Disturbance Dynamics in Foothills Riparian Zones

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David Andison
Riparian Zones Are Unique Landscape Features

- higher moisture regimes
- more toe slopes, valleys, steep slopes
- more non-forested
- more rich eco-sites
- different stand composition
- different stand structure
- land-water interface
- culturally important (recreation, fishing, water values, etc).

>> unique places
Assuming 25m buffers, riparian zones account for 5-10% of foothills landscapes.

And they are everywhere.
Are Riparian Zones Deserving of Special Management Consideration?

Clearly, yes.

Can Natural Disturbance History Tell us Anything That Might be Valuable Towards Sustainable Management of Riparian Zones?
Are there unique features of fire behaviour in riparian zones at the stand scale?
Tree Age Along Transect
Tributary of Beaver Creek

Distance Along Transect (m)

Tree Age

No.
Are Island Remnants More Likely to Form in Riparian Zones?

No – although…
## Are Riparian Zones More Likely to be Associated with Fire Edges?

<table>
<thead>
<tr>
<th>Landscape</th>
<th>Overall</th>
<th>All Streams</th>
<th>Large Streams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-Landscape 1</td>
<td>2.4</td>
<td>2.4</td>
<td>3.5</td>
</tr>
<tr>
<td>Sub-Landscape 2</td>
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<td>2.6</td>
<td>2.8</td>
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<tr>
<td>Sub-Landscape 3</td>
<td>4.0</td>
<td>4.8</td>
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<tr>
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<td>3.2</td>
<td>3.2</td>
<td>2.6</td>
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<tr>
<td>Sub-Landscape 5</td>
<td>2.8</td>
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<td>3.6</td>
</tr>
<tr>
<td>Sub-Landscape 6</td>
<td>2.9</td>
<td>3.0</td>
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<tr>
<td>Sub-Landscape 7</td>
<td>2.9</td>
<td>3.0</td>
<td>3.5</td>
</tr>
</tbody>
</table>

**No.**
Do Riparian Zones Have More Old Forest at Regional scales?

<table>
<thead>
<tr>
<th>Landscape</th>
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<th>Large Streams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Foothills</td>
<td>24</td>
<td>16</td>
<td>27</td>
</tr>
<tr>
<td>Upper Foothills</td>
<td>21</td>
<td>24</td>
<td>26</td>
</tr>
<tr>
<td>Sub-alpine</td>
<td>40</td>
<td>43</td>
<td>39</td>
</tr>
<tr>
<td>Montane</td>
<td>30</td>
<td>28</td>
<td>23</td>
</tr>
</tbody>
</table>

No.
All evidence of the interaction between riparian zones and fire behaviour was quite weak.

We found no evidence that riparian zones are refugia.

In other words, fire is an active process in riparian zones.
What happens if we significantly curtail the process of terrestrial disturbance in riparian zones?

A fundamental shift in ecosystem dynamics:

- Tree ingress (changes habitat)
- More old riparian habitat, less young.
- Fire, insect, disease risk may increase
- Old forest is no longer representative (BC)
- Old forest is linear – no “interior”
- Changes LWD dynamics
- Nutrient dynamics
- Changes in aquatic system dynamics
Is Harvesting a Sustainable Management Option in Riparian Zones?

*Not necessarily.*

*Traditional tree harvesting in riparian zones potentially results in:*

- compaction,
- rutting,
- erosion,
- removal of biomass, woody debris,
- destruction of aquatic habitat, and
- deterioration of water quality.
Dominant Management Strategy

Protection (from disturbance)

The reason being that they ARE unique components of the landscape, and more sensitive to environmental stress than other components of the landscape ecosystem.

Protection is intended as a conservative strategy.
But by protecting riparian zones,... we potentially create new risks.
Riparian Zone Protection Scaled up to the Landscape Over 200 Yrs

Proportion of "Old" Spruce

10-year Time-steps

Historic Range (NRV)
20% of our samples were associated with ingress.
The Dilemma: Harvesting in riparian zones creates some biological issues, and not disturbing riparian zones creates others.

The Question: Can we find some alternative management solutions that are (more) biologically sustainable?

Our Solution: See if the greater “natural model” can provide any further direction.
We understand these bits, but it provides no definitive management solutions.

Why don’t we try approaching this from the perspective of the conditions created by disturbance?
A wildfire runs through the riparian zone of a small stream

Dead trees fall down and create large woody debris (LWD) in and over the stream.

Changes in water flow, direction and velocity.

Organic matter and sediment erodes from the banks into the stream.

New LWD over the stream create bridges for small mammals.

Convoluted streams with LWD act as buffers against flooding.

Structurally diverse aquatic ecosystems filter toxins in water.

Healthy fish and invertebrate communities.
Summary

- Riparian zones are disturbed as often as any other part of the landscape.

- The disturbance regime was identified, but offered little specific guidance wrt best management practices.

- Our solution was to shift our focus on understanding NRV of (landscape condition) LWD attributes.

- *Stay tuned for tomorrow morning’s session!*