Threats to the Mojave Ecosystem: Past, Present, and Future

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What Constitutes a Threat?

- Threats are subjective, depending on one's perspective
- What constitutes a threat changes with time
- Threats are extremely difficult to predict

What Constitutes a Threat?

The User Perspective

The Environmentalist Perspective

The Science Perspective

What Constitutes a Threat?

- Intensity and areal extent are factors
- Three science – management perspectives
- (1) Decreases in species populations
- (2) Habitat changes
- (3) Change in ecosystem processes

What Constitutes a Threat?

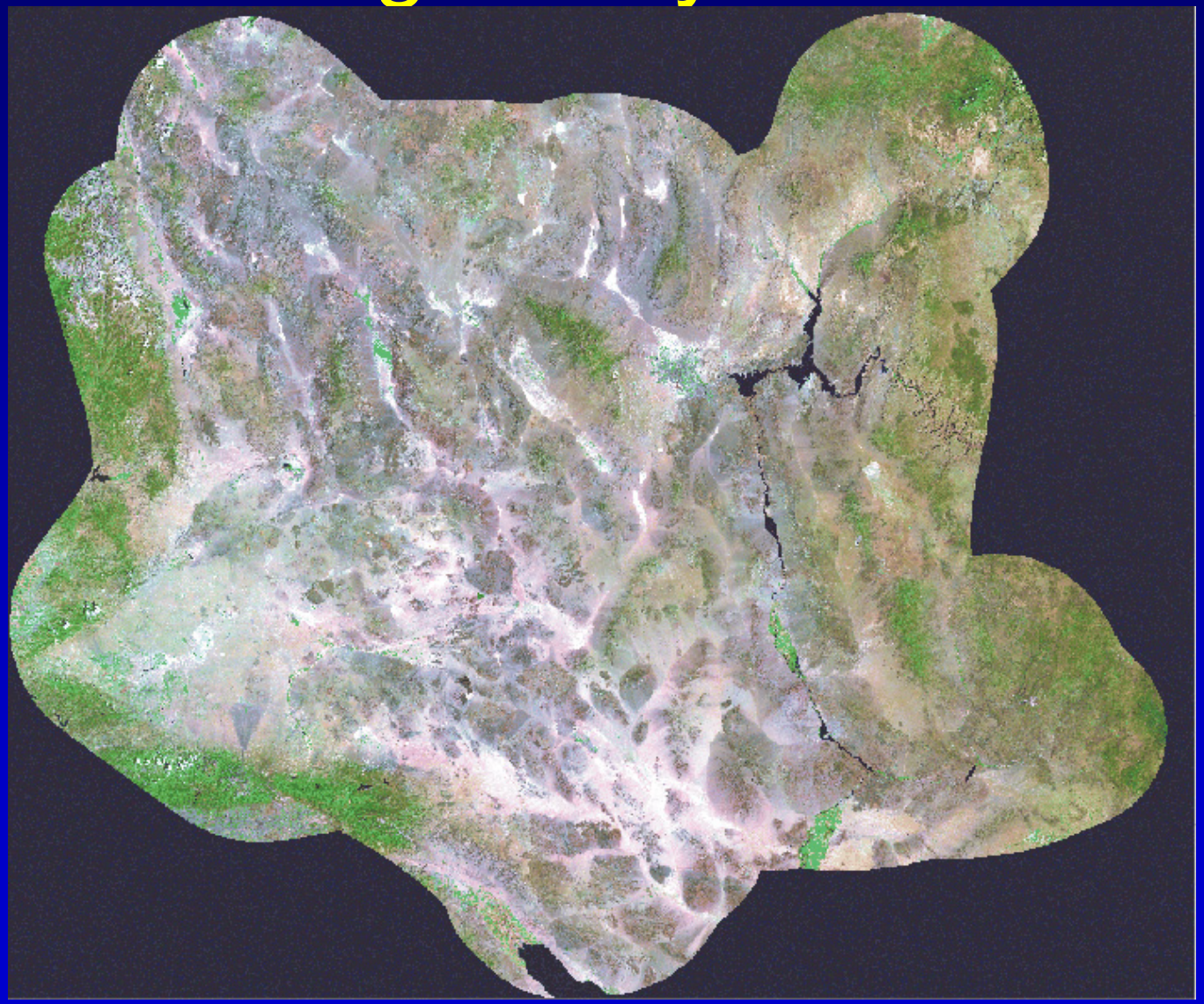
Intense, local impact

Intense, regional impact

Dispersed, local impact

Dispersed, regional impact

Mojave Ecosystem Threats (19th Through Early 20th Century)



Mining

Prospectors scour the Mojave in search of riches and find them

Deforestation to Feed Mills

National Forest Reserves

Transportation Corridors

Commerce in support of mining required railroads and roads

Tailings Piles

Furnace, California

Rhyolite, Nevada

Livestock Grazing

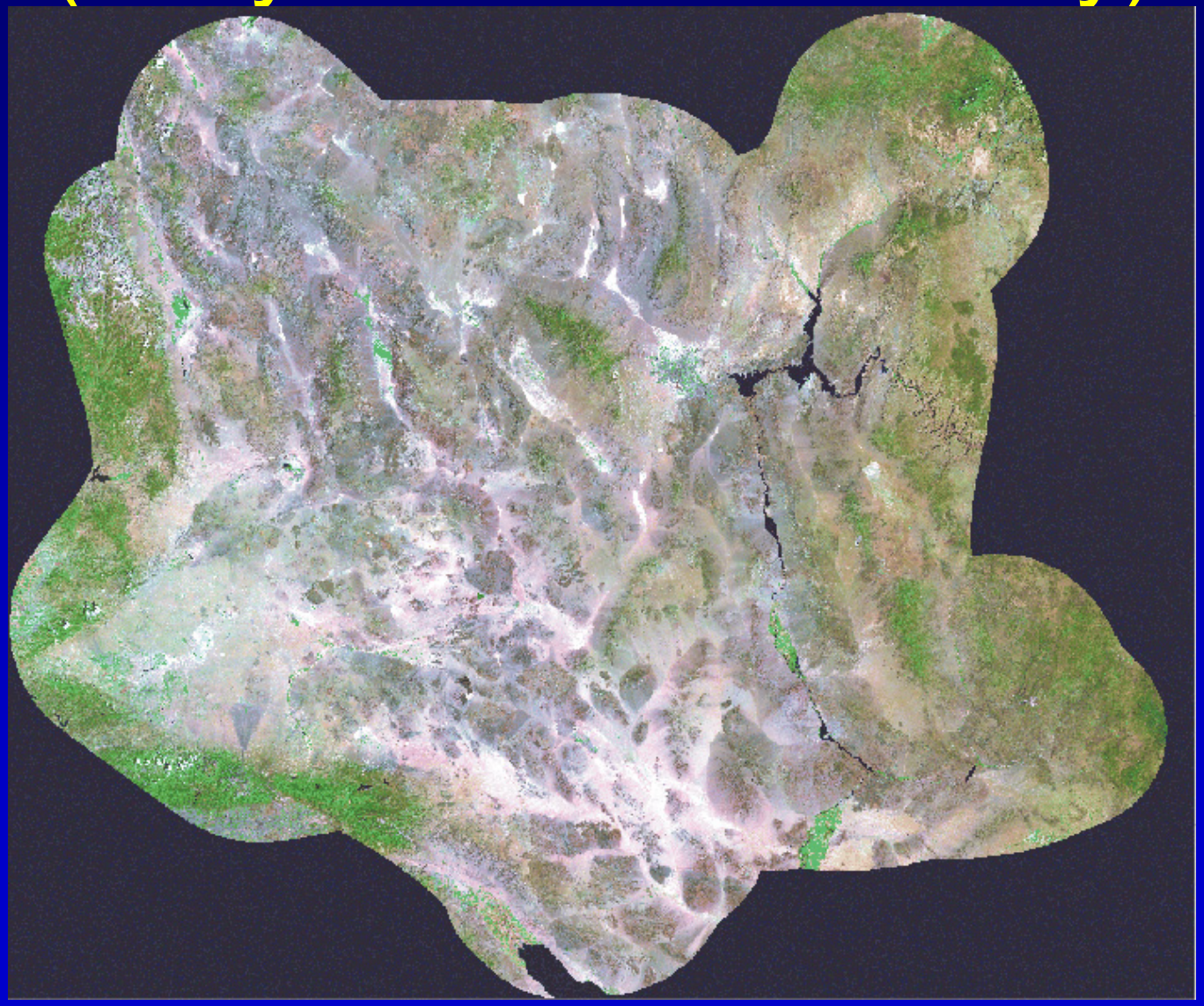
Livestock were trailed through the Mojave Desert beginning with the Spaniards. Widespread grazing required development of widespread watering sites and occurred in the 20th century.

Initial scientific interest was more concerned with range production and management, not environmental concerns.

Agriculture

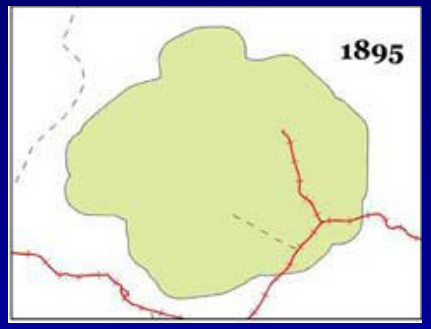
Farmers attempted three types of agriculture: dryland, irrigation with surface water, irrigation with ground water

Mojave Ecosystem Threats (Early to Mid-20th Century)

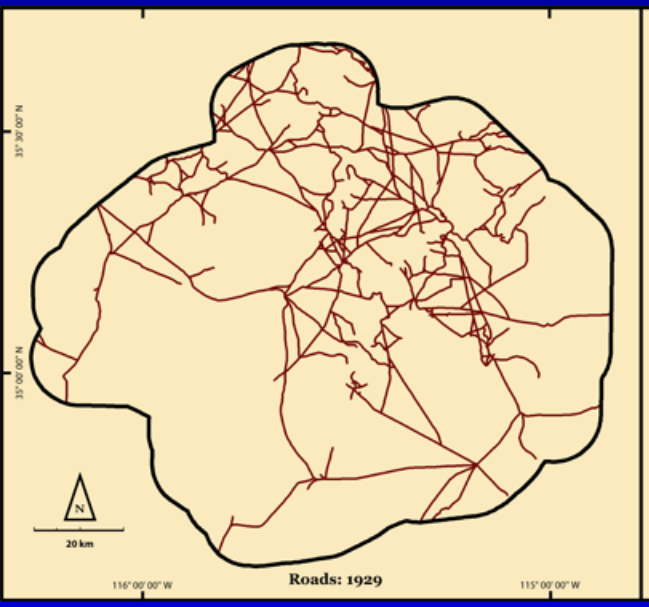


Proliferation of Roads

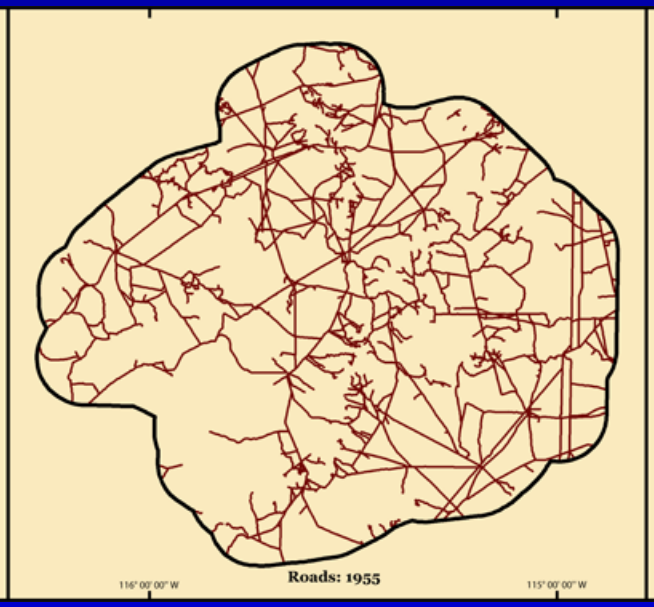
- The density of roads in the Mojave Desert increased through the 20th century
- Mojave National Preserve gives one example (Gass, Vogel, and Wallace, unpublished data



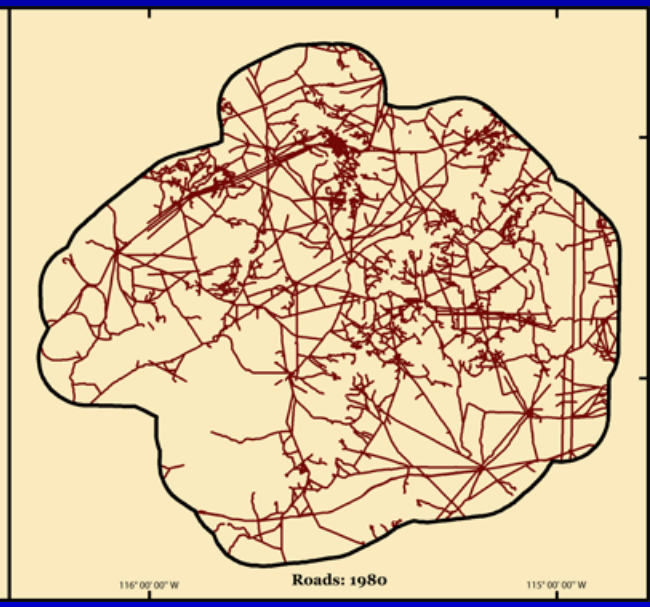
1929



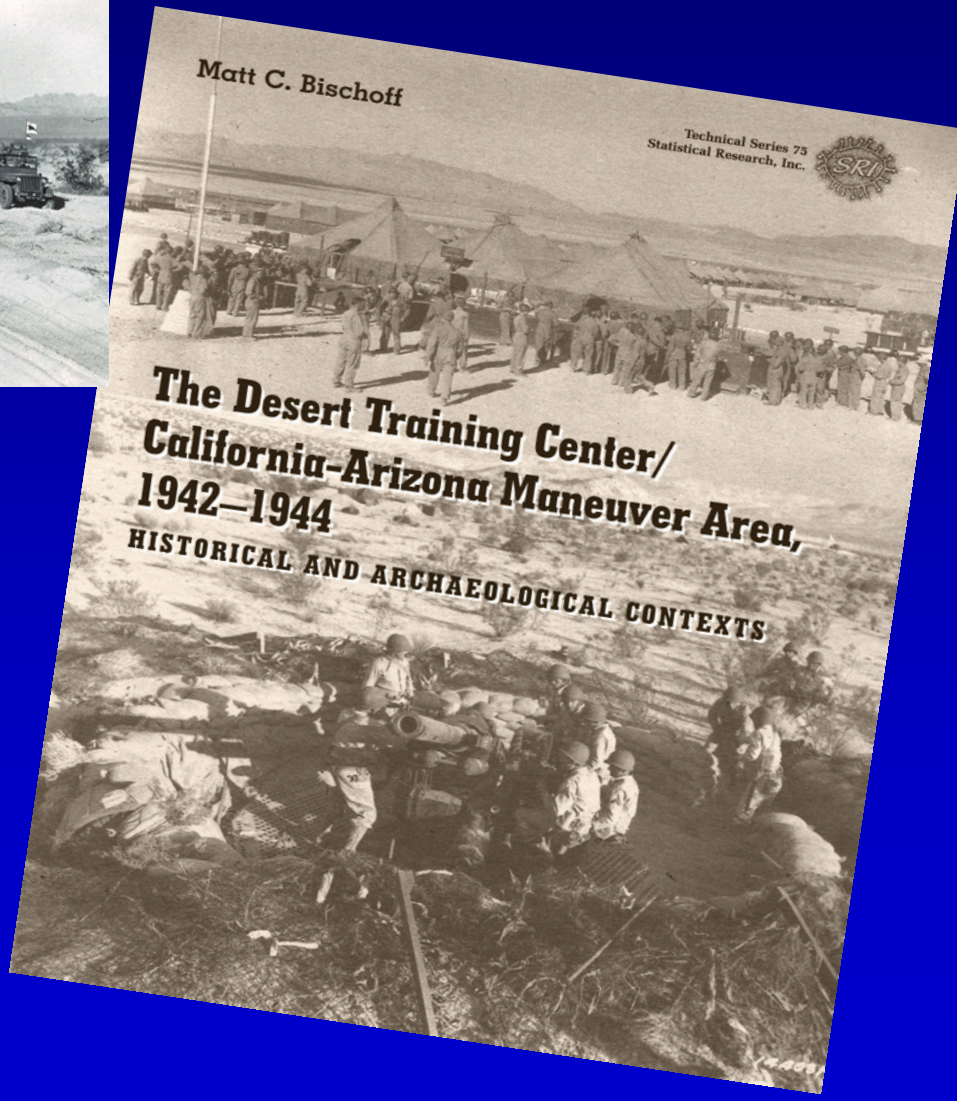
1955



1980

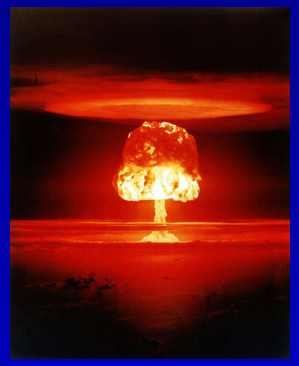


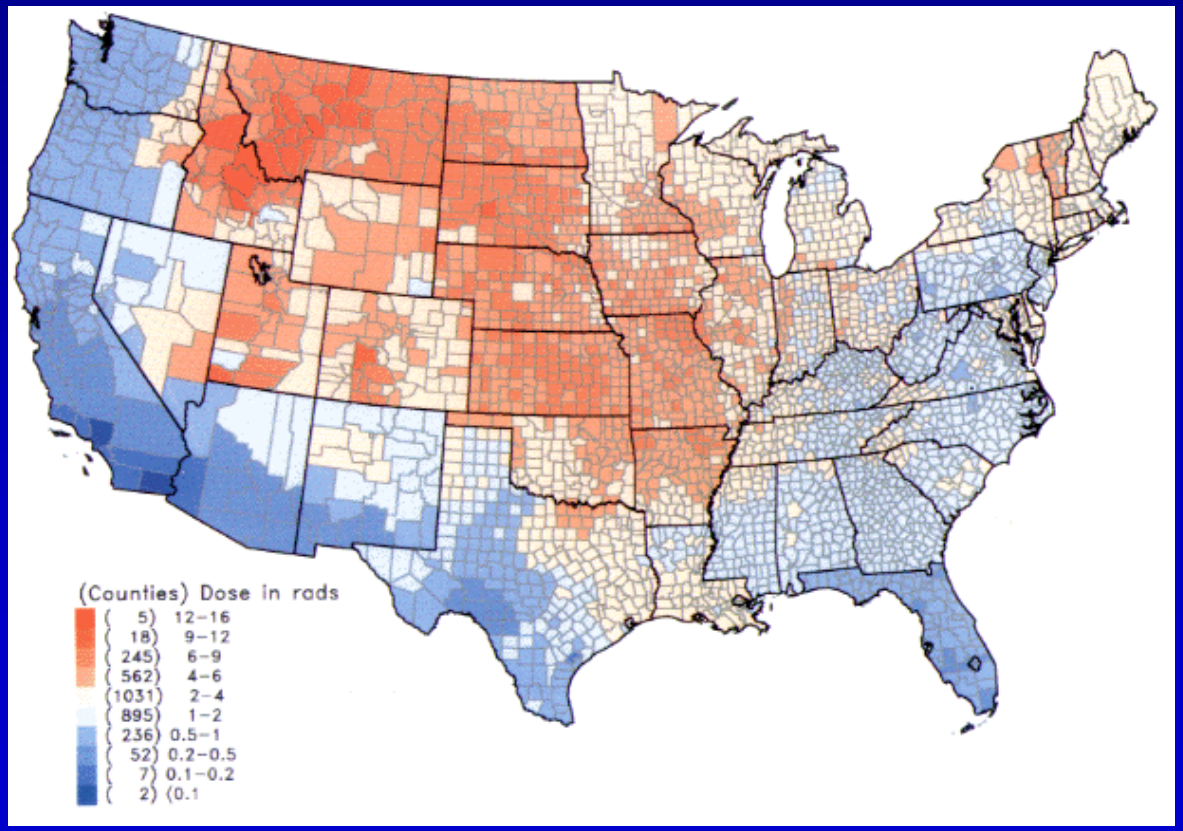
Military Training (1940s)



Nevada Test Site (1950s)

Testing needed to develop nuclear stockpile

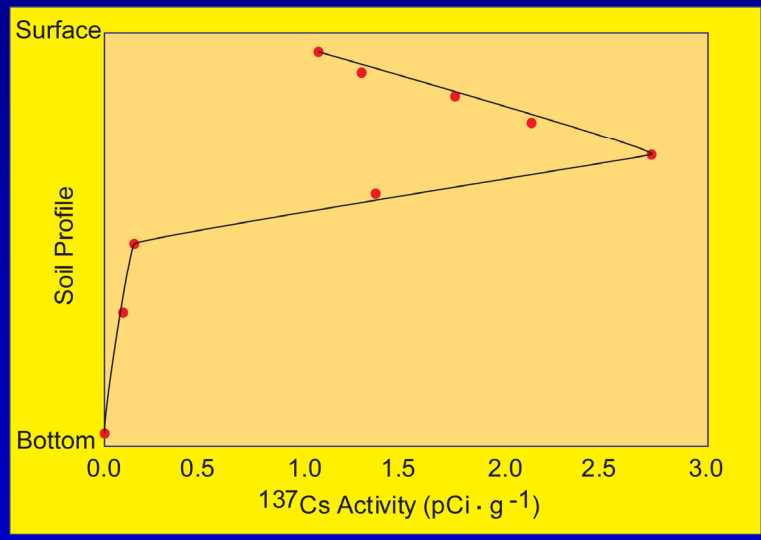




Fallout: Local and Regional

Above-ground testing began in the Mojave Desert in 1951 and ceased in 1963

Local, regional, and global fallout was significant in the Mojave



Environmental concern led to UCLA studies in Rock Valley (Nevada Test Site) in the 1960s

Utility Corridors

Engineers find increasing need for utility corridors crossing the Mojave Desert

Environmentalists deplore visual impairment of desert vistas and increasing damage to the desert

Scientists warn of increasing habitat fragmentation in the Mojave Desert ecosystem

Mojave Ecosystem Threats (Late-20th Century)

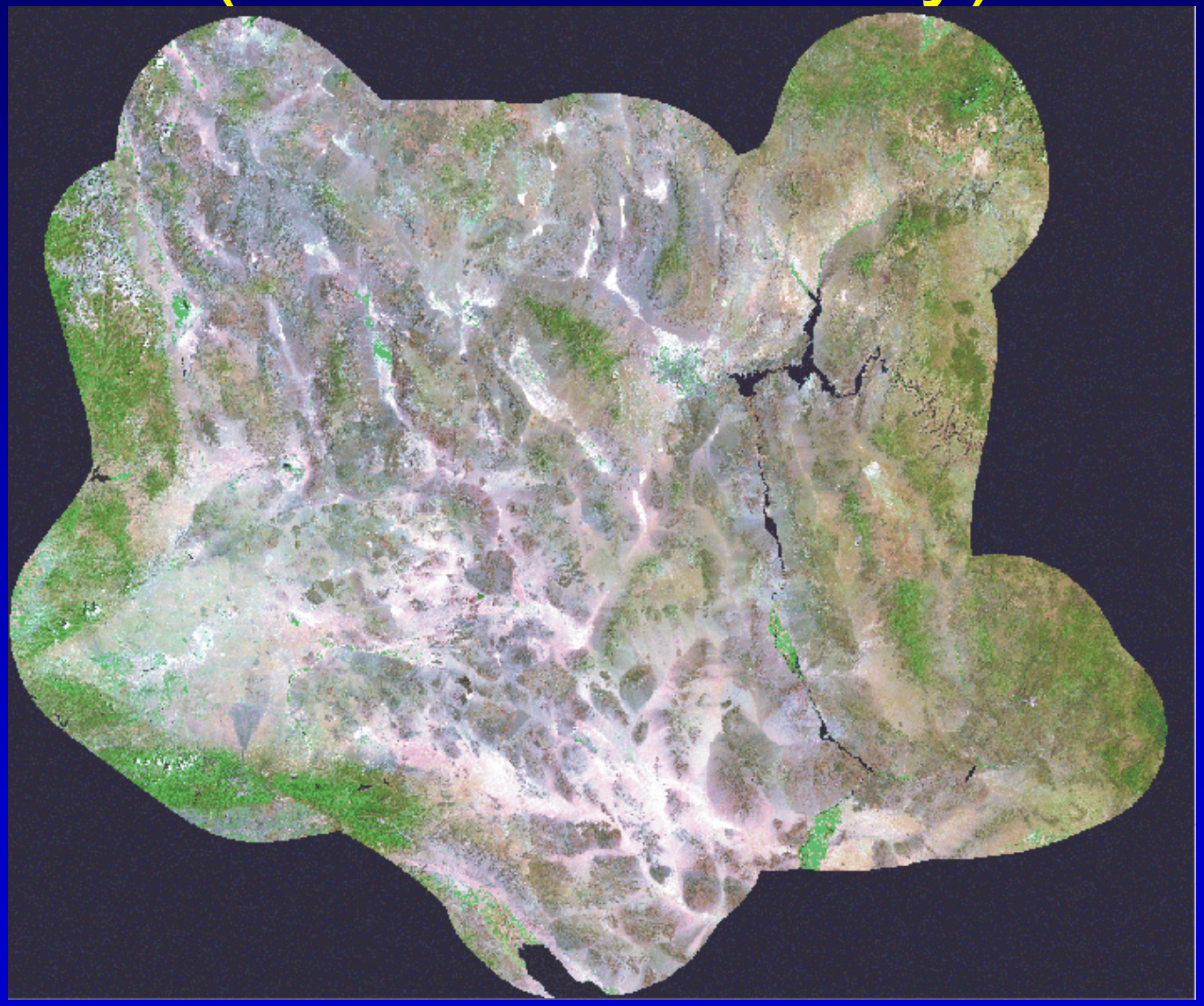
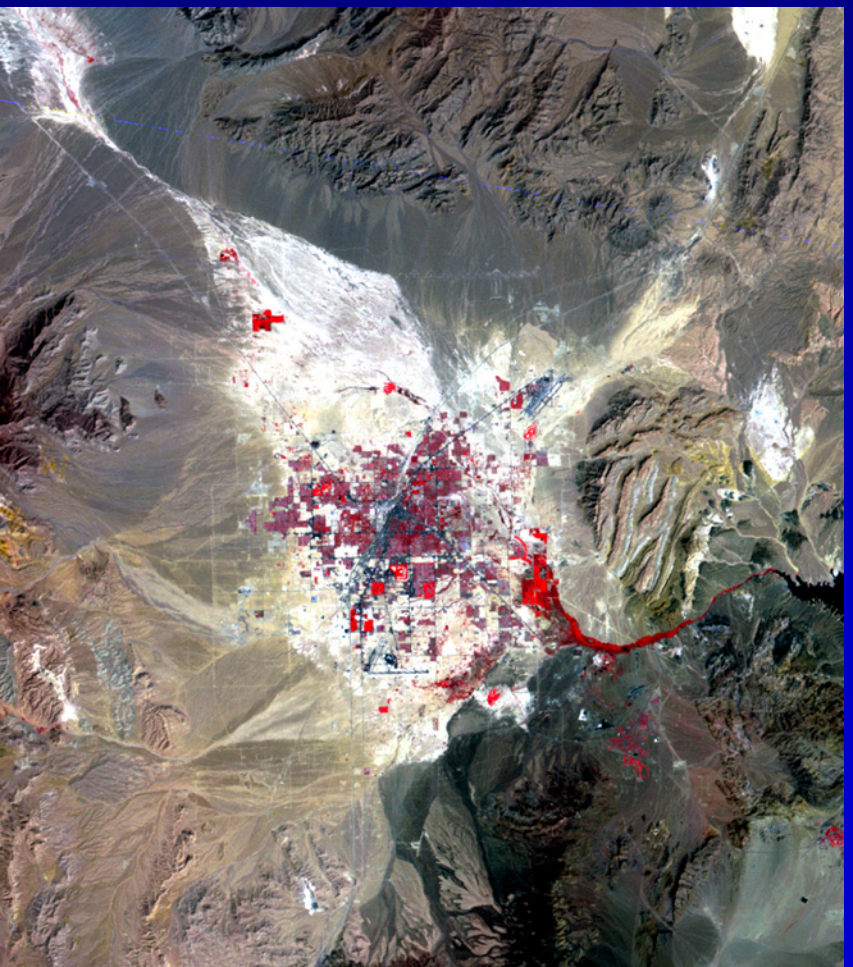


Image courtesy of Todd Esque, USGS

Urbanization

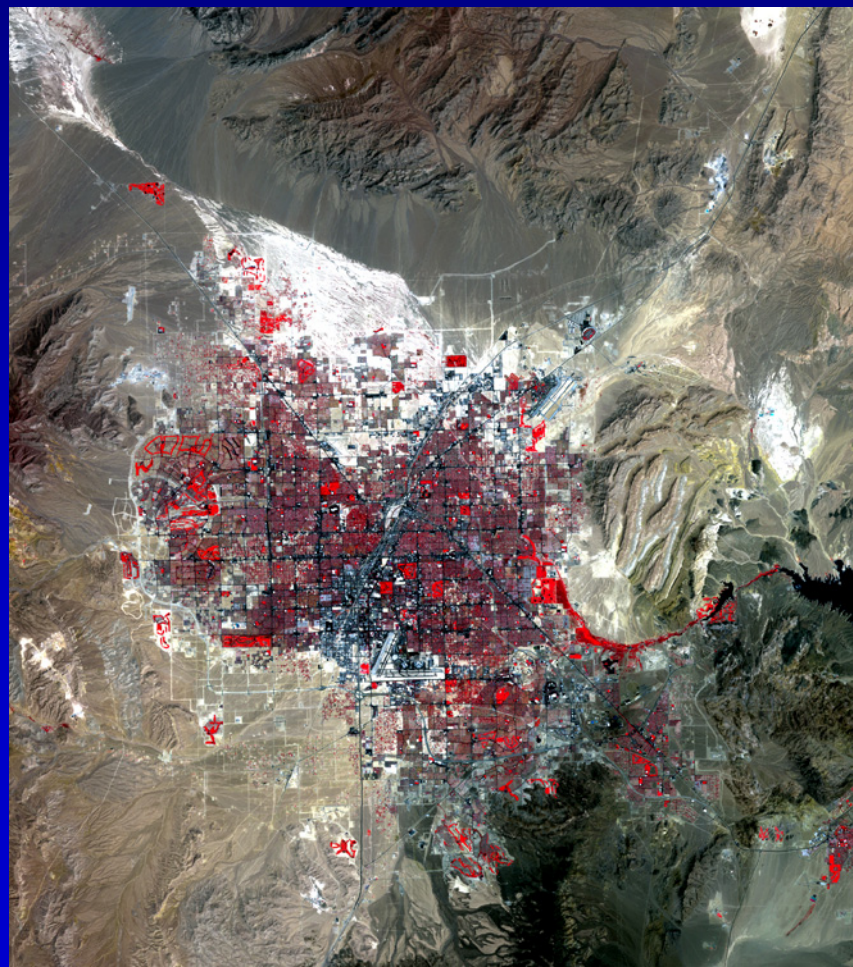
Las Vegas provides an example of the fastest growing region in the US



1972

1998

Images courtesy of William Kepner, EPA



Off-Road Vehicle Use (1970s-present)

Vehicle users want expansive desert areas for motorized recreation

Environmentalists see wanton destruction of an ecosystem that is “easily scarred and slowly healed”

Scientists report large negative effects on the Mojave Desert ecosystem

Expanded Military Training Areas

Modern military vehicles and tactics require larger areas for training exercises.

Environmentalists view training-area expansion as a large threat (severe landscape disruption, habitat fragmentation, declines in endangered species).

Scientists asked to study restoration potential as well as effects on endangered species

Non-Native Plants

Scientists warn that non-native plants create many habitat changes

Fires and Non-Native Annuals

Scientists warn that the buildup of non-native annuals could lead to wildfires where fires were unknown historically

Woody Fuel Loading

The problem of woody fuel buildup is greatest at higher elevations

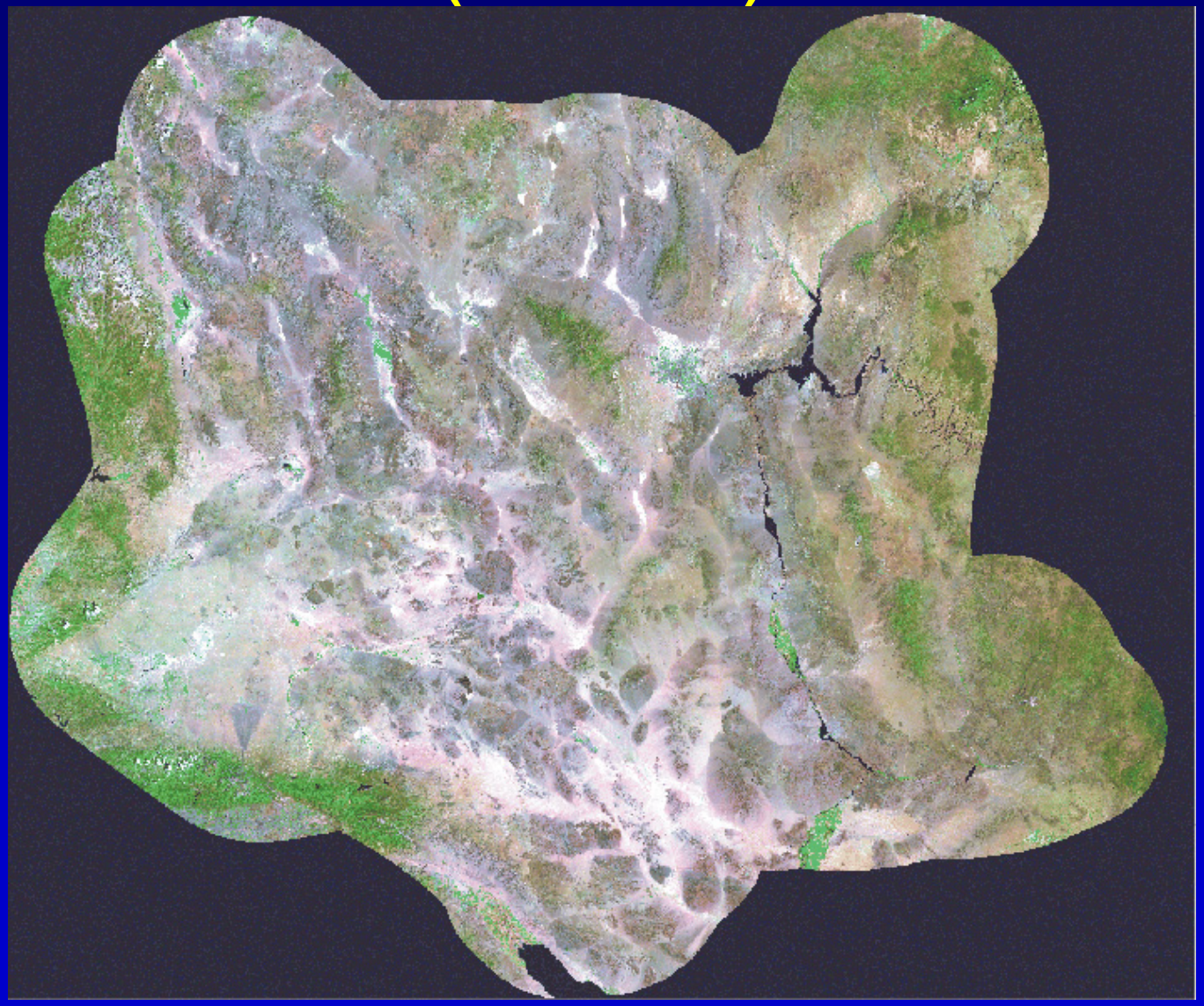
Hazardous Waste Disposal

Yucca Mountain

Environmentalists warn that importation of toxic or radioactive wastes could contaminate ground water or diminish air quality

Trash and Wildcat Dumping

Mojave Ecosystem Threats (Future)



Mojave Ecosystem Threats (Future)

- Continued soil disruption and erosion
- Reduction in productivity of native annuals and perennials
- Acceleration of habitat fragmentation

FUTURE THREAT?

16 THE NEW YORK TIMES **NATIONAL** SUNDAY, MARCH 14, 2004

There were high hopes for Sandstorm, a robot made at Carnegie Mellon University. Dashed by a fence.

Paul Saffo

No Winner in a Desert Race for Robots

By JOHN MARKOFF and JOHN M. BRODER

BARSTOW, Calif., March 13 — Fifteen robot vehicles took off across the Mojave Desert starting at dawn on Saturday, dodging boulders and 15-pound tortoises in search of a place in scientific history and $1 million in Pentagon cash.

ful robot, covering 7.4 miles, slightly farther than the vehicle built by the SciAutonics II team. The second-place entry was the joint effort of a team of off-road racers and aerospace engineers sponsored by Elbit Systems, an Israeli manufactu off-road vehicles

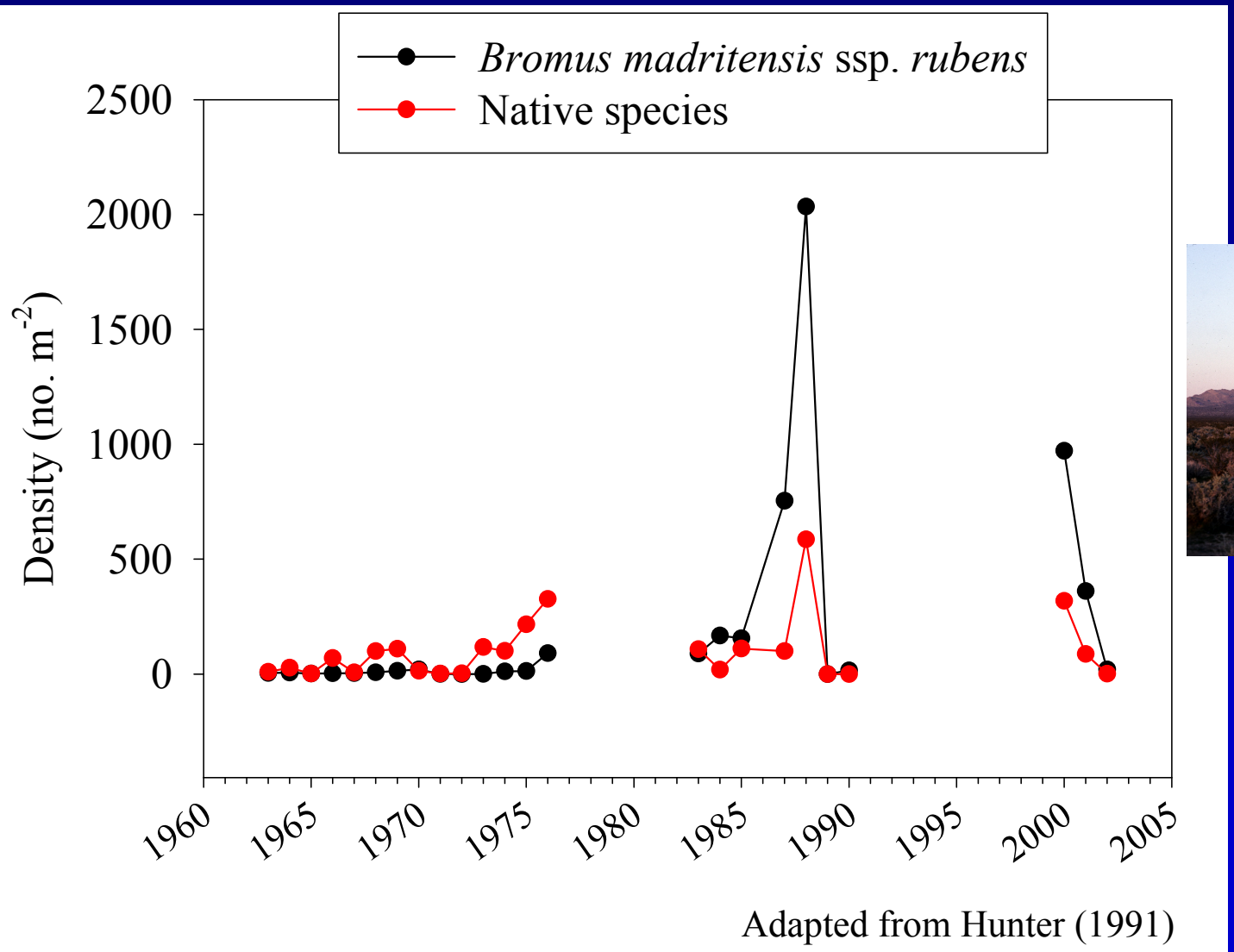
Stephen Wozniak drove his satellite television-equipped Hummer to the event with his friend Dan Sokol, Silicon Valley engineer wh the first Hom

Unmanned off-road vehicle races in the future of the Mojave Desert?

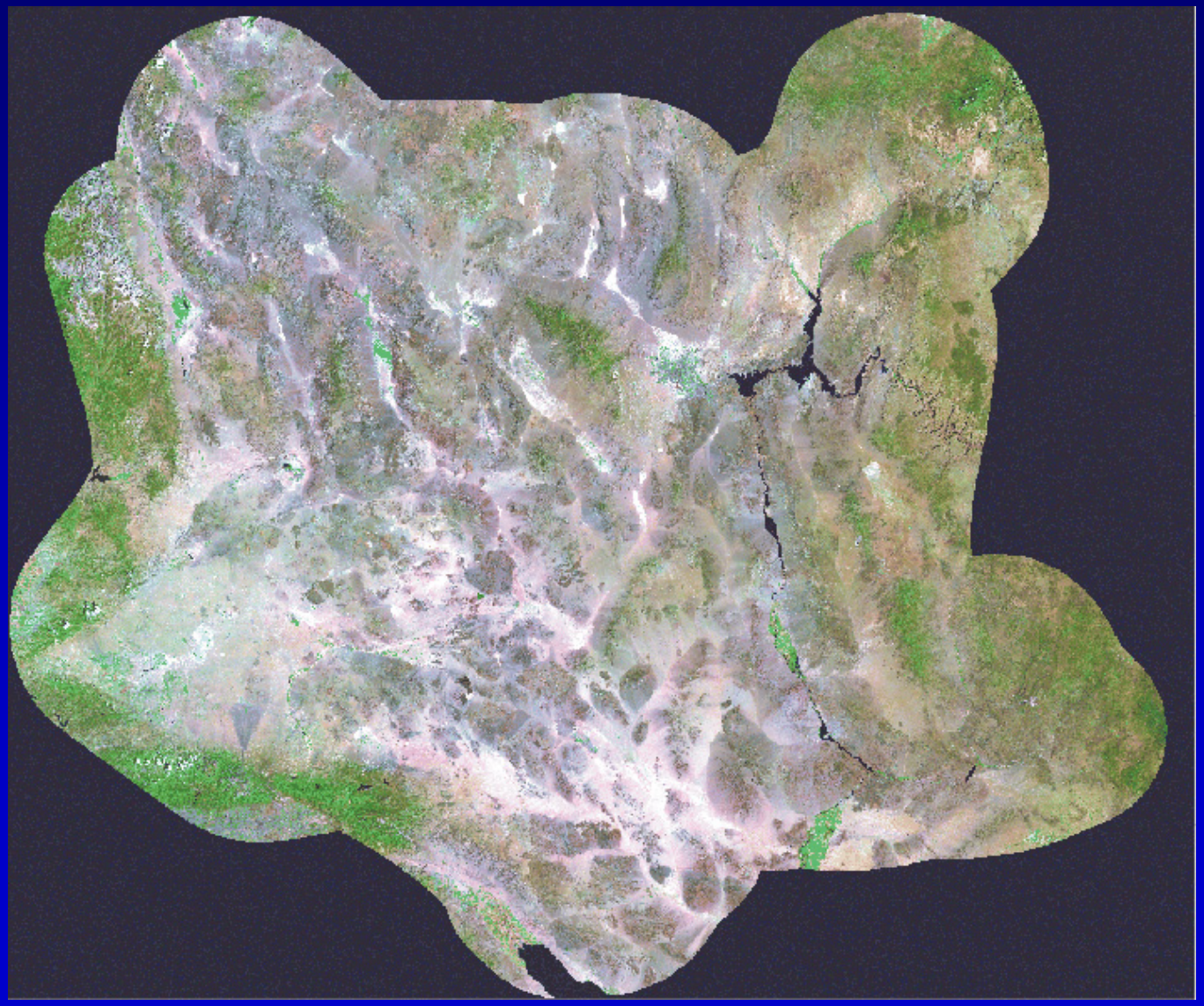
Hypothetical Future Scenario

?

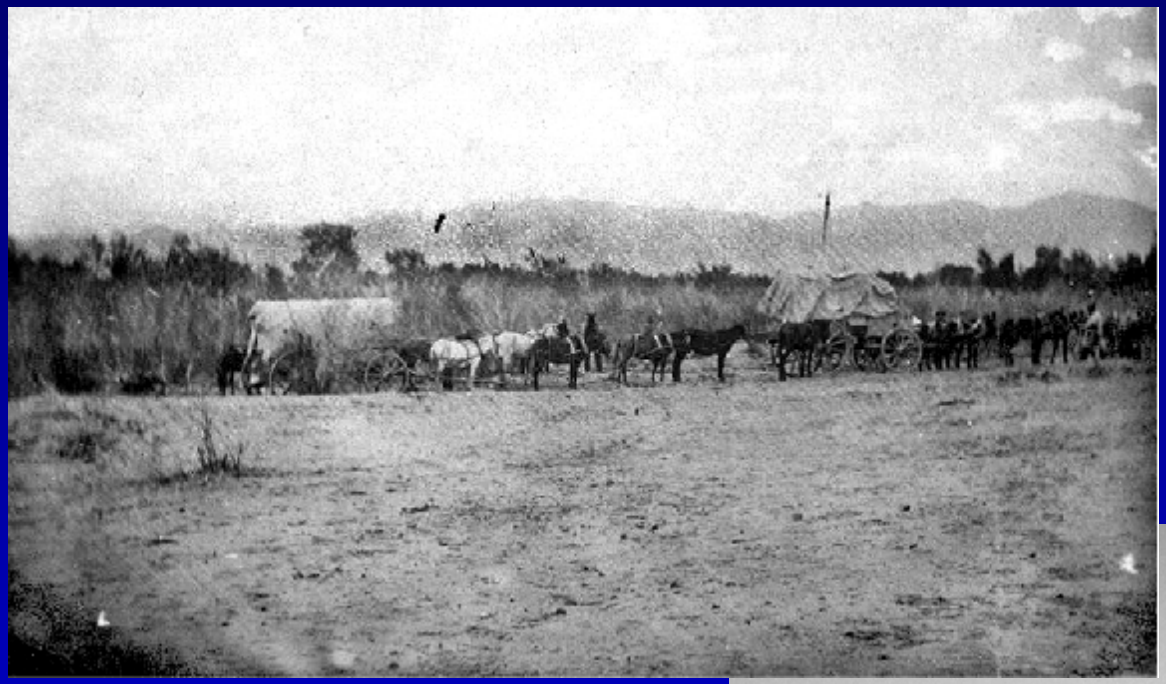
Non-Native Annuals: Will Drought Prevail?



Mojave Ecosystem Threats: Future Water Resource Development



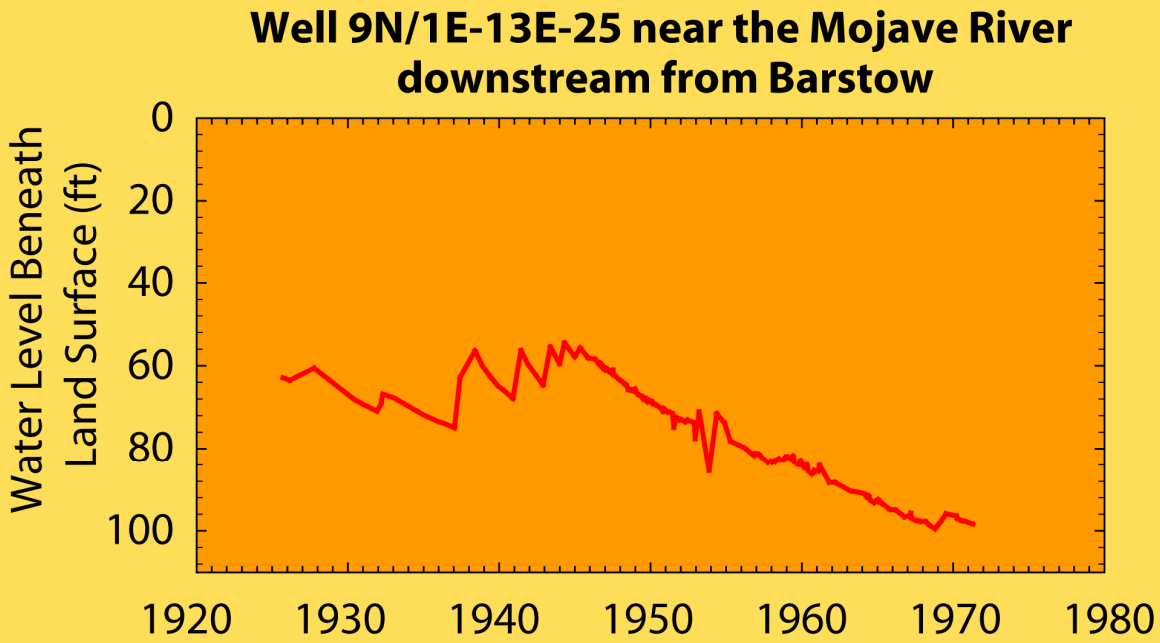
Riparian Vegetation on the Mojave River

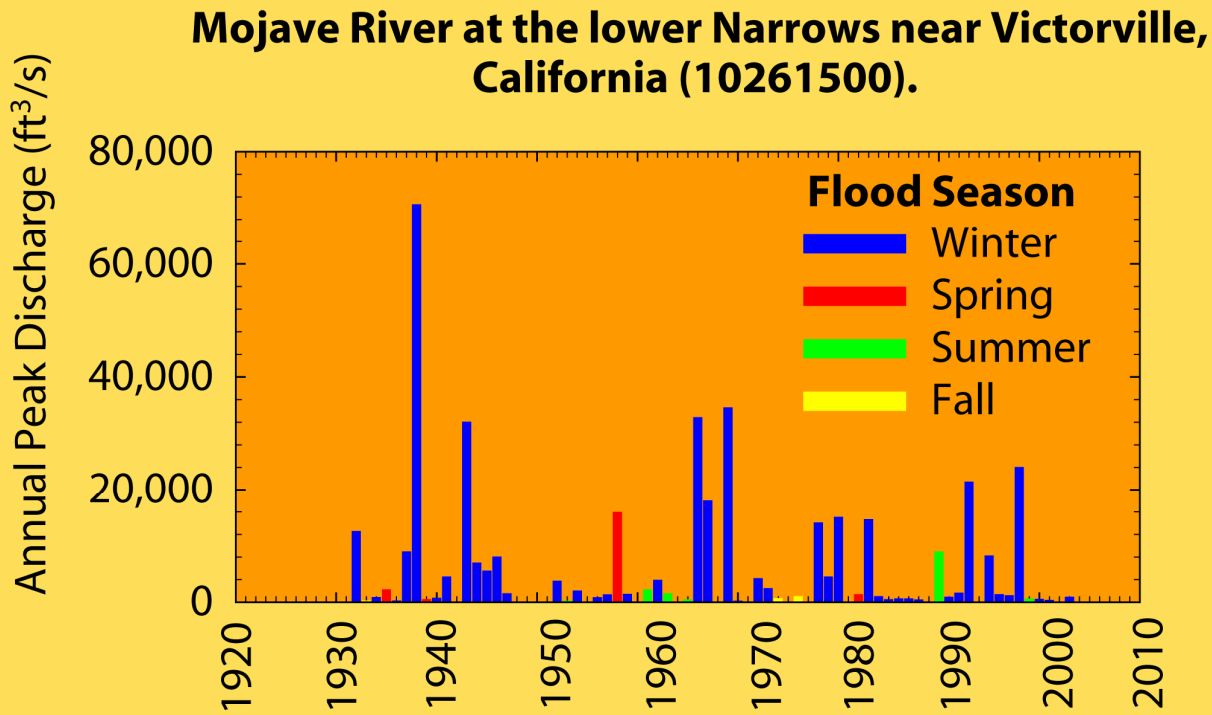


1863

2001

Water Resources Development and Riparian Vegetation





Increases in Riparian Vegetation

1919

2000

Conclusions

- Predicting the next major threat to the Mojave Desert ecosystem is extremely difficult – there are so many to choose from
- If there is a consensus, the largest general threat is from climatic change, and the largest local threat is the influx of non-native species