

Considering Climate Change in Cumulative Effects Assessment and Management



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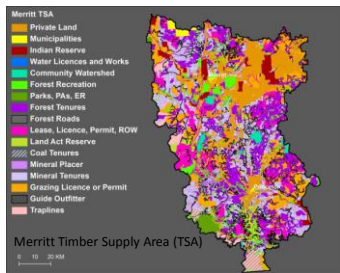
Adapting Natural Resource Management to a Changing Climate Workshop, Vernon - October 29, 2015

Outline

1. Discuss Cumulative Effects – watershed context
2. Example Strategic-level Cumulative Effects Assessment (SCEA) for Merritt TSA
3. Review SCEA Outcomes
4. Are we operationally ready to respond in light of climate change?

Cumulative Watershed Effects

- Land use activities and/or natural disturbances causing changes in watershed processes that includes alterations to:
 - Physical hydrology
 - Riparian function
 - Water quality
 - Channel morphology¹
- Unintended effects
- Overlapping tenures on public land,
- Coupled with private land.



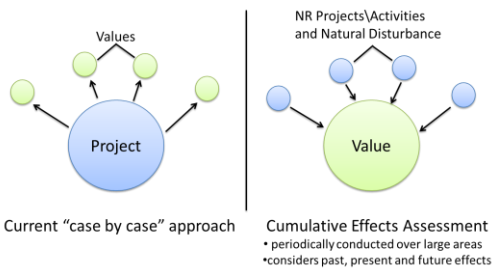
¹ Source: Reid (1993, 2010) summarized in Scherer (2011). Cumulative Effects: A primer for watershed managers. Streamline watershed management bulletin, Vol. 14(2)

Challenge in Managing Cumulative Effects

- Applying effective mitigation requires disentangling effects of multiple land uses, natural disturbance and their interactions.
- Requires understanding land use activity and natural disturbance effects on watershed processes including:
 - Severity, extent
 - Interactions
 - Change over time due to;
 - Modified practices
 - Regrowth/recovery

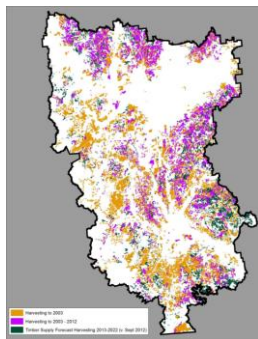


Strategic-Level Cumulative Effects Assessment (SCEA)

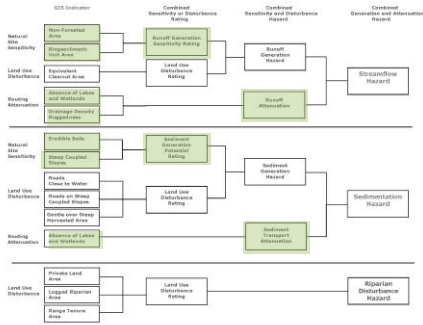


Application of SCEA in the Merritt TSA

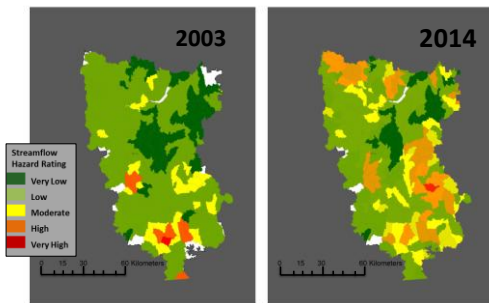
- Merritt TSA- 1.13 million hectares
 - 10 years back using historic datasets
 - Current condition
 - Future effects at 10,20 and 30 years
- Included existing and proposed new land use activity
- Forest harvesting primary change driver:
 - Estimated amount of future 'available' harvest at a watershed scale
 - Estimated hydrologic (snow)recovery



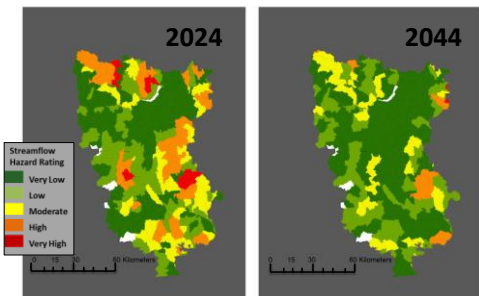
GIS Indicator-Based Model



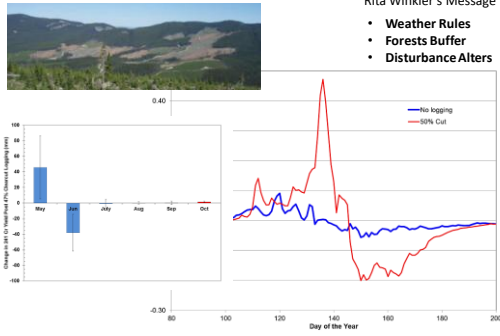
Streamflow Hazard - Historic – Current



Streamflow Hazard – Projected Future

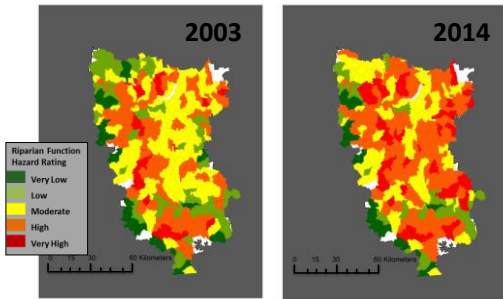


● **Effects of changing forest cover and snow on streamflow at Upper Penticton Creek**



Winkler, R., S. Bion, D. Spitzhauer and B. Zimnick. 2015. Forest disturbance effects on snow and water yield in interior British Columbia. *Hydrology Research* 46:4521-532.

Riparian Hazard - Historic - Current



Riparian Impacts

The increase in riparian hazard in upper elevation basins and sub-basins due to MPB salvage is additive to significant historic effects of private land riparian clearing at lower elevations.



Regulatory Dilemma

- Regulations being met by Natural Resource Sector
- Results beyond what is recommended under policy guidance for watershed condition & fish habitat
- Field monitoring verifies impacts to indicators assoc. with fish habitat



Are we operationally ready to respond to climate change?

- If we stopped all anthropogenic & natural disturbance today....
 - Past and current activities have accrued to reduce resiliency of system to respond and re-organize
 - 20-30 years of increased likelihood of:
 - increased frequency and magnitude of peak flows, flood events
 - Longer duration of low flows
- Persistent riparian impacts on private lands have reduced:
 - stream shading
 - bank stability
 - LWD inputs (longer-term).



What tools do we have?

Reactive (immediate) tools

- Environmental Flow Needs policy provides a reactive tool to:
 - Close fisheries
 - Reduce water use (irrigation) to maintain flows and water temperature for fish

Proactive (long-term) tools

- Plan to build resiliency back into the system
 - Culverts/Bridges that can accommodate increased flows?
 - Temperature and Fisheries Sensitive Designations:
 - Enhanced riparian protection
 - Manage harvest rates and recovery
 - Minimize sediment introduction
 - Riparian restoration on private land (tools?)

Other values?

Reactive (immediate) tools	Proactive (long-term) tools
<ul style="list-style-type: none"> Thoughts 	<ul style="list-style-type: none"> Ideas

Questions? – when is something too much – for what?



Thanks