EBM WG Focal Species Project
EI02 Workshop Summary

December 9 and 10, 2008

Stanley Park Pavilion, Vancouver

Prepared for the EBM WG

Prepared by Hannah Horn

Disclaimer

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EBM WG Focal Species Project EI02 Workshop

December 9 and 10 2008
Location: Stanley Park Pavilion, Vancouver

Workshop Outcomes

- Review of co-location scenario outputs for the South Coast for individual focal species and for all species combined.
- A set of recommendations for:
    - Implementation of old growth retention areas in the South Coast
    - Adjustments to future scenario runs for the Mid and North Coasts
- Identification of outstanding gaps re mapping and research

Workshop Participants

Domain experts:

Name	Affiliation	Topic area
Volker Michelfelder	Ministry of Environment	Tailed frog
Pierre Friele	Cordilleran Geoscience	Tailed frog
Helen Davis	Artemis Wildlife Consultants	Bears
Grant MacHutchon	A Grant MacHutchon Consulting	Bears
Tony Hamilton	Ministry of Environment	Bears
Shawn Taylor	Goat Mountain Resources	Ungulates
Kim Brunt	Ministry of Environment	Ungulates
Ken Dunsworth	Ministry of Environment	Ungulates
Sally Leigh-Spencer	International Forest Products	Ungulates
Erica McClaren	Ministry of Environment	Northern goshawk
Todd Mahon	Wildfor Consultants	Northern goshawk
Frank Doyle	Wildlife Dynamics Consulting	Northern goshawk
Alan Burger	Alan Burger Consulting	Marbled murrelet
Louise Waterhouse	Ministry of Forests and Range	Marbled murrelet
Stephanie Hazlitt	University of British Columbia	Marbled murrelet

Workshop delivery:

Chuck Rumsey	DS04 project manager
Hannah Horn	EI02c project manager

Observers:

Name	Affiliation
Sally Leigh-Spencer	EBMWG – project steering ctte
Buck Tanner	EBMWG – project steering ctte
Audrey Roburn	EBMWG – project steering ctte
Kelly Brown	EBM WG Chair
Wally Eamer	DSP harmonization
Dave Donald	Ministry of Environment

OBSERVATIONS AND RECOMMENDATIONS BY SPECIES

1. Grizzly Bear and Black Bear

Domain experts: Helen Davis, Grant MacHutchon and Tony Hamilton

1.1 Context

- Only Class 1 and 2 habitats have been mapped throughout the South Coast. Some Class3 has been mapped but only where it is incidental to the Class 1 and 2 habitat.
- A 'line of grizzly bear occupation' has been defined. Grizzly bears mainly occur east of this line. There are few grizzlies west of the line – possible reasons include limited denning potential, less habitat diversity, more people and greater competitive exclusion.
- There is a target of 100% Class 1 habitat in all scenarios and is reflected in the LUO so the bear team focused their efforts on changes in Class 2 habitats.
- The amount of Class 2 is low in the CWHvh1 relative to other parts of the study area. Likewise, the CWHws2, CWHdm and MHmm have a small areal extent and are mainly associated with avalanche tracks (although there is some floodplain habitat e.g., in the Klinaklini). Therefore the team did not review Class 2 in these ecosystems and focused their review, instead on the Class 2 in the vm1 and vm2.
- Class 2 habitats vary in quality/ importance. Avalanche chutes in the vm2 and MH have a suitability rating of Class 2 but they are relatively common. Other Class 2 habitats are more rare e.g., fans and non-forested wetlands at lower elevations. Early spring habitats are more important than summer based on importance to the bears and their availability.

- The scenarios only address vegetative habitats; they do not include
    - Salmon availability or abundance
    - Non-forested habitats that are not mapped as Class 1 or 2
    - Winter denning habitat; suitability was only ranked for the four active seasons of early spring, late spring, summer, and fall

1.2 Observations

Marxan scenarios: Black Bears

1. The team had assumed that the needs of black bear would be addressed in the Class 2 habitats to the west of the study area. They are NOT.
2. For black bears, OGRAs provide just one level of habitat selection. Other components of EBM are equally important:
    - Maximum 50% mid-seral by LU (provides for a steady flow of early seral habitats and berry production – want to avoid 'boom and bust' situation)
    - Minimum 15% stand level retention – bb require large, old forest structure for denning
    - Requirements for retention of cedar
    - Active fluvial and fans – riparian management is very important, including management of small streams
    - Representivity of the diversity of ecosystems (wet to dry, young to old, low to high elevation)
    - Connectivity

    If any of these aspects of EBM are not in place, OGRAs become even more important.
3. Retention of monumental cedar will not necessarily address the needs of black bears for denning. Monumental cedar are selected for their structural integrity and, therefore, may not have the structural features needed for denning (e.g., decayed core). Note that Marxan does not necessarily pick up the large structure required by bb for denning.

Marxan scenarios: Grizzly Bears

The lower risk scenario= to retain 100% of Class 2 habitats. The team looked at how habitat capture changes under a moderate risk (50% Class 2) and higher risk (no Class 2) and compared to the sss30 scenario (no habitat driving the outcomes).

1. The GB-moderate-risk-30R (MR-30R) scenario has the same outcome as all-species-MR (FSMR) scenario. Get about 50% captured through locked in/ reserve areas; 50% is acquired randomly. A large amount of Class 2 habitat is therefore selected randomly.
2. The model does well where Class 2 habitats are comprised of old growth (i.e., the model selects old forest) however Class 2 habitats are often either non-forested or logged. Need to incorporate OG into reserve design in a way that captures the range of Class 2 habitats (e.g., entire complexes of forested-non-forested).
3. Want to capture lower elevation habitats (Grant paper).

4. Targets for habitat retention should be adjusted according to whether Class 2 habitats are common or rare (see recommendations)

Overlap with other species

The greatest overlap is between black bears and marbled murrelets. However BB is not addressed by MM – habitats are too patchy in the hypermaritime.

Mapping

- TEM has an effect on Class 2 mapping. There is an over-representation of Class 2 in the LUs where habitat mapping is based on TEM. This affects the outputs in those LUs
- In the South Coast, have seven map products with varying levels of detail. This affects the scenario outputs.
- It is challenging to assess the impact on black bears without a black bear suitability layer.
- The Scott license area in the Klinaklini is missing data.

General observations

- After 2nd growth is harvested there may be a reduced forage supply. Third growth stands may not provide the same quality and quantity of understory growth for forage. This emphasizes the importance of within-stand retention.
- There is not a direct overlap with the upland stream objective but this would contribute to the overall quality of habitats across the landbase.
- Key changes predicted under climate change that are of concern to bears are:
  - Reduced salmon populations
  - Increased snowload and scouring of avalanche chutes
  - Late snowfall at high elevations resulting in poor pollination and fewer berries
- Comment that Class 1 habitat is critical and should never be logged (is not a habitat that should be considered for some timber removal) (maintain vs protect in the LUO).
- High retention harvesting is not always beneficial to bears on the coast – if the stand is comprised of hemlock it will infill too quickly to provide adequate forage. It depends on the stand. A Douglas-fir stand will provide understory forage.

1.3 Recommendations for Black and Grizzly Bears

Marxan scenarios:

1. Need to vary the goals and rules in Marxan by ecosystem i.e., there is no single rule set. Examples of where this is important:
   - Where GB are on the edge of their distribution,
   - In drier ecosystems (ws2 and xx) which are more heavily disturbed (e.g., the Kimsquit).
2. Represent 100% of Class 2 in the vh1.
3. If the goal is to capture 50% of Class 2 habitat, preferentially retain

- the rarest or most threatened habitats e.g., lower elevation habitats, alluvial fans; and
- most important seasonal habitats e.g., early spring habitats.

This can be achieved, in part, by:

- Identifying different goals by BEC unit e.g., increasing the goals for retention of Class 2 in the vm1; and
- Stratifying and weighting goals by season (mapping currently types habitats by season)

Assume that fall habitats are addressed through objectives for hydroriparian areas.

4. If not looking at landscape level forage supply, Class 1 and 2 habitat become even more important, especially where there is a high ration of THLB to total forested.
5. Need to do a full comparison of the suite of EBM objectives and their contribution to black bear habitat.

Mapping:

1. Need to address the issue of over-representation of Class 2 using TEM as this throws out the scenario results in the LUs where TEM is used.
2. Need more refined mapping for the South Coast to inform a second iteration of guidance for reserve design.
3. A model of black bear habitat is needed as a driver in future co-location scenarios.
4. Mapping of habitats for both grizzly and black bears would benefit from coastwide TEM.

2. Marbled Murrelet

Domain experts: Alan Burger, Louise Waterhouse, Stephanie Hazlitt

2.1 Context

- The marbled murrelet mapping is based on air photo interpretation that ranks habitats according to 6 classes. The team focused on Classes 1 to 3.

  Lower risk: 62% of Class 1 – 3 habitats where Class 1 and 2 habitats are captured first and made up to 62% with Class 3

  Higher risk a: 62% of Class 1 – 3 habitats where Class 1 = Class 2 = Class 3

  Higher risk b: 100% of Class 1 and 2 habitats

- MM Recovery Team goal is to slow the decline of the species with the ultimate goals of stable populations after 2032 and downlisting of the species. These goals assume a 1:1 relationship between the amount of habitat and the number of murrelets.
- Goals for habitat retention are based on the MM Recovery Team goal of conserving 69% of suitable habitat in the central coast in the long term. 90% of nests have been shown to occur in Class 1 – 3 habitats. 10% occur randomly in Class 4 and 5 habitats but the low use of these habitats precludes their inclusion as suitable nesting habitat. Instead of setting targets for lower class habitats, 62% is an adjustment of the 69% to account for those 10% of nests that occur outside of the suitable (Class 1 – 3) habitats.

- A relationship between habitat quality and MM density has not been determined but researchers do know that MM are more likely to use Class1 and 2 habitats than Class 3 habitats.
- The scenarios did not use marine foraging mapping to drive a Marxan solution. However, preliminary analysis by UBC suggests that including marine foraging information does not change the outcome too much, likely because of the limited amount of remaining suitable (Class 1 and 2) habitat.
- The mapping may overestimate habitats areas in the hypermaritime because there are big trees with no moss for nesting platforms and a wind shear effect closer to the ocean. Experts are considering the need to downrate the habitat classes in the HM.

2.2 Observations

1. There is a limited amount of Class 1 and 2 habitat in the SC (3523 ha of Class 1 or 0.01% of the SC study area; 25,516 ha of Class 2 or 1.5% of the SC study area).
2. The team focused on the MM low risk–30R (MMLR-30R) scenario and compared other scenarios to this.
    - The SSS30R scenario (target = 30% of RONV by SSS) does not achieve the minimum amount of habitat for MaMu. There is a substantial deficit of the higher value habitats in particular, with only one-third of the Class 1 and one-quarter of the Class 2 habitats captured.
    - The SSS_50R scenario (target = 50% of RONV by SSS) captures more MaMu habitat than the SSS_30R scenario. It captures approximately 72% of combined Class 1 and 2 habitats with a 9% deficit in the amount of overall suitable habitat captured compared to the lower risk MM_LR_30R scenario.
    - The SSS_70R scenario (target = 70% of RONV by SSS) captures large amounts of habitat, with almost all Class 1 and Class 2 habitats captured and 32% more Class 3 habitats than in the lower risk MM_LR_30R scenario. The SSS70R scenario would work well for MaMu.
    - The moderate risk scenario captures less Class 1 and 2 habitat and over-represents Class 3 but captures more hectares overall. However there is less certainty about the value of the habitat captured to MM, especially in the hypermaritime. (Note: if Class 3 habitats are identified in the HM they may, in fact by Class 4 or 5 and so not suitable)
    - The higher risk scenario captures all of Classes 1 and 2 but does not capture adequate amounts of Class 3 and results in a large deficit in the overall habitat area.
    - Cost layer – as shift from sss30R to sss 50R to sss70R, only a small increase is observed in the amount of class 1 and 2 habitats captured (they are costly) with most of the increases in class 3 habitat (less costly). MM are not using as much of the NTHLB; is mainly the THLB. Unless targets for MM habitat specifically drive solutions to the costlier class 1 and 2 habitats, the class 3 will be picked up instead.
    - Spatial distribution of available suitable habitat is very patchy and uneven across LUs for Class 1 and 2. 6 – 10 LUs contain most of the Class 1 and 8 – 10 LUs contain most of the Class 2. If reserves are evenly spread across the region, some LUs will do well for MM and some will not. Class 3 tends to be more evenly distributed.

- Re. recruitment – much of the historic Class 1 and 2 habitats have been logged. To what extent will picking up Class 3 habitats help to mitigate the loss of Cl 1 and 2?
- Distance to ocean: distance is a limitation – most MM nest within 30 km of salt water. Over 50km, the use of suitable habitat is trivial.
- Many MM find new nests every year. This suggests that if they have good habitat adjacent to an area that is logged, they will be able to find another nest site. Assessment of patch size distribution – defer to operational planning re the amount of edge. Is not a strategic level issue. The Recovery Team recommends a range of patch sizes and soft edges. Hard edges are a concern. Achieving an even distribution of habitats is not as important as picking up the best remaining habitat.

<u>Overlap with other species</u>

- Most species have about a 20 – 30% overlap with MM but other species aren't necessarily picking up the Class 1 and 2 habitats. One would expect NG to pick up MM class 1 and 2 habitats – this may occur if the NG nesting layer is used in the next round of scenarios.
- There is a fairly strong overlap between MM class 3 habitat and the habitat for a variety of other focal species, in particular deer and NG (although the deer mapping is not accurate)
- NG has some overlap with MM – the generalized habitat requirements in the foraging layer get pushed to MM habitats under co-location. Both MM and NG need a lot of THLB to achieve the LR goals.
- Other species are not good surrogates for MM, mainly because they do not require as much THLB.

2.3 Recommendations for Marbled Murrelets

- sss30R does not provide adequate habitat for MM. sss70R best captures overall habitat quantities, however, neither the sss50R or sss70R scenarios capture all Class 1 and 2 habitats; solutions are driven to less costly class 3 habitats.
- Goals for co-location in Marxan should be as per the lower risk scenario i.e., capture 100% of Class 1 and 2 and make up to 62% with Class 3.
- Habitats are unevenly distributed therefore there needs to be tweaking of the rules in Marxan to accommodate the different concentrations of habitat. There needs to be flexibility in the objectives for sss representation by LU to allow for uneven distributions.
- In the Mid Coast and North Coast there is likely enough existing old growth to meet targets for habitat retention. The MM team recommends capturing what is there now and not making trade-offs against future recruitment; the time required to recruit suitable trees is too long (200 years).
- Take distance-to-ocean into account:
    - Delete habitats > 50km from the sea (i.e., distance from the closest shoreline)
    - Undertake separate analysis of 0 – 30 km and 30 – 50 km using the same targets. This is to prevent Marxan making trade-offs between the two. This will be important in large watersheds where there are large valleys that go a long way (>30 km) inland.
    - Don't worry about deleting habitats within 500m of the ocean – this has only been shown to apply on the outer coast of Vancouver Island

- For the South Coast – set goals by sub-region rather than by LU. This would focus outcomes on LUs that already have remaining class 1 and 2 habitats.
- Apply the same rules from the SC to the MC and NC.
- Assess the habitats captured in the hypermaritime post-hoc.
- Compare scenario outcomes to MM radar count data to verify the value of habitat polygons (Doug Bertram to provide radar data).
- Compare the scenario outcomes to the marine habitat models being derived by Stephanie Hazlitt.

3. Northern Goshawk

Domain experts: Erica McClaren, Todd Mahon, Frank Doyle

Note: the NG team undertook a review of a rerun of co-location scenarios that included the NGRT modeled nesting layer in January 2009. The results of their second review is not reported here but is reported in the final project report.

3.1 Context

- The NG Recovery Team has developed NG nesting and foraging models that are combined into a territory model. The forage layer is coarse filter; the nesting layer is fine filter. Only the foraging layer was used in this set of scenario runs.
- The NG Recovery Team has not yet identified targets for NG foraging areas. There is not enough information. However, for the purpose of the Marxan runs, they identified approximate L, M and H risk goals.
- Foraging habitat will not be met entirely within reserves. There is a need to consider the condition of the overall landbase over time. The Marxan targets are to capture a portion of NG habitat within reserves.
- The Marxan runs did not capture older second growth (60-80 years) although this is captured in the foraging habitat. This habitat type can contribute valuable foraging habitat for NOGO in South-central Coast area.
- NG are territorial. It is not possible to maintain the same number of birds by increasing density as the amount of habitat is reduced. They have a set spacing between territories.

3.2 Observations

<u>Marxan scenarios</u>

1. The team focused on the NG lower risk-30R (NGLR-30R) scenario and compared other scenarios to this:
    a. The sss30 and sss30R scenarios achieved approximately half of the LR target for NG.
    b. The LR multi-species run captures more than the NGLR-30R run
    c. The LR multi-species run without NG captures a bit less than the NGLR-30R
    d. The LR multi-species run without NG +30R is the same as the NGLR30R

2. Generally, foraging habitat in OGRAs appears to be well distributed in SSS scenarios or focal species scenarios with NOGO implicit. Scenarios without NOGO (c and d above) result in some landscape units with very little foraging habitat
3. One challenge with the way the foraging layer was defined in Marxan is that M is non-exclusive of H. It is therefore not possible to assess how much M vs H is captured – whether it is straight M or is really H. Also, it is not possible to force the cost layer to the M value habitats.
4. There seems to be more M than H in the solution. This is likely driven by the cost layer. The cost layer appears to be driving the selection of too much foraging habitat from upper elevations and steeper slopes
5. It is important for NOGO to have sufficient amounts of foraging habitat near nest areas. Need to account for this in the co-location model (linking solutions for the foraging layer to the nesting areas)
6. Focus on locating nesting habitat within reserves + capturing as much foraging habitat as possible opportunistically. If reserves are distributed across the landbase, it will capture foraging habitat. The sss scenario drives a reasonable solution for NG for foraging because the results are distributed across numerous ecosystems.
7. Is hard to evaluate the outcomes without the nesting layer included. Good nesting habitat always equals good foraging habitat but the reverse isn't necessarily true. Foraging habitat is more generalized.
8. Issues with the timber cost model – is modeled over 400 years and compared against current suitability for species – the result is that focal species habitats get pushed into the habitat that is left (the cost stays constant over time). For NG, need to think about second growth coming on-line. The cost layer has implications as clearcut areas stay high cost over time. This negates the habitat capability of the stand.
9. Recruitment – younger stands are in the valley bottoms – want to account for forests coming into older second/ third growth stands.
10. Existing protected areas account for ~ 1/3 of area required to meet target

Suspect approach and results should be similar among sub-regions (SC, MC, NC)

<u>Overlap with other species</u>

There is no one species that capture NG habitat.

- There is a large amount of overlap with MM Class 1 but there is 10x the amount of NG habitat so it works well for capturing MM habitat but not NG habitat.
- There is some overlap with TF and MG at higher elevations. Is unexpected to see so much habitat captured at higher elevations
- Is also a high overlap with deer, which one would intuitively expect.
- GB capture valley bottom habitats but the reported amounts of overlap are skewed by the large amounts of Class 2 habitats in the Fulmore and Stafford.
- The overlap with all other species combined is more than 85%.

Mapping

- The RT has had more confidence in the foraging layer to date. This is why the foraging layer was used for the Marxan runs. The nesting model has recently been field verified and have confidence in that layer as well.

3.3 Recommendations for Northern Goshawks

1. Don't just use the foraging model (is more generalized). The team would like to run the nesting model as well. Nesting habitat is more critical. Running the nesting and foraging models could result in more old forest being required but not necessarily.
2. Capture all of the habitat within the 800m (200ha) nest buffer and not just the old forest.
3. Define mature forest as >60 years for the SC.
4. Adjust the reporting of M and H value habitats so that they can be assessed separately.
5. Ensure distribution of reserves across the landbase to account for territoriality. NG team to develop a method to drive distribution e.g., using the territory model to force spacing or otherwise stratify the landbase.
6. Run an analysis of the scenario outcomes against the NG territory model (combines nesting and foraging habitat layers) post hoc to determine number/distribution of potential territories supported by various scenarios. Redefine Marxan rules to capture areas of higher habitat quality e.g., to distribute more effectively by elevation e.g., nesting habitat with an elevational constraint or stratify by BEC
7. For NG it is important to look at the landscape over time inside and outside of reserves e.g., using SELES. Run a time series of future forest projections using the NG habitat models.
8. Consider 'floating reserves' that change over time – linked to targets for habitat retention.

4 Coastal Tailed Frog

Domain experts: Pierre Friele, Volker Michelfelder

4.1 Context

Mapping

- The CIT model only identified optimal TF creeks – was very accurate but only captured a small % of TF habitats.
- New TF mapping based on basin size and ruggedness is a good representation of TF habitats. Is neither suitability or capability – is a prediction of potential sites. Are looking for hillslope streams and step-pool channels. Habitat drops out at lower elevation fluvial riparian areas.
- Non-forested polygons have been removed from the dataset (age class = 0) – are trying to capture forested polygons.
- Priority for conservation is (1) the buffered stream and (2) the contributing watersheds.

4.2 Observations

1. There are two problems with the Marxan outputs:
    - resultant polygons fragment stream segments; and

- stream buffers and basins need to be together for a functional solution i.e., want the ecological benefit (hydrologic) of the watershed as a whole linked to buffered streams.

Ideally we want to capture entire basins but the main concern is to minimize fragmentation of stream segments.

2. The upland stream objective is ambiguous – there are different potential outcomes depending on whether the objective is operationalized. The objective is a minimum 70% equivalent clearcut area with the intent that this will apply over the entire landbase feeding the creek and not just the creek itself. There are no defined buffers for S5 and S6 streams under the LUO.
3. Want to target breeding reaches by habitat value, including mid-range habitats. Focus on capturing stream buffers then look at basin qualities.
4. Patchiness of TF habitats and lack of inventory result uncertainties with the model solution. Could adjust Marxan to address these. The limitations of the input data affects the reliability of the Marxan solutions.
5. Could ask Marxan to capture the entire basin, but that creates a higher timber cost than is strictly needed for the ecological benefit sought.

<u>Overlap with other species</u>

- There is not a lot of overlap between species.
- Because tailed frogs are lotic and other focal species are terrestrial, trying to find overlap is challenging. TF need streams plus OG, not OG alone.

4.3 Recommendations for Tailed Frogs

1. Recommend using different TF targets to drive Marxan. The intent is to
    - Have entire streams segments projected; and
    - Have stream buffers and basins linked.

    Proposed method – to do sequential Marxan runs, building on the solution each time:

    i. Do a run without TF
    ii. Use solution (i) to anchor runs with stream segments
    iii. Use solution (ii) to run basins with rules that drive outcomes to areas adjacent to stream segments with minimal fragmentation.
2. Map dispersal notes based on geography (low elevation forested passes linking metapopulations. Mapping exercise.
3. Due to the ambiguity associated with the operational application of the LUO, will not assume that the upland stream objective will address TF habitat.

5. Coastal Blacktailed Deer

Domain experts: Kim Brunt, Ken Dunsworth, Shawn Taylor and Sally Leigh-Spencer

5.1 Context

- Are only looking at winter range. The new deer mapping for the coast uses snow interception cover and arboreal forage to drive mapping of winter range locations.
- The deer model is comprised of BEC, slope, aspect, and solar insulation. Each of these four variables was ranked 1 – 4. The model excludes Cw, Yc and HM leading species and forest age class < 140 years.
- The cut-offs of L, M and H value habitat were set to achieve proportions of 25% H, 50% M and 25% by area. Coastal and Mountain ecosections were rated separately – the mountain ecosections are more stringent to account for the more challenging winter habitats.
- The direction to Marxan is based on a 'target retention value' (TRV) approach whereby Marxan is instructed to capture a minimum amount of H value habitat and make up the target with twice as much M habitat (to allow flexibility in the solution).
- A rule of minimum 40ha patch size was not applied to the model.

5.2 Observations

- The map overestimates the amount of high quality habitat, especially in the mountain ecosections.
- With regard to amount of habitat captured:
    - the sss70R scenario captures the amount of habitat in the lower risk scenario
    - the sss50R scenario captures the amount of habitat in the moderate risk scenario
    - the sss30R scenario captures the amount of habitat in the higher risk scenario

    with the caveat that the amount of habitat is currently overestimated

<u>Overlap with other species</u>

There is overlap of deer with NG and Mtn Goat.

5.3 Recommendations for Blacktailed Deer

1. Rerun the deer habitat model using different cut-offs for H vs M habitat.
2. Do a minimum patch size assessment post hoc or run a patch size rule when rerun the deer model.

6. Mountain Goat

Domain experts: Kim Brunt, Ken Dunsworth, Shawn Taylor and Sally Leigh-Spencer

6.1 Context

- A new biological layer of mountain goat habitat suitability was created for Phase 2 of this project. The mountain goat mapping is different in the NC, MC and SC and different targets have been set for each subregion.
- Mapping is based on a resource selection function (RSF) model using age, solar loading, elevation, distance to escape terrain and slope.
- The mapping was validated against GPS data of MG locations in the Stafford and Kingcombe areas.
- Cut-offs were set to identify Type 1 and Type 2 habitats. The goat scenarios are also based on target retention values for Type 1 and Type 2 habitats.
- Want to capture the best habitats in the lower elevations (with their important snow interception values) without losing the upper valley habitats. All goat habitats are contained within the Central Pacific Ranges ecoprovince.
- Forest age was included in the model, but other variables contributed more to the model so there are some younger aged stands included. Younger stands provide adequate habitat in milder winters but in severe winters older forest is very important e.g., for snow interception and thermal cover and litterfall for winter food.

6.2 Observations

1. With regard to amount of habitat captured:
    - the sss70R scenario captures the amount of habitat in the lower risk scenario
    - the sss50R scenario captures the amount of habitat in the moderate risk scenario
    - the sss30R scenario captures the amount of habitat in the higher risk scenario
    - The multispp LR scenario captures > the MGLR-30R scenario, which is as expected.
    - The multispp MR scenario meets the target for Type 2 habitats but less of Tyoe 1
    - The multispp HR scenario does not meet targets well.
2. The current habitat model is more of a capability model (or suitability for non-severe winters) because of the inclusion of younger forest. Distribution the NG low risk 30R scenario falls short in capturing snow interception cover (i.e., forested cover in upper elevations). Need to assess whether the goat habitat being picked up is of good functionality i.e., in harsh winters.

6.3 Recommendations for Mountain Goats

1. Only use the female habitat layer in future runs (has a wider distribution)
2. Do not include habitats outside of the Central Pacific Ranges ecoprovince
3. Identify cut-offs at age class 8 and 9 to define “critical winter range” needed for harsh winters

4. Review scenario outputs to assess whether the existing Marxan rules and targets is pushing the solutions to poor habitat. Current mapping gives priority to lower elevation habitats (these habitats are higher ranked). Identify rules to drive solutions to better habitat e.g., based on age class, BEC

BIG PICTURE RECOMMENDATIONS

- Future scenarios:
    - individual species without the sss30R
    - all species but minus one species (as was done for NG this time)
    - Chuck to provide a tabular summary of age class x LU x BEC for future runs; will also report by area of habitat as well as %
- Need to redefine the THLB – the TSR2 THLB layer is now defunct. Could look to the 'depletion layer' to see the actual geographic extent of harvesting.
- Consider what should be included in hard and soft reserves – want some habitats captured in solid reserves and others that move over time.
- Each team to consider the implications of the cost layer as it is currently defined and determine whether additional rules are needed to ensure that habitat issues are optimally addressed
- The 'target retention value' is an approach to setting habitat targets that introduces flexibility (is currently the approach used by the ungulate and NG teams).
- Address minimum polygon size in the original habitat maps– is preferable to assessing patch size distribution post hoc.
- The submaritime and maritime are well covered in EBM through focal species. The hypermaritime is poorly represented by the focal species and other EBM components. Re focal species - need to find other species to represent the Hecate Lowlands e.g., sandhill cranes. Re other aspects of EBM, need to also map and seek representation of bogs, ocean spray sites. These are falling through the cracks.
- Domain experts to provide some estimate of uncertainty with respect to the Marxan outputs in consideration of the quality of the habitat mapping and the information behind the rules and targets in Marxan. For example, note how much of the information is based on empirical findings (with refs if possible) versus expert opinion. Can also make suggestions for how to improve the process and reduce or mitigate uncertainties.

<u>Mapping</u>

- Focal species maps are based on suitability, not capability so are less useful for picking up recruitment areas
- Need the best possible mapping for the co-location with the limitations/ uncertainties stated up front. Needs to be appropriate for the strategic scale of analysis.

  Mapping limitations by species:

    - *GB:* overestimation of Class 2 habitats in TEM-surveyed areas; missing data in Scott license area

- *BB:* need a black bear suitability map; way of picking up high value denning areas in Marxan
- *MM:* overestimation of habitat quality in the hypermaritime; exclude habitats >50k from the ocean
- *NG:* need to bring in the nesting model and deal with the issue of low elevation recruitment
- *Deer:* need to adjust cut-offs to deal with overestimation of high value habitats in the mountain ecosections; apply a patch size rule to the habitat model
- *Goats:* use the female map layer only; need to adjust cut-offs to better capture age class 8 and 9 (i.e., critical winter habitats); exclude habitats outside of the Coast Pacific Ranges
- *Tailed frog:* need method to capture entire stream segments and link to basins; map and include connectivity nodes in the co-location

LANDSCAPE LEVEL PILOT MAPPING

Terry Lewis and Laurie Kremsater described a project they are undertaking to do detailed mapping of reserves at the landscape scale. Is to pilot ground-up methods of landscape design.

- Will test the use of Marxan outputs – will use the strategic level reserve design as a starting point for their own work.
- Process is
    - Determine values/ targets/ priorities
    - Evaluate the LU – look at the pattern of values within the LU
    - LU design. Look for concentrations of habitat value e.g., riparian. Look for significant habitats e.g., red and blue-listed
    - Do representation check last and fill in gaps.
    - Provide a range of sizes. Focus on forest interior. Consider connectivity.
- Is an iterative process. Each LU is distinct. Vary the approach to fit the landscape dealing with.
- Are seeking to also minimize cost but priorize habitat where necessary
- Are starting with the Roddick LU (MC) and Stafford LU (SC). In the Stafford will compare outcomes when use sss vs TEM. Will include the Gilford LU in the NC.
- Where necessary, will recruit based on capability.
- Will use Marxan outputs as a strategic starting point for reserve design. Strategic level design → mapping of individual LUs → incorporation of cultural information → operationalized.

Comments from DEs that the LUs chosen do not provide the representation of the more "complex" LUs; right now the pilot is focused on more simple areas with only one or two variants.

FINAL COMMENTS

- Comment that the land use objective has lost its biodiversity focus e.g., species habitats are limited to what can be captured in OGRAs.
- The products of this project will inform the spatial design of OGRAs – the teams have described their preferred low risk scenario – need to state
    - Why this scenario is preferred and what is lost in moving to a higher risk scenario.
    - If an adequate amount of habitat is not ending up in OGRAs, how else might these habitat needs be met?

This information will inform social choice decisions by other bodies.

Process:

1. Marxan runs based on the land use objective – strategically, how well are focal species covered off? Where are the gaps?
2. Compare to Terry Lewis/ Laurie Kremsater LU mapping – how much better are the reserves if done at the LU level? How well are the gaps identified in (1) addressed?
3. If not addressed in (2), is there another mechanism to address gaps e.g., soft reserves?
4. If there are still gaps, then there need to be discussions about what needs to happen e.g., changes to the land use objectives.

Wally Eamer reported to the group that there are three sources of info that need to be considered in the design of OGRAs: economic, ecological, and cultural. To date the focus has been on the economic and ecological. Cultural information is also an important consideration. LRFs have been asked to develop a workplan for spatial reserve planning that will include a process for capturing the FNs values so that the final design of OGRAs includes these cultural elements.