Wildlife Need Structure

Fire Ecology and the Beneficial Aspects of Fire

Kris McCleary
Foothills Model Forest

foothills model forest
a growing understanding

CIF Wildfire: Trends, Challenges and Choices May 13, 2000

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

Outline

- Fire ecology
  - fire regimes
  - landscape level effects
  - plants/animals
- Foothills Model Forest Natural Disturbance Research Program

foothills model forest
a growing understanding

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

Fire is a Natural Part of Ecosystems

- Have shaped landscapes and determined productivity for thousands of years
- Lightning starts over 6000 fires each year in the US

foothills model forest
a growing understanding

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

Fire is a Natural Part of Ecosystems

- Native Americans used fires for hunting and food production
- Animal species native to fire adapted ecosystems are adapted to fire and many actually benefit

foothills model forest
a growing understanding

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

Fire and Landscape Pattern

- Driving force in structuring landscape patterns, species diversity and composition
- Future disturbance behavior is determined by the patterns that result from fire

Fire and Landscape Pattern

- Increased habitat heterogeneity leads to increased species diversity

Fire Regimes: Stand Maintaining

- Generally not lethal to dominant vegetation
- Do not substantially change structure of dominant vegetation
- Approximately 80 of above ground vegetation survives

Stand Maintaining Fire: Succession

- Fires maintain open forest floor
- Occasionally old trees are killed, providing seedbed for new seedlings
- Often results in multiple even-aged stands

Fire Regimes: Stand Replacing

- Fires kill the above ground parts of dominant vegetation
- Approximately 80% of above ground vegetation is killed

foothills model forest
a growing understanding

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

Stand Replacing Fire: Succession

- Fire creates seedbed and nutrient supply for new seedlings
- Lodgepole pine cones open and fall to ground

Stand Replacing Fire: Succession

- Deciduous shrubs resprout and dominate for a while
- Regenerating stands often produce large amounts of browse until the canopy closes

Stand Replacing Fire: Succession

- Bottom line:
  - Reduces habitat quality for species that need dense cover, increases habitat quality for those that like open sites

Influence of Fire on Wildlife Populations

- Variety is the order of the day
- Discussion is limited to species we have information on

Influence of Fire on Wildlife Populations

- Habitat changes influence populations more than fire itself
- Increases in some species and decreases in others

foothills model forest
a growing understanding

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

Influence of Fire on Wildlife Populations

- Examples:
  - Fires favor raptors by decreasing cover and exposing prey
  - Small carnivores respond to changes in small mammal populations

Influence of Fire on Wildlife Populations

- Examples:
  - Large carnivores are largely unaffected as they have large home ranges
  - Species that prefer mature forest decrease if remnants of forest aren't left
  - Species that prefer a dense closed canopy decrease

Wildlife Need Structure

- Standing dead trees
  - become food for insects
  - insects provide food for birds
  - provide perches for raptors
  - decaying trees provide nest sites for woodpeckers and then secondary cavity nesters

Wildlife Need Structure

- Fallen dead trees
  - provide cover for small mammals, salamanders, ground nesting birds
  - fungi living in fallen trees provide food for birds and small mammals

Fire Effects on Wildlife Forage

- Often increases/improves forage for up to 100 years
- Provides a diversity of vegetative communities from which to select food species

Fire Effects on Wildlife Forage

- Usually results in increased biomass of forage species
- May increase nutritional content and digestibility of plants

Effects of Fire Exclusion

- Changes in seral stage distribution
- Changes in fuel loads, leading to changes in fire intensity


3943


'97 7 29


3936


'97 7 29

Beneficial Aspects of Fire

- Maintains a range of plant communities (seral stages) which in term provides habitat for a diversity of animals
- Positive/negative effect on animals depends on habitat preferences but many benefit

Foothills Model Forest
Natural Disturbance Program

1996-2000

foothills model forest
a growing understanding

WWW.FMF.AB.CA

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

Program Support

- **Foothills Model Forest**
- **CFS**
- **Weldwood of Canada, Hinton Division**
- **Jasper National Park**
- **Alberta Environment**
- **Alberta Newsprint Company**

Collaborators

- **U.of A. Cultural Ecology and Restoration Program**
- **Weyerhaeuser Canada**
- **U of A Biological Sciences**

foothills model forest
a growing understanding

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

Organization of NDP

Program Coord. & Science - David Andison

Program Biologist - Kris McCleary

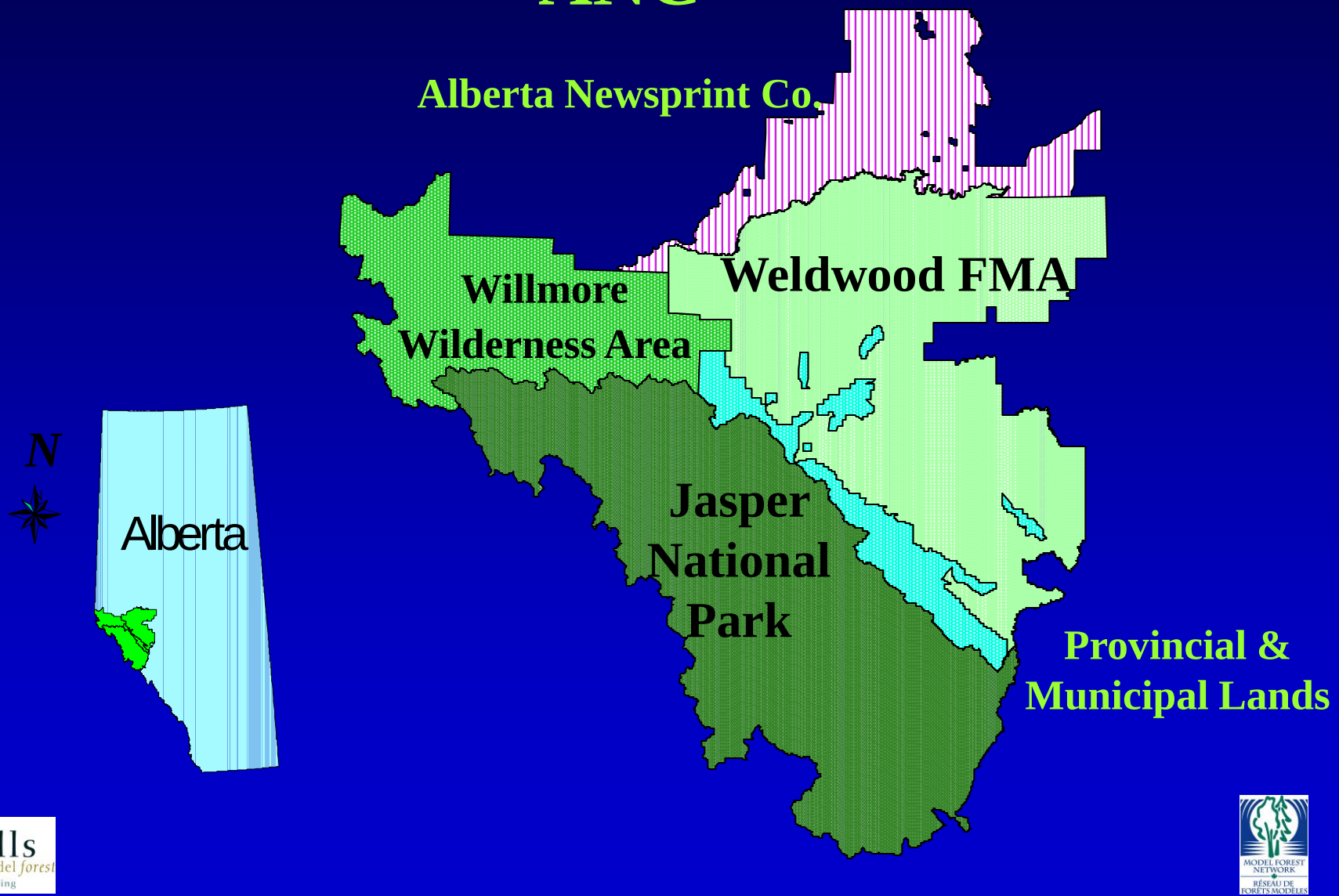
Program Team:

- **Hugh Lougheed, Weldwood**
- **Alan Westhaver, JNP**
- **Don Harrison, AEP**
- **Dan Farr, Foothills Model Forest**
- **Greg Branton, ANC**

foothills model forest
a growing understanding

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

Study Area = Foothills Model Forest + ANC



foothills model forest
a growing understanding

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

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

foothills model forest
a growing understanding

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

Stand replacing or stand maintaining?

Coarse woody debris?

Patch shape distribution?

Topographic “hot” and “cold” spots?

How many disturbance regimes are there?

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

Dead standing?

Edge architecture?

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

Within-stand age cohorts?

Change in structure through riparian strips?

Patch size distribution?

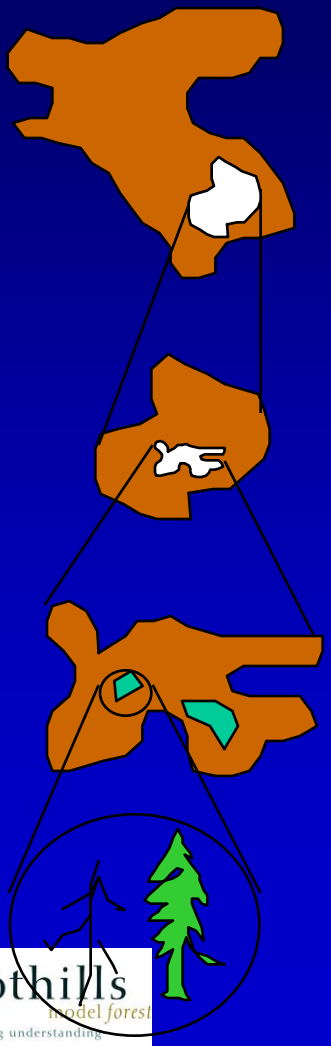
Numbers and sizes of island remnants?

Range of seral-stage percentages?

foothills model forest
a growing understanding

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

The ND Program Includes Many Projects, Defined by Scale



Region - Foothills Model Forest

Landscape - Upper Foothills Natural Sub-region

Disturbance - Gregg River Burn

Stand - Remnant island

foothills model forest
a growing understanding

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

Why Study Natural Disturbance Patterns?

- Develop and defend management strategies based on historical precedent

- Template for maintaining biodiversity through "emulation" of ecological patterns

- "Pattern" is quantifiable

--> allows translation to planning

--> use in monitoring programs

foothills model forest
a growing understanding

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

Project Example #1:

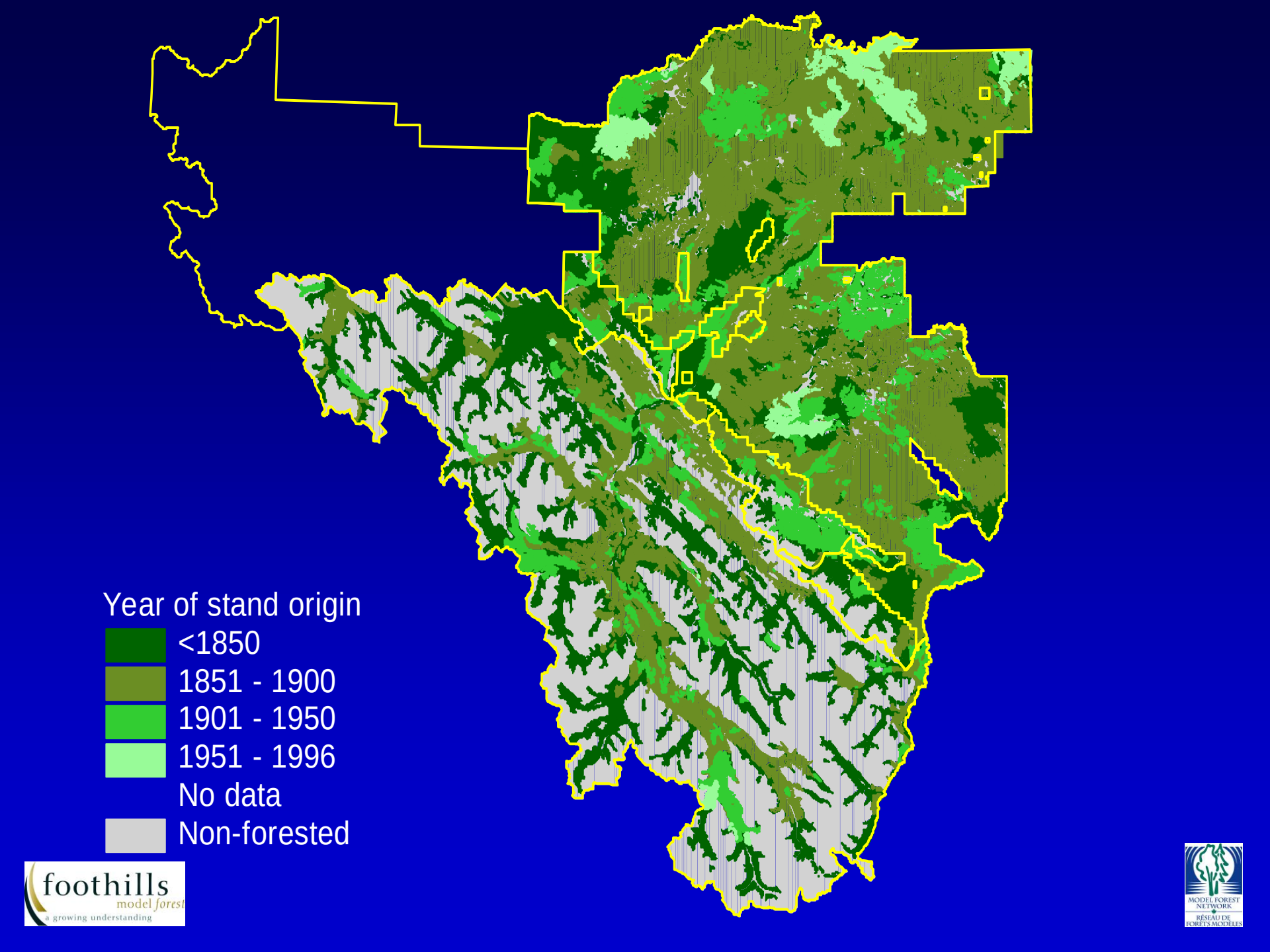
Managing for old growth on the Weldwood FMA

Practical Question:

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

foothills model forest
a growing understanding

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES


Year of stand origin
<1850
1851 - 1900
1901 - 1950
1951 - 1996
No data
Non-forested
foothills
model forest
a growing understanding
MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

Older Forest as of 1950 on the Weldwood FMA

Ecological Region	%>300 yrs	%>200 yrs	%>100 yrs
Lower Foothills	0	0	16
Upper Foothills	0	4	21
Subalpine east	2	15	45

Note that these represent "natural" percentages of older forest.

foothills model forest
a growing understanding

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

So far….

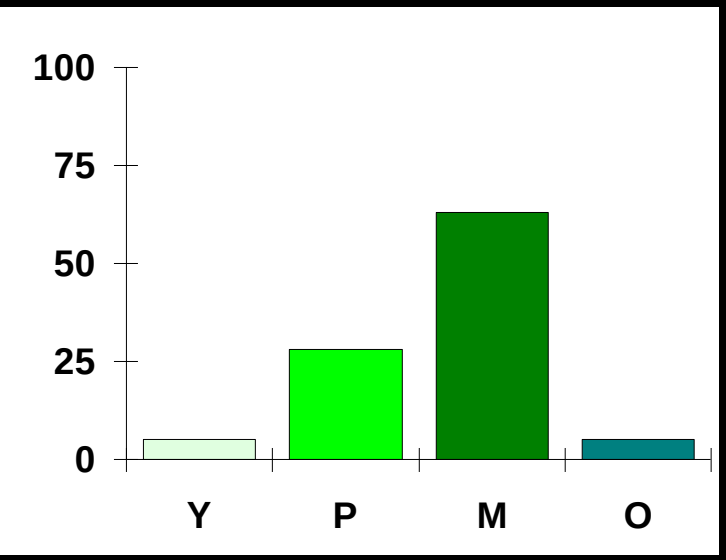
- **Distinctive levels of young, mid-seral, and old growth forest in each ecological region.**

HOWEVER, despite high data quality, the description of old growth "pattern" is limited by the sample size (1).

foothills model forest
a growing understanding

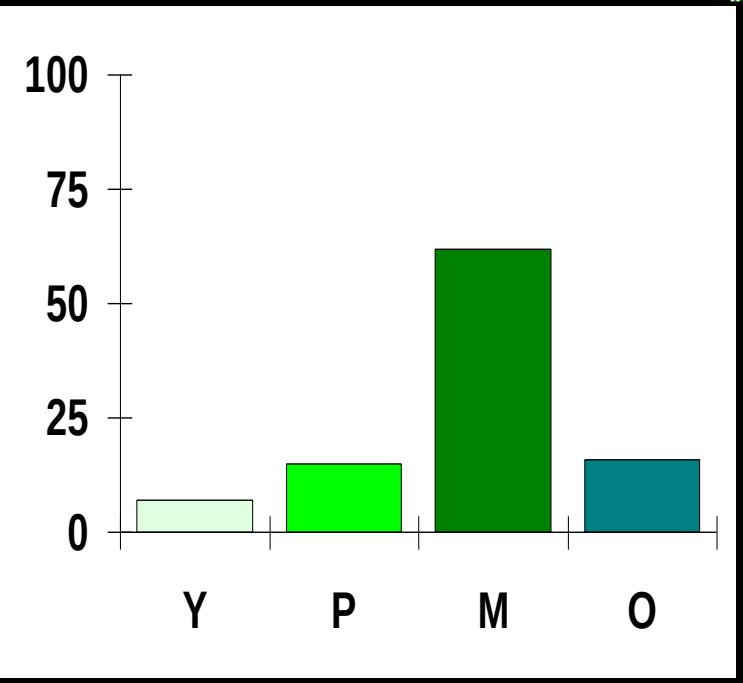
MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

Landscape in 1950 - Initial Condition



foothills model forest
a growing understanding

Landscape in 20 Years?



foothills model forest
a growing understanding

Older Forest as of 1950 on the Weldwood FMA

Ecological Region	%>300 yrs	%>200 yrs	%>100 yrs
Lower Foothills	0	0	16
Upper Foothills	0	4	21
Subalpine east	2	15	45

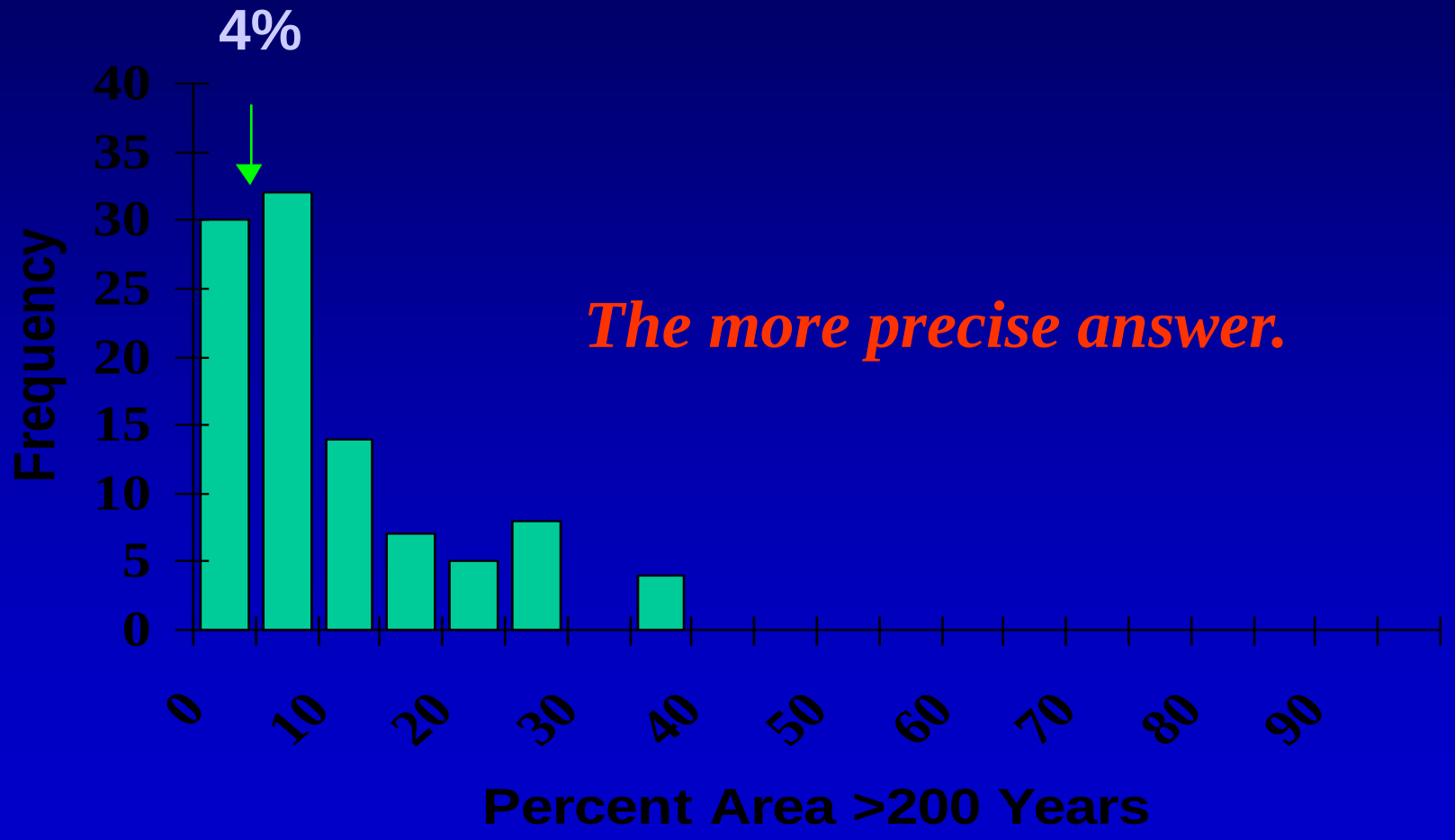
The simple answer.

foothills model forest
a growing understanding

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

Projected Historical Range of Area

for the Mature Forest of the Upper Foothills



The more precise answer.

foothills model forest
a growing understanding

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

Foothills Model Forest Natural Disturbance Research Program

- Natural disturbance research at all scales
- Presently in year 5 of the program
- Based on scientific research
- Driven by practical questions that are guided by project partners

foothills model forest
a growing understanding

WWW.FMF.AB.CA

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES