Changing Gradients: Effects on Species Invasions & Migrations

What will we manage for?

Julio Betancourt USGS &
Rita Beard, NPS

Natural Resource Needs Related to Climate Change in the Great Basin & Mojave Deserts: Research, Adaptation, Mitigation

April 21, 2010
Las Vegas, NV

Buffelgrass (*Pennisetum ciliare*) invasion in the foothills of the Santa Catalina Mts. north of Tucson

Decisions, Decisions…

Do we save the deserts or resign ourselves to these combustible grasslands?

Which species do we control and which spots do we save?

Who makes this decision, with what consensus and authority?

How do we overcome political obstacles & garner political will?

How much will this cost and what are we willing to pay?

Who bears the cost and responsibility?

What framework do we use to organize ourselves?

How do we know if we are failing or succeeding?

How long is our commitment?

If we fail or decide to do nothing, how will we adapt?

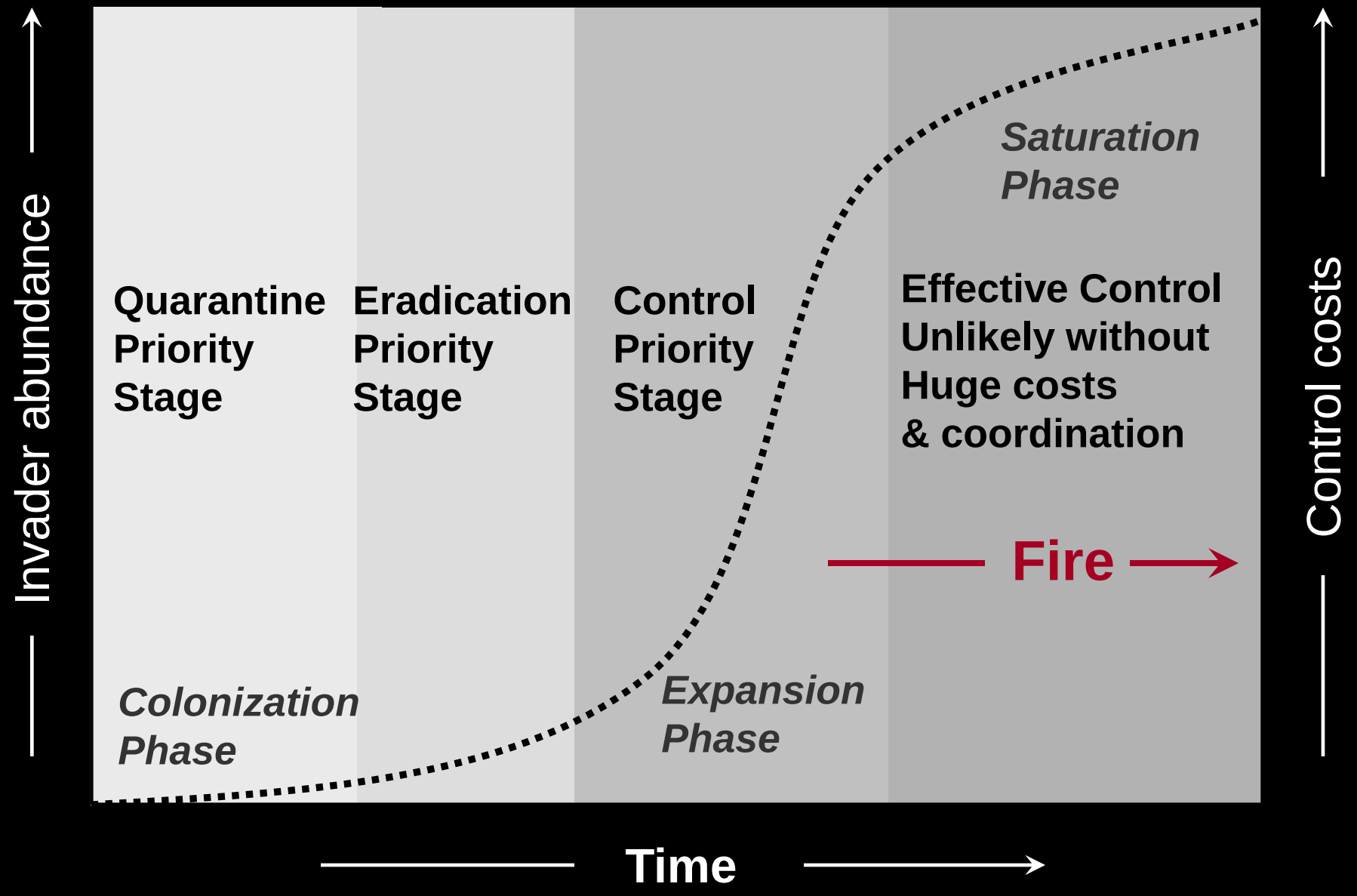
SOUTHERN ARIZONA

Buffelgrass

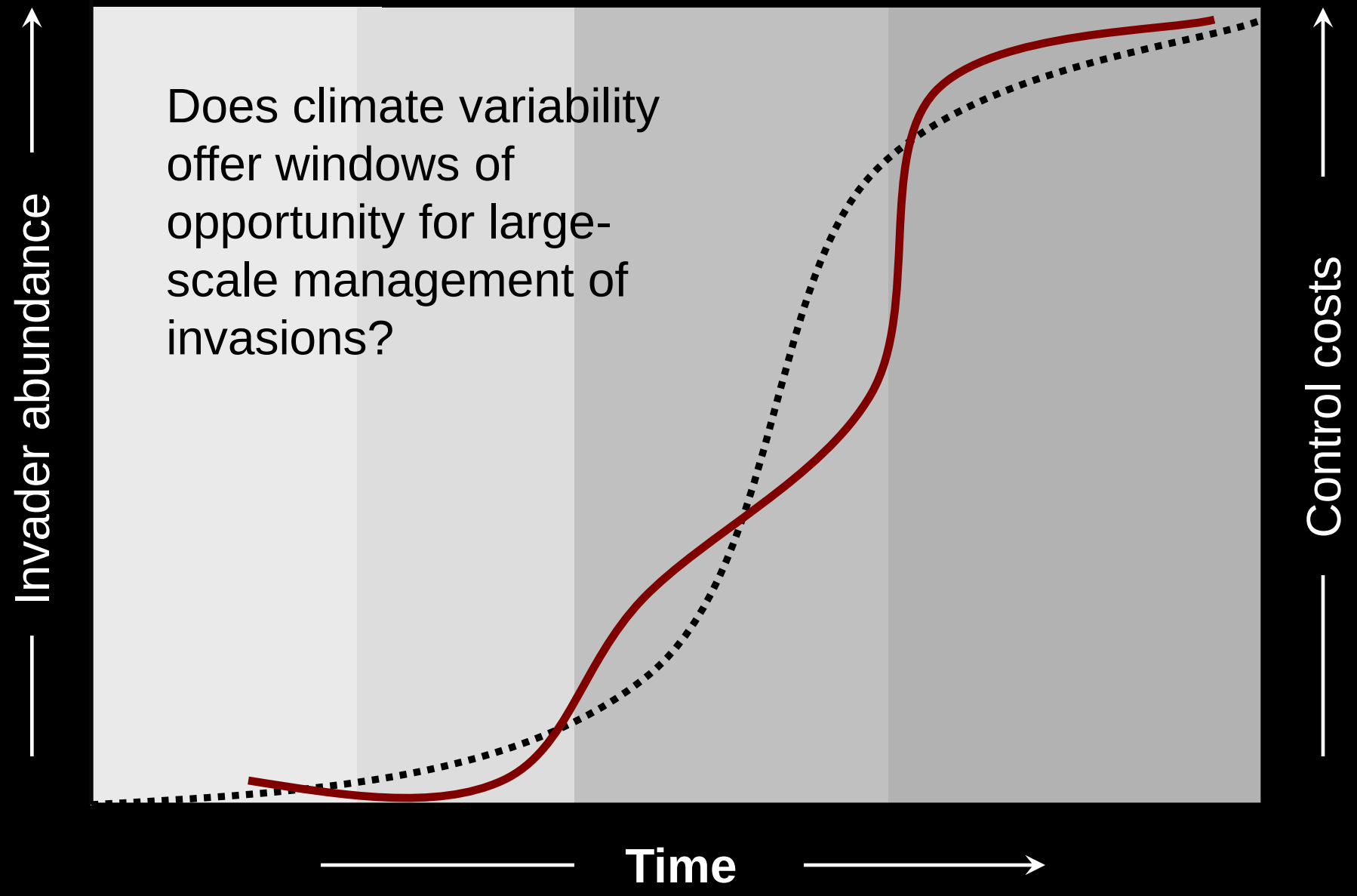
COORDINATION CENTER

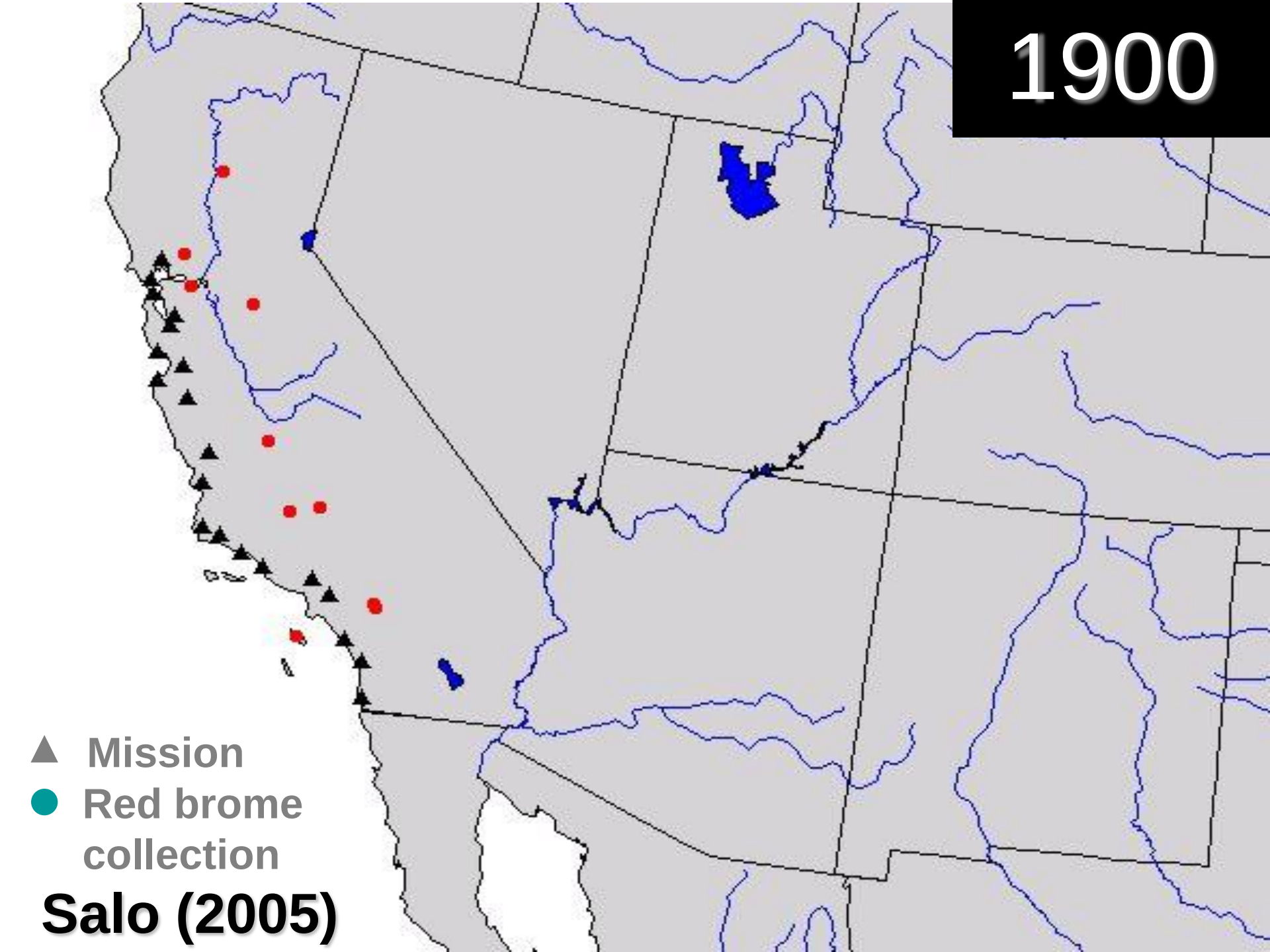
- *Lindy Brigham,* Executive Director, SABCC
- *Sarah Smallhouse*, Pres., T. R. Brown Foundations
- *Jim Kiser*, VP, So. Arizona Leadership Council
- *Erik Bakken*, VP, Tucson Electric Power
- *Lisa Lovallo*, VP, Cox Communications-SoAz
- *Teresa Olson*, Tucson Assoc. of Realtors
- *Chuck Huckelberry*, Pima County Administrator
- *Mike Letcher*, City Manager, City of Tucson
- *Claire Zucker*, Pima Association of Govt's
- *Tom Brandhuber*, Fire Chief, Pima Rural Metro
- *Lisa Graumlich*, SNR, University of Arizona
- *Carolyn Campbell*, Coalition for Sonoran Desert Protection
- *Marilyn Hanson*, Sonoran Desert Weedwackers
- *Rick Brusca*, Arizona-Sonora Desert Museum
- Julio Betancourt, U. S. Geological Survey
- *Darla Sidles,* Supt., Saguaro National Park
- *Jeanine Derby*, Sup., Coronado National Forest
- *Michael Taylor*, Deputy Director, BLM, AZ

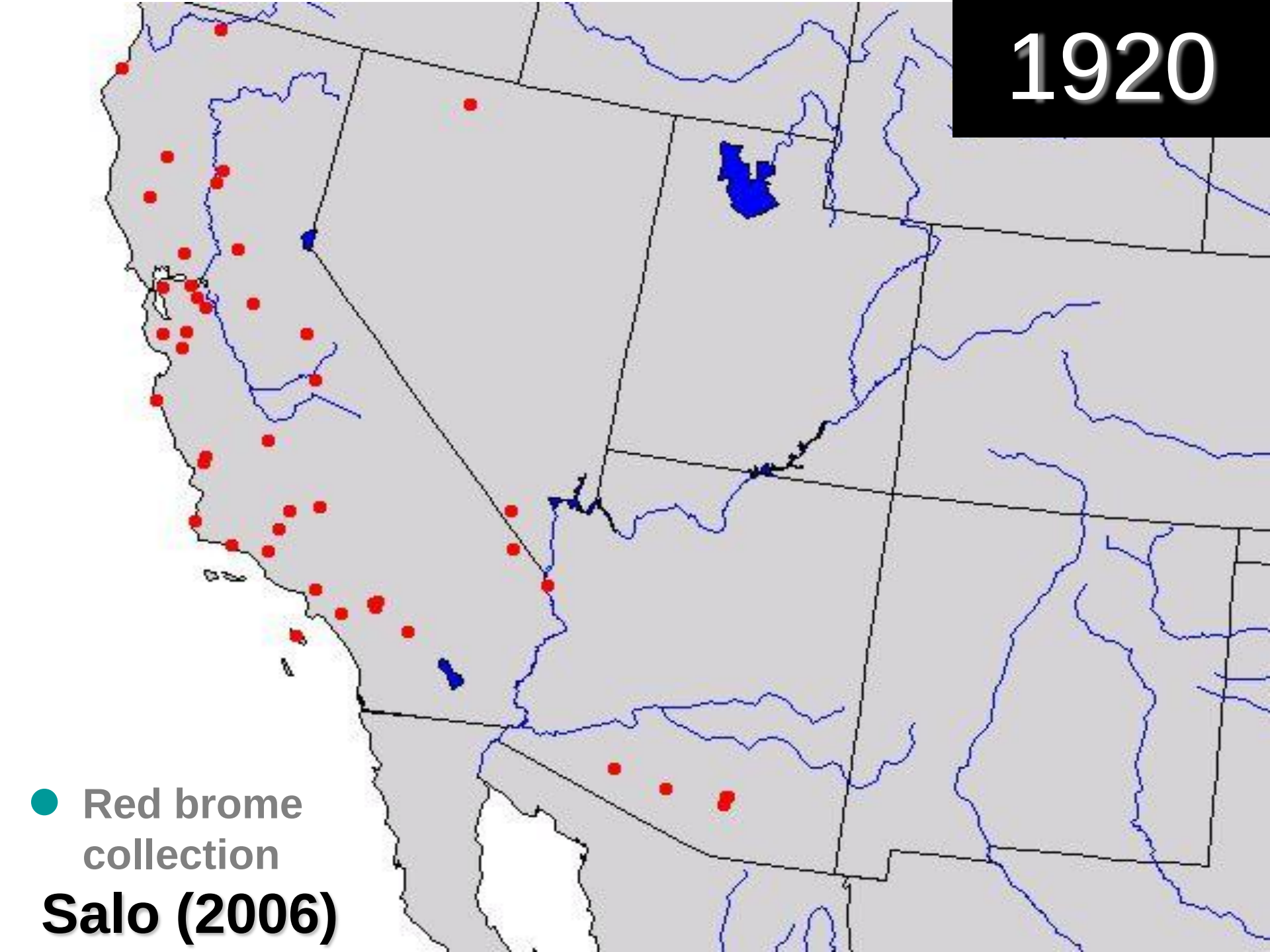
Logistic Growth Curve for Invasions

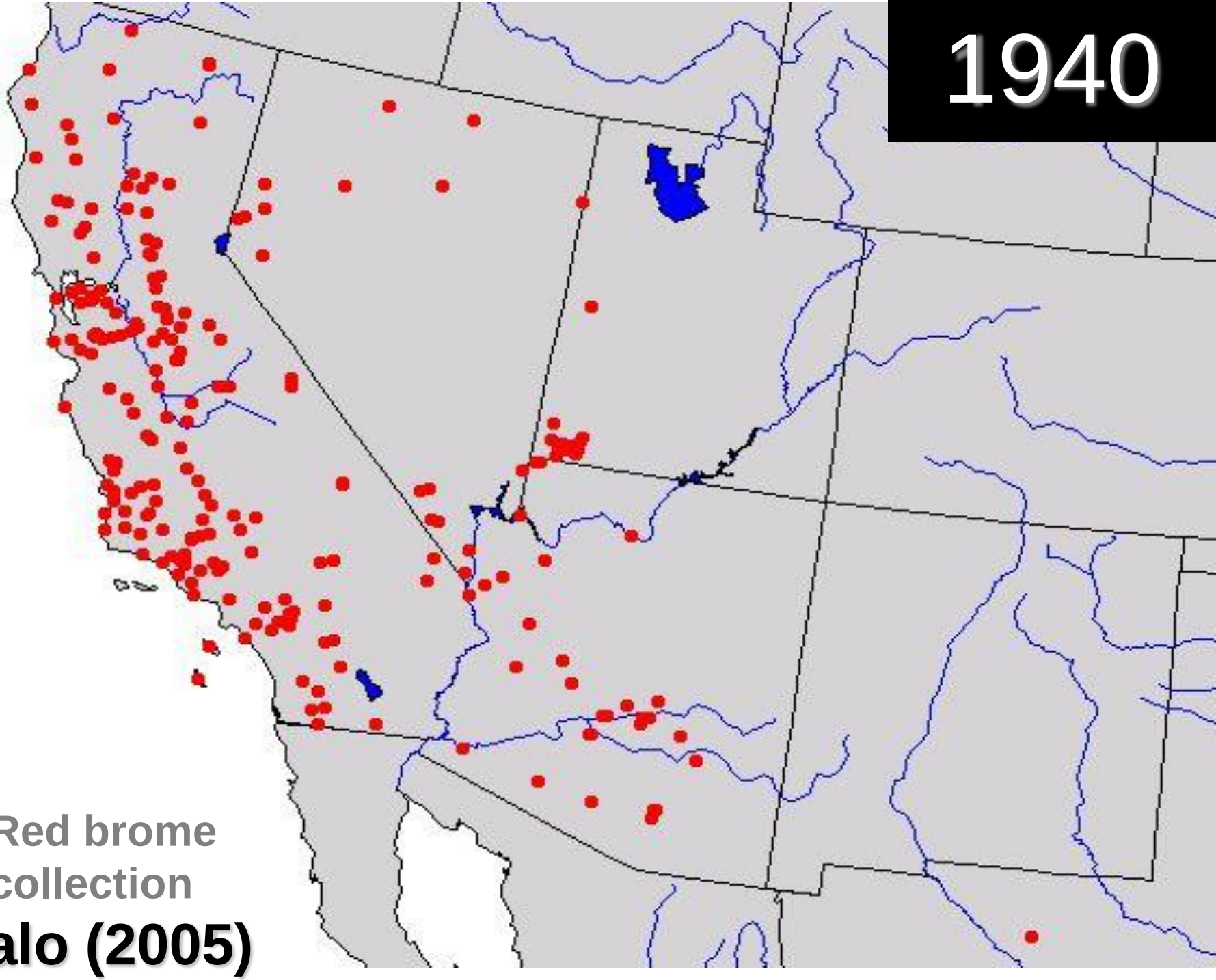


Logistic Growth Curve for Invasions



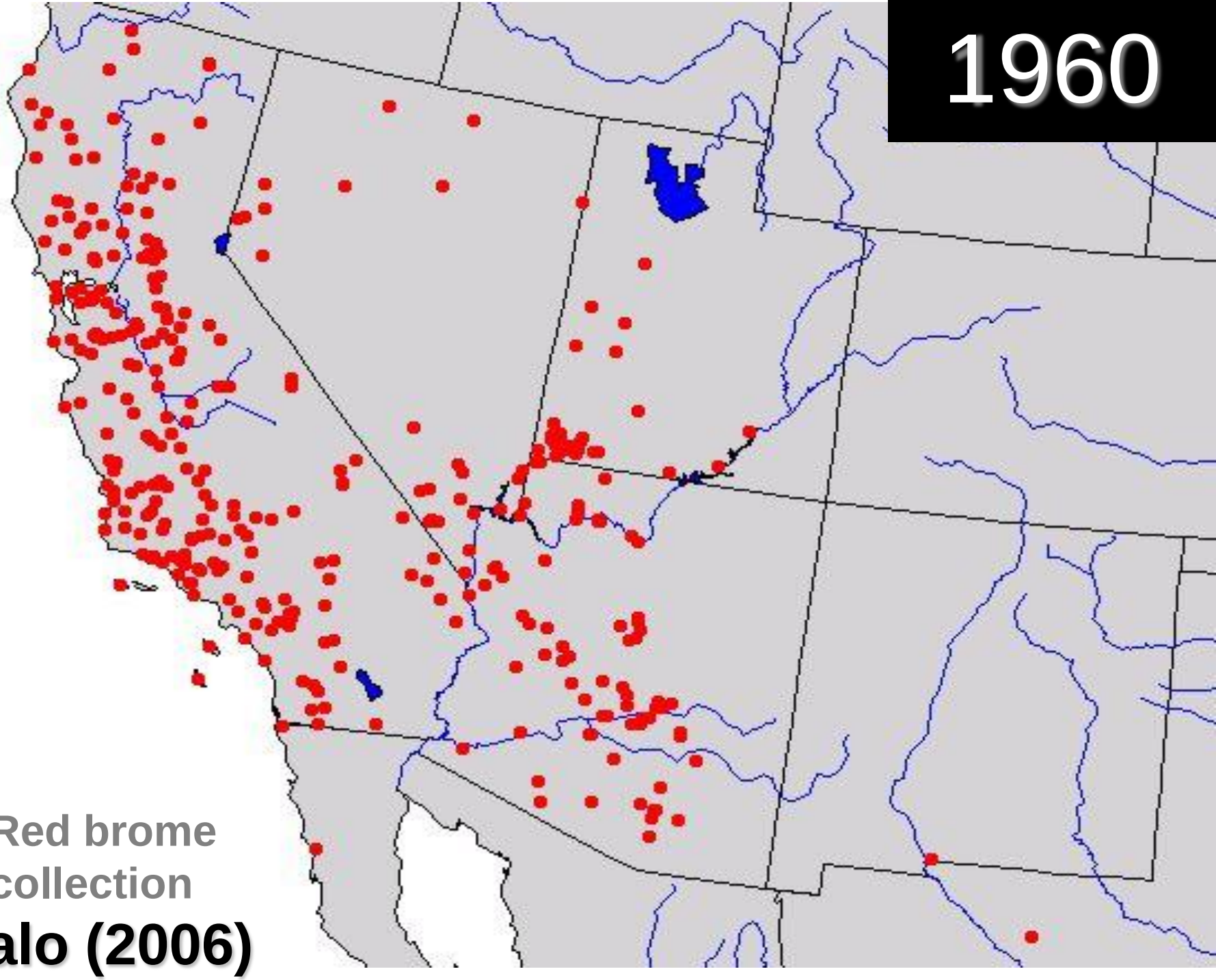

1900
Mission
Red brome collection
Salo (2005)


1920
Red brome collection
Salo (2006)



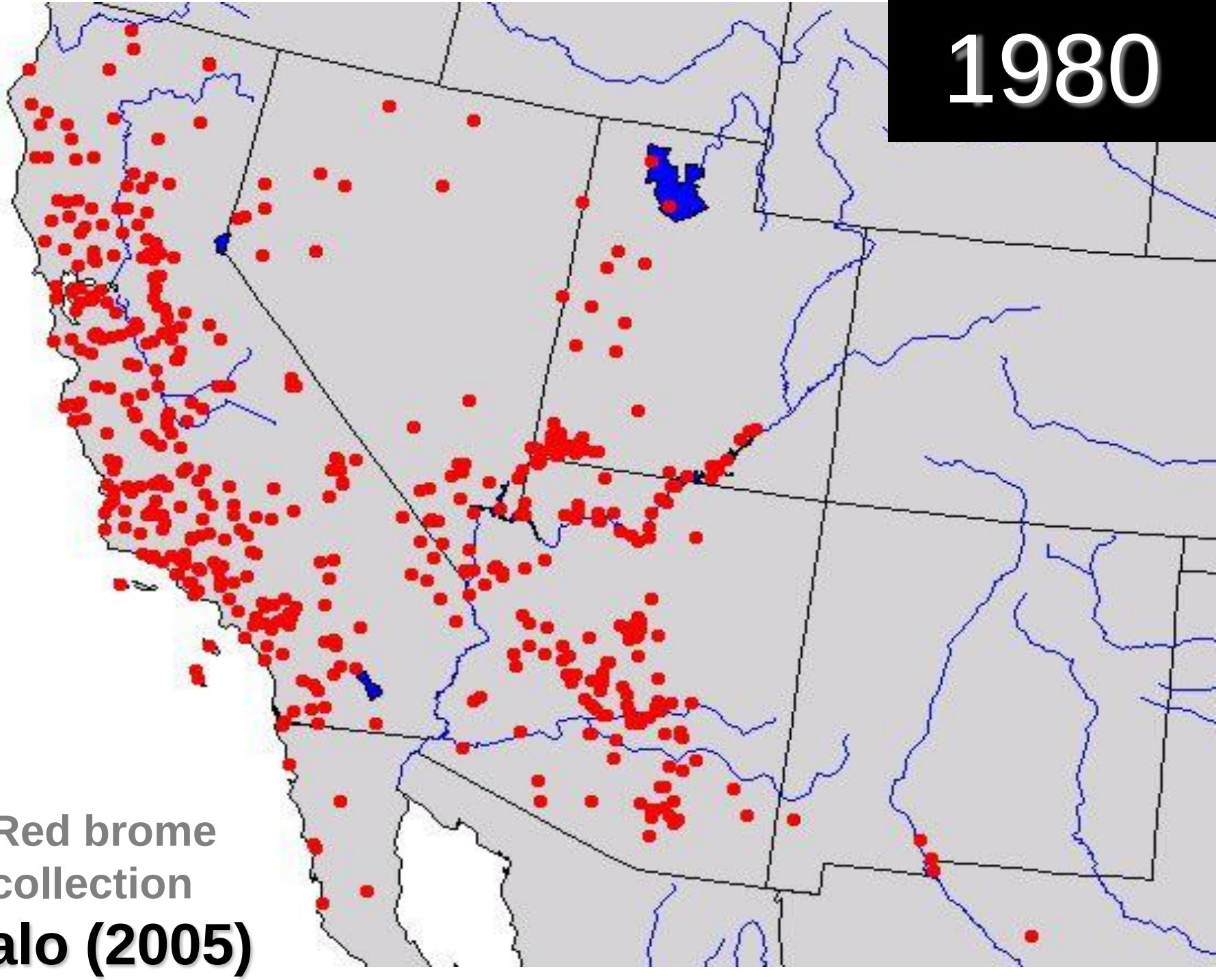
- Red brome collection

Salo (2005)



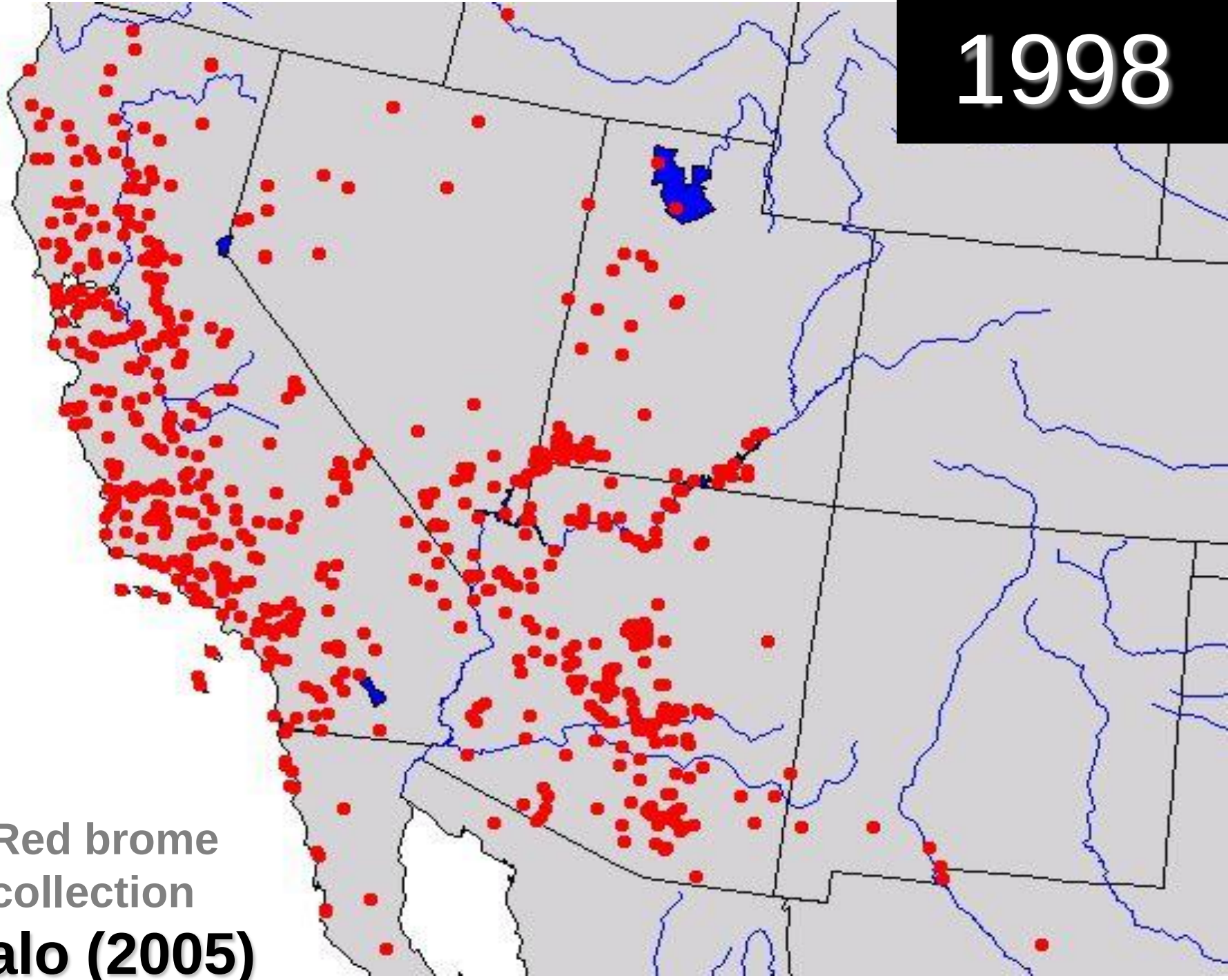
- Red brome collection

Salo (2006)



- Red brome collection

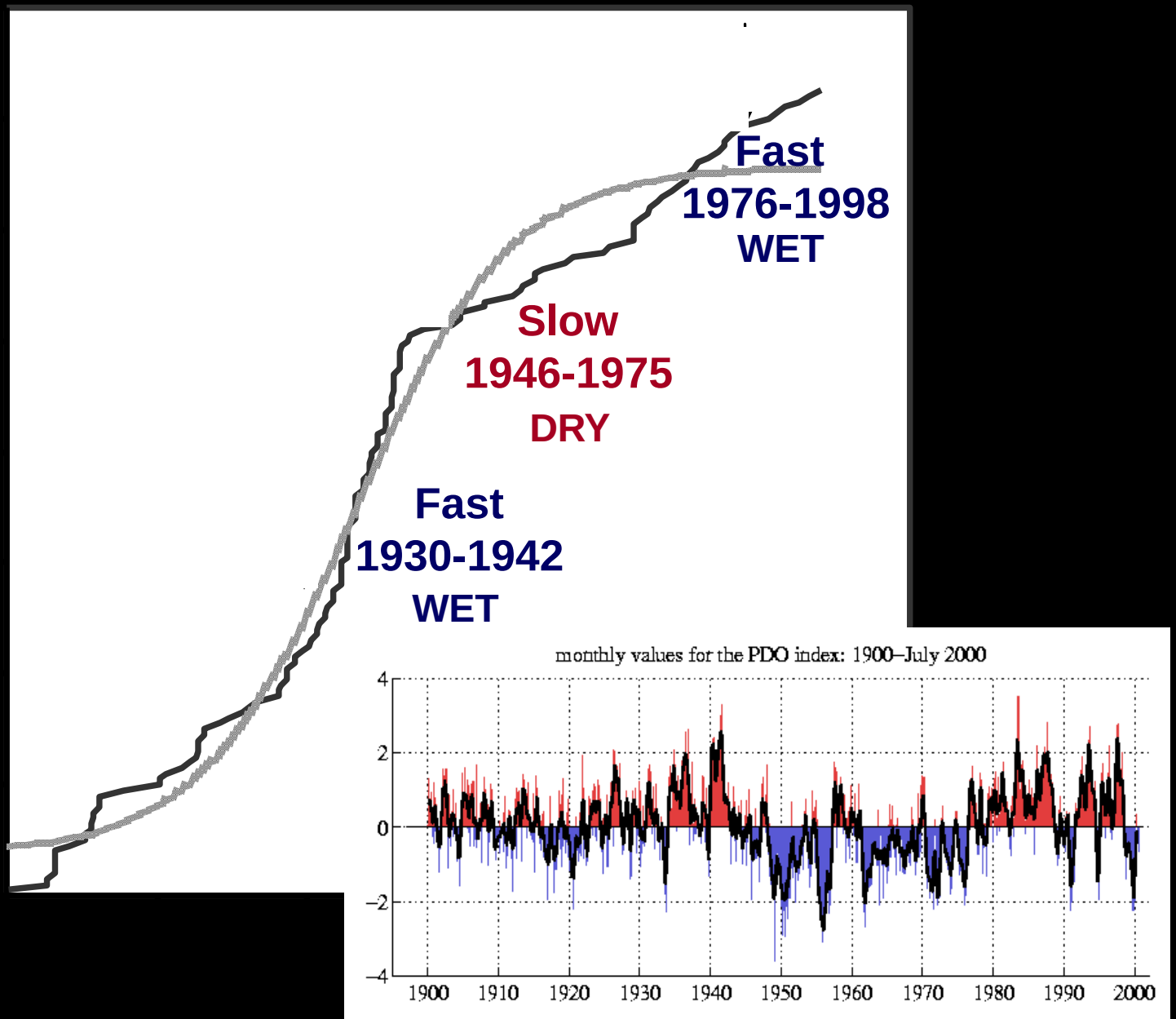
Salo (2005)



- Red brome collection

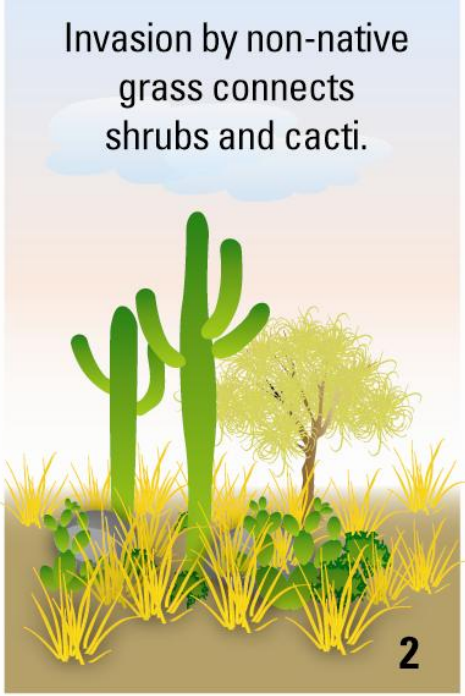
Salo (2005)

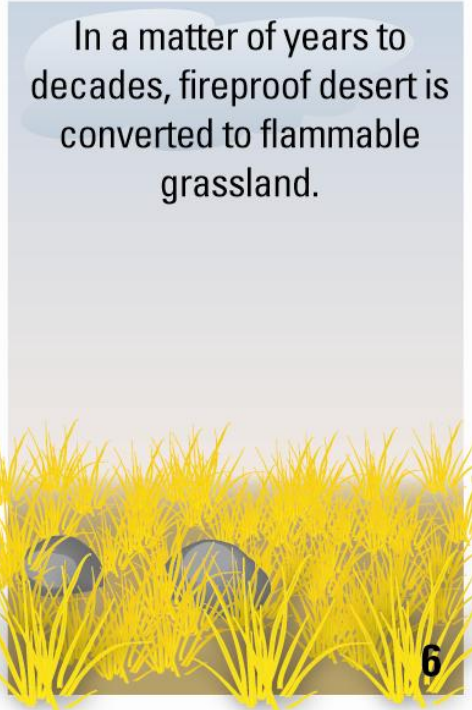
PDO and Red Brome Invasion in Western North America
(Salo 2005 *Biological Invasions)*



Invasions by non-native grasses have introduced fire in desert ecosystems that have previously experienced little or no fire.

The Grass-Fire Cycle

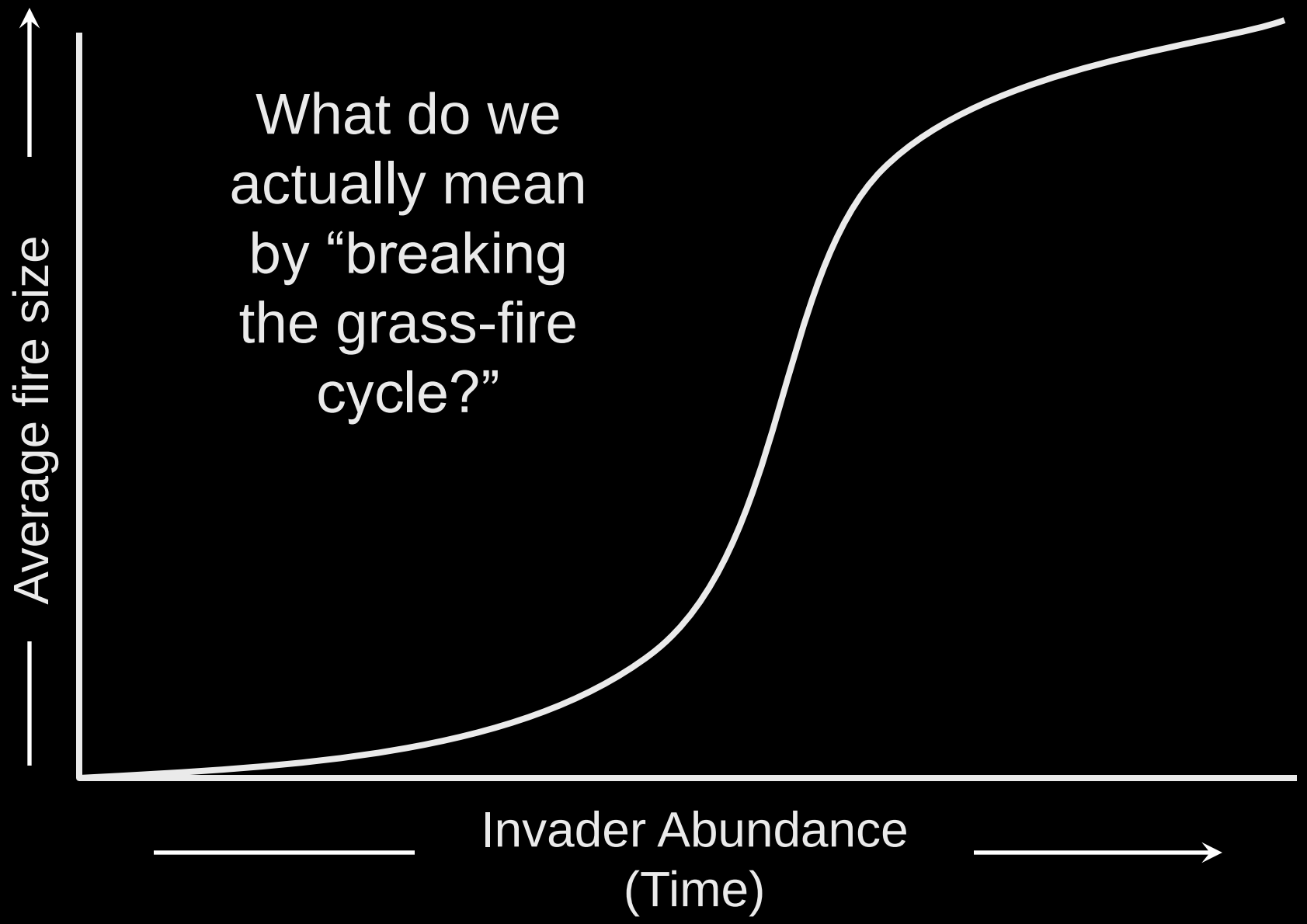




As the grass-fire cycle repeats itself, fire frequency, size and severity increases.

Non-native grasses spread, native species decline, risks to life and property escalate, and regional economies suffer.

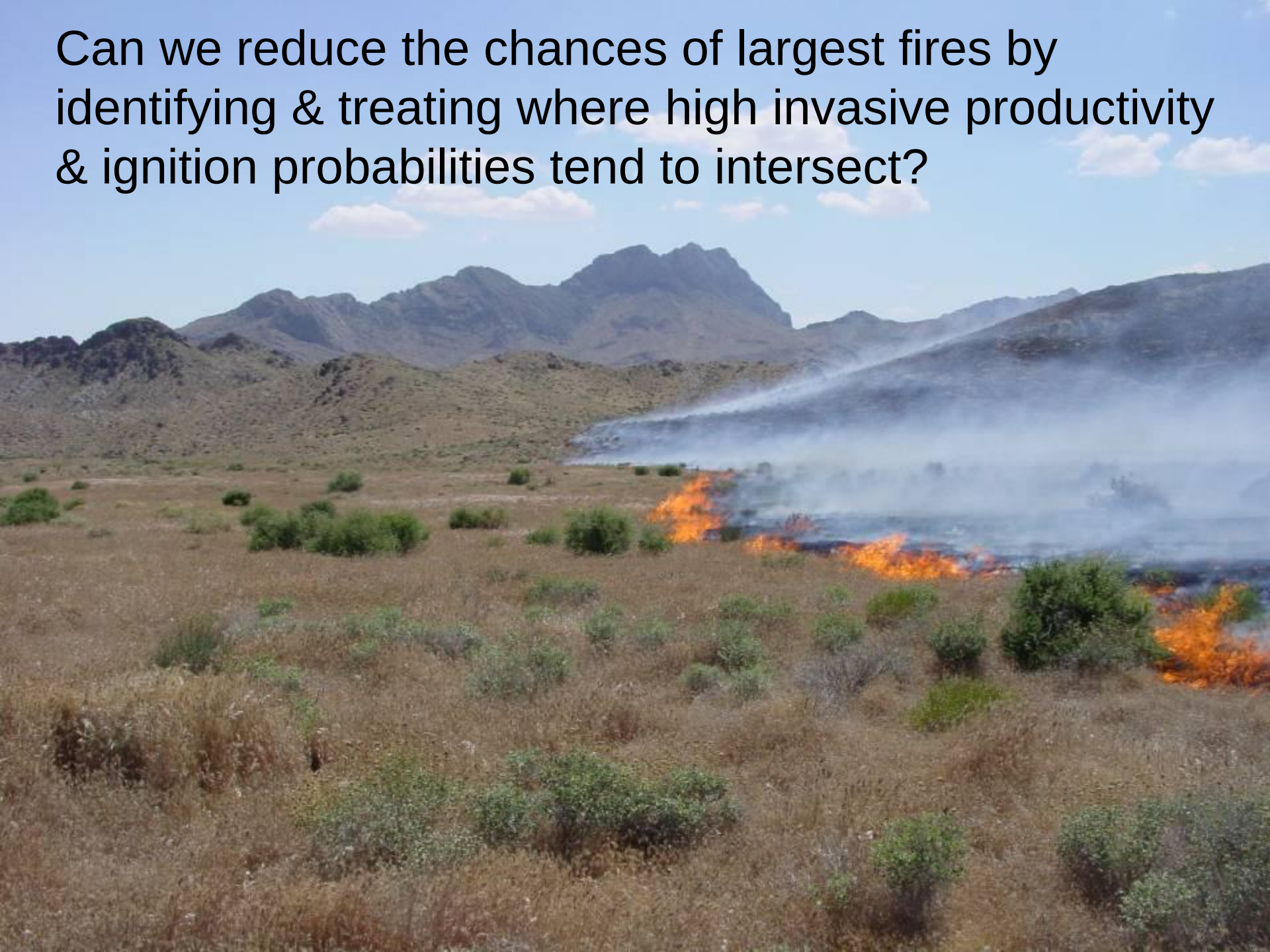
Invader Abundance, Fuel Connectivity & Wildfire Size

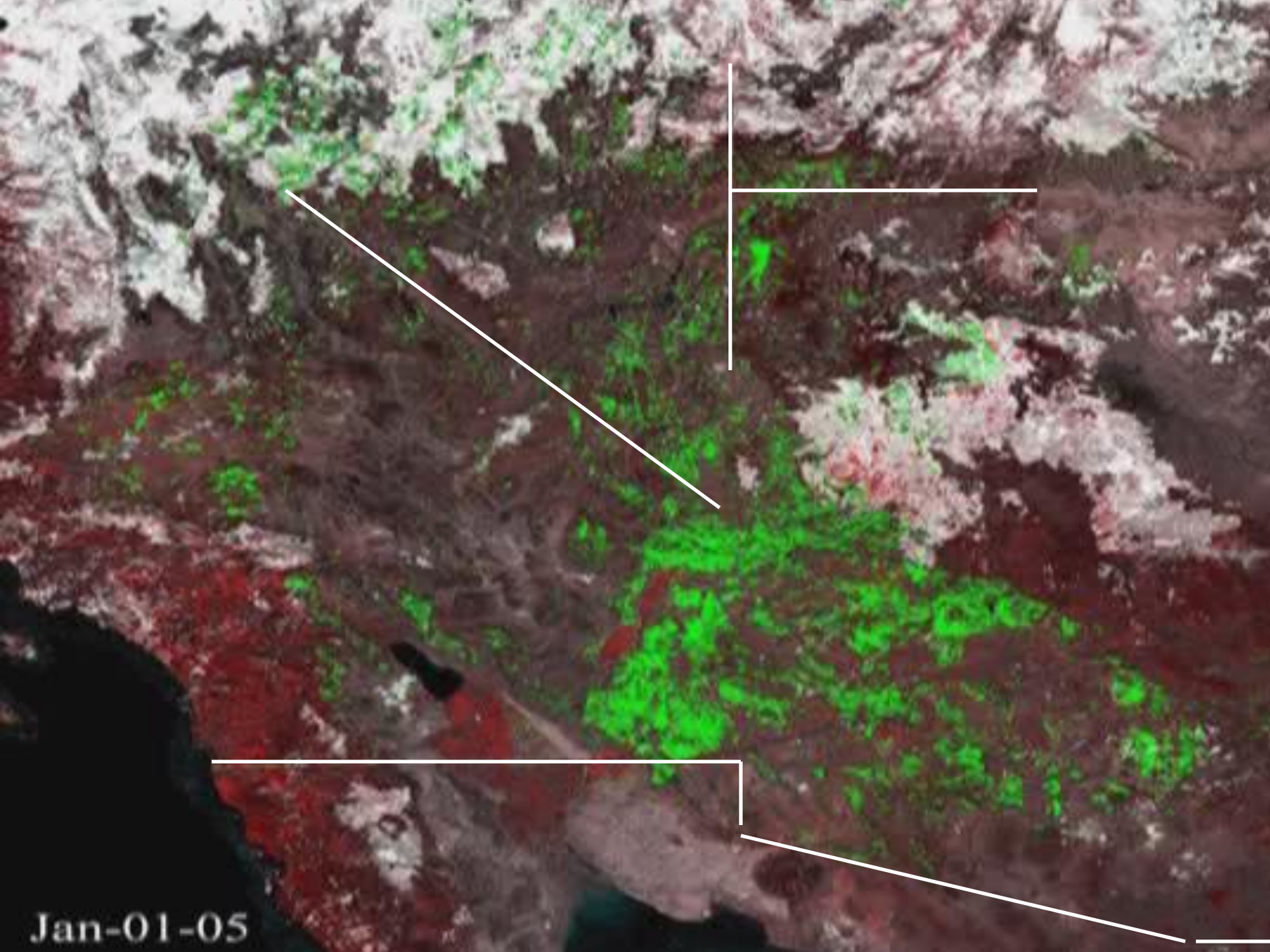


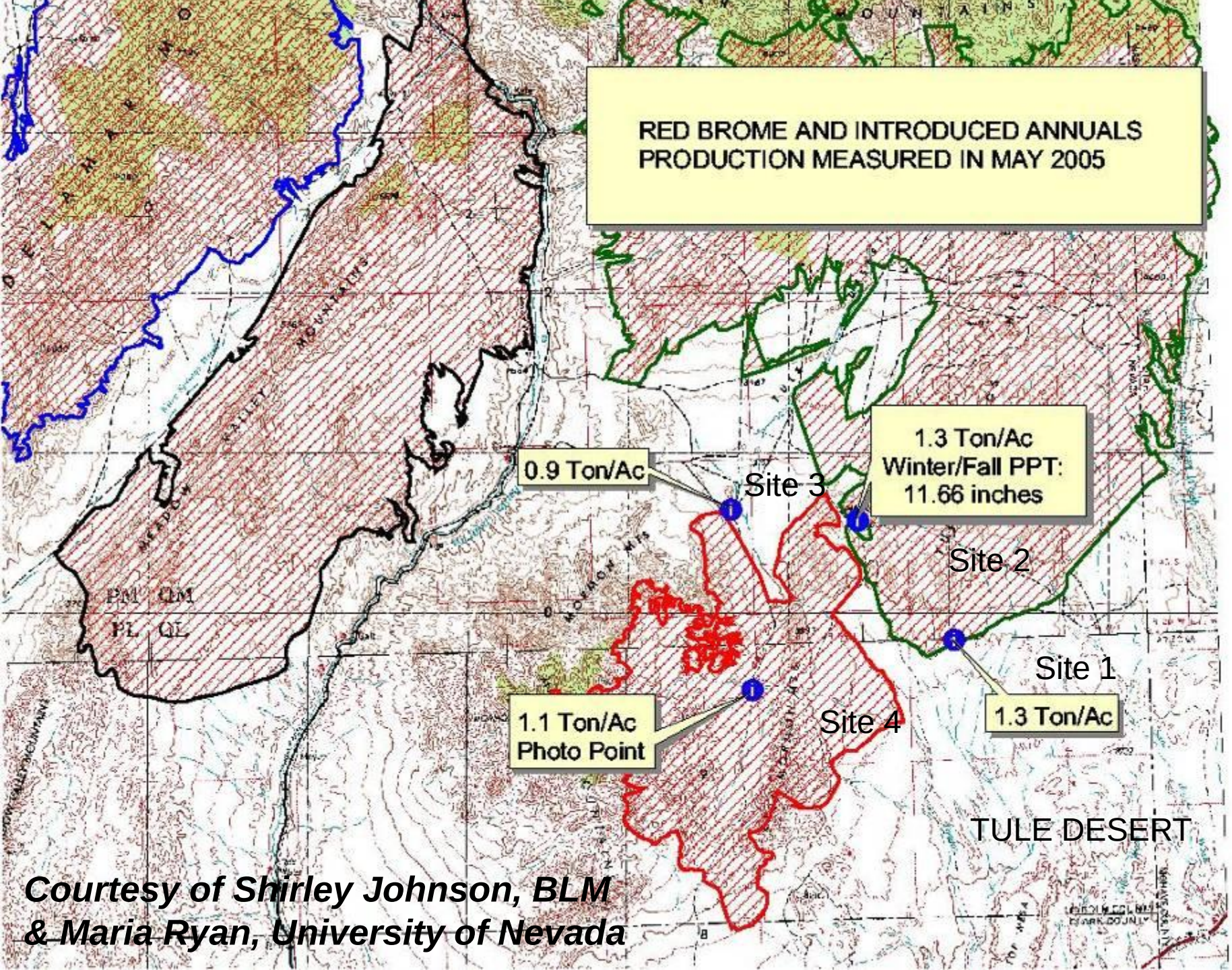
Recent Invasives-Driven Wildfires in the Western U.S.

Fire	Desert	Year	State	Size
Murphy Complex	Great Basin	2007	Nevada/ Idaho	653,000 acres
Milford Flat Complex	Great Basin	2007	Utah	363,000 acres
Winters Fire	Great Basin	2006	Nevada	238,000 acres
Southern Nevada Complex	Mojave	2005	Nevada	735,000 acres
Cave Creek Complex	Sonoran	2005	Arizona	248,000 acres

Can we reduce the chances of largest fires by identifying & treating where high invasive productivity & ignition probabilities tend to intersect?



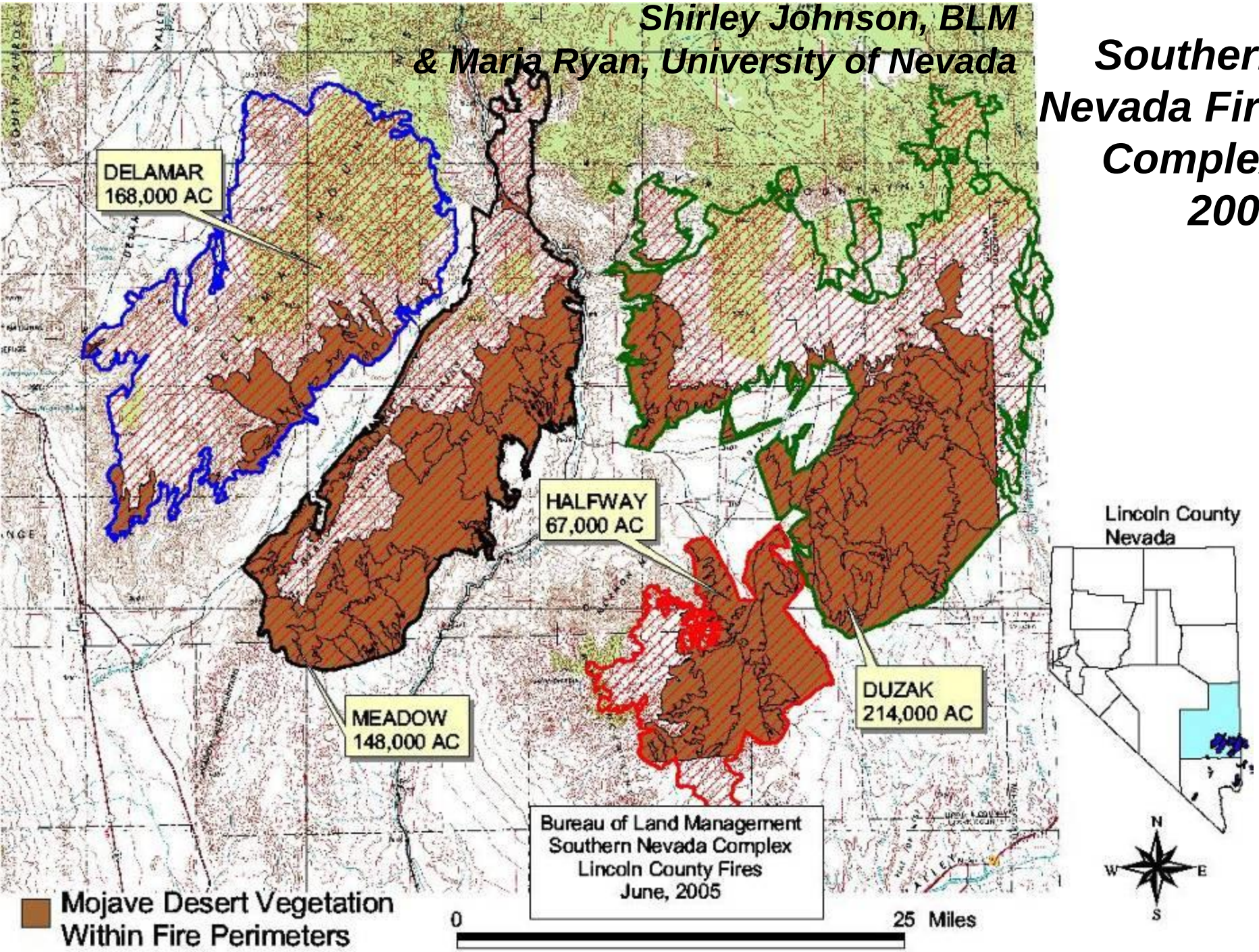

Jan-01-05



Courtesy of Shirley Johnson, BLM & Maria Ryan, University of Nevada

Shirley Johnson, BLM
& Maria Ryan, University of Nevada

Southern Nevada Fire Complex 2005

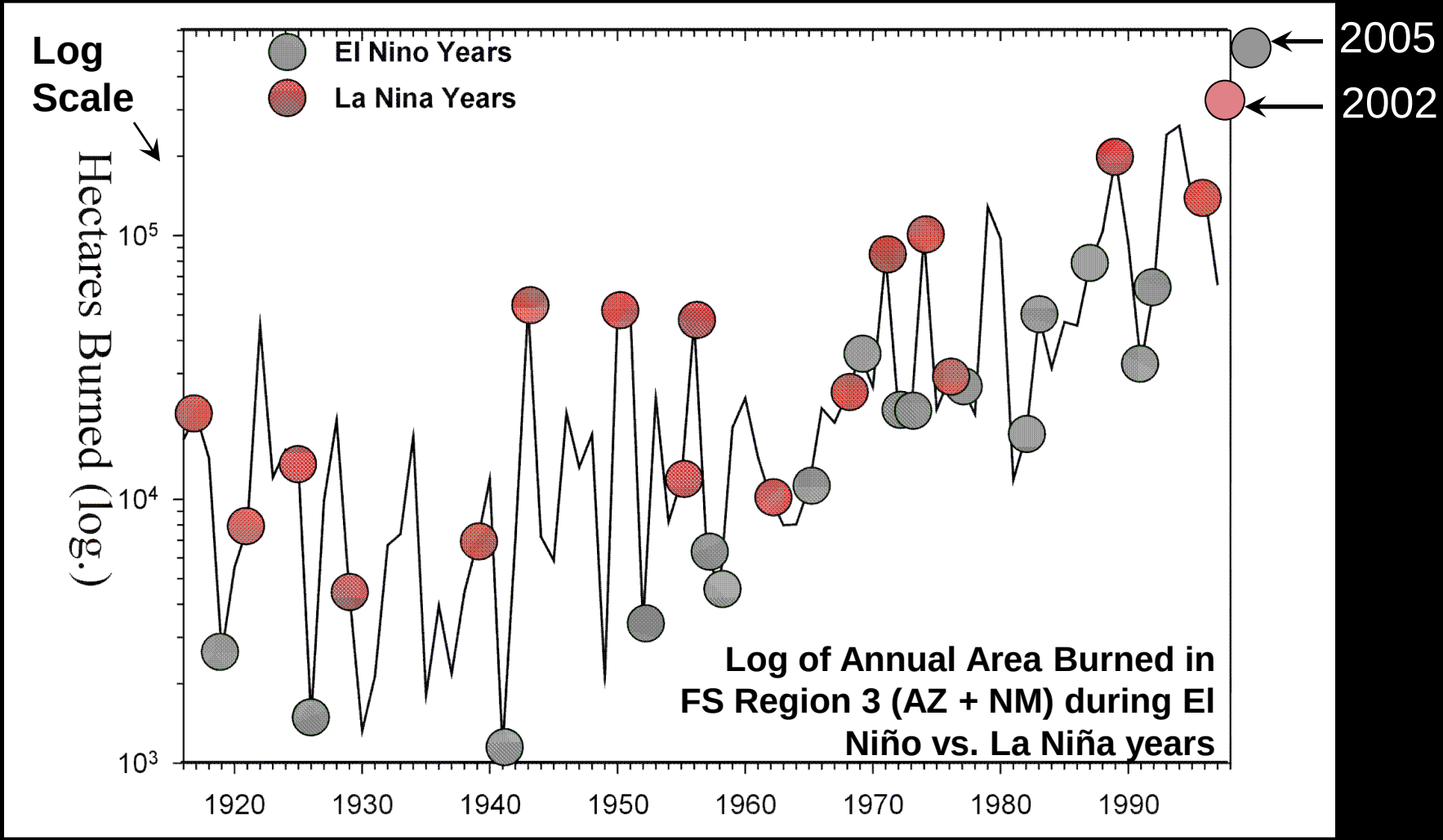


Can large invasives-driven wildfires start and spread anywhere, or are there central tendencies in time and space?

Can we use these central tendencies to focus sustained treatments in most likely areas to initiate largest fires?

Can we pool and bank resources from multiple jurisdictions to implement sustained treatments in these problematic areas?

Are grass invasions in deserts changing the relationship between climate and fire in the Southwest?

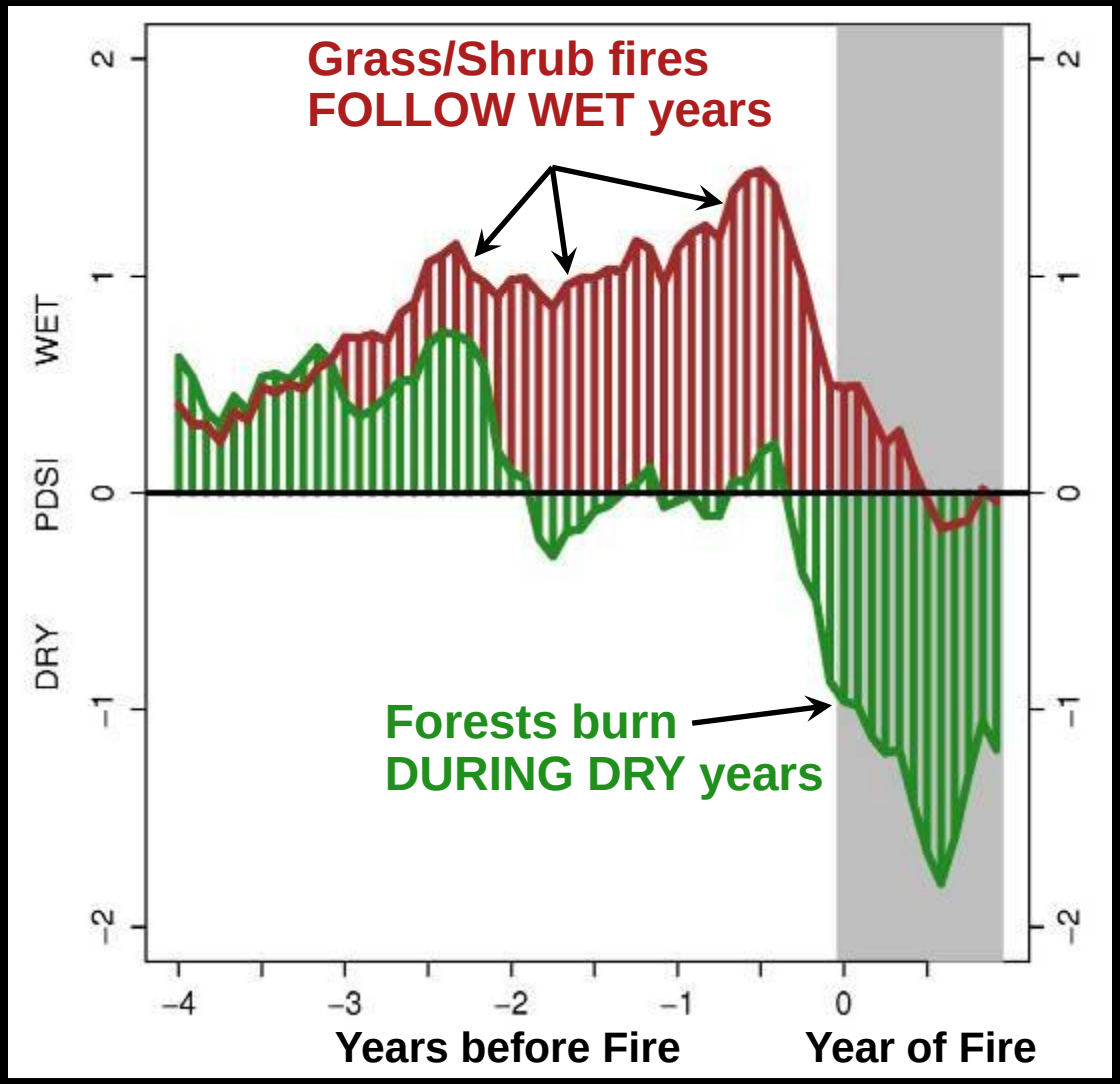


Swetnam, T. W., and J. L. Betancourt. 1990. Fire-Southern Oscillation relations in the southwestern United States. *Science* 249:1017-1020

Are fires in our desert lowlands becoming forest fires in our mountains and vice versa?

How will this change regional fire dynamics and the landscape mosaic?

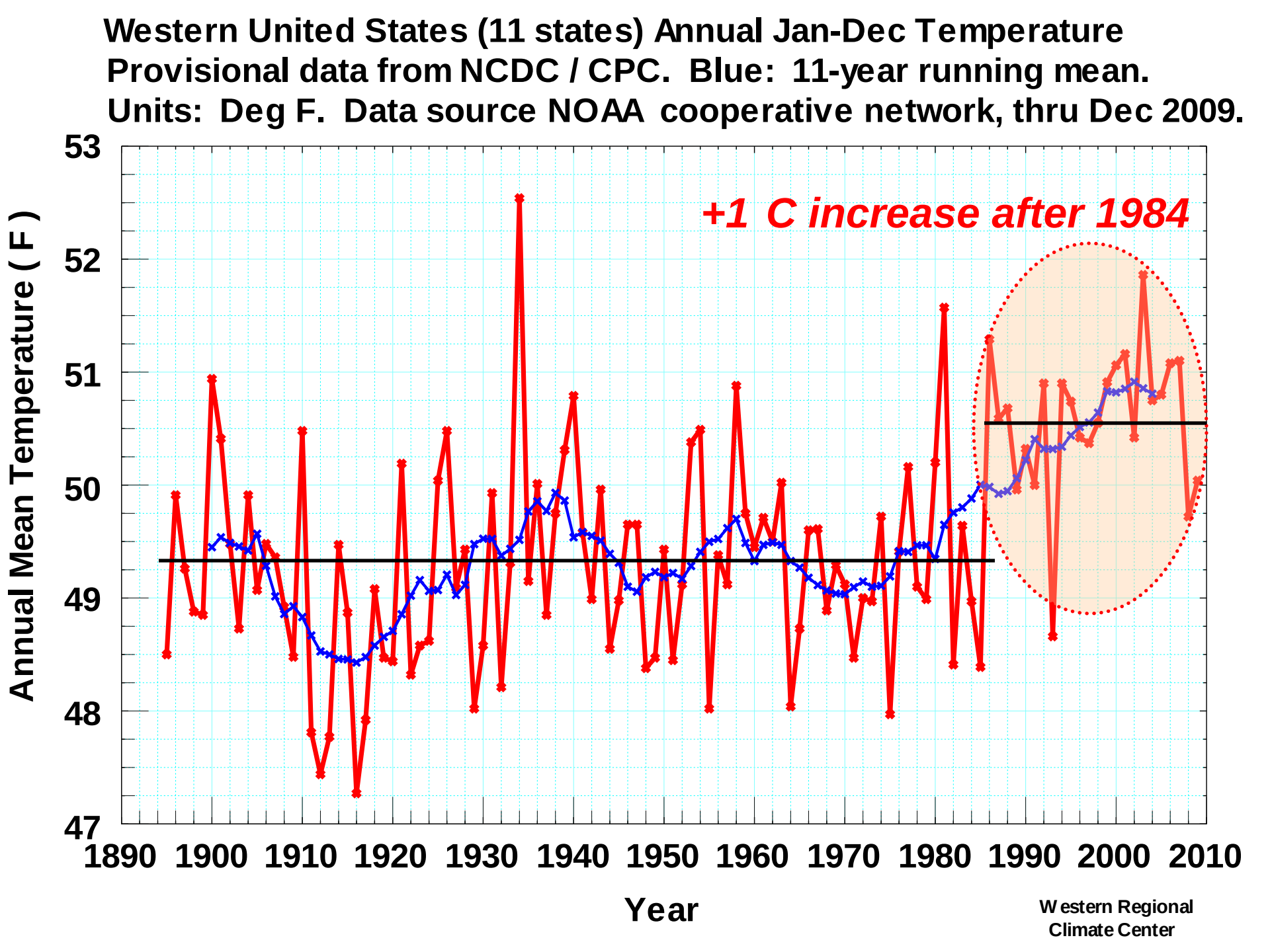
Grassland/shrubland fires have different climatologies than forest fires. With increasing frequency, size and intensity of invasives-driven fires, expect desert fires to become forest fires, and fire climatologies to change.



Courtesy of Tony Westerling, UC-Merced

Ignition front, Beatty Fire 2006

Can we unambiguously detect and attribute aspects of ongoing invasions and altered wildfire regimes to the climate change that seems to have already occurred?


Western United States (11 states) Annual Jan-Dec Temperature
Provisional data from NCDC / CPC. Blue: 11-year running mean.
Units: Deg F. Data source NOAA cooperative network, thru Dec 2009.
+1 C increase after 1984
Annual Mean Temperature (F)
53
52
51
50
49
48
47
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
Year
Western Regional
Climate Center

Regional Assessment of Invasive Species and Wildfire Responses to Recent and Projected Climatic Trends in the American Deserts

A Guide For Monitoring, Mitigation, and Adaptation to Plant Invasions and Climate Change

Grass Invasions & altered wildfire regimes are well on their way to causing irreversible ecosystem transformation in the West

This would probably would have happened with or without climate change

Despite abrupt warming post-1970s/1980's, rates and pathways of invasion can not be unambiguously attributed to early stages of climate change

We are failing miserably at managing grass invasions and associated wildfires

Our goal should be to break the cycle between non-native invasive grasses and the fire regimes they promote

Mitigate the adverse ecological effects that might result from the synergy of invasives, altered wildfire regimes, and climate change.

Gotta Prioritize and Fund the Right Science

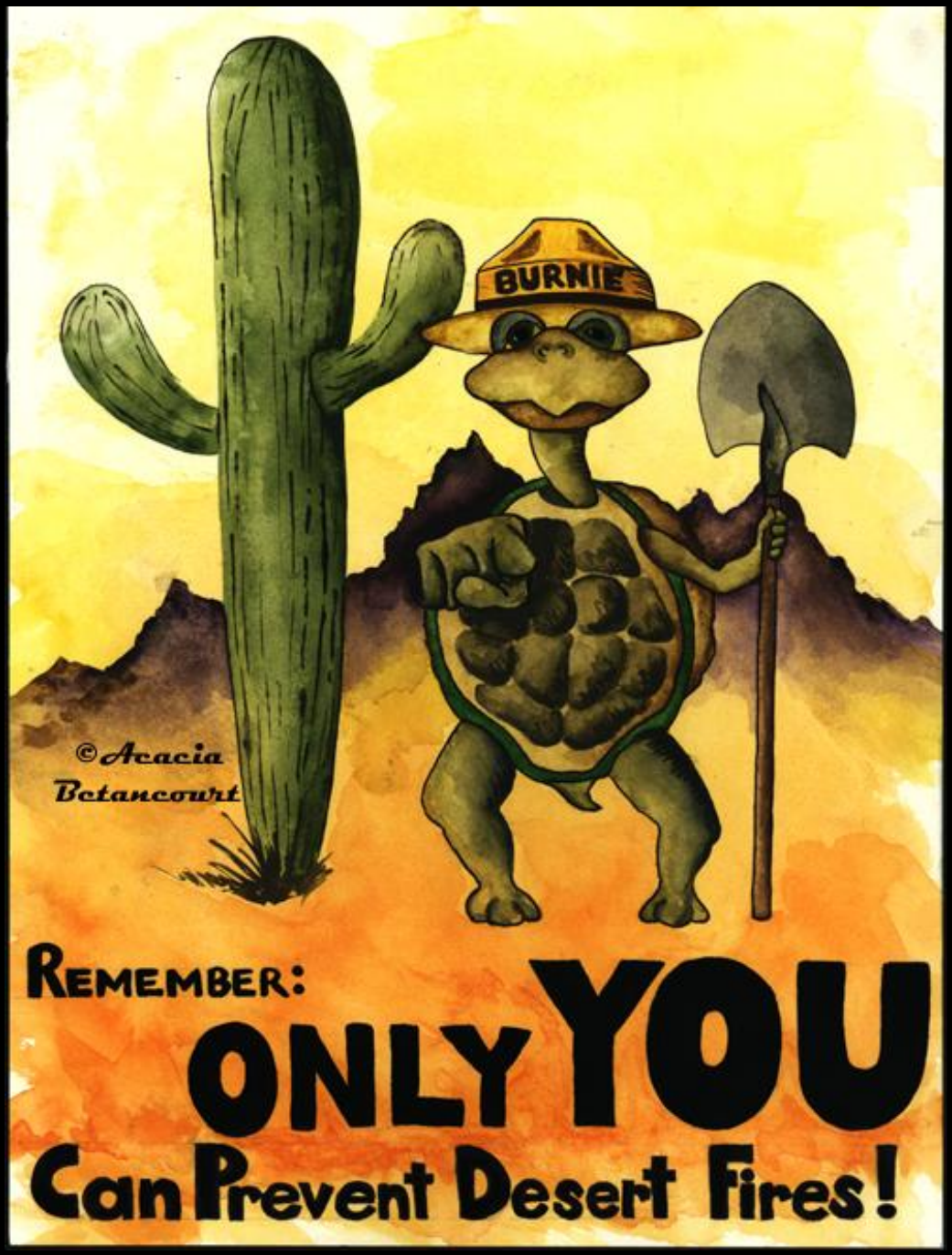
- Mapping, monitoring, and remote sensing
- Decision support/adaptive management
- Control methods- Life cycle of treatments
- Habitat suitability models & sensitivity simulations
- Fuel load & fire spread models
- Post-fire restoration
- Long-term effects of invasion & forecasting of environmental consequences should mitigation fail
- Cost-benefit analysis and long-term (20+ yrs) under alternate climatic and social scenarios

http://doubletroublebulletin.wordpress.com

The Double Trouble electronic news bulletin is published by the Australian Invasive Species Council as part of its Pests and Climate Change Project

Aimed at convincing decision & policy makers of the urgent need to prepare for the combined dangers of climate change & invasive species

Help increase awareness of the growing need to recognize invasive species as a major component of the climate change problem,


BURNIE
©Acacia
Betancourt
REMEMBER:
ONLY YOU
Can Prevent Desert Fires!