Spatial modeling of vegetation dynamics after disturbance:

The vegetation dynamics scenario builder

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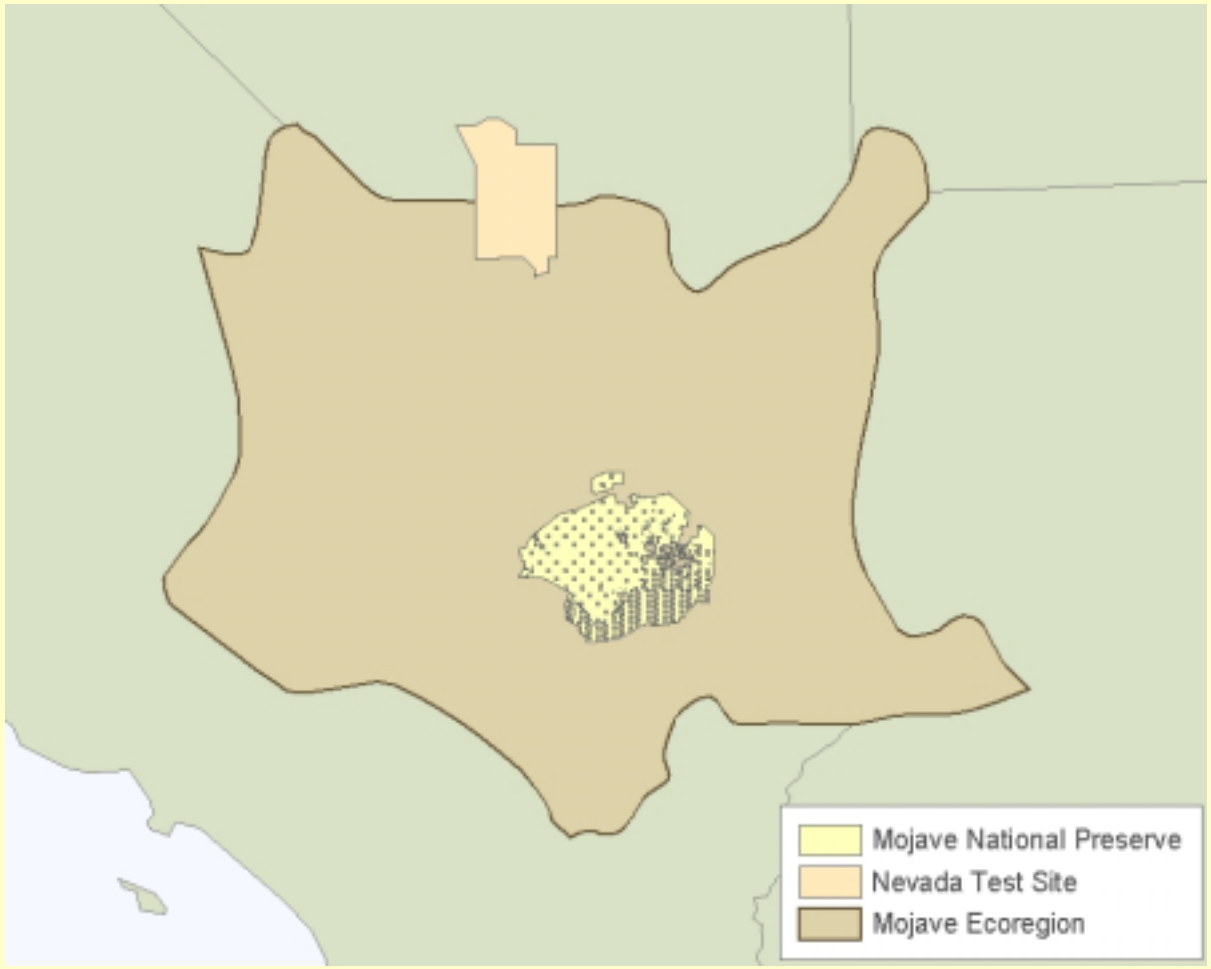
2003 Goal

- To develop spatially explicit scenarios of vegetation dynamics for the Nevada Test Site and Mojave National Preserve after severe disturbance based on measured recovery on dated sites

Mojave Ecoregion



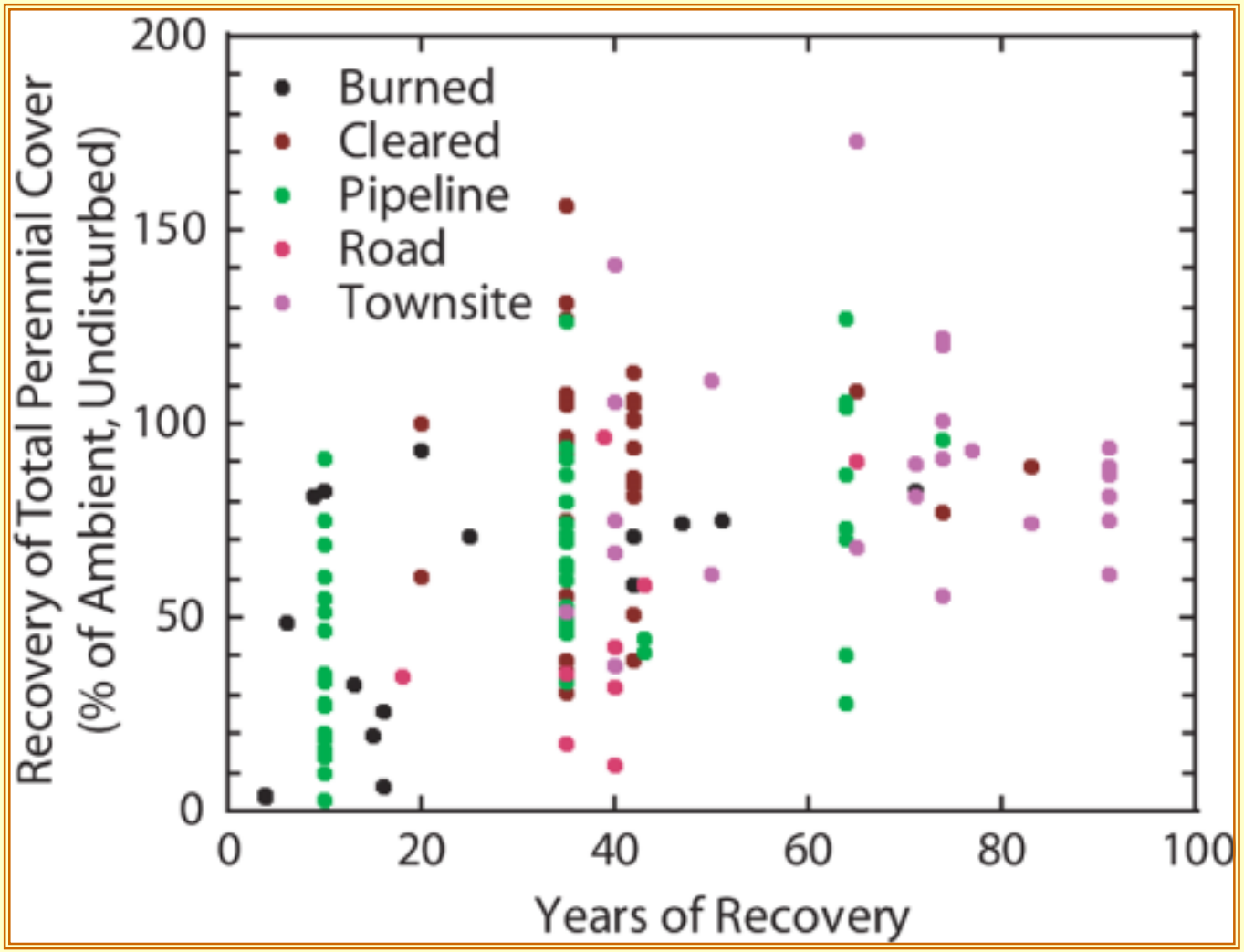
Does Natural Recovery Occur in Disturbed Mojave Desert Ecosystems?

Creosote Shrubland: Coaxil Cable Line

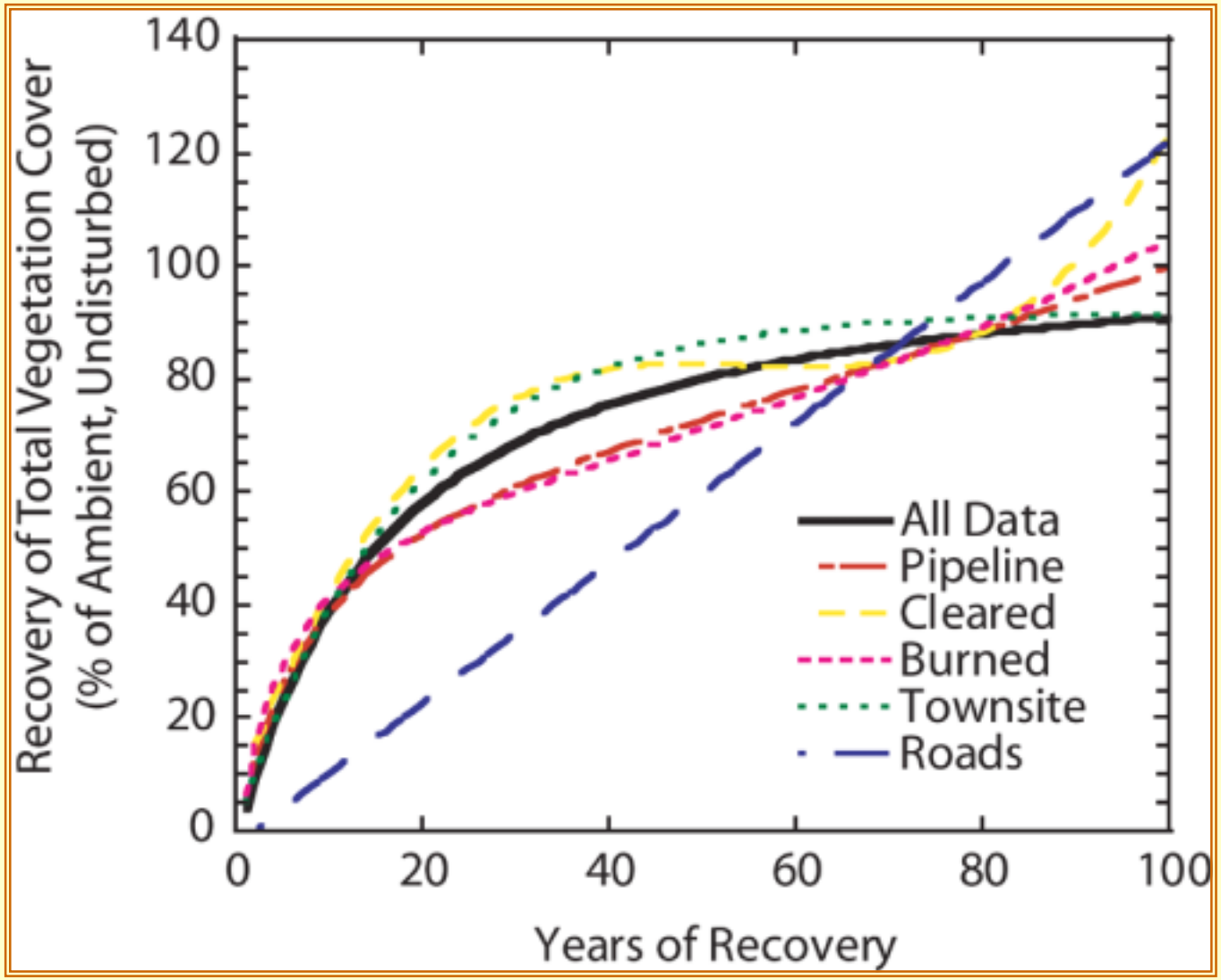
Recovery response

- Regeneration of cover, regardless of species
- Density of plants, regardless of species
- Reestablishment of initial species composition

Recovery of Total Perennial Vegetation Cover (n =134)



Recovery of Total Perennial Vegetation Cover (6 treatments, n=134)



Vegetation dynamics scenario builder

- Apply statistical descriptions of vegetation recovery in time to distribution maps of vegetation to create spatially explicit predictions of vegetation recovery

Upper Elevation Creosote

$C=90.7(1-e^{-.04t})$

Recovery Equations

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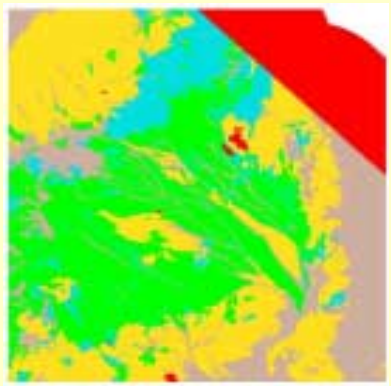

Distribution Map

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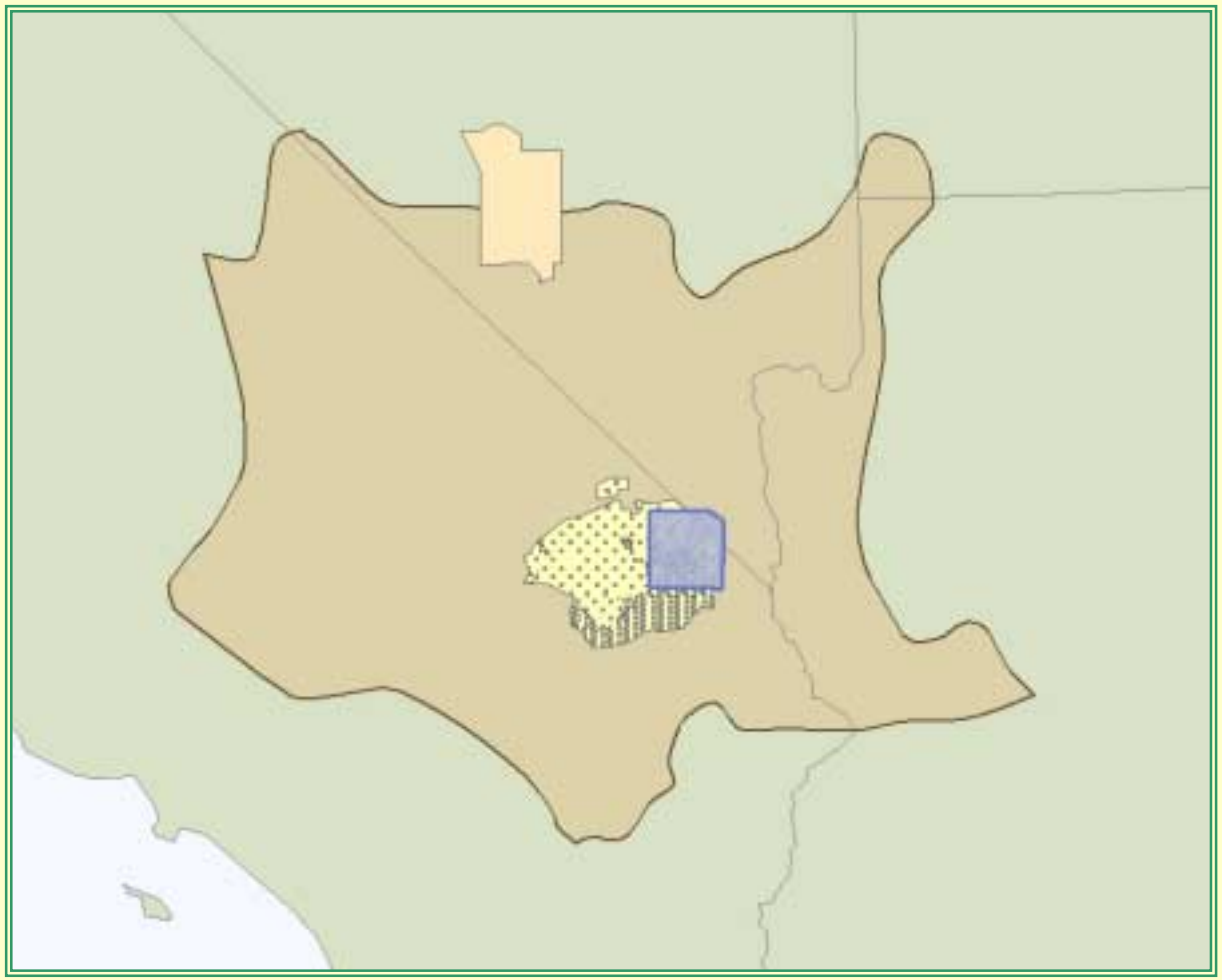
Recovery Scenario

Pilot Area – Lanfair Valley



What do we predict the cover of vegetation will be 25 years after disturbance?

Vegetation dynamics scenario builder

Upper Elevation Creosote

$C = 90.7(1-e^{-.04t})$

Recovery Equations

Equations for Recovery of Cover

Upper Elevation Creosote

$$\text{Cover} = 90.73(1-\exp^{(-.04t)})$$

Mixed Mojave Shrub

$$\text{Cover} = 98.42(1-\exp^{(-.04t)})$$

Blackbrush & Blackbrush Juniper

$$\text{Cover} = 65.28(1-\exp^{(-.12t)})$$

Vegetation dynamics scenario builder

Upper Elevation Creosote

$C=90.7(1-e^{-.04t})$

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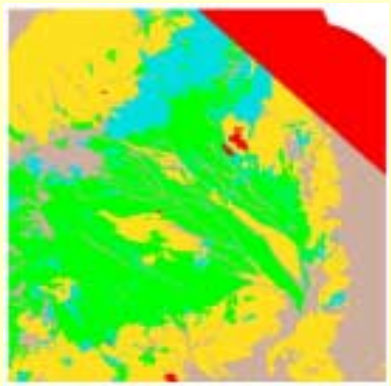
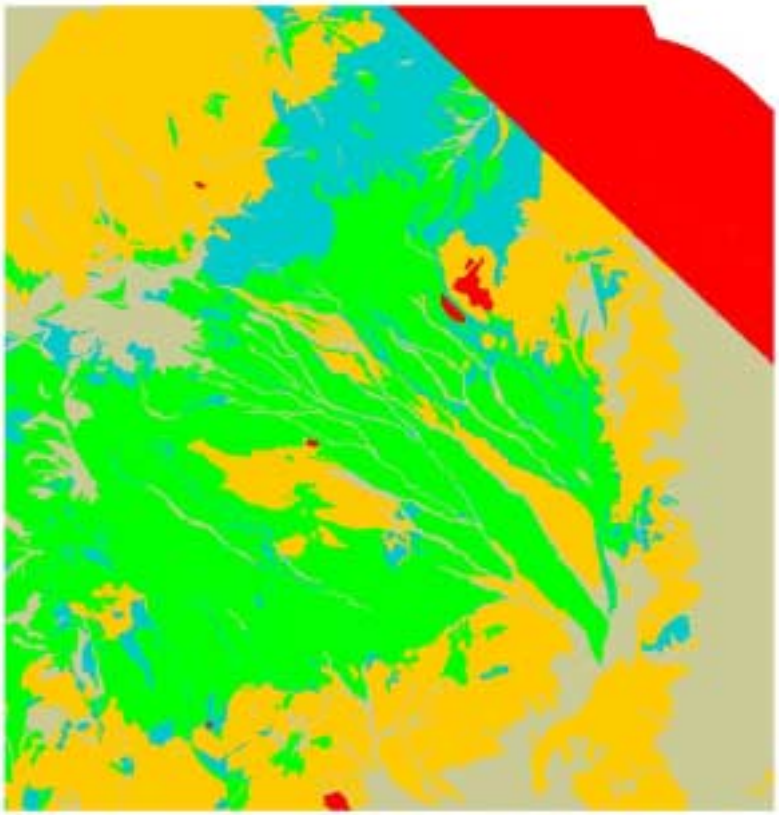


Recovery Equations

Distribution Map

Vegetation Distribution



Vegetation dynamics scenario builder

Upper Elevation Creosote

$C=90.7(1-e^{-.04t})$

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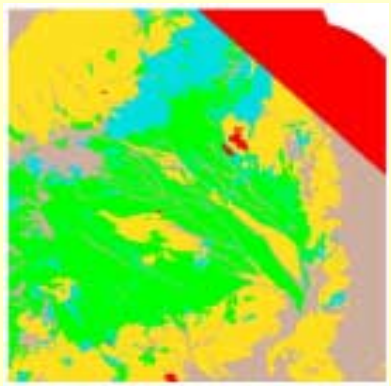

Distribution Map

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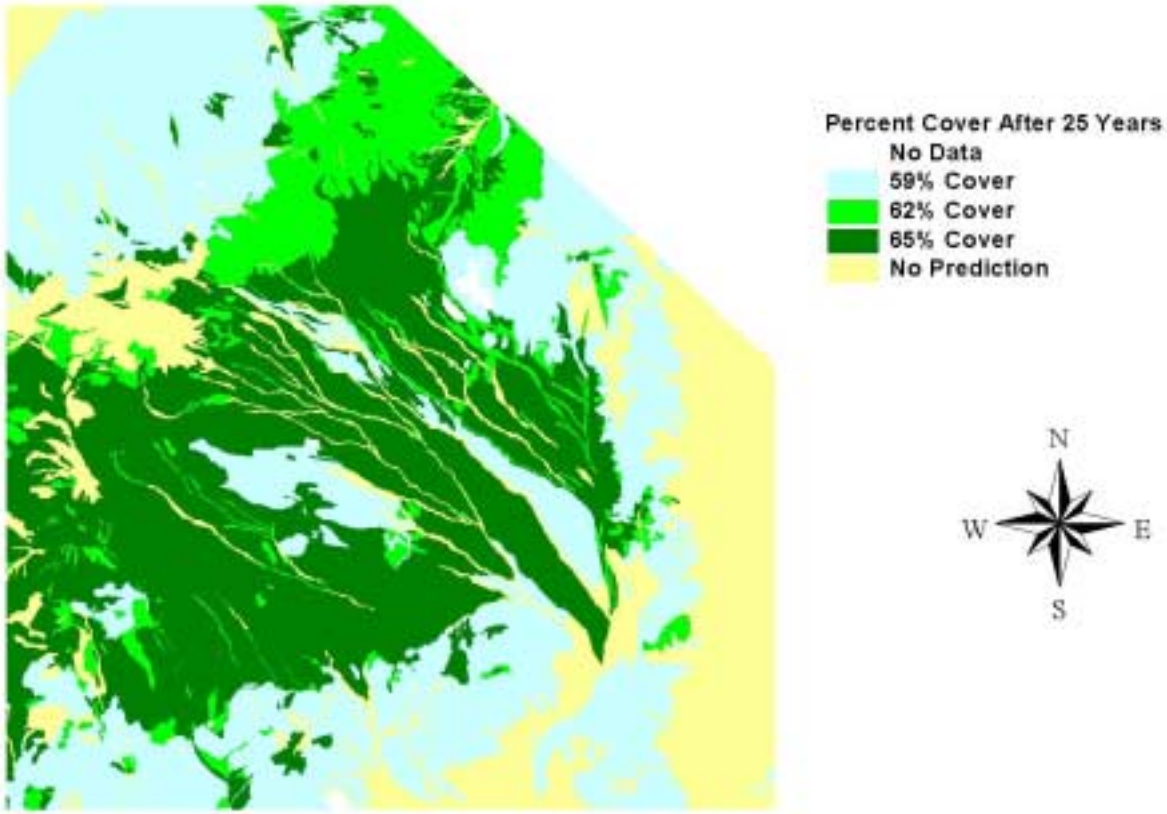
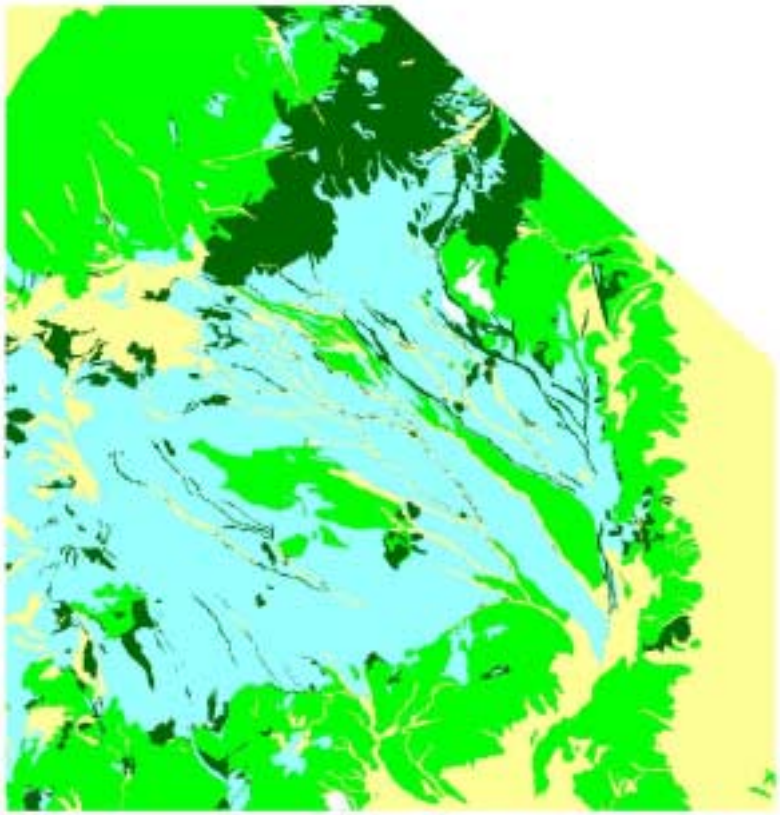
Recovery Scenario

Vegetation Recovery Scenario



What do we predict the cover of vegetation will be 50 years after disturbance?

Vegetation Recovery Scenario



Percent Cover After 50 Years
- No Data
- 80% Cover
- 87% Cover
- 65% Cover
- No Prediction

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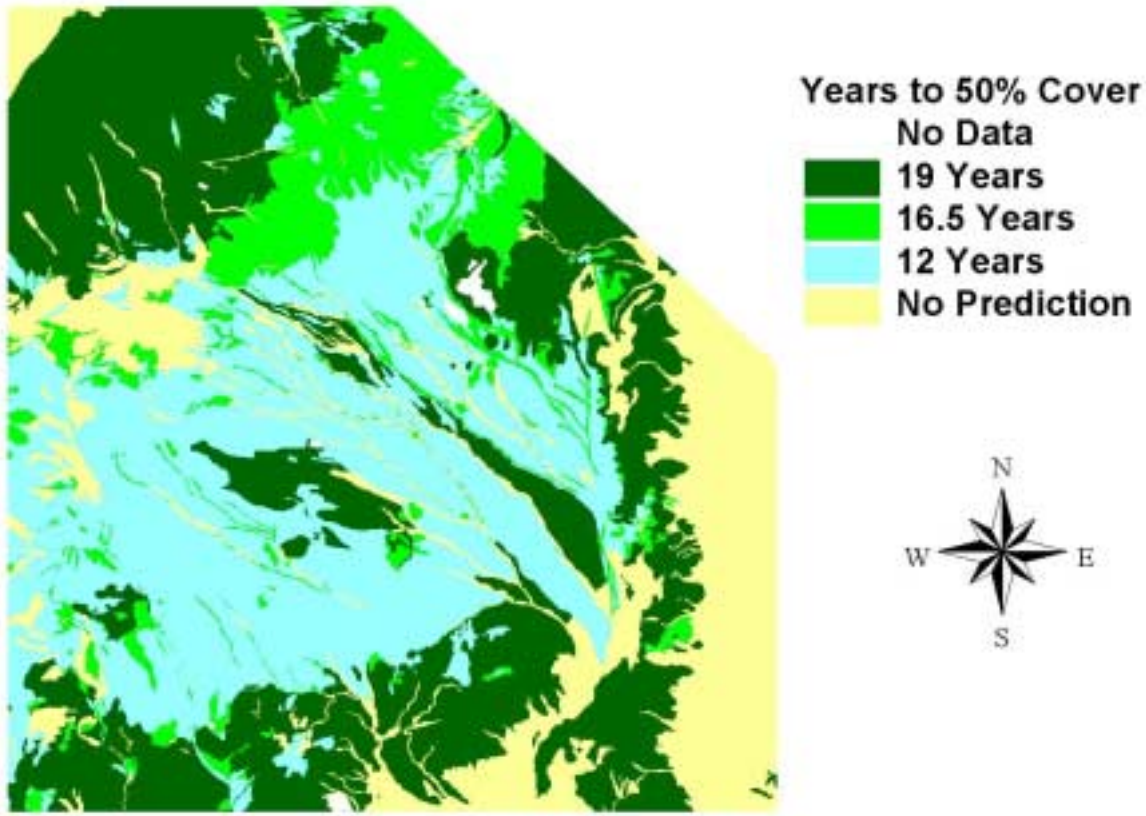
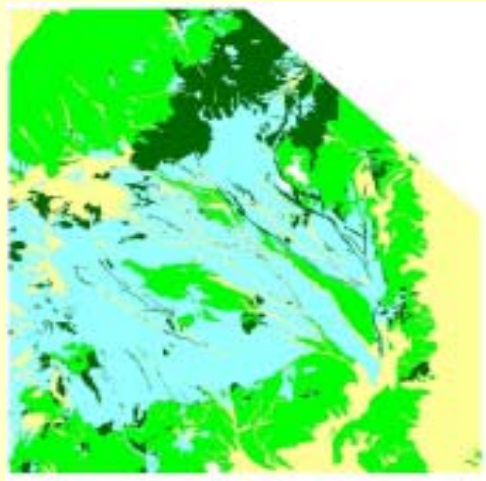
How many years will it take for cover to be 50% of ambient vegetation?

Vegetation Recovery Scenario



Lessons Learned

Cover after 25 Years



Cover after 50 Years

Highest Cover

Middle Cover

Lowest Cover

Recovery Questions

- How does size of disturbance influence recovery?
- Is the number of wet/dry periods a better indicator of recovery than simple years passed?
- How does soils compaction influence recovery?
- Does the same vegetation type or species show different recovery rates depending on location surficial geology?

Modeling Questions

- Does scaling up from plots to landscapes influence the scenario predictions?
- How do we express uncertainty in the model?
- How do we verify predicted changes?

What's Next?

- Expand the pilot project to the entire Mojave National Preserve and Nevada Test Site
- Identify 'gaps' in our information input into the vegetation dynamics scenario builder
- Further develop the functionality of the vegetation dynamics scenario builder

Integrate the Vegetation Dynamics
Builder into Decision Support Tools