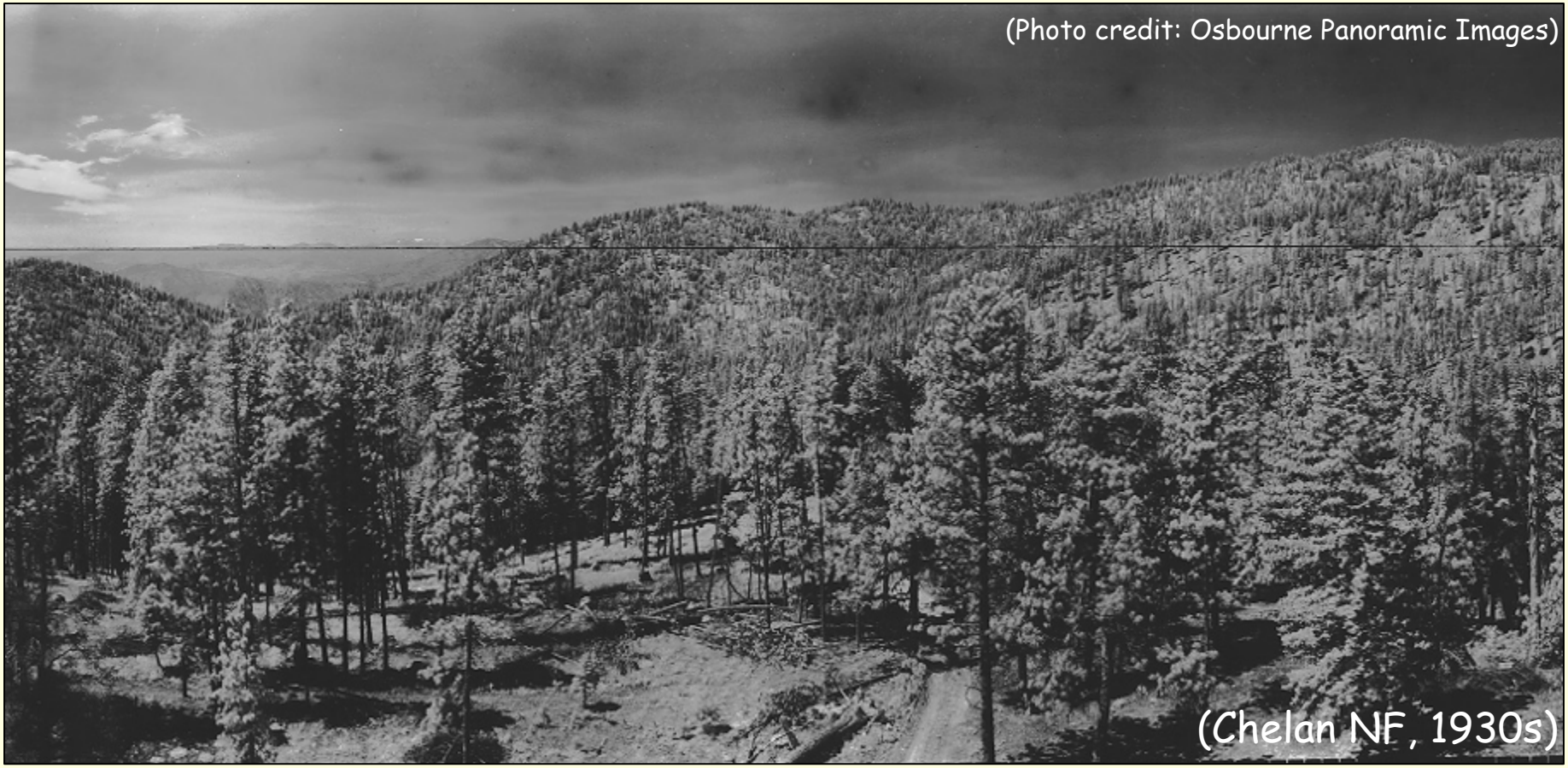
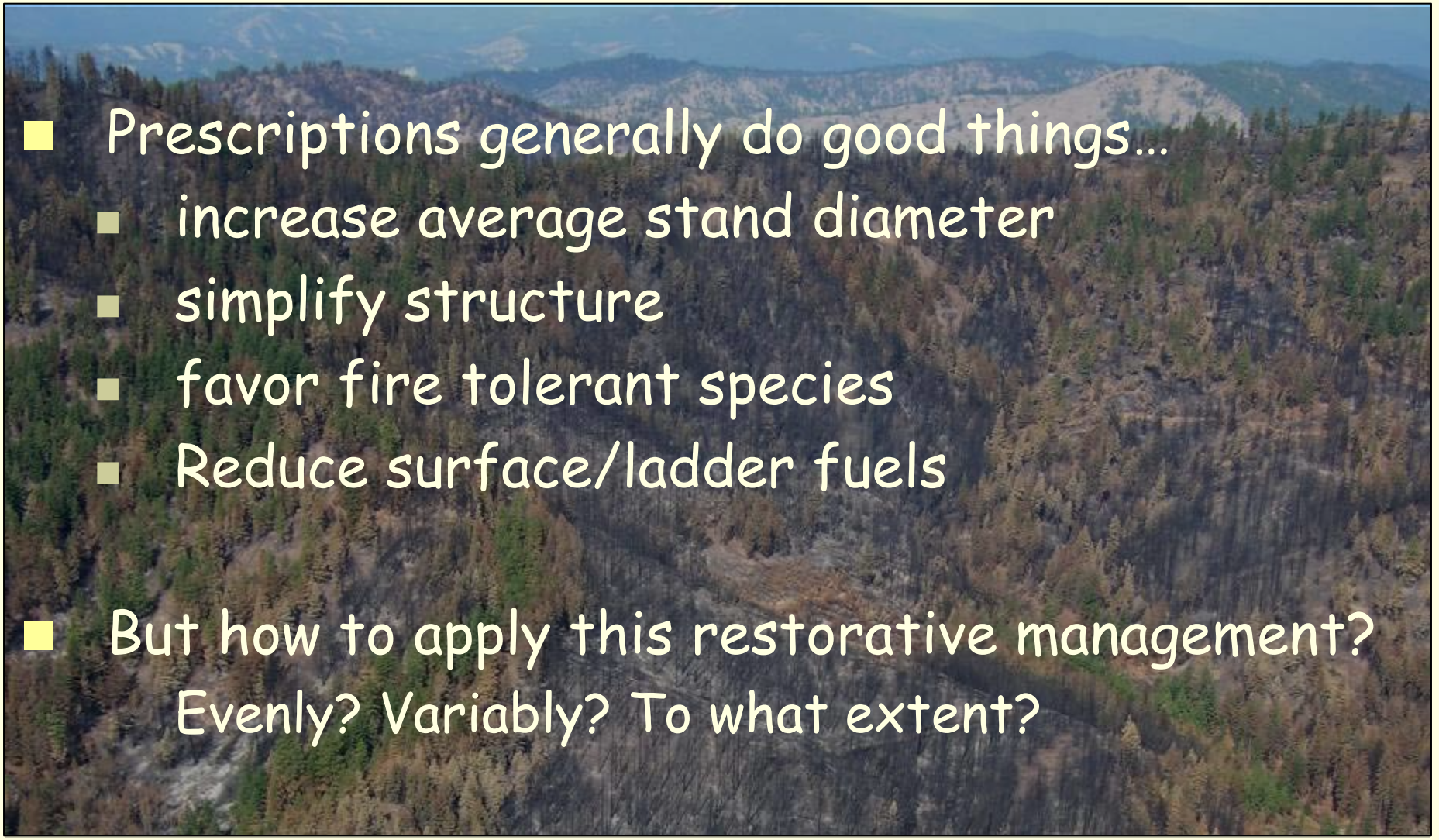
Homogeneous or Heterogeneous Stands?
Prescriptions for Restoring Mixed Conifer Forests



Paul Hessburg USDA-Forest Service,
Pacific Northwest Research Station, Wenatchee, WA

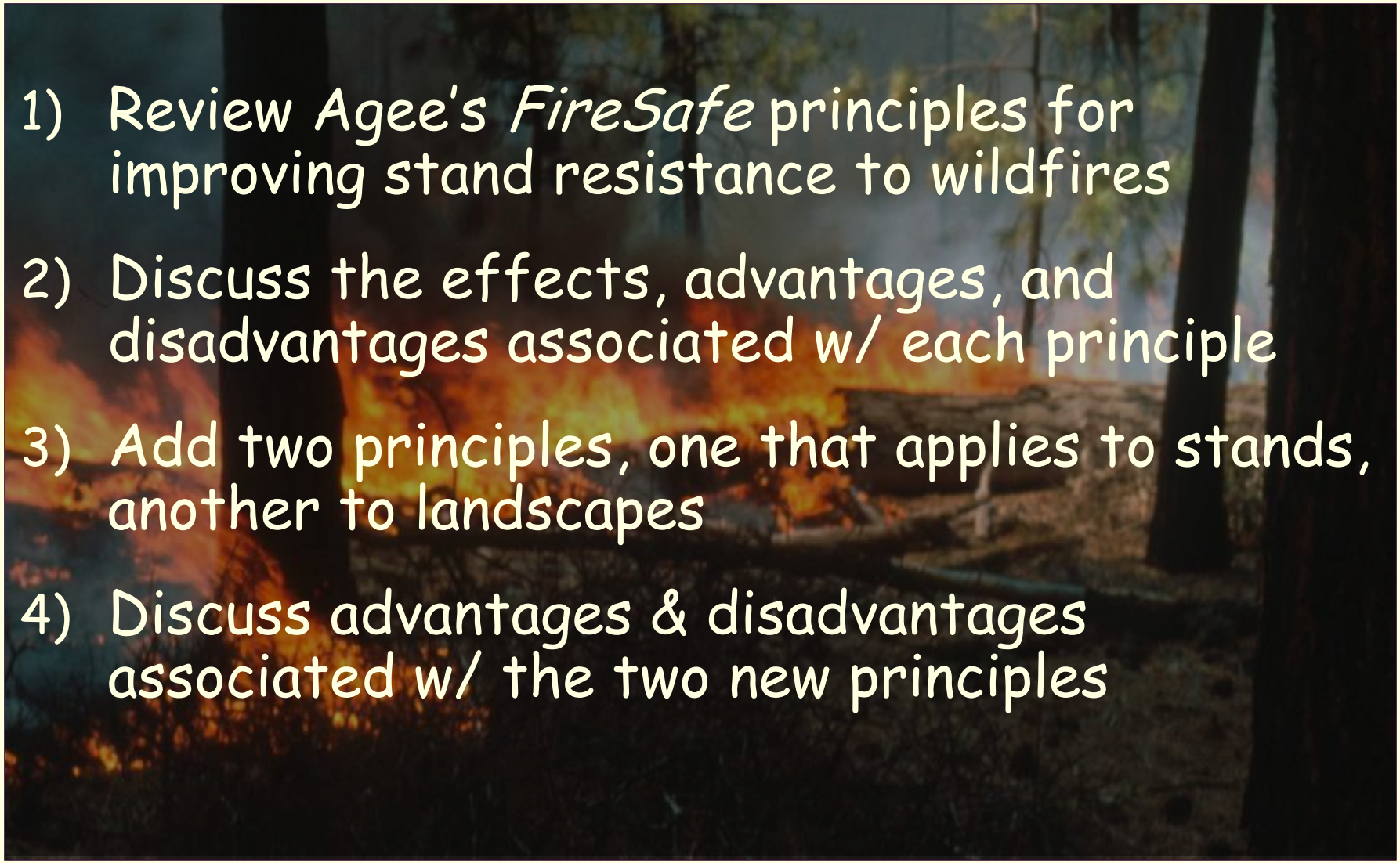
Inland Northwest mixed conifer forests are burning with increased severity and extent

In response, managers are prescribing controlled burns, often combined with thinning or other mgt, to improve stand tolerance to wildfires.



- Prescriptions generally do good things…
  - increase average stand diameter
  - simplify structure
  - favor fire tolerant species
  - Reduce surface/ladder fuels
- But how to apply this restorative management? Evenly? Variably? To what extent?

Objectives



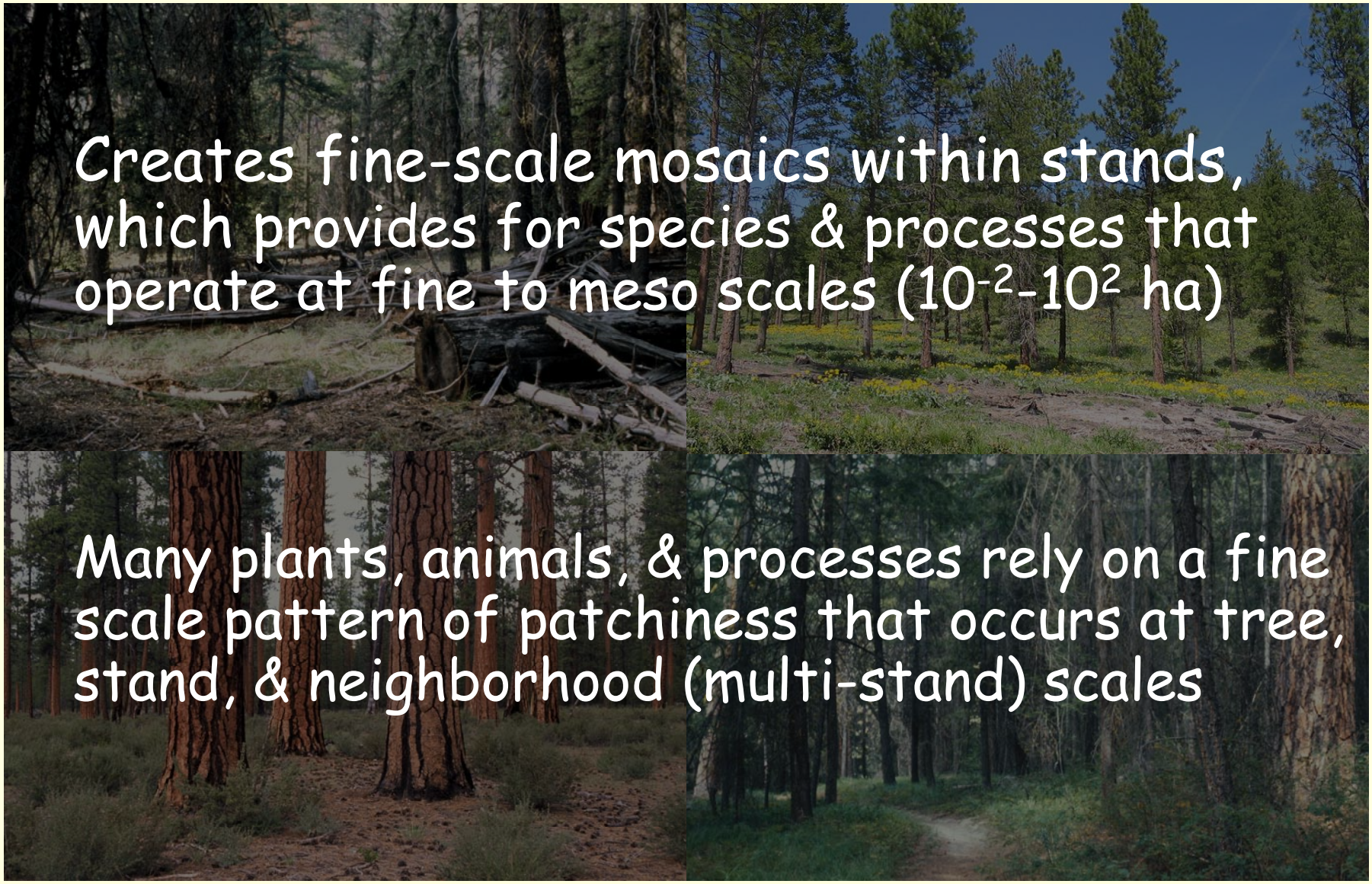
1) Review Agee's *FireSafe* principles for improving stand resistance to wildfires
2) Discuss the effects, advantages, and disadvantages associated w/ each principle
3) Add two principles, one that applies to stands, another to landscapes
4) Discuss advantages & disadvantages associated w/ the two new principles

Principles of Fire Resistance for Dry Forests

PRINCIPLE	EFFECT	ADVANTAGES	DISADVANTAGES
Reduce surface fuels	Reduces flame length & fireline intensity	Easier fire control, Less torching	Surface disturbance, less w/ fire, more w/ thinning
Increase height to live crown	Eliminates ladder fuels; Longer flames needed to initiate torching	Less torching	Opens up the understory; Surface winds may increase
Decrease crown density	Reduces crown fuel continuity & heat trapping	Reduces crownfire ignition & spread potential	Surface winds may increase; Drier surface fuels
Favor fire-tolerant tree species	Reduces overall tree mortality	Higher landscape tolerance to L & MSFs	If too broadly applied, simplifies landscapes
Favor large fire-tolerant trees	Reduces mortality for same fireline intensity	Yields more LSOF, remnant large tree structure	May reduce economic viability, increase bark beetle risk
Apply treatments unevenly *within* stands	Creates fine-scale mosaics within stands	Supports fine-scale processes & habitats	Takes effort, must understand historical *within-stand* clumpiness of fuels, canopy cover, trees
Vary patch sizes *among* stands	Creates meso-scale landscape mosaics within regional landscapes	Supports meso-scale processes & habitats	Takes effort, must understand historical landscape patterns of fuelbeds, structure, composition, canopy cover

(Adapted from Agee 2002, Hessburg and Agee 2003, Agee and Skinner 2005)

Apply treatments unevenly **within** stands--**Why?**



Creates fine-scale mosaics within stands, which provides for species & processes that operate at fine to meso scales (10^{-2}-10^{2} ha)

Many plants, animals, & processes rely on a fine scale pattern of patchiness that occurs at tree, stand, & neighborhood (multi-stand) scales

Apply treatments unevenly **within** stands--**How?**

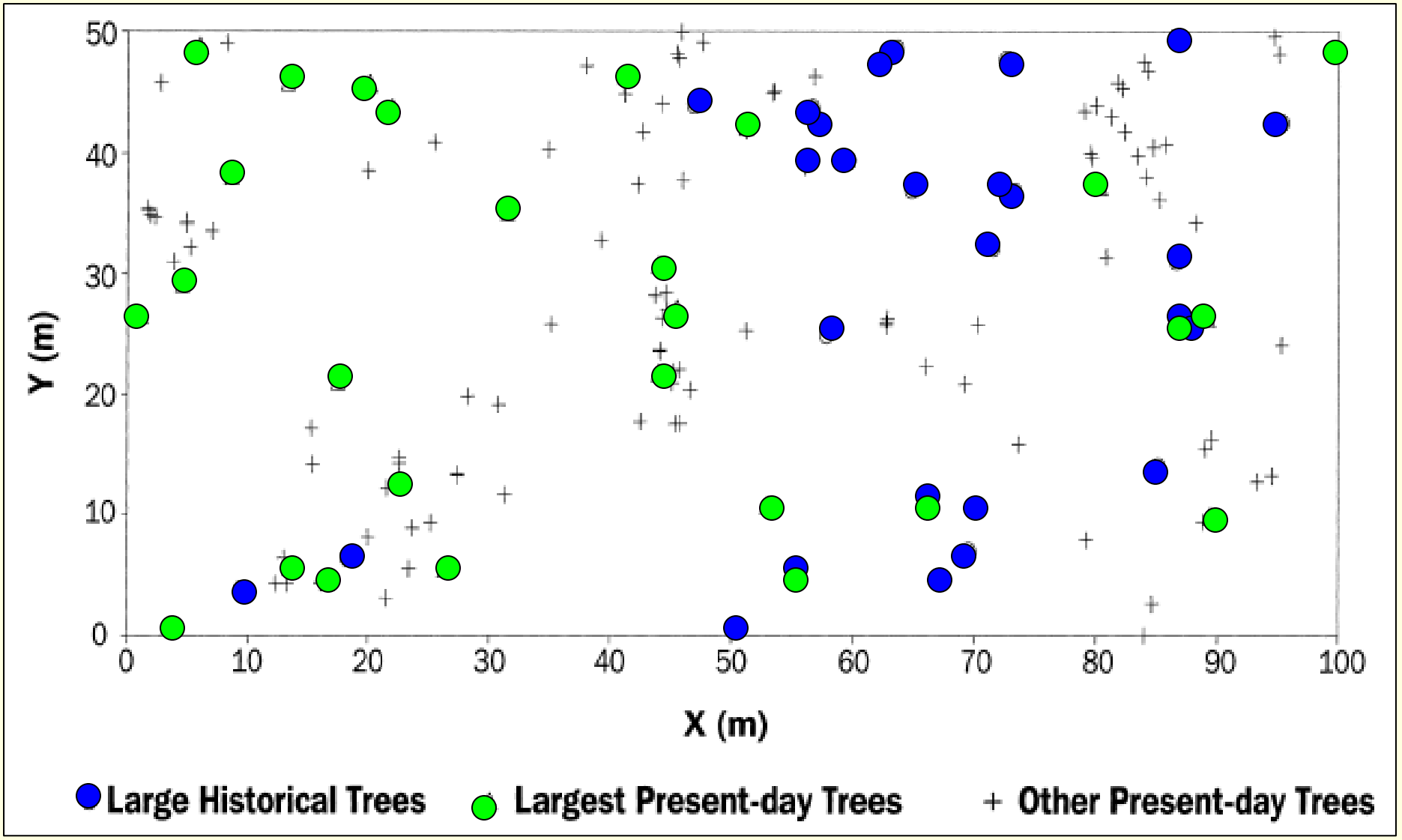
Create clumpy vs. even conditions

- Reduce surface fuels--but leave some fuels in variable sized clumps
- Increase height to live crown--but leave scattered clumps with low crown bases
- Decrease crown density--but leave scattered clumps with interlocking crowns
- Favor fire tolerant PP--but leave occasional clumps of intolerant DF and GF
- Favor the large PP--but occasionally leave DF, GF

RJ Harrod et al./ Forest Ecology and Management 114 (1999) 433-446

Example stem map from a Hot Dry Shrub/Herb plot (HD1)

(Pooled PIPO/PUTR/AGSP and PSME/PUTR/AGSP PAG)



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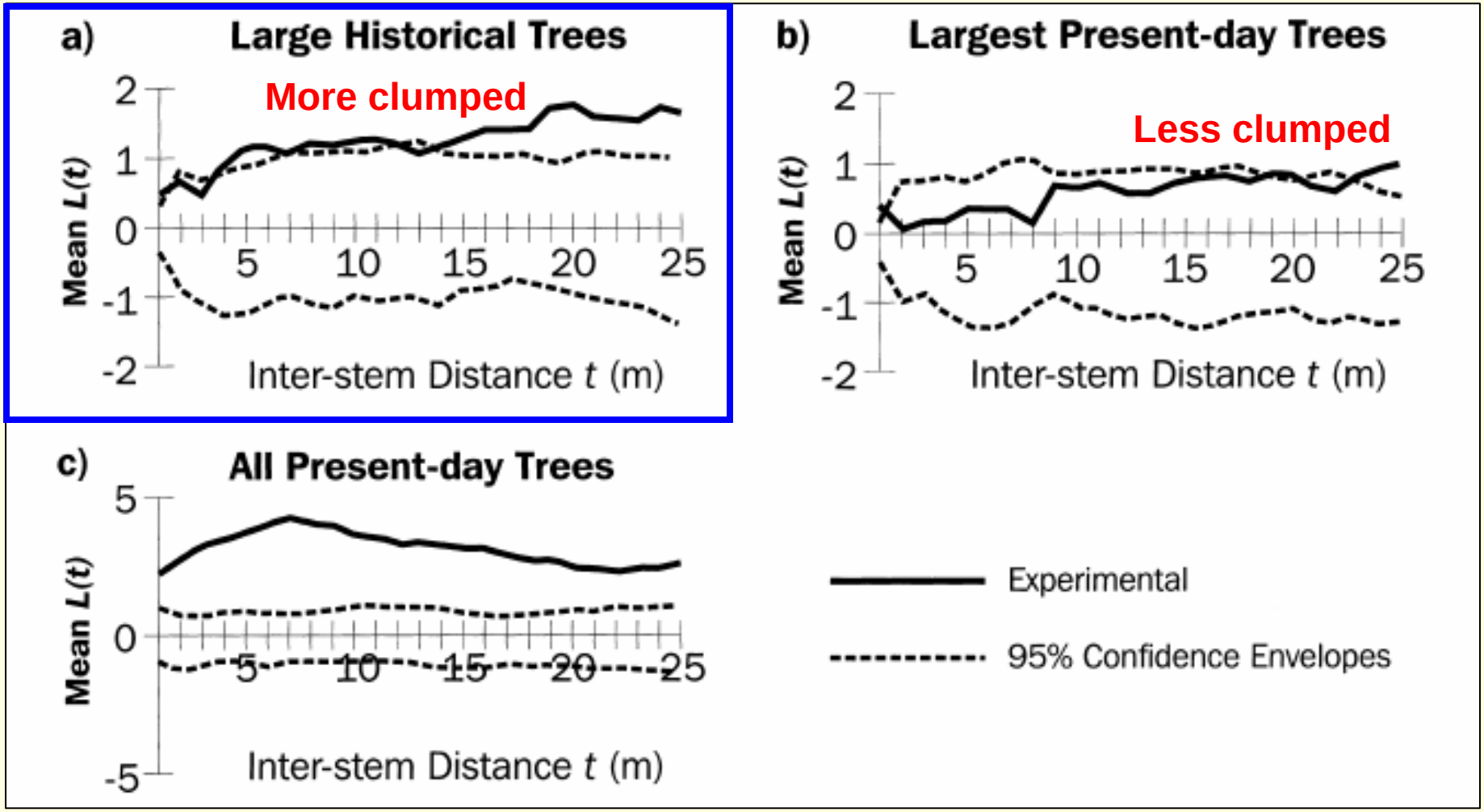
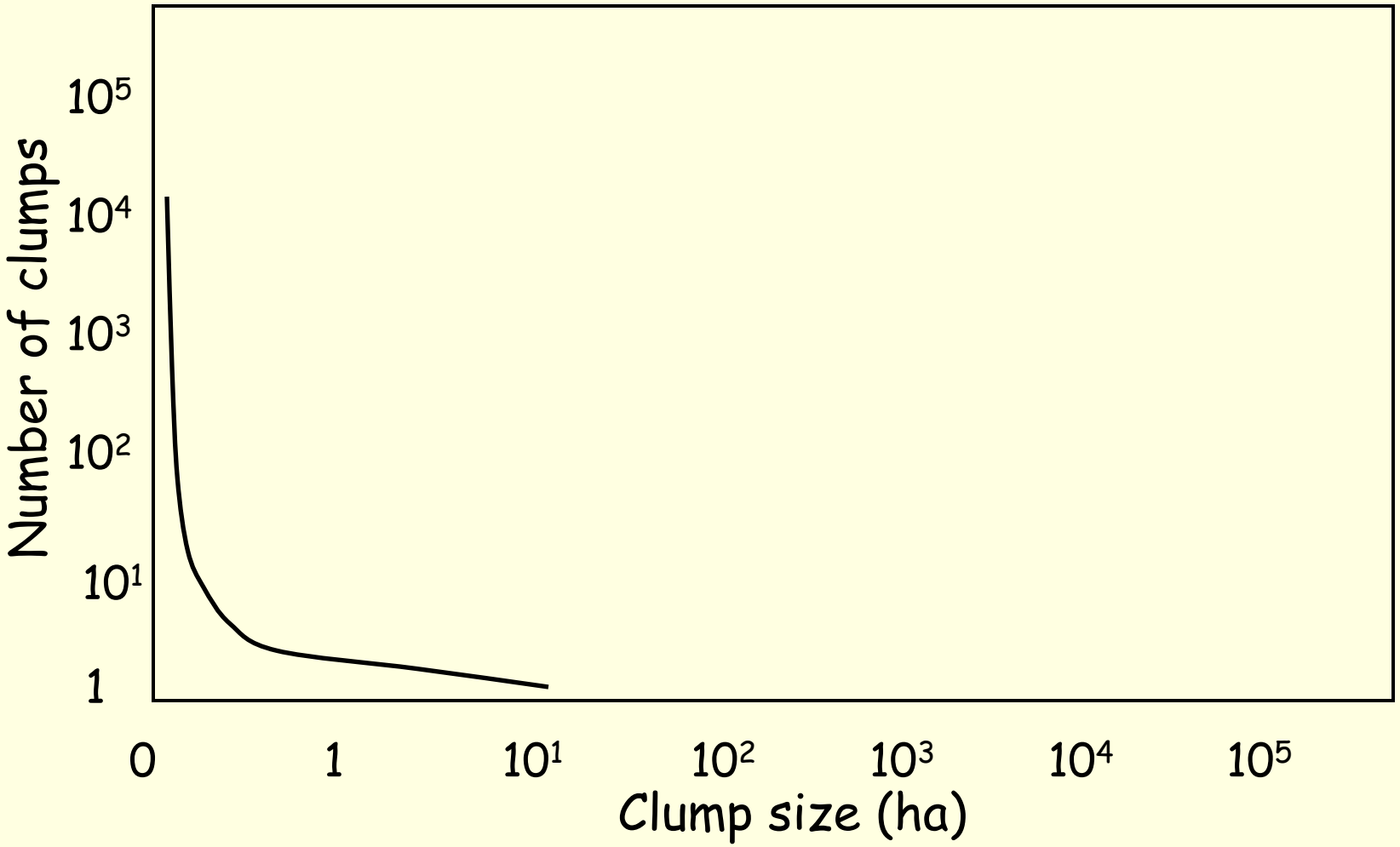
Mean positive *L(t)* values reflect clumped historical stem distribution

(negative values reflect more regular patterns)



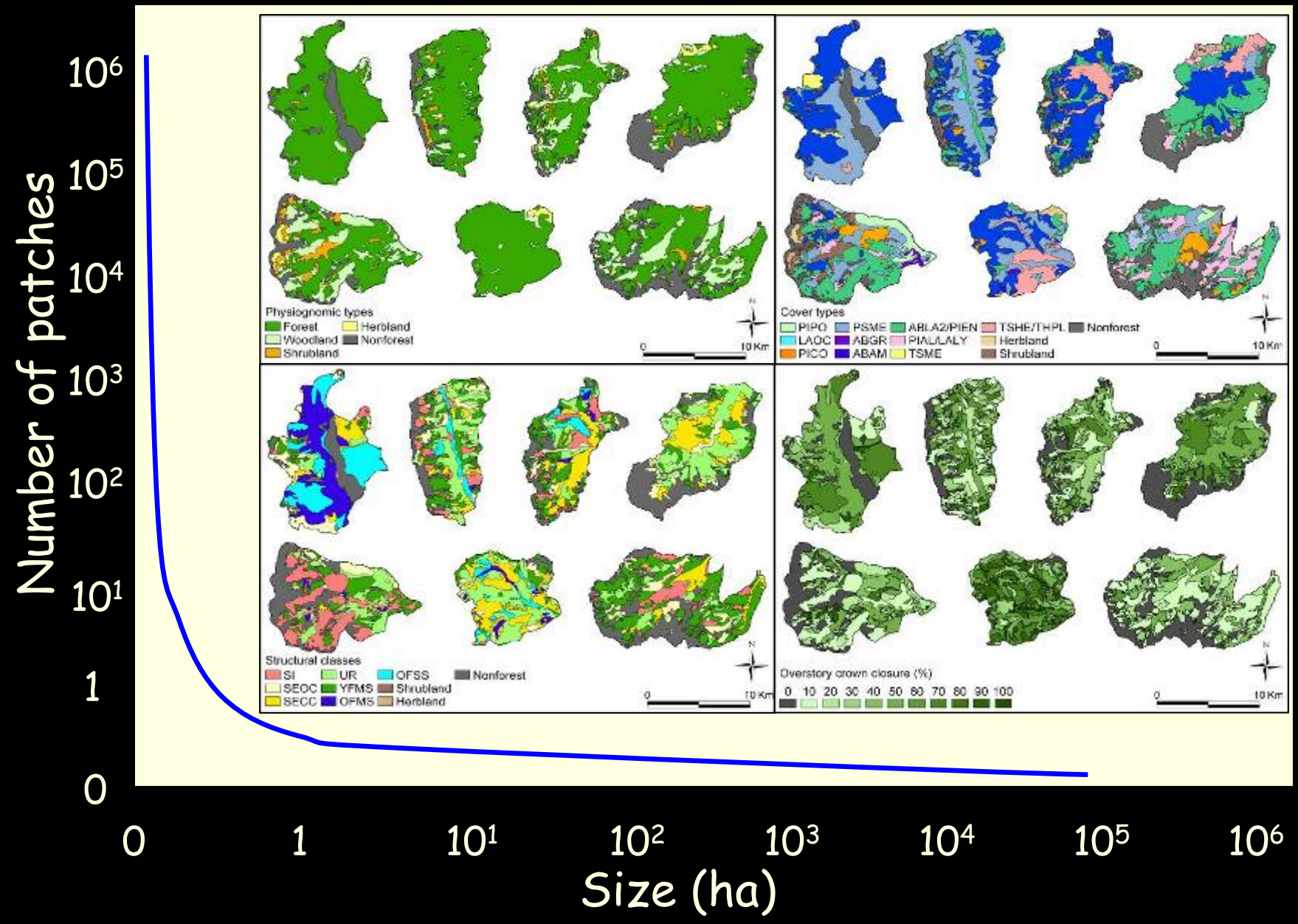
Apply treatments unevenly **within** stands--**How?**



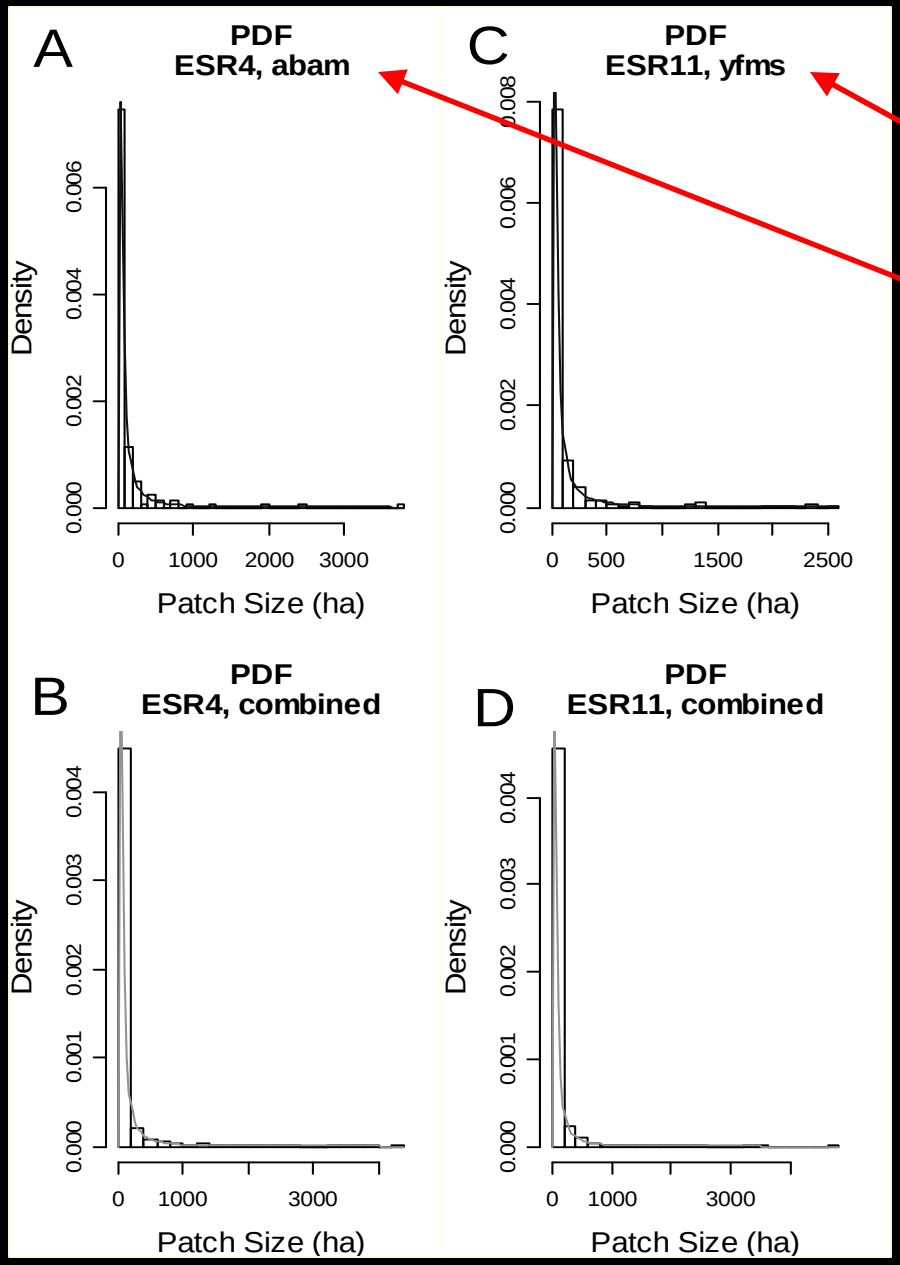
Vary patch sizes **among** stands

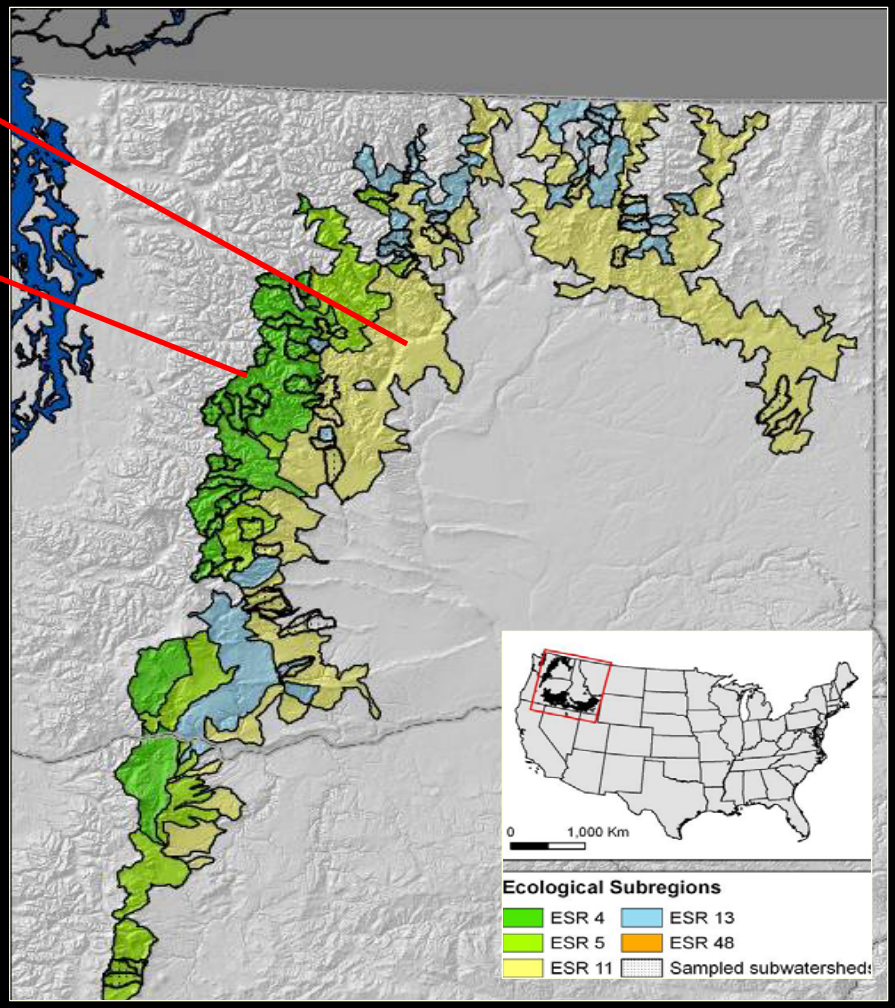
- Create mosaics of variably sized patches of forest structural condition, cover type, & physiognomy
- We consistently find more varied historical patch sizes than those occurring under mgt
- Recall that in forest, grass and shrub patches are typical early seral conditions in forests, especially after fires

Vary patch sizes among stands



Probability density functions (PDFs)



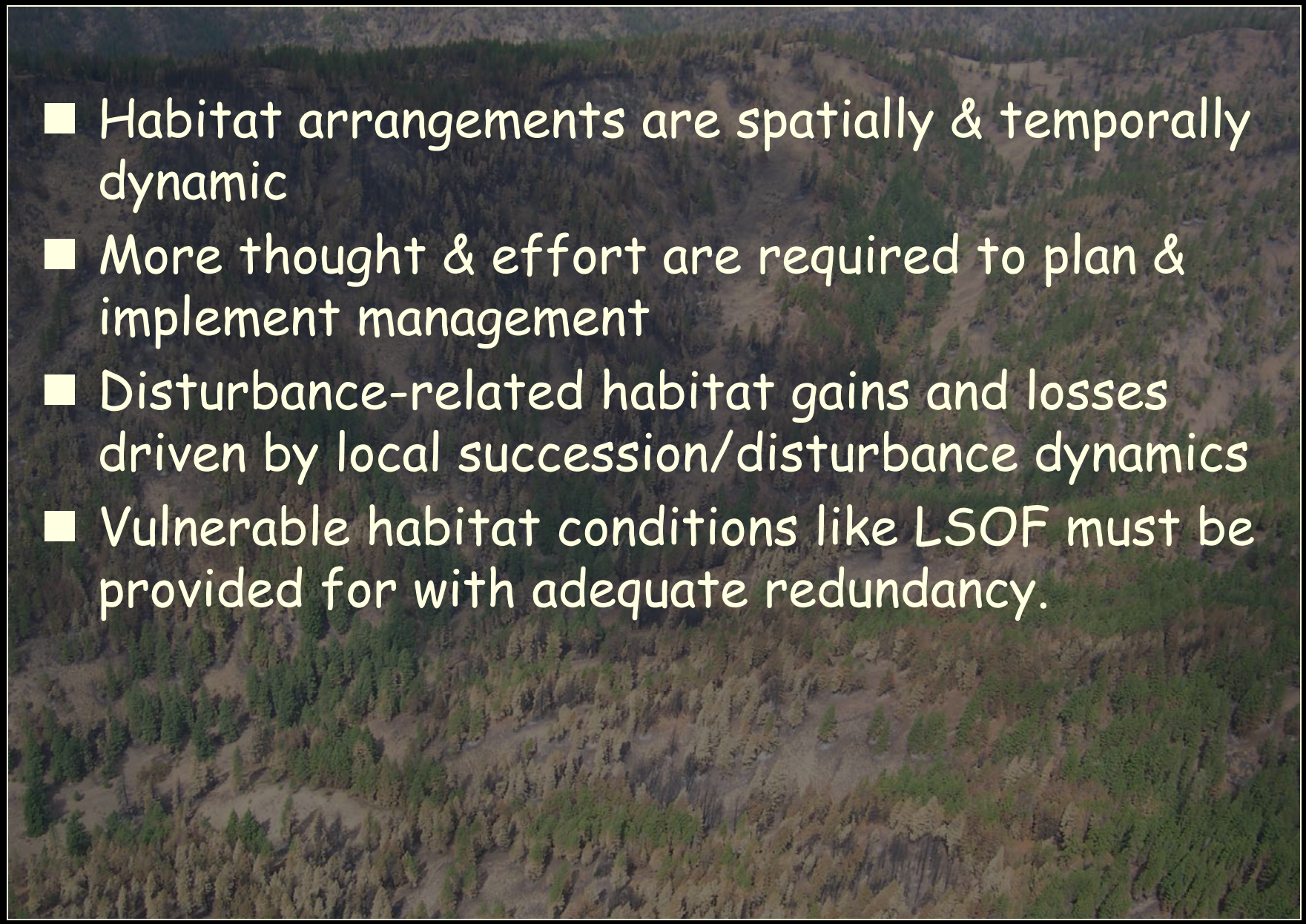


Lots of small, fewer medium, large, and very large patches

Advantages of varying patch sizes

- Broadly varying patch sizes varies the threat of stand replacing disturbance in space & time
- Creates a spatial discontinuity, impt. w/ "migratory" disturbance processes
- Yields smaller average and more variably-sized wildfire/bark beetle/defoliator disturbed areas.
- Yields more variable fire severity and severity patch sizes, i.e., more LSF & MSF, less HSF
- Also true of other disturbances, desirable from vantage of native species and processes
- Reduced severity fosters retention of more large trees, LS + OF structure

Disadvantages of varying patch sizes



- Habitat arrangements are spatially & temporally dynamic
- More thought & effort are required to plan & implement management
- Disturbance-related habitat gains and losses driven by local succession/disturbance dynamics
- Vulnerable habitat conditions like LSOF must be provided for with adequate redundancy.

Summary

Stands (Patches)

- Create mosaics within stands
- No two stand mosaics the same
- Don't overdo it and lose sight of goals
- Study local historical within-stand variation of fuels, density, spp composition, clumpiness

Before

Landscapes

- Vary stand size broadly
- Primary focus--creating stand sizes in the "middle numbers"; i.e., 10^{1} to $10^{3.5}$ ha range
- No two landscape mosaics the same

After

Vary patch size **among** stands