

# Desert Restoration

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# The challenge

- Extensive damage from development, recreation, agriculture and ranching
- Utility lines, roads, pipelines, corridors
- Exotic invasive species
- Nutrient cycle changes
- Global change



# Understanding disturbance



- We would like to know the health of the ecosystem
- How has it changed?
    - **Structure**
    - **Function**
  - Nitrogen pollution has facilitated exotic grasses invasions

# Structure



- Who used to live here?
  - Which species
  - How many
- What species are here now?
- What is the diversity?
- Trends?

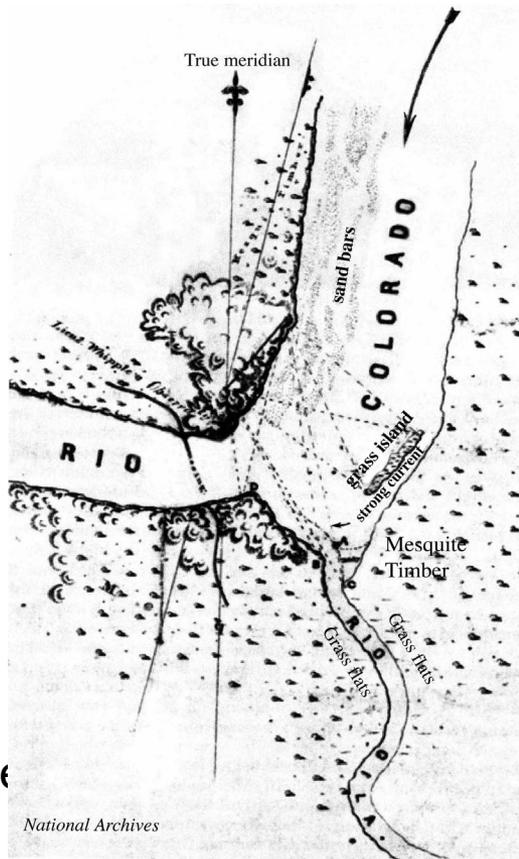
# Function



Penetrometer

- Often more important
- Nutrient cycles
- Water flow and retention
- Soil strength and infiltration
- Erosion/stability - wind and water

# Develop a site history



- We have a poor understanding of the undisturbed desert
- Most was hit by grazing
- Mining, farming, development and other impacts
- Early diaries, surveys and maps can help
- Some photos from the late 1800s

# Assessing Damage

- Soils
- Hydrologic cycle
- Plants
- Animals, insects etc.
- Invasive weeds
- Ongoing damage - OHV, grazing, fire

# Planning

- Objectives
- Budget and time
- Area (scope)
- Diagnostic survey

***Start seed collection immediately,  
some seeds may only be available  
every 10-20 years***

# Possible interventions



- Fences
- Soil treatment
- Hydrologic cycle interventions
- Seeding
- Planting
- Irrigation and monitoring

# Budget and stakeholder issues

- Goals
- Regulations
- Requirements
- Staffing
- Volunteers
- Equipment availability
- Funding cycle

# Approaches

- Fencing and signing
- Soil treatment and shaping
- Container planting
- Irrigation
- Monitoring and maintenance

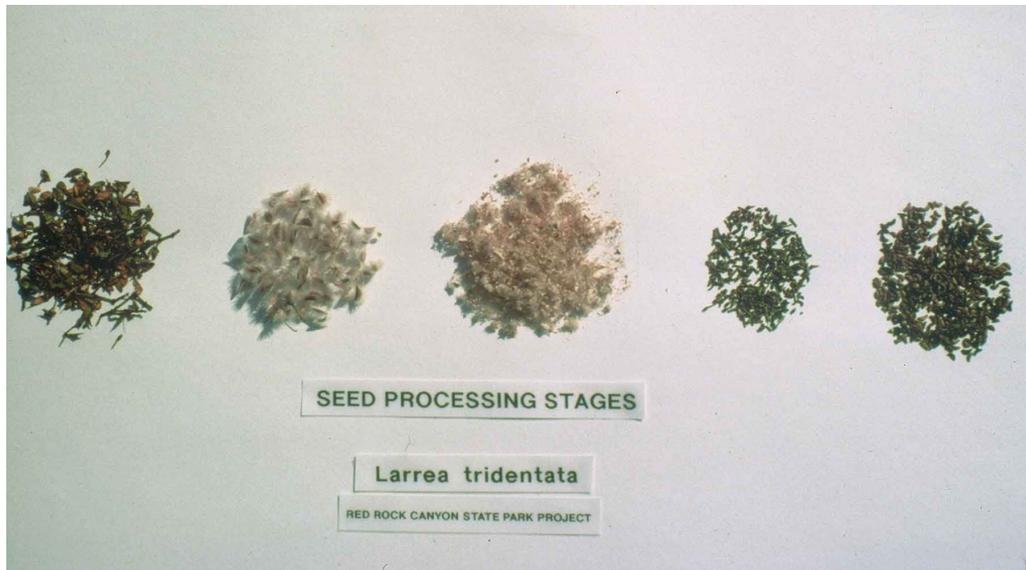
# Costs

- From \$1,000 to \$100,000 acre
- Generally it is possible to do a fairly good job for \$10-20,000 per acre
- But it depends on how badly damaged the site is, access, and goals for speed of recovery

# A typical project

- Seed collection-plant production
  - Possibly cuttings for riparian areas
- Soil ripping and shaping (pits or swales)
- Container planting
- Irrigation
- Monitoring and maintenance (5 years)

# Seed collection



- Correct ID
- Mature
- Local
- Genetic diversity (50-100 plants)
- Cleaned and stored properly

# Plant production



- Start plants early
- Grow in season
- Harden them properly
- Use a range of containers
- Try tall containers for extensive root development

# Outplanting

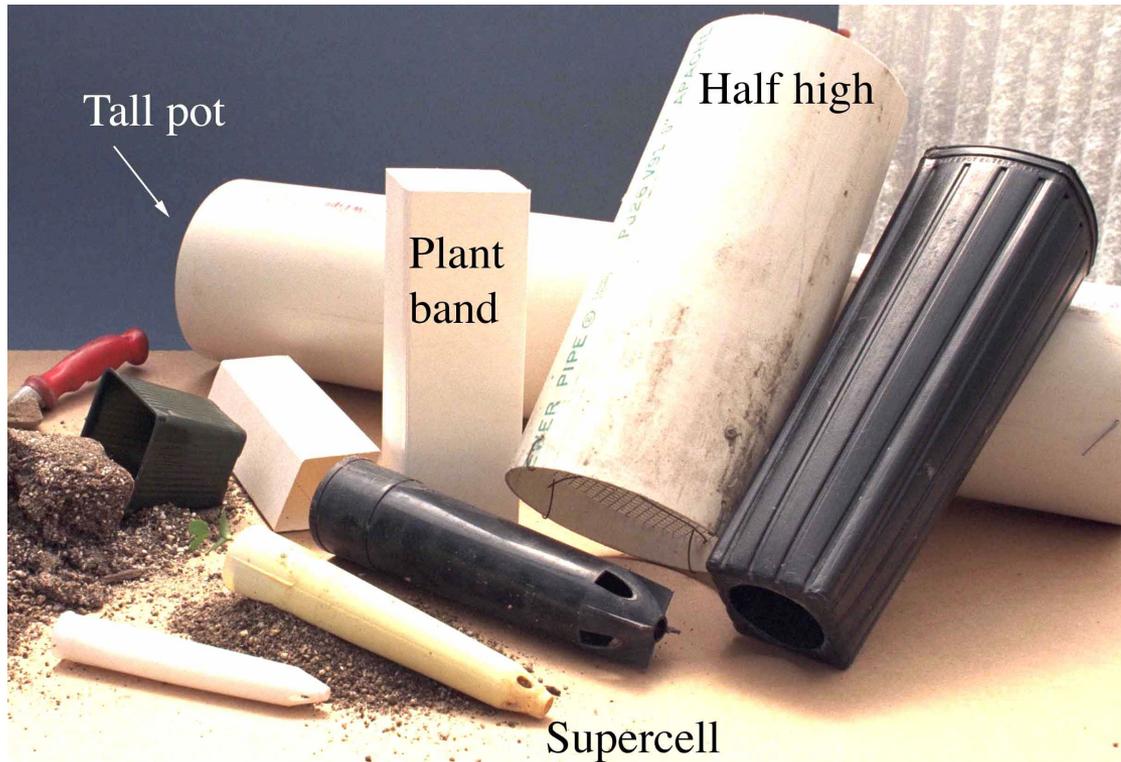
- Plant in early spring preferably for most species and locations
- Planting after late summer rains may work in some areas
- Drill plant holes with power auger
- Protect plants in transit and on site

# Tall pots



- These 32" tall pipe sections work well
- They are costly but tough
- Use power auger
- Wet hole
- Protect seedling

# Plant bands



- The most economical choice
- Custom sizes
- 3x3x12 good
- 2x2x8 for early outplanting

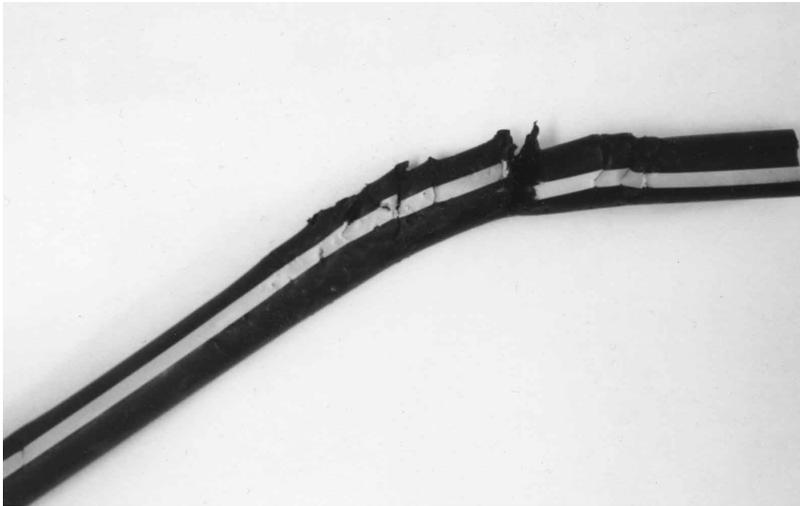
# Tree shelters



8 years

- Plant protection is usually critical
- W/o double wall treeshelter survival 10% - with 70%
- Pink or tan seems better
- Use 1/4 rebar stakes

# Irrigation



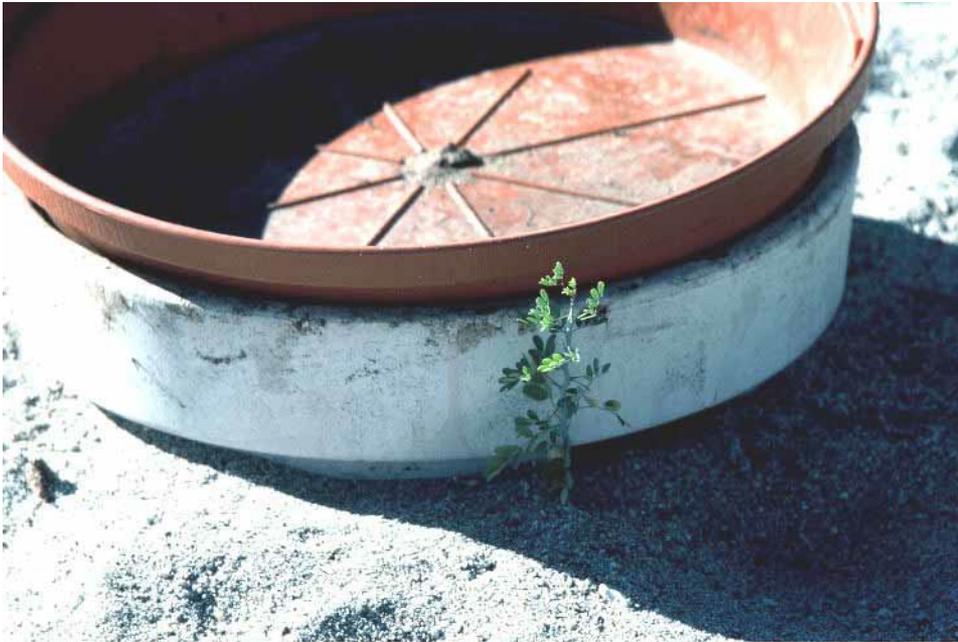
- Deep pipe
- Clay pot
- Porous hose
- Wick
- Many others
- Drip is problematic

# Deep pipe



- Pipe with screen lid moves water into deep root zone
- Small holes drilled on seedling site wet roots until deep roots develop
- Low cost, reusable for many years

# Clay pot



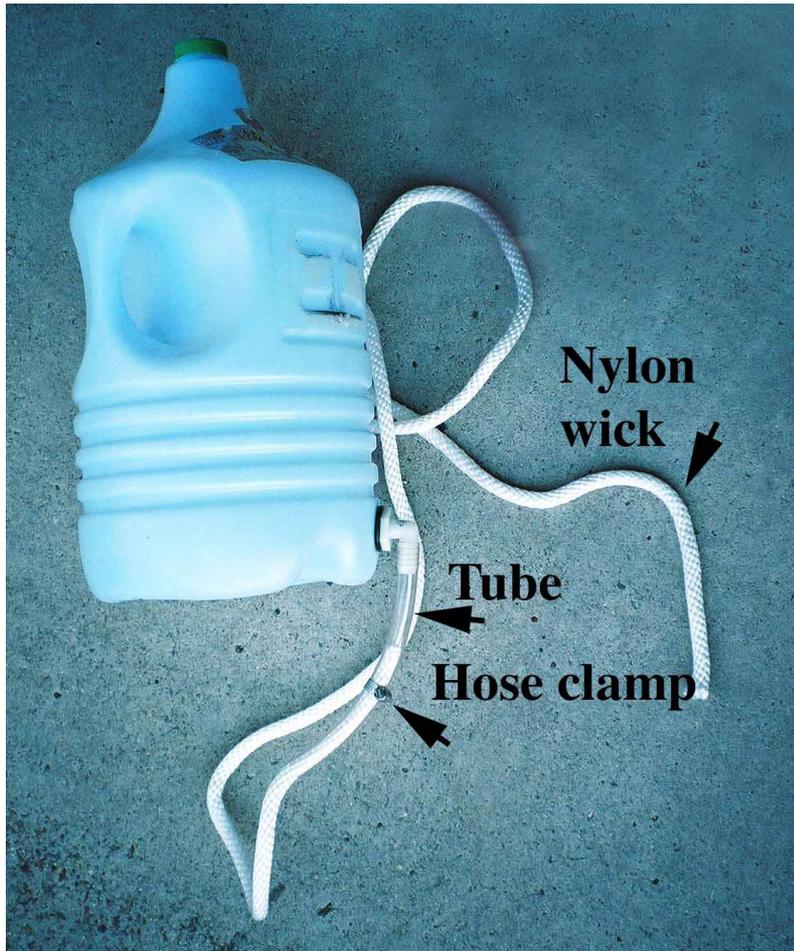
- Very effective in fast draining soils
- Can be used for seeding or container planting
- Good with cuttings
- Very effective use of water
- (hole in clay pot plugged)
- Use lid with drain hole

# Porous hose



- Weeping hose can be used on a drip line or inverted sport bottle
- High rate leaker hose needed
- Low cost, not as good as clay pot

# Wick



- Wick transfers water to soil
- Capillary wicks very low rate (weeks per bottle)
- Gravity wick (shown) good for days

# Water harvesting



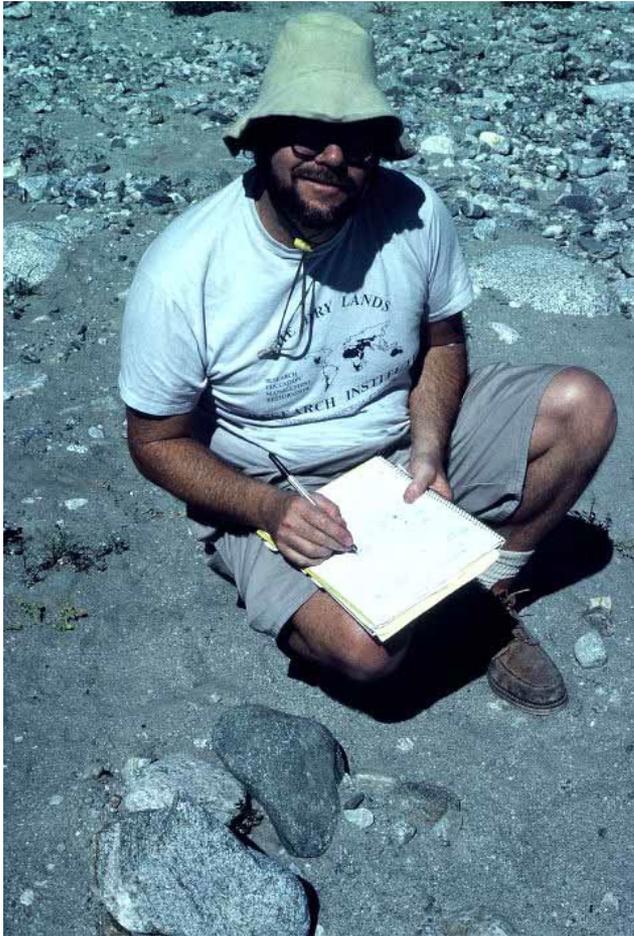
- Water harvesting can be helpful for water collection and irrigating plants
- Especially in bimodal rainfall areas
- If it doesn't rain, use water truck



# Maintenance

- Keep fences and signs up
- Repair damage to plant protection and irrigation
- Keep water tanks topped off as needed
- Watch erosion and repair damage
- Look for problems with herbivory or recreational use and damage

# Monitoring



- Keep careful track of costs
- Track survival and growth
- Recovery of ecosystem function
- Recovery of ecosystem structure
- 20 year+ recommended

# Sequences

- Often these ecosystems recovery slowly even with intervention
- No rain - little growth
- But be prepared to be surprised, sometimes growth and recovery is very rapid

# Tree planting

Mesquite mitigation planting Hywy 86



3 years



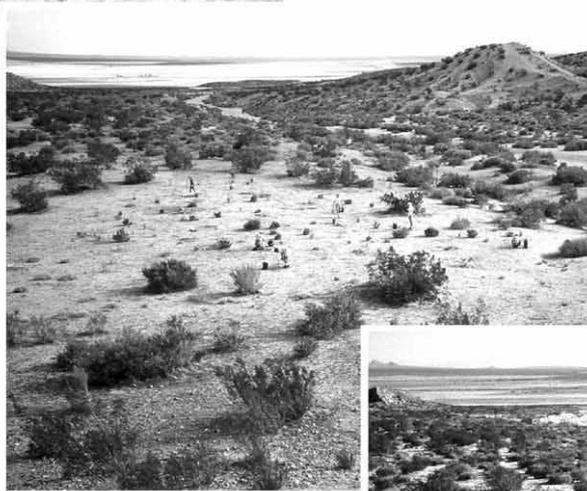
5 years



# OHV Repair, Red Rock



1990



1994  
2nd year of project



1999

# Mining, Travertine



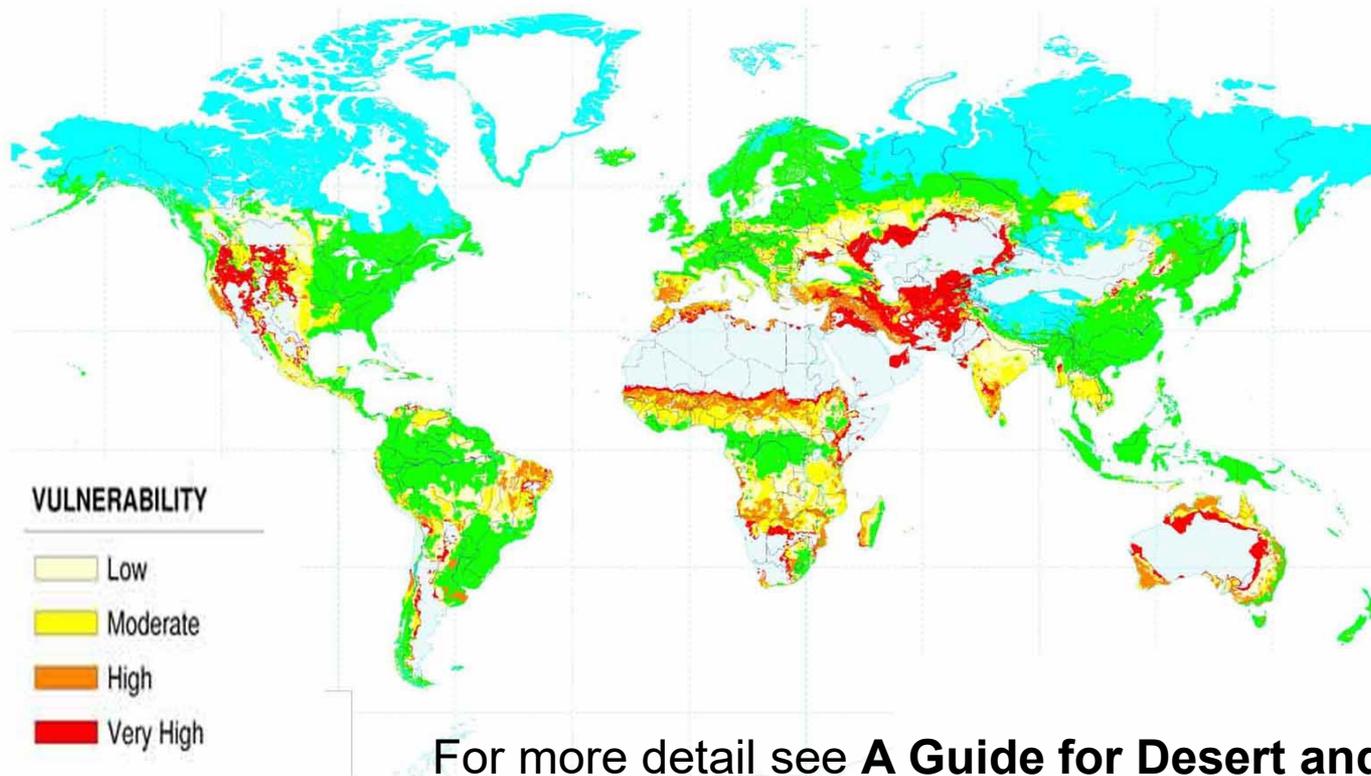
March 1990

April 1992

Resource islands,  
borrow pit  
Coachella Valley



# The global challenge



For more detail see **A Guide for Desert and Dryland Restoration**, Island Press, 2007.

# Conclusion



SER desert restoration class  
Red Rock Canyon State Park

- The desert can be restored
- It is not easy, it is not inexpensive
- Protect the remaining good areas
- Work on the most important areas first
- Learn from experience