Threats to Mohave Desert Ecosystems and the Needs for Revegetation

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Livestock Grazing Effects on Vegetation

- Artificial watering sites were developed beginning in the late 1800's to support livestock grazing in the deserts of North America.

- Many grazing allotments are now being retired.

- There is a need to understand the ecological changes that these watering sites have caused so that they can be restored to pre-use conditions.

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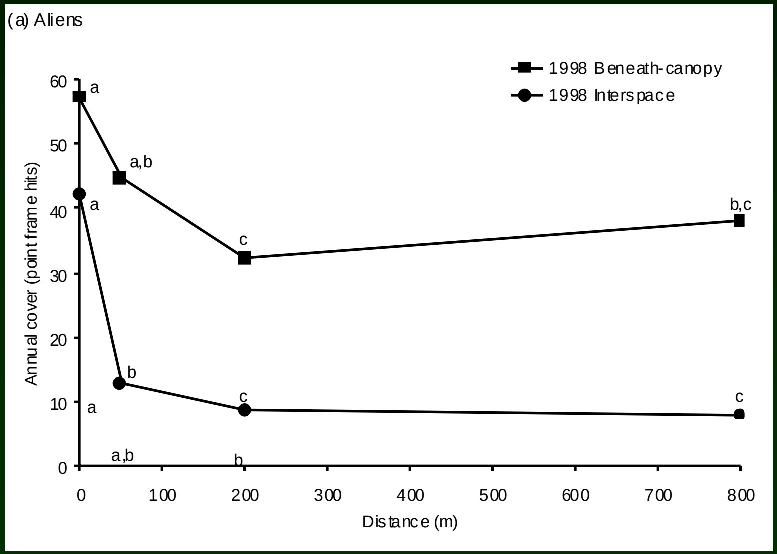
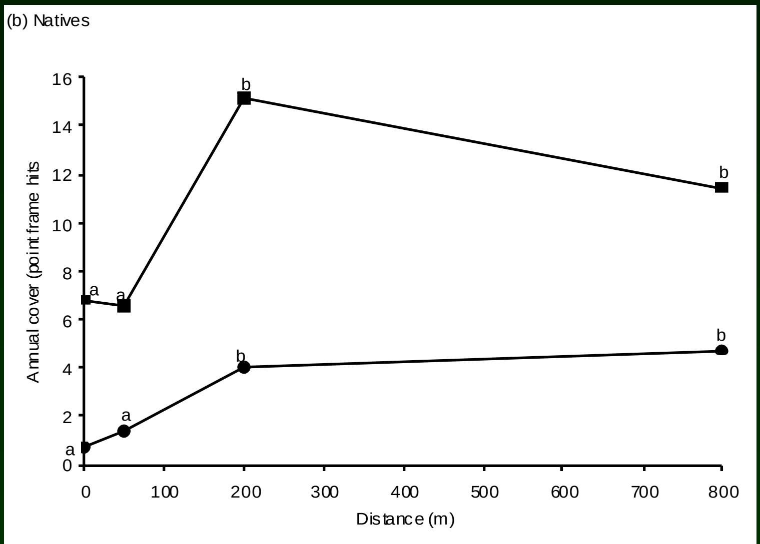
Livestock Grazing Effects

We evaluated spatial patterns of alien and native plant abundance and diversity associated with watering sites in the central Mojave Desert.





Revegetation efforts should focus on the area within 200m of watering sites.

(Brooks et al. in press)


Within the immediate footprint of the watering site
No perennial plant cover
Very little annual plant cover, mostly non-native species
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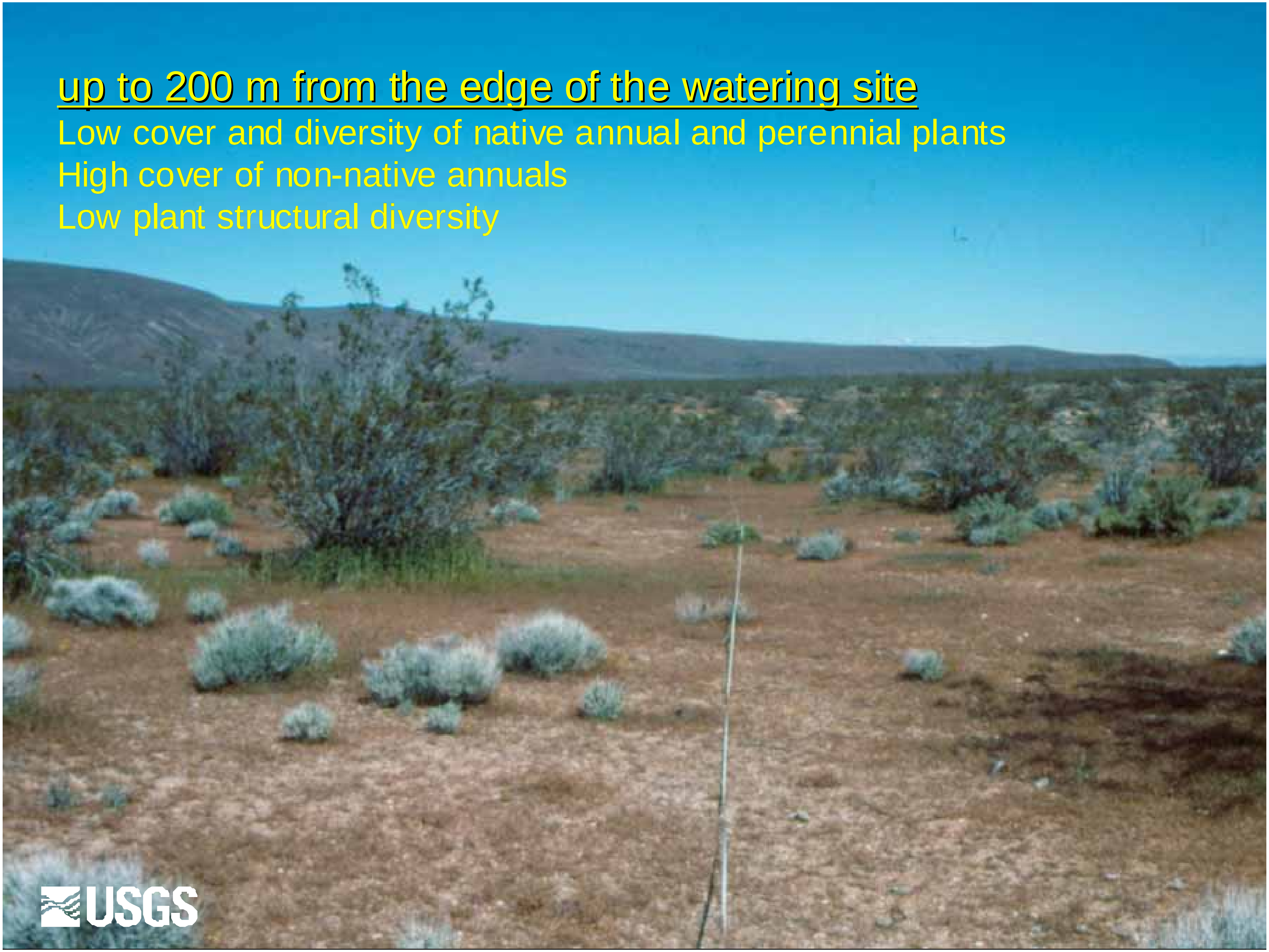
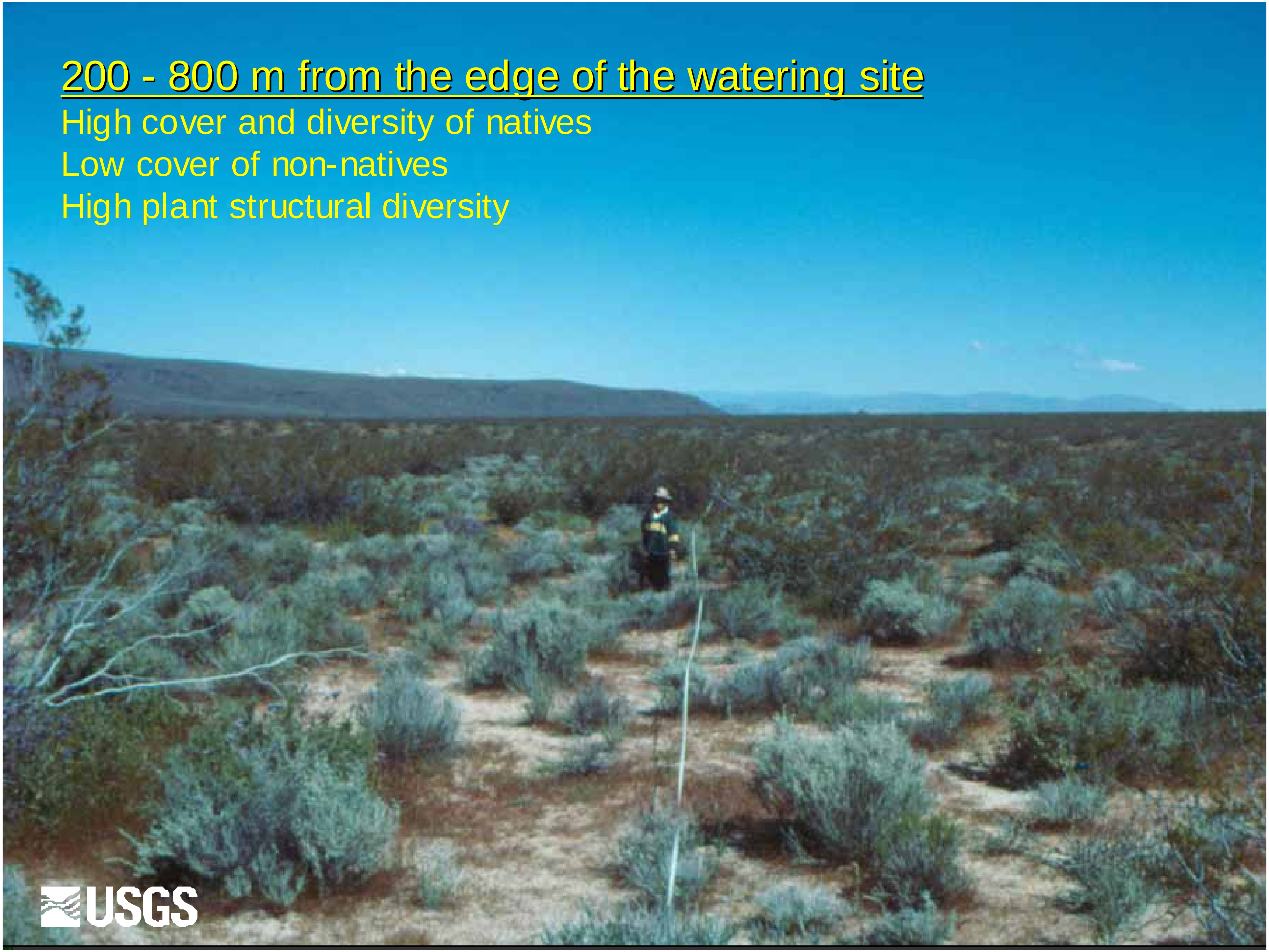

up to 200 m from the edge of the watering site
Low cover and diversity of native annual and perennial plants
High cover of non-native annuals
Low plant structural diversity
USGS

200 - 800 m from the edge of the watering site

High cover and diversity of natives
Low cover of non-natives
High plant structural diversity



Vehicular Route Effects on Vegetation

- OHV trails
  - single-track motorcycle and two-track 4WD
- Local roads
  - unimproved and improved dirt
- Collector roads
  - improved dirt, gravel,paved
- Arterial roads
- Limited-access highways

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(Brooks and Lair accepted)

Limited-Access Highways

Arterial Roads

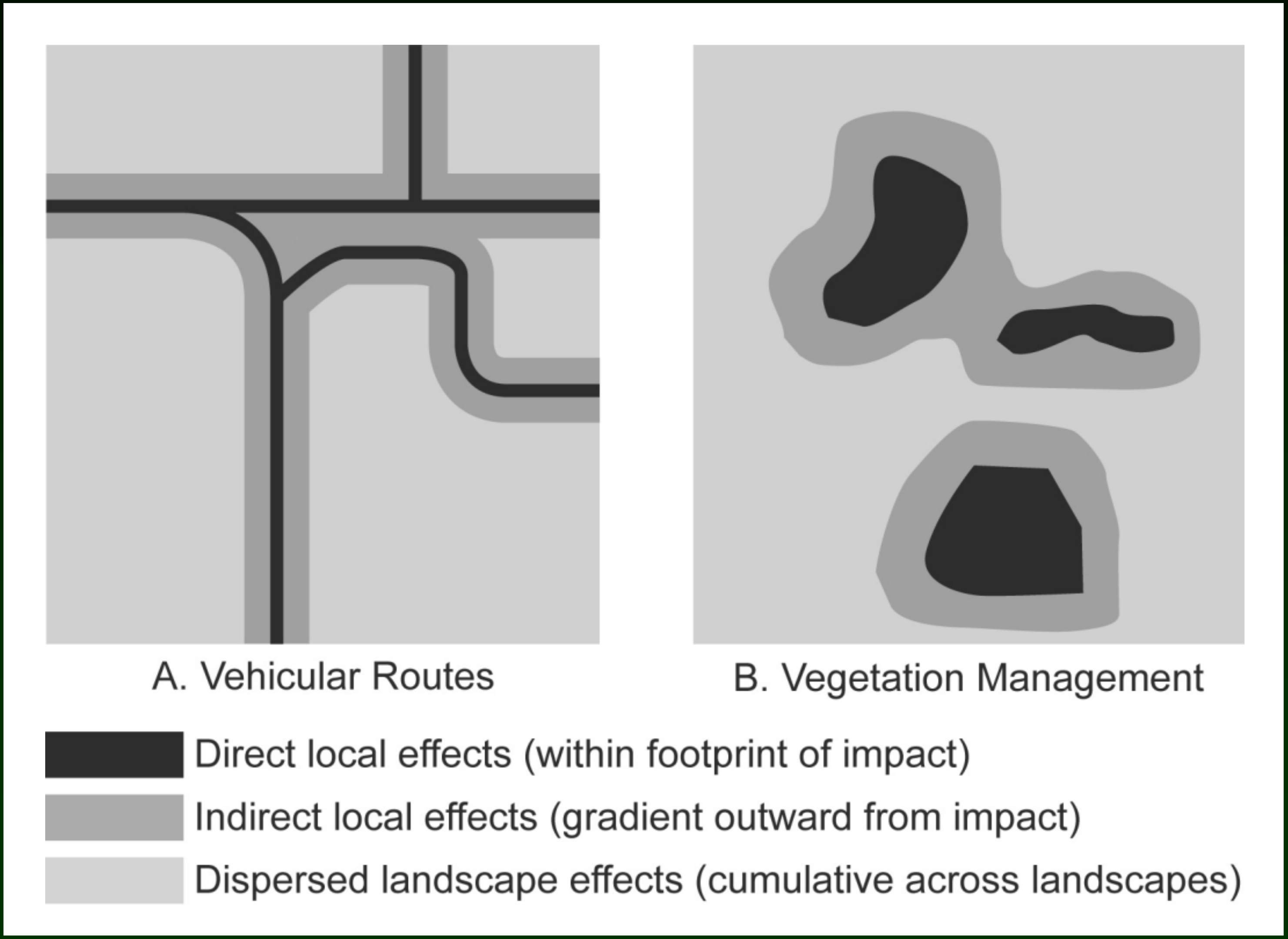

Collector Roads

Improved Local Roads

Unimproved Local Roads

Off-highway Vehicle Trails

Spatial Scales of Impacts



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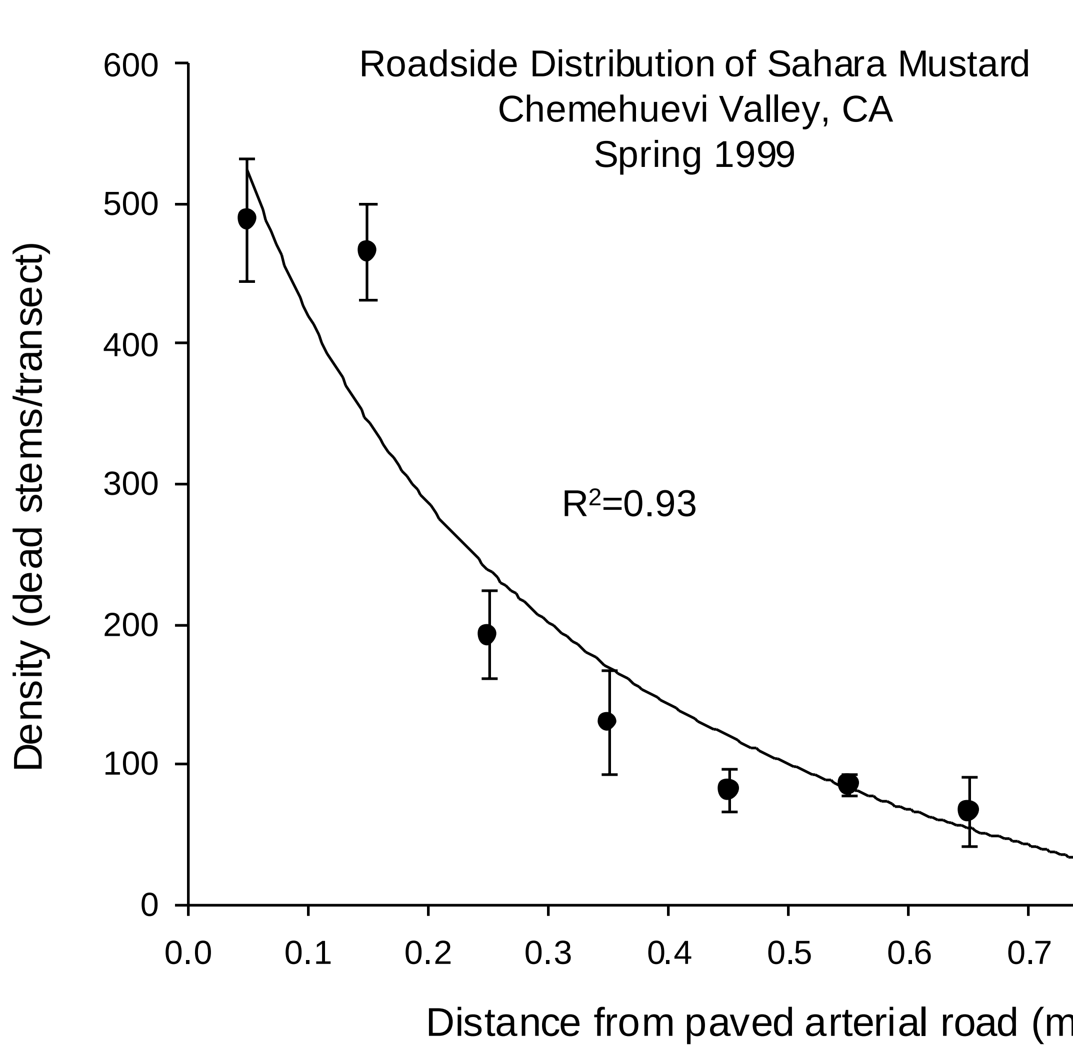
(Brooks in review)

Indirect Local Effect

gradients of invasive plants outwards from roadsides



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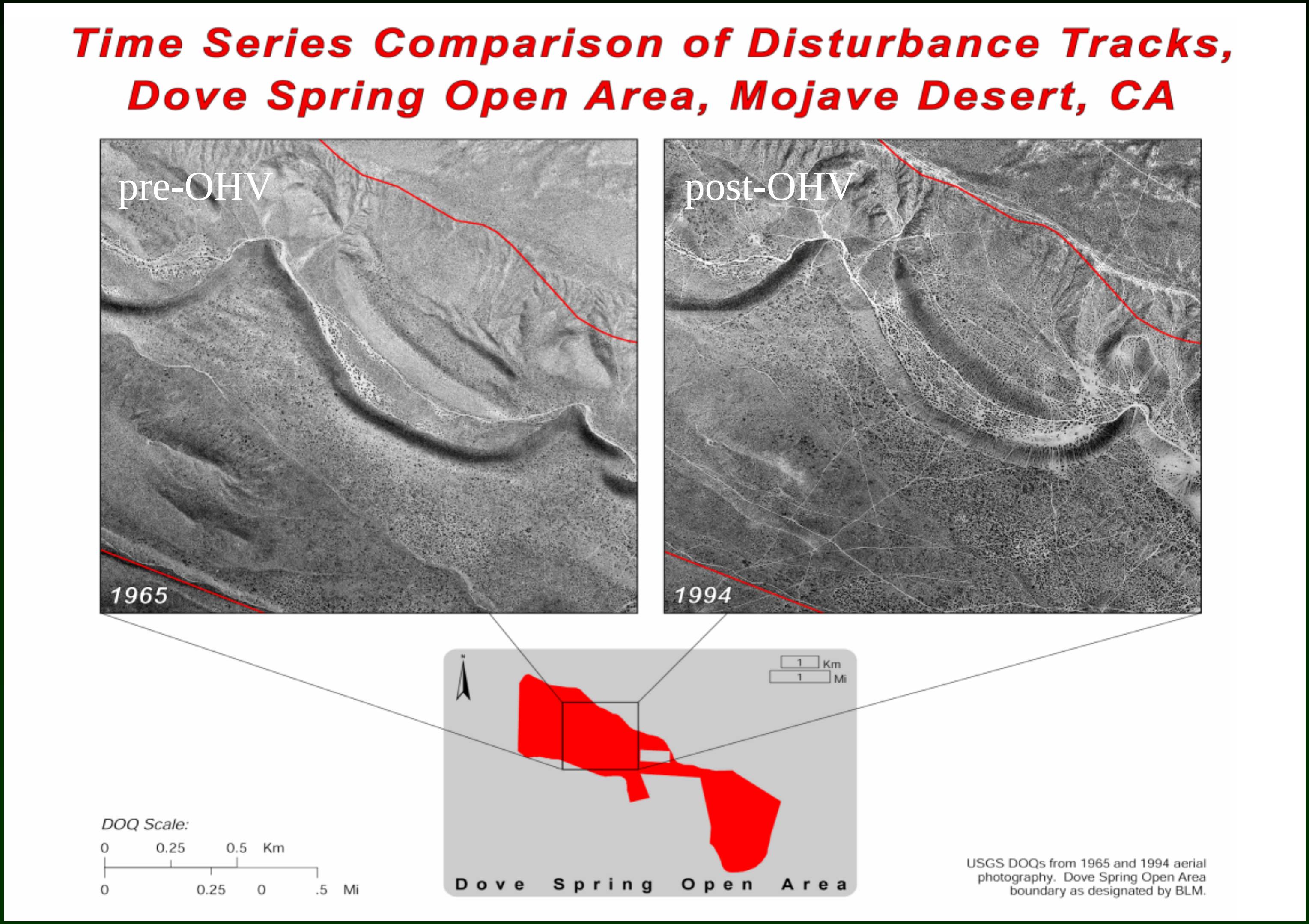
(Berry and Brooks in prep)

Dispersed Landscape Effect

vegetation patterns associated with route densities



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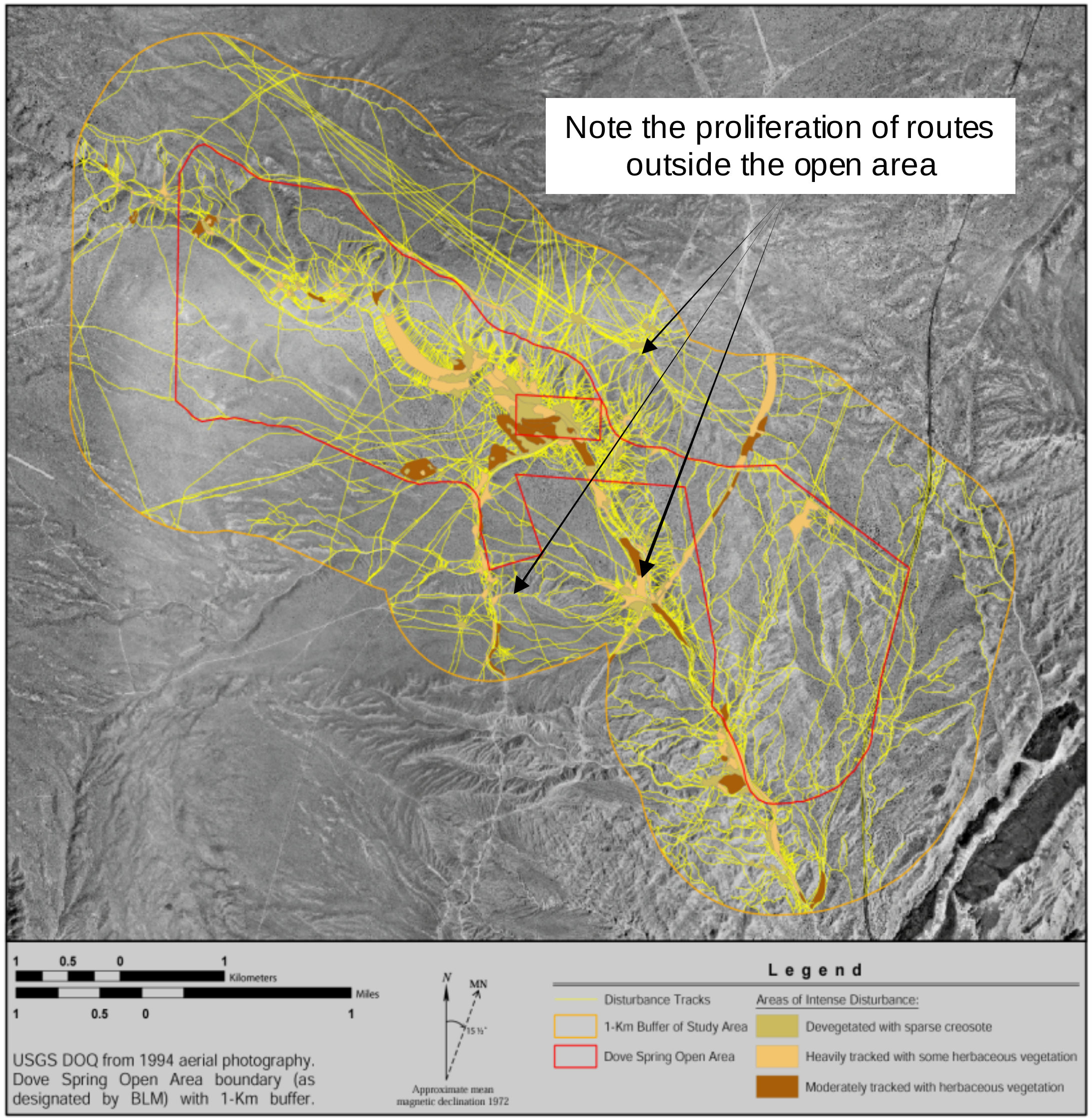
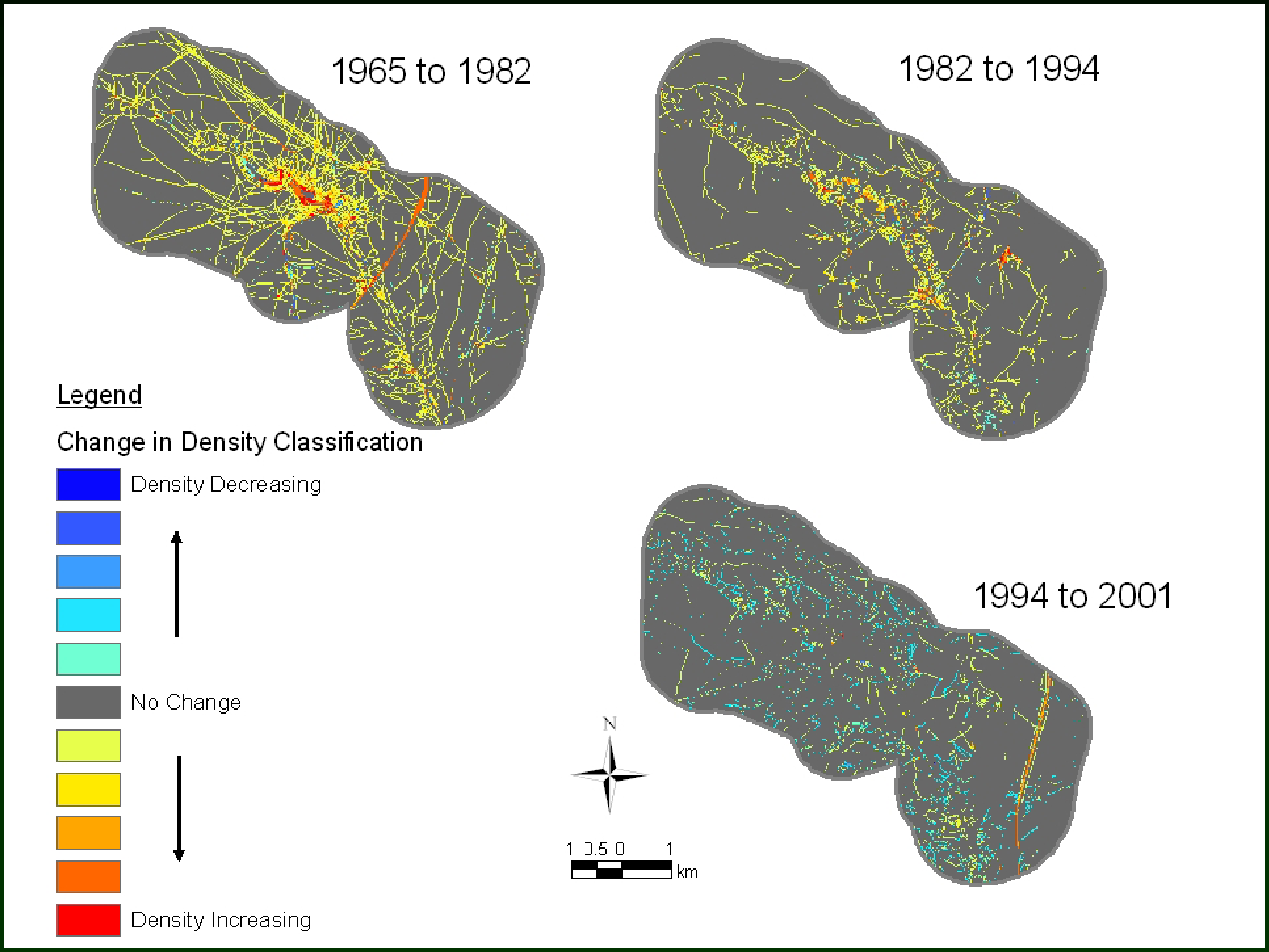
(Matchett et al. 2004)

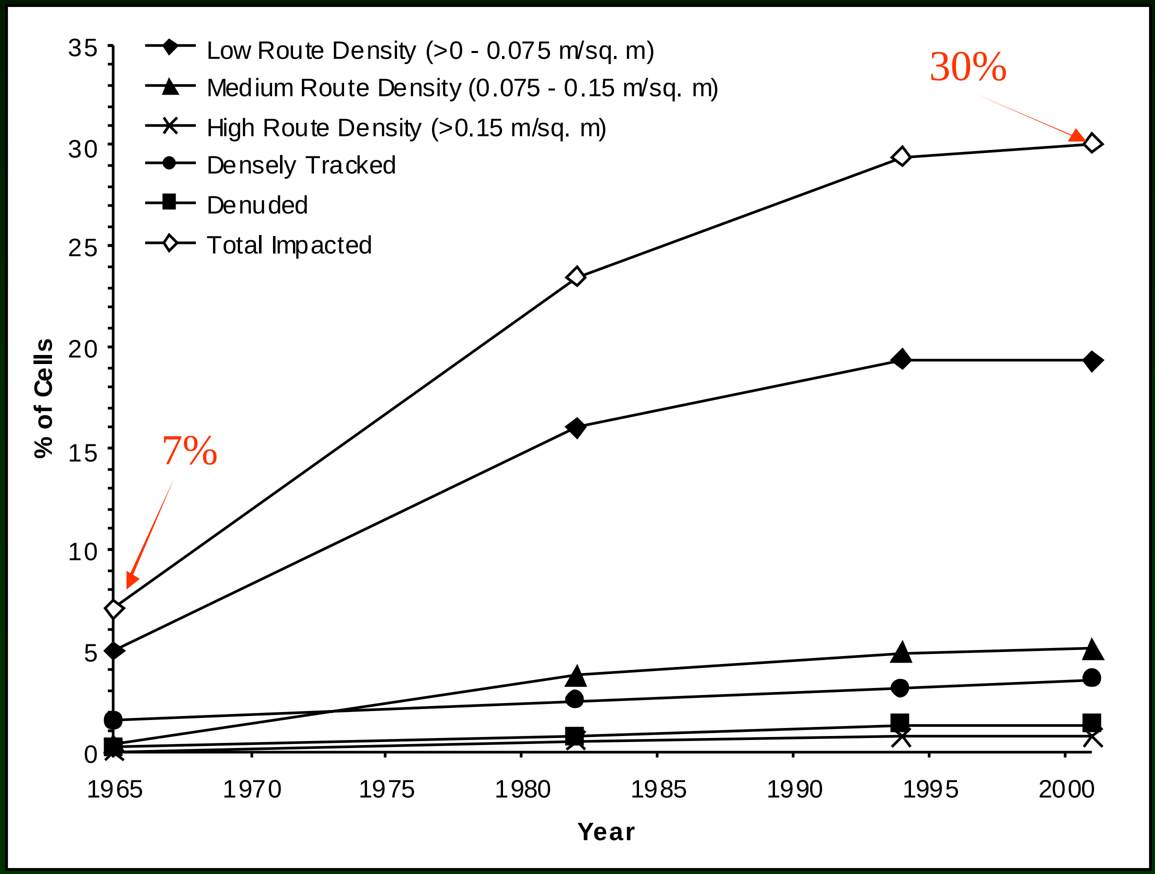
digitized routes from aerial photography

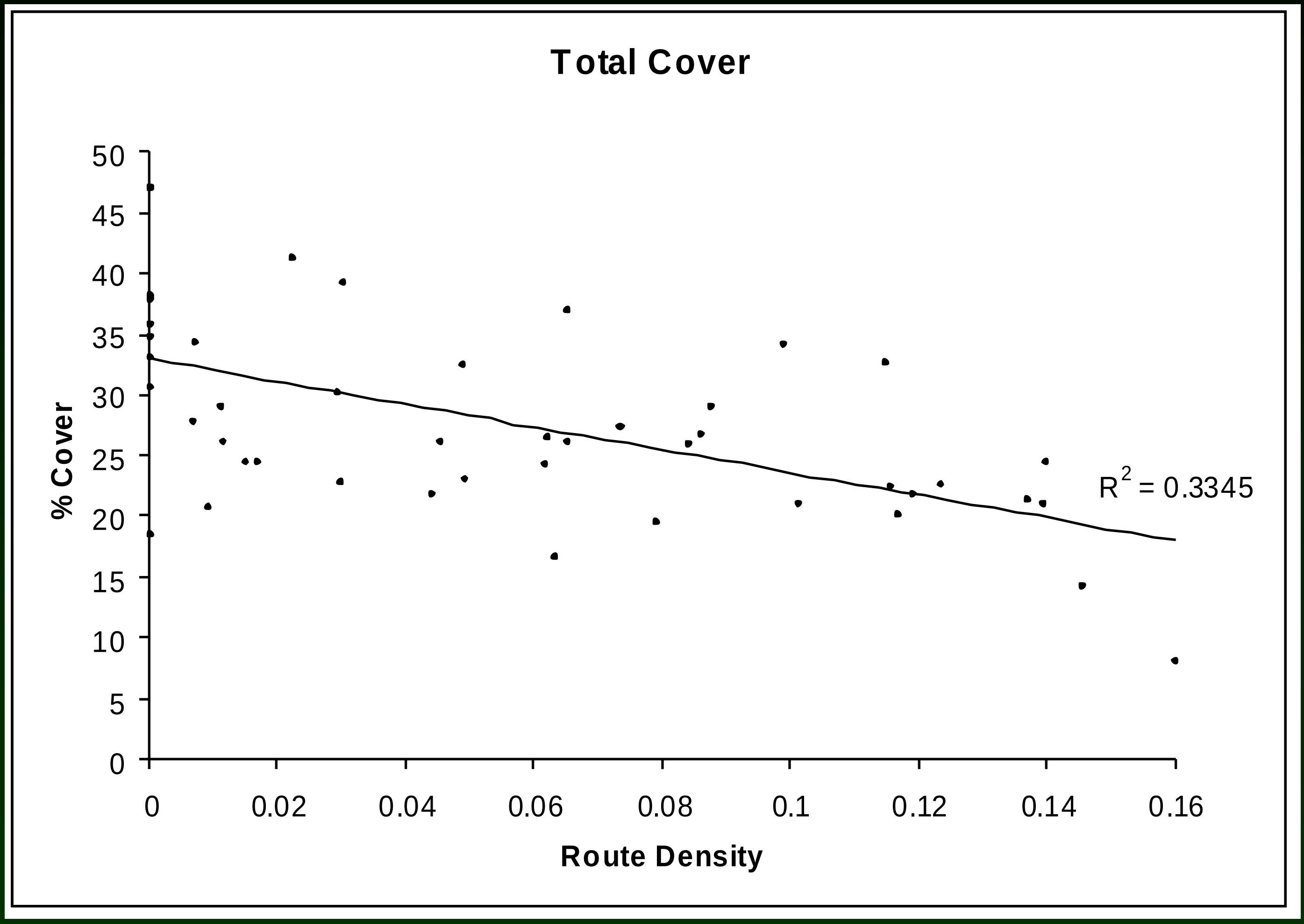


change detection to evaluate patterns in road proliferation



determined separate trends over time for different route densities to identify emerging management issues, and research priorities





Total plant cover decreased with increasing OHV route density.

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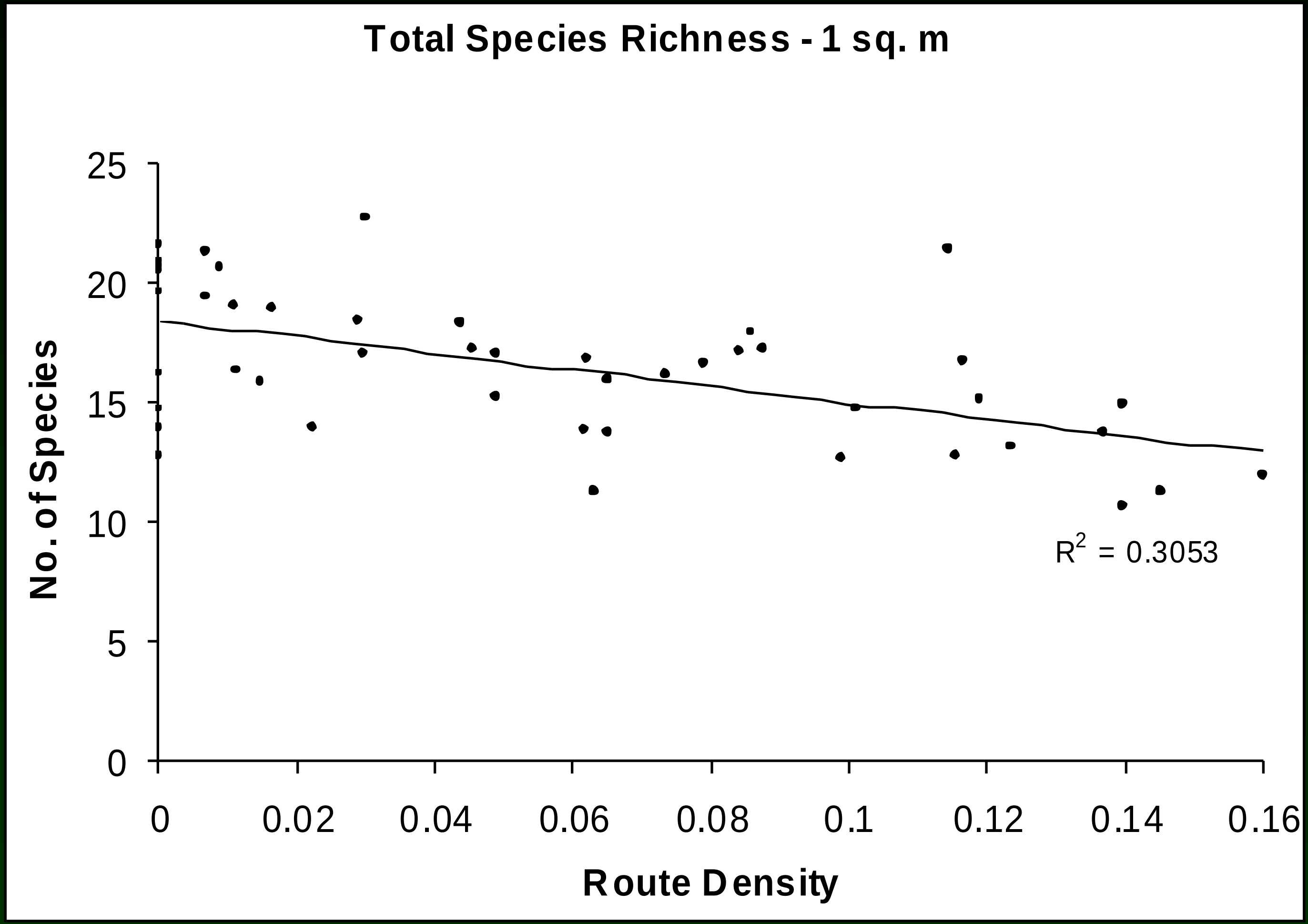
(Brooks in prep)



Plant species richness decreased with increasing OHV route density.

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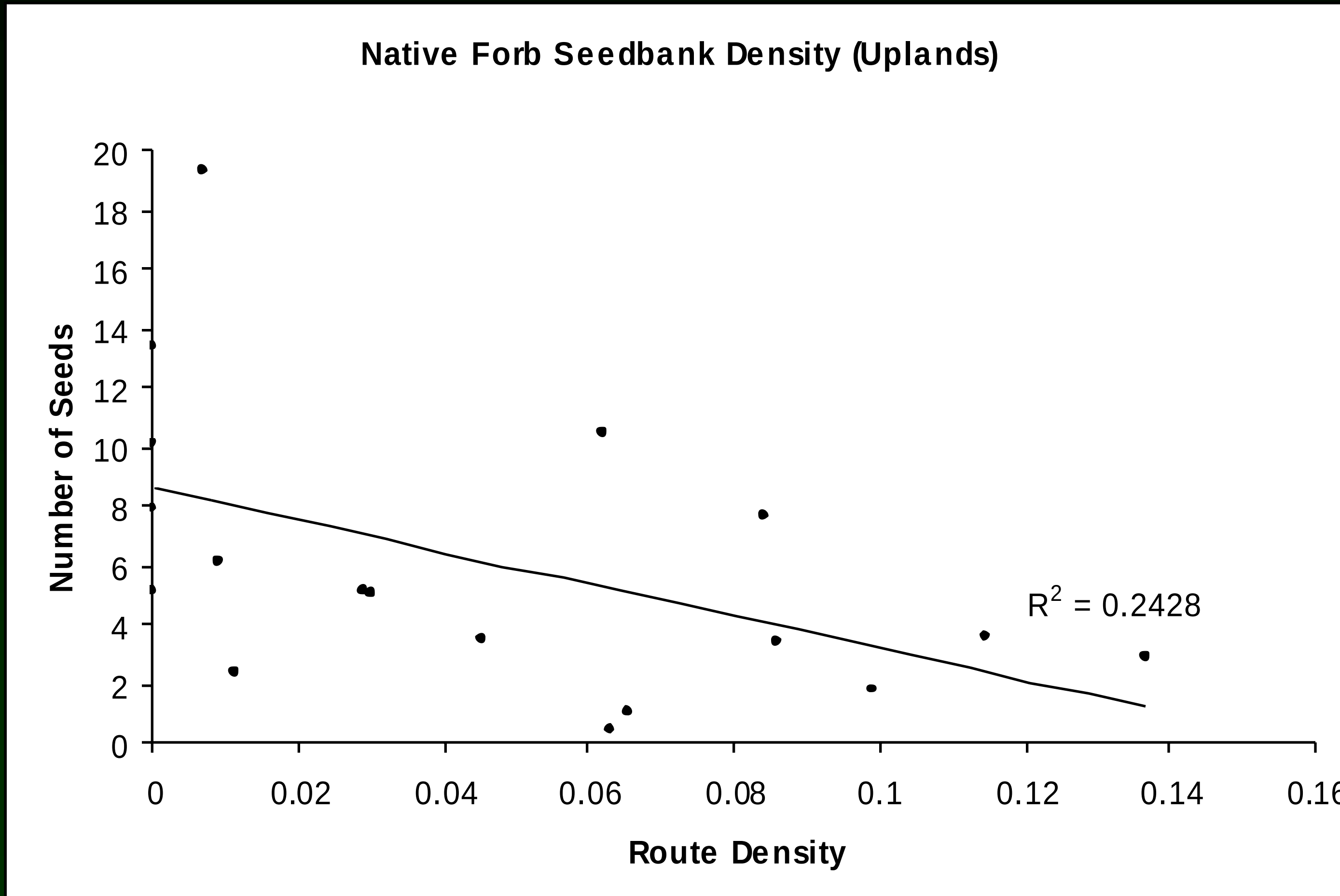
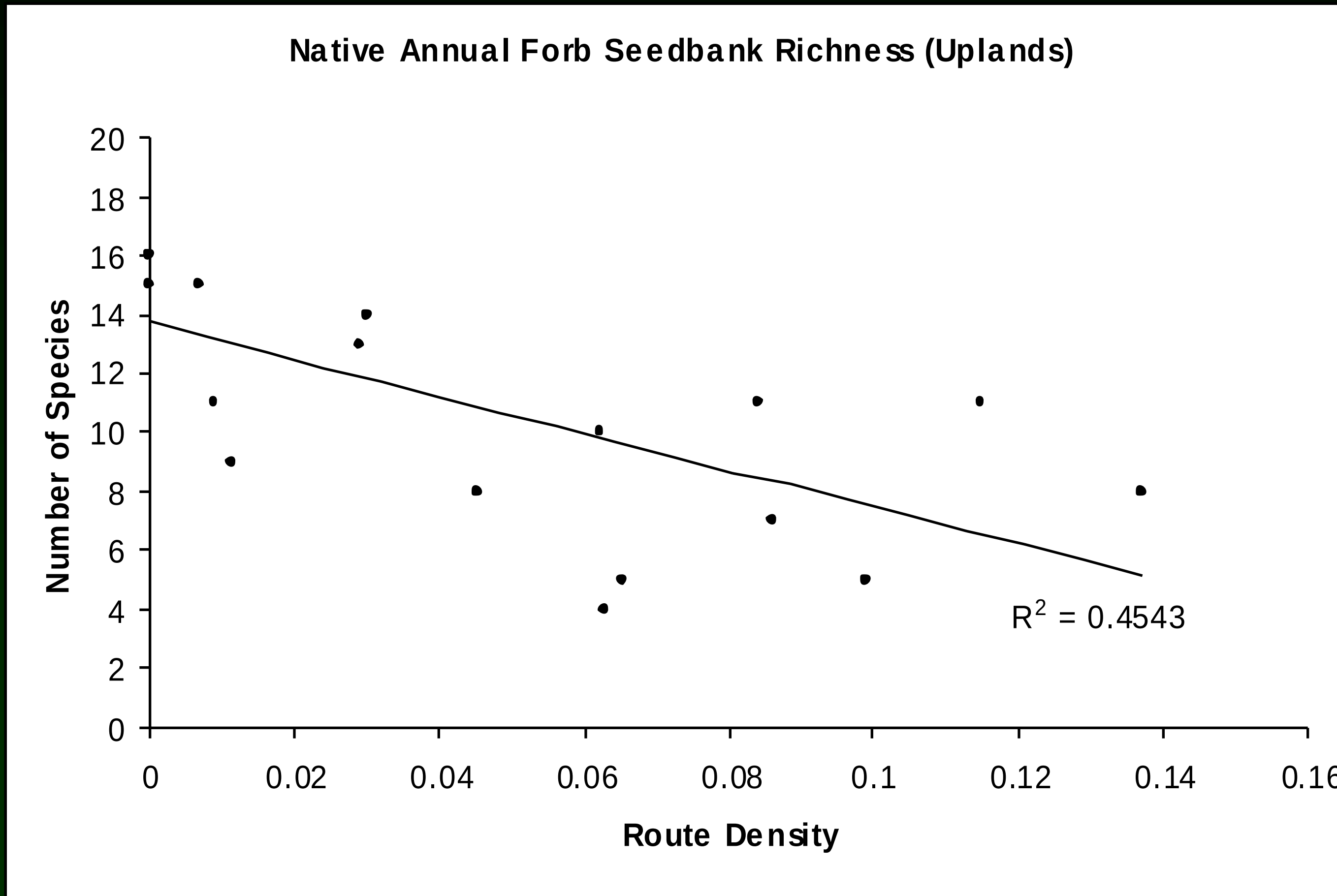


Seedbank density of native forbs decreased with increasing OHV route density.



Seedbank species richness decreased with increasing OHV route density.

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Research Questions

- Could reduction in OHV route density reverse these trends?
- Would revegetation be cost-effective?

Fire Effects on Vegetation

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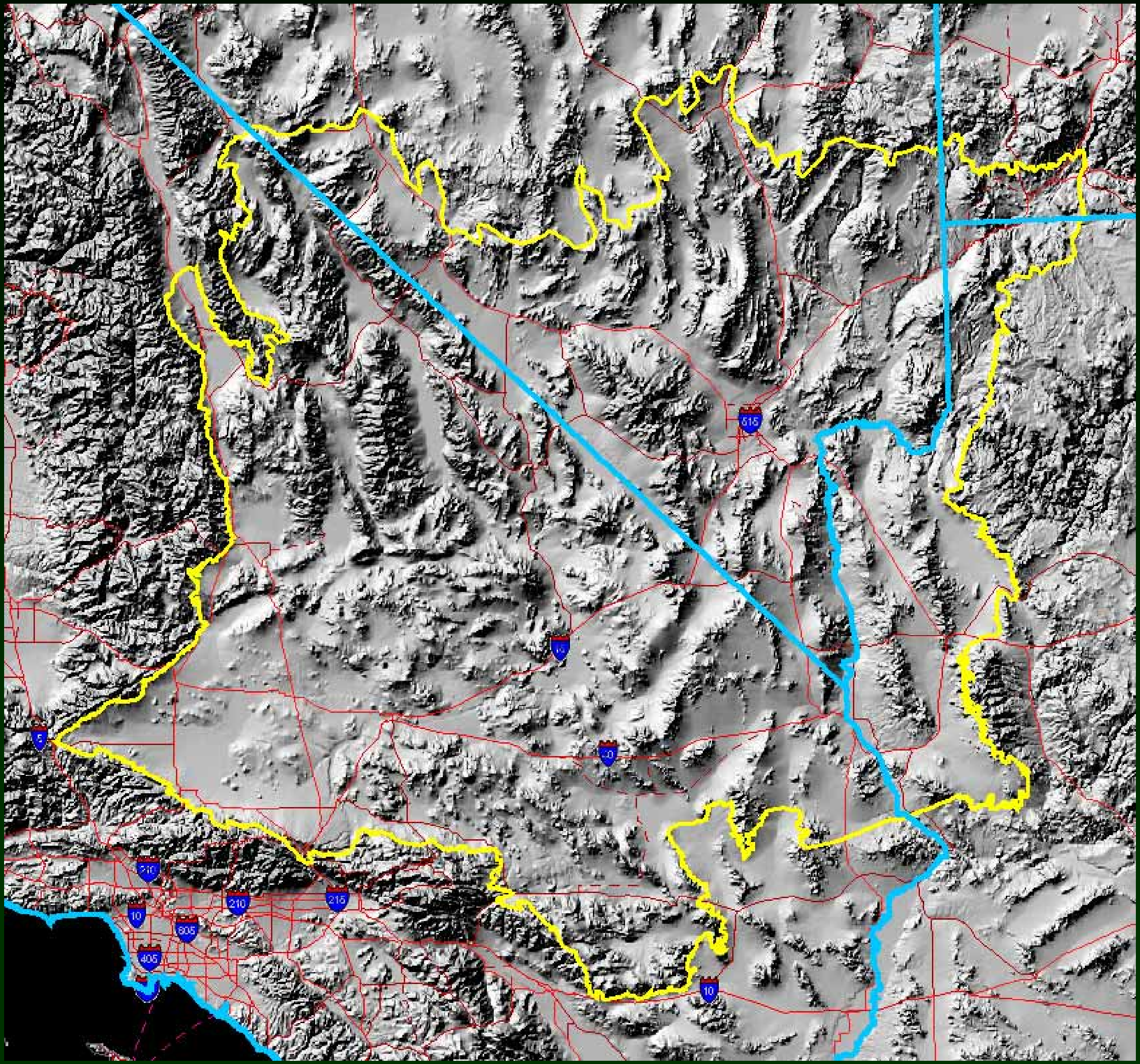
Mojave Desert Ecoregion



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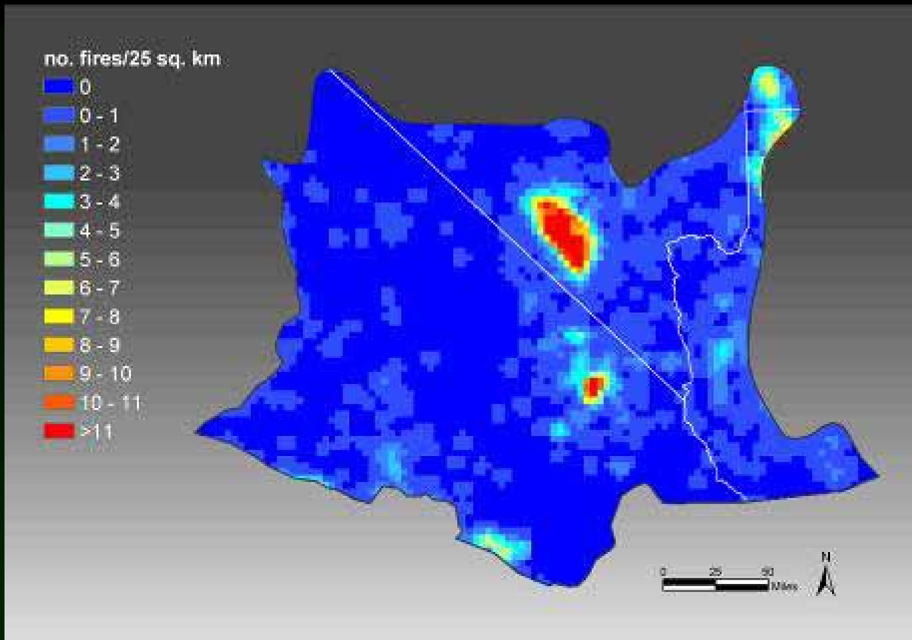
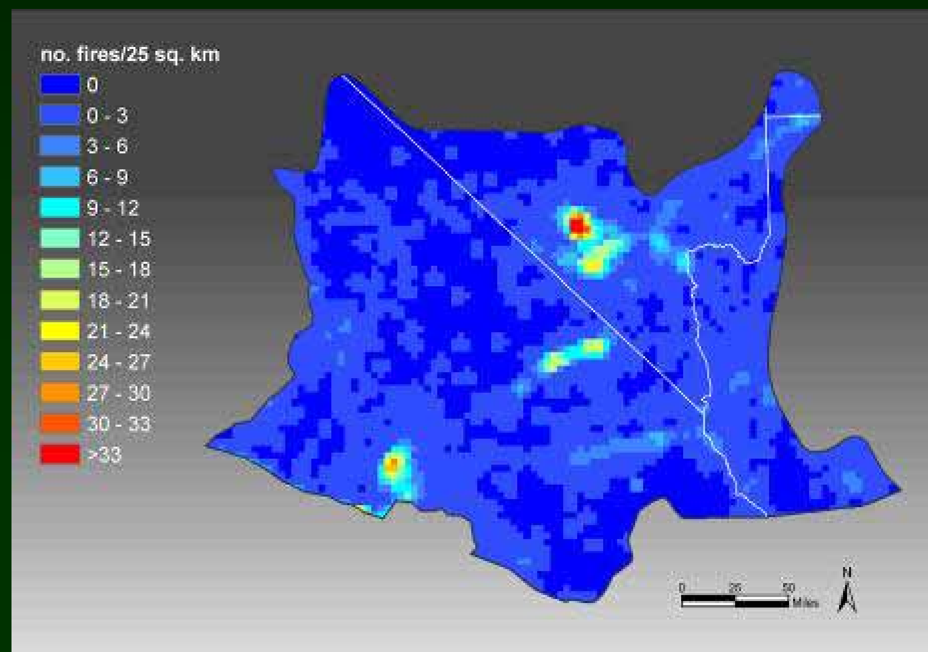


Lightning-caused fires are most dense in the Spring Mountains of Nevada, the New York and Providence Mountains of the Mojave National Preserve in California, in the Beaver Dam and Virgin Mountains in Utah and the Arizona Strip, and Joshua Tree National Park in California.



Human-caused fires are most dense in the Spring Mountains, along the I-15 and I-40 corridors , and the Stoddard and Lucerne valleys.

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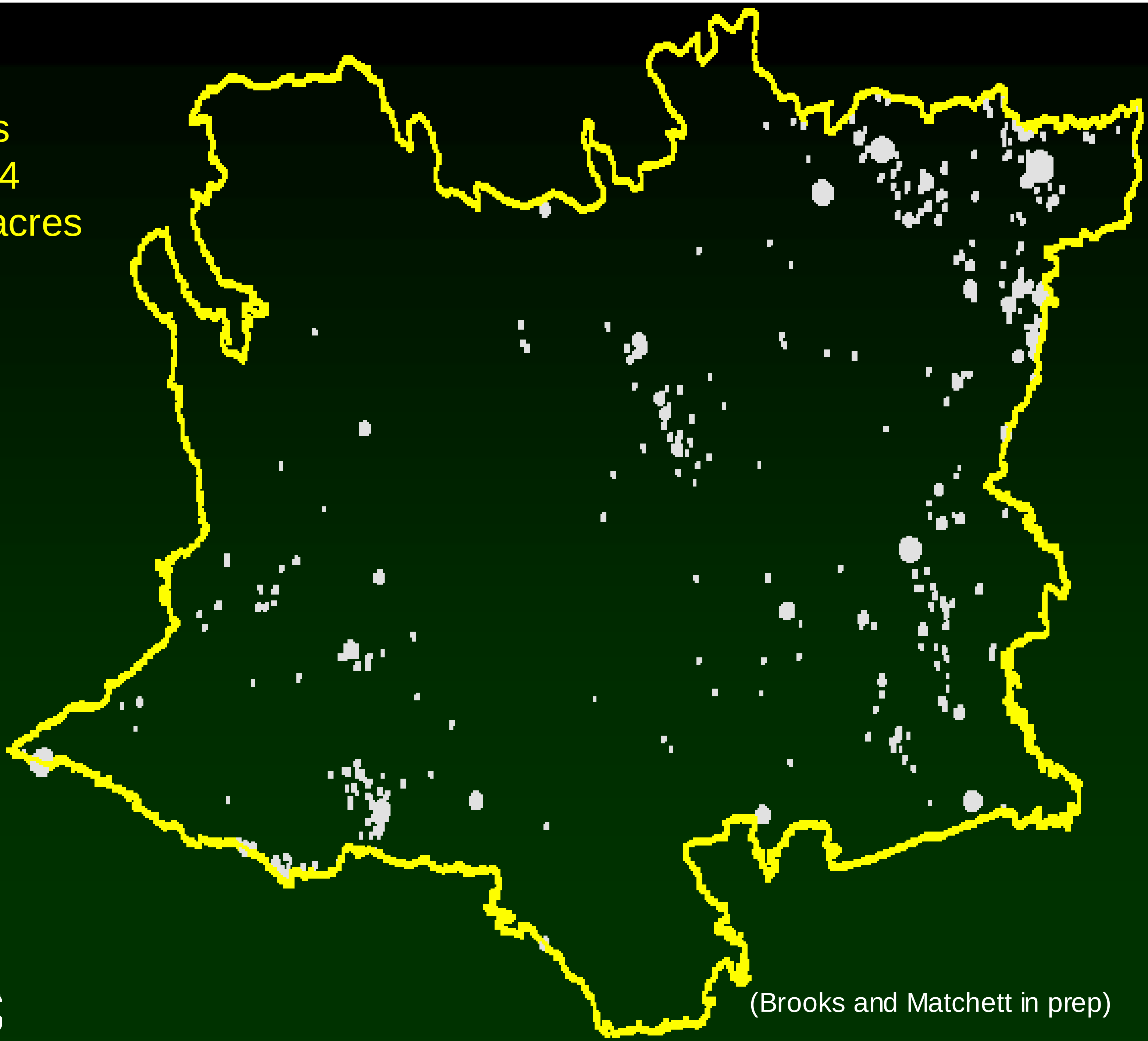
Past Fires
1980-2004
722,000 acres



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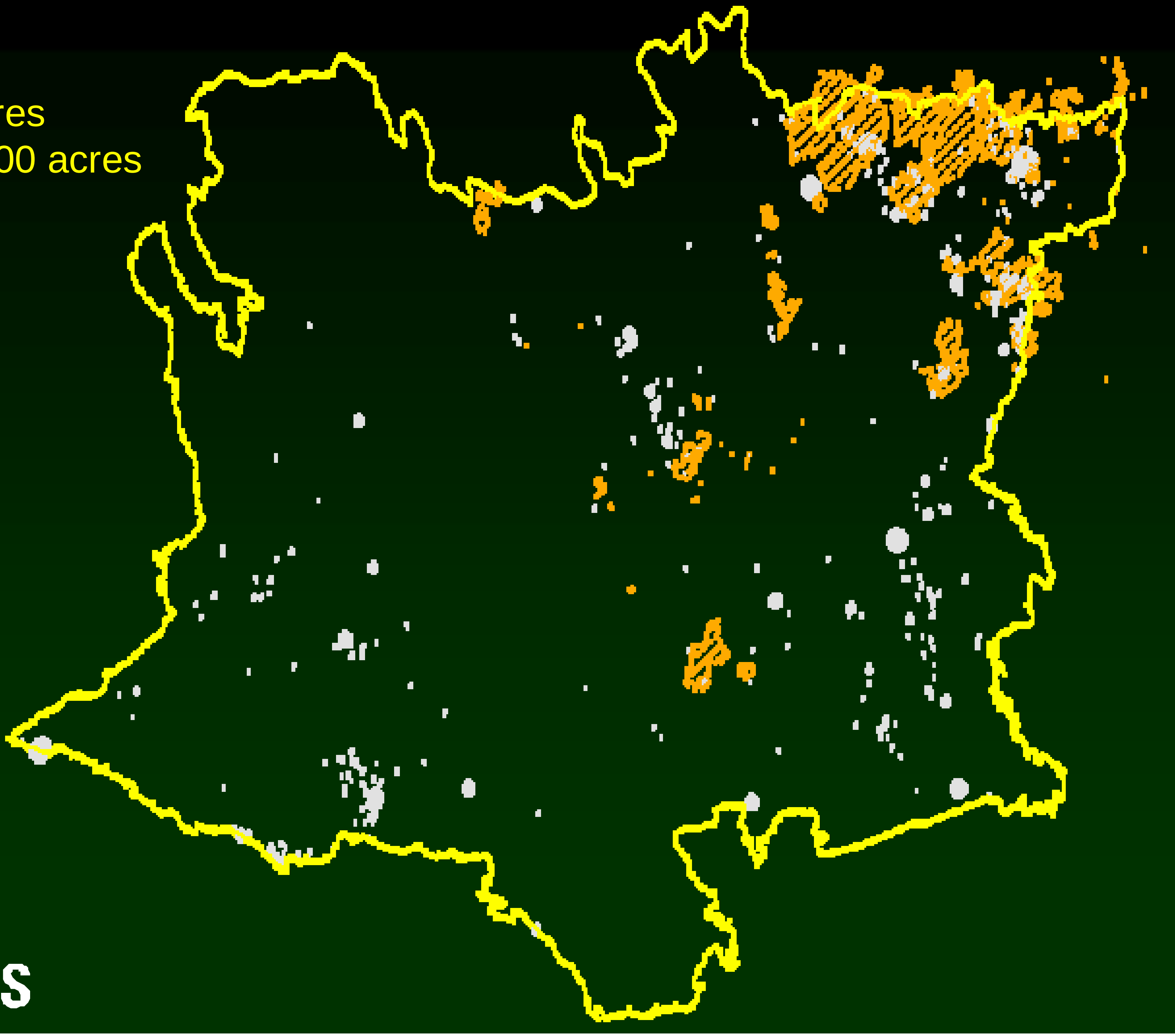
(Brooks and Matchett in prep)

2005 Fires
1,029,000 acres



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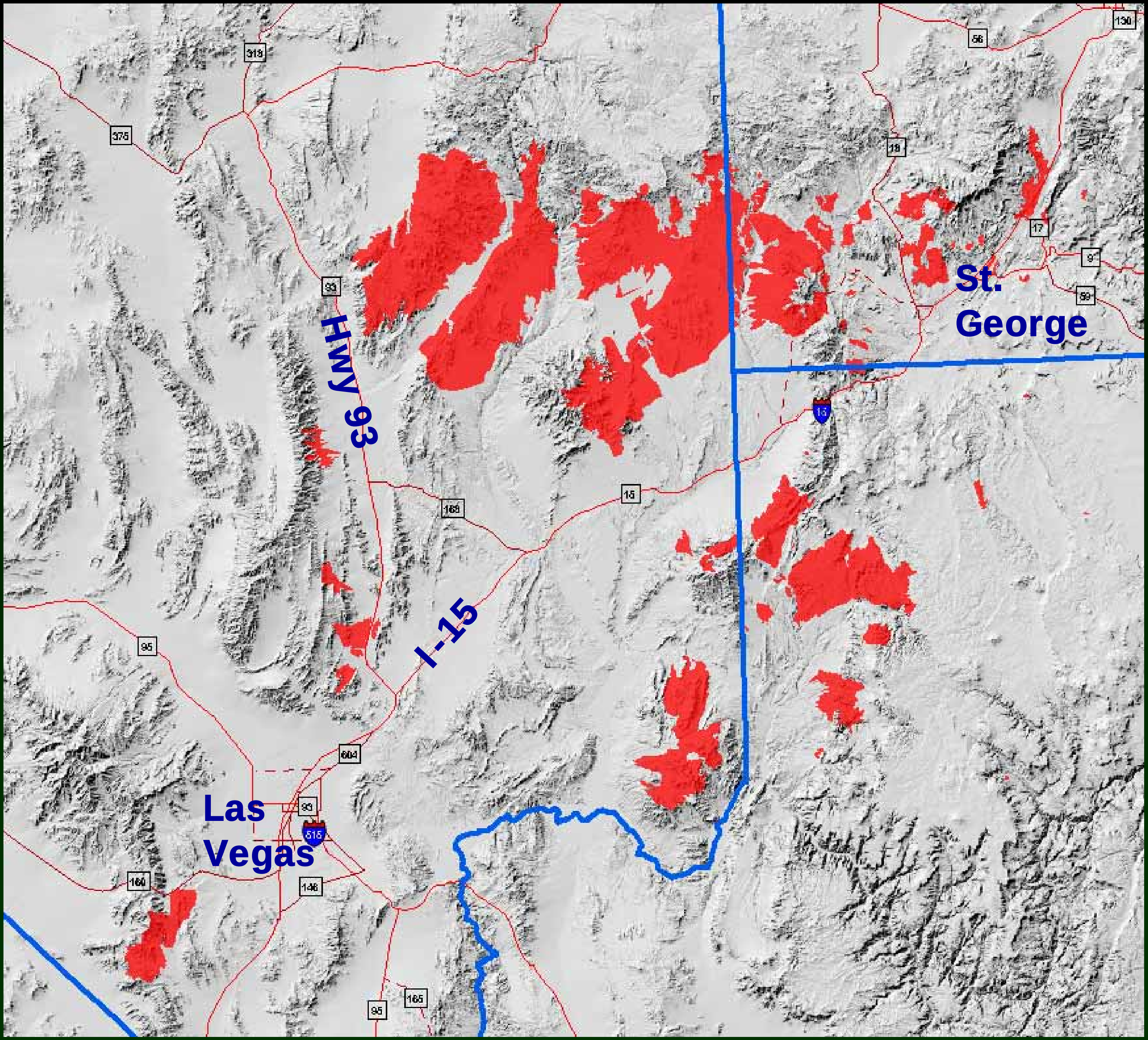
2005 fires in the Northeast Mojave

- 739,000 ac in NV
- 215,000 ac in AZ & UT
- 75,000 ac in CA



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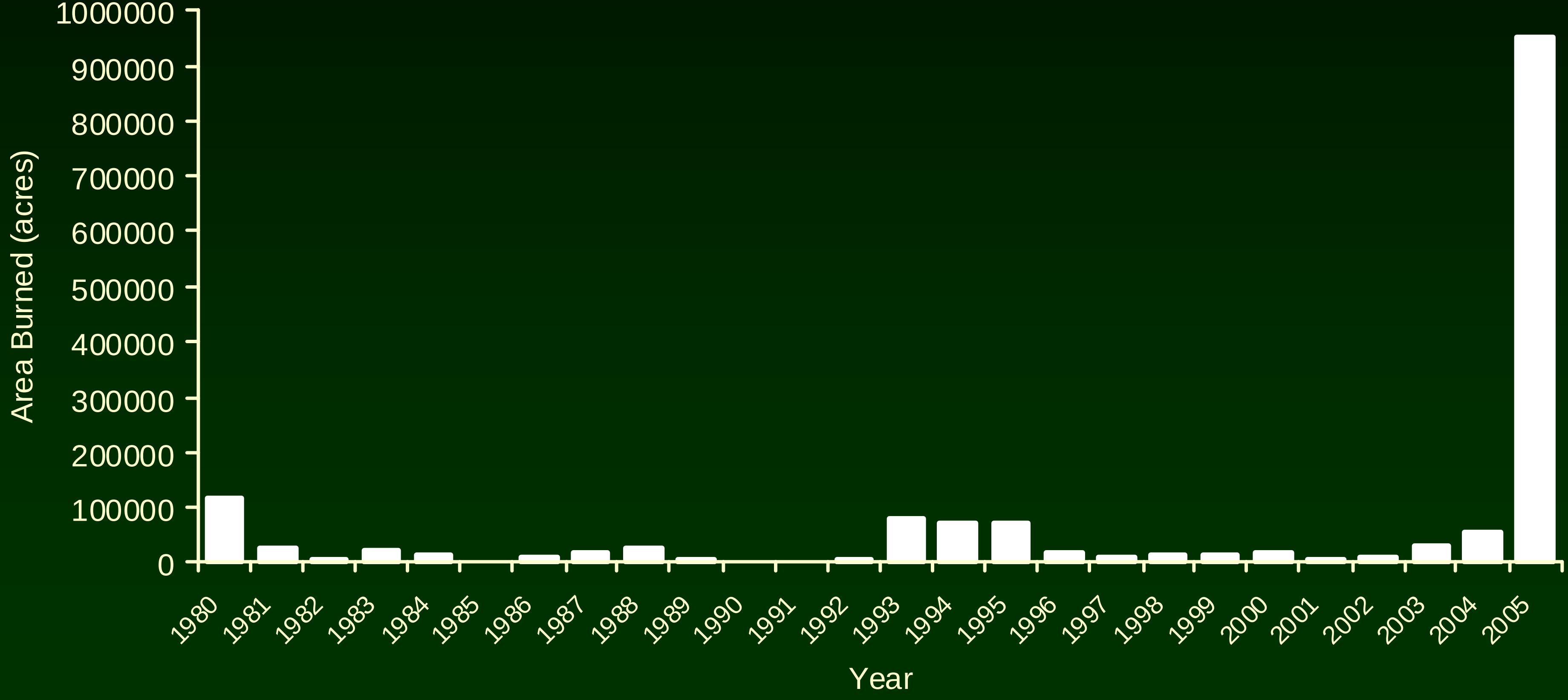
Annual Area Burned 1980-2005



Mojave Desert Vegetation Types

acres burned in 2005

blackbrush	485,000
creosotebush	219,000
pj	103,000
sagebrush	86,000
chapparal	17,000
mojave yucca	15,000
joshua tree	11,000
saltbush	8,000
other	8,000

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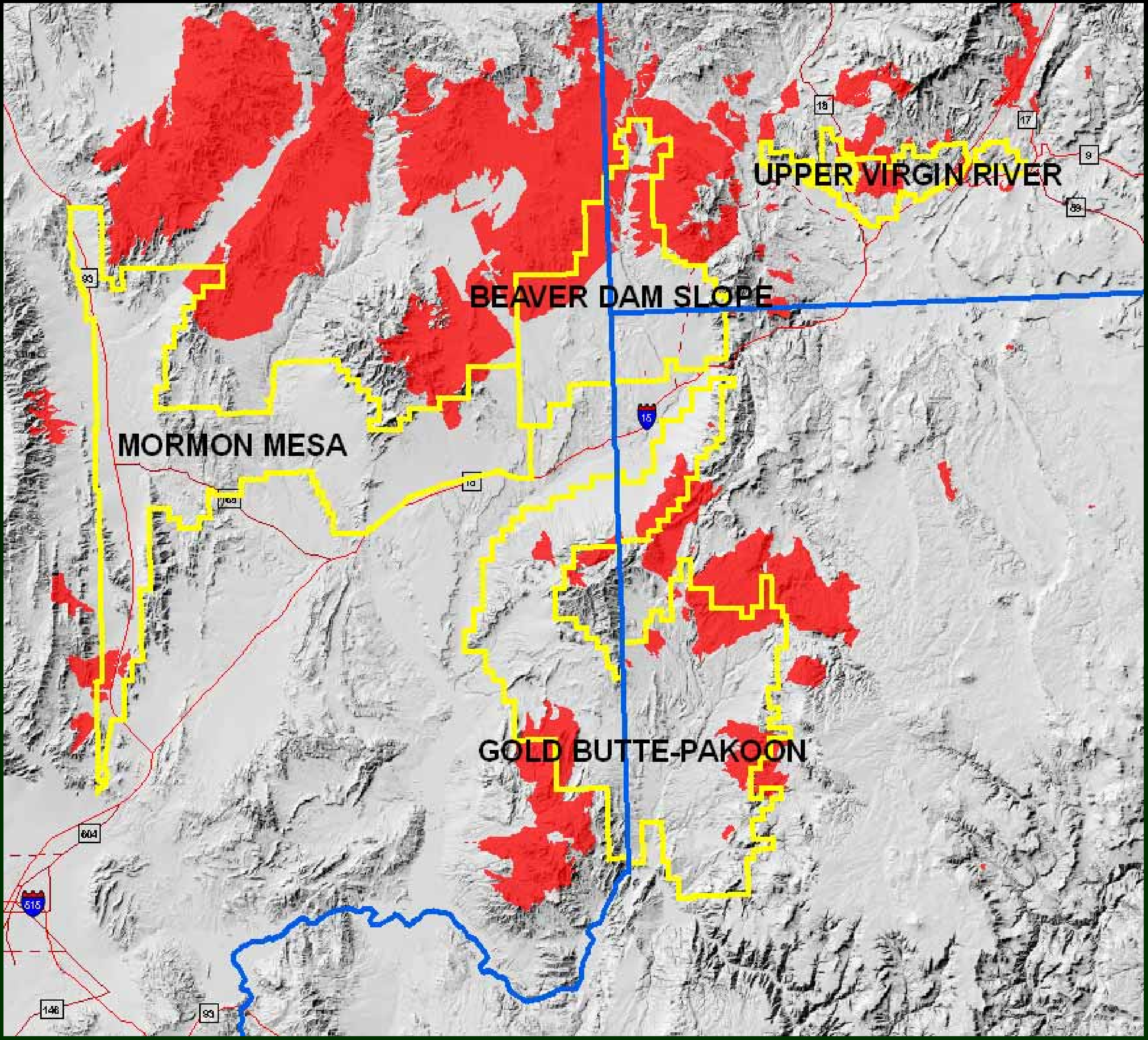
Desert tortoise Critical Habitat Units burned in 2005

24% of BDS

19% of UVR

14% of GBP

4% of MM



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Concerns About Vegetation Loss Due to Fire

Flooding and Soil Erosion

Mojave National Preserve - Summer 2005 (photos by S. Dingman)

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Concerns About Vegetation Loss Due to Fire
Flooding and Soil Erosion

Southern Nevada Fire Complex

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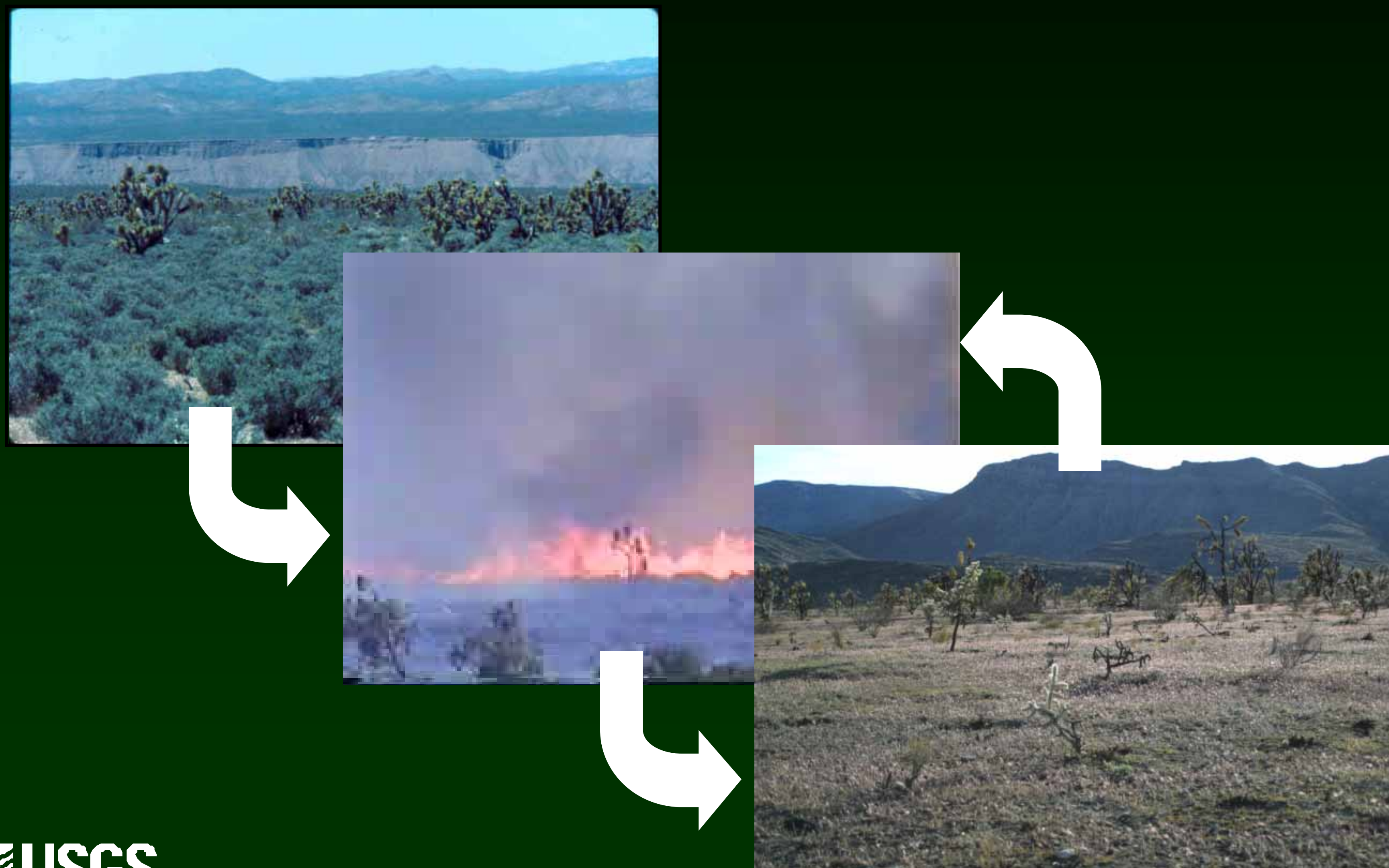
Concerns About Vegetation Loss Due to Fire

grass / fire cycle



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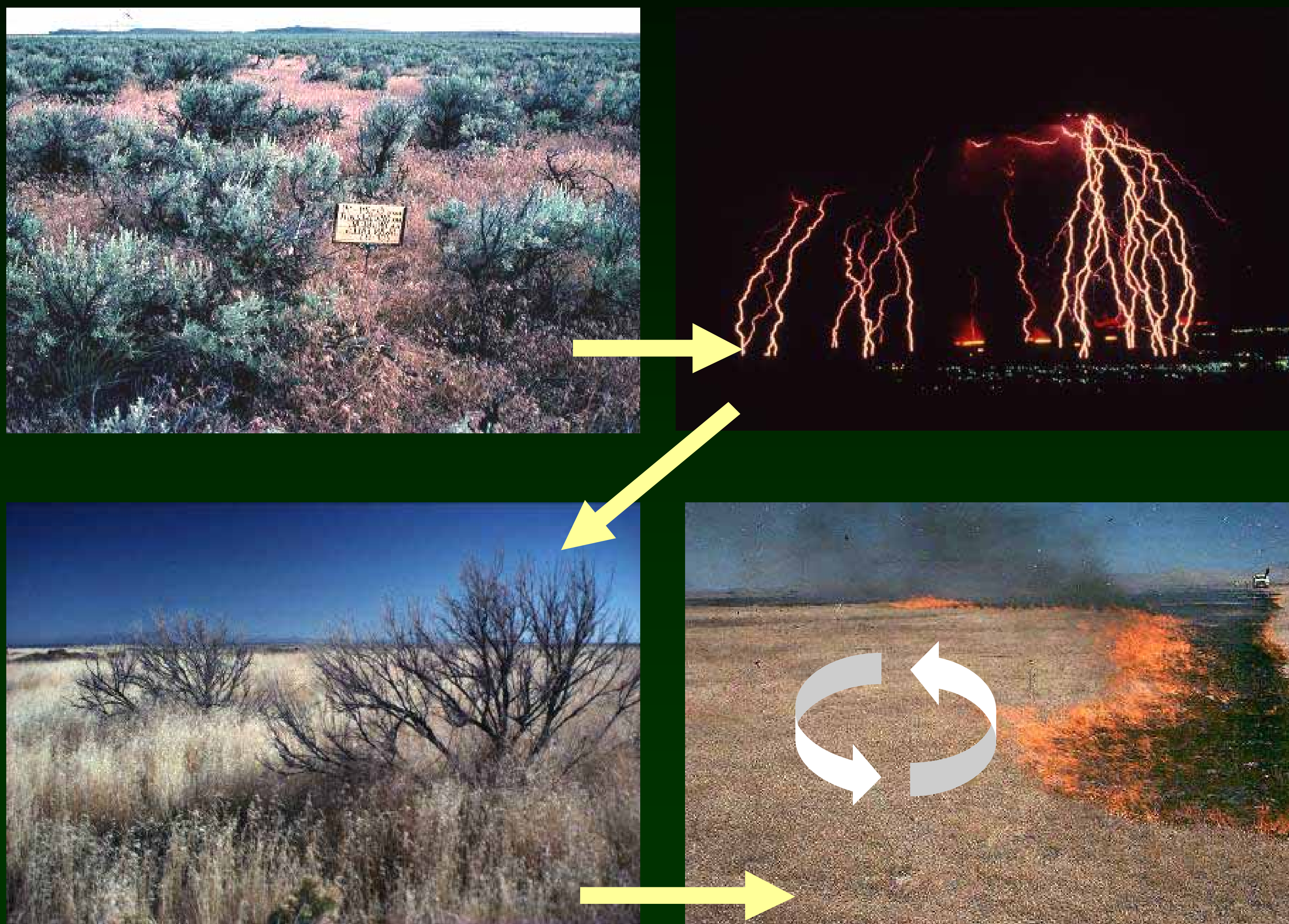
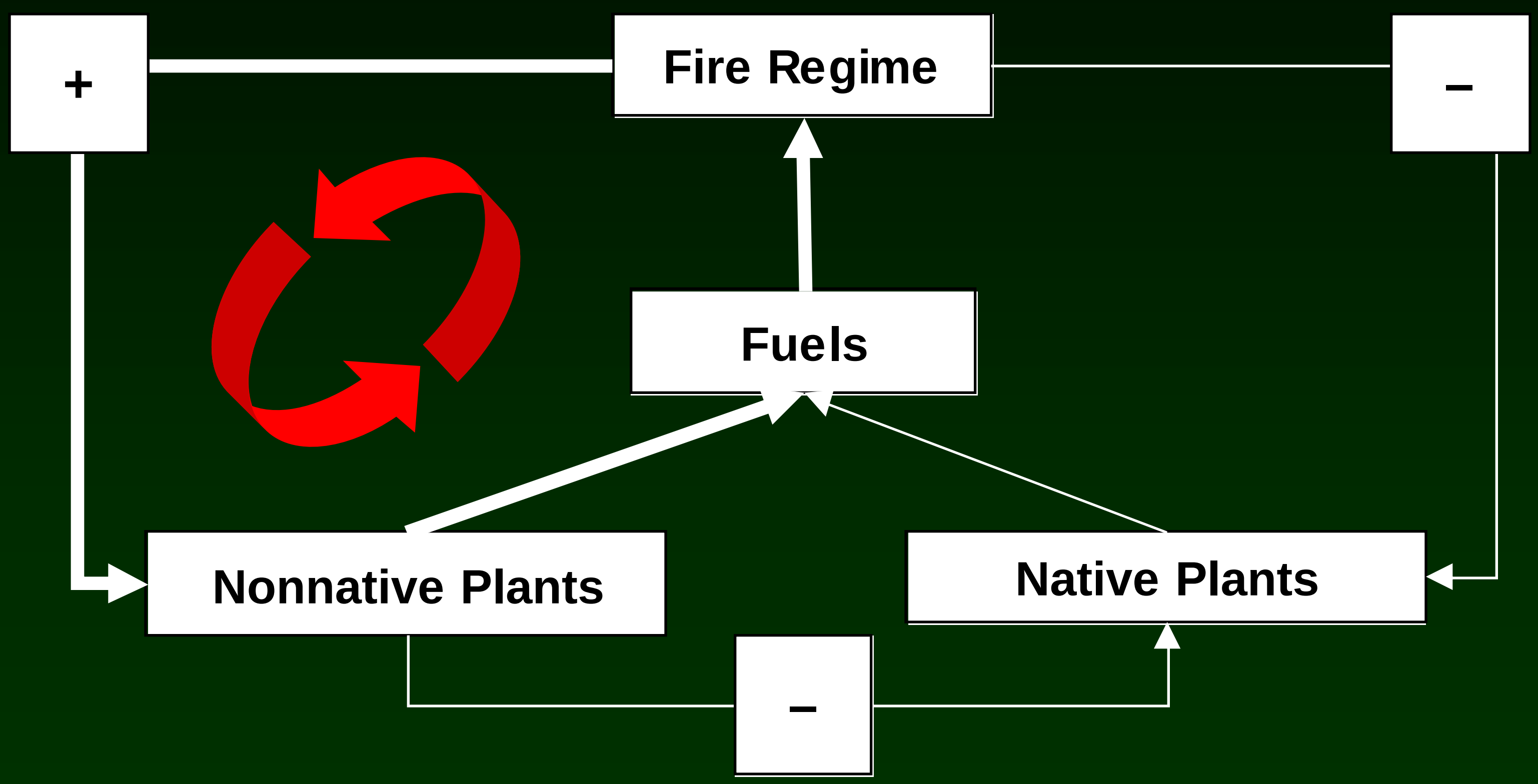
Annual Grass / Fire Cycle in the Great Basin



Invasive Plant / Fire Regime Cycle



(Brooks et al. 2004)

Dominance of annual grasses postfire is nothing new in the Mojave Desert

A few years after fire
in blackbrush shrublands…

… but this phenomenon seems to have increased in frequency at various hotspots of fire activity during the past few decades (Brooks and Esque 2002).

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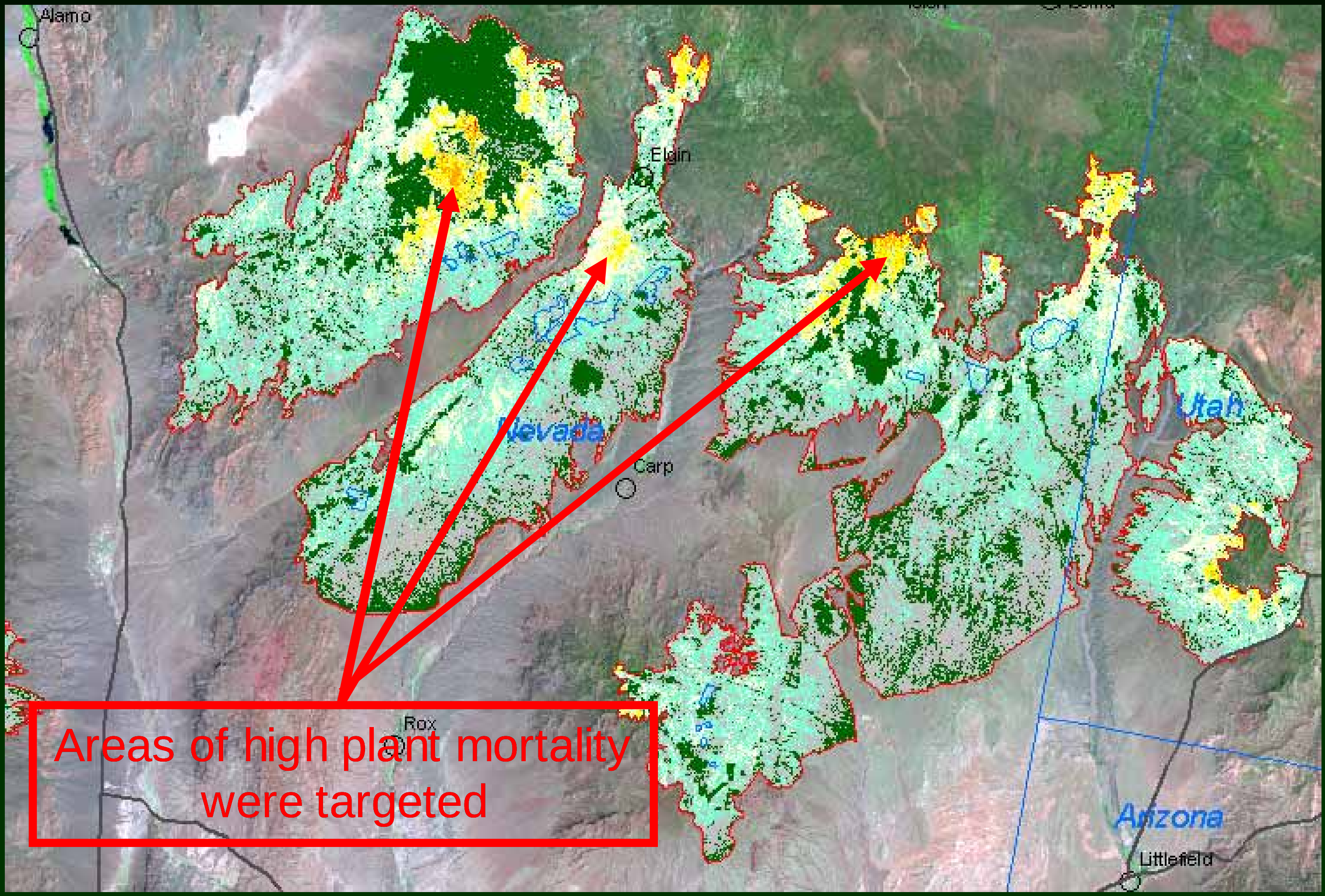
Seeding Treatments Were Implemented on the Southern Nevada Fire Complex



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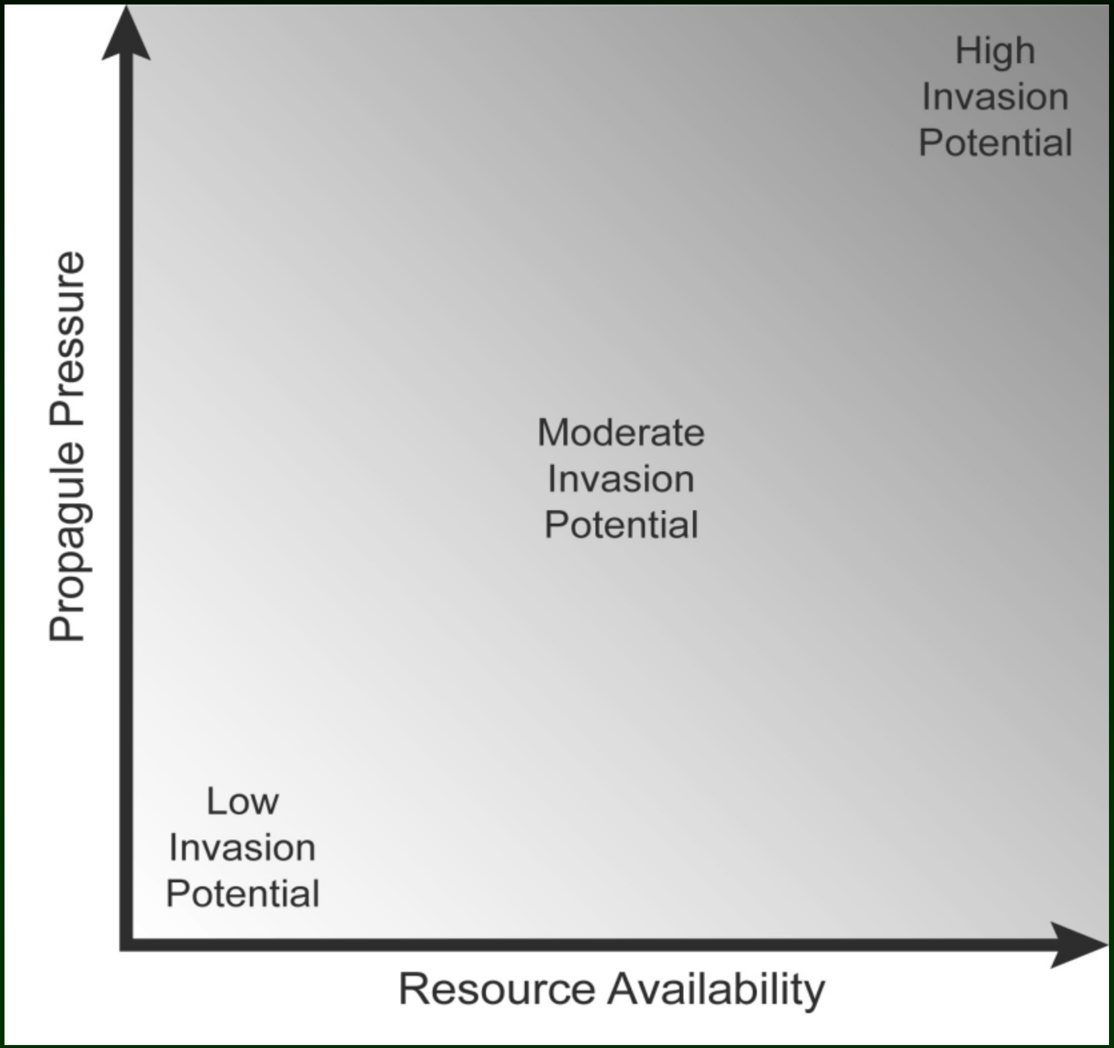
Invasion Model



(Brooks in review)

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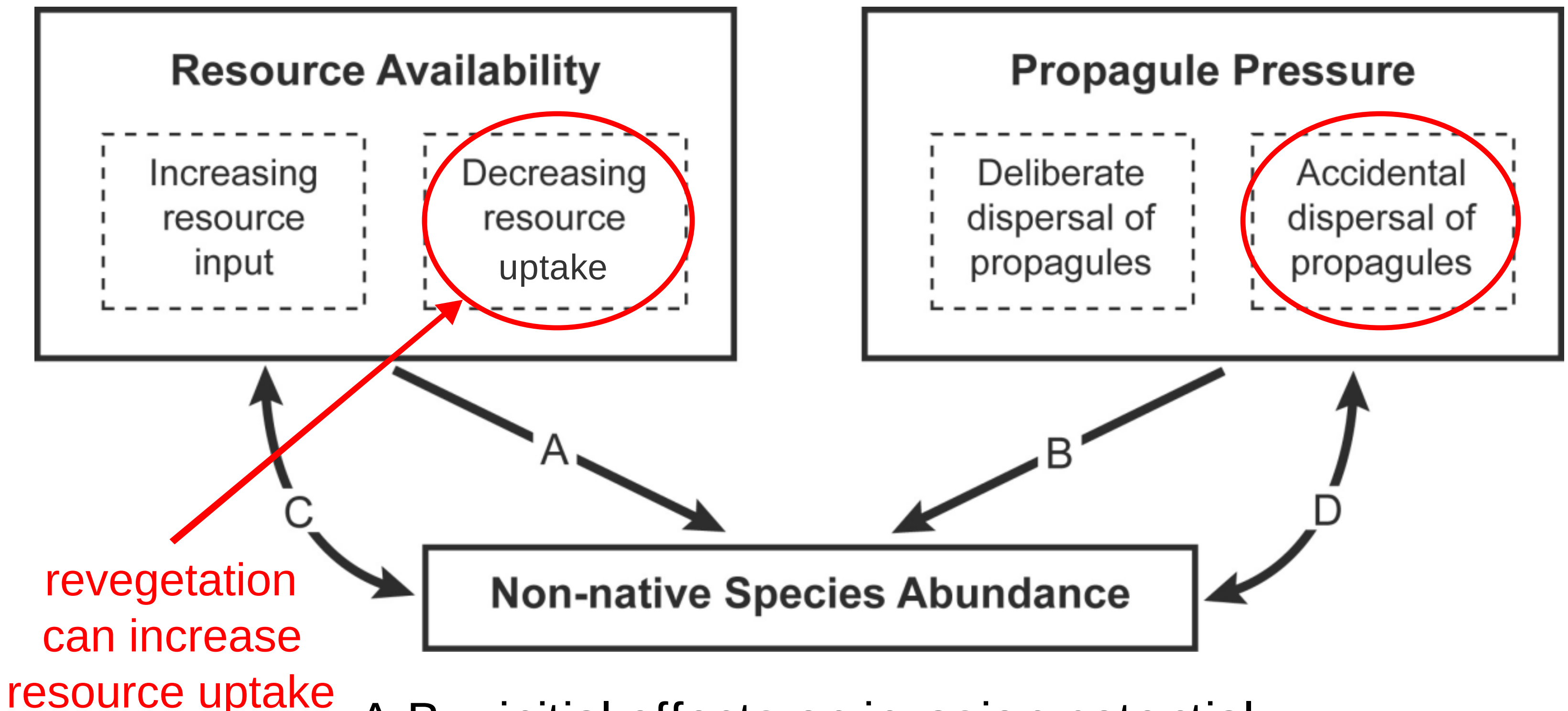
Invasion Model



A,B = initial effects on invasion potential
C,D = feedback effects after establishment

Management of Non-native Brome Grasses

Brome grasses cover the bottom of Zion Canyon, creating a significant fire hazard that could prevent evacuations of the Park during a fire.

Management of Non-native Brome Grasses

Previous herbicide treatments (Imazapic) effectively reduced the dominance of ripgut brome (*Bromus diandrus*), but increased dominance of cheatgrass (*Bromus tectorum*).

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Management of Non-native Brome Grasses

Compare the effects of various combinations of short-term brome grass control and long-term native plant seeding treatments.

Treatments	Timing
Bromus control (short-term)	
Fire	Fall 2005
Mowing	Fall 2005 (concurrent with fire treatments)
Herbicide	Fall 2005 (within 1 month after fire/mowing)
Native plant seeding (long-term)	
Sowing native seed	Fall 2005 (immediately after herbicide)

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Management of Non-native Saltcedar

Across southwestern North America saltcedar has increased coarse fuel loads and ladder fuels, creating significant fire hazards in WUI areas and preventing the recovery of native riparian vegetation.

Management of Non-native Saltcedar

Fire has been used as a relatively inexpensive way to reduce fuel loads, but saltcedar recovers quickly post-fire.

Reducing plant vigor prior to burning may increase post-fire mortality. This may be done using herbicides or biocontrol insects.

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Management of Non-native Saltcedar

Mechanical plowing, slash-piling, and burning can be effective at eliminating saltcedar

… but it often re-invades quickly if there are no follow-up treatments.

Management of Non-native Saltcedar

Revegetation of native riparian plants may be the best hope for impeding the reinvasion of saltcedar and minimizing the need for re-treatment.

Quailbush (*Atriplex lentiformis*)

Management of Non-native Saltcedar

Compare the effects of various combinations of saltcedar control and native plant seeding treatments.

Treatments
Saltcedar control (short-term)
Mechanical plowing
Fire followed by herbicide
Biocontrol followed by fire
Native plant seeding (long-term)
Sowing native seed

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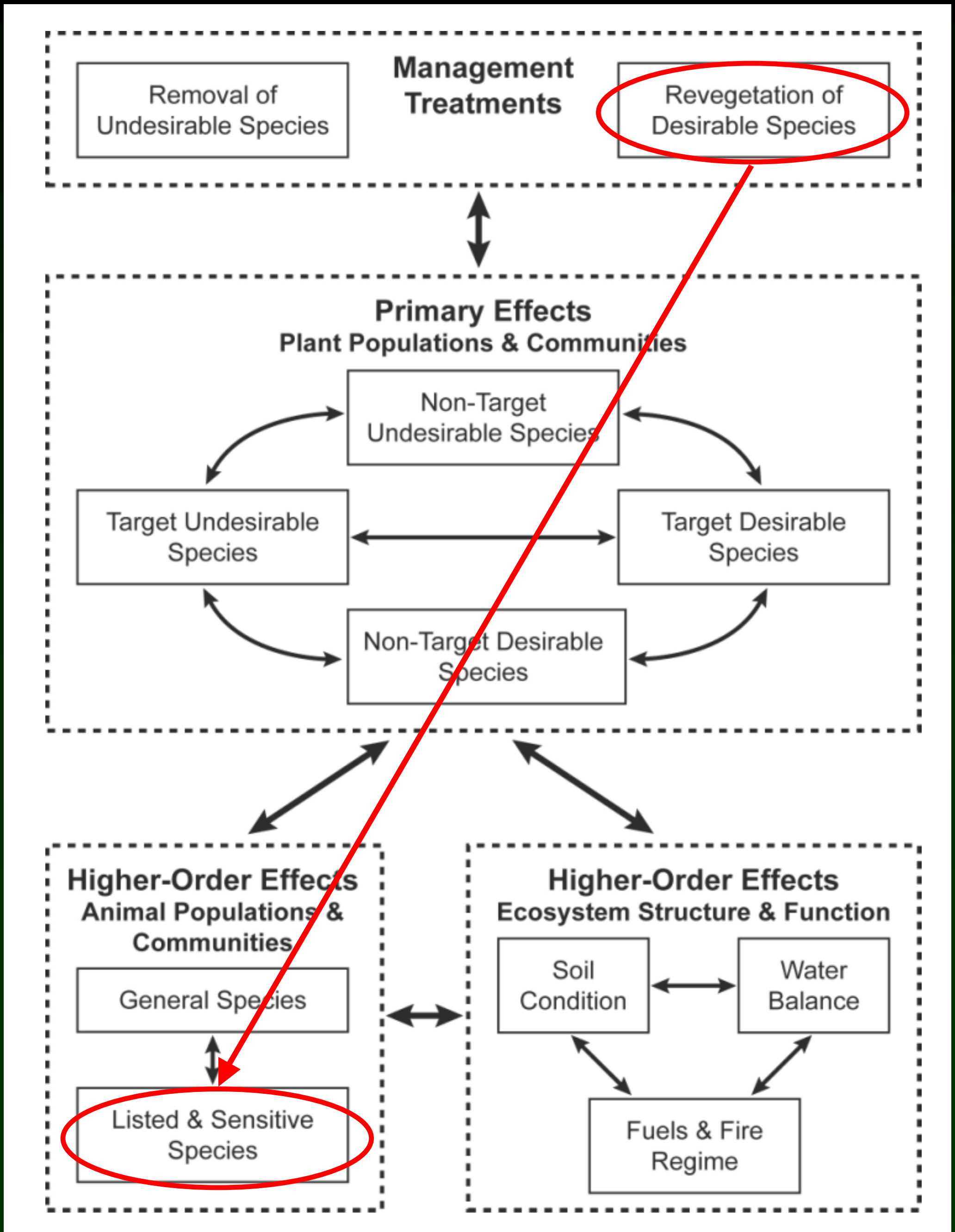
The Challenge



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