

# Setting goals for old growth forest: How large should management units be?

---

Rebecca Tittler &  
Christian Messier



# Mise en contexte





# Mise en contexte



How much?



# Mise en contexte



Natural-disturbance-based management:  
Within the range of natural variation.



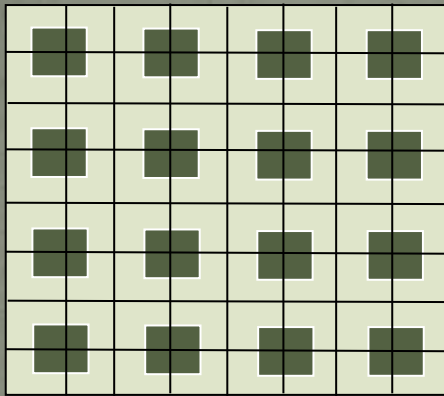
# Mise en contexte

Over what spatial scale?

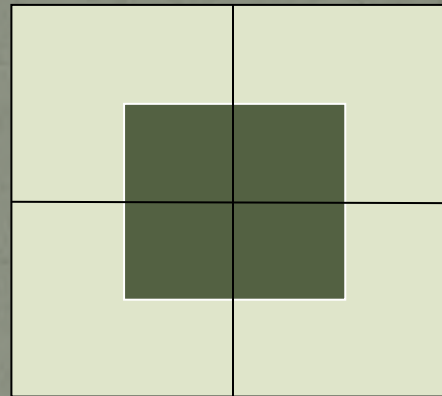


# Why does the size of the management unit matter?

Size of management unit



64 manage. units



4 manage. units

Maximum possible core area

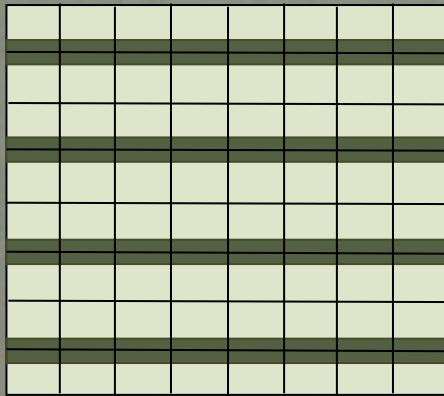
Landscape fragmentation

- Old growth
- Management unit

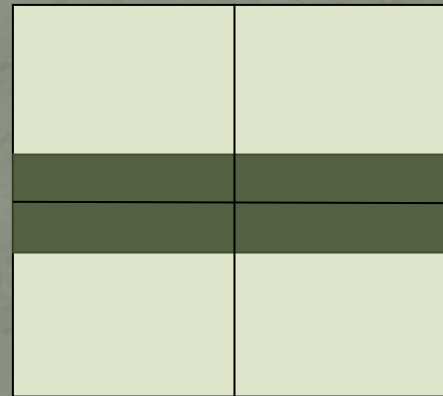


# Why does the size of the management unit matter?

Size of management unit



64 manage. units



4 manage. units

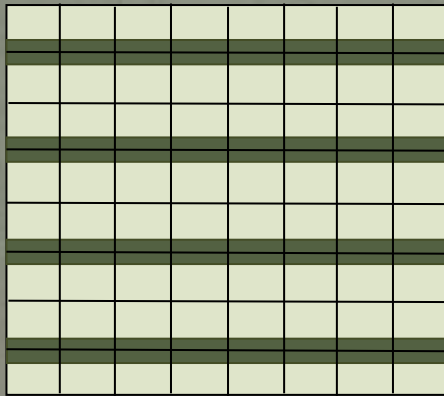
Maximum possible patch size

Landscape fragmentation

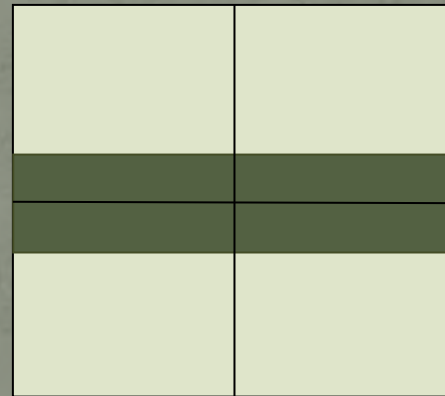
- Old growth
- Management unit

# Why does the size of the management unit matter?

Size of management unit 



64 manage. units



4 manage. units

**Relatively large patches of old-growth forest <-relatively large management areas.**

Old growth  
Management unit



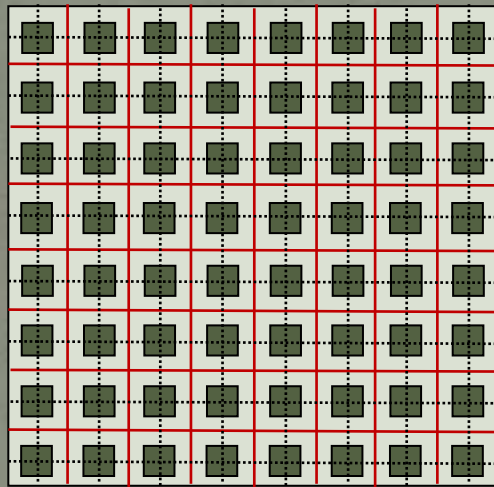
# So what is the appropriate size of management unit?

- In the context of NDBM, the area over which % old growth is relatively homogeneous in a natural forest, i.e., little variation in % old growth

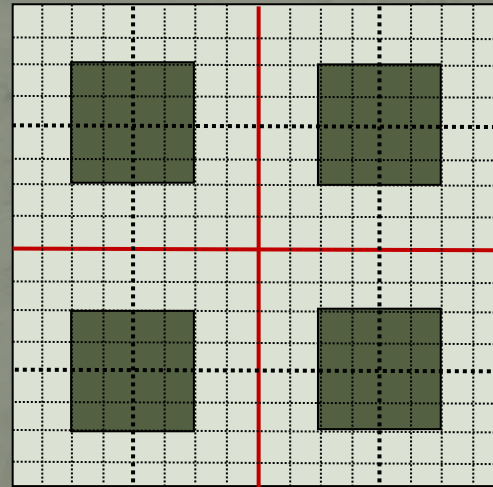
# So what is the appropriate size of management unit?

Here,  $\geq 4 \times$  patch size

4 squares



64 squares



■ Old growth □ Management unit



# Hypothesis

In a naturally fire-disturbed landscape, appropriate size of management unit will be  $>$  mean fire size

**MEAN FIRE SIZE, GRAIN OF LANDSCAPE**



**SCALE AT WHICH VARIATION IN AGE STRUCTURE DROPS OFF**

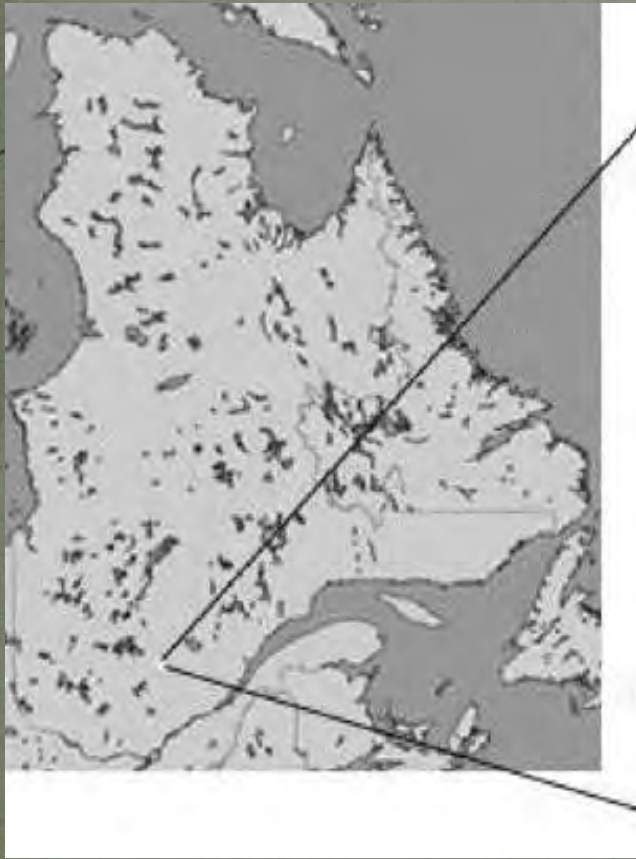
**APPROPRIATE SCALE OF MANAGEMENT**

# To test the hypothesis:

- 1. Identify the spatial scale over which variation in amount of old growth forest drops off in natural forests (threshold) OR in *MODELLED* natural forests**
- 2. Examine the relationship between this *most appropriate management unit size* and fire size**



# Study Area: Vermillon



-430 000 ha  
(390 000 ha  
forest) in  
Mauricie

-Spruce—  
yellow birch/  
Spruce—white  
white birch

-Naturally fire-  
disturbed

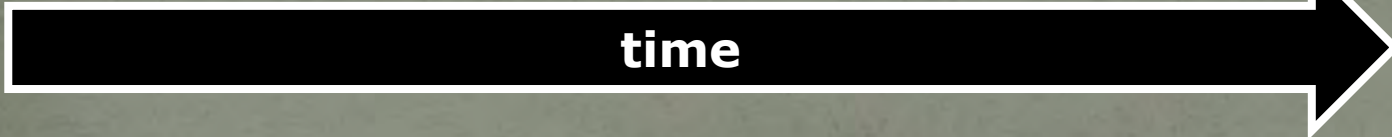
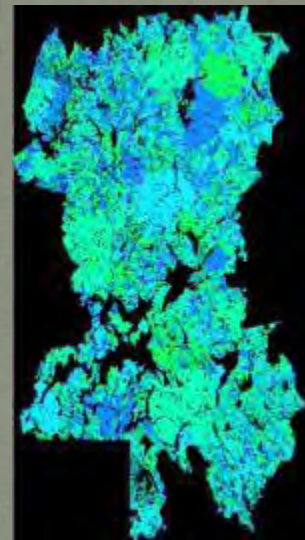
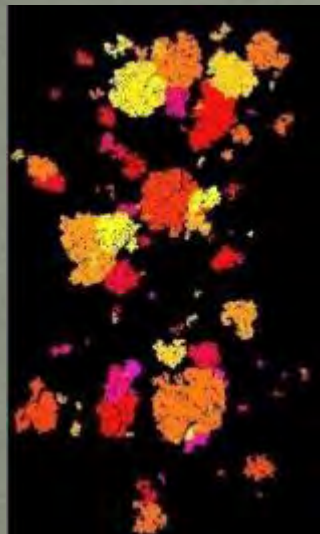
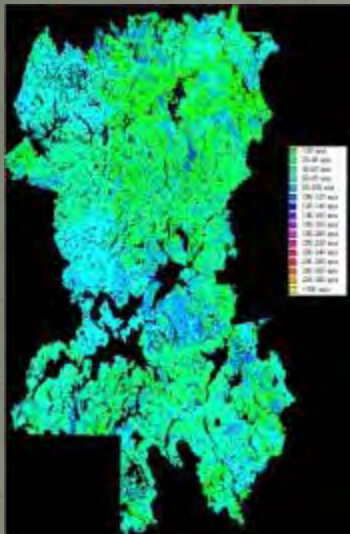
# The Model: VLM in SELES



- **Spatially Explicit Landscape Event Simulator**
- **Spatial resolution: 50x50m**
- **Temporal resolution: 5 years**
- **Simulates disturbance events (ignition, spread, succession, aging)**
- **Based on 3<sup>rd</sup> decadal SIFORT data (1997)**



# The Model: VLM in SELES

Landscape A + Fire + Succession = Landscape B



 20-year age classes  
 Fires

# The Model: VLM in SELES



## FIRES:

- Initiated at random, probability of spread depends on composition
- Negative exponential distribution

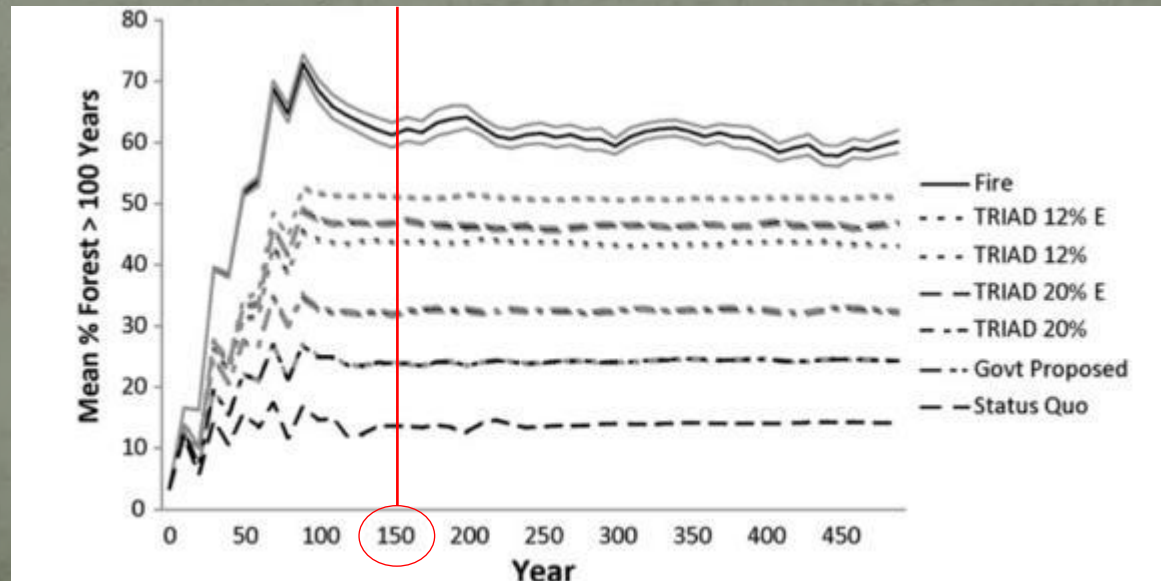
## SUCCESSION & AGING:

- Based on characteristics of pixel
- Age = 0 after fire
- Otherwise, Age = Age + 5



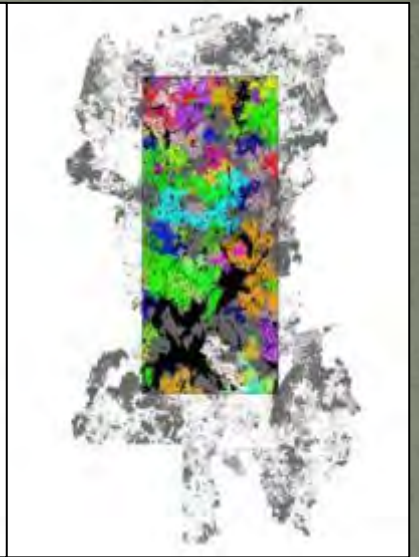
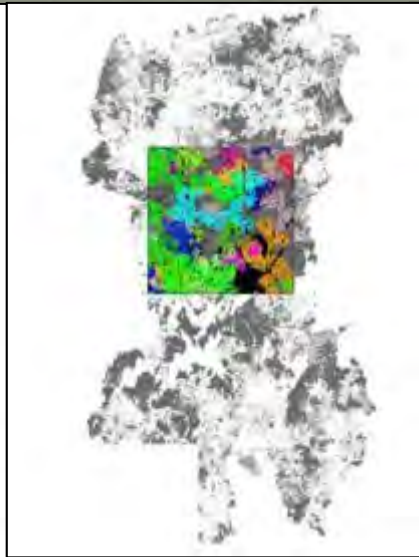
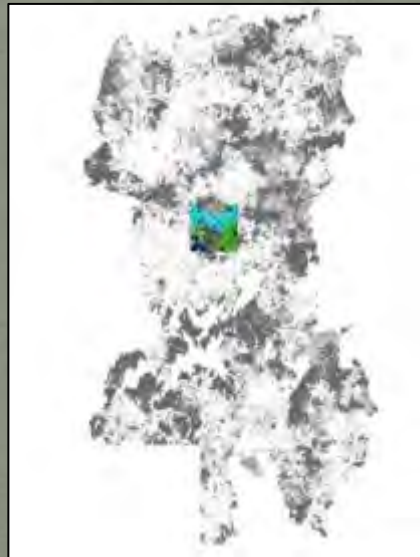
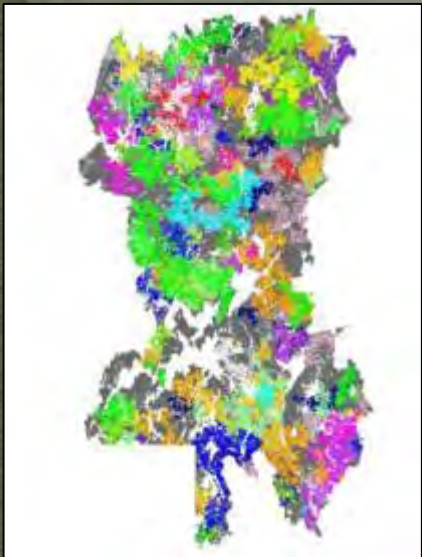
# Scenarios

- 10 different scenarios, varying in mean fire size ( $\sim 2300$ - $3900$  ha)
- 20 runs x 10 scenarios = 200 runs
- 150 years for each run



# Management Units

Amount of old growth calculated in management units of different sizes (1000-200 000 ha; 0.25 to 86 x mean fire size)



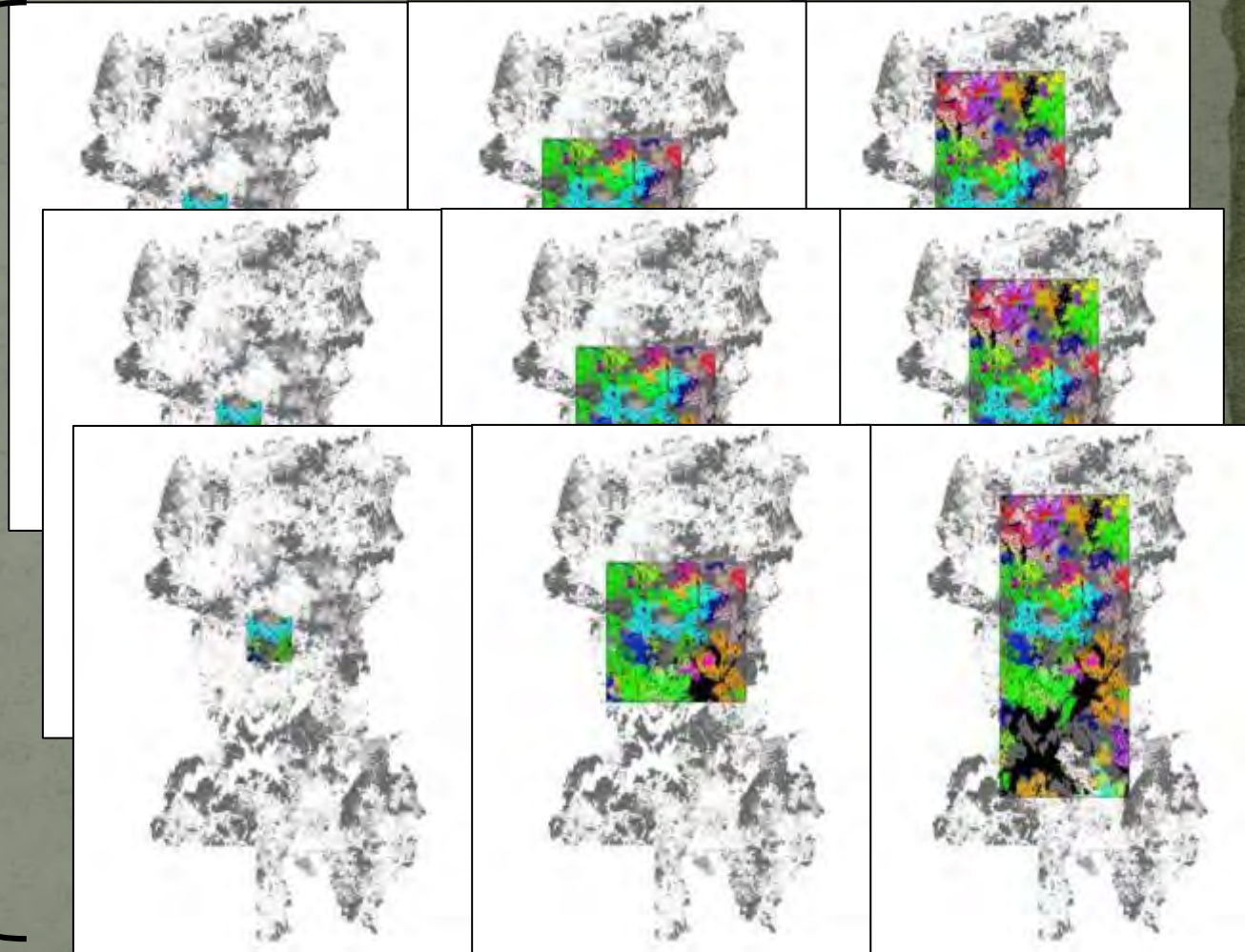
Management unit size (MU):      10 000 ha                      100 000 ha                      200 000 ha

x 10 scenarios x 20 runs = 200 times



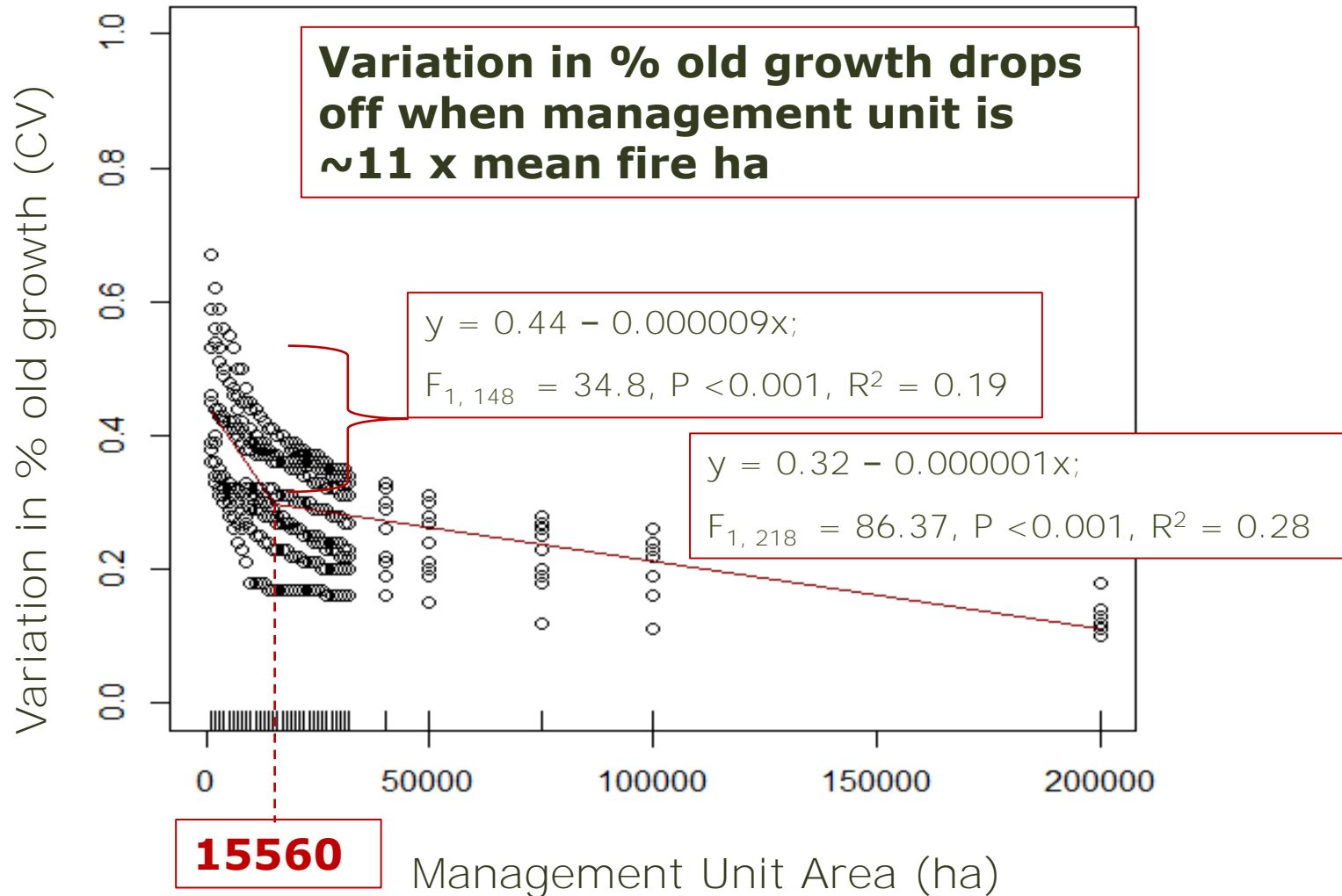
# Management Units

Variation  
(CV) in % old  
growth  
calculated  
between the  
20 runs of  
each  
scenario for  
each  
management  
unit size



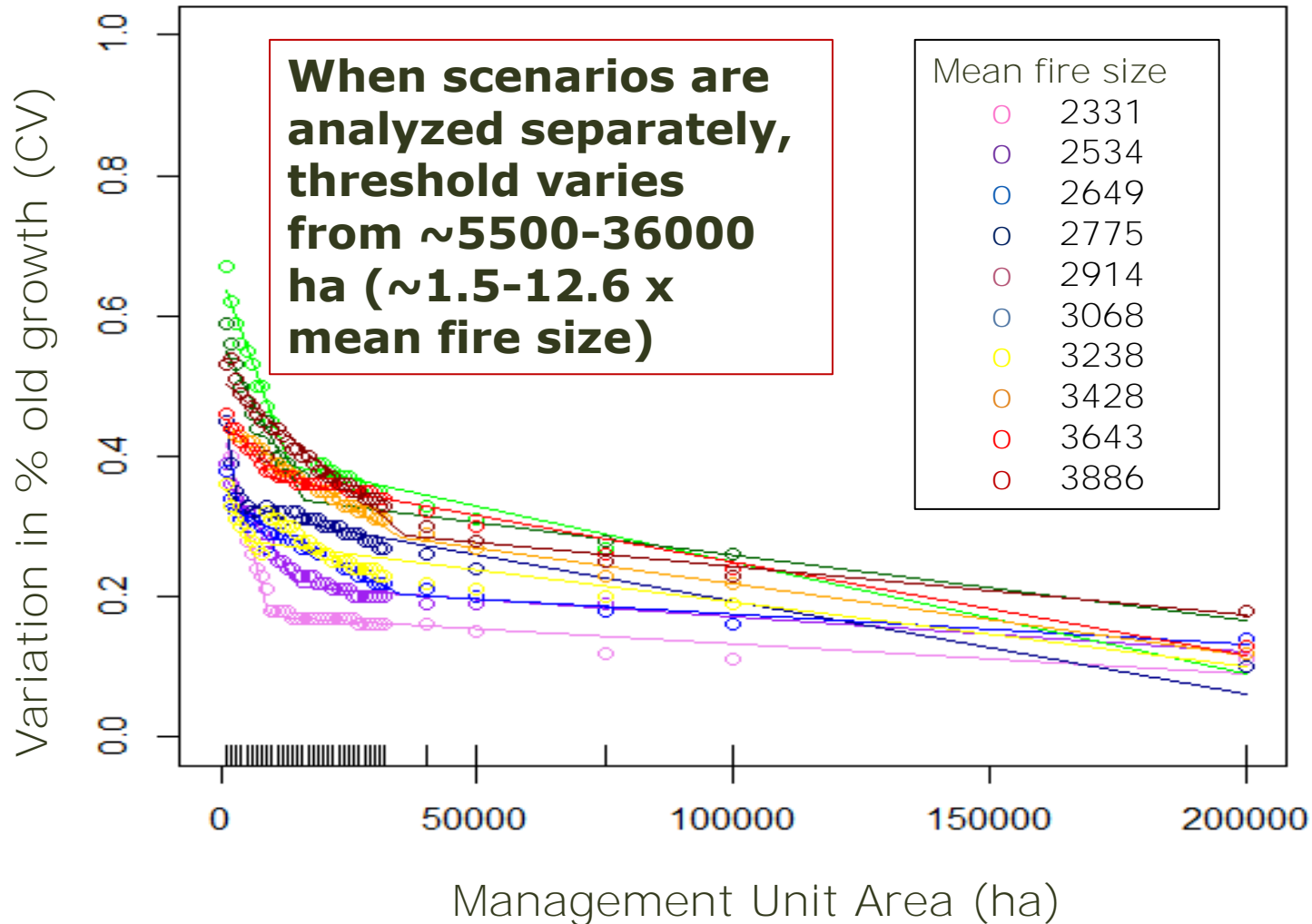
**x 20 for each scenario**

# Results

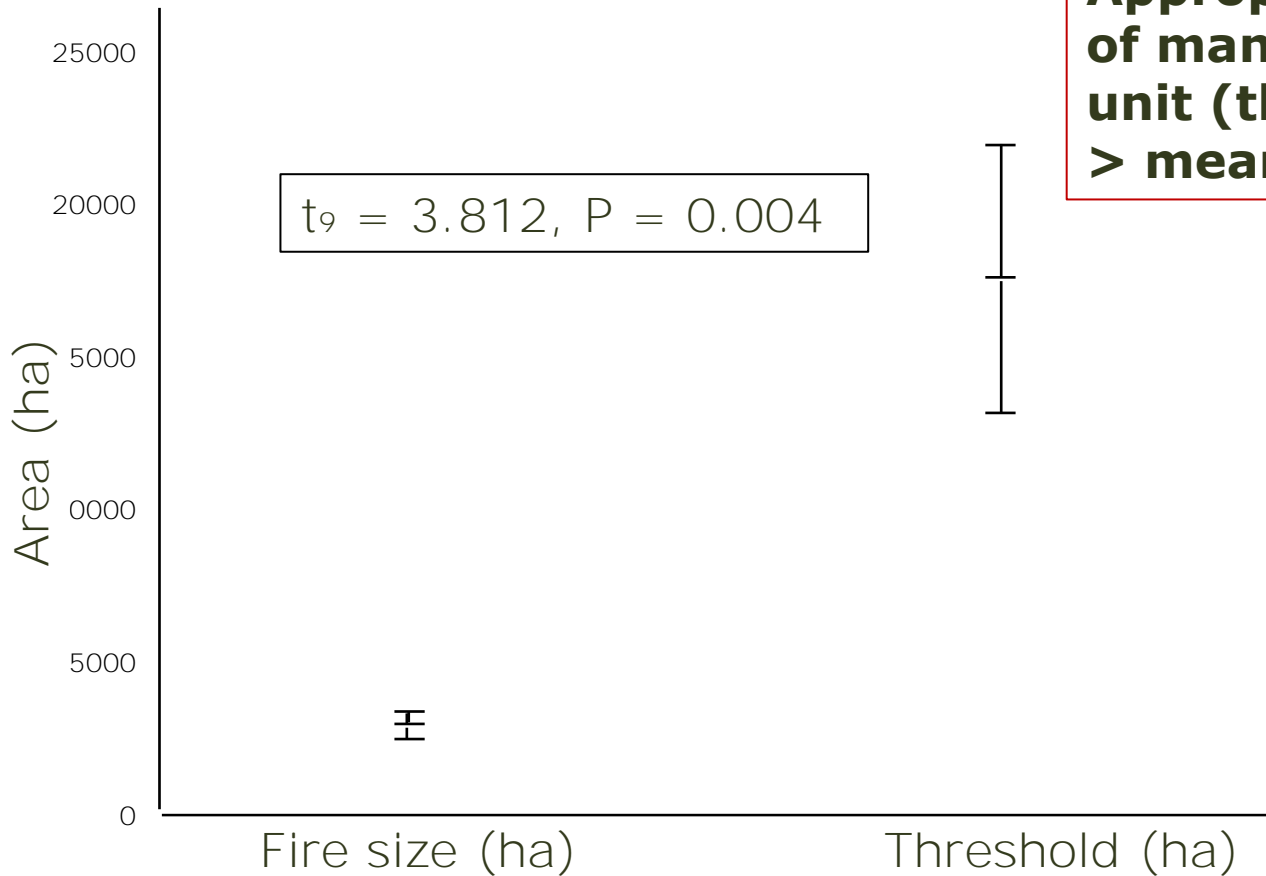




# Results



# Results

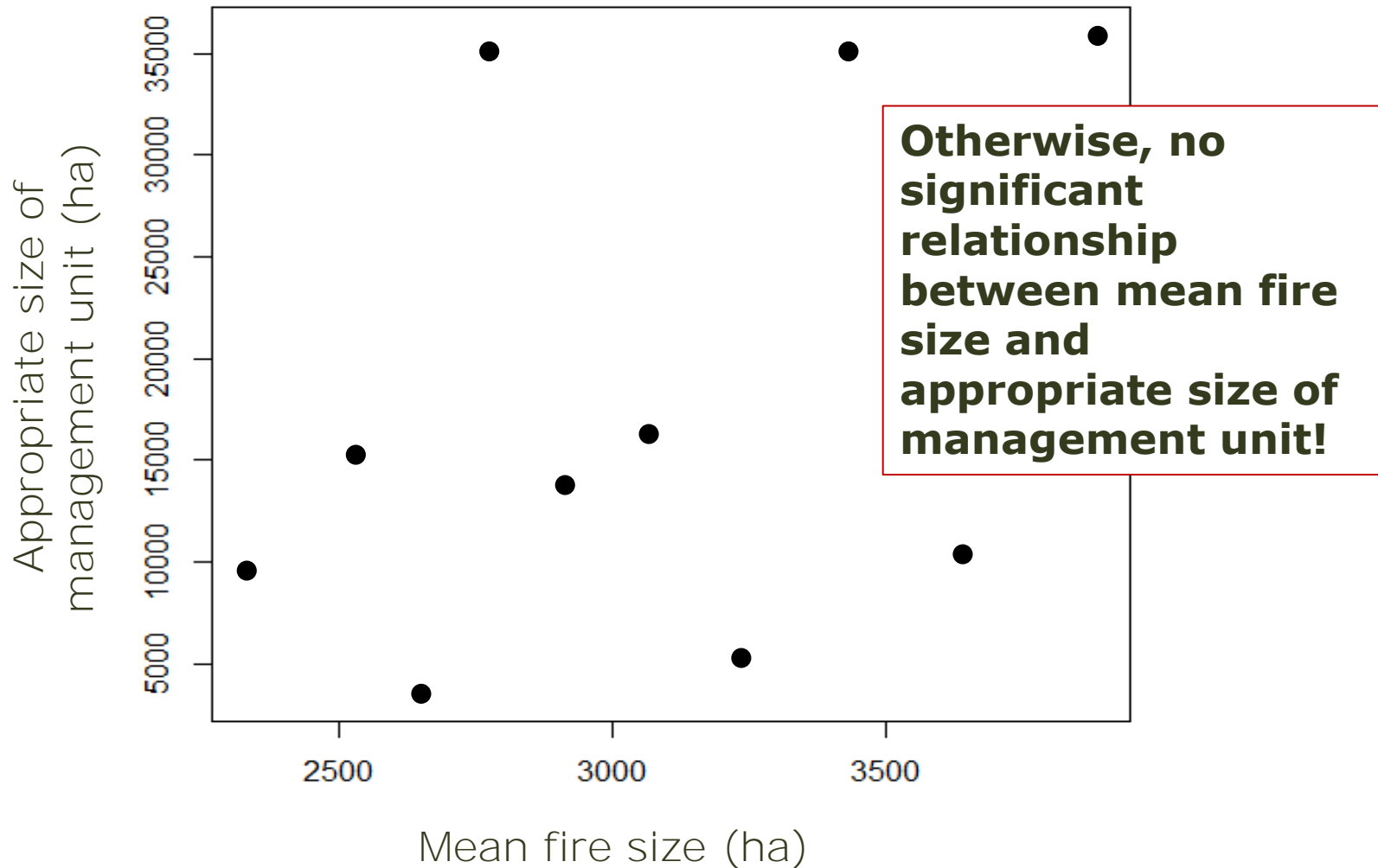


**Appropriate size  
of management  
unit (threshold)  
> mean fire size**

Mean  $\pm$  standard error



# Results



# Implications

- **In the Mauricie, goals for old growth should be set in management units an order of magnitude larger than mean fire size**
- **Management units should be larger than mean fire size...BUT otherwise no significant linear relationship between the two!**



# Further questions

- Perhaps the mean is not the best reflection of distribution in fire size? Examine median? Max?



# Further questions

- **Greater variation in fire size distributions**
- **Topography? Water?**

?