areas to allow TF to disperse and repopulate areas.

The LU is a more appropriate planning unit than subregion for TF.

Q5: Spatial Configuration

Spatial configuration is defined by the shape of the watershed – are looking to maintain streams within watersheds of a certain size. Watershed distribution falls out of the TF mapping.

Q6: Connectivity

It is desirable to have connectivity between watersheds to allow frog dispersal. TF need to stay in forested areas (cool moist environment) with no barriers to movement.

Existing management for hydroriparian is not sufficient to maintain connectivity for TF since small upland streams are not well protected.

Connectivity features:

- along riparian areas between stream segments
- between watersheds via 'nodes' i.e., linkages over divides.

Q7: Resiliency

Maintaining forest cover is critical – it becomes more important under climate change when there are predicted higher temperatures, reduction in aquatic habitats and humidity. TF are not able to move about as effectively in warmer, low moisture conditions.

Focus resiliency efforts into drier areas and areas fragmented by logging. Include ecosystem wetness/dryness by BEC and level of watershed fragmentation during TF modelling.

Q8: Recruitment

Focus on more vulnerable, drier ecosystems by BEC zone.

Q9: Scale up to MC and NC

Need to exclude areas from mapping where TF do not occur. The TF team created a map showing the extent of the TF range in the SC.

Compile existing data and incorporate known occurrences as a layer – use these points to derive TF watersheds.

4. SYNTHESIS OF RECOMMENDATIONS

Q1: Data Inputs

Mountain goats:

Existing UWR mapping in the SCC is of acceptable quality.

Consider applying Shawn Taylor SC model or Keim NC model to derive the biological layer for the coast as a whole. Assess whether these models can be applied to other areas.

Compare modelled to negotiated UWR – what is at risk with only using the negotiated UWR?

Deer:

GAR UWR underestimates habitat. Need the biological mapping layer.

Could build a model based in simple algorithms (Kim and Ken)

Marbled murrelet:

Air photo interpreted/ low level aerial assessment-based mapping is more reliable than MMRT model.

Need to discuss application of boundary modifier – concern that this could force selection of Class3 over Class 1 and 2. Needs to be used with care.

Recognition that the 30% habitat retention used in the MARXAN model is less than the 69% recommended by the MMRT for this region.

Northern goshawk:

Recovery team model: nesting and foraging habitat. Based on forest cover – data quality is an issue. The level of resolution is intended for strategic purposes; the mapping is not suitable for stand level work.

Is a habitat suitability model that looks at amount and distribution of habitat relative to territory sizes.

Need to bring in known nest site locations and lock them in as buffered points (10 ha). The purpose of buffering is to account for spatial uncertainty of the point location.

The recommended old growth reserve patch size is 100 – 200ha.

Action: Todd to send NOGO nest site data to Chuck/ Hannah. Needs to be buffered.

Grizzly bear:

Salmon availability is a primary consideration re fish concentrations and 'fishability' of stream segments.

Non-forested areas with forested buffers – need to capture both as a complex

Class 1 and 2 habitats for GB – mapping methods affect the amount of habitat captured (TEM distorts the amount of land area).

Have missing LUs for SCC (Upper and Lower Kliniklini).

Black Bear:

There is no coast-wide mapping. Only have coverage for Kermode (TEM-based mapping for Princess Royal Island). Could do mapping based on BEC x AU x seral stage and apply habitat ratings. GB mapping does capture BB habitat except that Class 3 habitats are not mapped and there is no mapping of the hypermaritime (is outside of GB occupied area).

Overall, BB is a lower priority for habitat mapping. Is addressed in general through EBM.

Tailed frog:

Have an incomplete inventory – existing mapping only covers approx 5% of TF habitats. Tailed frog occur outside of the inventoried area. Need a new input map.

Need to adjust map to exclude the Hecate Lowlands; map in 'nodes' to allow dispersal.

Incorporate data re known occurrences and apply watershed boundaries around these.

Action:

Glenn and Pierre to provide occurrence data for tailed frogs to Chuck/ Hannah

Hannah to follow-up re having boundaries delineated around TF watersheds, based on occurrences

Q2: Habitat quality

Mountain goat:

Need to manage for forest cover + alpine

Deer:

Need to manage for habitat elements for deer as per model

Undertake a post hoc assessment for deer and elk. In the SC, check the 'locked' scenario to see if the few localized moose and elk winter range areas (lower Kilinaklini/ Apple/ Phillips) are captured in other reserves, esp riparian.

Action: Brad to provide a habitat capability map for moose/elk in the NC

Marbled murrelet:

Emphasis is on the area of habitat selected. Try to reduce fragmentation, especially hard edges e.g., due to roads

Downgrade ratings of habitats in the vh1 and vh2 (from Class 2 to Class 3) – is not adequate habitat. Is already being considered for the SCC. Can also be done by weighting these habitats lower.

Need to consider marine foraging areas – do a post hoc assessment of whether good habitat is near to marine feeding areas[5].

Actions:

Hannah to follow-up with Dave Donald re changing habitat classifications for the vh1 and vh2.

Alan to follow-up with Chuck re ideas for post hoc assessment for MAMU and NOGO

Northern goshawk:

Have applied a continuous habitat rating based on amount and quality of habitat

There is strong territoriality that effects the structure of habitats within a population

Need to consider distribution of seral stages across the landscape, inside and outside of reserves. Different forest types affect the quality of habitat for resting and foraging.

Will undertake a post hoc assessment of scenarios re NOGO habitat quality and quantity

Black Bear and Grizzly Bear:

Need to assess habitat and effectiveness and mortality risk post hoc – affects the value of the old seral reserves.

Need to have reporting out of scenarios based on seral stage distribution x time step x LU.

Tailed frog:

Existing data does not provide fine enough resolution. Ideally want stream segments associated with watersheds 0.3 – 10 km2 in size.

Can look at induced fragmentation as a surrogate for estimating levels of logging disturbance at the watershed scale

[5] Peter A is working on marine forage areas and the link to terrestrial habitat quality. Can also check with Doug Bertram (CWS) re use of radar database and GIS marine database.

Q3: Habitat Quantity

Mountain goat:

Population objective: to maintain existing populations

Goals:

- 100 % of nursery WR (are all in existing UWRs)
- For NC, have a RSF model – based on probabilities of occurrence, seek to capture 100% of Class 1, 80% of Class 2, 50% of Class 3 habitats by winter range unit. Is very preliminary/ conceptual – needs more discussion.
- Strategy goat habitats in the NC and MC into mountain blocks and capture 100% of winter range on the blocks.

Deer:

Population objective: to maintain existing populations

Goals:

- Select high capability habitats $\geq$ 40 ha in size; $\leq$ 5 km apart.
- Capture up to 10% of the total forest by LU.

Marbled murrelet:

Expand range of targets in Marxan to Class 1 – 3 (not just Classes 1 and 2). Weight habitat classes 1 + 2 equally, with Class 3 weighted less.

MMRT population objective = to limit population decline and maintain 69% of the population, equivalent to 69% of habitat that existed in 2002. Is estimated by conservation region – is 69% in the central coast. CC and NC populations are considered healthy.

Estimate that approximately 10 – 15% of MAMU nesting habitat is missed in inventories. May want to consider this when setting targets for habitat retention.

Need to also consider the impact of climate change and depletion of marine resources on MAMU populations.

Northern goshawk:

Recommended target = 100% of nest sites (buffered by 200 ha) and range of % of foraging areas.

Empirical thresholds of habitat amounts:

> 60% suitable habitat within a territory - no impairment to fitness

< 20% suitable habitat within a territory – territories are abandoned.

Proposed three thresholds by territory (as per RT model):
20 – 40% - low probability of occurrence

40– 60% - moderate probability of occurrence

60% - high probability of occurrence

Black bear and grizzly bear:

Population objective (MoE): to maintain / restore population numbers sufficient to allow for consumptive use

Where need to restore populations, need a higher standard of habitat quality and quantity.

100% of Class 1 and 2 GB habitats should provide for the best habitats for both species.

Stratification by season – can break out habitat classes by season – will assess post hoc.

Tailed frog:

Do not have enough data to set a low/ sufficiency threshold.

In general:

Estimate that 70% of upland streams need protection

Existing mapping only captures 5% of tailed frog habitat

Approach:

Incorporate known TF occurrences and delineate watershed boundaries around them.

Lock-in 100% of TF habitat that is already mapped (entire basins) and assess the rest post hoc. Need to be transparent in the reporting that this is not adequately addressing tailed frogs.

Q 4. Distribution

Mountain goat:

Escape terrain and adjacent forest = winter range.

Have high fidelity to habitats. Need to maintain 100% of UWR where goats known to occur.

Deer:

Want elevational distribution of habitats – is more important than horizontal.

Want distribution of habitat across the coast. Ensure distribution of habitats in the hypermaritime and maritime/ sub-maritime with UWR distributed equally by LUs.

Marbled murrelet:

RT focus has been to capture habitats within 30 km of the ocean

Core areas – are possibly addressed by conservancies (need to consider management within conservancies and links to known marine aggregations of murrelets)

Northern goshawk:

Need to look at spacing of territories across the landbase, anchored by nest areas

Can identify territories/ groups of territories related to a population.

In the absence of nest occurrences, cannot be completely sure about territory pattern, so need enough LUs to have adequate habitat to meet thresholds (to be determined by post hoc assessment).

Action: Todd to talk to the NOGO RT about use of the NOGO data and the Cortex model

Black bear and grizzly bear:

Weighting by BEC variant to provide a distribution of habitats across elevations (by LU). Run with and without the cost surface to assess amount of skew in distribution.

If Class 2 is rare there will be effects in specific landscape units. It would be useful to undertake an analysis of commonness vs rarity re bear habitats.

Also need to assess what is captured already by EBM and focus OG reserves on what is not captured

Social regulation – subordinate bears (BB in GB territory, females, non-dominant males) need Class 3 and 4 habitats because they aren't able to use the prime (Class 1 and 2) habitats. Will risk being killed by the dominant males. Is esp a concern for females with cubs.

The LU is a more appropriate planning unit than subregion for bears.

Action: If want elevational distribution, will need to tag bear polygons as L, M, H to allow stratification by elevation. Chuck cannot do this in Marxan within our timelines.

Tailed frog:

Want habitats dispersed rather than clumped (by LU). This will allow recruitment areas to allow TF to disperse and repopulate areas.

The LU is a more appropriate planning unit than subregion for TF.

Q5: Spatial configuration

Mountain goats:

Key factor = escape terrain next to forested cover.

Deer:

Need adjacency of spring forage within 2 km of UWR – to be achieved on the managed landbase (e.g., through timing and location of cutblocks)

Marbled murrelet:

Maintain patch sizes in proportion to availability. Do not want too many small patches.

Minimize hard edges (roads, forests < 40 yrs)

Want to avoid isolation of patches by not having large distances (> 10 km) between patches.

Action: Chuck to look into applying a patch size distribution goal in Marxan

Northern goshawk:

Want patch sizes 100 – 200 ha in size for nesting and foraging areas. Dispersed is better than clumped. Assess post hoc.

Black bear and grizzly bear:

Dispersed habitats are better than clumped. Want elevational dispersal. Assess by landscape unit.

Consider the effect of roads on habitat effectiveness.

Assess spatial configuration through post hoc assessment.

Tailed frog:

Spatial configuration is defined by the shape of the watershed – are looking to maintain streams within watersheds of a certain size. Derives from the TF mapping.

Q6: Connectivity

Mountain goat and deer:

Elevational connectivity is important.

Want to avoid barriers to movement:

- Roads – increase access to predators; create side cast slopes that interrupt elevational connectivity.
- High density forests are impassable to ungulates (>5000 sph); 20 – 50yr old forests need spacing

Marbled murrelet and northern goshawk:

Connectivity is not an issue except where patches are isolated by large distances

NOGO territories are bounded by geographic features such as large lakes, inlets – are not fussed by forest condition.

Black bear and grizzly bear:

Connectivity is addressed at a regional scale by conservancies and other reserve areas.

Need to assess connectivity post-hoc at a landscape unit scale e.g., lowland – upland. Is mainly a concern re mortality risk re roads and people and other bears.

Large travel corridors are an issue – can fragment populations. Is not a big issue on the coast.

Tailed frog:

TF need to stay in forested areas (cool moist environment) with no barriers to movement.

Connectivity features:

- along riparian areas between stream segments
- between watersheds via 'nodes' i.e., linkages over divides.

Hydroriparian is not sufficient to maintain connectivity for TF since small upland streams are not addressed.

Q7: Resiliency

Mountain goat and deer:

Elevational expansion of UWRs – into lower and higher elevations to account for shifts in climatic envelopes and maintain options for distribution i.e., allow animals to move up and down in response to changing winter conditions.

Marbled murrelet and northern goshawk:

Maintain heterogeneity through a variety of features re elevation, aspect, BEC zones in order to maintain options for the future

Black bear and grizzly bear:

Provide a diversity of well-dispersed habitats over space and time – want to provide bears with the condition to allow them to adapt to changing circumstances.

Tailed frog:

Maintaining forest cover is critical – it becomes more important under climate change when there are predicted higher temperatures, reduction in aquatic habitats and humidity. TF are not able to move about as effectively in warmer, low moisture conditions.

Focus resiliency efforts into drier areas and areas fragmented by logging. Include ecosystem wetness/dryness by BEC and level of watershed fragmentation during TF modelling.

Q8: Recruitment

Mountain goat:

Recruit the oldest forest first

Deer:

Recruit from high capability habitats rather than high suitability. May not be the oldest forests available. Is hard to model – requires site specific assessment.

Marbled murrelet:

There is currently enough old forest in NC and CC under current management, however, if you needed to recruit:

- pick sites having a high site index as these are productive and will produce the big trees with platforms needed by MAMU
- include areas where past selective logging has left veterans.

Northern goshawk:

Priority for recruitment is mesic – subhydric sites in Hemlock, Douglas-fir and Spruce stands.

Black bear and grizzly bear:

Seek recruitment of specific habitat elements e.g., zonal dry sites for denning (esp in the hypermaritime for BB). Maintain a distribution of habitats during recruitment.

Also address through stand level retention/ silviculture re retention of on-block structure

Tailed frog:

Focus on capturing recruitment habitat drier, more vulnerable ecosystems by BEC zone.

Q9: Scale-up to the MC and NC

Ungulates:

Add moose and elk in for the MC ad NC. Have winter ranges for elk and moose mapped on the MC. There is not a lot of info available on elk.

Actions:
Hannah to follow-up with Brad re habitat capability mapping for moose and elk in the NC
Ken to look into mapping from LRMP Phase 1.

Marbled murrelet:

Focus on air photo data rather than MMRT mapping

If mix air photos and RT data, assess for bias towards including less suitable habitat.

Use marine features if possible, in the future – (based on marine productivity, substrate)

Undertake site specific verification before undertaking air photo interpretation in the MC and NC. Have started this work in the MC and SC.

Northern goshawk:

Apply mapping across regions – need to consider different territory spacing in each region

Black bear and grizzly bear:

First Nations have concerns about Kermode

In the NC, have district-wide PEM mapping that might be used to derive a BB map

Compare the MC WHA package to the GB Class 1 and 2 mapping – see what risk there is outside of WHAs

Tailed frogs:

Need to remove mapping where TF do not occur.

Incorporate known occurrences as a layer – use these points to derive TF watersheds.

5. DISCUSSION OF NEXT STEPS

Ideally, we want to use data and models that are robust and reliable enough to guide strategic planning. Where possible, we want to data that we are confident enough to use in Marxan rather than post hoc. However, there is work involved to make this happen.

Need to assess how beneficial it is to address a particular species or habitat layer up front vs through post hoc assessment. Need to be transparent about the deficiencies/limitations to this strategic exercise. There are many caveats associated with this work!

How is risk being addressed through this process? Are concerned about risk to species persistence over time.

We are relying on peer review of the Marxan outputs to tell us something about whether the scenarios are addressing sufficiency of habitat supply; through reporting of how well goals for

habitat supply have been met. Keep in mind that this is a strategic assessment. Need to also address resiliency.

Will ask domain experts to provide feedback on the adequacy of the habitat capture in scenarios once the SELES runs are completed for Phase 1.

Actions:

All DEs to provide Chuck/ Hannah with the indicators that they want reported out on – for Marxan scenarios and SELES

Hannah to try to track down a cross-walk of analysis units to BEC units for DEs

Landscape level planning pilots

Asked for input from DEs re a pilot to compare strategic Marxan outputs to landscape level planning for old seral retention:

- Choose a pilot area where there is a long history of logging
- Look to the SC – there are fewer concerns about the NC
- Pick 1 – 2 landscape units that don't have enough old in them to meet EBM targets but have TEM. In the SCC there are two: Stafford and Roderick that have been assessed through Patchworks

Phase 2 Scale-up

Next decision: to finesse SCC or roll up to MC and NC? Concern expressed by DEs that it would be a waste to proceed with roll-up before making an effort to incorporate the input from domain experts at the workshop.

Chuck clarified that the input from DEs will be included to the extent possible (given timelines and resources) in the next draft of the Phase 1 scenarios. Can make a decision on whether or not to scale-up to MC and NC at that time.

NEXT STEPS:

1. Hannah to complete workshop notes and send out to DEs for review.
2. Chuck to review the recommendations and determine what is/ is not feasible in terms of what can be done in Marxan and also within available time and resources.
3. Project steering committee to discuss next steps re products and timelines and scale-up to the Mid and North Coasts
4. Hannah will update DEs concerning next steps and what will be requested re their involvement.