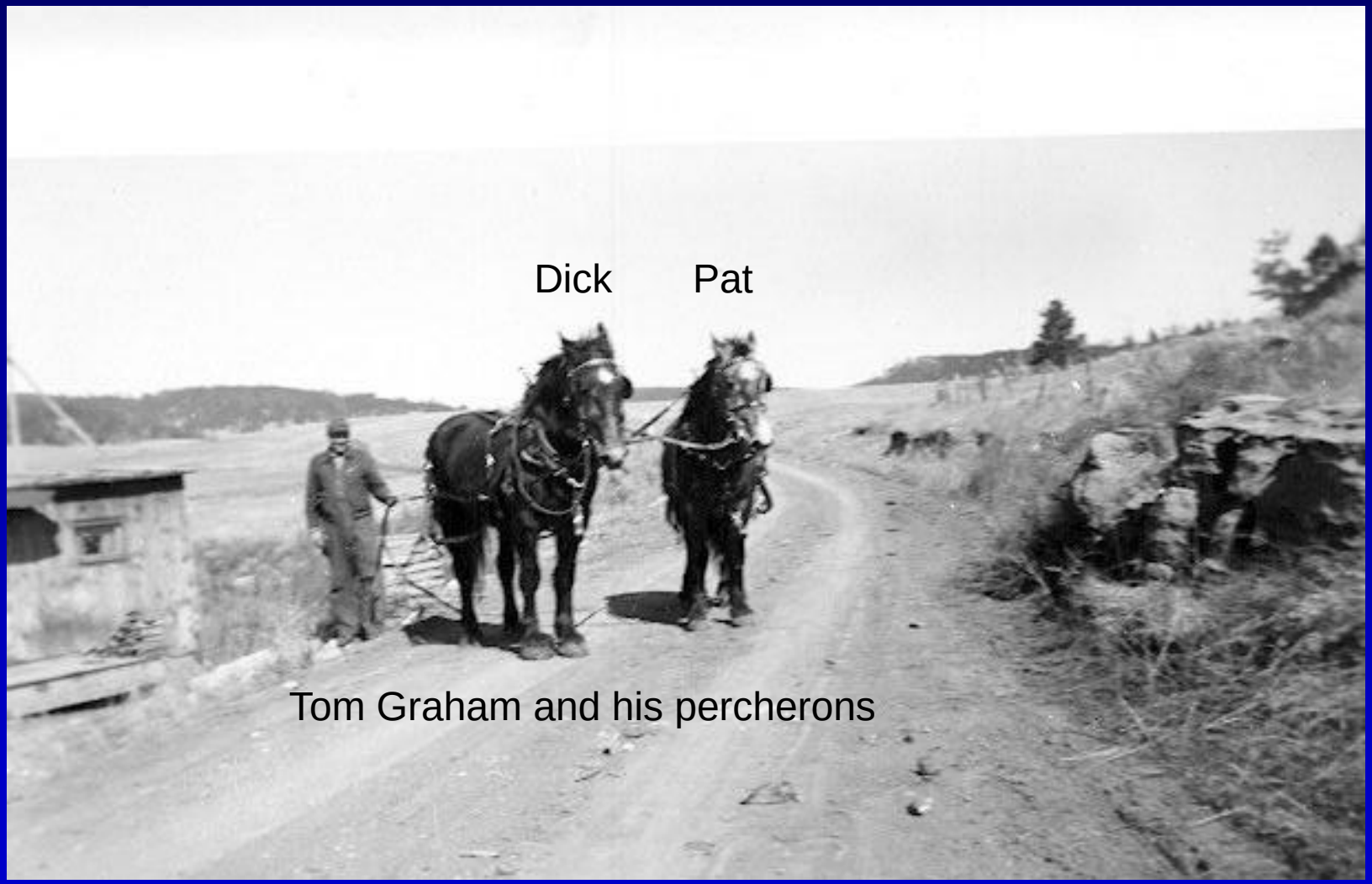
RMRS



Tom Graham and his percherons

Dry and Moist Mixed Conifer Forests of Idaho

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Rocky Mountain Research Station
USDA Forest Service
Moscow, ID 83843
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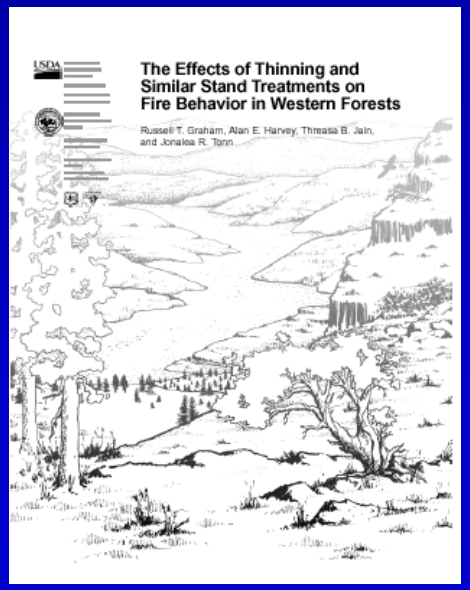
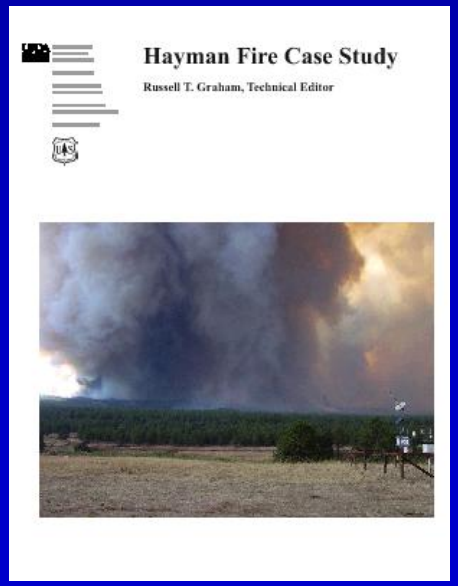
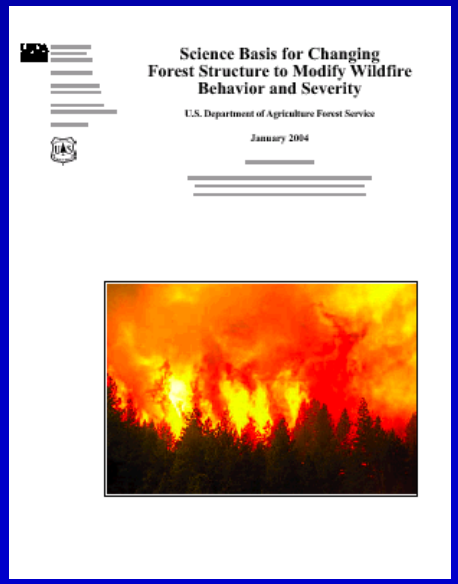
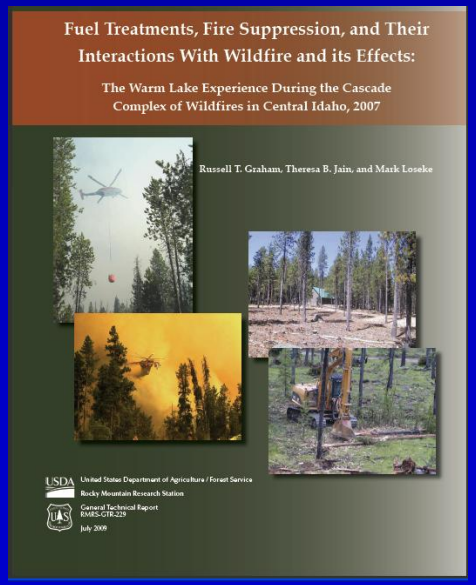
Information

- The effects of thinning and similar stand treatments on fire behavior in western forests; PNW-GTR-463
- Hayman Fire Case Study; RMRS-GTR -114
- Warm Lake RMRS-GTR - 229
- Science Basis for changing forest structure to modify wildfire behavior and severity; RMRS-GTR-120









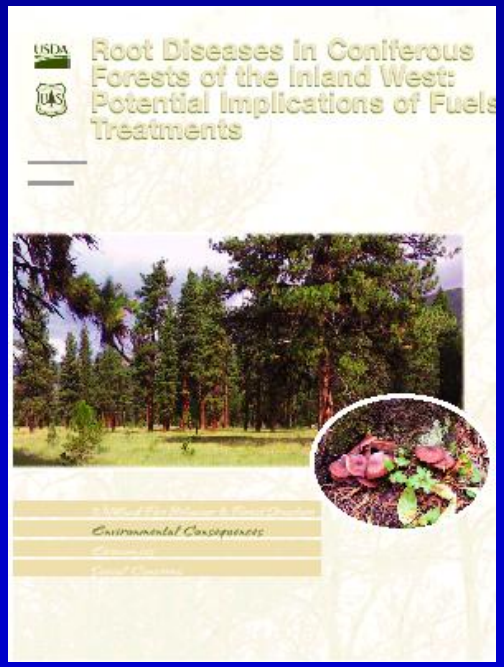
Fuel Synthesis

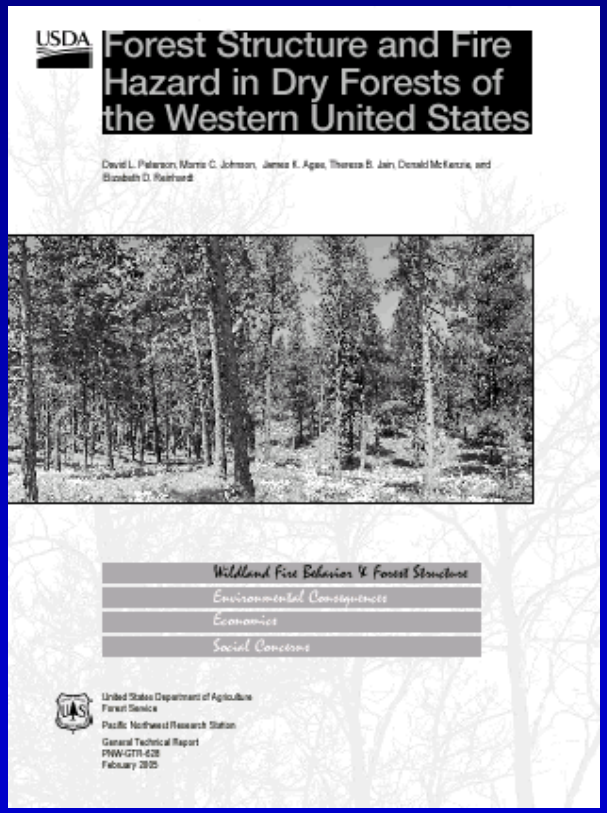
7-GTRs

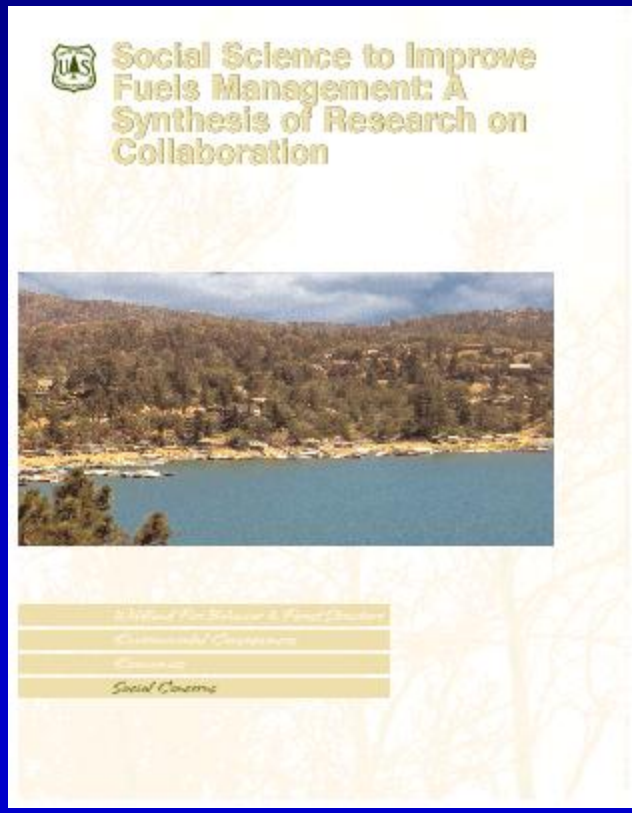
49 Fact Sheets (Res. Notes)

All Publications

http://www.fs.fed.us/rm/publications/







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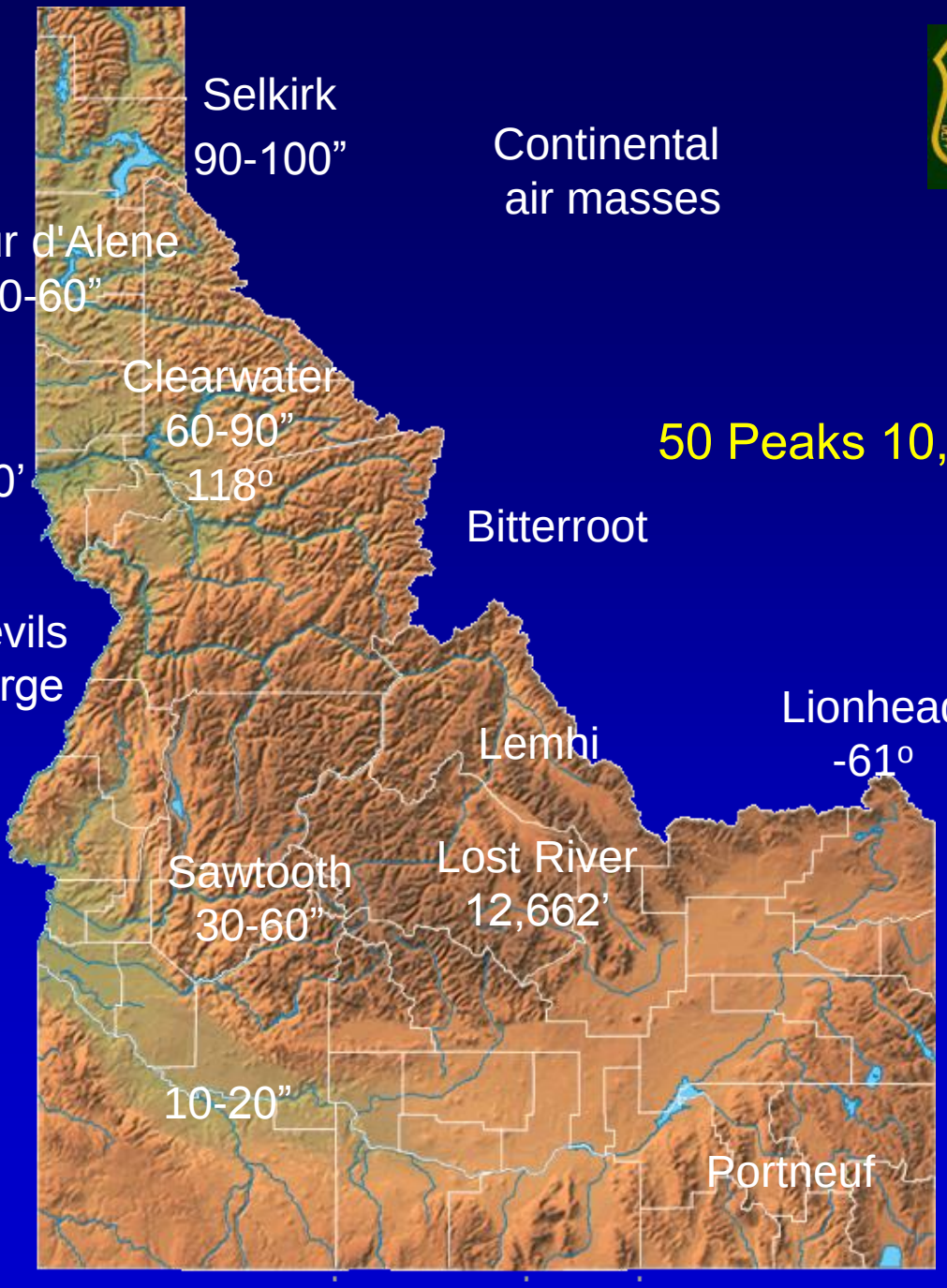
Idaho Landscapes & Climate



Continental air masses

80 Mountain ranges

50 Peaks 10,000’ +

Pacific Air masses

479 mi

305 mi

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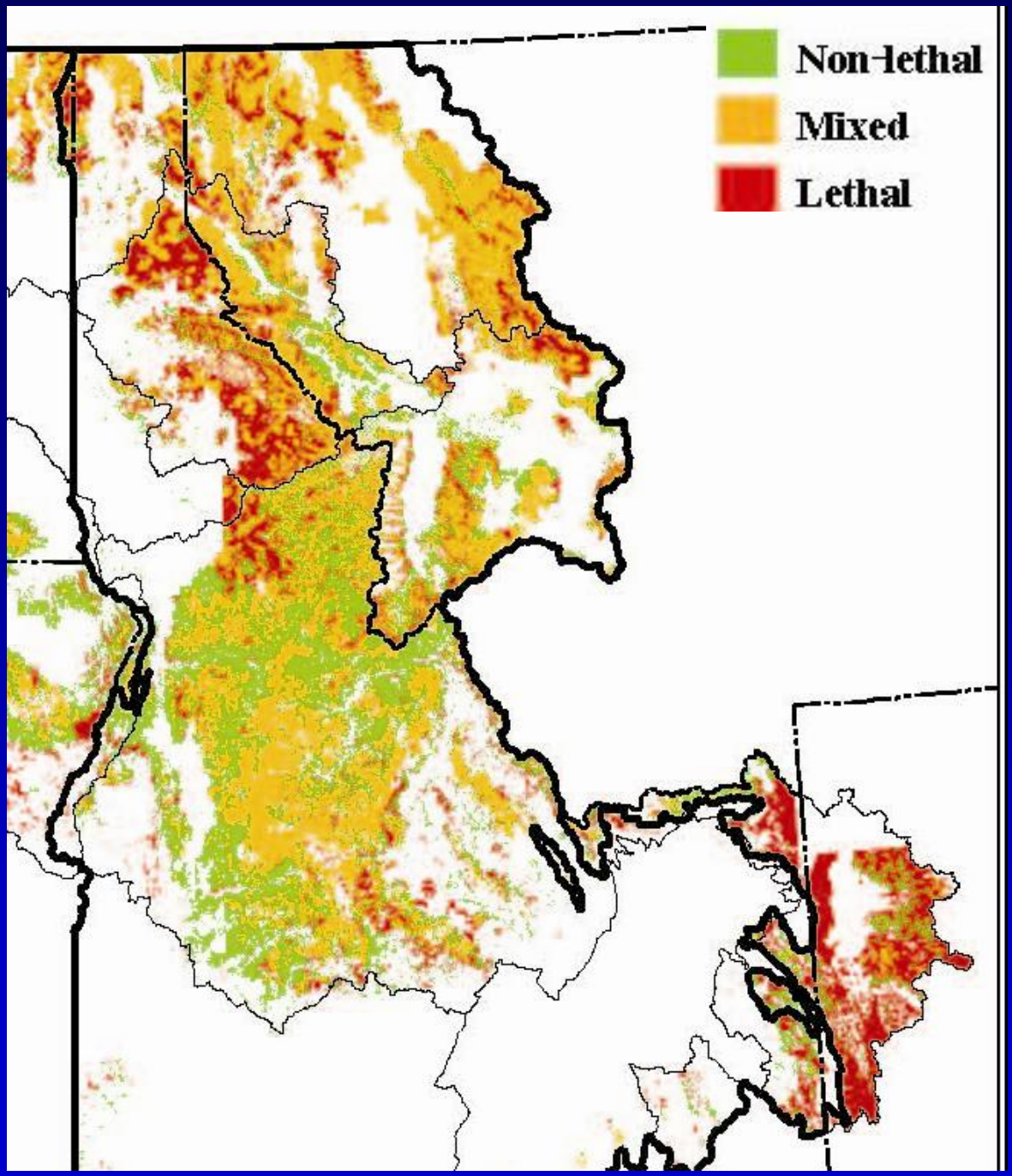
Historical Mixed Fire Regimes

ICBEMP



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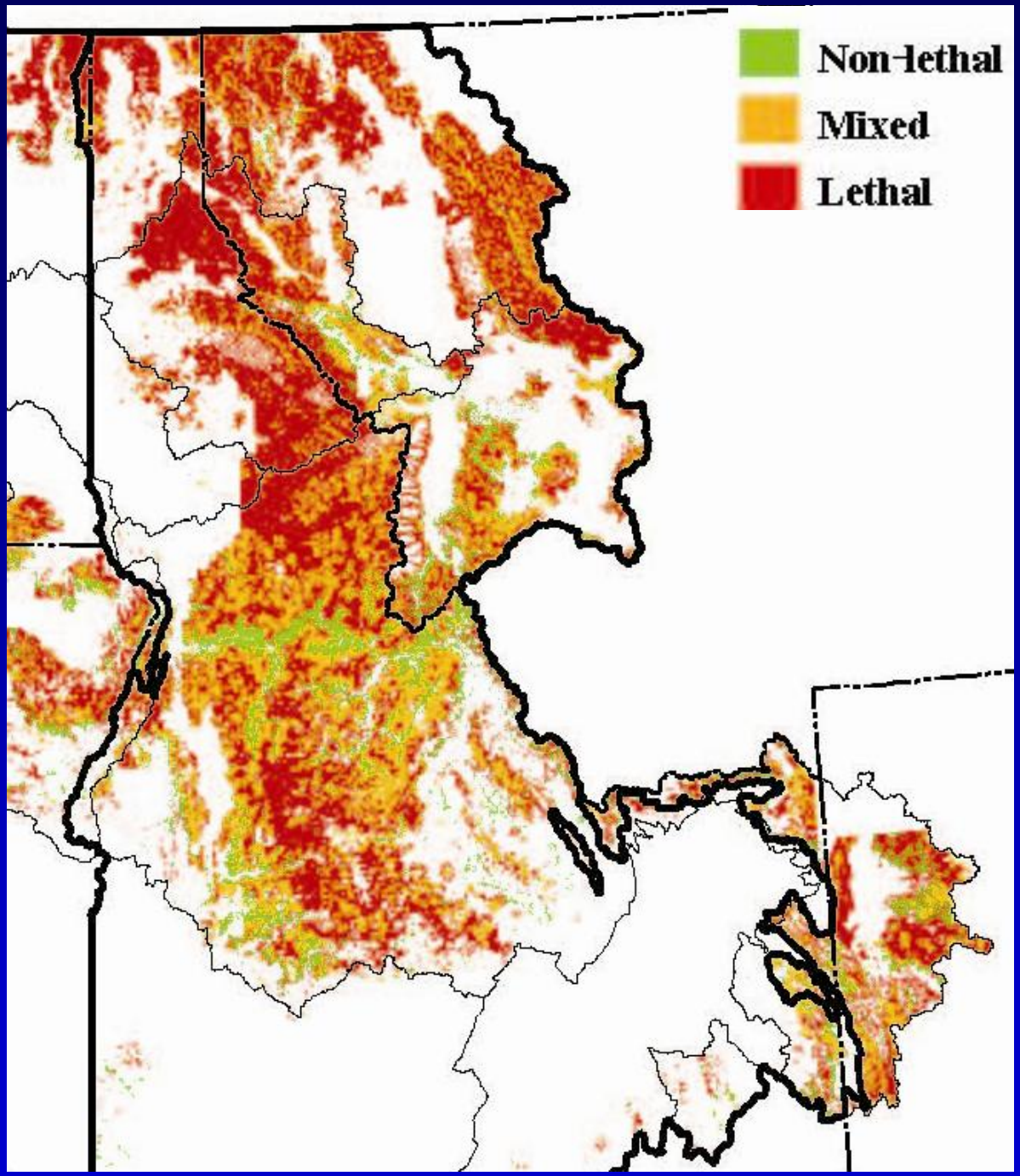
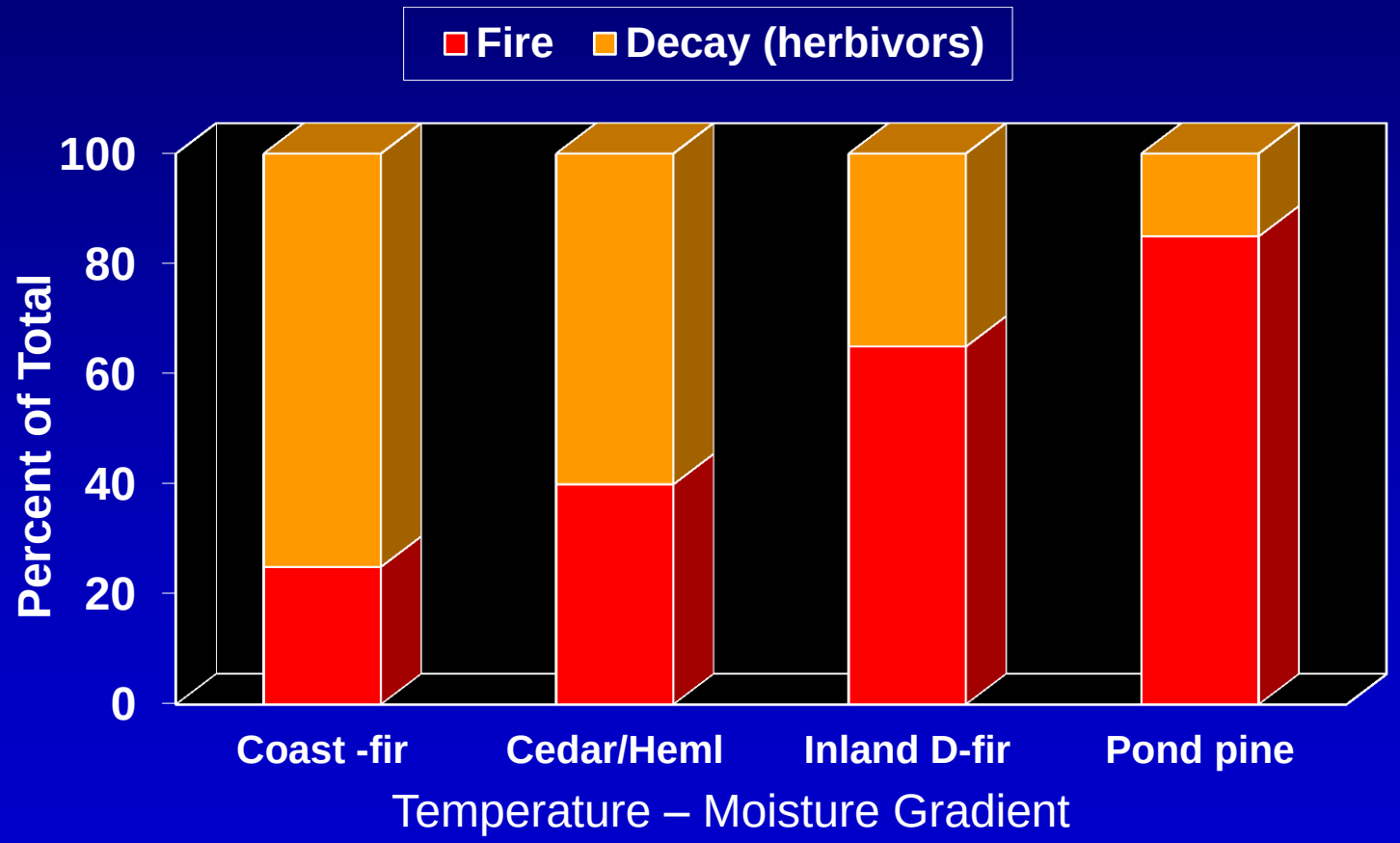
Current Mixed Fire Regimes

ICBEMP



Combustion-Decomposition

Recycling of Carbon and Other Nutrients



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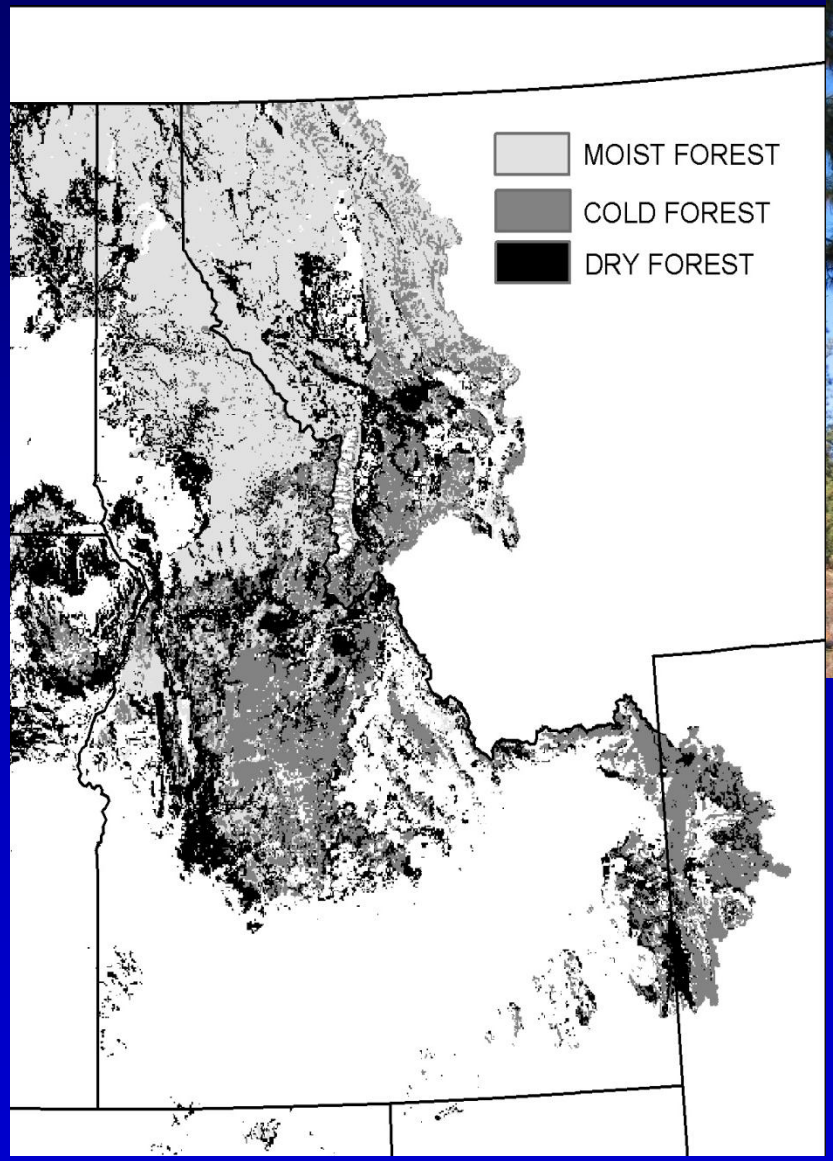
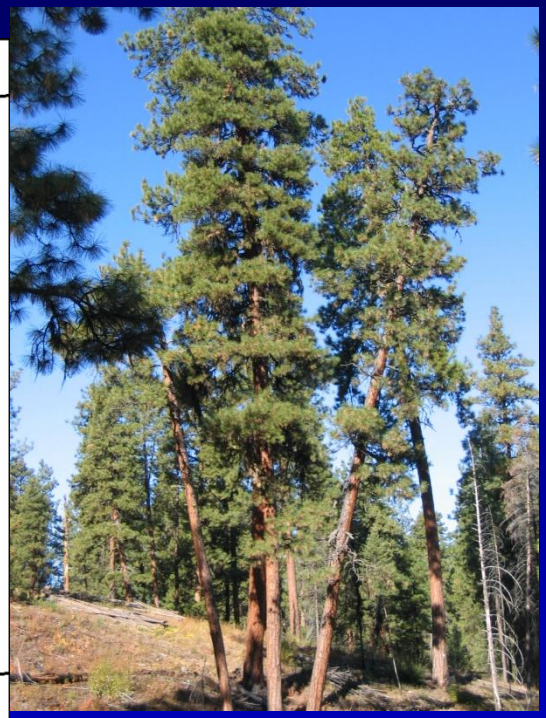
Forests of Idaho





Dry

Moist

Cold

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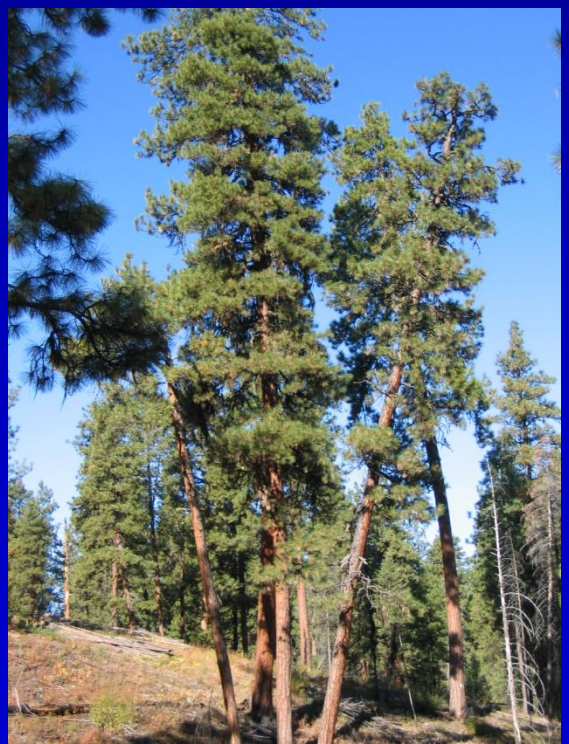
Forests are Inherently Unique

- Fire regimes
- Other disturbances
  - Insects
  - Disease
  - Weather
- Succession
- Species

Dry

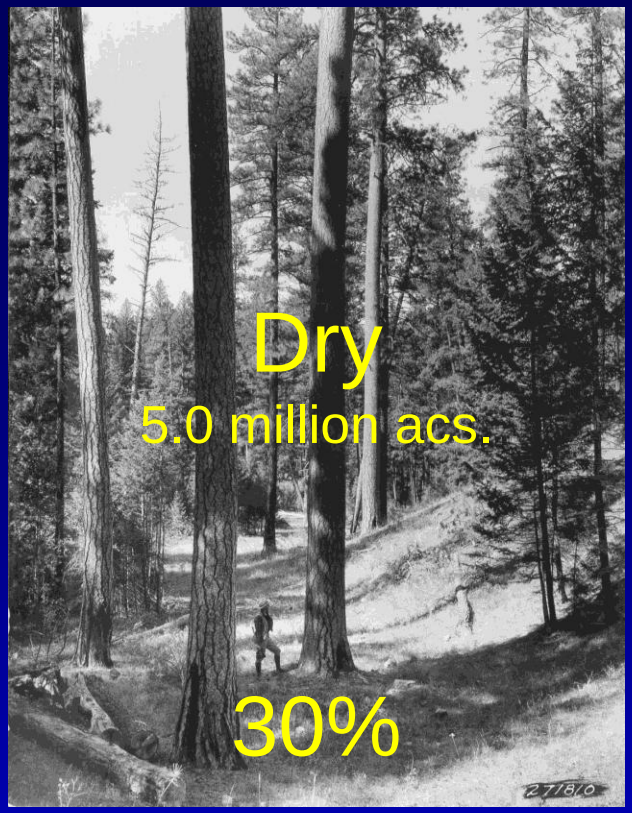


Moist

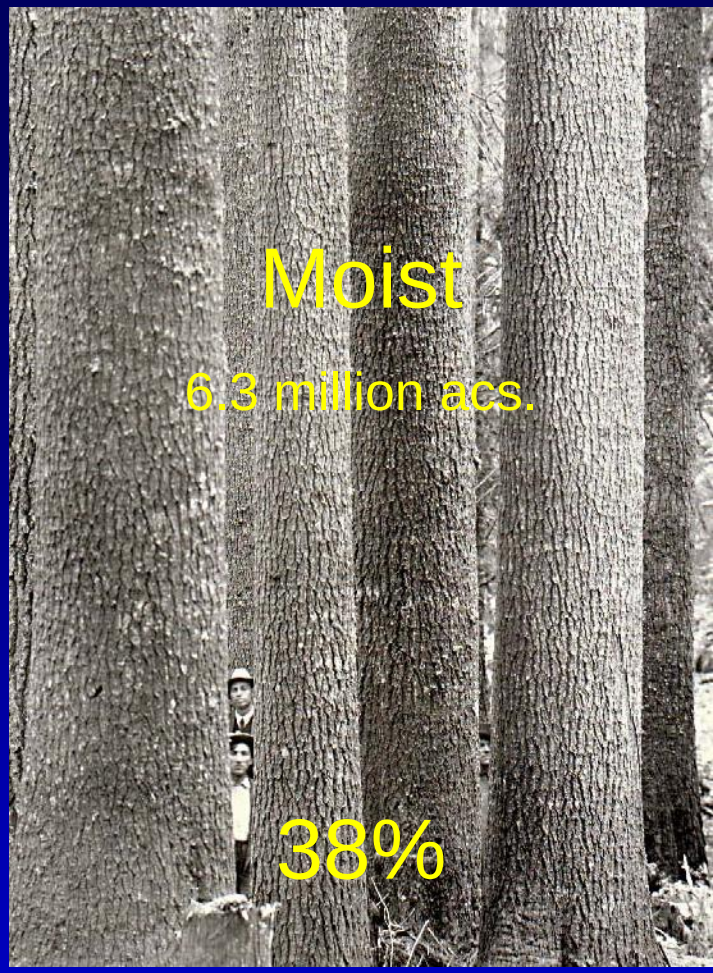
Cold

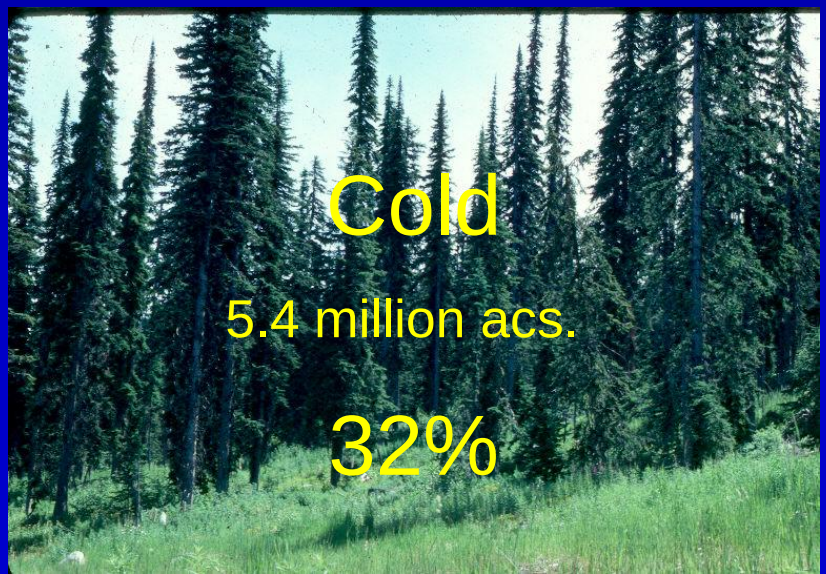
- Ground, surface, crown
- Intensity – rate at which fuel is consumed and heat generated
- Burn severity – damage to both abiotic and biotic forest components

No two fires are the same



16.7 million acres of forests in Idaho (31%)



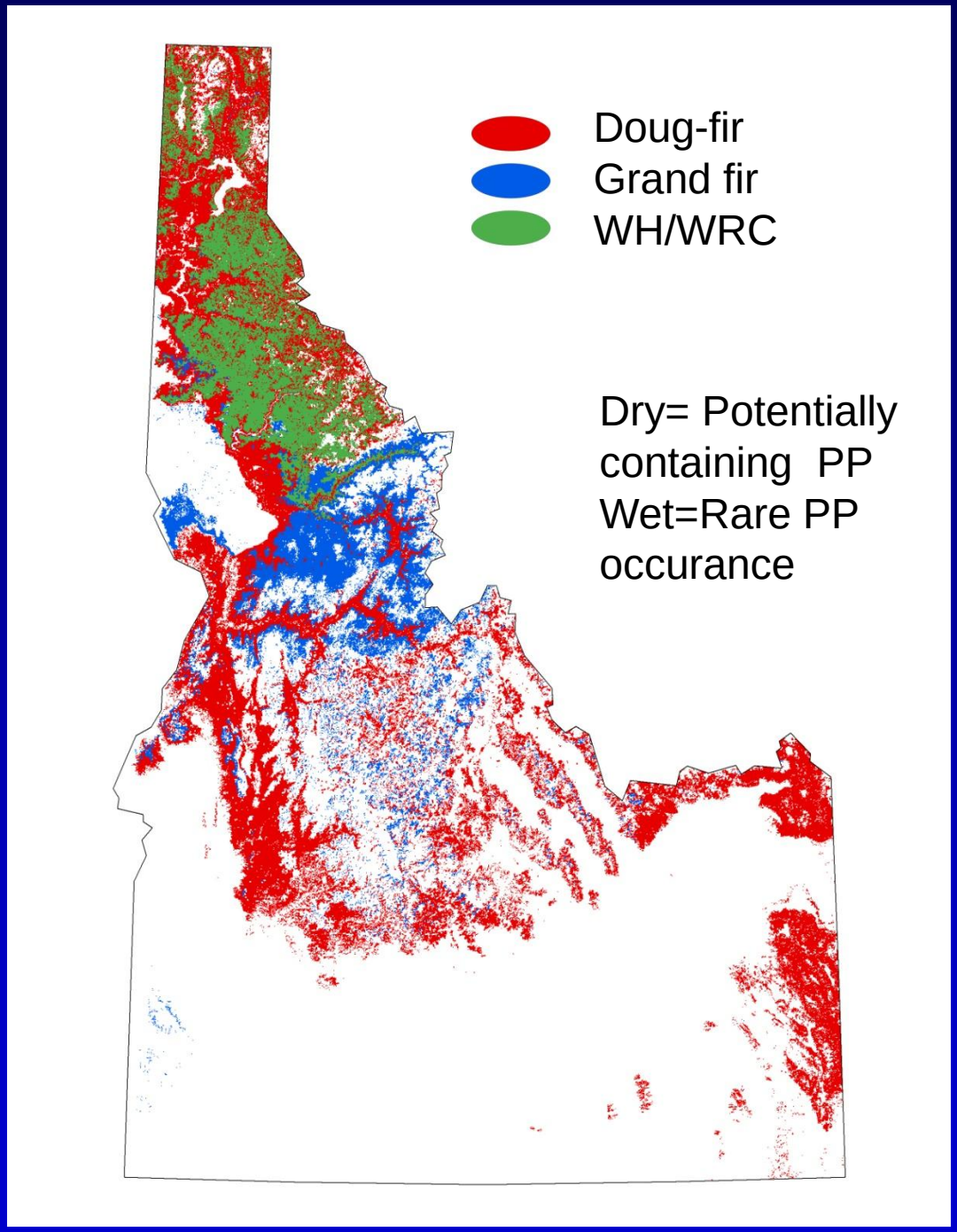


Historical Forests

RMRS

Dry and Moist Mixed Conifers

Potential Vegetation Groups PVG



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Succession

Successional stage

≠

Structural stage

Early seral Ponderosa pine

Late seral western hemlock

- The gradual supplanting of one community of plants by another
- The sequence of communities is called a sere or seral stage

Ponderosa Potential Vegetation (pvt)

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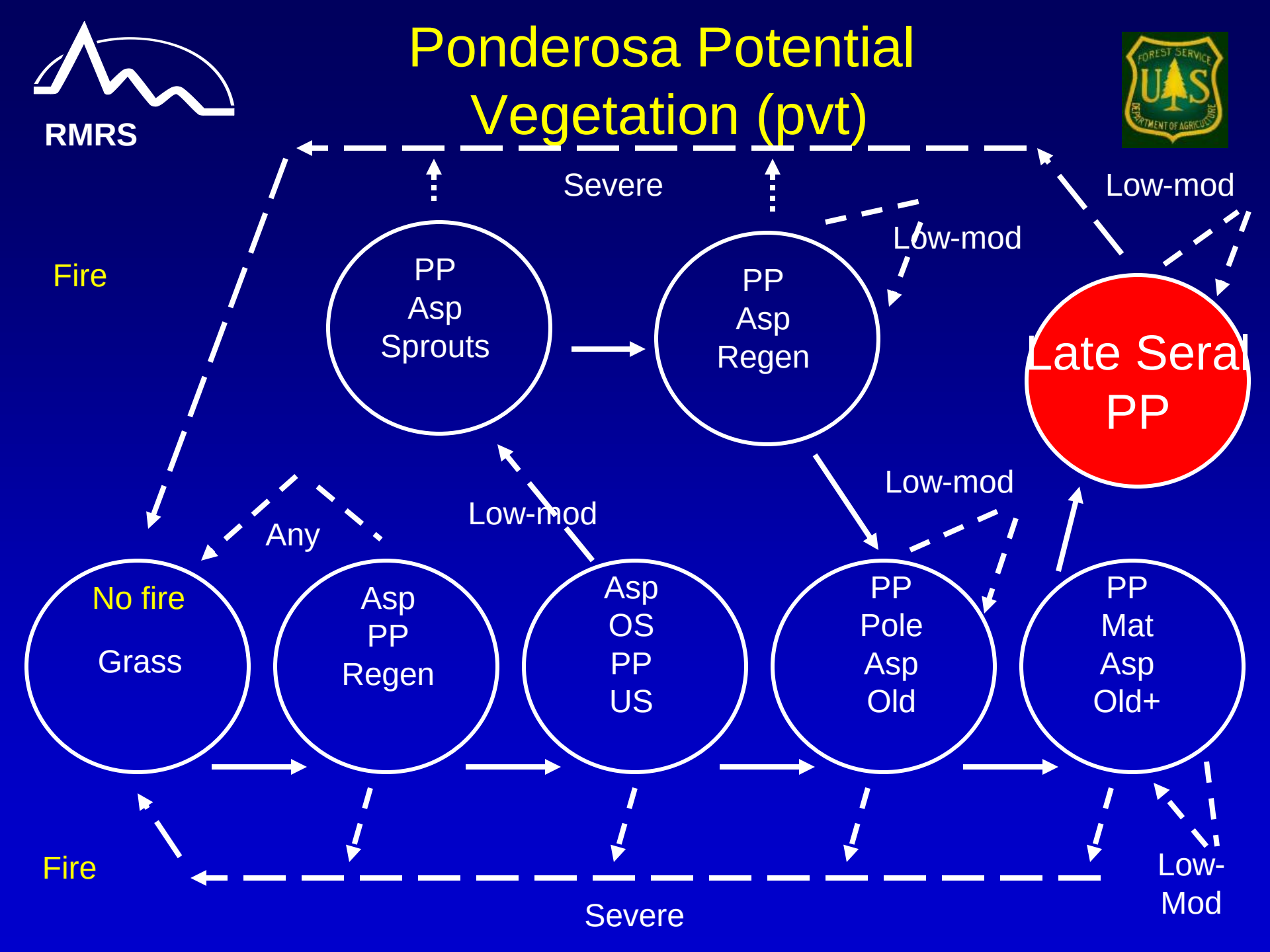
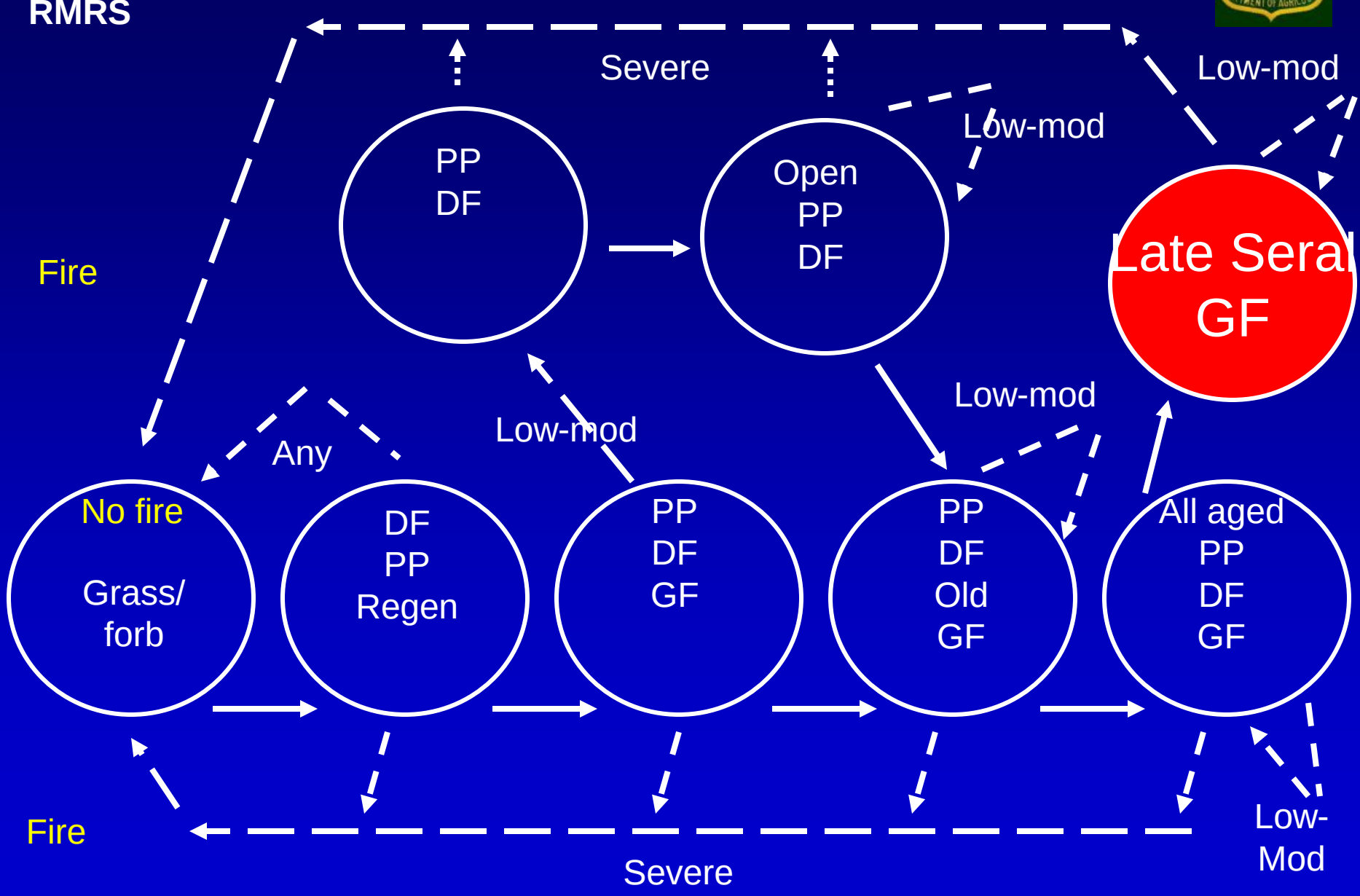


Grand Fir Potential Vegetation (pvt)



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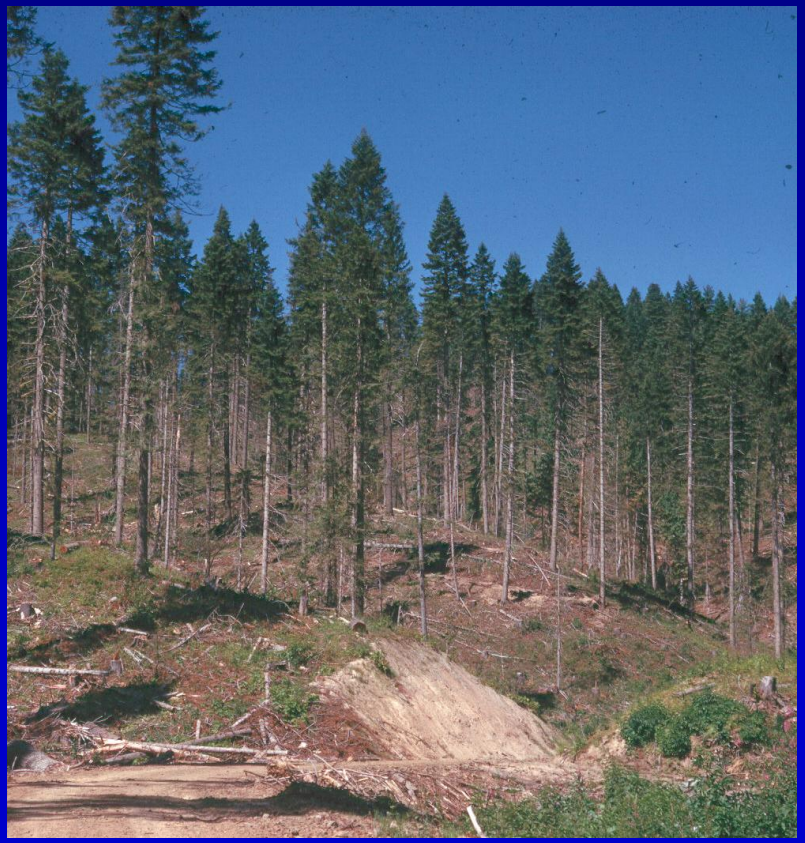
Potential Vegetation

- A physical and biological environment, that produces a kind of vegetation. Potential vegetation (climax) types are identified by indicator species of similar conditions

Late seral grand fir



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Potential Vegetation Types with Moist Mixed Conifer

- Western redcedar
  - Devils club
- Western hemlock
  - Clintonia
  - Lady fern

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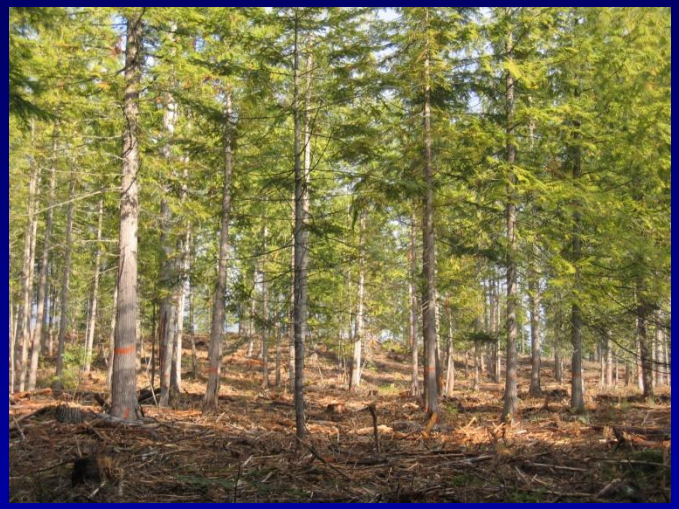
Moist Forests



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Moist Forests

Late-seral

Tolerance

Early-seral

Trees	Lower Veg.
• W. hemlock	• Bear grass-S*
• W. redcedar	• Menziesa-S,C
• Grand fir	• Ninebark-S
• W. white pine	• Alder-S, N-fix
• Douglas-fir	• Maple-S
• Lodgepole pine	• Shiny leaf-C, N-fix
• Western larch	• Red stem-C, N-fix

*S=Survivor, C=Colonizer

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Moist Forest

- Soil wood BCC 25-30%
- Organic matter rich soil
- Adequate organic reserves
- Microbiological activity
  - Ectomycorrhizae
  - Nitrogen fixation
  - Carbon cycles

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Current Moist Forests

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Dry Forests

Potential Vegetation Types with Dry Mixed Conifer

- Douglas-fir
  - Ninebark-pine grass
- Grand fir
  - Maple-pine grass
- Western redcedar
  - Clintonia

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Dry Forests

Late-seral

Tolerance

Early-seral

Trees

- Western redcedar
- Grand fir
- Douglas-fir
- Ponderosa pine
- Lodgepole pine
- Western larch

Lower Veg.

Tolerance

- Pine grass-S
- Elk sedge-S, C
- Ninebark-S
- Bitter brush-N-fix

*S=Survivor, C=Colonizer

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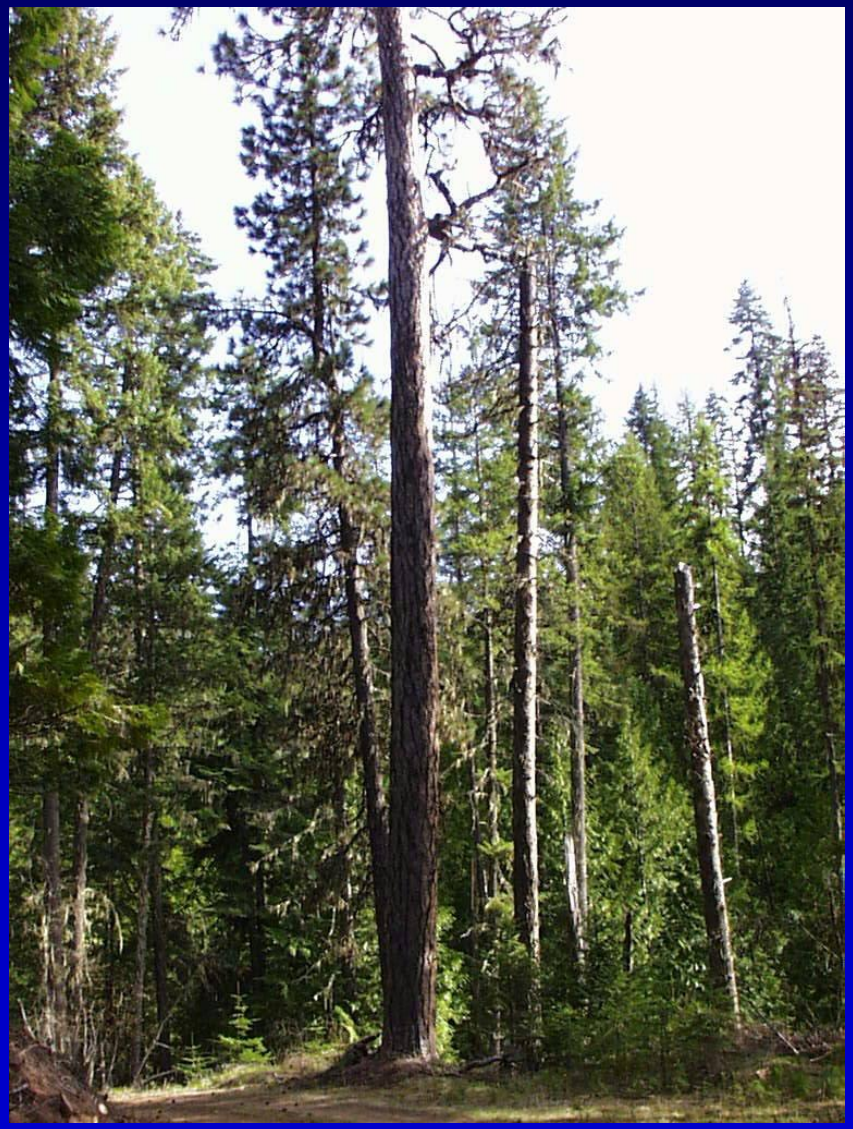
Northern Idaho P.Pine

Cedar/Wet Grand fir PVTs



Dry Forests

Forest Change

Diseases

Fire

Mixed →

Crown

Weather

Insects

Surface

Changing From An Early Seral to Late Seral Forest

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Early Seral

- Fire tolerant
- Low nutrient demand
- Tolerant of low supply
- High canopy
- Low N content
- Deep roots
- Mixed soils
- Tolerant of native “pests”
- Tolerant of site/soil var.
- Tolerant of climate var.

Late Seral

- Fire intolerant
- High nutrient demand
- Intolerant of low supply
- Low canopy
- High N content
- Shallow roots
- Strongly layered soils
- Susceptible to native “pests”
- Intolerant of site/soil var.
- Intolerant of climate change

Shifting from adaptable, long-lived, disturbance tolerant forest to “specialized,” short-lived, change intolerant forests is a very risky during times of change

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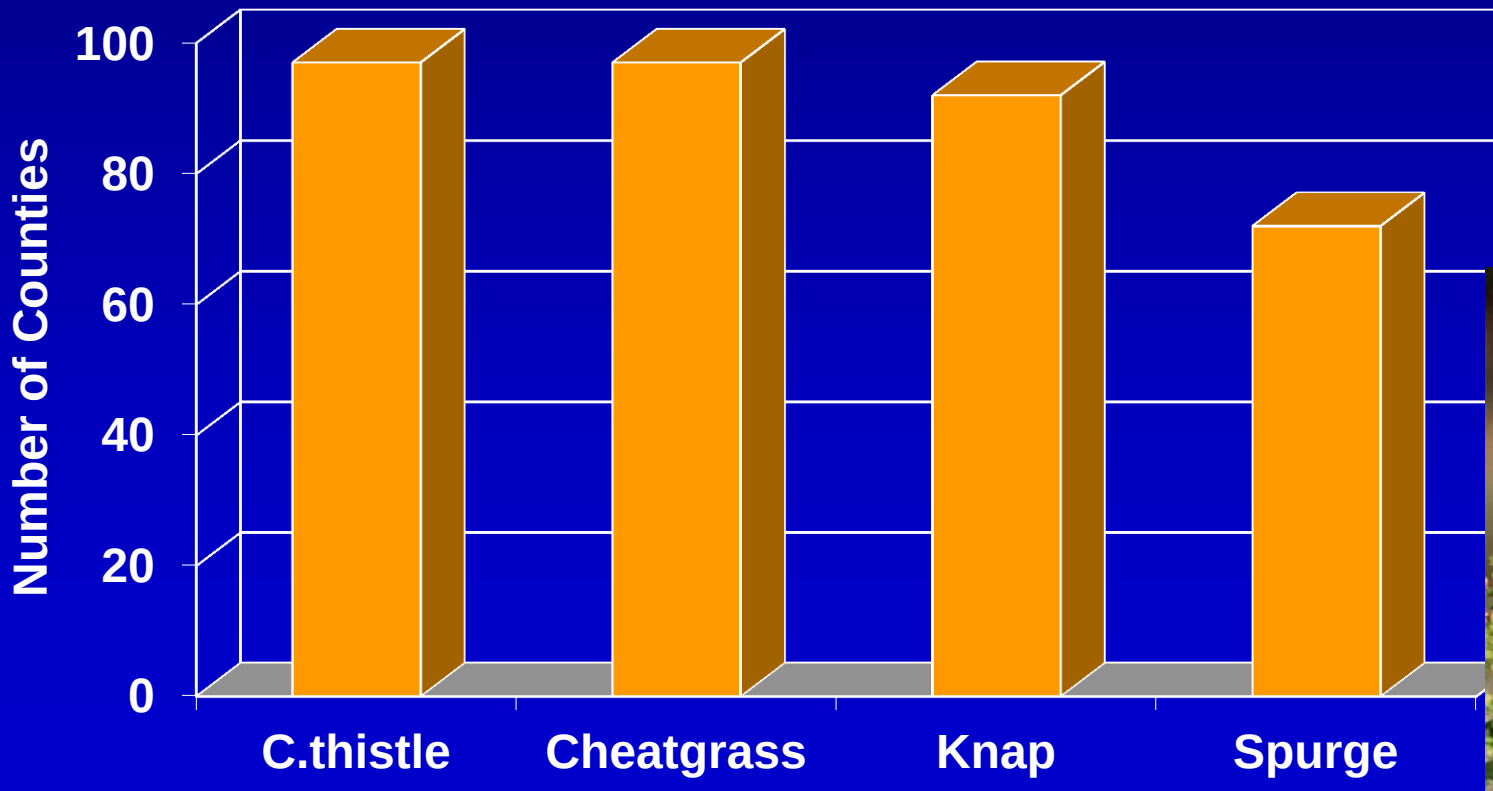
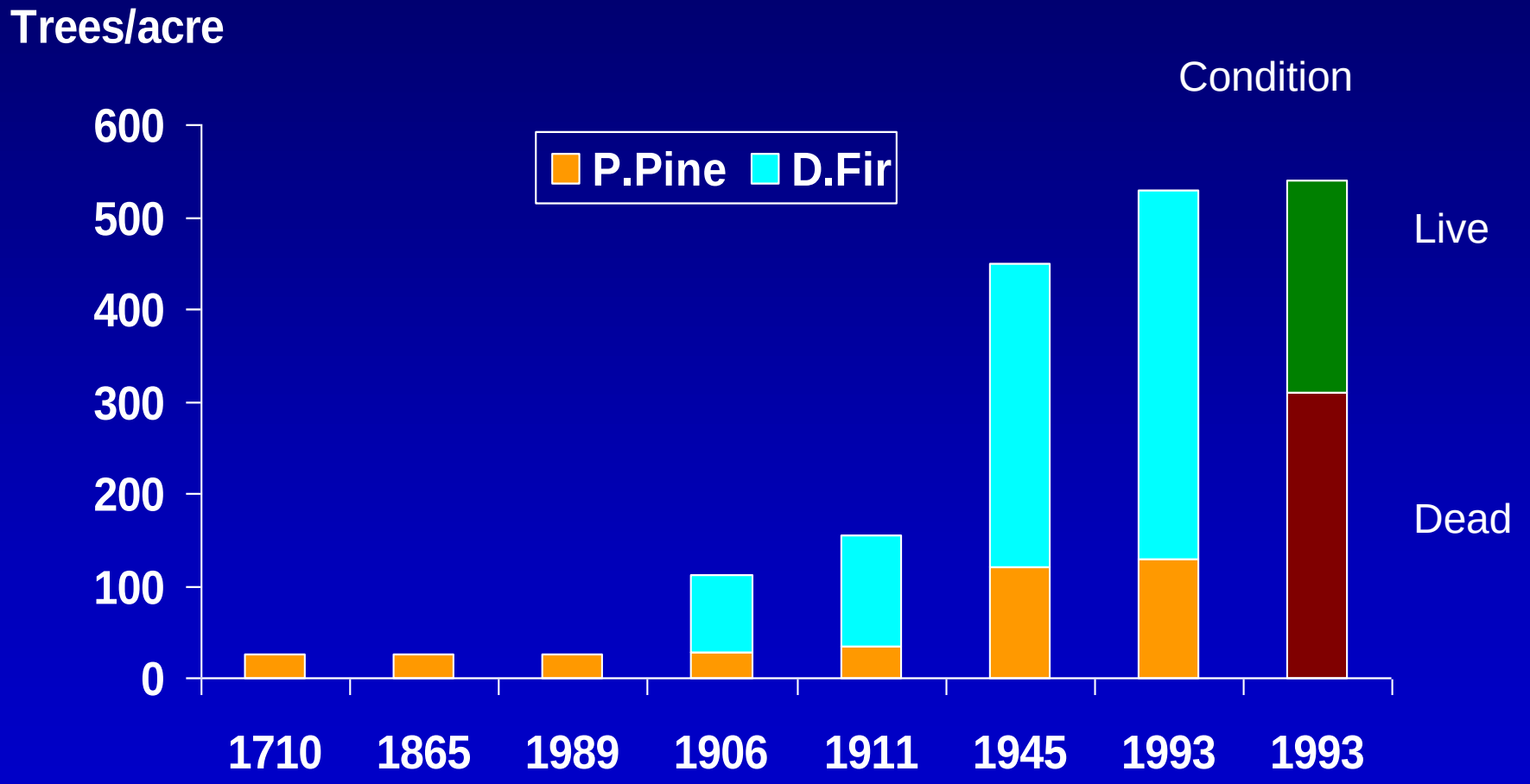
Exotic Plants ICRB



Composition Change In Idaho Undisturbed, Dry Forest



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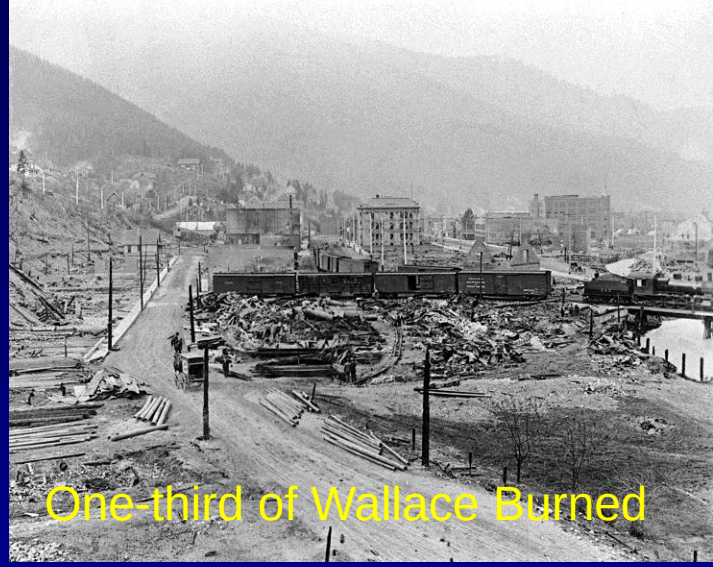
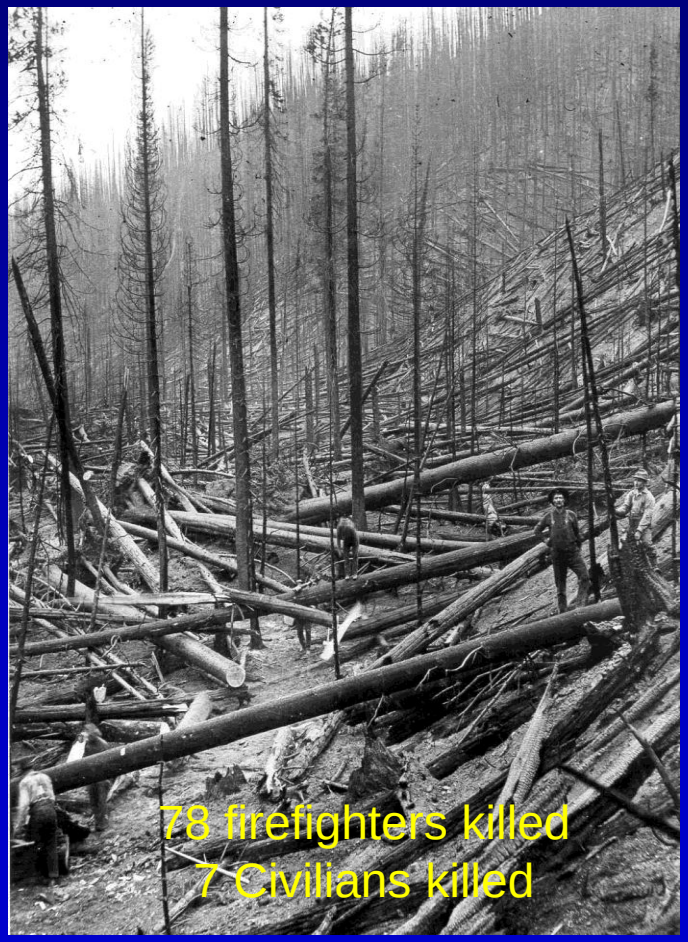
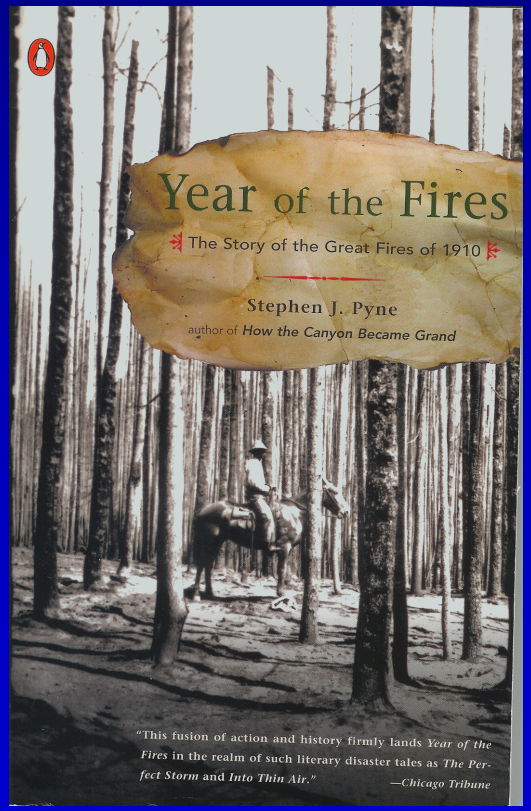
Northern Rockies August 20-21, 1910







Moist Forest Change
Decline of White Pine

Blister rust

European disease introduced beginning of century

Civilian Conservation Corp

Pulling Ribes

"Like bailing the ocean with a tea cup"

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Dry Forest Change

- Climate change (cycles)
- Grazing
- Fire Exclusion
- Timber harvesting
- Urbanization
- Land-use changes
- Insects
- Disease
- Reproduction

1909

1948

1989

Bitterroot - Montana

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Fire Exclusion/Succession

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Dry Forest Change Idaho 2007

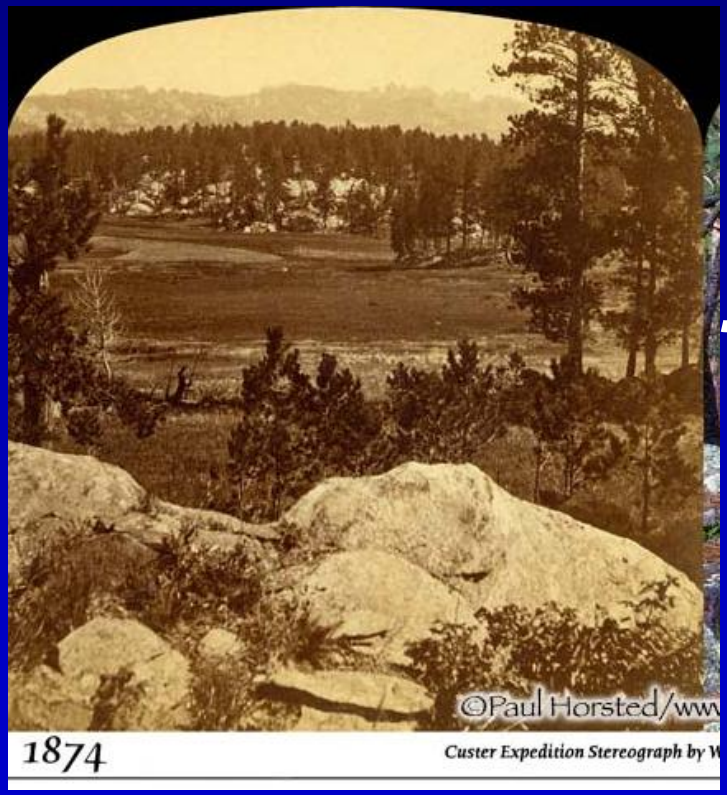
- 1.9 million acres
- 1454 fires
- Cascade complex 300,000 + acres

Historical Forest Floor

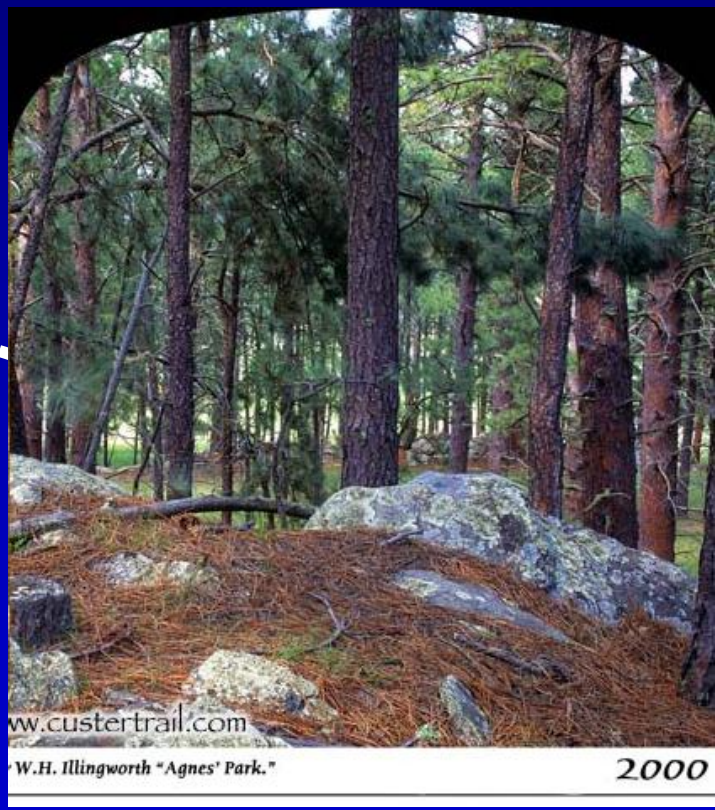
Nutrients and microbial activities deep in mineral soil

Nutrient/organic matter compression towards the soil surface

Crowns



Soil surface



Roots/myco/
nutrients

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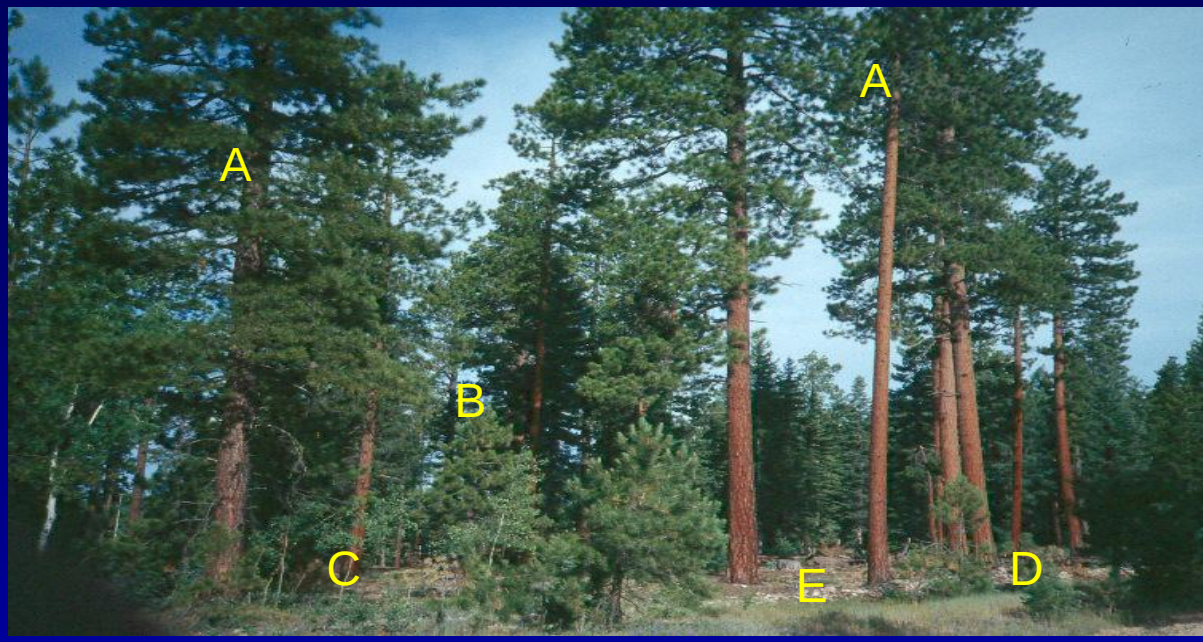
Forests as Fuel

<u>Crown</u>
A Canopy
B Ladder
C Shrub
<u>Surface</u>
D Low veg
E Woody fuel
F Ground fuels
<u>Smoldering</u>
E Woody
F Ground



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Ponderosa Pine Fire Resistance

- Seedlings can maintain themselves with fire intervals as short as 6-years
- Self pruning
- Open loose foliage (Low bulk density)
- Unburnable bark

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Decomposers

- Top rotters
- Bottom rotters
- Live rotters
- Dead rotters
- White rotters
- Brown rotters
- Black rotters

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Roller Chopping and Chipping

- Create deep compacted layers
- Insulating soil surface
- Slowing decomposition
- Especially on cool sites
- Destroys
  - Nitrogen fixation
  - Animal habitat
  - Site protection

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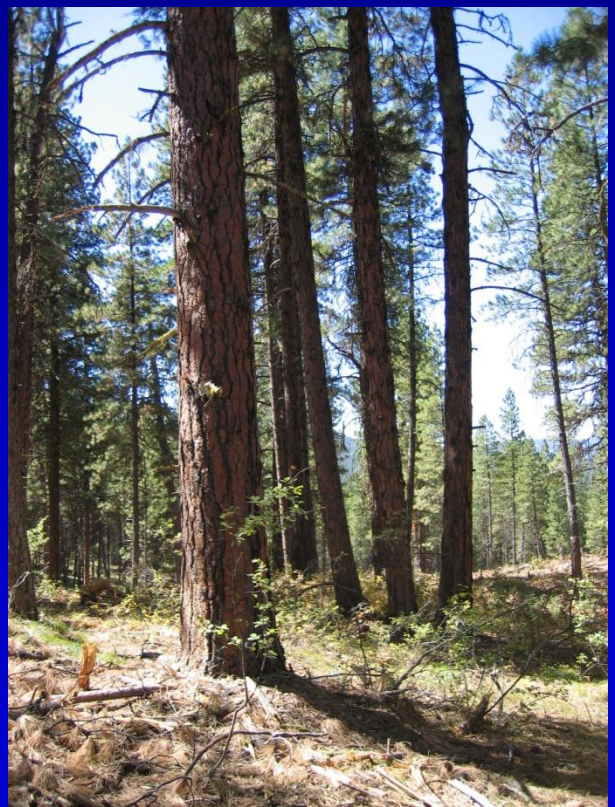
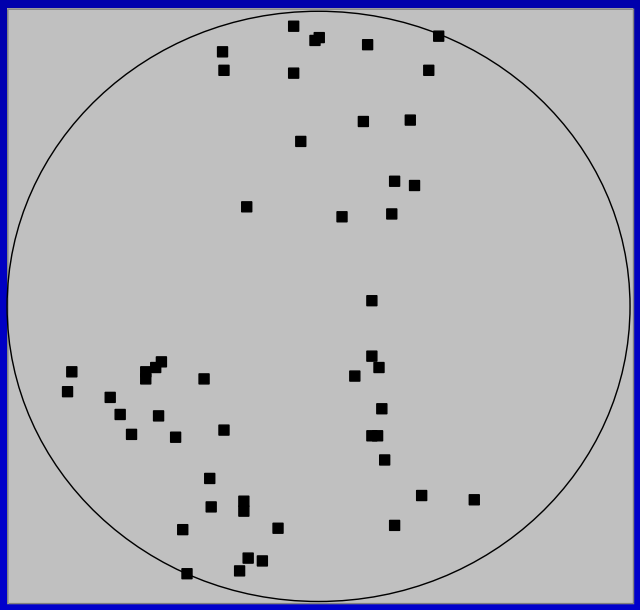
Vertical and Spatial Arrangement

- Spatial
  - Group
  - Line
  - Regular
- Vertical
  - Single story
  - Multi-story





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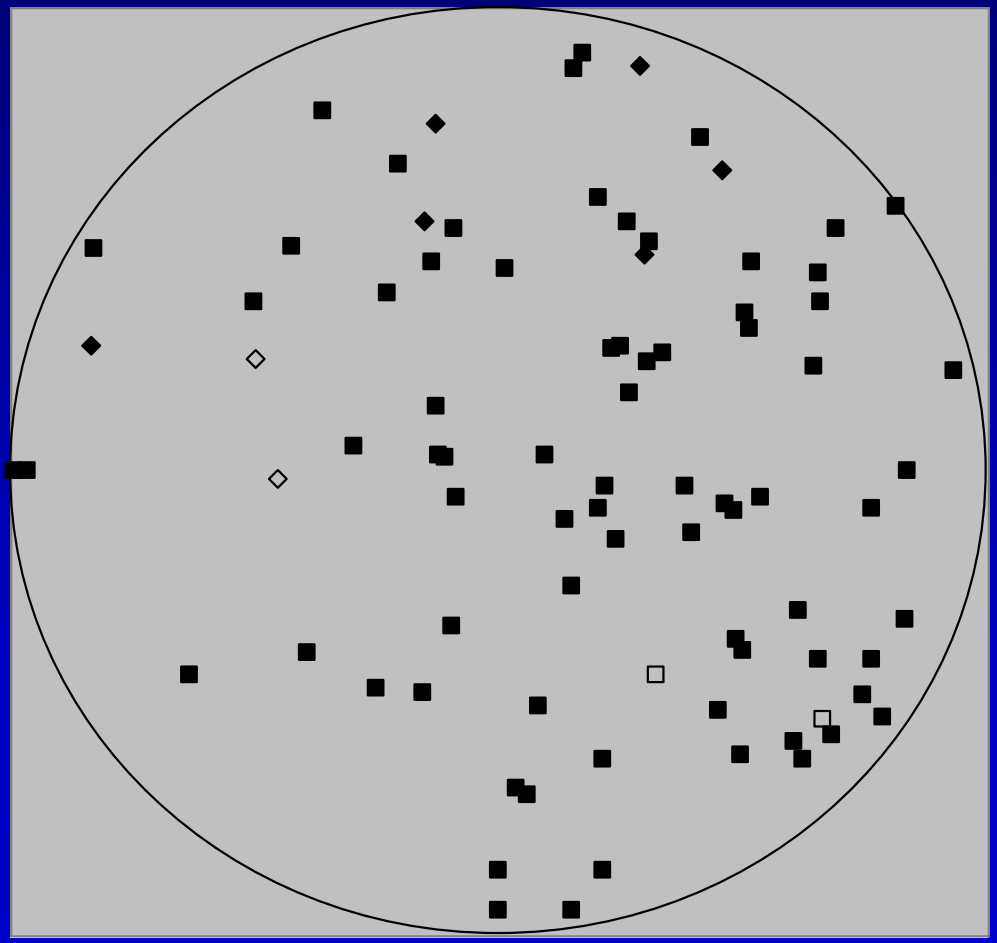
Dry Forest Treatments



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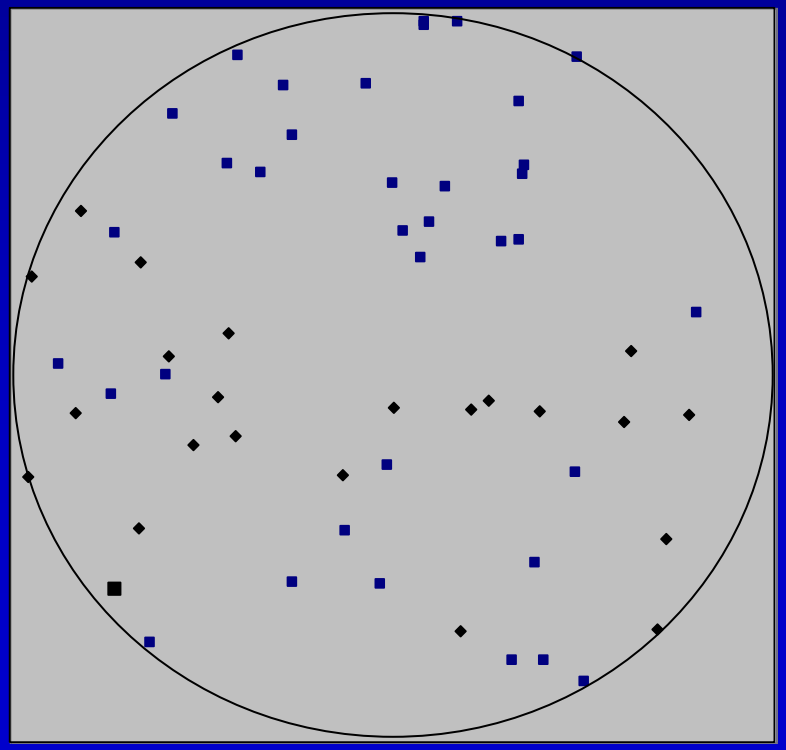
Dry Forest Ladder Fuel Treatments



118 5”+ Trees/Ac

575 Total Trees/Ac

112 Ft^2 BA/Ac

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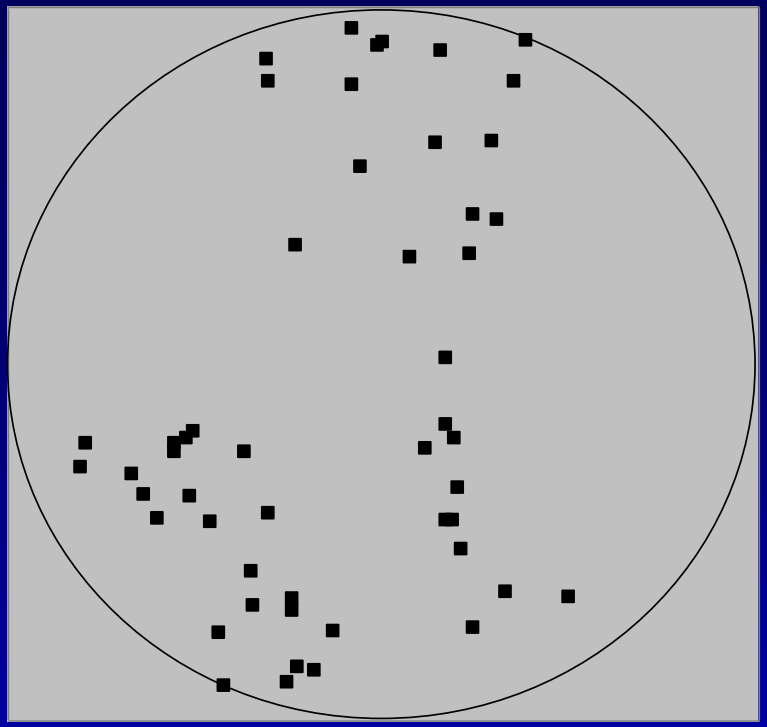
Dry Forest Treatments



56 Trees/Ac

70 Ft^2 BA/Ac

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Chunking

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9-months Later

Chunk

Chunk and Burn

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Cleaning/thinning Ladder Fuels

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Snow Well Burning

- Lower layers
  - >100% moisture
  - < 40^{o} F
- Fine root activity minimal

Moist Forest Treatments Urban Interface

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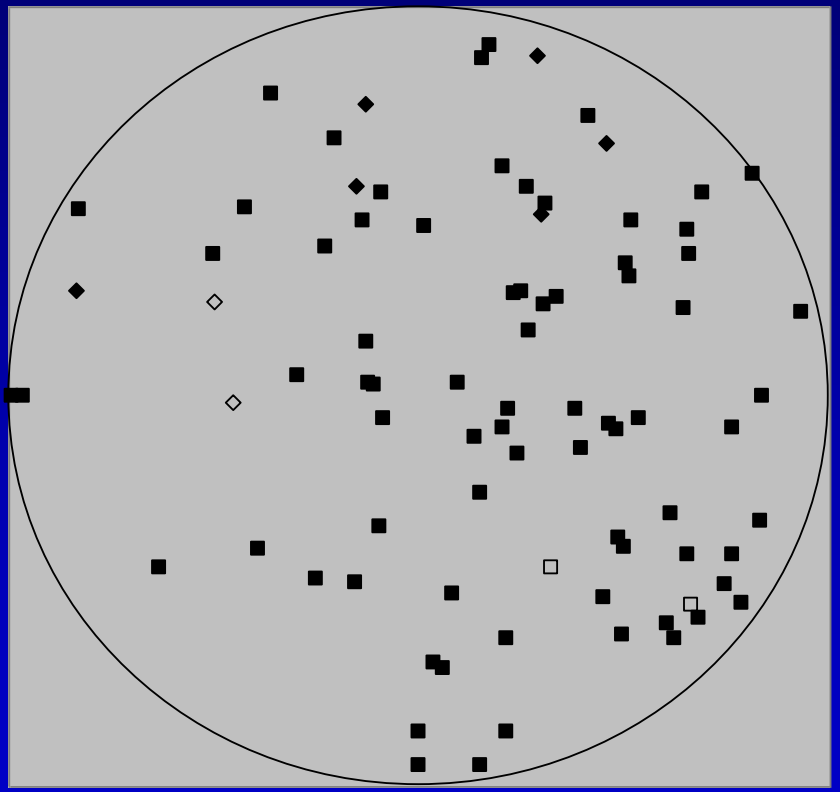
Moist Forest WUI Treatments



CWD 33.8 Tons/Ac

179 Trees/Ac

121 Ft^2 BA/Ac

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Moist Forest Treatments

- Yr 0---Standing dead removal
- Yr 4 --- Hazard tree removal
- Yr 8 --- selection cutting
- Yr 10 --- Surface fuel reduction
  - Chunking & piling and burning
- Yr 18 Selection cutting

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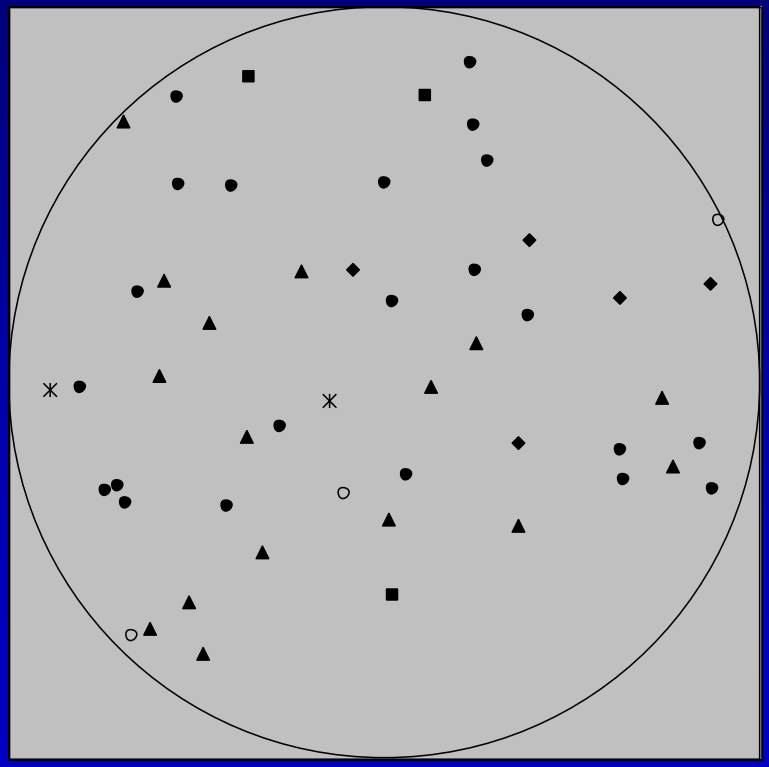
Moist Forest Treatments



CWD 13.4 tons/Ac

117 Trees/Ac

118 Ft^2 BA/Ac

Moist Forest Restoration

Harvesting-Ladder Fuels, Surface Fuels

- Restore western white pine
- Reduce stand and landscape fire risk
- Irregular selection
- Shelterwoods

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Post Harvesting
Pre-mastication

137 Trees/Ac
118 Ft^2 BA/Ac

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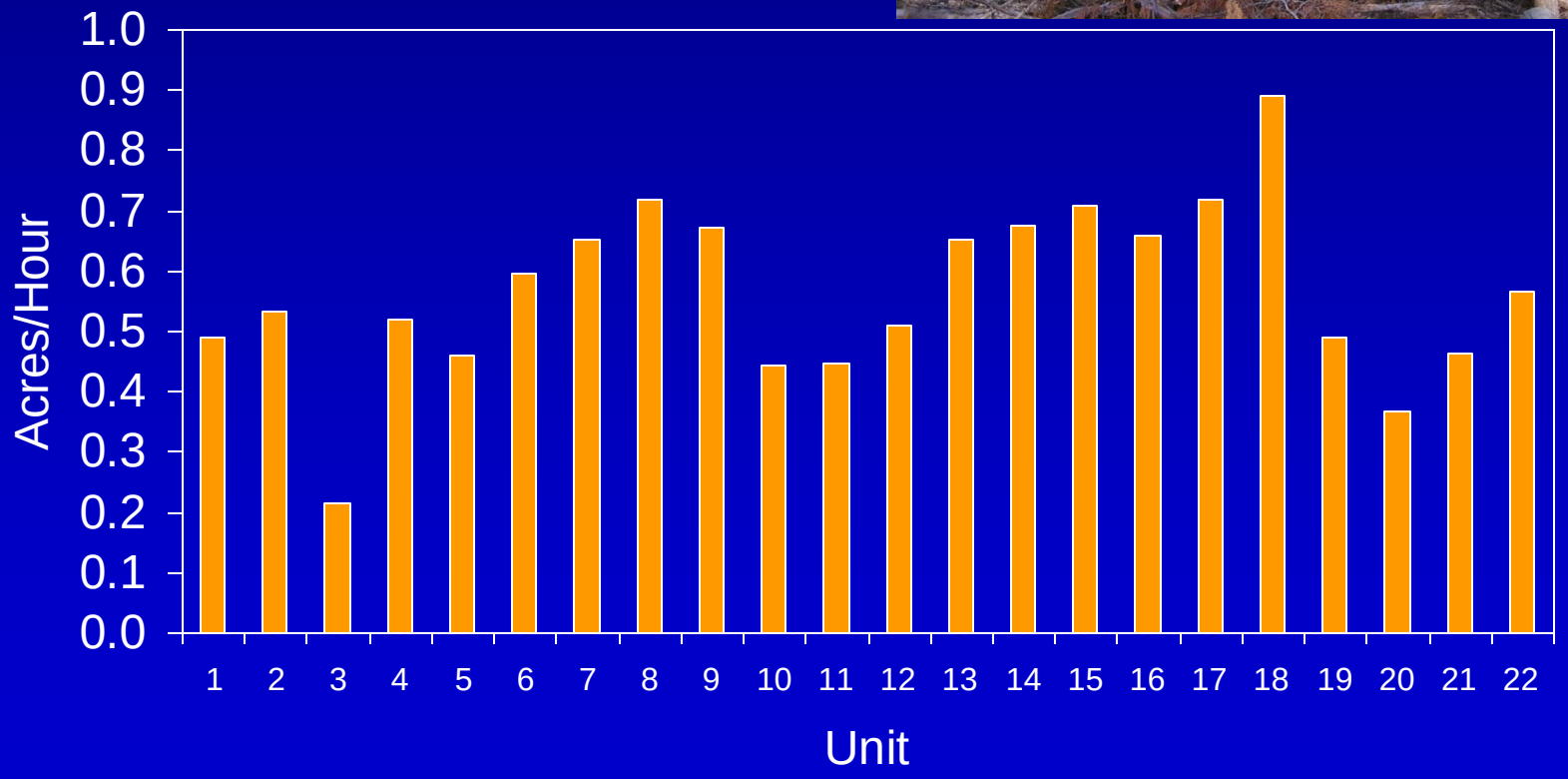
Production

Mean 0.57 acres/hour



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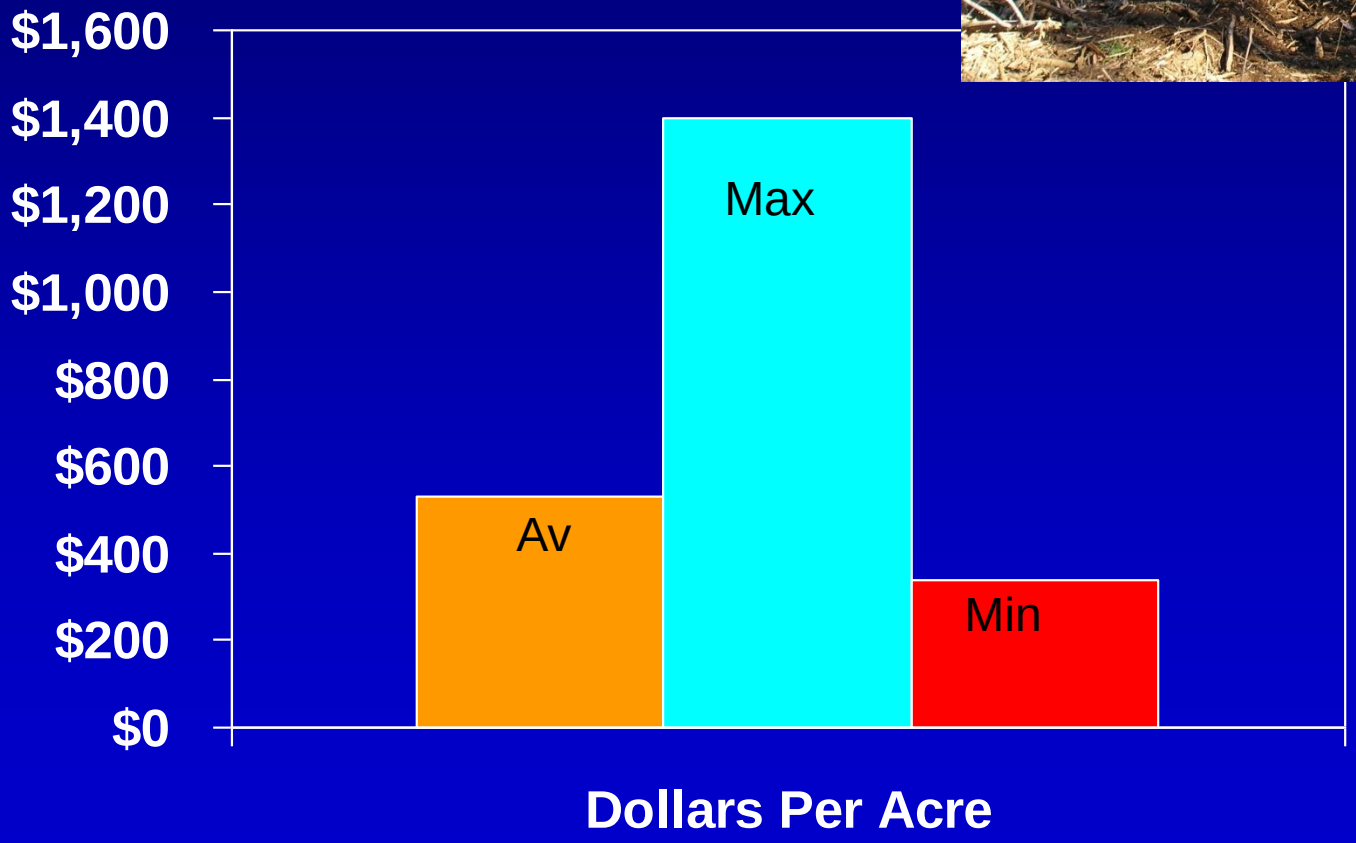
Cost Per Acre
37.5 Acs.



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Post Mastication

88 Trees/Ac
116 Ft^2 BA/Ac

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Mastication
Moist Forest Ladder Fuels

1286 Trees/Ac

57 Ft^2 BA/Ac

CWD 17.3 Tons/Ac

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Post Mastication

268 Trees/Ac

41 Ft^2 BA/Ac

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Post Mastication

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Forest Treatments in Idaho Forests

- Diverse forest settings
- Diverse moist and dry forests
- One-size treatment does not fit all forests
- Variety of wildfire intensities and burn severities
- Integrated silvicultural prescriptions tailored to the forest and management objectives

RMRS