# Cumulative Effects Framework

*Assessing and Managing Cumulative Effects in British Columbia*

## Summary of Feedback on Value Summaries and Protocols for Aquatic Ecosystems, Grizzly Bear, and Old Growth Forest

### Primary Sources of Feedback

1. Technical peer-review workshop on June 27/28, 2016, with environmental non-government organizations, environmental assessment consultants, academics, and government officials,
2. One written submission, and
3. Internal government feedback.

### Overall Perceptions of the Draft Value Summaries and Protocols

Most stakeholders believe that the draft value assessment summaries and protocols provide useful information to support land use planning and decision-making.

### Common Suggestions for All Values

1. Include 'state-level'/condition indicators to help future planning processes.
2. Assess future impacts on values.
3. Consider effects of climate change and natural disturbances in assessments.
4. Flag issues in the conceptual models (i.e., identify indicators, factors, processes, components in the model that are impacted as per assessment, identify policy gaps) as well as maps.
5. Ensure consistency across values, including using similar colouring scheme in roll-up maps for all values and consider value impacts on each other.
6. Ensure consistency in data inputs and contingency for assessments with low or poor data.
7. Consider grizzly bear metrics and data for other species (e.g., roadedness and seral state).
8. Include multiple stakeholders (e.g., First Nations, ranchers) in determining future condition.
9. Caution to take 'results' at face value versus using local expertise, review, and interpretation.
10. Science-based benchmarks/thresholds are important for answering the question of how much development is enough. Keep science benchmarks separate from the objectives that have incorporated socio-economic factors.
11. Consider using an overarching value of ecosystem function or ecosystem services that include current values as indicators (rather than as separate values). If the existing values were treated as indicators, then trade-offs would become easier to consider because each will be context specific.

## Aquatic Ecosystems

### Weaknesses of the Procedure

1. Simplistic, conservative and will be difficult to use in a decision making context.
2. It is not a cumulative impact assessment, it is a hazard assessment. Cumulative Effects Assessment needs to happen at a more local level.
3. Does not have interactions with marine environment.
4. Danger that thresholds/benchmarks can become the "goal" for early proponents - need long term plan.
5. Shifting baseline issue.
6. Uses only stressor indicators.
7. No context to the landscape.
8. Road density specifically requires a data set that is more comprehensible.
9. The assessment/ range of indicators is too broad – may not be useful in an environmental assessment process or for specific decisions.
10. Number of mines/ water withdrawals are not good indicators and not useful.
11. Does not mention shifting/reducing development, just mitigation.
12. Not clear how benchmarks were established, link to the questions (Forest and Range Evaluation Program's function).
13. Descriptive of current condition but not predictive (no future).
14. Does not include baseline (pre-contact) condition (past).
15. Assessments may be valid where forestry is the main stressor, but may not capture multiple stressors.
16. Indicator roll up is not clear – not clear how many indicators are considered.
17. Temporal aspect is not included.
18. Any assessment will be an unsatisfactory compromise between the desire to have an accurate assessment verses more limited assessment based on the limited data available.
19. Three classes of high are not very useful.

### Recommendations

1. Integrate the three conceptual models into one conceptual model to describe the overall picture.
2. Clarify how physical properties for watersheds (i.e., assimilation capacity) will be considered in indicators such as fish and water quality.
3. Need to assess biotic state. Need current conditions on hydrology and fish presence/ diversity.
4. Incorporate marine/estuarine ecosystems.
5. Clarify the scale of value, watershed values, and the objectives for the watersheds.
6. Map the established benchmarks from the watershed assessment procedure (current policy).
7. Simplify the overlap and correlation of indicator stressors.

8. Consider *Water Sustainability Act* work with the Ministry of Environment's objectives for the land base, cumulative withdrawal by watershed as a tool to capture climate change. Clarify how *Water Sustainability Act* objectives have/ or not been incorporated for quality, quantity, and riparian.
9. Clarify how impacts from the mining/ energy sector are being included. Put water quality indicators in the context of current Mines Guidelines (i.e., how many mines have been above current guidelines on any metric) and figure out a way to roll-up this information to a watershed level. Classify the mines into categories and give greater weight to the higher risk categories. At very least, area and volume of the tailing impoundments need to be part of this spatial layer. In addition, a data layer on historic mines needs to be developed for this factor with information on known levels of Acid Mine Drainage or total volume of rock exposed. This would allow the indicator to be more representative of actual conditions, while still taking into account the number of mines within a given area.
10. Similarly to the recommendations for mines above, classify the dams into categories and give greater weight to the categories which are the larger barriers.
11. Narrow/ focused look at level of minerals/ discharge would be meaningful indicators for fish.
12. The value needs to be put into place-based context (i.e., what is important regionally vs. what is important at a local, site level). Clarify where the specific site report comes in.
13. Compare smaller scale assessment to larger scale assessment.
14. Consider climate change effects on water quantity, timing of peak flows, snowpack, snowmelt, precipitation, and temperature. Use hydrometric data and climate data to facilitate modeled assessment.
15. It would be best if you benchmark against where you want to be/ best case and not the current case.
16. Incorporate ground water sources relative to fracking.
17. Clarify where monitoring takes place. Include as a flag, or use to calibrate.
18. Assemble all data for the province on fish passage, riparian, sediment, and the Environmental Monitoring System.
19. Explain why risks are lower in urban areas.
20. Clarify correlations among indicators - both obvious, not obvious (e.g., road density and topography).
21. Clarify if the resource is used to a medium benchmark in cases where a benchmark is set without a land plan in place.
22. Clarify how upstream habitat will be affected by marine shoreline disturbance, estuary and marine environment.
23. Consider point source effluent.
24. Clarify the linkage to the fish value as part of Forest and Range Evaluation Program's resource values.
25. Look broader than just the forestry context (i.e., roads – though forestry is still the most active industry on the land); look at other sectors' guidelines.

26. Introduce two layers of nested conceptual models under the Stream and Riparian Systems Component is a scale specific system. Maintain the existing 1:20,000 assessment unit scale and develop a second conceptual model for the large basins of BC.
27. Include state indicators as part of the factors considered in the conceptual models, such as: measures of pollution, alteration of flow, biological communities, habitat heterogeneity, water temperature and substrate distribution.
28. The Aquatic Ecosystems Value Summary document provides an interpretation of risk to aquatic ecosystems deriving from the stressors identified. Need to apply the vulnerability approach to identifying risk when assessing cumulative effects both province-wide to marine habitats and at a watershed scale to salmon and eulachon. The approach as applied to the coastal assessment is described in Ban et al. (2010) and Clarke-Murray et al. (2015). The vulnerability criteria applied to habitats is described in Teck (2010).
29. Restructure the conceptual model for Aquatic Ecosystems to include the five elements of riverine ecology identified in Instream Flows for Riverine Resource Stewardship Revised Edition. The five factors to include are: water quality, hydrology, connectivity, biology and geomorphology. Hydrology is already partially captured under the Component Water Quantity, but this component should be renamed to hydrology to reflect the fact there is more than quantity that needs to be considered.
30. Include floodplain complexity in the factors to consider related to Aquatic Habitat Structure when analysing and reporting at basin wide scales. Fortunately for BC, the majority of BC rivers have already been assessed and described in Whited et al. (2013).
31. Under the Component of Hydrology include the Functions and Processes of magnitude, frequency, duration, timing and rate of change that are foundational hydrologic metrics used in environmental flow studies.
32. Water use permits for small scale domestic use should not be treated the same as an industrial use permit. The volumes granted on water use permits should be used to determine volume of water allocated vs. volume available unless more accurate reporting data exist for a region.
33. Develop a more precise assessment of wastewater discharge by taking quantity and material being discharged. The publicly accessible National Pollutant Release Inventory (NPRI) housed by Environment and Climate Change Canada is an inventory of pollutant releases (to air, water and land) from across Canada and gives information such as the quantity released, the substance released, the responsible body, the date and location of the release. By using this inventory to create a more precise indicator, the water quality component as a whole will be more representative of the conditions on the ground.
34. There are many ways to incorporate other types and sources of pollution in the water quality component. There are a variety of databases that can be used. Agriculture Canada has separate datasets with information on risk of contamination for nitrogen, phosphorus, and pesticides. The dataset has information on the relative risk of agricultural runoff based on polygons from Soil Landscapes Canada. By using these three datasets to create a more informed indicator based on the risk of contamination from agricultural runoff, the water quality component as a whole will be more representative of the conditions on the ground.

35. Under the Function and Process Channel, sediment dynamics include substrate as a Factor in the conceptual models. Identify substrate as a state Factor with data gaps in the conceptual models. Include a Factor related to soil erosion and length of stream under the same Function with percentages of stream length in unstable or erodible soil as the indicator.
36. Include biodiversity as a Component. Review elements of biodiversity such community structure, productivity, abundance, gene flow, diversity and invasive species for inclusion as Functions and Processes under the Biodiversity Component. As a Factor under community structure it is recommended the province use the Hilsenhoff Biotic Index for Benthic Maroc-Inverterbrates.
37. Identify data gaps both in the conceptual model and spatially in the final maps. For Factors for which there is no data this could be represented by including grayed out Factor boxes in the conceptual model. For Factors that have partial data this should be reported in map format with grayed out watersheds representing watersheds where there is no data.

## Grizzly Bear

### Weaknesses of the Procedure

1. Core security does not relate to a large scale in terms of keeping populations viable.
2. Unclear why this is a single species value/ cannot manage one species in isolation of others (contrast this with aquatic ecosystems). Value centric approach is problematic - managing for one will be a problem for another.
3. A lot of correlations among indicators, magnifiers, or distorts, hazards. Model might perform better than reality (if you are managing mortality, then hunter density/access is probably doing ok for bears).
4. Too complex to implement, mandate, and understand. Need 1) food, 2) security, 3) isolation from humans.
5. Unclear if supplemental or context indicators are these useful for non-domain experts. Concern that they may 'muddy the water' or not be useful for decision-makers.
6. Lacks population objectives and is disconnected from Land and Resource Management Plan-type objectives. Seems to be missing a large-scale approach (i.e., Yukon to Yellowstone connectivity; Y to Y views the Pine Pass area as critical to grizzly bear's biodiversity).
7. Not meant to look at interconnection of bear populations.
8. Something missing between viability map and the flag map.
9. Unclear consideration of objectives related to the hunt (mortality indicator does relate to the hunt) or bear viewing. Clarify how the concept of social carrying capacity can be incorporated.

### Recommendations

1. Create a generalized/ simplified model for proponents as a communication tool at a high level and then link to mechanistic and data models that show more detail.

2. Include current government objectives into the grizzly bear values.
3. Conduct an integrative assessment for multiple species (not just grizzly bear).
4. Add a metric for core security habitat at a larger scale to include large areas of virgin forest in the metrics proposed for grizzly bear.
5. If requiring proponents to share data, habitat suitability modelling must be done not only to local benchmarks, but to the provincial benchmarks as well, so that it is comparable across regions (same for predictive ecosystem mapping conducted for major projects). Habitat capability does not describe the current state of the component.
6. Need to assess (map) and manage landscape for grizzly bears in areas where they are extirpated. Clarify if there has been a decision not to repopulate these areas.
7. At species level, determine the ecological resiliency - what the system is capable of, determine ecological thresholds and what society wants as future condition.
8. Categorical variables need to directly link to population status.
9. Clarify how easy it is to change the model, and if the quality of food is linked into increasing encroachment of habitat.
10. Look at changes in assessments not only because of changes in data, but also changes in our understanding of structure.
11. Clarify what components you would like to measure that you are not currently measured and clarify if those are critical.
12. Clarify how modelling is done in terms of what you want to be modelled vs. data availability.
13. For habitat suitability use satellite info to get at productivity.
14. Clarify how the mine/oil and gas impacts influence the decision to let Fort St. John be extirpated.
15. Phase implementation.
16. Multi-scale approach may help guide provincial assessments, but information at regional level maybe more relevant and refined for application to a particular decision.
17. Clarify what the habitat should look like into the future for Grizzly Bear, including distribution and abundance.
18. Caution with using population as a management lever (may or may not be effective in the short-term); investigate other jurisdictions' work.
19. Clarify if Grizzly Bear was selected as an umbrella species, intended to capture other values, or only as Grizzly Bear.

## Old Growth Forest

### Weaknesses of the Procedure

1. "Old growth" is not the right level. Communities are concerned with forest biodiversity.
2. The usefulness of the value seems limited because these areas are not valuable from a timber perspective.

3. This assessment is less relevant than the other assessments. Need to consider the biological and ecological needs for key species Old Growth supports, which is a political vs. ecological question. Connectivity, structural diversity are the things that people care about Old Growth forests.
4. Connectivity between old forest is a measure of fragmentation.
5. The conceptual model does not address the ecological/scientific threshold (unlike other values), but accounts for the government willingness to protect Old Growth Management Areas.

## Recommendations

1. Old growth forest should be considered as part of the forest biodiversity value as its indicator or component. Forest structure and/or diversity can have more meaning (species related needs).
2. Monitor old forests for their effectiveness in providing value (effectiveness monitoring).
3. Ensure that the government meets legal and non-legal objectives (compliance monitoring).
4. Revise the definition of 'forest.' The current definition is too narrowly scoped. The issue is that some grassland/parkland habitats are classified as forest, but some subalpine parkland forests are not.
5. Harvest rate should influence where the enhanced trigger is set (close to town has a higher cut rate).
6. Consider shifting terminology - old forest vs. old growth vs. old and mature.
7. Reflect in the value summary that the conceptual basis for the Old Forest value is the Biodiversity Guidebook and natural disturbance types (reflect as a broad objective).
8. Old Growth Management Areas are usually already located in inoperable areas (e.g., Parks and Ungulate Winter Ranges). They are the tools that were intended to represent Old Growth and the values in Old Growth Forests. Need to look ecologically at Old Growth to describe its intended nature as a vale and identify risks to meeting the ecological components of Old Growth. Old Growth Management Areas are a management response to the management of old forest, rather than reflecting the condition of the value. In fact, some Old Growth Management Areas are currently young forest and are expected to recruit old forest over time. This needs to be accommodated in the analysis.
9. Clarify how this information is integrated with Timber Supply Analyses. Timber Supply Review identifies how much can be cut according to legal requirements but does not direct the location of the cut. This might be an opportunity that the cumulative effects assessment can provide. Lack of recent information in tree farm licences creates a significant data gap.