How Can Tribal Land Managers Adapt to Climate Change?

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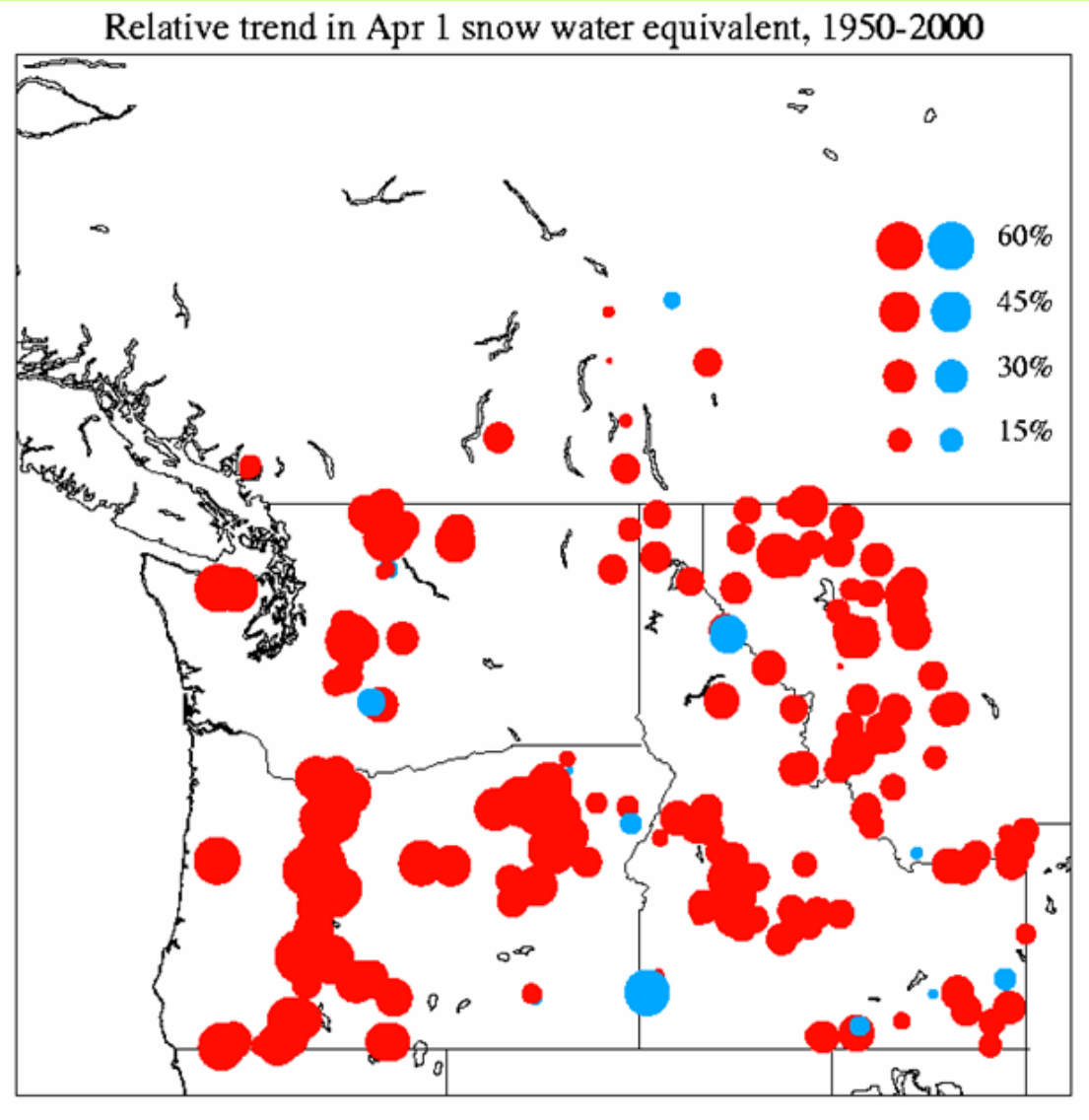
Climate Change in the Northwest
May 29, 2008

“If there is one word that describes the West, it is **aridity**.”

Wallace Stegner

Where the Bluebird Sings to the Lemonade Springs

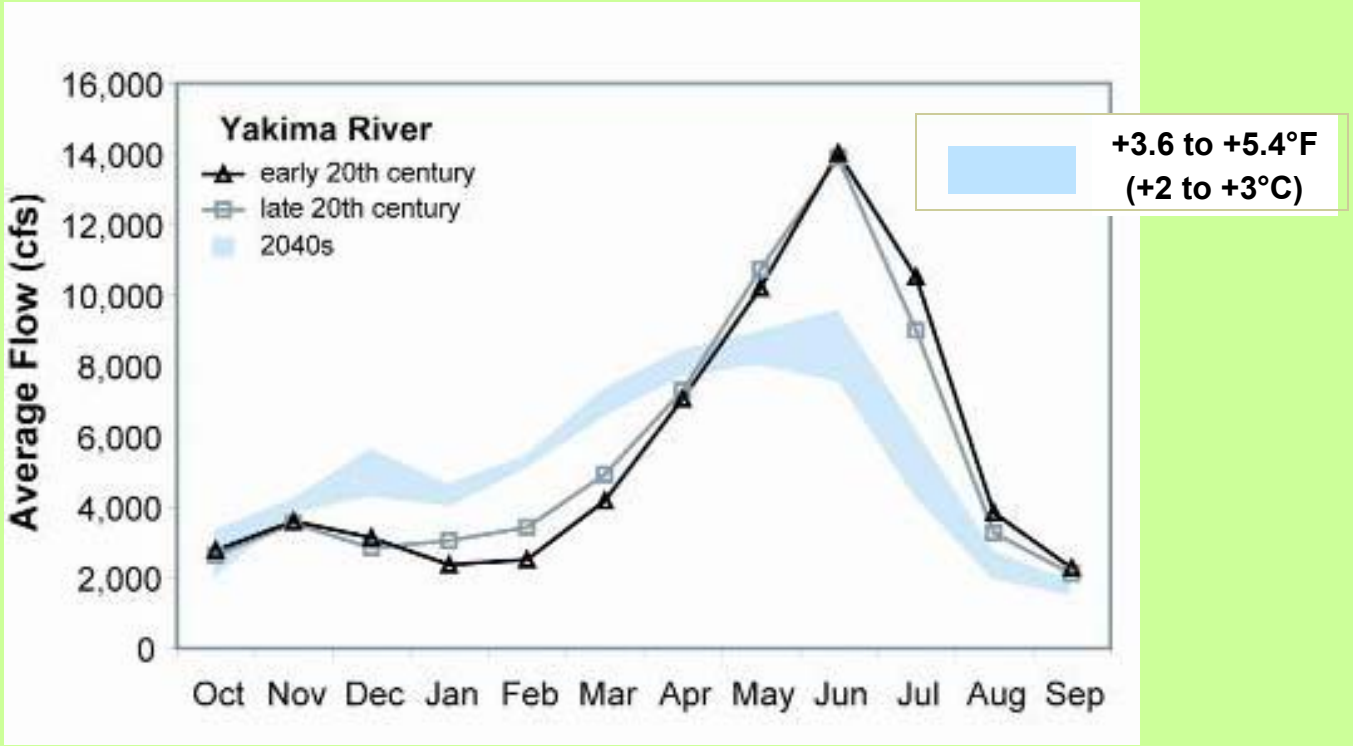
Snowpack trends



Altered Streamflow

- More winter rain, less snow → higher winter streamflows
- Warmer temperatures → shift in timing of peak runoff
- Lower winter snowpack → lower spring and summer flows

Projected streamflow changes, 2050s

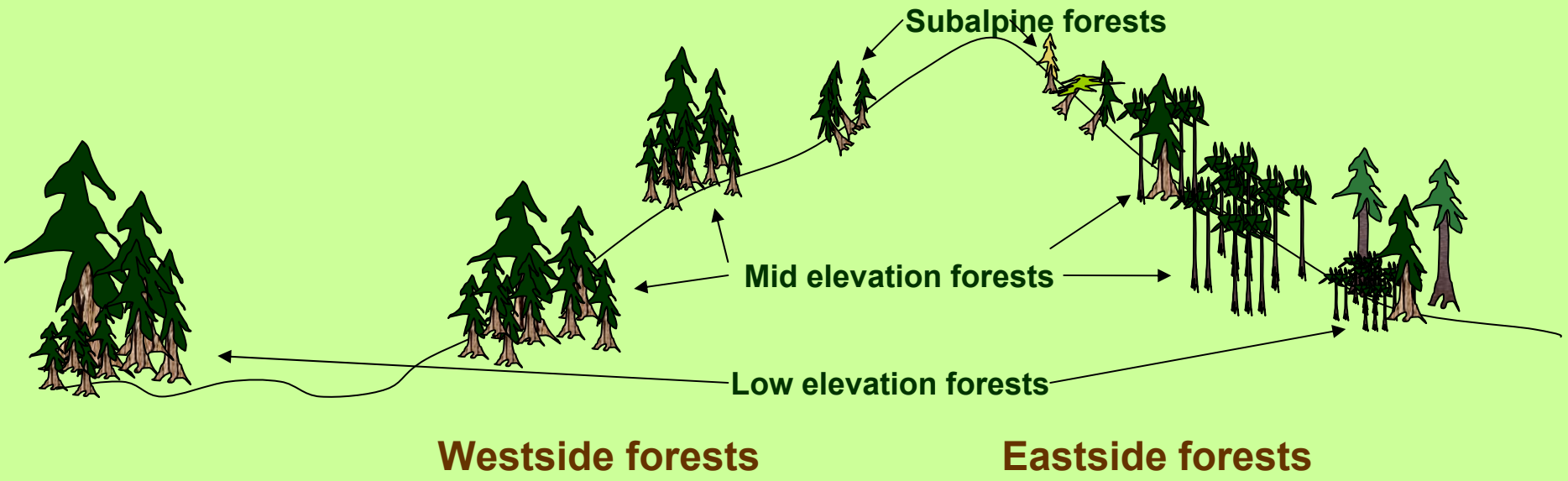


Climate change and tree growth

Subalpine forests: Less snowpack; longer, warmer growing seasons = **Growth increase**

Mid elevation forests: Warmer summers, less snow pack = **Depends on precipitation**

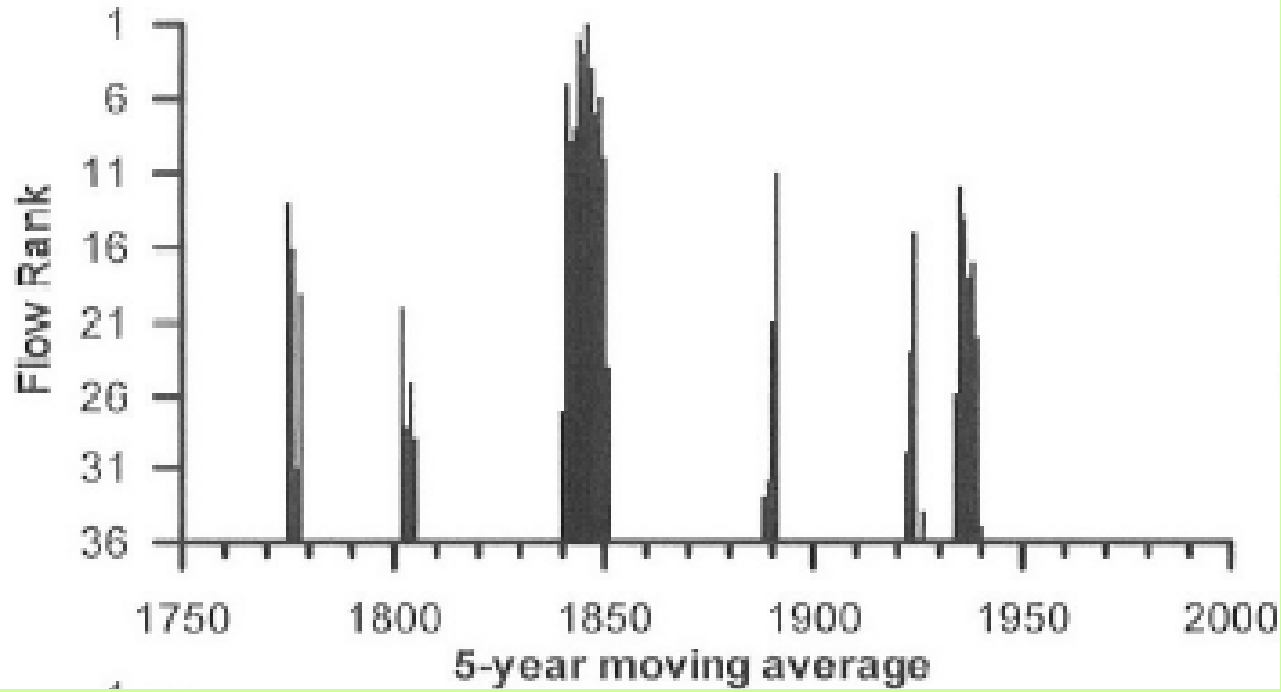
Low elevation forests: Warmer summers, less snow pack = **Large growth decrease**



Dying pinyon pine **Jemez Mts., October 2002**

Jemez Mts., May 2004

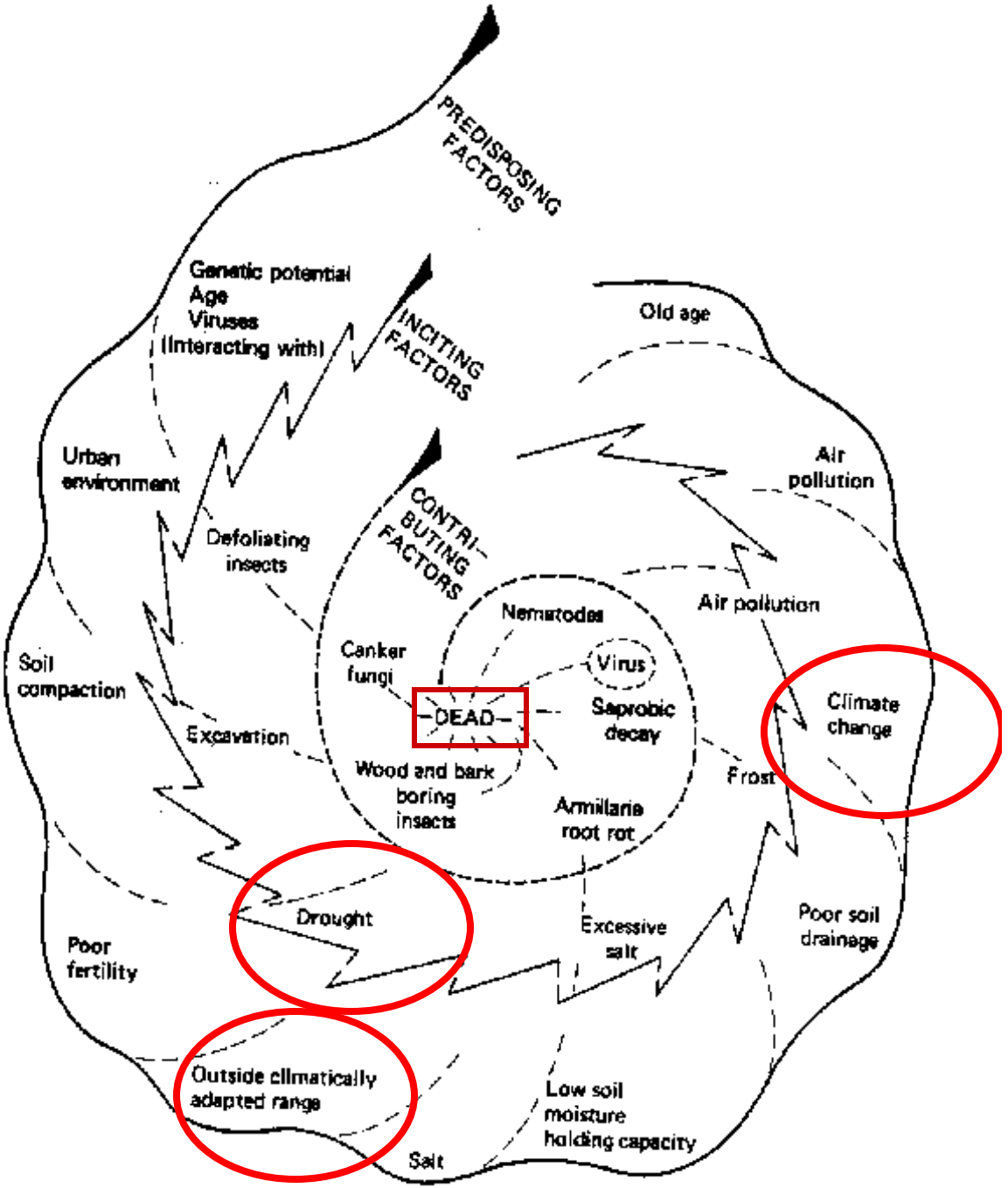
Droughts were more common prior to 1950



Gedalof et al. (2004)

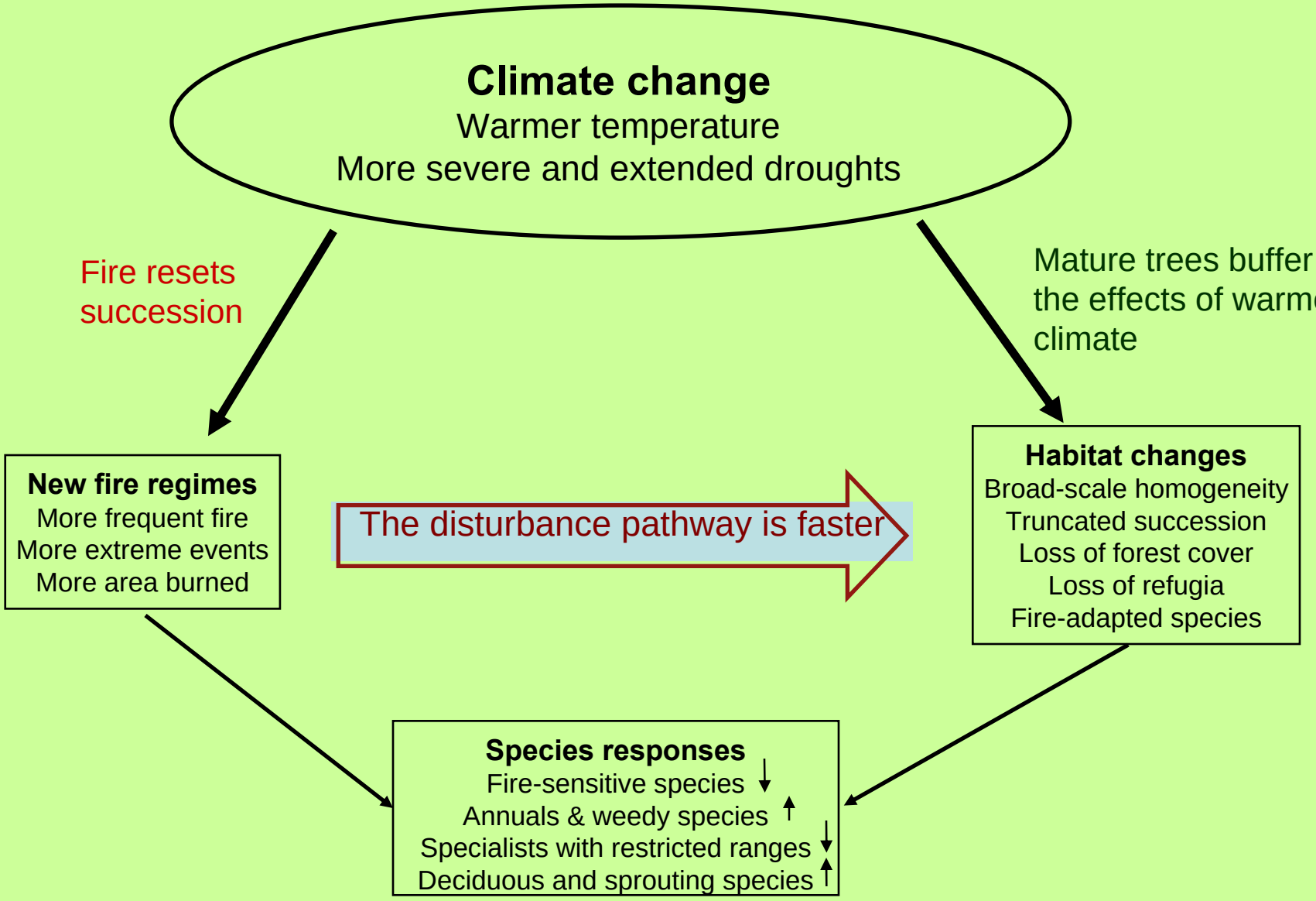
Streamflow for the Columbia River, reconstructed from tree-ring data

The Disease Spiral

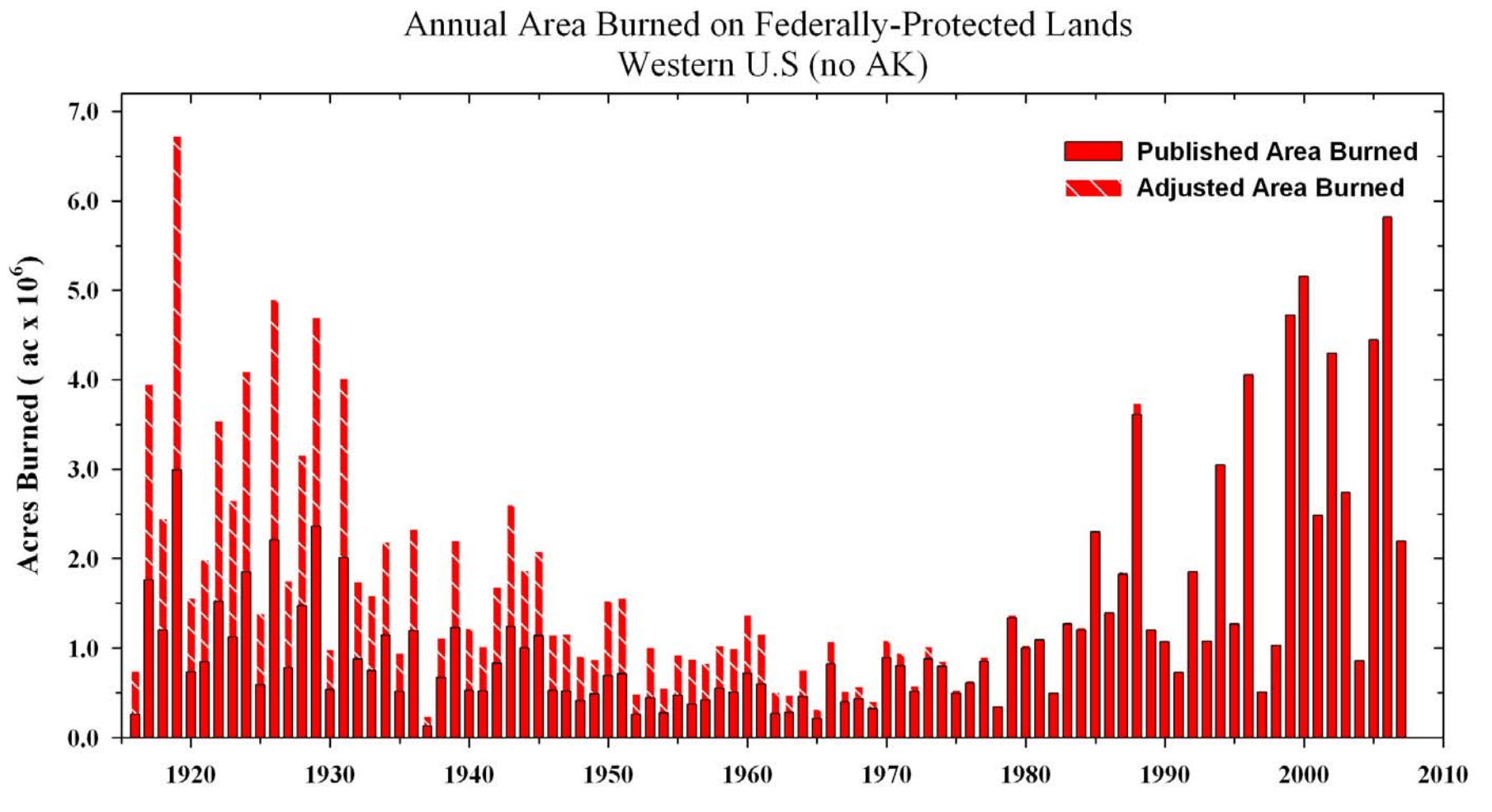


From Manion (1991)

Disturbance drives ecosystem changes



Area burned – Western U.S., 1916 - 2007



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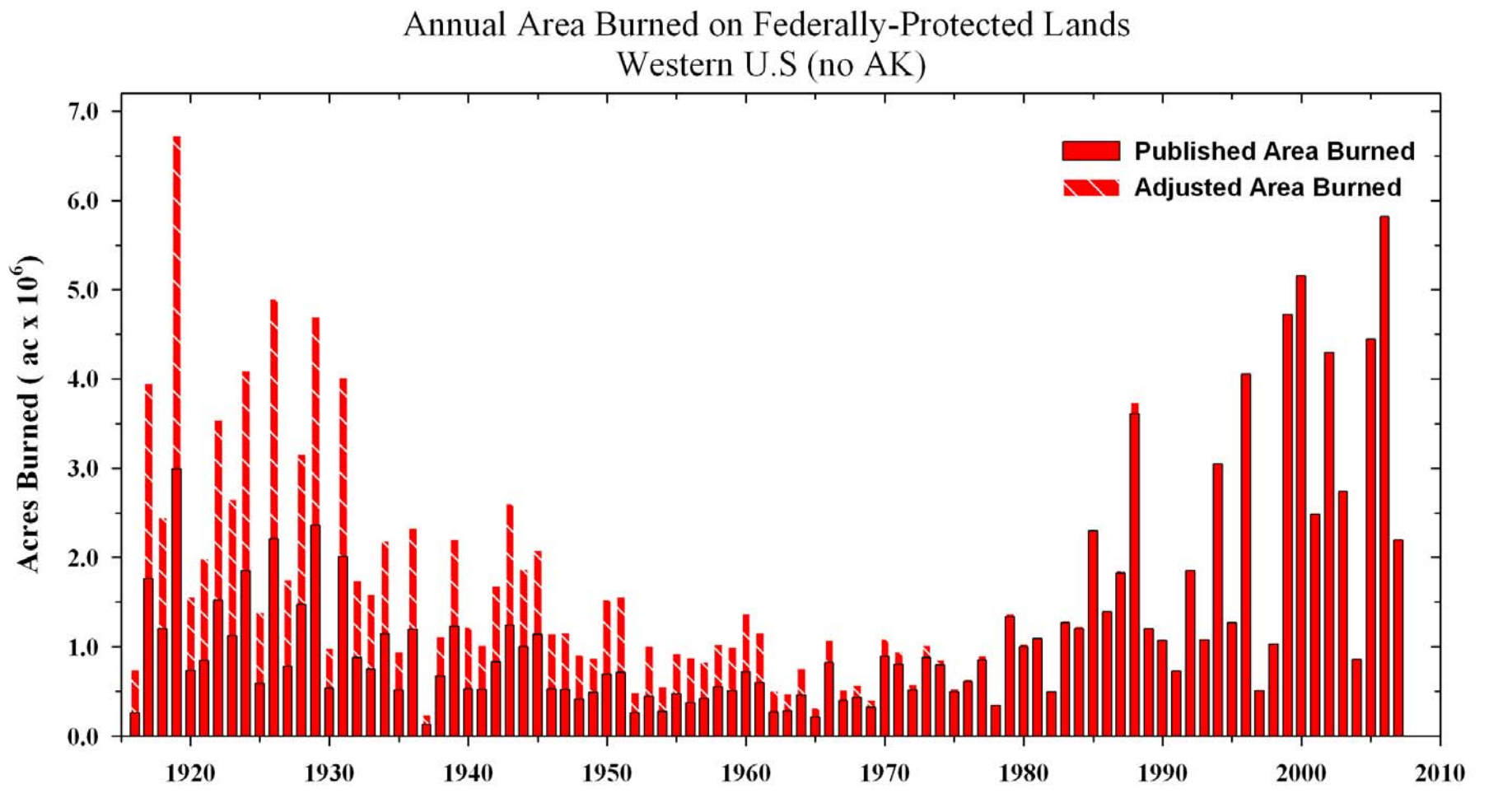

Fire suppression → Fire exclusion → Fuel accumulation

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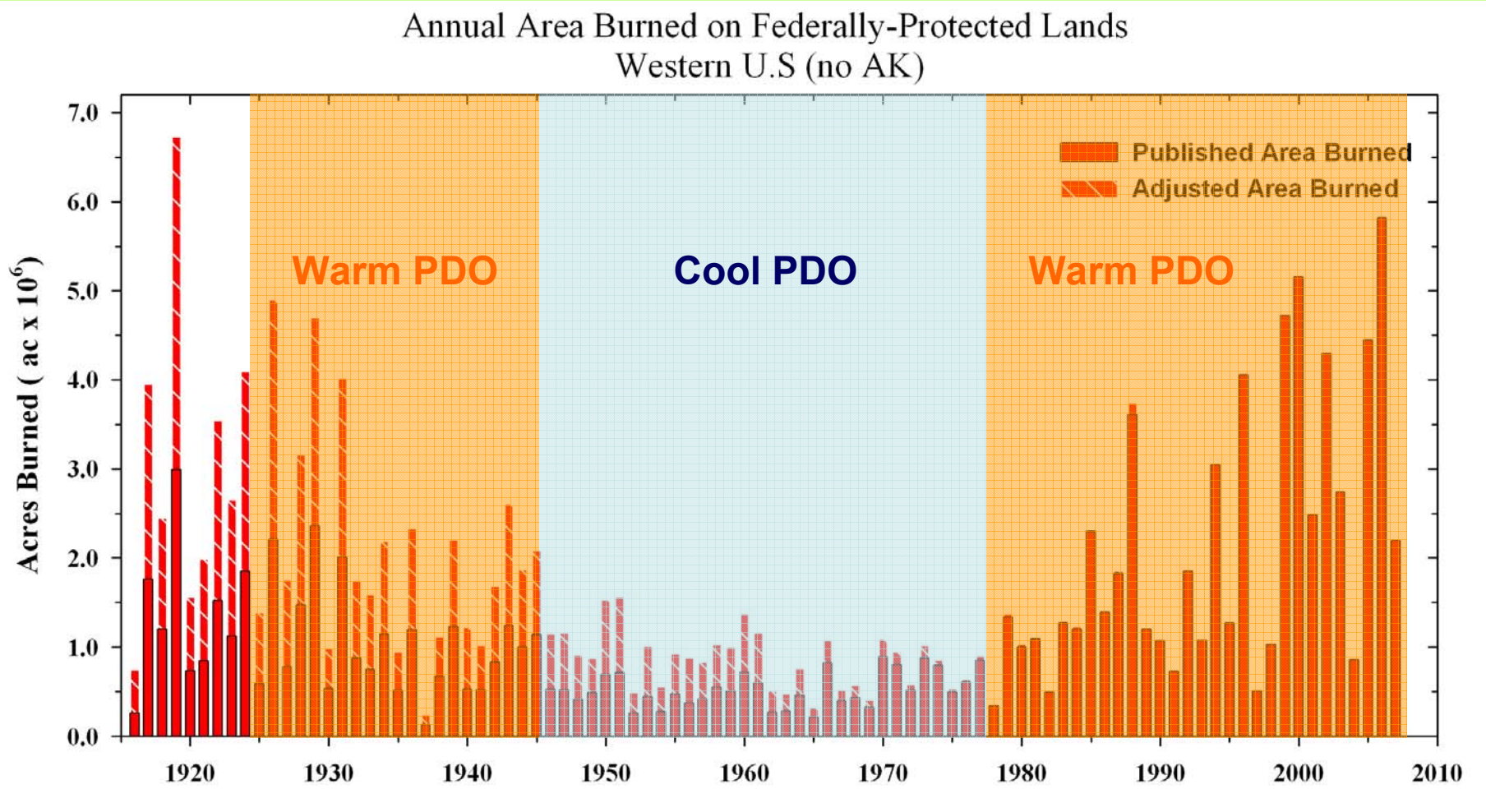

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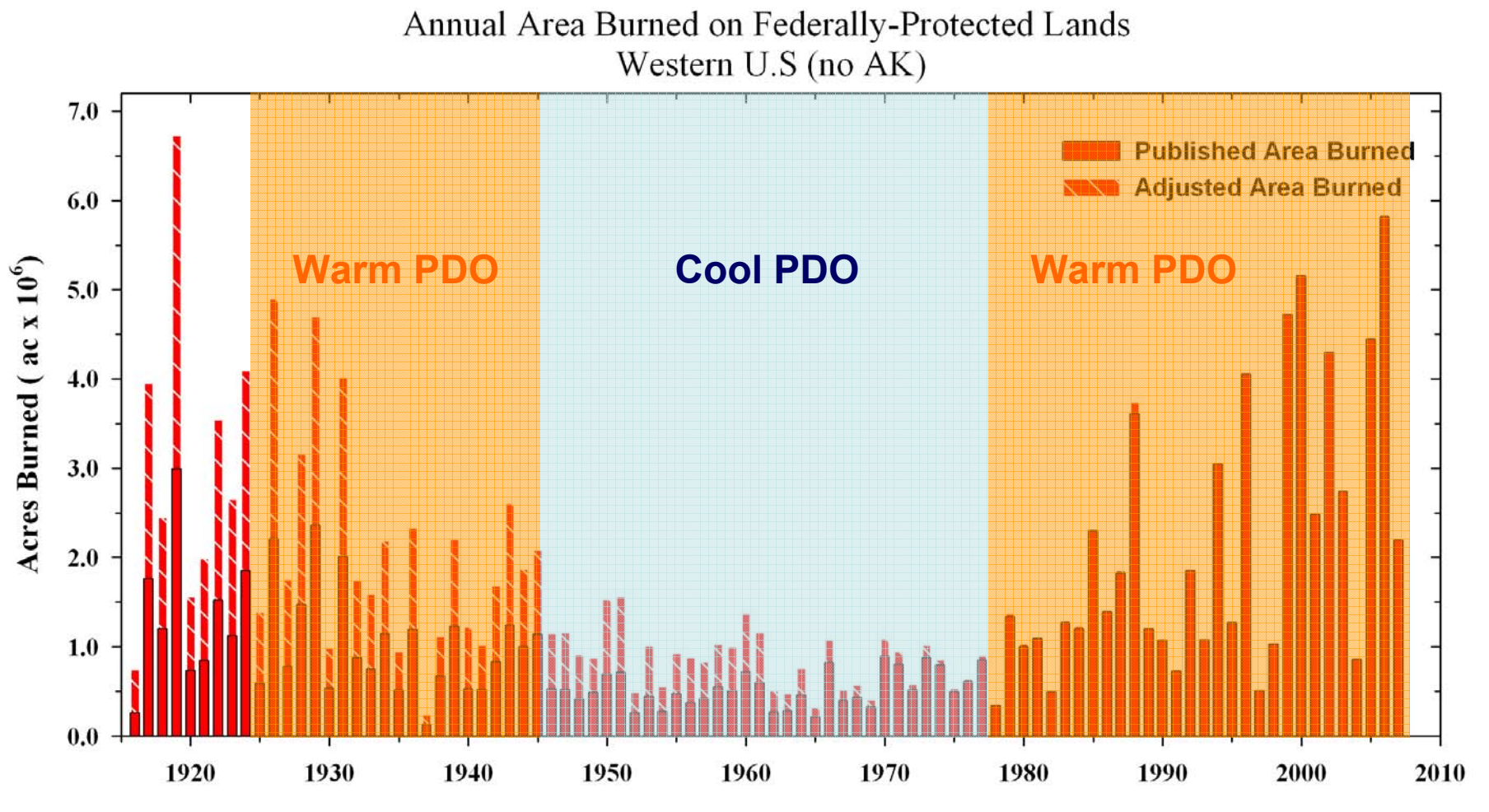


Fire suppression → Fire exclusion → Fuel accumulation

Lots of fire → Much less fire → Lots of fire

Years with fire area > 200,000 acres

	Warm-phase PDO	Cool-phase PDO
Idaho	15	7
Oregon	14	5
Washington	11	2
TOTAL	**40 (74%)**	**14 (26%)**

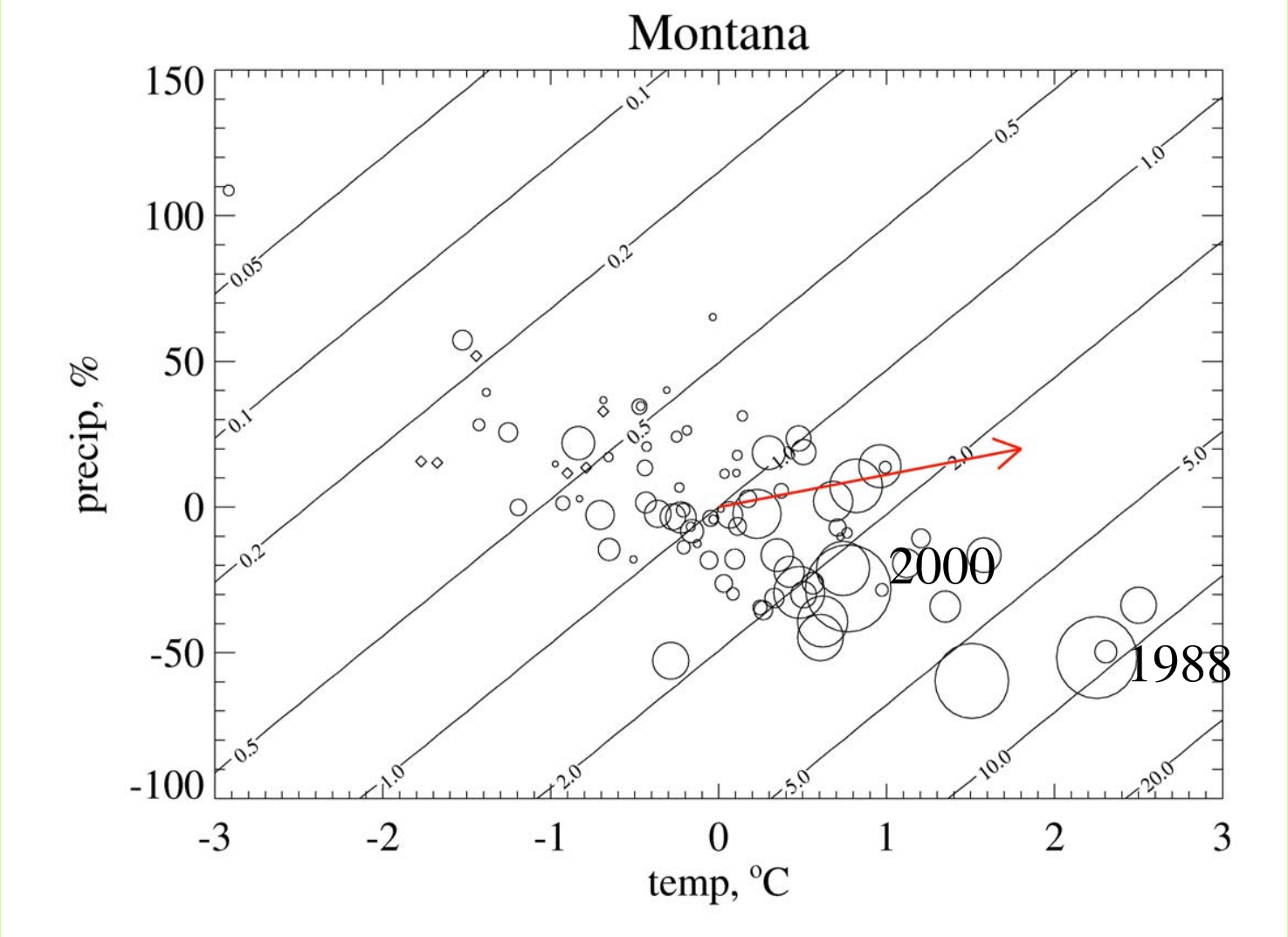
National Forest data, 1916-2007

Future wildfire?

Analysis of wildfire data since 1916 for the 11 contiguous Western states shows that *for a 4ºF increase* that *annual area burned will be 2-3 times higher*.

McKenzie et al. (2004), *Conservation Biology* 18:890-902

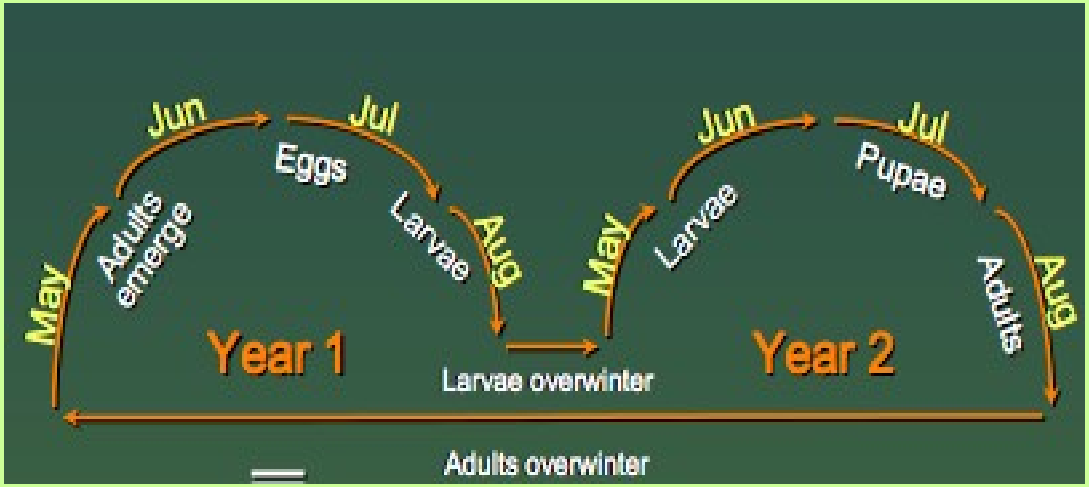
Wildfire area burned – *2°C increase*



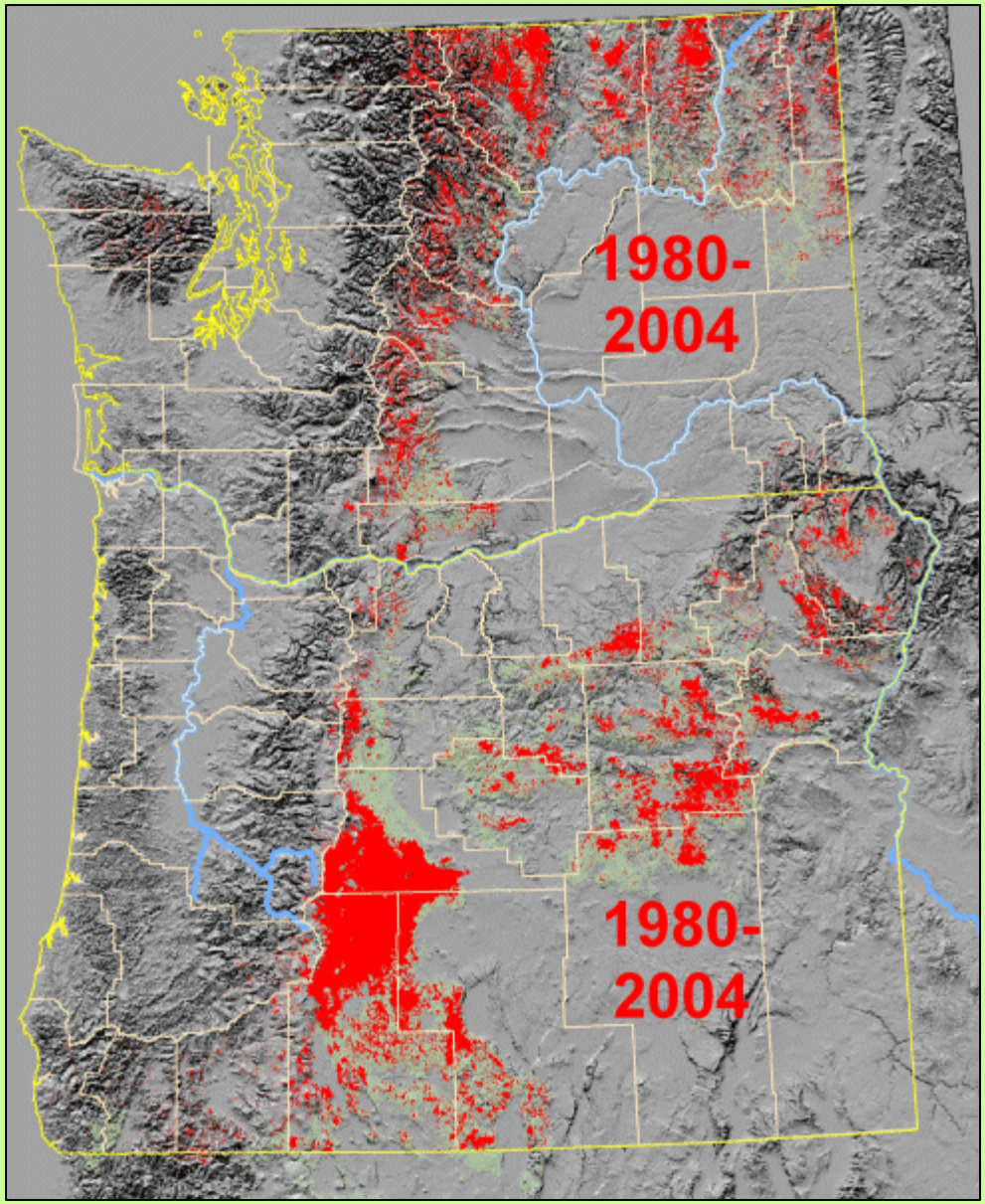
Dendroctonus ponderosae Hopkins

Effects of temperature increase on mountain pine beetle

- Population synchronized by temperature (onset of spring)



- Rate of generation turnover increases with temperature increase



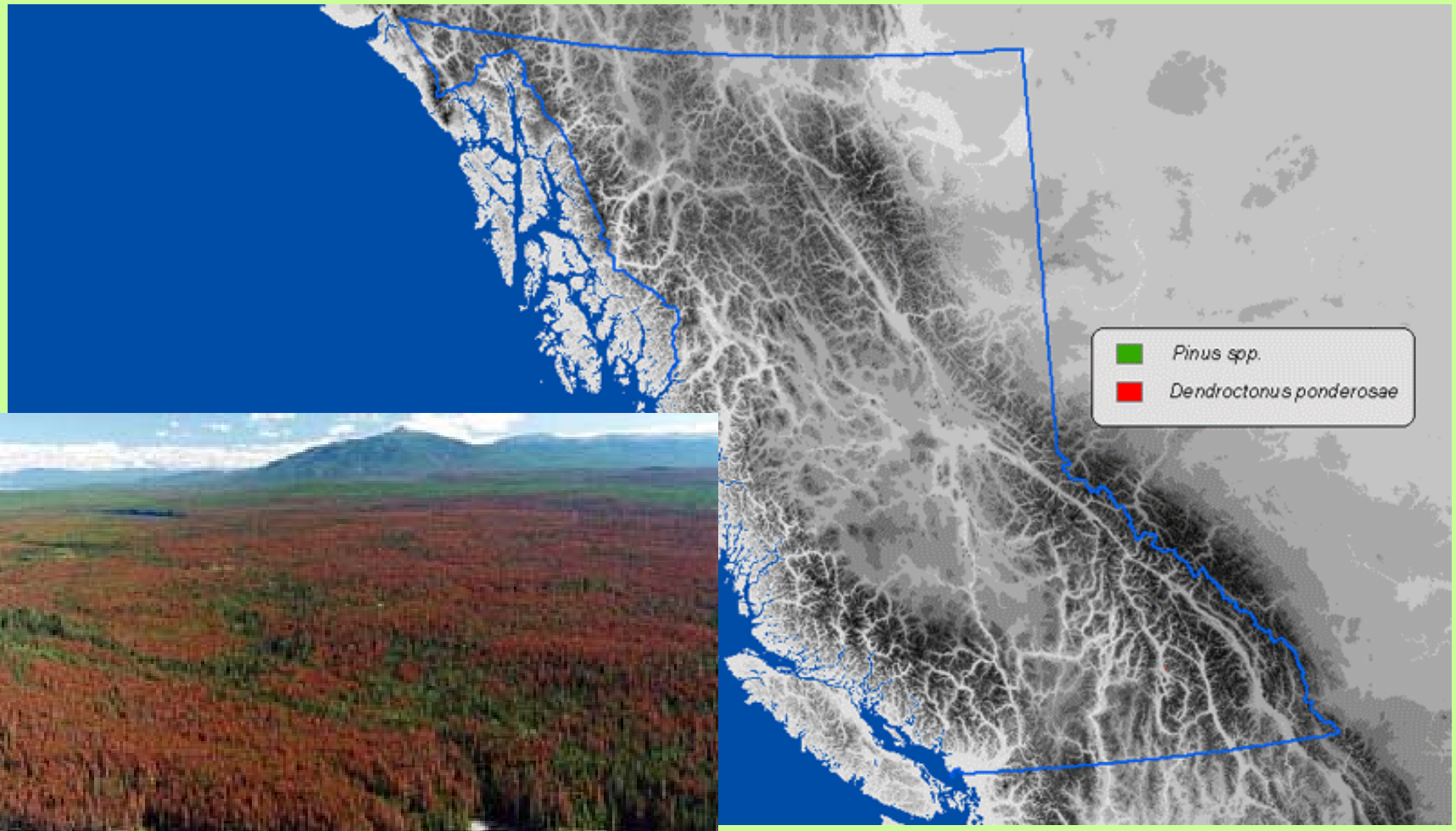
Tree Mortality

Mountain Pine Beetle

1980 - 2004

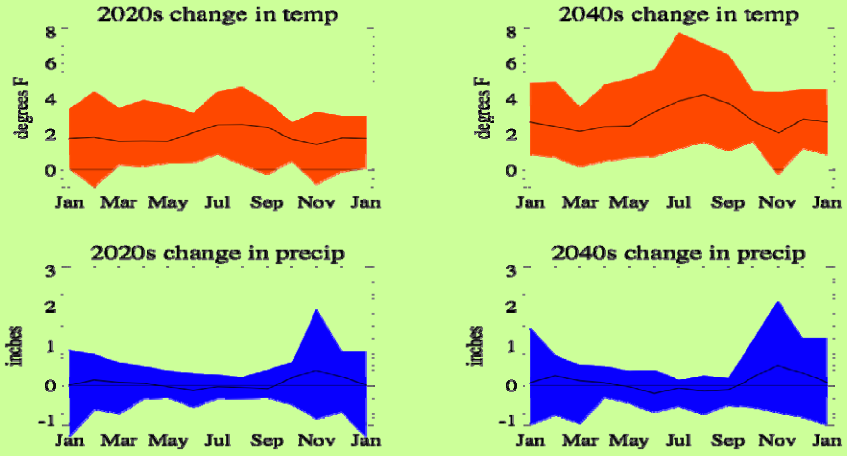
Shaded areas show locations where trees were killed. Intensity of damage is variable and not all trees in shaded areas are dead.
www.fs.fed.us/r6/nr/fid/data.shtml

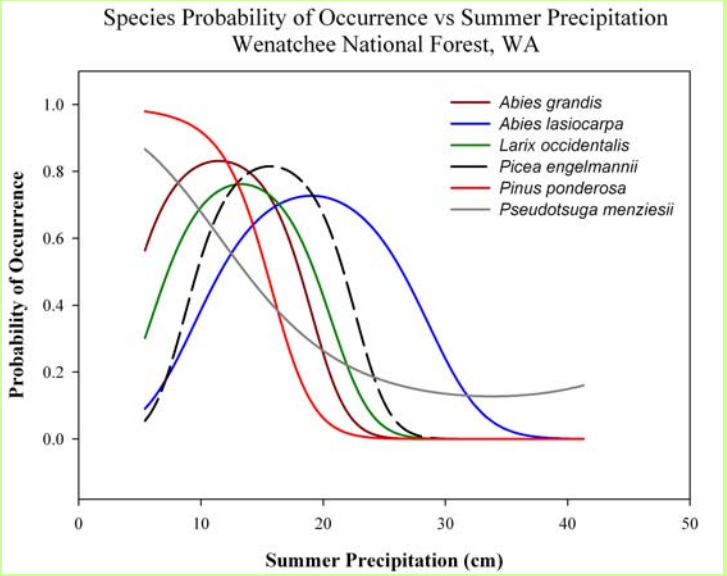
Mountain Pine Beetle outbreaks
British Columbia

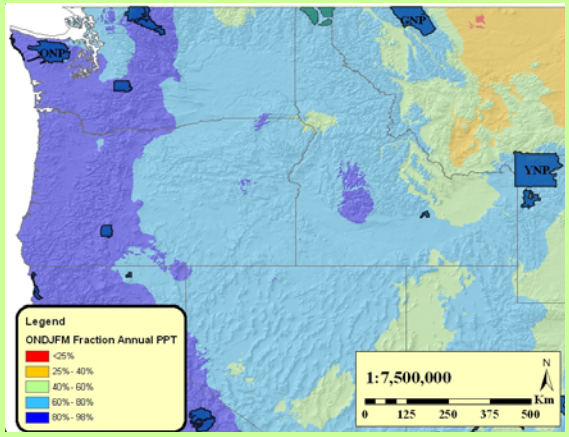


Courtesy of Mike Bradley, Canfor Corporation

Planning for climate change in Western forests







Coming Soon….

US Climate Change Science Program Synthesis and Assessment Product 4.4 (SAP 4.4)

Adaptation Options for Climate-Sensitive Ecosystems and Resources

National Forests

National Parks

National Wildlife Refuges

Wild and Scenic Rivers

National Estuaries

Marine Protected Areas

http://www.climatescience.gov/Library/sap/sap4-4/default.php

General adaptation strategies

Implement adaptive management

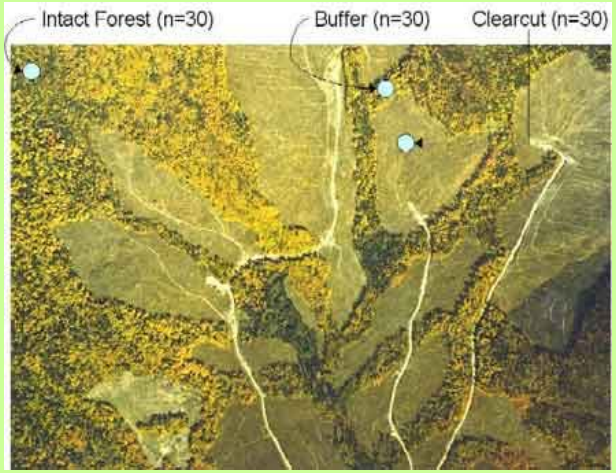
Incorporate uncertainty in science and management

View fire disturbance (and ecological disturbance in general) as an opportunity

Work with your neighbors – collaborate with other organizations

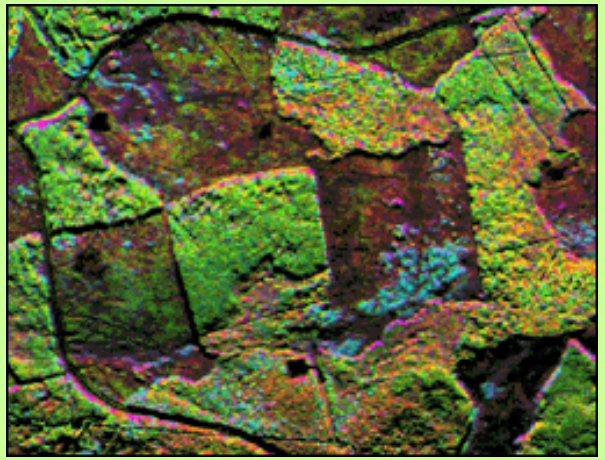
Adaptation strategy #1

Increase landscape diversity



Increase resilience at large scales

-- Treatments and spatial configurations that minimize loss of large number of structural and functional groups



Increase size of “patches”

-- Larger areas for treatments and age/structural classes

Maintain connectivity

Adaptation strategy #2

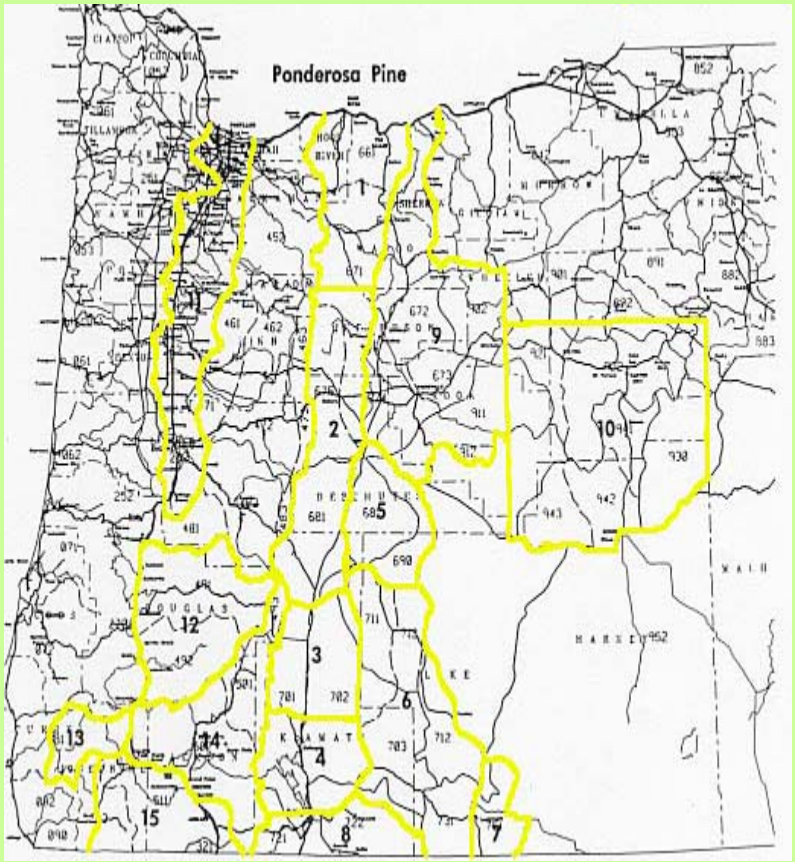
Maintain biological diversity

Modify genetic guidelines

Experiment with mixed species, mixed genotypes

Assist colonization, establish neo-native species

Identify species, populations, and communities that are sensitive to increased disturbance



Adaptation strategy #3

Plan for post-disturbance management

Treat fire and other ecological disturbance as normal, periodic occurrences

Incorporate fire management and other disturbance options in land management

Adaptation strategy #4

Implement early detection / rapid response

Eliminate or control exotic species

Monitor post-disturbance conditions, reduce fire-enhancing species (e.g., cheatgrass)

Adaptation strategy #5

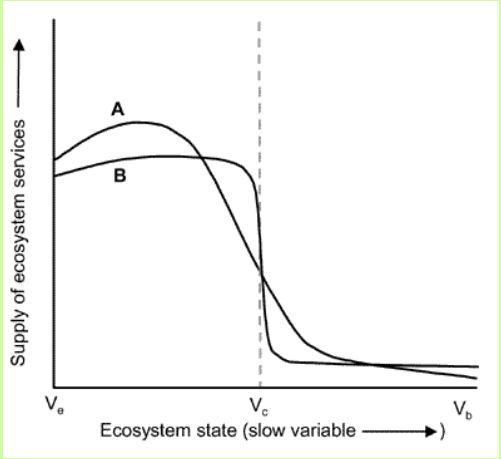
Manage for realistic outcomes

Identify key thresholds for species and functions

Determine which thresholds will be exceeded (e.g., salmon)

Prioritize projects with high probability of success; abandon hopeless causes

Identify species and vegetation structures tolerant of increased disturbance



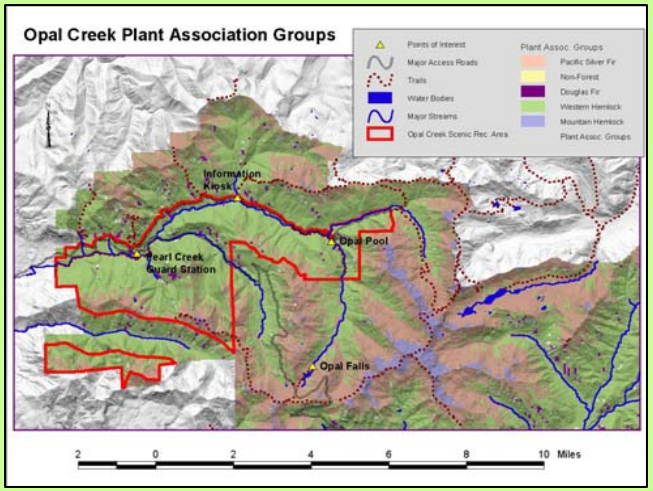
Adaptation strategy #6

Incorporate climate change in restoration

Reduce emphasis on historical references

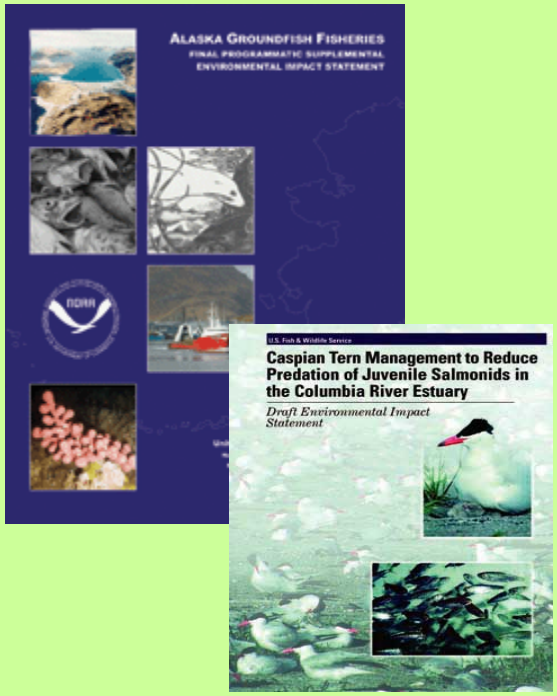
Reduce use of guidelines based on static relationships (e.g., plant associations)

Develop performance standards appropriate for accomplishing realistic restoration trajectories



Adaptation strategy #7

Develop climate-smart regulations, policies



Address regulatory issues
(e.g. Endangered Species Act)

Address policy issues
(e.g., historic range of variation)

Address process issues
(e.g., NEPA, public opposition)

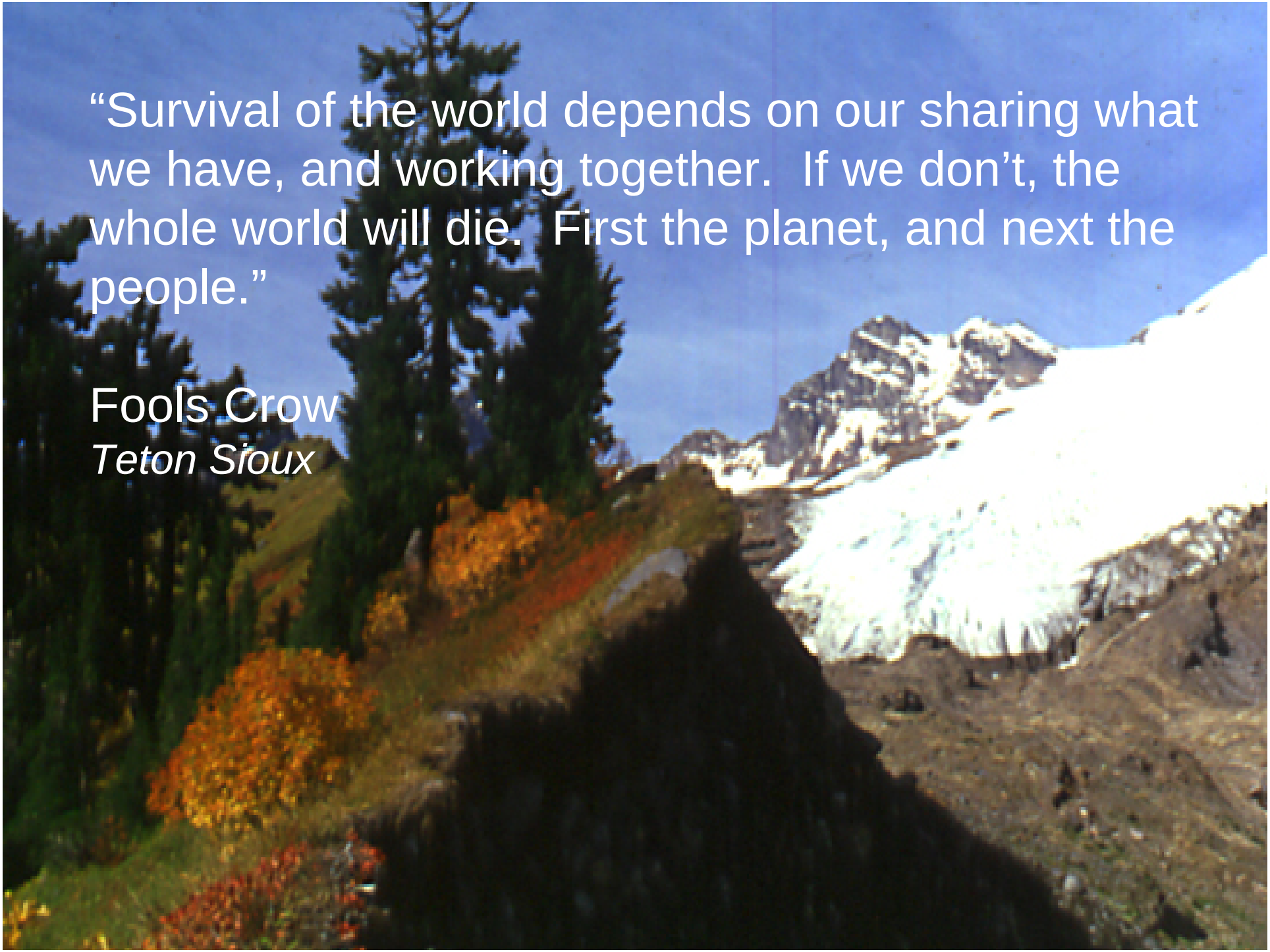
Work with tribal leaders, legislators and policy makers to raise awareness; work closely with local stakeholders from onset of projects

Adaptation strategy #8

Anticipate surprises

Expect mega droughts,
big fires, system collapses,
species extirpations.

Develop management
options for these events.


“Survival of the world depends on our sharing what we have, and working together. If we don’t, the whole world will die. First the planet, and next the people.”
Fools Crow
Teton Sioux


Thank you!
Dave Peterson
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http://www.fs.fed.us/pnw/fera