Disturbance–Driven Dynamics in Riparian Zones: 

*Knowledge is Power*

David Andison…

& many others.
Overview

- What is a riparian zone?
- What are the management issues?
- How are those issues dealt with?
- Why might that not be “sustainable”?
- What is our part in all this? The CD research opportunity.
Terrestrial area adjacent to water bodies...
Are Riparian Zones Special?

- interface between aquatic and terrestrial systems.

>> specialized habitat, water quality, flood control,…
Are Riparian Zones Unique Terrestrial Landscape Features?

- higher moisture regimes
- more toe slopes, valleys, steep slopes
- more non-forested & white spruce
- less pine & aspen
- more rich eco-sites
- lower tree density

>> unique habitat

>> more susceptible to soil erosion, rutting, & compaction.
Assuming 25m buffers, riparian zones account for 5-10% of foothills landscapes.
Are Riparian Zones Deserving of "Special Management Consideration"?

Clearly, yes.

What Should That Involve?

Knowledge, respect, and integration of natural processes.
How do we Manage Them Today?

Protection (from disturbance)

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

Thus protection is being applied as a conservative strategy.
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.
What Other Knowledge do we Have WRT Riparian Zone “Protection”?
## Are Riparian Zones Older?

<table>
<thead>
<tr>
<th>Landscape</th>
<th>Area 1</th>
<th>Area2</th>
<th>Area3</th>
<th>Area4</th>
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<tbody>
<tr>
<td>Lower Foothills</td>
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<tr>
<td>Lower Foothills minor river zones</td>
<td>118</td>
<td>130</td>
<td></td>
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<tr>
<td>Upper Foothills</td>
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<tr>
<td>Upper Foothills minor river zones</td>
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<td>Sub-alpine</td>
<td>118</td>
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<td>Sub-alpine minor river zones</td>
<td>119</td>
<td>149</td>
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No.
Are Island Remnants More Likely to Form in Riparian Zones?

<table>
<thead>
<tr>
<th>Fire Number</th>
<th>Percent Land in Riparian Zone</th>
<th>Fire Average</th>
<th>Island Remnant Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
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<td>2</td>
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<td>8</td>
<td>No</td>
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</table>
Riparian remnant islands more likely to form at wide streams, and on steep sites.
Are Riparian Edges Related to Eco-Site?

<table>
<thead>
<tr>
<th>Nat Sub.</th>
<th>Site Type</th>
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<td>rye tea1 cra hon mea tea2 tea3 hor bog fen1 fen2</td>
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Less likely to form edges | More likely to form edges
However, all evidence of the interaction between riparian zones and fire behaviour was quite weak.

We found NO evidence that riparian zones are “safe sites”, or “refugia”.

Meaning, fire is an active *disturbance process* in riparian zones.
What Happens to the Terrestrial System if we Protect Riparian Zones From the “Process” of Disturbance?

- Tree ingress (changes habitat)
- Riparian zones all become “old”
  - No young riparian zone habitat
  - Fire, insect, disease risk increase
  - Old forest no longer representative (BC)
- Fragmentation
- Old forest is linear – no “interior”
We protect riparian zones.

Riparian Zones are spruce dominated.

Therefore, riparian zones are perpetually old.

… and old forest patches are very small, with no interior.
What Does NRV Tell Us?

Historical range of **upland areas** that were “old” at any one time was 1-20%.
(95% of the time on ¼ million ha)

Historical range of **riparian areas** that were “old” at any time was 0-22%)
(95% of the time on ¼ million ha)
Long-Term Impacts of RZ Protection

Proportion of "Old" Spruce

Protecting Riparian Corridors

NRV
So is “Protection” a Sustainable Management Option in Riparian Zones?

No.

There are very real ecological risks associated with a “Protection” strategy.

It does not respect and integration knowledge of the full range of natural processes.
How Can We Change That?

With More and Better

Knowledge (of the
patterns of, and responses to
disturbance)

…and a Broader

Operational Toolbox.
Our Collaborative Research Group

To quantify and understand:

1) the natural range of variation in both the terrestrial and aquatic components of riparian ecosystems following forest fires, and

2) how that compares to other disturbance treatment options.

..towards gaining more knowledge (research), and broadening our toolbox (adaptive management)
The CD Fires Provide us with Unique “Treatment” Starting Points

- Burnt, then salvage logged (variable retention levels)
- Burnt, no salvage logging (variable width)
- Harvested with buffer, then burnt.

That we can then link with…. 

- Harvest with no buffer (variable retention levels)
- Harvest with buffer (variable width)
Who is Involved?

- **Foothills Model Forest** (co-ordination, and natural disturbance, fire behaviour and impacts, and stream classification expertise)

- **Weldwood, Sunpine, Others?** (adaptive management riparian management options, support)

- **Department of Fisheries and Oceans** (regulation)

- **Alberta Research Council (ARC)** (ecological & fire impacts expertise)

- **Canadian Forestry Service** (soils expertise).

* **Alberta Sustainable Resource Development** (regulation), Water Resources?
The Plan:

Next Year: Take the Time to do it Right, but Maximize Opportunities

- Stream Classification & channel morphology
- Low altitude aerial photography
- Facilitate discussions and agreement of critical issues with ALL stakeholders wrt “protection”
- Select sample units and treatments
The Plan:
Next: Be Effective and Integrate

- Use both fires.
- Structure and composition measurements.
- Options open for tracking soil movement, soil nutrient loss, water flows, woody debris recruitment, debris recruitment, stream morphology, sediment loads, macro inverts, fish…. and links to the landscape.
- Link with large-scale future demonstration and experimentation areas.