

Road Restoration: Developing a Mojave-wide Monitoring Program

Lesley DeFalco

USGS, Western Ecological Research Center

Henderson, Nevada

Impacts of roads

Loss of top soil
Soil compaction
Reduced infiltration
Erosional channels
Loss of vegetation

Methods used in restoration



Strategies for monitoring and evaluating restoration (SER 2002)

Attribute analysis

Direct comparison

Trajectory analysis

Strategies for monitoring and evaluating restoration (SER 2002)

- **Attribute analysis**
 - 9 attributes
 - Basis for determining success

- 1) Restored road contains characteristic assemblage of species that provide appropriate community structure.
- 2) Restored road consists of indigenous species to the greatest practicable extent.
- 3) All functional groups necessary for the continued development and/or stability of the restored ecosystem are represented or have the potential to colonize naturally.
- 4) The physical environment of the restored road is capable of sustaining reproducing populations of species for continued stability or desired trajectory.
- 5) Restored road functions normally for its ecological stage of development without signs of dysfunction.
- 6) Restored road is suitably integrated into larger ecological matrix or landscape, with which it interacts through abiotic and biotic flows and exchanges.
- 7) Potential threats to the health and integrity of the restored road site from the surrounding landscape have been eliminated or reduced.
- 8) Restored road is sufficiently resilient to endure normal periodic stress events in the local environment.
- 9) Restored road is self-sustaining to the same degree as the reference site.

(Adapted from SER 2002)

- 1) Restored road contains characteristic assemblage of species that **provide appropriate community structure.**
- 2) Restored road consists of indigenous species **to the greatest practicable extent.**
- 3) All functional groups necessary for the continued development and/or **stability of the restored road** are represented or have the potential to colonize naturally.
- 4) The physical environment of the restored road is **capable of sustaining** reproducing populations of species for continued stability or desired trajectory.
- 5) Restored road **functions normally** for its ecological stage of development **without signs of dysfunction.**
- 6) Restored road is **suitably integrated** into larger ecological matrix or landscape, with which it interacts through abiotic and biotic flows and exchanges.
- 7) Potential threats to the **health and integrity** of the restored road site from the surrounding landscape have been eliminated or reduced.
- 8) Restored road is **sufficiently resilient** to endure normal periodic stress events in the local environment.
- 9) Restored road is **self-sustaining** to the same degree as the reference site.

Strategies for monitoring and evaluating restoration (SER 2002)

- **Direct comparison**
 - **Restoration vs. reference sites**
 - **Biotic and abiotic responses**

An experimental approach

Newberry Mountains, NV
Spring, 2001

Decompaction

Hand raked

Ripped using back hoe

Mulch

Geojute©

Geojute© + vertical mulch

Seed

Golden-eye, goldenbush, cheese bush



Why is hypothesis-driven monitoring of road restoration important?

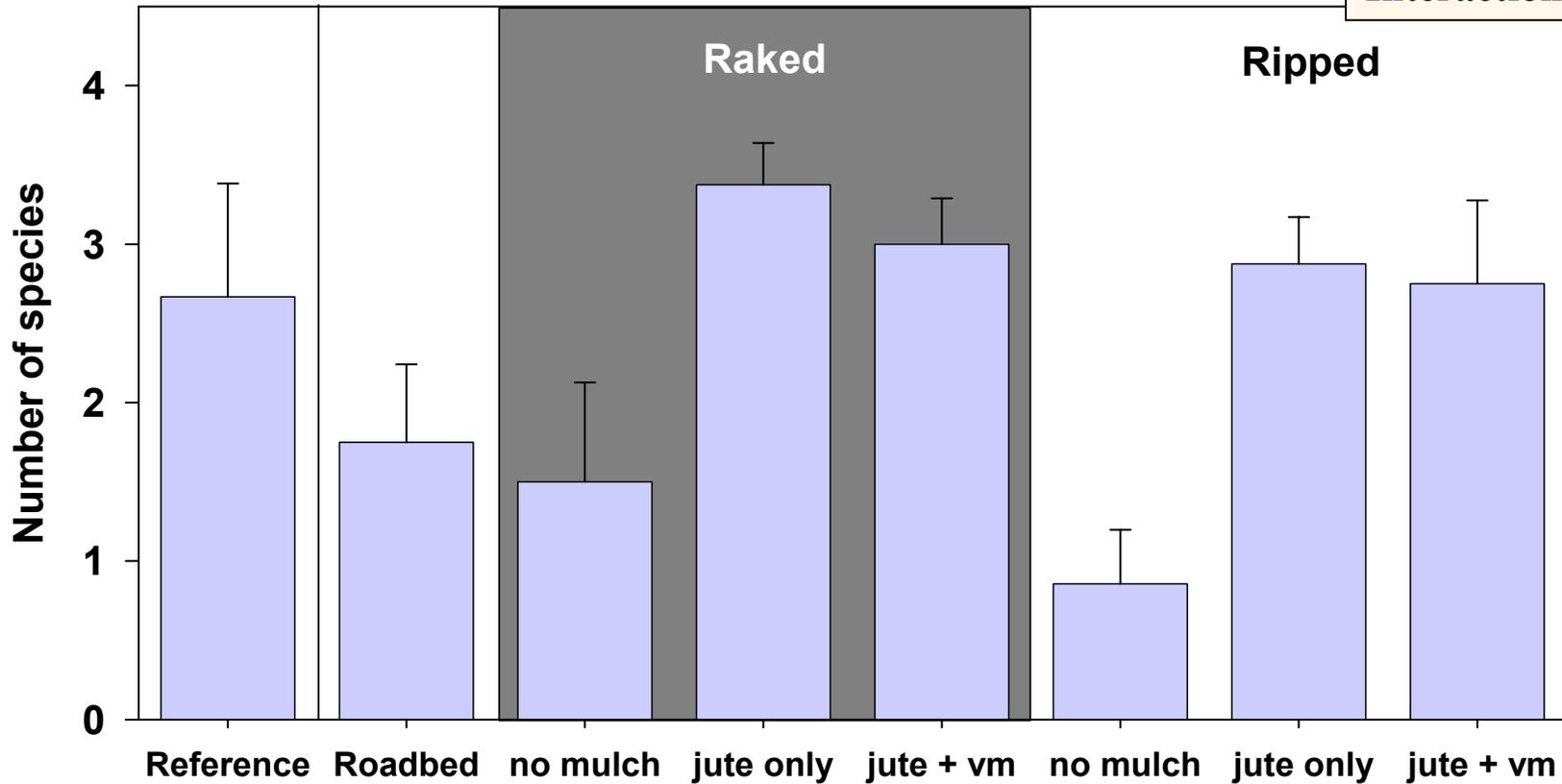
- **Suitability of restoration methods is uncertain**
- **Success is dependent upon multiple factors**
- **Resources may be expended without accountability for success**

Seed capture

<u>Factor</u>	<u>P</u>
Decompaction	0.12
Mulch	<0.01
Interaction	0.84

Newberry Mountains, Lake Mead NRA, NV

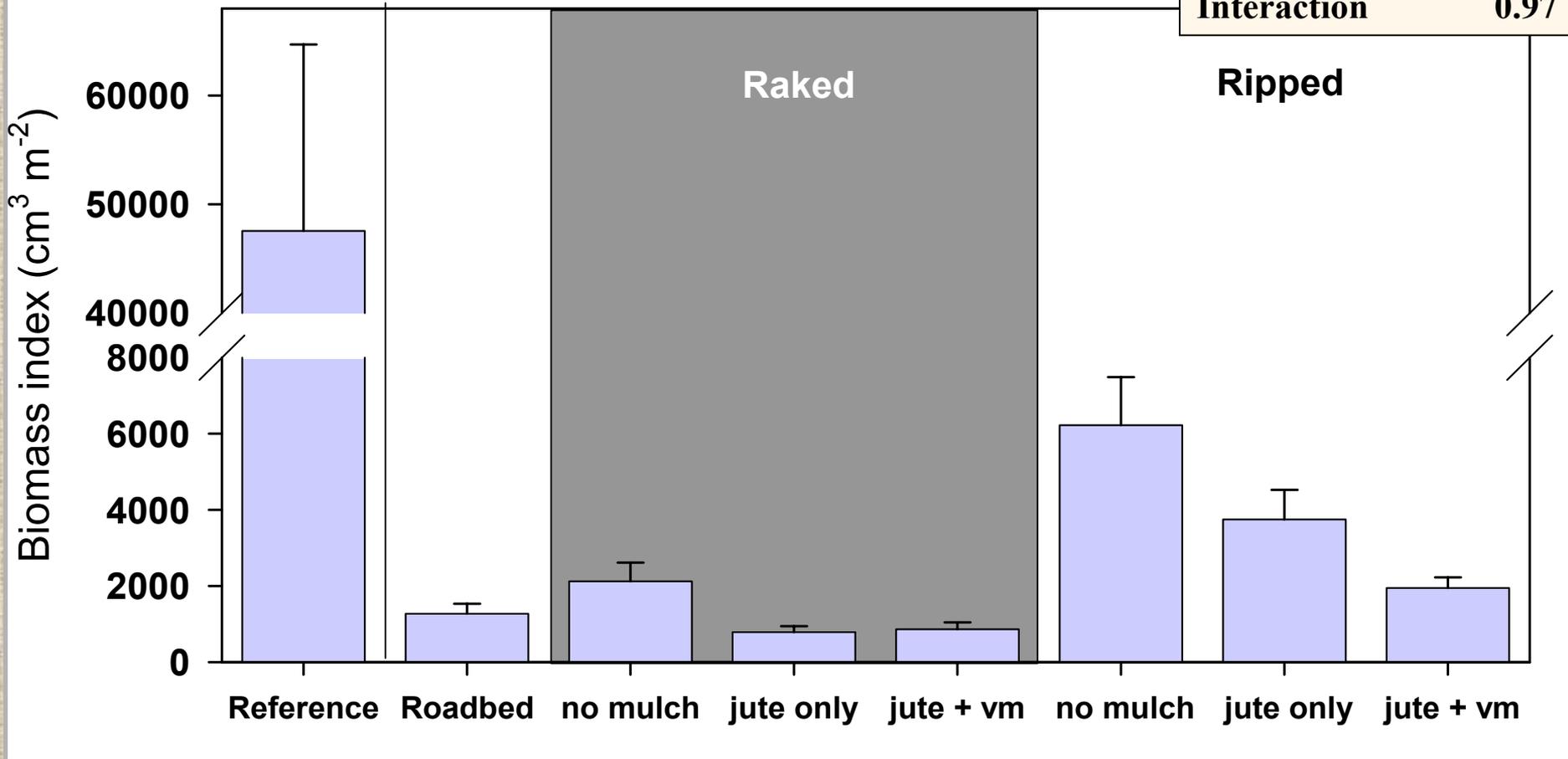
Summer, 2001



Non-native annuals

Newberry Mountains, Lake Mead NRA, NV Spring, 2003

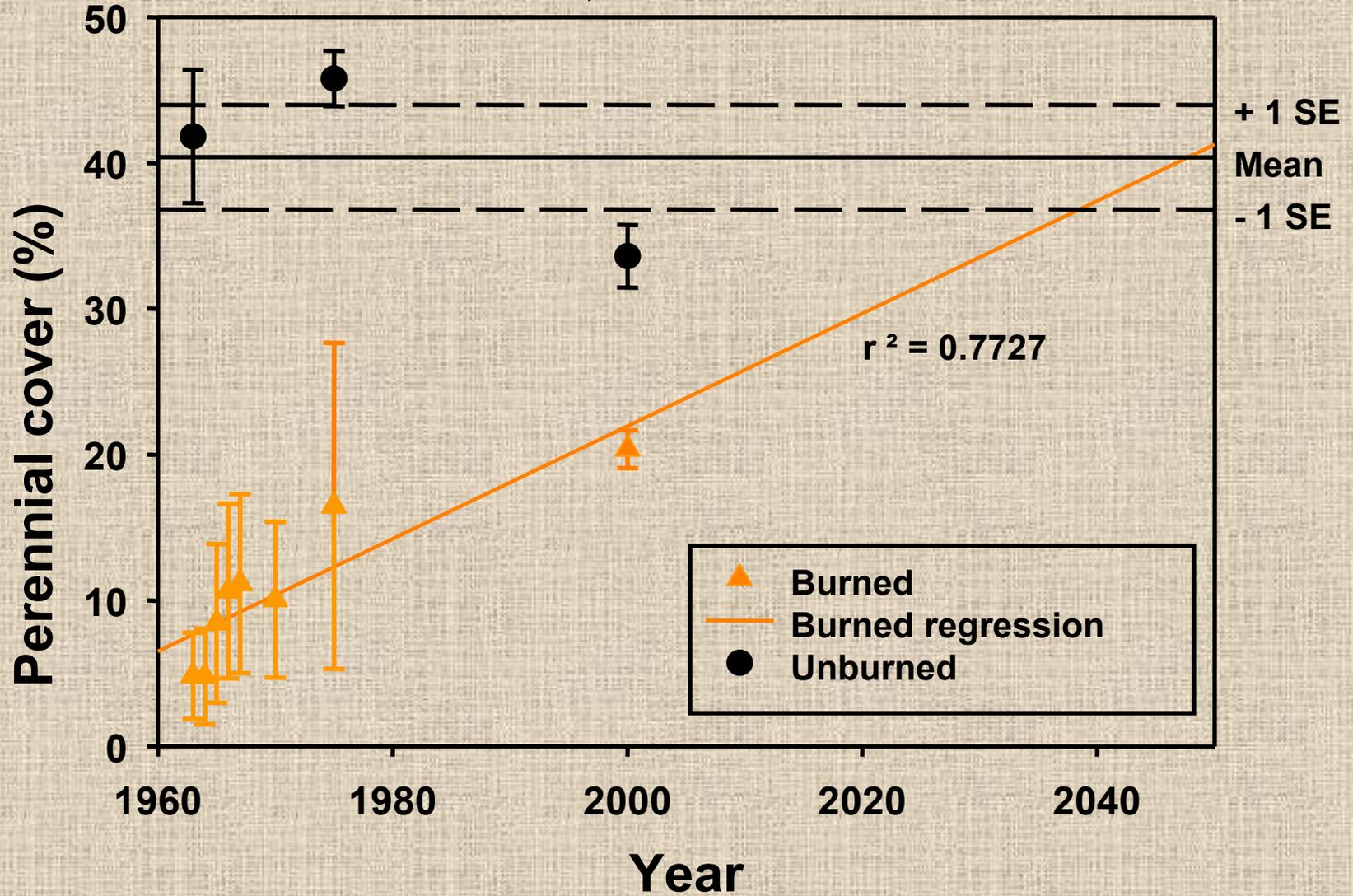
<u>Factor</u>	<u>P</u>
Decompaction	<0.01
Mulch	0.10
Interaction	0.97



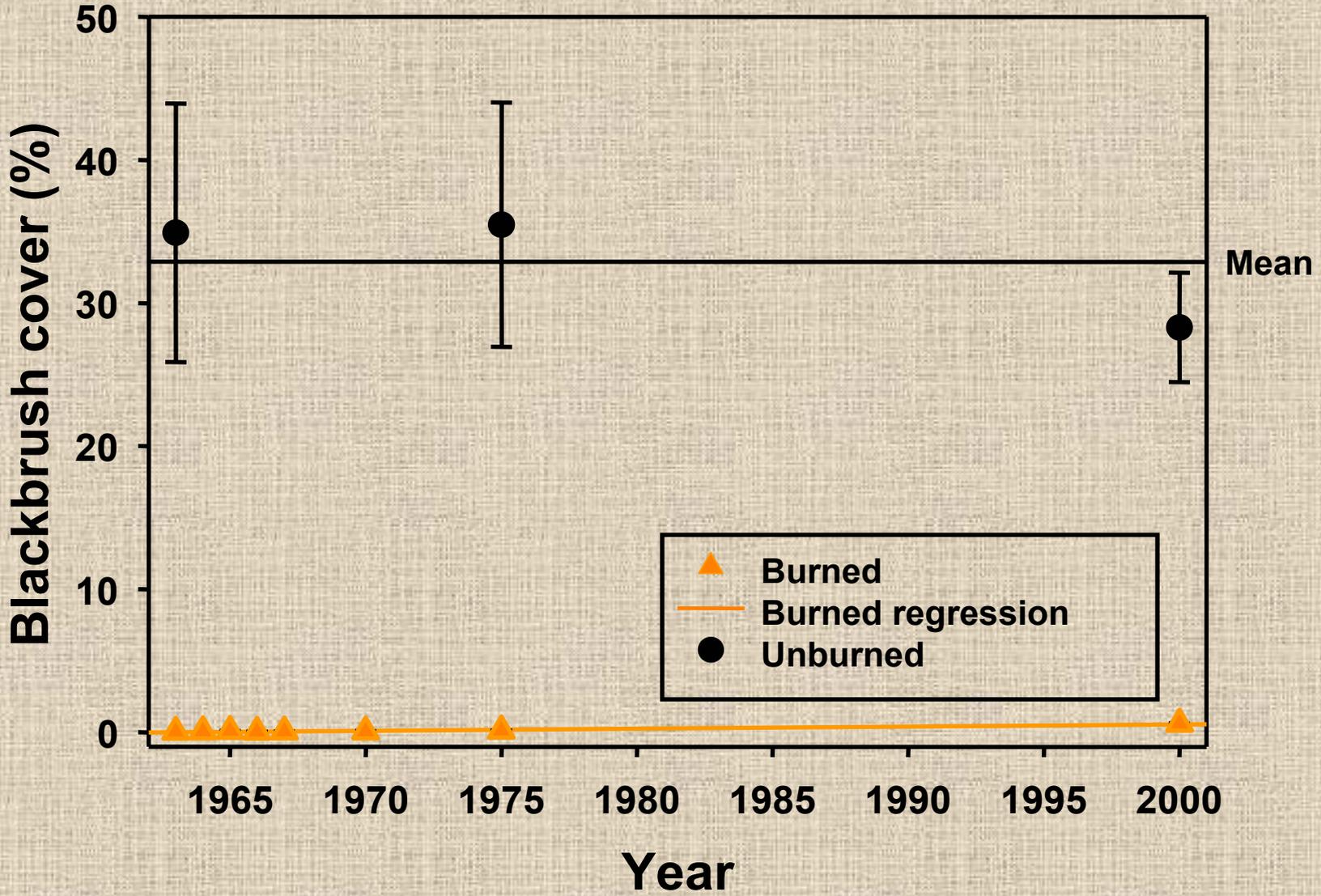
Strategies for monitoring and evaluating restoration (SER 2002)

- **Trajectory analysis**
 - Data that are collected periodically are plotted to establish trends
 - Trends that converge toward reference site confirm restoration success

Nevada Test Site, NV



Nevada Test Site, NV



Strategies for monitoring and evaluating restoration (SER 2002)

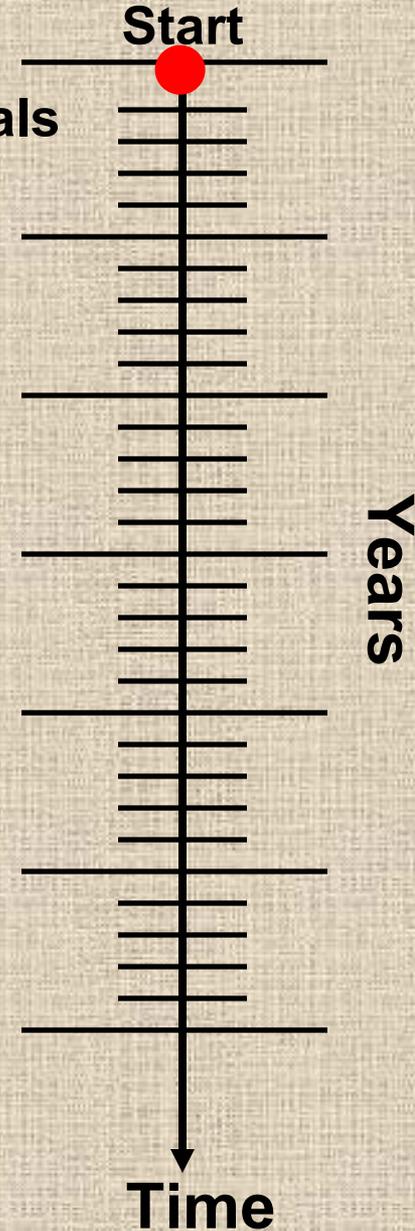
Attribute analysis

Direct comparison

Trajectory analysis

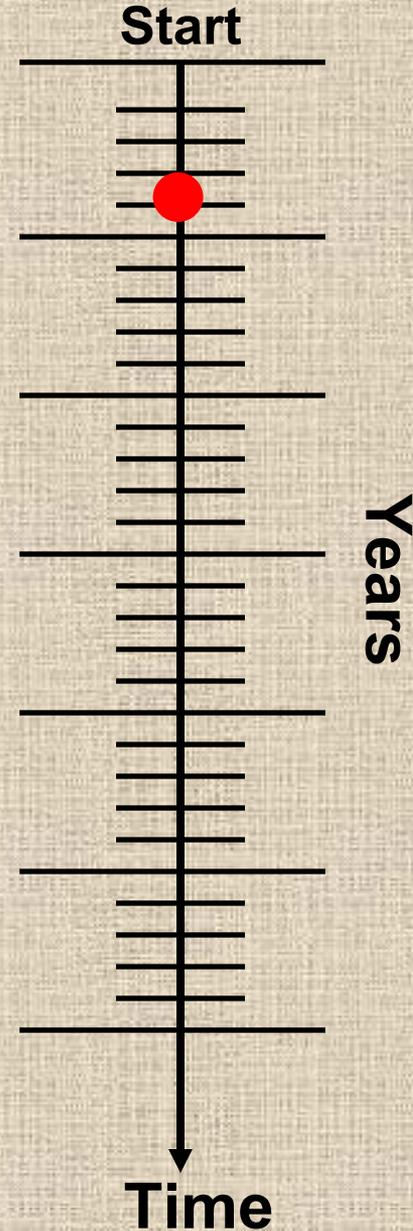
Strategy for Mojave Desert

- Attribute analysis
 - Define the criteria for goals



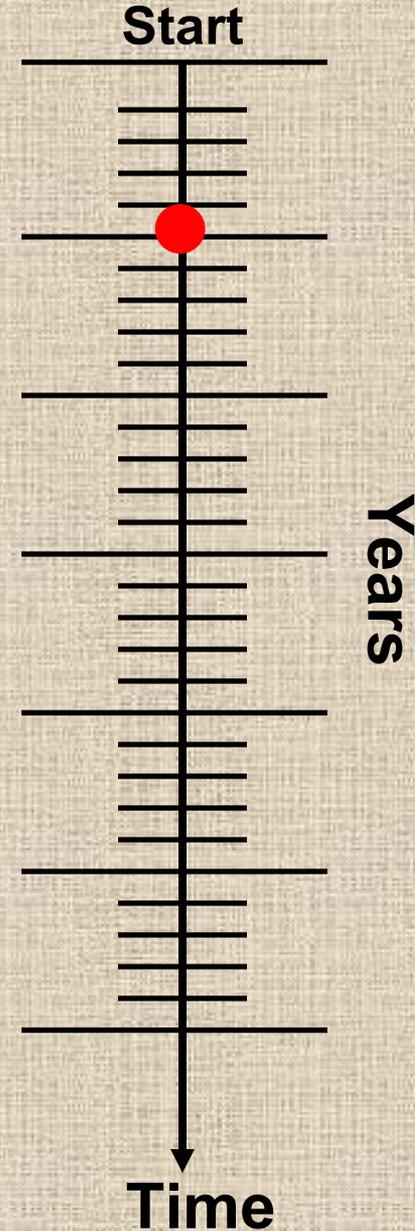
Strategy for Mojave Desert

- Direct comparison



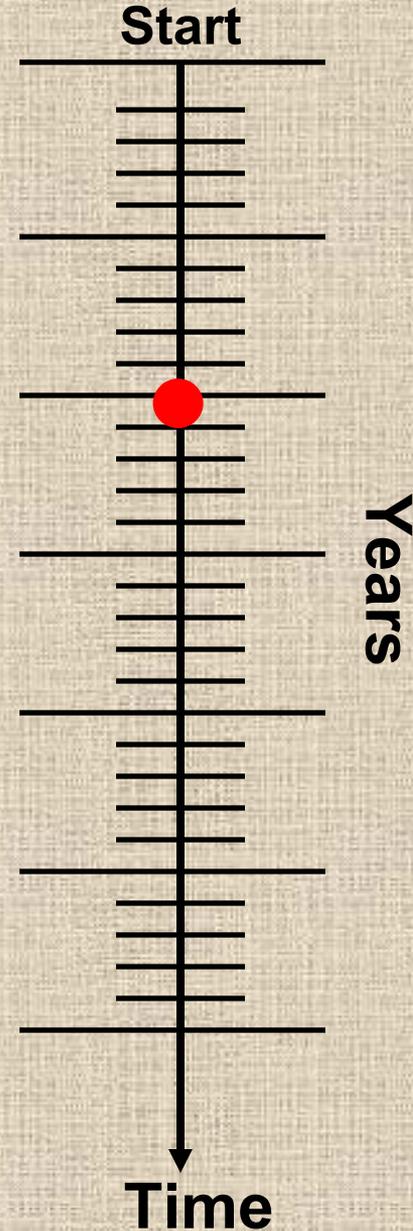
Strategy for Mojave Desert

- Trajectory analysis



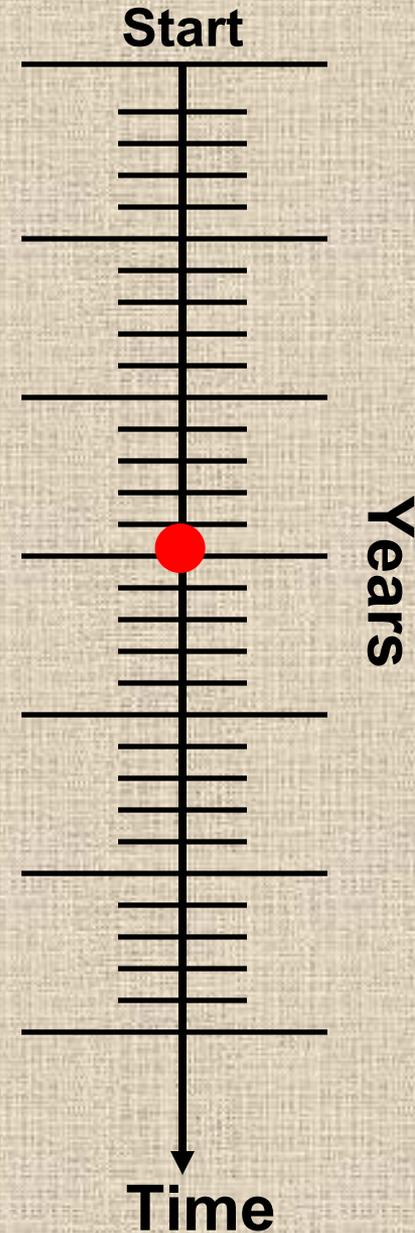
Strategy for Mojave Desert

- Direct comparison
 - Direct comparison
 - Trajectory analysis



Strategy for Mojave Desert

- Attribute analysis
 - Re-examine goals



Vision for Mojave-wide monitoring effort

- **Inventory of past and planned road restoration efforts in the Mojave Desert**
- **Revisit road sites to fill in data gaps**
- **Implement a hypothesis-driven monitoring program across the desert**

Opportunities for monitoring

Many independent efforts on restoring unused roads occur throughout the Mojave Desert

Newberry Mountains, NV

Nevada Test Site, NV

Joshua Tree National Park, CA

California BLM, CA

Red Rock Canyon State Park, CA

Mojave National Preserve, CA

Develop an Inventory

- **Location of road**
- **Date decommissioned**
- **History of road**
- **Techniques**
- **Goals**



Site visits

- **Soil geomorphology and texture**
- **Soil compaction level**
- **Plant community**
- **Granivore potential**
- **Precipitation and temperature patterns**

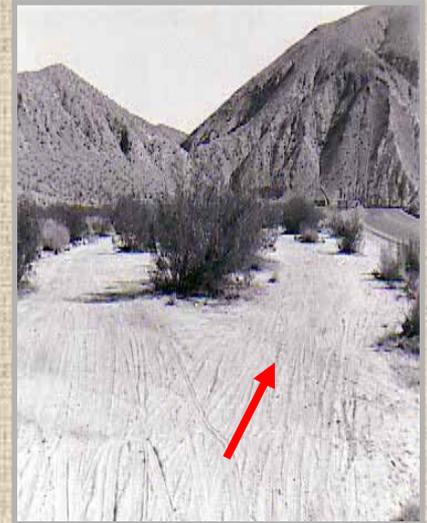
Understand priorities

Eliminate further use of road

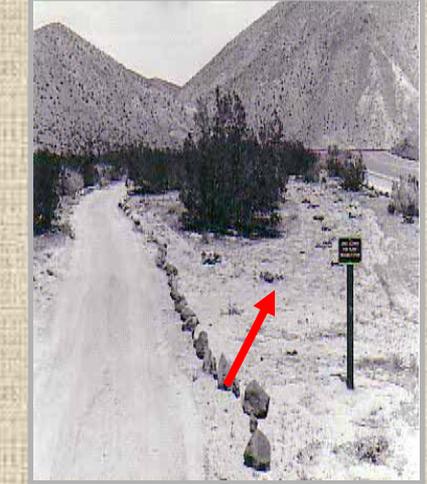
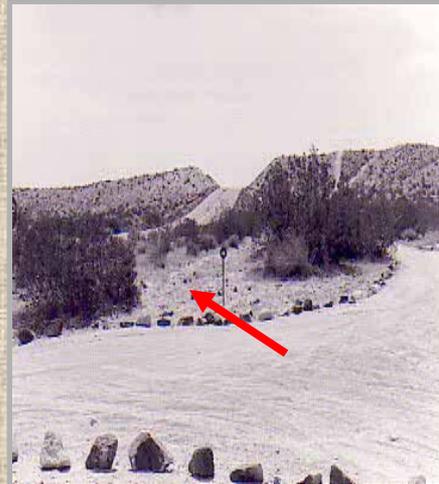
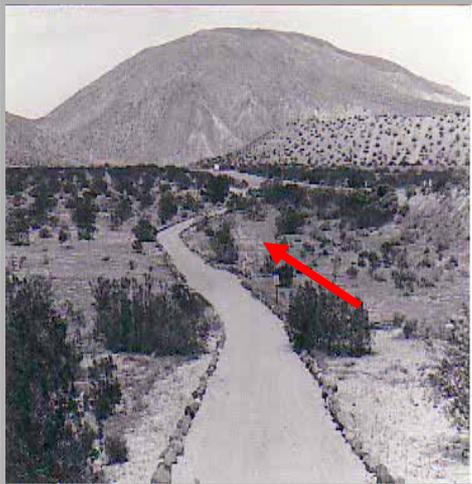
- Deter habitual trespassers
- Discourage new use

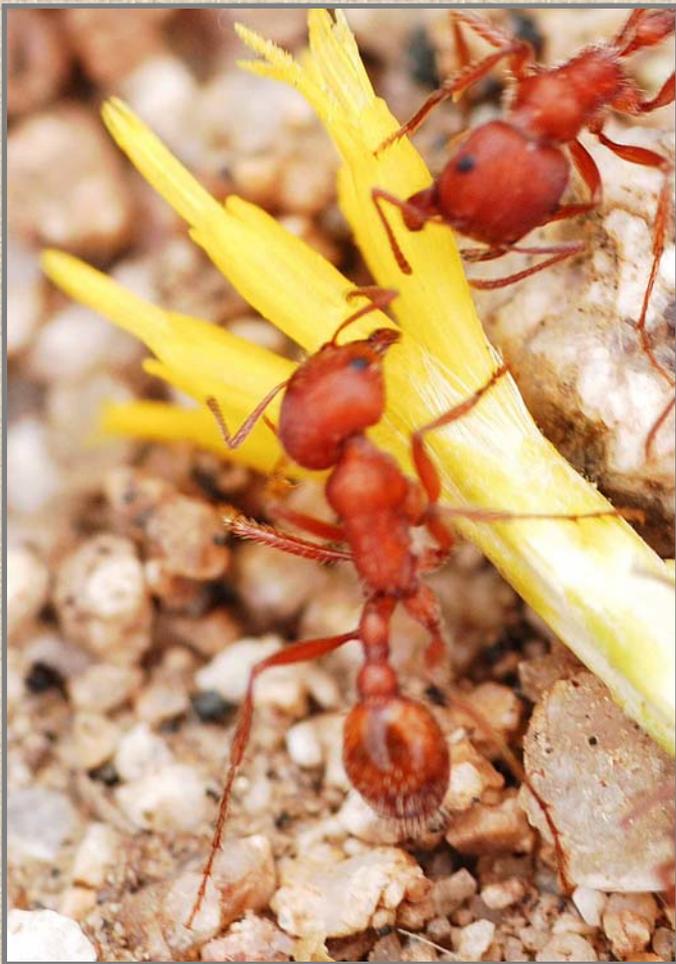


August, 1985

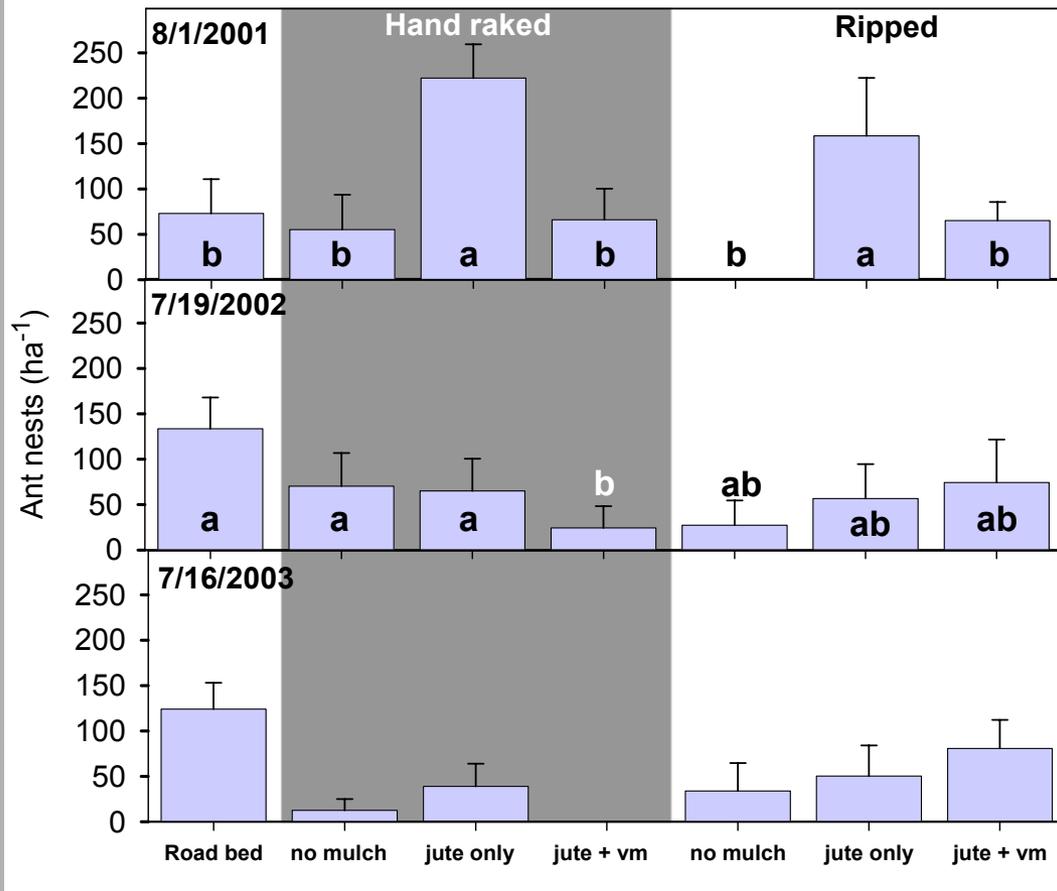


August, 1986

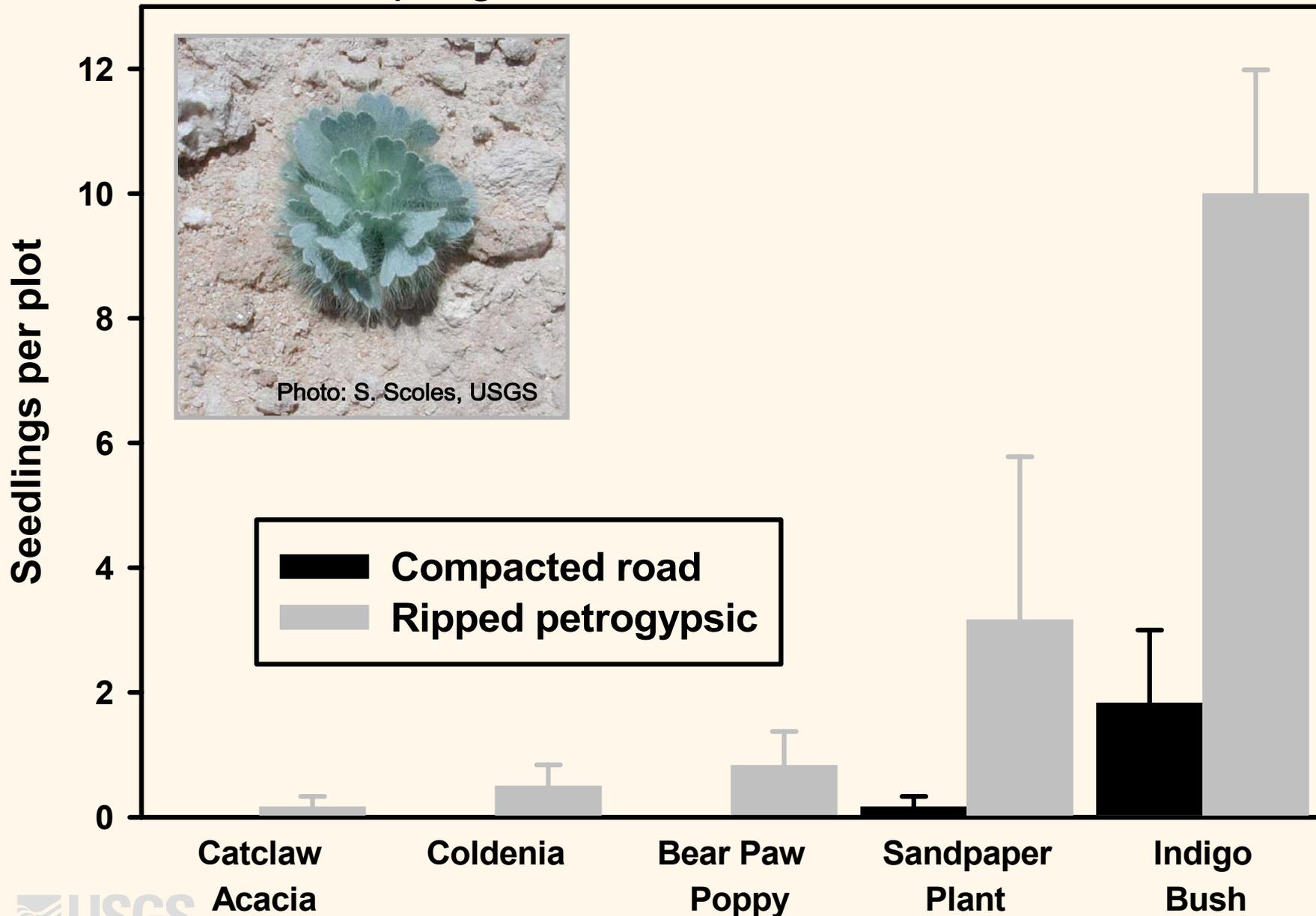




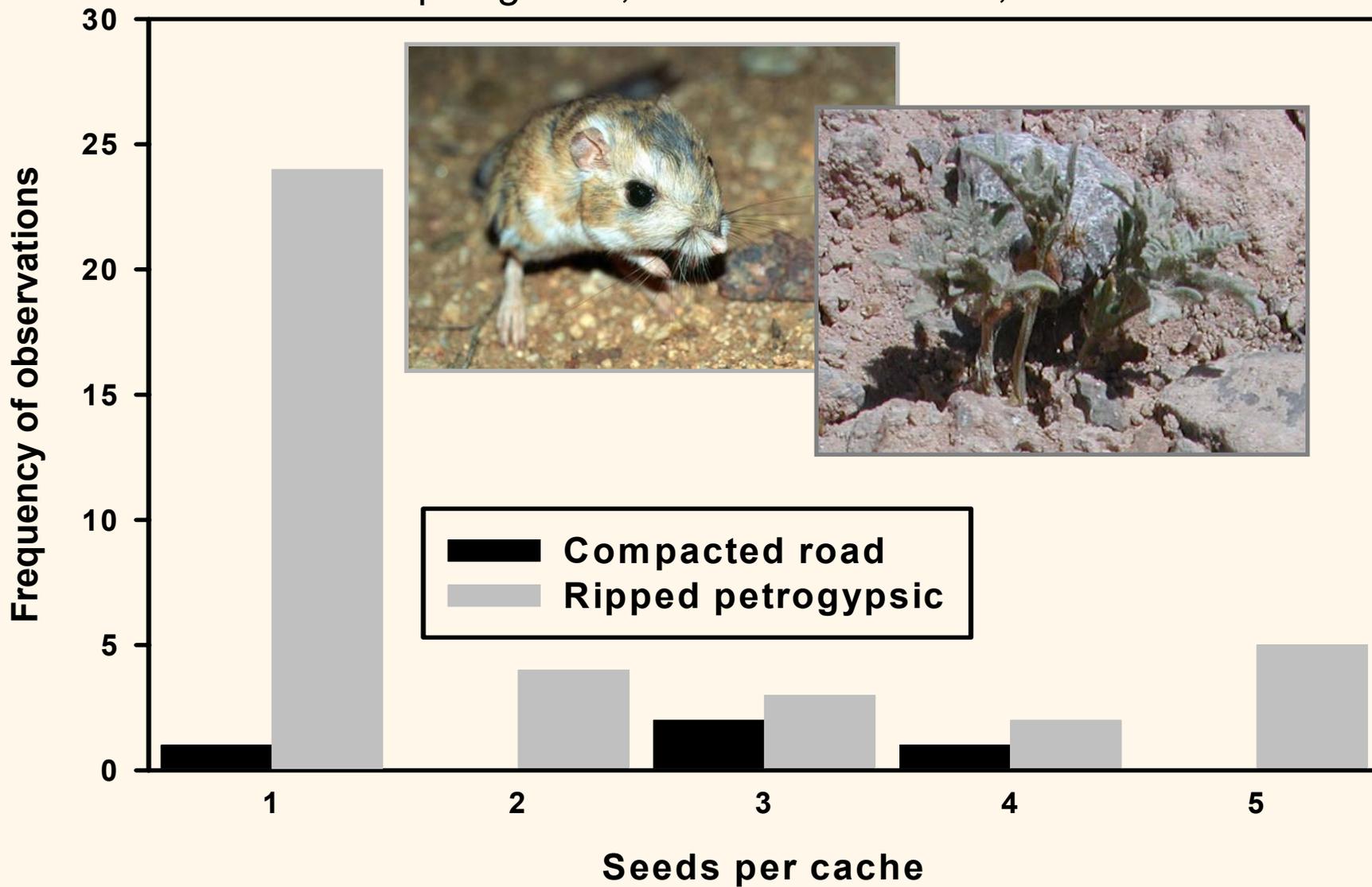
Newberry Mountains, Lake Mead NRA, NV



Blue Point Spring Site, Lake Mead NRA, NV



Blue Point Spring Site, Lake Mead NRA, NV



Passive Recovery or Active Restoration?



Ensuring success of road restoration and monitoring

- **Collaborations between resource managers and scientists are essential**
- **Assessment of restoration methods through experimentation will define protocols**
- **Standardization of monitoring efforts across resource/land jurisdictions**

Acknowledgments

- Lake Mead NRA
- Mojave National Preserve
- Joshua Tree NM
- California BLM
- Red Rock Canyon State Park
- Student Conservation Association
- Nevada Conservation Corps
- USGS-BRD and USGS-WRD

