Ecological Consequences of Salvage Logging

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Overview

- **Fire: A natural but shifting disturbance**
  - **Historical Regimes**
  - **Forest structure and health**
- **Salvage Logging**
  - **Forests, forest regeneration**
  - **Watershed hydrology**
- **Carbon and other considerations**
- **Salvage: When, where, why?**

Fire as a natural force of change

- Fire and Western Forest Ecosystems
- Fire regimes: Eastside/westside
- Influence on forest structure, composition and function
- Role of indigenous land management
- Climate change, fuel accumulation

Some Legacies of Fire

- Tree mortality
- Live scorched trees
- Loss of understory cover
- Loss of O horizon
- Sprouting, regeneration
- C & N emissions
- Habitat alteration
- Hydrophobic soil
- Ash, soil pH
- Nutrient pulse, N, P, Ca
- Runoff/erosion/water quality
- Formation of Pyrogenic Carbon (charcoal)

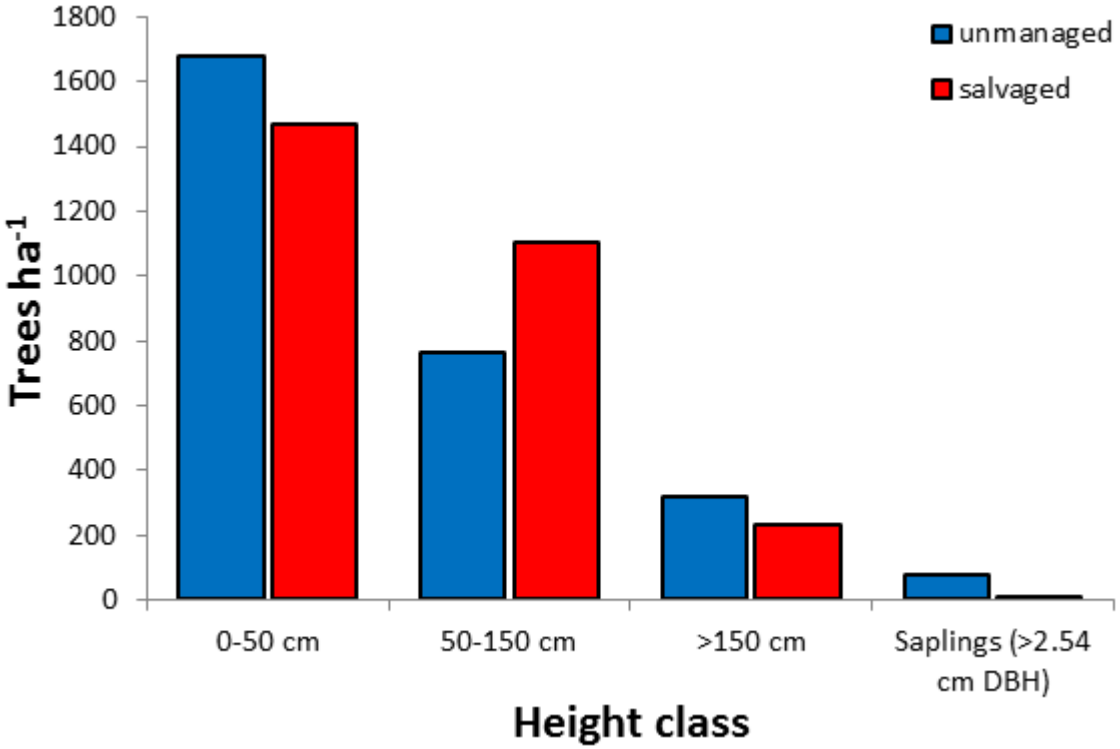
Salvage logging

Ecological consequences?

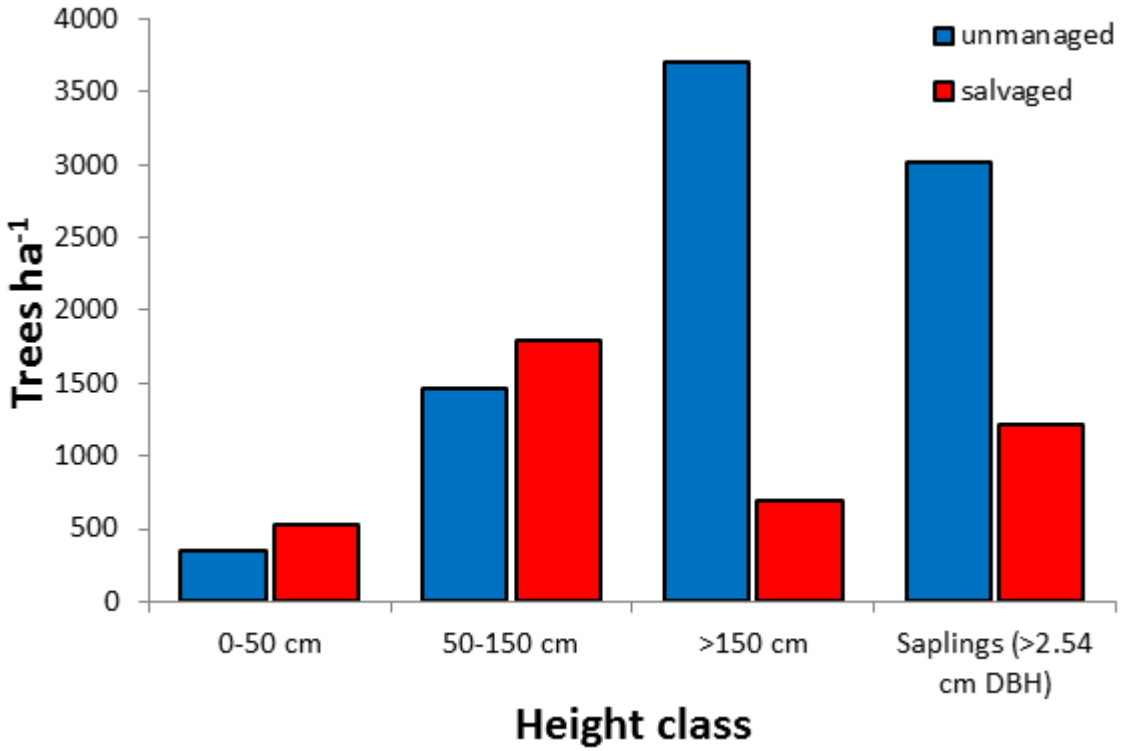
- Salvage logging removes dead trees and some live trees
- Disturbs surface soils
- May enhance exotic pressure
- Ecological consequences: Consider land use objectives
  - Unmanaged vs managed vs plantation

Tree regeneration

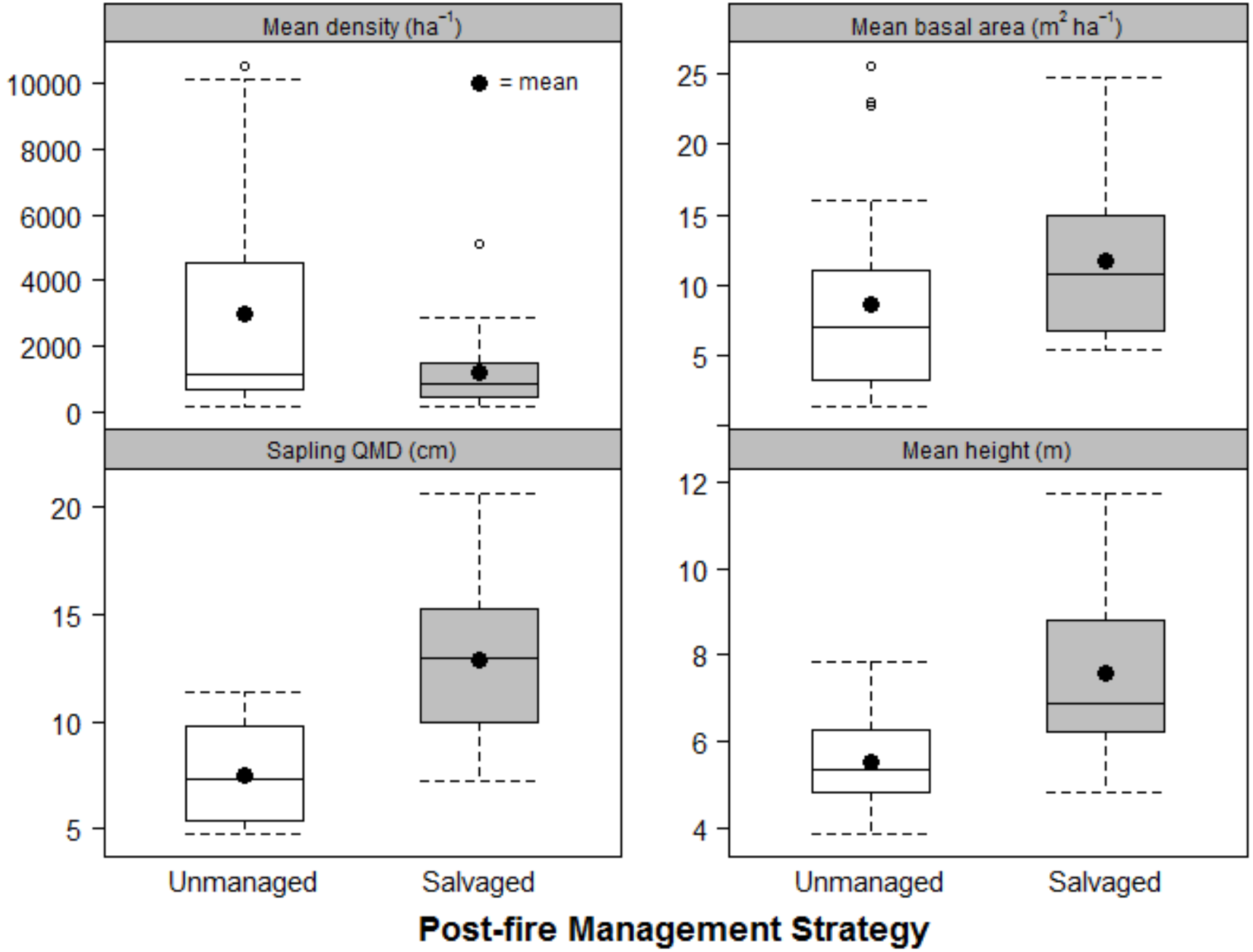
10-years post-fire



22-years post-fire



Saplings 22-years post-fire



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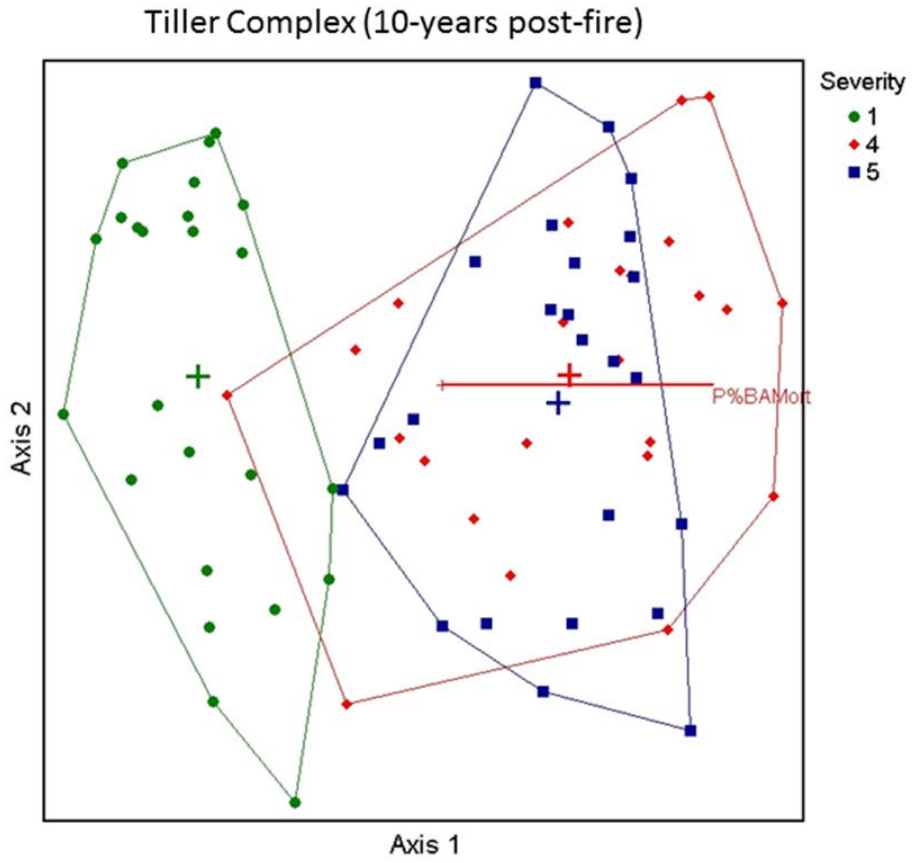
Understory communities

Unburned

Unmanaged

Salvaged



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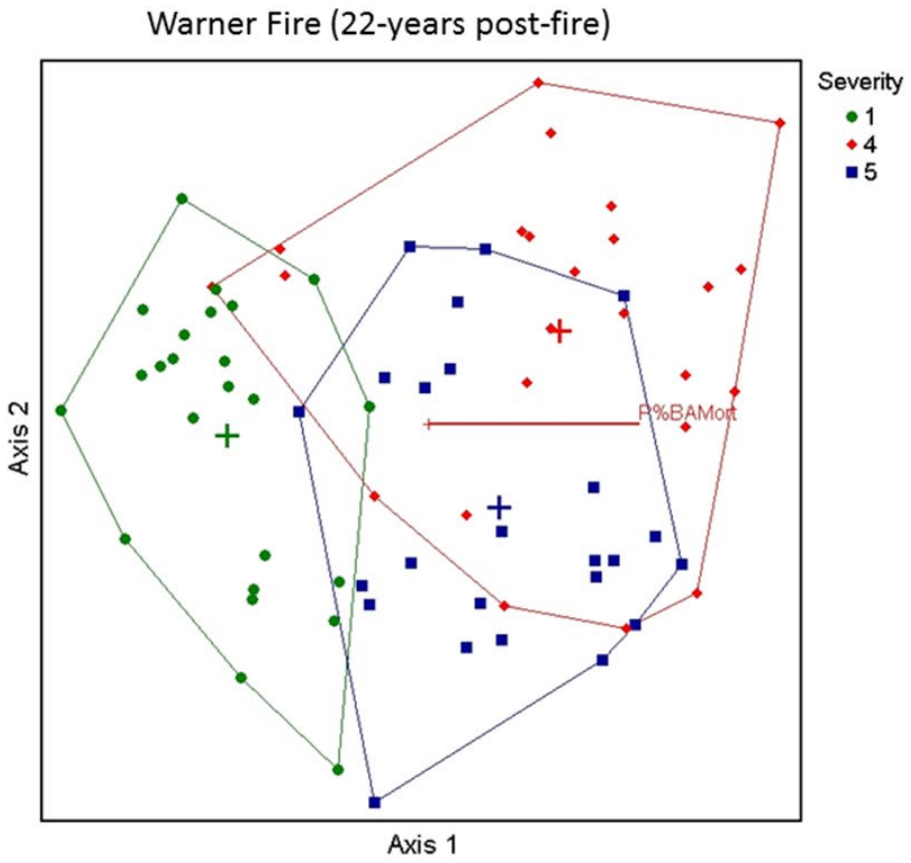

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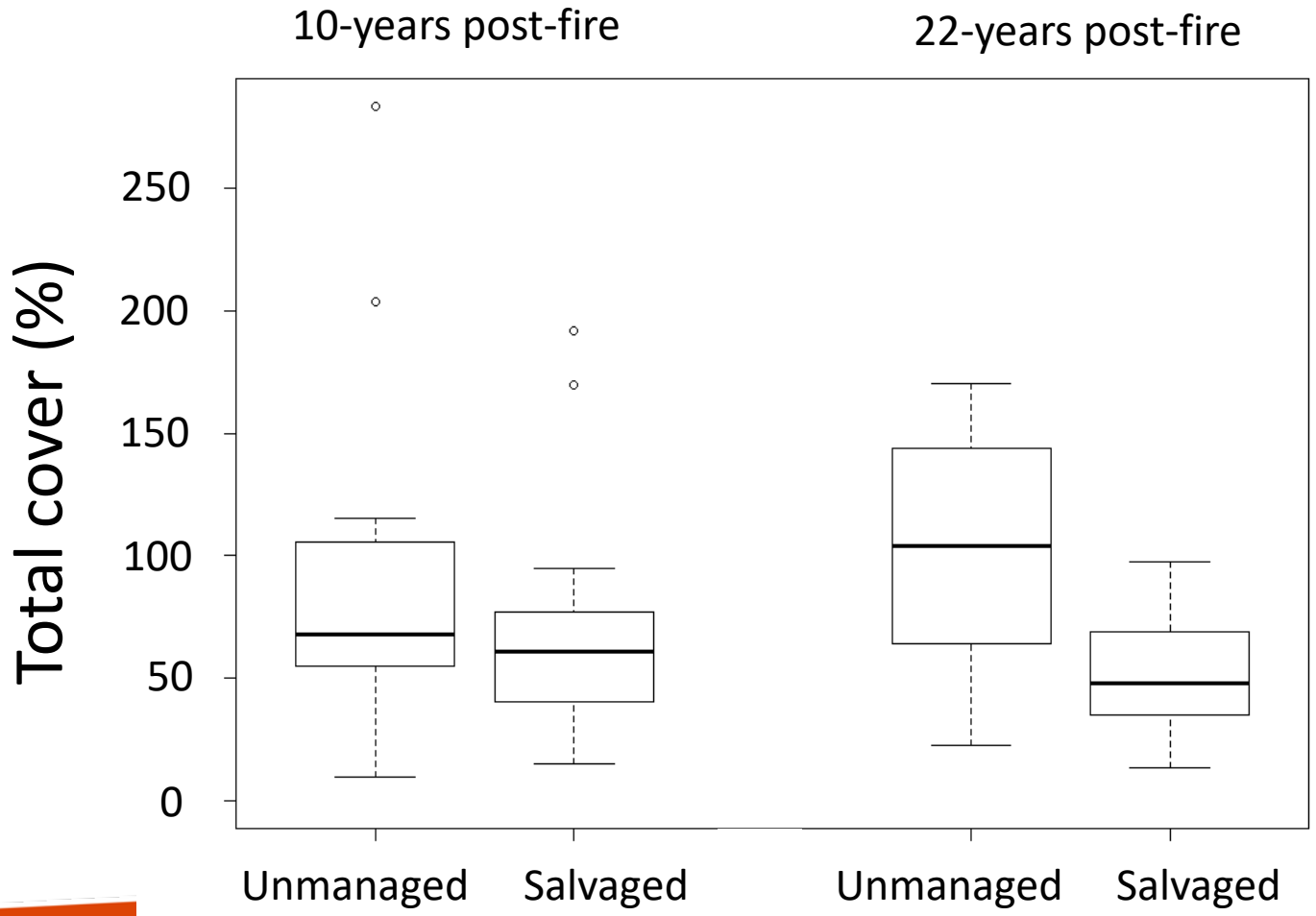
Total shrub cover



Loss of individual species

10-years post-fire

Species	Salvaged	Unmanaged	Unburned
LIBO	0	46	54
PAMY	0	72	28

22-years post-fire

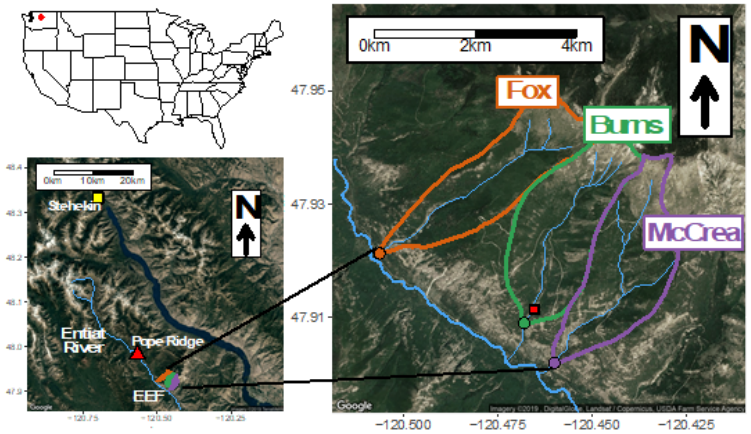
Species	Salvaged	Unmanaged	Unburned
CHUM	0	4	96
LIBO	0	14	86
GAFR	0	100	0
MAAQ	0	98	2
PAMY	0	94	6
PREM	0	100	0
RULE	0	100	0
VAME	0	95	5

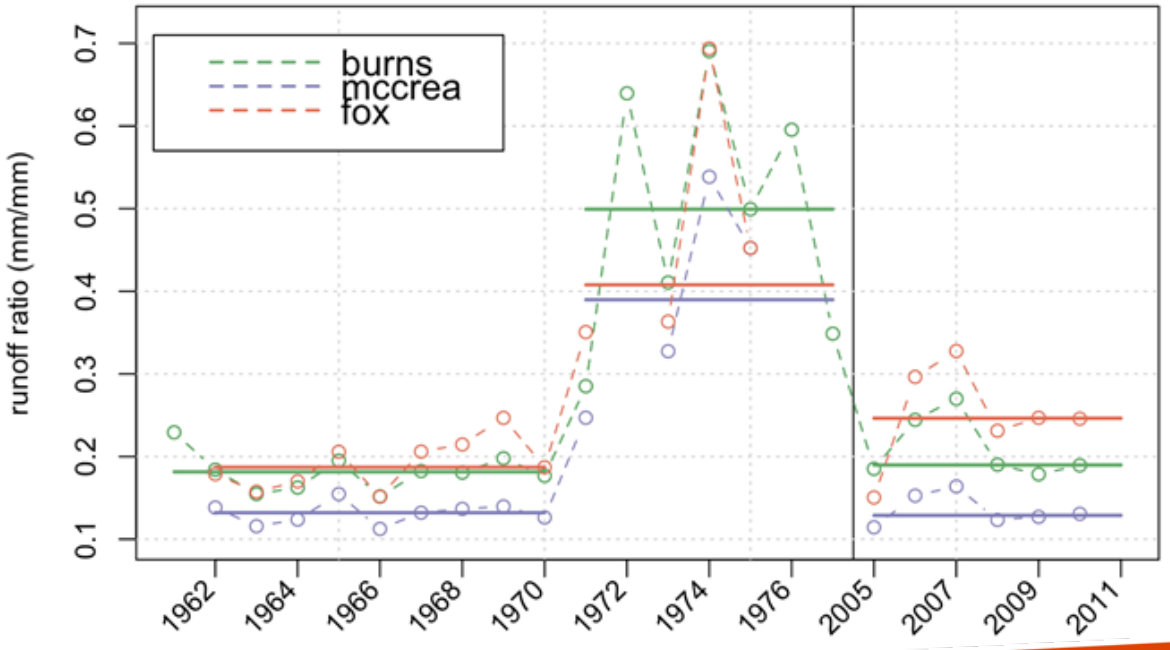
Old-growth associate, poor response

Old-growth tolerant, positive response

Early seral associate

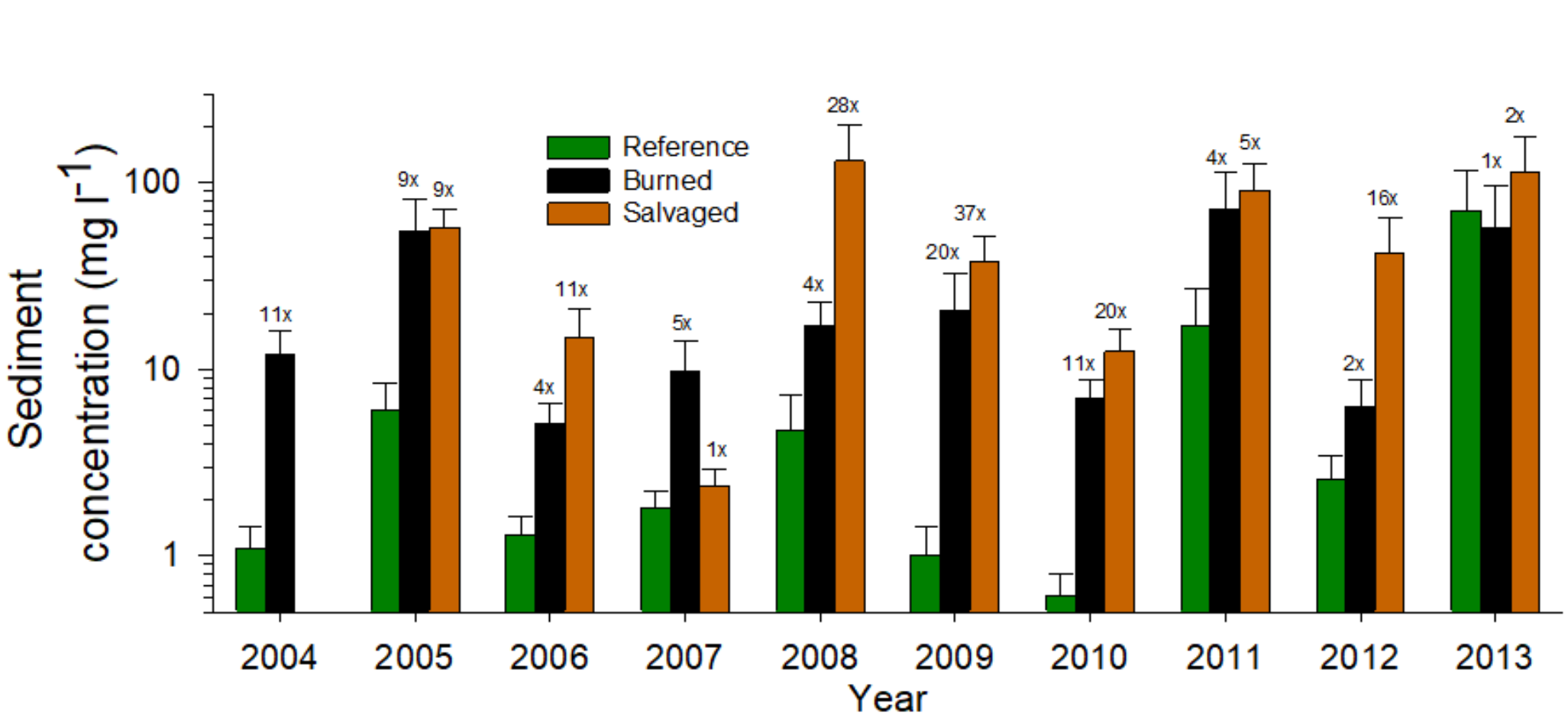
Relative abundance





Water and watersheds

- Wildfire = more water, more often
- Main factors driving post-fire streamflow:
  - post-fire climate, burn severity, area burned (20%)
- Entiat, WA example (long-term effects):
  - 2 catchments salvage logged, aerially seeded, fertilized = recovered
  - 1 burned catchment 37 % above predicted from pre-fire 35–41 yrs post-fire



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Wildfire and salvage logging effects on erosion and sediment

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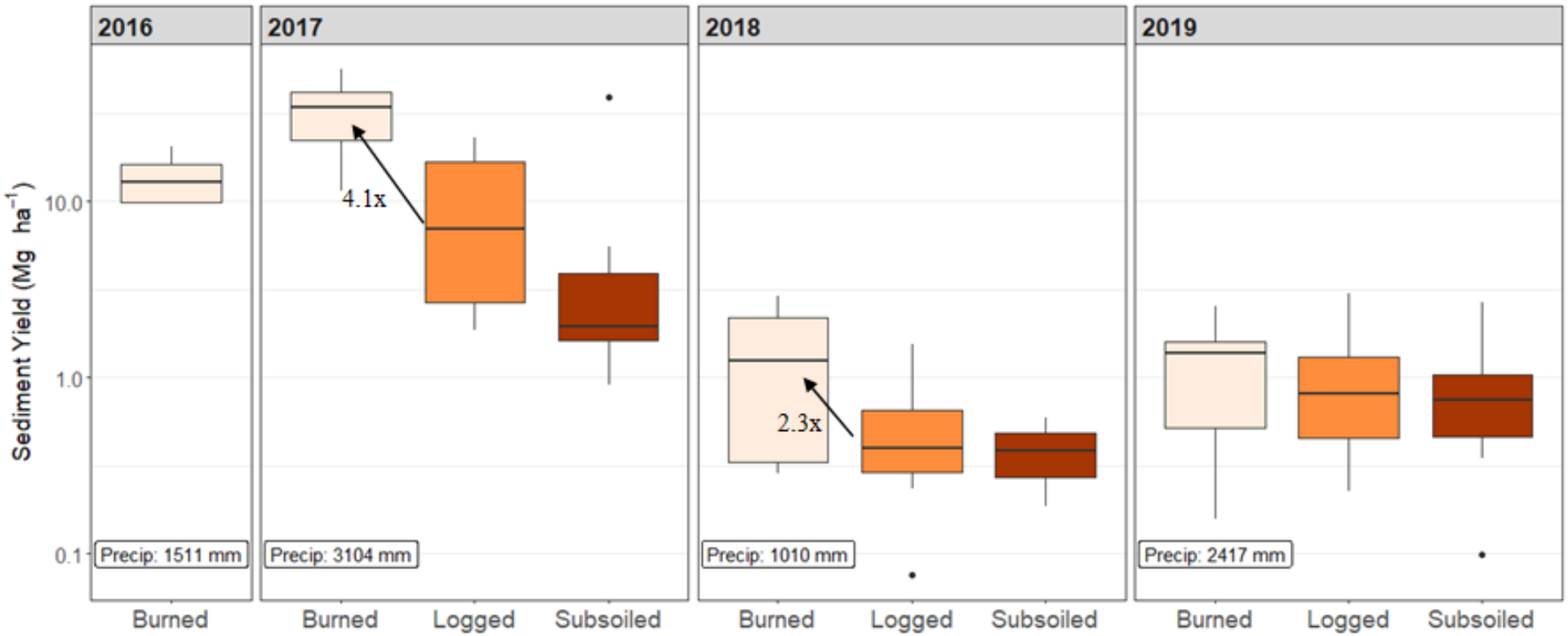
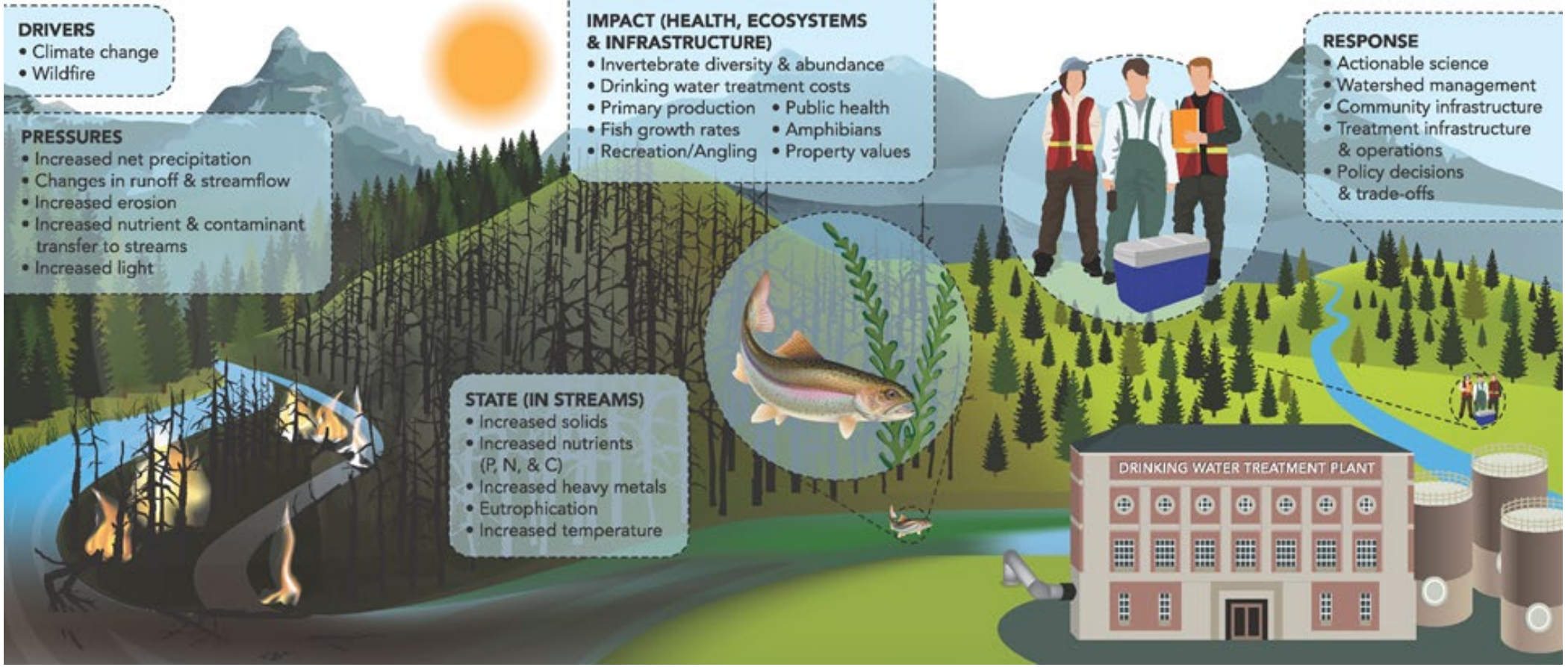


- Ground cover is key to reducing post-fire and post-salvage erosion



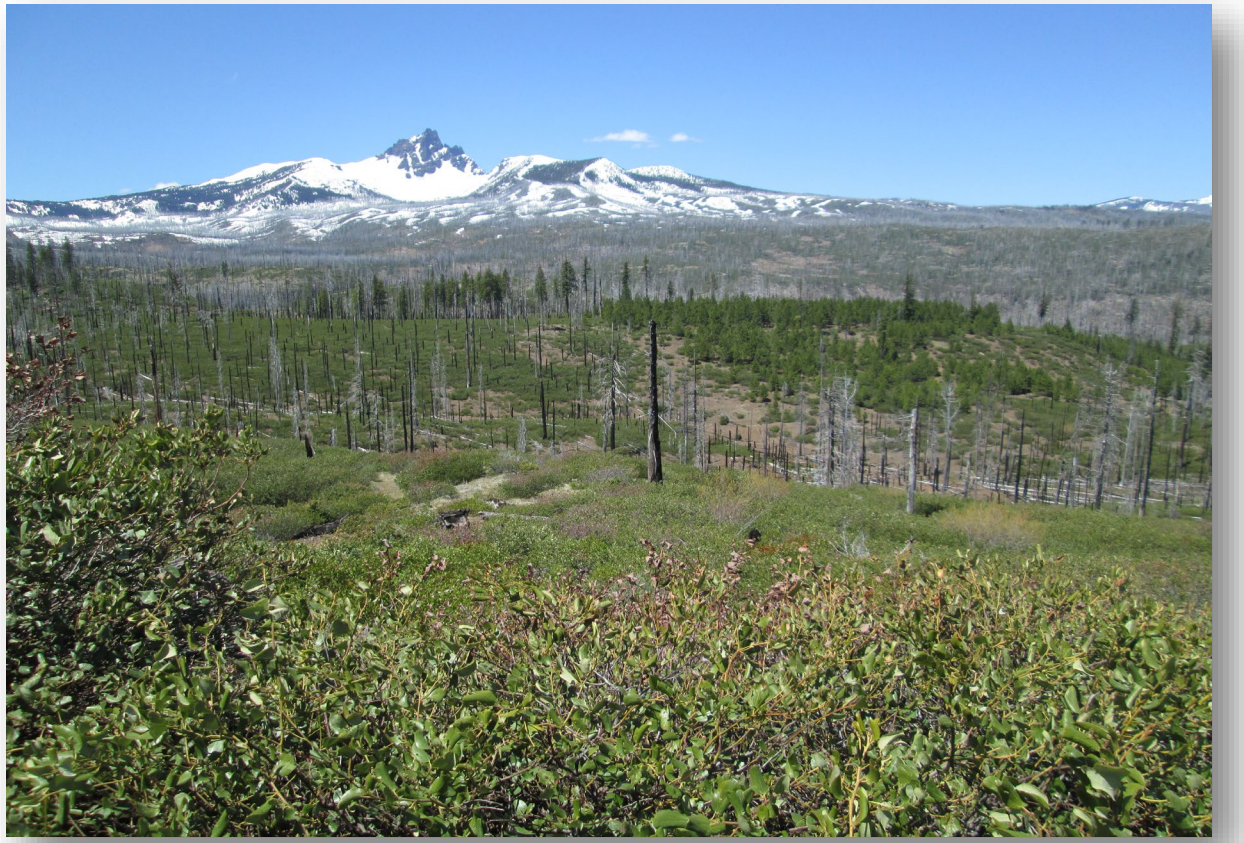
- Leverkus et al. (2018) review on salvage logging effects on ecosystem services:
  - 4341 publications: water = 1; fish = 2; nutrients = 4; erosion = 7

SUMMARY: Salvage logging impacts

- **Initial impact AND impact over time (ecosystems and recovery)**
- **Balance impact against degradation of wood quality and economics**
- **Influences on the carbon cycle**
  - **Living pool or dead pool**
  - **Reburn probability**
  - **Life cycle analyses**

Salvage logging operations and practices

- **Landowner objectives**
  - private (often plantations)
  - other landowners
- **Residual fuel loading**
- **Intensity of salvage**
  - % of the trees
  - Sizes



Bottom Lines

Salvage is…

…an economic decision

- **Landowner objectives**
- **Ecological impacts**

…a silvicultural tool

- **Stand density, composition (all taxa), structures, and functions**
- **Fuel hazard and future risk**

These guide where and why a landowner might salvage timber.


Thank You!
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