Foothills Model Forest
Natural Disturbance Research

1996-2001

Kris McCleary
Partners

Alberta Environment
Weldwood of Canada
Alberta Newsprint Company
Foothills Model Forest
Jasper National Park
Collaboration

Informal
- Prince Albert Model Forest
- MacGregor Model Forest
- Forestry Canada, PFC
- UBC
- University of Wyoming
- University of Colorado
Collaboration

Formal

- Weyerhaeuser Canada Ltd.
- Forestry Canada, NOFC.
- Alberta Environment, Edmonton Fire Centre
- Western Fire Centre
- Banff National Park
Study Area

- Alberta Newsprint Co.
- Weldwood of Canada FMA
- Willmore Wilderness
- Jasper National Park
- Provincial & Municipal Lands

N

Alberta
Ecological Zones of the Study Area

Alpine
Central Mixedwood
Lower Foothills
Montane
Sub-alpine
Upper Foothills
The FMF Natural Disturbance Program

Began from a common desire among FMF partners to *maintain biodiversity.*
Biodiversity:

“... the variability among living organisms and the ecosystems of which they are a part.”

*Canadian Council of Forest Ministers*
How Do We Maintain Biodiversity?

Option 1: Eliminate cultural activity over a very large area.

Not a feasible option:

1. Forest fire control
2. Towns, roads, gas and oil activity = people.
3. Forest harvesting
How Do We Maintain Biodiversity?

Option 2: Issue-based Approach. What are the requirements to maintain each species or value on the landscape?

**Pluses**
- Long history of research
- Target most important issues
- Aids species understanding
- Concepts easily grasped

**Minuses**
- Lots of research left to do
- Interpreted targets (goals)
- Targets are subjective
- Forces “tradeoff” mentality
How Do We Maintain Biodiversity?

**Option 3: Natural Disturbance Approach.** What patterns historically maintained natural levels of species and values?

**Pluses**
- Study of cause vs. effect
- Shorter path, less work
- Directly quantifiable

**Minuses**
- Past as model for future?
- Can we figure it all out?
- Flavour-of-the-day
- New science, no precedents
Operating Within the Range of Natural Variability

The unmanaged forest is subject to a variety of natural processes:

- succession
- nutrient cycling
- fire
- flood
- blowdown
- insects and disease
Operating Within the Range of Natural Variability

These processes vary in duration, frequency of occurrence, size of affected area and severity.

For each type of process, there will be a particular range of variability.

Alberta Forest Conservation Strategy, draft July 8, 1996
Operating Within the Range of Natural Variability

Each of these communities plays an integral role in maintaining landscape level diversity.

An understanding of "natural variability" is fundamental to the implementation of ecological management.
Operating Within the Range of Natural Variability

The result is a mosaic of natural communities representing the range of natural variability in forest ecosystems.
Landscape in 1950

Year of stand origin

- <1850
- 1851 - 1900
- 1901 - 1950
- 1951 - 1996
- No data
- Non-forestiald
Operating Within the Range of Natural Variability
Operating Within the Range of Natural Variability

This trend has the potential to simplify the diversity of the forest and, over the next several decades, may push it beyond the historic range of natural variability.
Projected Historical Range of Area
for stands > 200 years in the Upper Foothills

1995 (4%)
Projected Historical Range of Area
for stands 101-140 years in the Lower Foothills

Amount of mature forest in the Lower Foothills in 1995 is beyond the “natural range of variability”
Operating Within the Range of Natural Variability

Ecological management proposes that we use human activities to maintain that range of natural variability.
Species are ecologically and evolutionarily adapted to the historical range of patterns.

If we use natural patterns as a template, we are more likely to conserve biodiversity over the long term.
Summary of the Natural Disturbance Approach

However, it is not a perfect solution. Best overall strategy is to merge issue-based efforts with natural pattern research.
What are the historical, “natural” disturbance patterns on the Foothills Model Forest?

How are patch shape and size related to non-forested?

Patch size distribution? Edge architecture?

“What are the historical, “natural” disturbance patterns on the Foothills Model Forest?”

Within-stand age cohorts?

Change in structure through riparian strips?

Numbers and sizes of island remnants?

Range of seral-stage percentages?
What are the historical, “natural” disturbance patterns on the Foothills Model Forest?”

Stand replacing or stand maintaining?

Coarse woody debris?

How many disturbance regimes are there?

Patch shape distribution?

Topographic “hot” and “cold” spots?
Research Includes Many Projects, Defined by Scale

<table>
<thead>
<tr>
<th>Region</th>
<th>- Foothills Model Forest</th>
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</thead>
<tbody>
<tr>
<td>Landscape</td>
<td>- Upper Foothills Natural Sub-region</td>
</tr>
<tr>
<td>Disturbance</td>
<td>- Gregg River Burn</td>
</tr>
<tr>
<td>Stand</td>
<td>- Remnant island</td>
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</tbody>
</table>
Project Example #1: Managing Age-Class Distributions on the Weldwood FMA

Practical Question:

What amounts of old growth forest are appropriate to manage for on the FMA over the long term from a biodiversity perspective?
Project Example #1:
Managing Age-Class Distributions on the Weldwood FMA

Scientific Question:
What are the natural, historical levels of all seral-stage percentages over the last 2-300 years?
Landscape in 1950

Year of stand origin
- <1850
- 1851 - 1900
- 1901 - 1950
- 1951 - 1996
- No data
- Non-forested
**Older Forest as of 1950 on the Weldwood FMA**

<table>
<thead>
<tr>
<th>Natural Subregion</th>
<th>%&gt;300 yrs</th>
<th>%&gt;200 yrs</th>
<th>%&gt;100 yrs</th>
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</thead>
<tbody>
<tr>
<td>Lower Foothills</td>
<td>0</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>Upper Foothills</td>
<td>0</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td>Subalpine</td>
<td>2</td>
<td>15</td>
<td>45</td>
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BUT...

These numbers only represent a single point in time (1950).

And we know that fire activity is highly variable.
A Brief History of Forest Fire Activity on the Weldwood FMA

- Upper Foothills (UF) Area -

Between 1930-1949  2%  of the UF burnt
Between 1910-1929  8%  of the UF burnt
Between 1890-1919  22% of the UF burnt
Between 1870-1889  51%  of the UF burnt
Between 1850-1869  36%  of the UF burnt
Between 1830-1849  47%  of the UF burnt
Landscape in 1950 - Initial Condition

Age Class Distribution
Landscape in 20 Years?

Age Class Distribution
Older Forest as of 1950 on the Weldwood FMA

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4% forest greater than 200 years old in the Upper Foothills - the simple answer
Projected Historical Range of Area
Greater Than 200 Years of age in Upper Foothills

The more precise answer is a RANGE of values
(= solution space)
Example #1 Summary

Original Question:

What amounts of old growth forest are appropriate to manage for on the FMA over the long term from a biodiversity perspective?
Example #1 Summary

Answer:

There is no single amount of old, mature, or young forest that is more “natural” than many others.

Weldwood now has a series of *seral-stage ranges of natural variation* with which to compare long-term planning projections.