

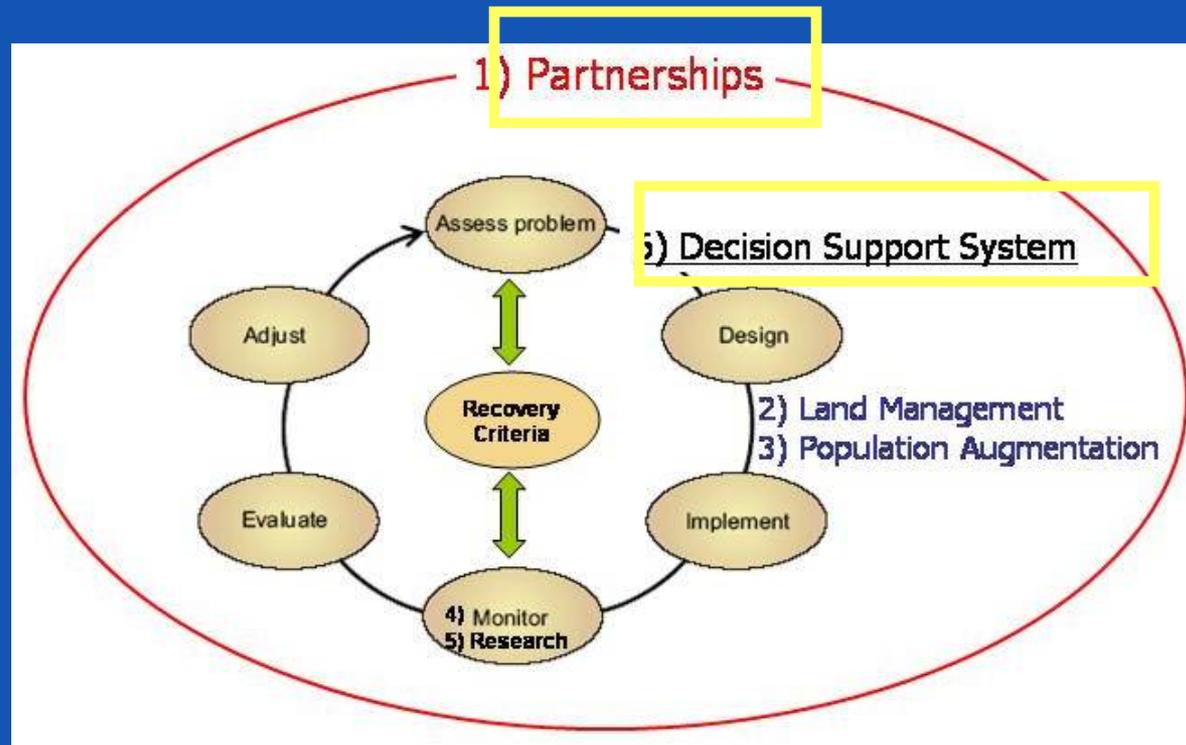
Collaboratively Tracking Implementation and Effectiveness of Recovery Actions



Catherine Darst
Desert Tortoise Recovery Office



Strategic Elements of 2010 Desert Tortoise Recovery Plan



Strategy to better connect science and management

Partnerships

Regional Recovery Implementation Teams (RIT)

WHY?

The desert tortoise has a huge range which includes four states & crosses many jurisdictions

- We need a structure to coordinate this scale & diversity

DTRO is modeling and monitoring at the recovery unit scale

- We need your help with local, on-the-ground information and implementation



Partnerships

Regional Recovery Implementation Teams (RIT)

WHY?

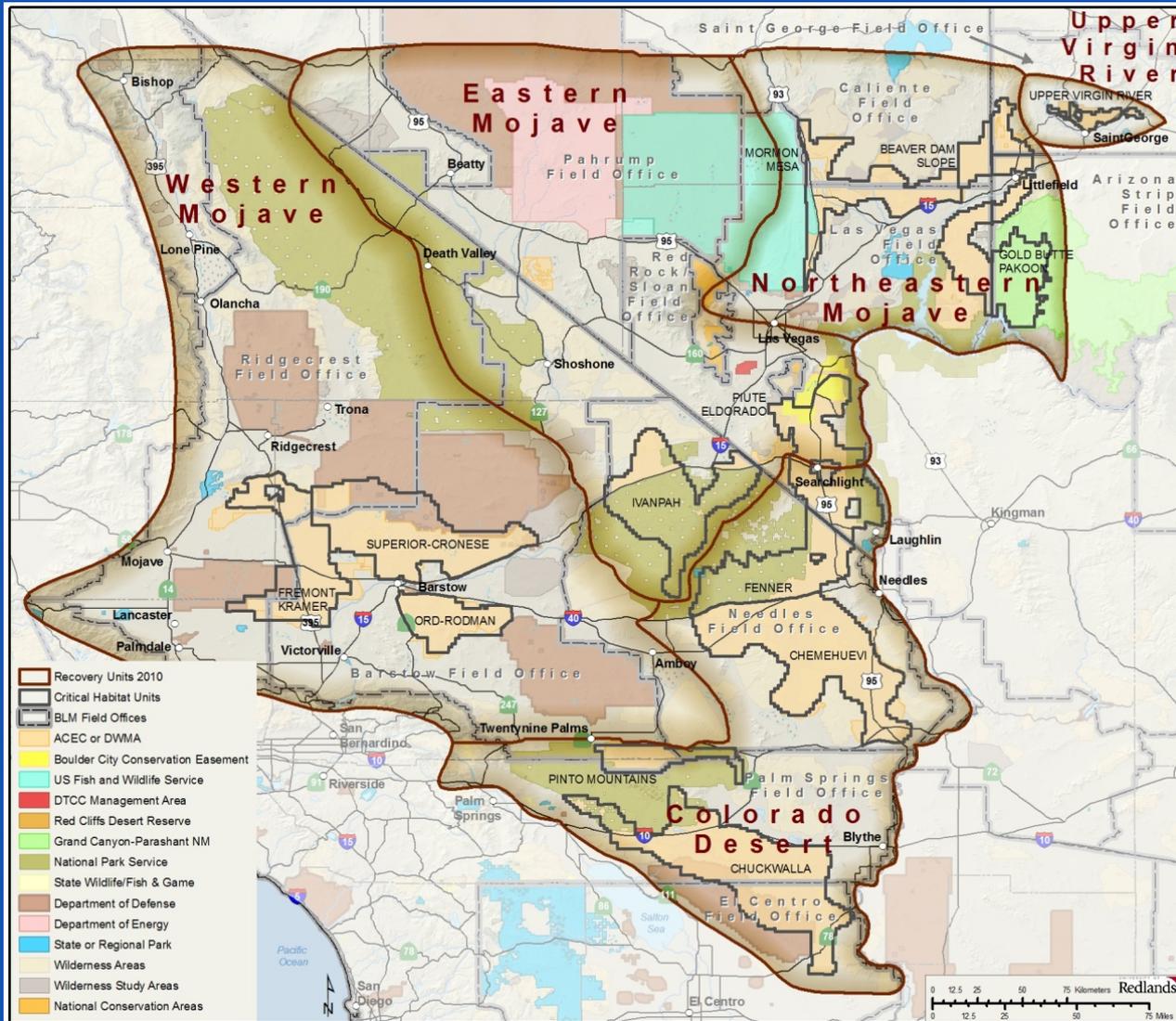
RITs will be a structure to:

- Facilitate collaboration amongst regional land managers, wildlife managers, stakeholders, & scientists
- Increase information exchange and reduce duplication to increase efficient use of resources and expertise
- Provide consistent information on the status of the tortoise and recovery implementation activities
- Assess what we're doing and whether or not it's working



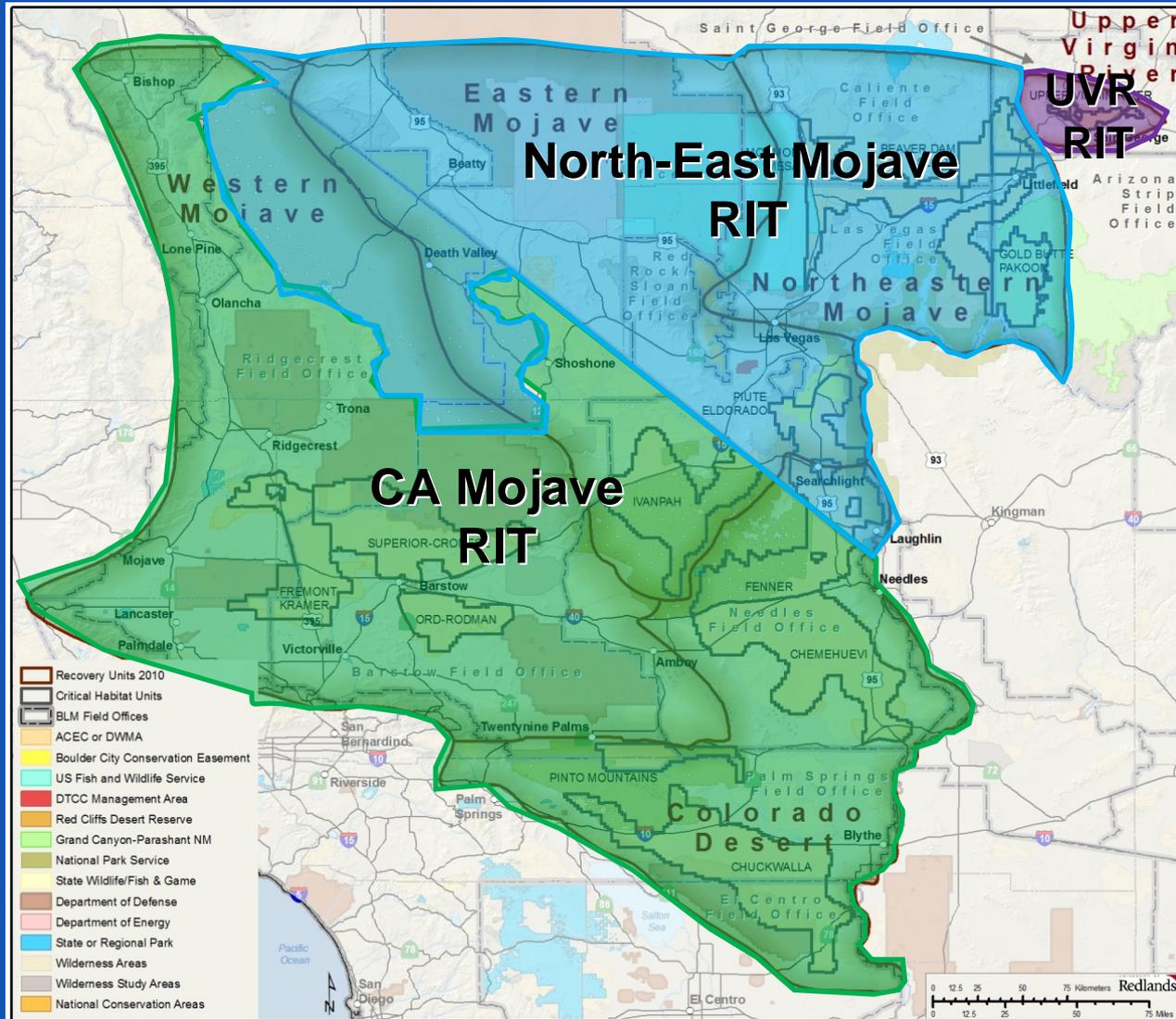
Partnerships

Regional Recovery Implementation Teams (RIT)



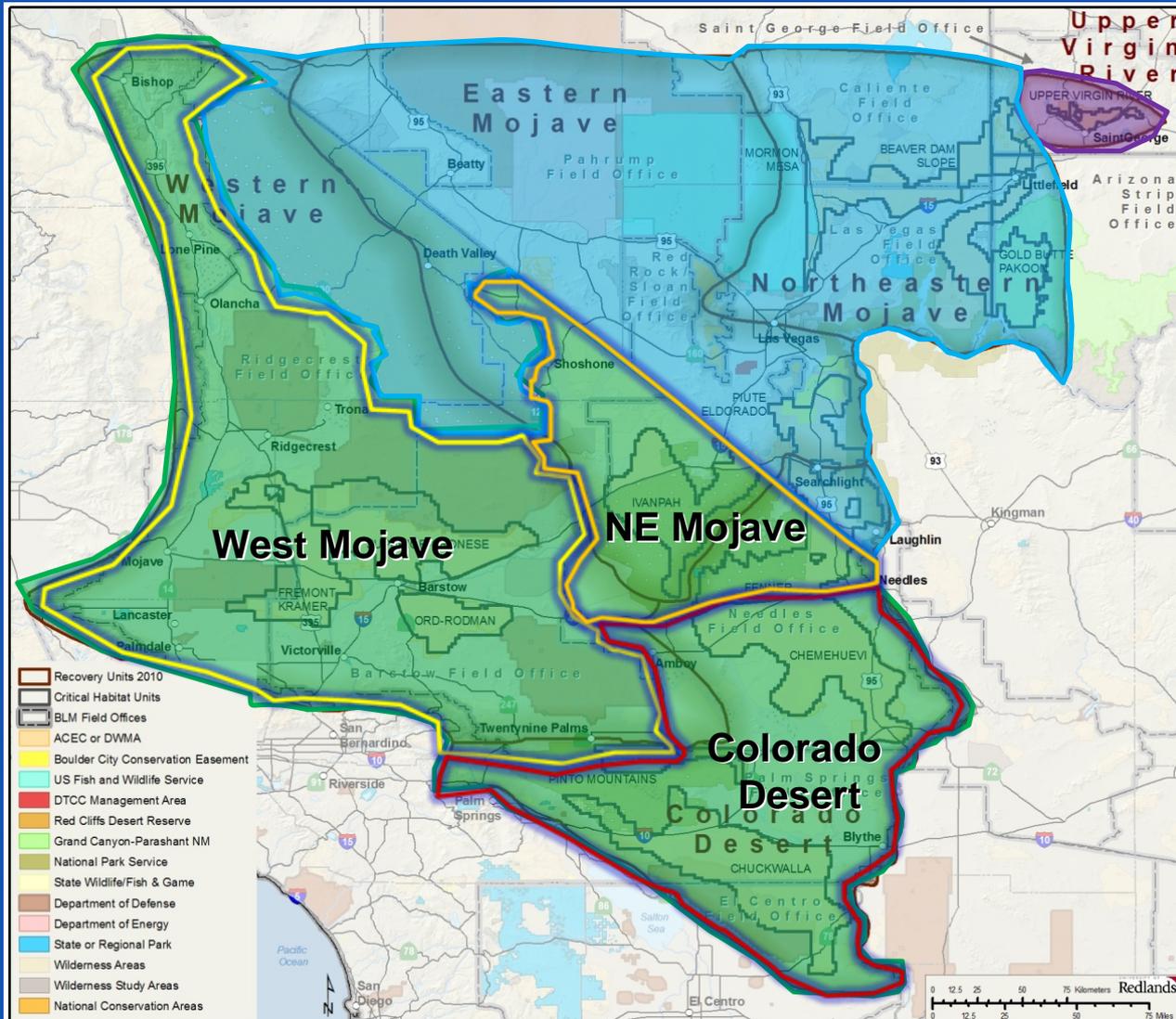
Partnerships

Regional Recovery Implementation Teams (RIT)



Partnerships

California Mojave RIT: Workgroups



Partnerships

Regional Recovery Implementation Teams (RIT)

Each workgroup will consist of ~8-15 individuals, representative of:

Agency representatives:

- land management
- wildlife management
- local government
- tribal resource agency

Stakeholder representatives:

- natural resources use group
- recreation group
- conservation organization
- scientific community



Recovery Implementation Teams

- Create prioritized Recovery Action Plans
- Track implementation and threat reduction
- Examine correlations between management actions and tortoise recovery

TOOL: Spatial Decision Support System

Model-based approach to characterize, assess, and prioritize recovery efforts

Range-wide tracking and reporting on recovery actions and progress

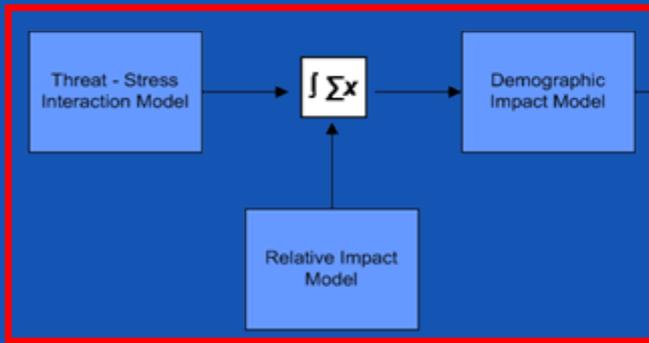
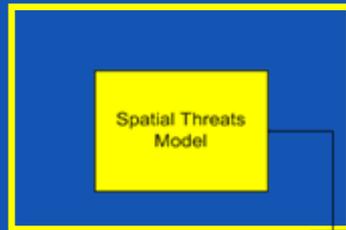


Spatial Decision Support System

Evaluates effects of different management actions for desert tortoise recovery

Action Effectiveness

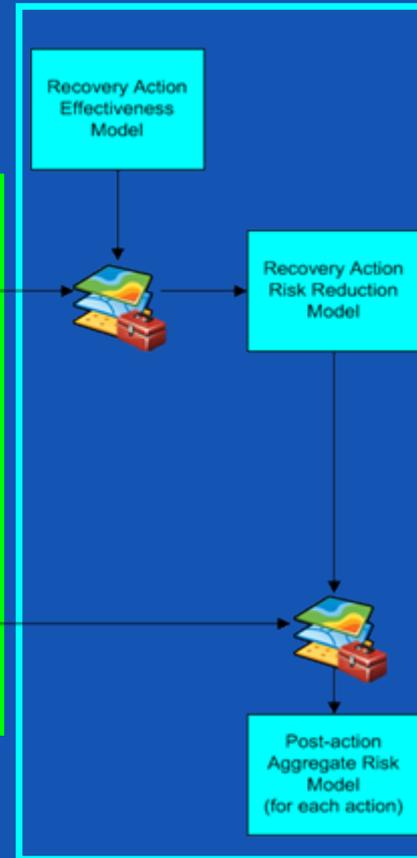
Spatial Threats



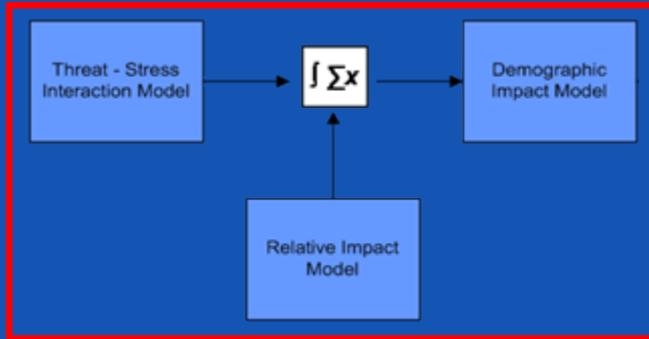
Impact of Threats



Risk to Population



Spatial Decision Support System

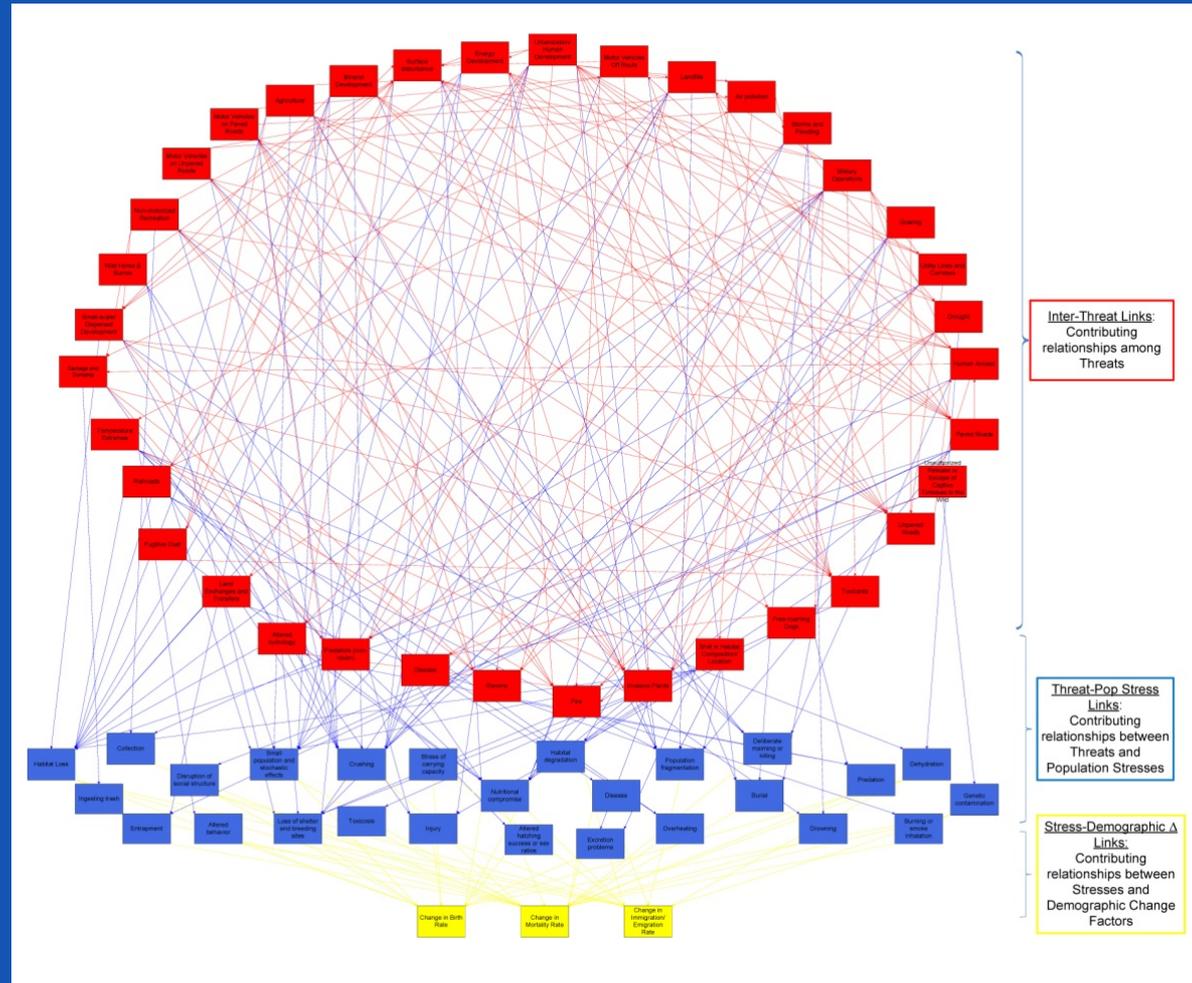


Estimates the contribution of each individual threats to tortoise decline

Impact of Threats

Utilizes Salafsky et al. (2008) lexicon for biodiversity conservation

Every link is defined with citations as available

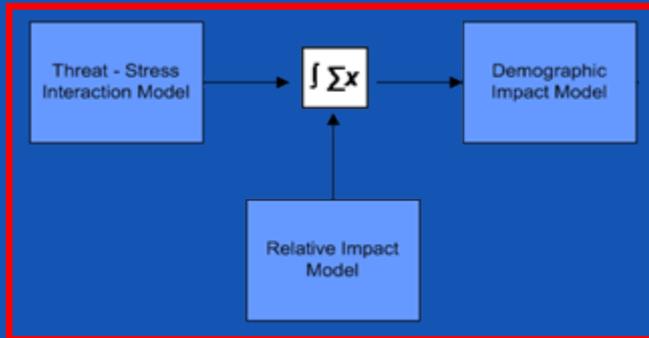


Inter-Threat Links:
Contributing relationships among Threats

Threat-Pop Stress Links:
Contributing relationships between Threats and Population Stresses

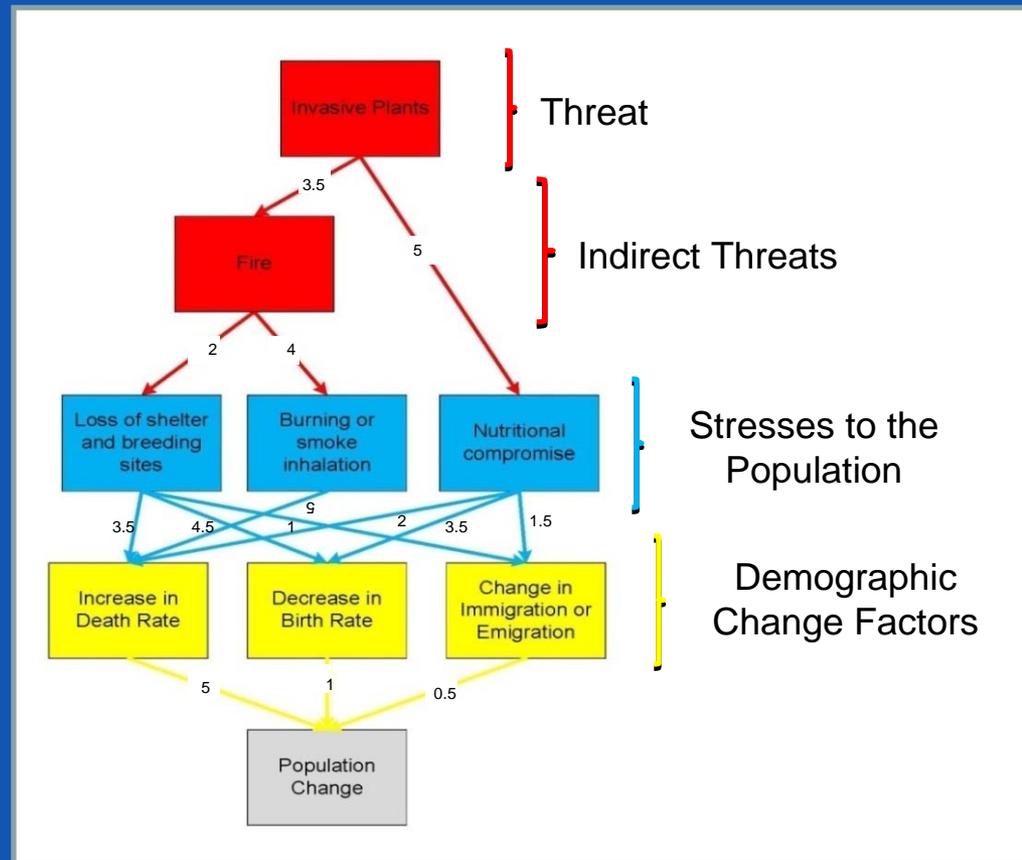
Stress-Demographic Δ Links:
Contributing relationships between Stresses and Demographic Change Factors

Spatial Decision Support System



Impact of Threats

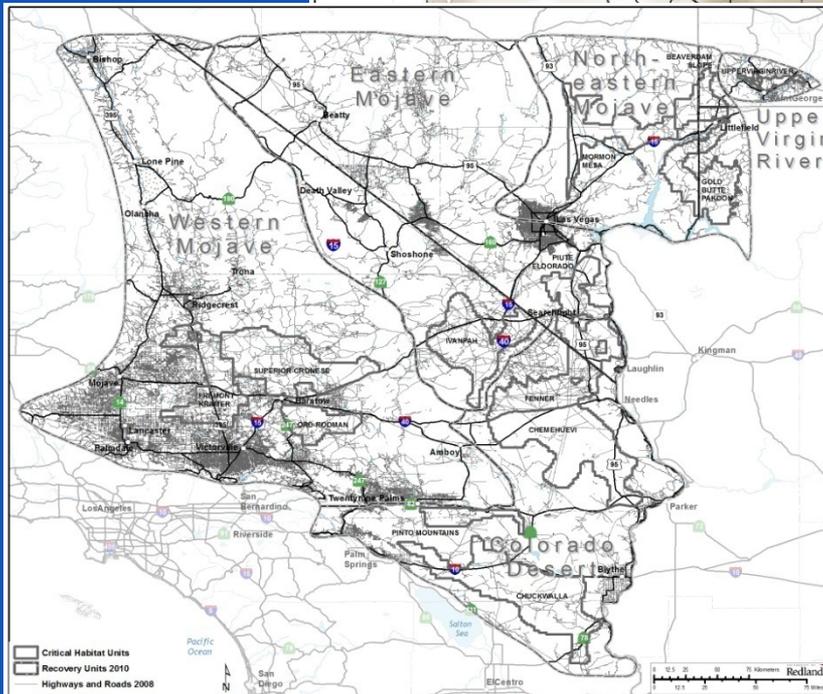
Estimates the contribution of each individual threats to tortoise decline



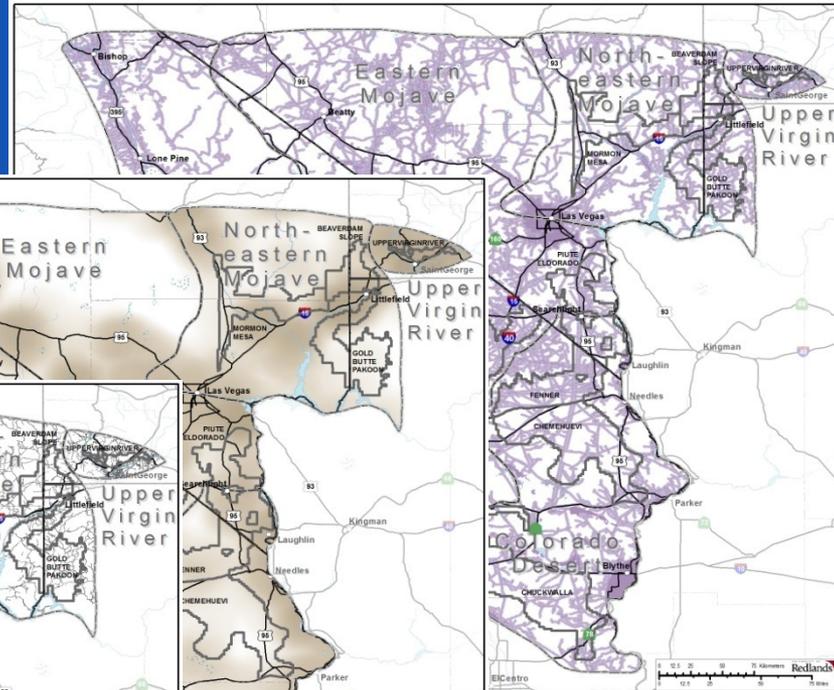
Utilizes expert assessments to quantify the relative strength of relationships between threats and population demographic change factors

Spatial Decision Support System

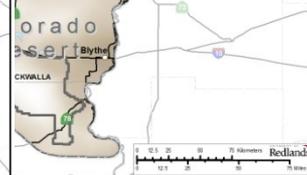
Spatial Threats



Roads



Invasive Plants

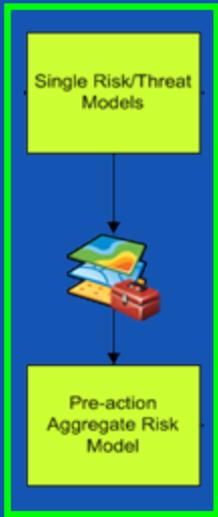


Ravens

Locations of threats to desert tortoise

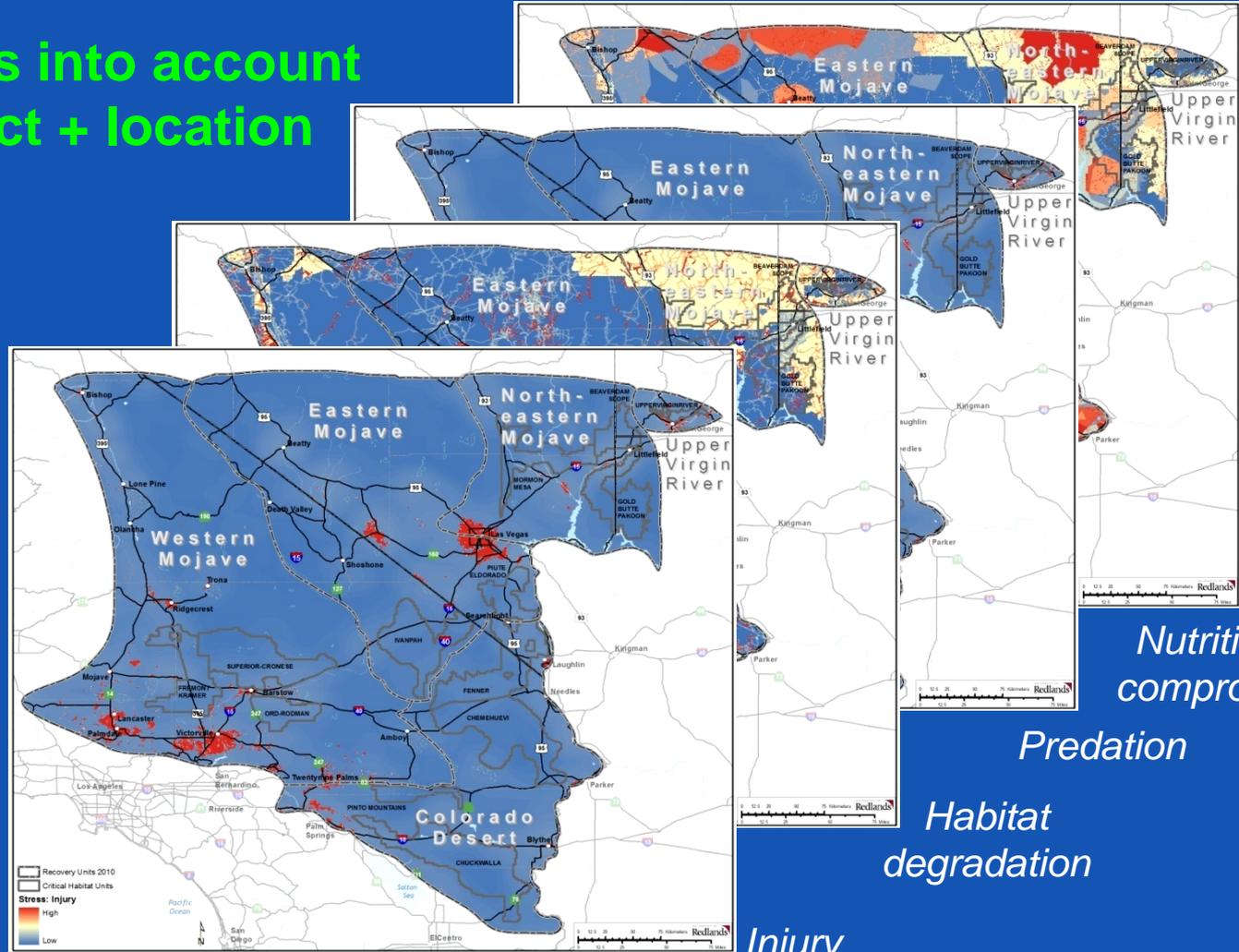


Spatial Decision Support System



Takes into account impact + location

Risk to Population

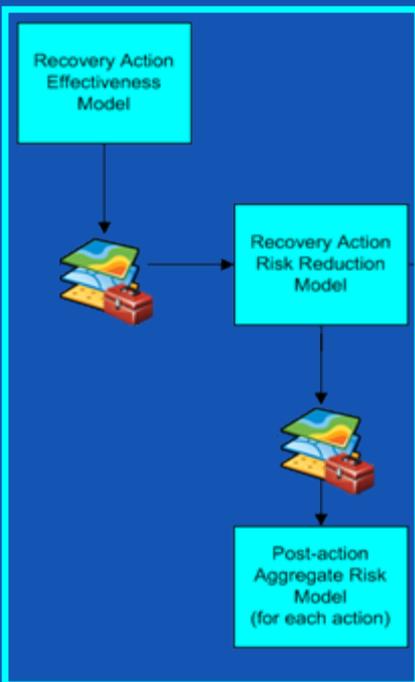


Spatial contribution of each stress to tortoise decline = risk to the tortoise

Spatial Decision Support System

Action Effectiveness

Takes into account how individual recovery actions effect threat–stress links



Recovery Action/ Threat–Stress	Mortality– Disease	Habitat degrad–OHV	Collection– Human access	Nutritional comp–Grazing
Close Roads	1.1	4.6	3.25	0
Connect Habitat	1.7	0	0	0
Environmental Education	2.5	3.5	3.9	0
Control Ravens	0	0	0	0
Close allotments	0	0	0	4.8
Increase Law enforcement	0	4.9	3.3	0
Revegetation	0.8	3	0	0.5

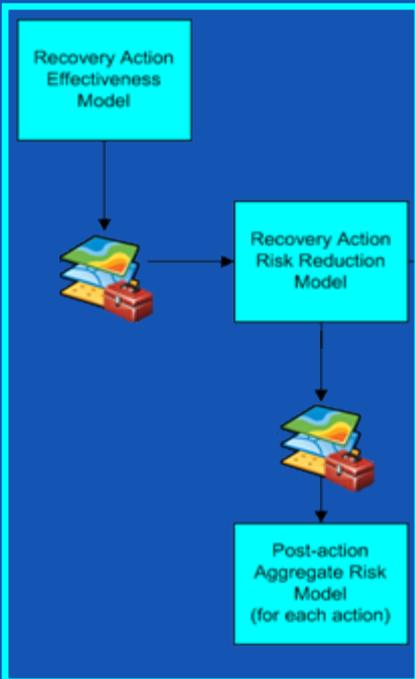
Utilizes expert assessments of threat–stress and action relationships on a scale of 0 (none) to 5 (high)



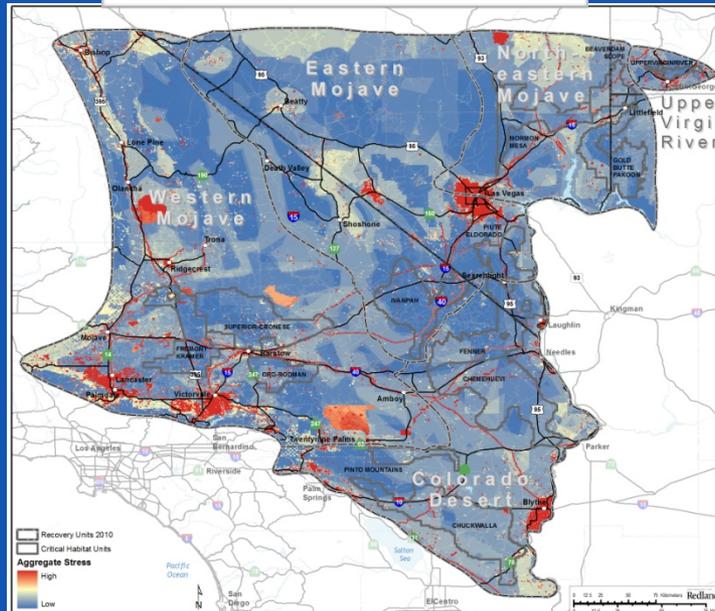
Spatial Decision Support System

Action Effectiveness

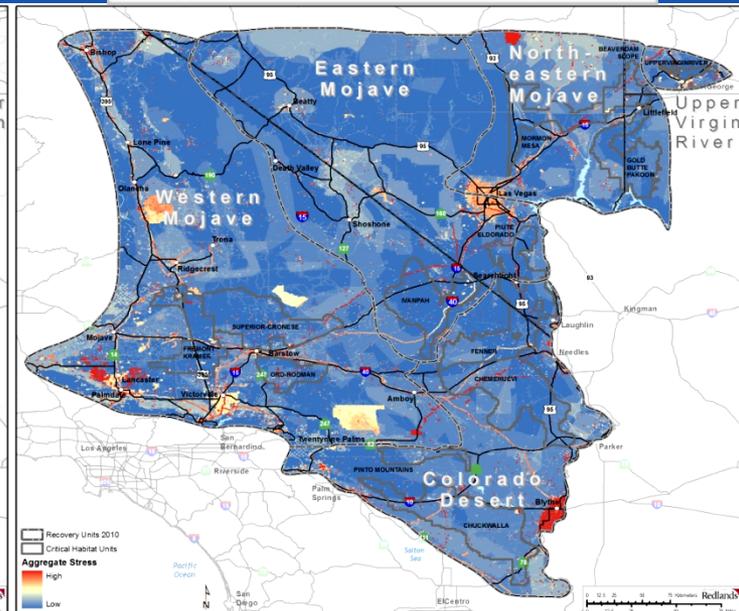
Takes into account how individual recovery actions effect threat–stress links



Aggregate Risk to the Tortoise



Remaining Risk after Remove-all-Predators Action



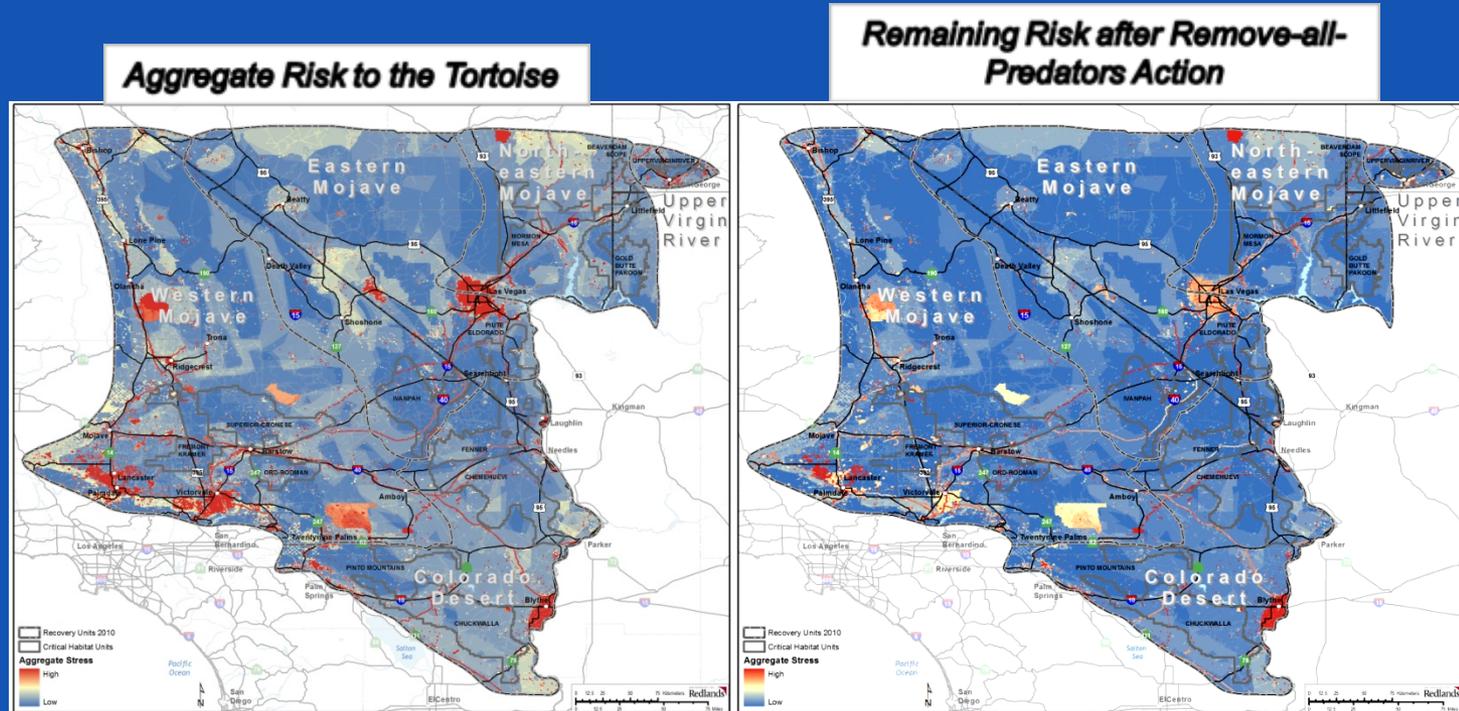
Post-action population stress severity (risk to the tortoise) as a result of the hypothetical action of removing all tortoise predators

Spatial Decision Support System

Spatial Summary/
Prioritization

Compares remaining threat severity
across recovery actions

Extent of
threat after
actions



After remove-all-predators action, Δ risk to the tortoise = +464,000

Spatial Decision Support System

Spatial Summary/
Prioritization

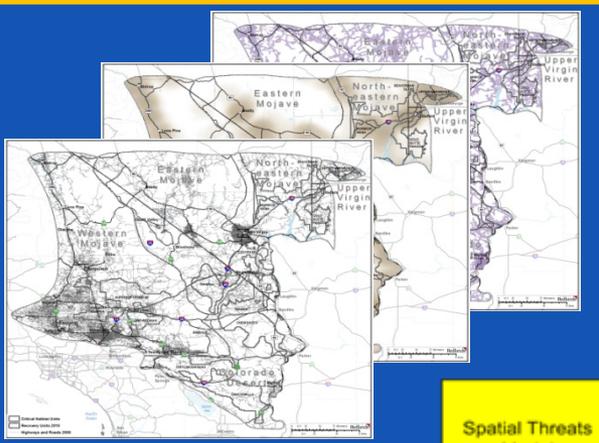
Utilize prioritization to create
Recovery Action Plans

Extent of
threat after
actions

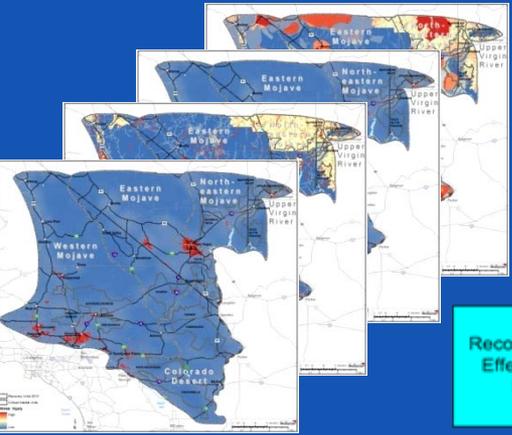
UTAH: Upper Virgin River Recovery Unit		
Action	Δ overall risk	Rank
Increase law enforcement	970	1
Close OHV routes	832	2
Decrease subsidies to predators	458	3
Restore habitat	183	4
Environmental education	154	5
Install culverts for connectivity	70	6

Change (decrease) in overall risk is calculated for all possible actions within a given area, actions can then be prioritized according to total risk reduction

Spatial data processing and management system designed to help the RITs prioritize, track and evaluate recovery efforts

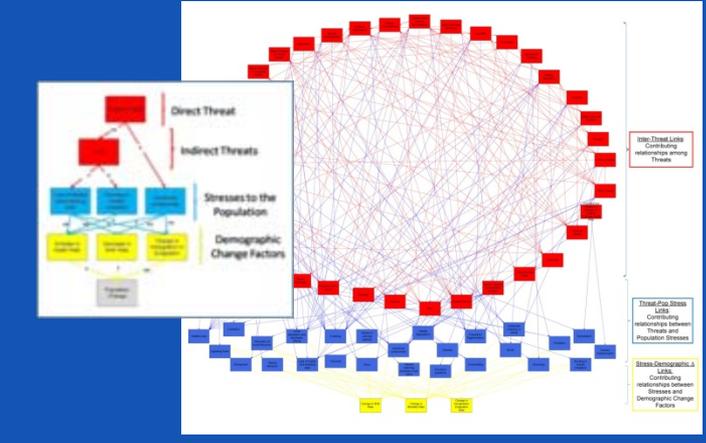
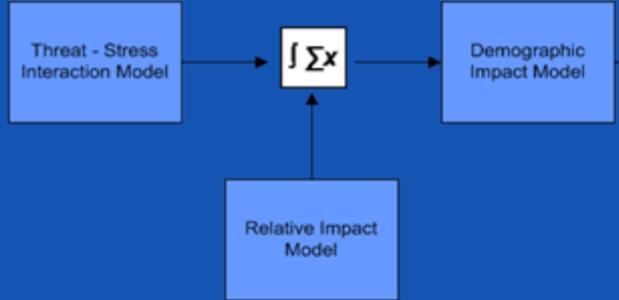


Spatial Threats Model



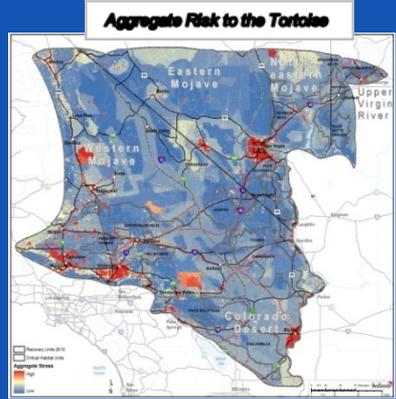
Recovery Action Effectiveness Model

Recovery Action/Threat	Disease	OVM routes	Collection	Cattle Grazing	Air Pollution
Close roads	1	3	2	0	0.5
Connect Functional Habitat	1	0	0	0	0
Environmental Education	2	3	3	0	1
Control Ravens	0	0	0	0	0
Fence Roads	0	0	3	0	0
Increase law enforcement	0	3	3	0	0
Revegetation	0	3	0	0	1



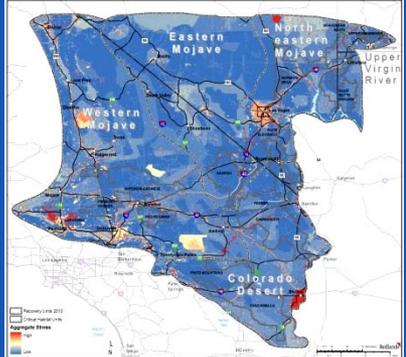
Single Risk/Threat Models

Pre-action Aggregate Risk Model



Recovery Action Risk Reduction Model

Post-action Aggregate Risk Model (for each action)



Spatial Summary/Prioritization

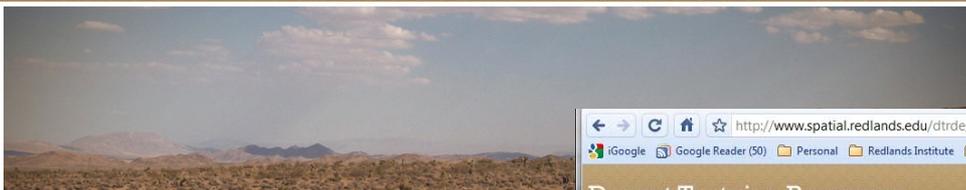
Upper Virgin River Recovery Unit		
Action	Δ overall threat	Rank
Increase law enforcement	6.60	1
Close-roads	5.32	2
Environmental education	4.58	3
Control ravens	2.23	4
Connect functional habitat	1.54	5
Conduct revegetation	0.07	6

Online Model and Data Explorers

http://www.spatial.redlands.edu/dtro/threat/?id=4

Desert Tortoise Recovery Resource Site

home data explorer threat reports about contact



Quick threat selector

Navigate through



Threat: Mineral Development (A.8.)

Threat

Mineral Development (A.8.)

Exploring for, developing, and producing minerals and rocks, and semi-metals, minerals, sand and gravel, coal etc.

Recovery Actions

Protect intact desert tortoise habitat (2.1)

Withdraw mining (2.12)

Restore Habitat (2.6)

Corollary Threats

Surface disturbance (A.1.)

Toxicants (C.2.)

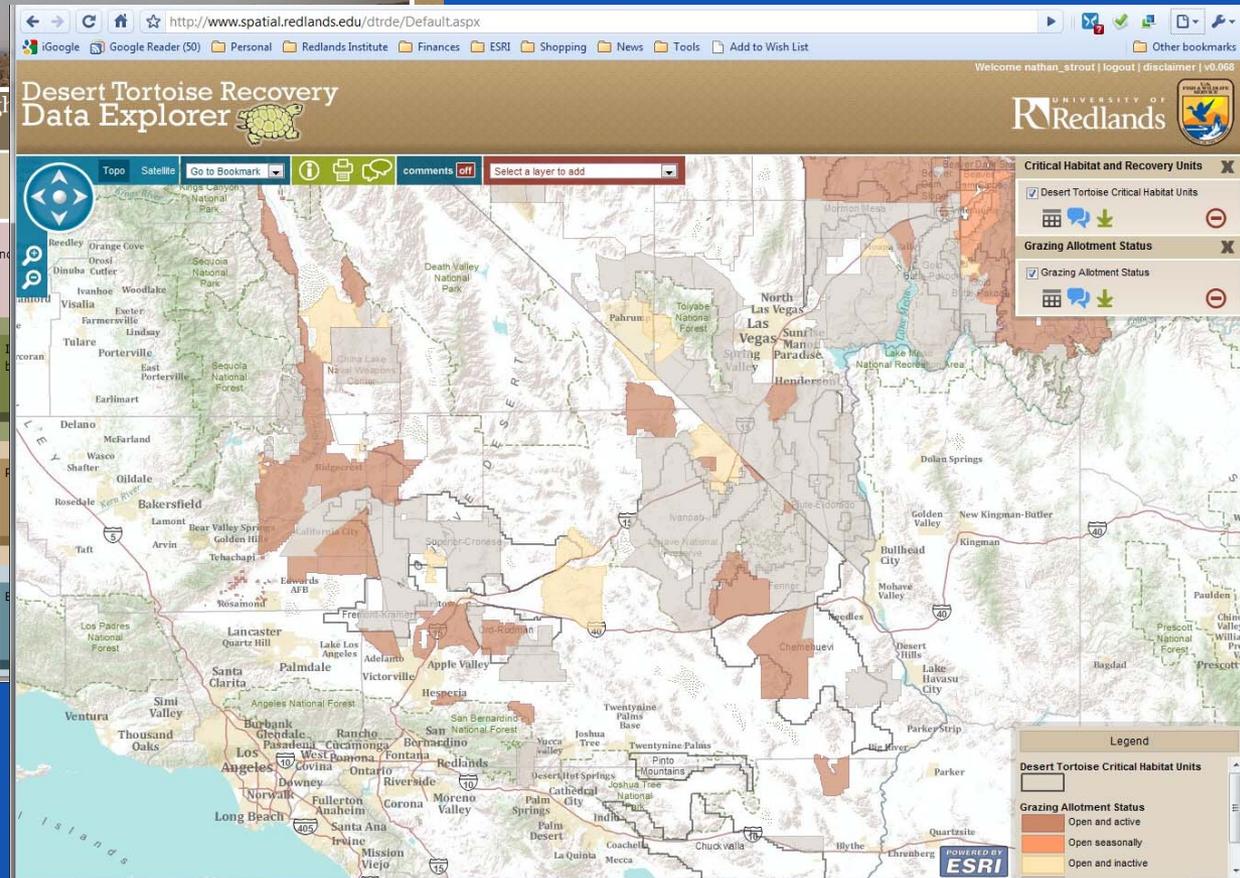
Unpaved Roads (A.2.)

Stresses

Habitat Loss

Crushing

Population fragmentation



ArcGIS RIT Application

The screenshot displays the ArcGIS RIT Application interface. On the left, the 'Desert Tortoise SDS Data Explorer' window shows a map of California with various layers. The 'Layers' panel on the left includes 'Recovery Units', 'RIT Areas', and 'Basemap'. The main map area shows a detailed view of the West Mojave Planning Area. On the right, the 'Study Area Report' window is open, displaying the following information:

West Mojave Planning Area
Total Area: 14,651,817 acres

Top Stresses

- Predation
- Habitat loss
- Disease
- Crushing
- Burning or smoke inhalation
- Loss of shelter and breeding sites
- Nutritional compromise
- Collection
- Deliberate maiming or killing

Contribution to Pop. Change

Stressor	Contribution
Predation	14
Habitat loss	13
Disease	8
Crushing	8
Burning or smoke inhalation	7
Loss of shelter and breeding sites	6
Nutritional compromise	5
Collection	5
Deliberate maiming or killing	5

Recommended Actions

- Protect intact desert tortoise habitat (2.1)
- Install and maintain tortoise barrier fencing (2.5 & 2.7)
- Land acquisition (2.9)
- Environmental Education (2.3)
- Restore Habitat (2.6)
- Increase law enforcement (2.4)
- Withdraw mining (2.12)
- Remove grazing (close allotments)
- Sign and fence protected areas (2.8)
- Install and maintain human barriers (wildland-urban interface)

At the bottom, the 'Data Inventory' window shows a table of 89 datasets. The table has columns for 'Add...', 'Threat Type', 'Dataset Title', 'Description', 'Data Source', 'Year', and 'metadata'. The first row is highlighted:

Add...	Threat Type	Dataset Title	Description	Data Source	Year	metadata
	Agriculture	National Land Cover Data 2001	Pasture/Hay and Cultivated Crops classifications from the raster file	U.S. Geological Survey	2001	

Add layer directly from inventory

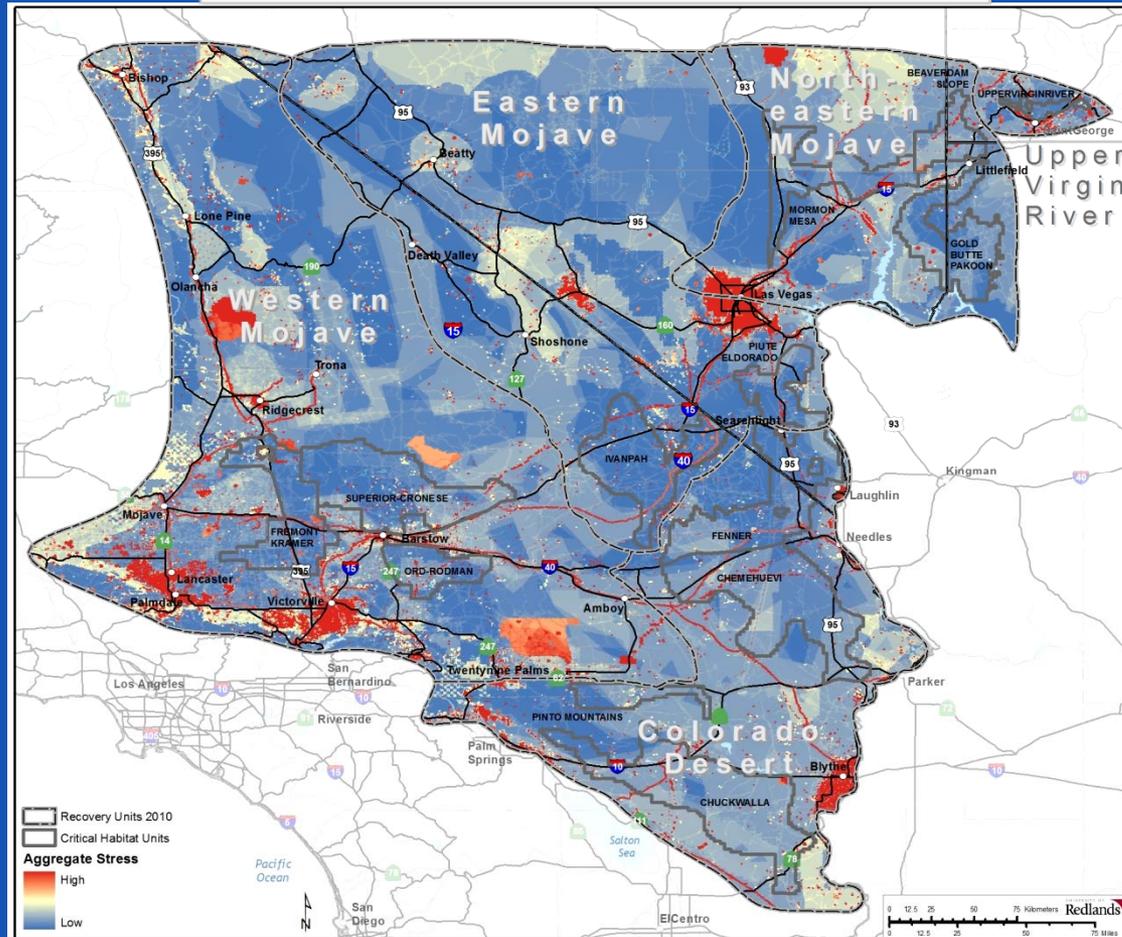
Create custom reports for any given extent (RIT area, DWMA, or user-drawn area)

Tabs for modeled layers

View full metadata record for each data layer

Spatial Decision Support System

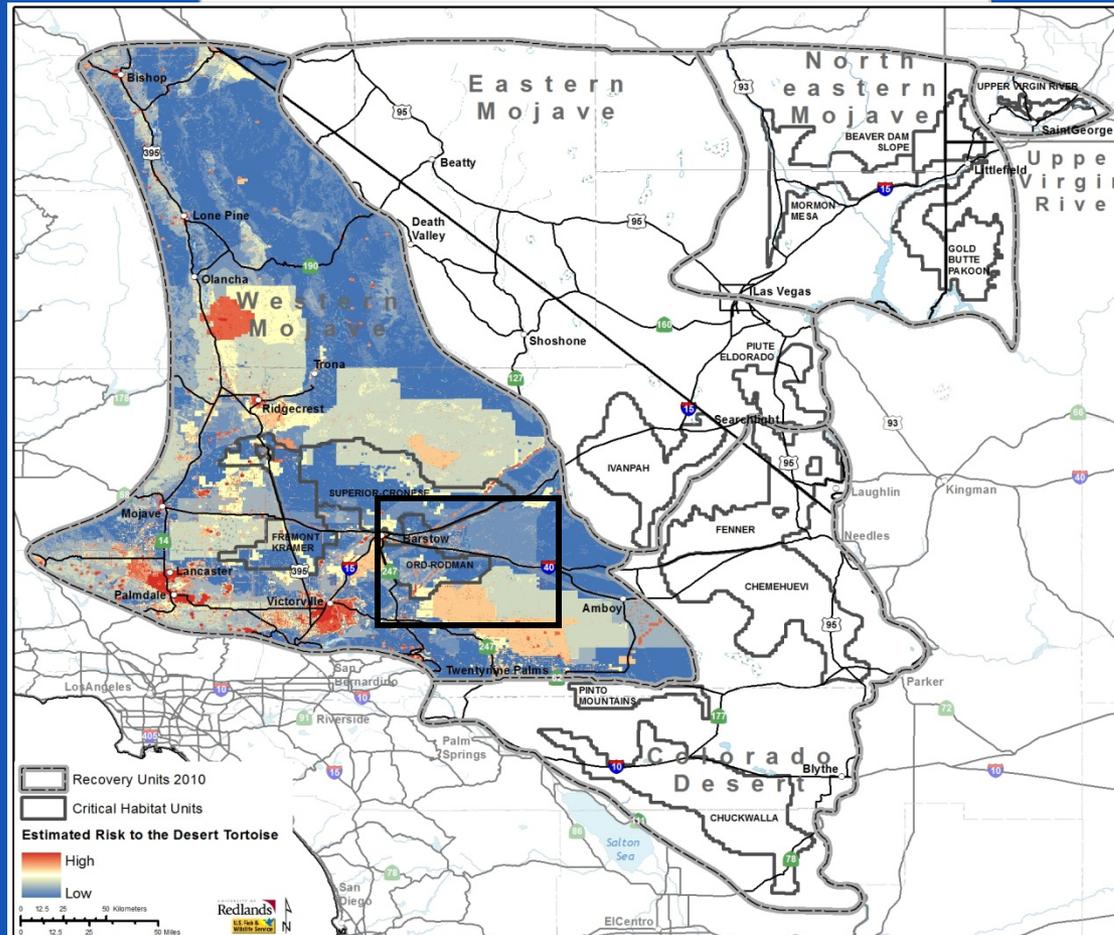
Aggregate Risk to the Tortoise



Tool for Quantifying Solar Development Impacts and Mitigation Needs for the Desert Tortoise

Spatial Decision Support System

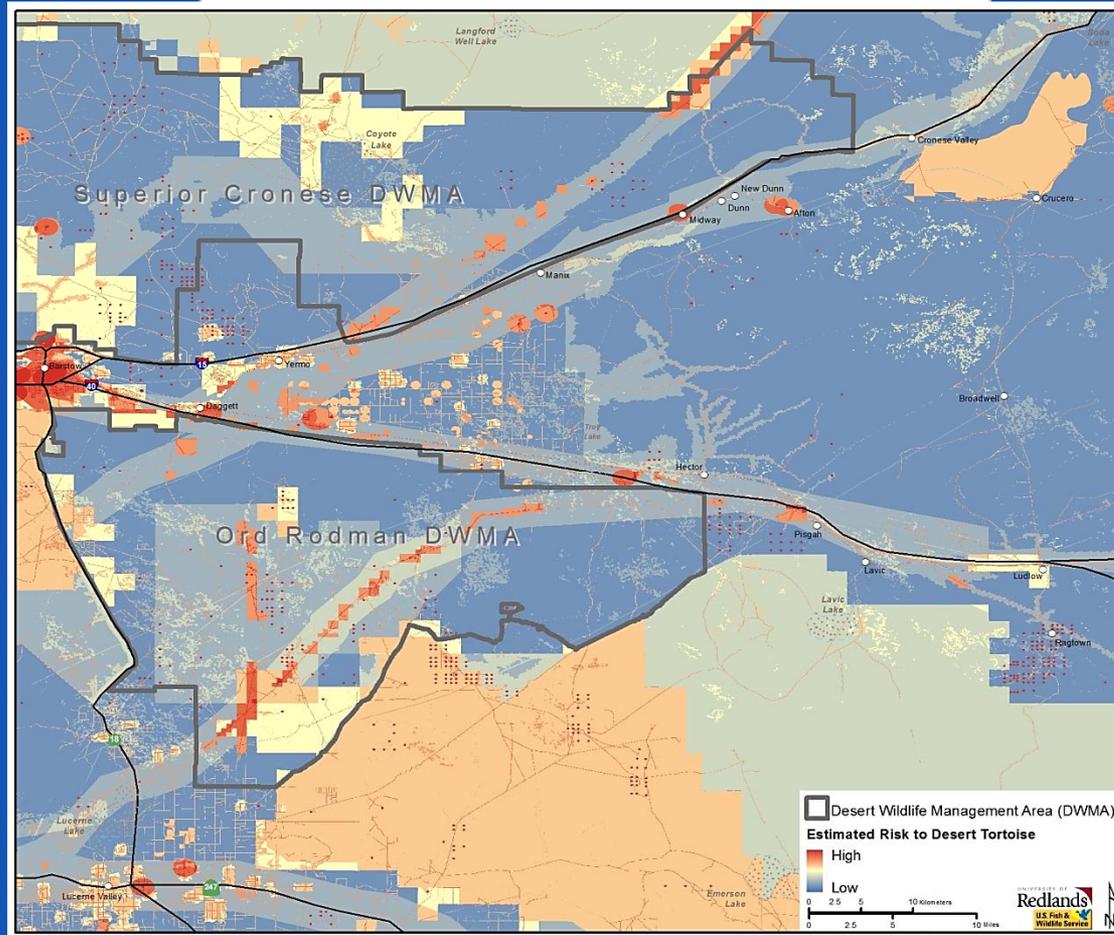
Aggregate Risk to the Tortoise



Tool for Quantifying Solar Development Impacts and Mitigation Needs for the Desert Tortoise

Spatial Decision Support System

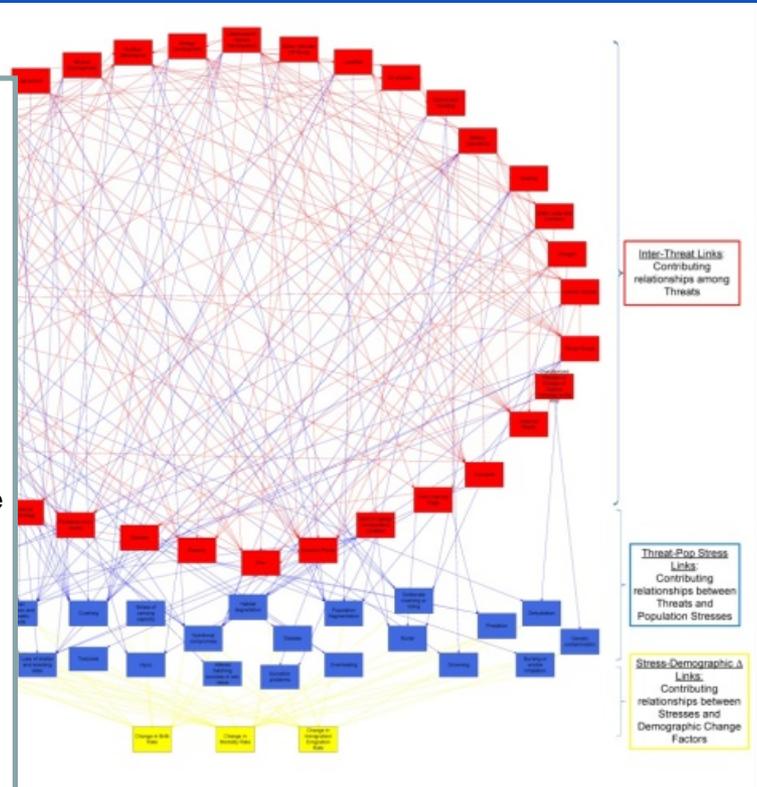
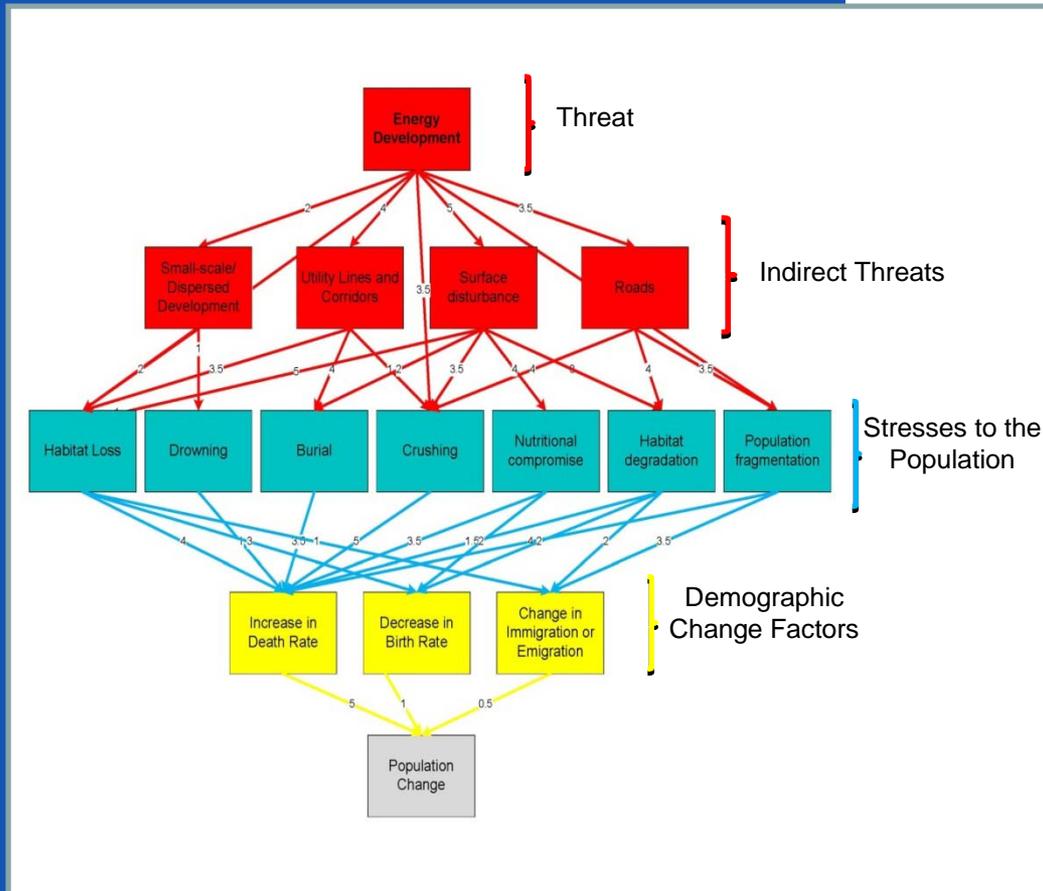
Aggregate Risk to the Tortoise



Tool for Quantifying Solar Development Impacts and Mitigation Needs for the Desert Tortoise



Spatial Decision Support System

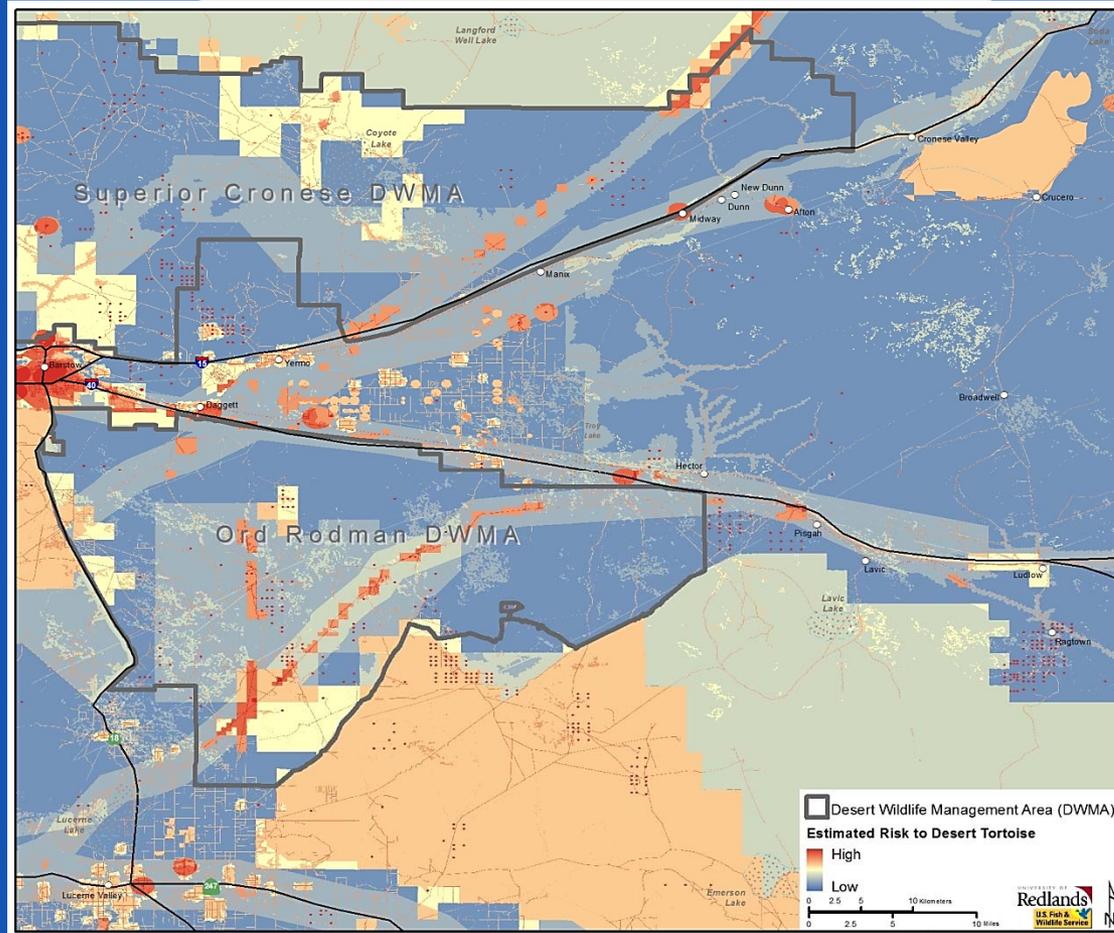


Tool for Quantifying Solar Development Impacts and Mitigation Needs for the Desert Tortoise



Spatial Decision Support System

Aggregate Risk to the Tortoise

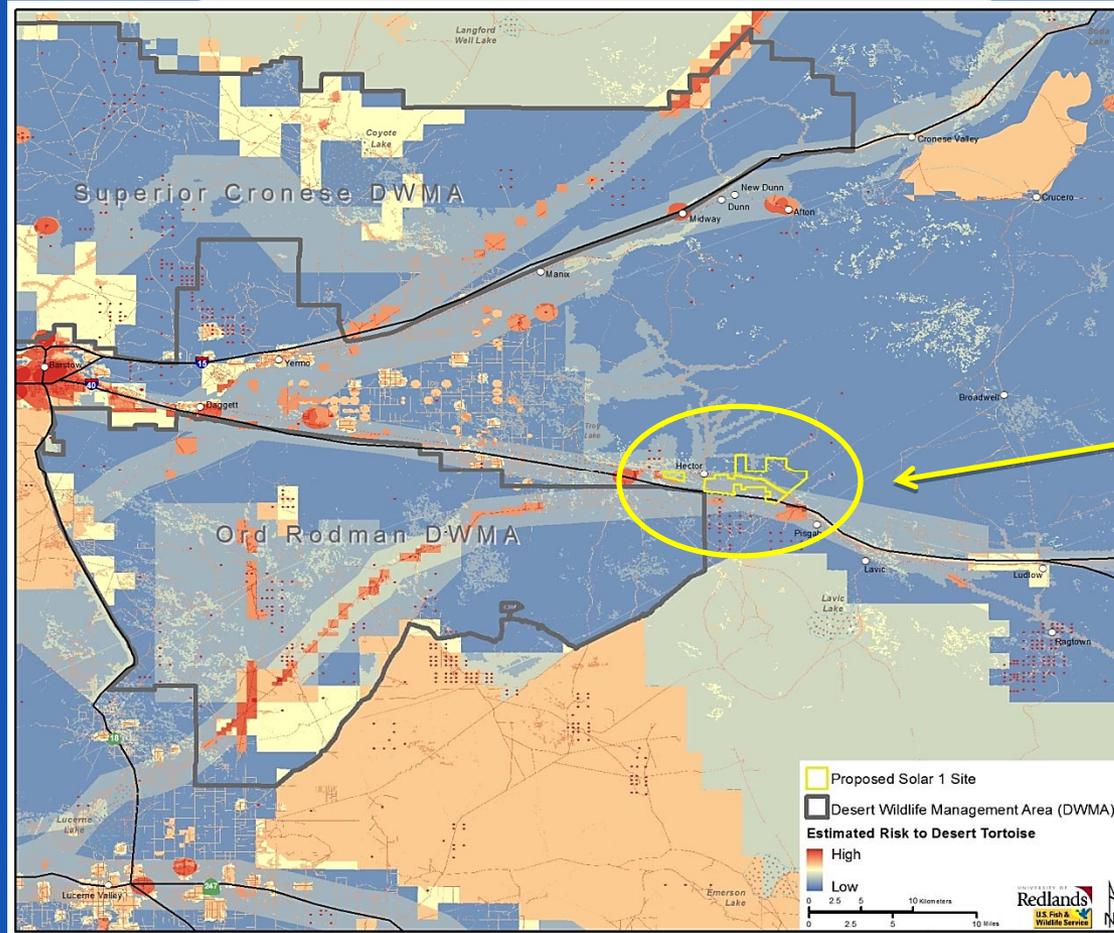


Tool for Quantifying Solar Development Impacts and Mitigation Needs for the Desert Tortoise



Spatial Decision Support System

Aggregate Risk to the Tortoise



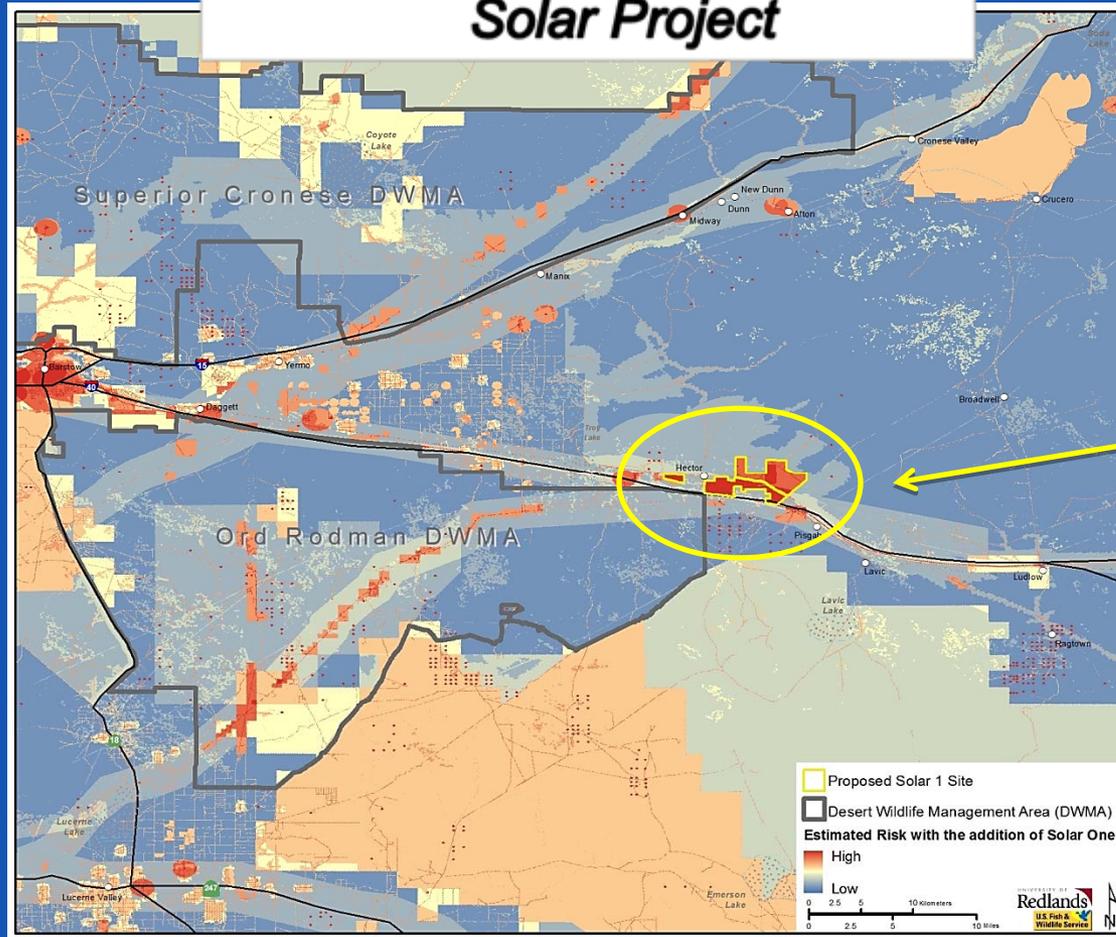
Addition of proposed solar development project

Tool for Quantifying Solar Development Impacts and Mitigation Needs for the Desert Tortoise



Spatial Decision Support System

Increased Risk with Addition of Solar Project

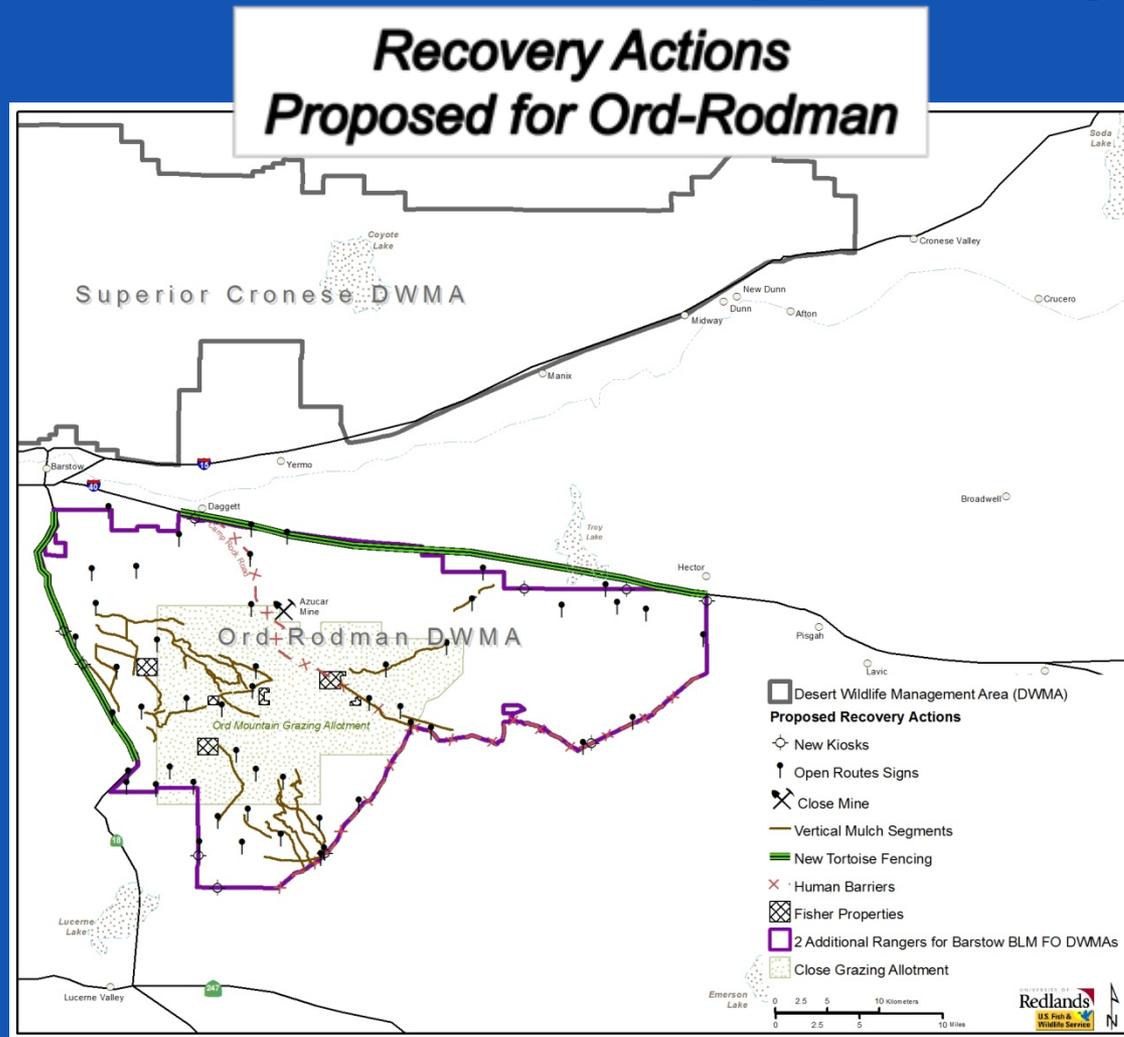


Run model with the addition of proposed solar development project

What if after factoring in solar project, result overall risk is still risk to the threat is not as high as before, off-setting amount?



Spatial Decision Support System



What sets of recovery actions will result in a overall risk to the tortoise in an opposite, off-setting amount?

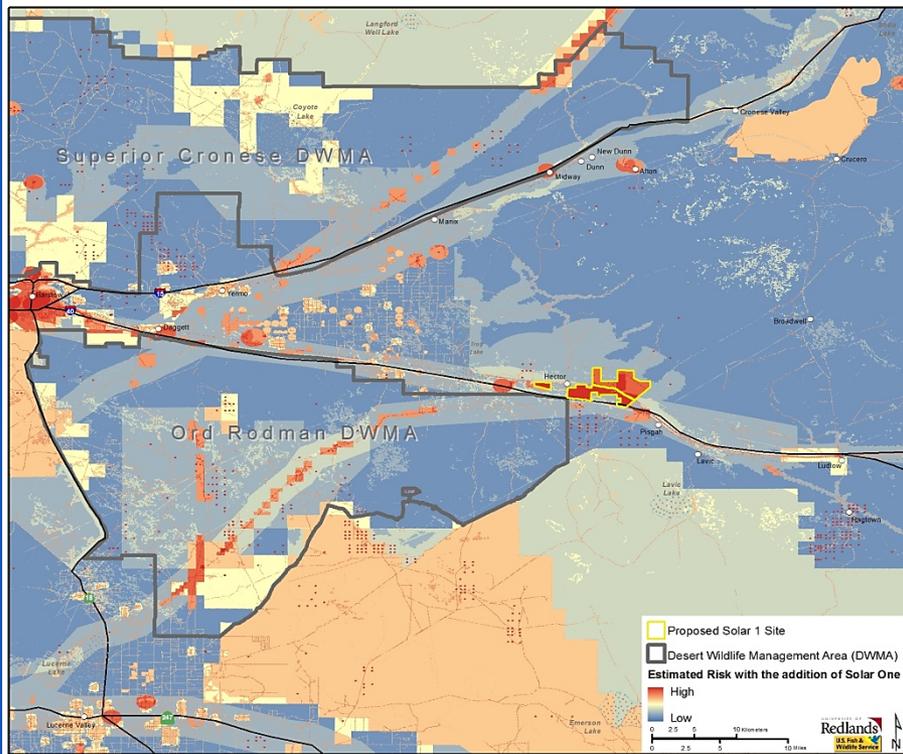
Spatial Decision Support System

Proposed Management Actions	Decreased Risk to the Tortoise
Increase law enforcement (2 rangers in BLM Barstow jurisdiction)	18,000
Remove grazing in Ord Rodman (acquire Fisher properties, ~2500 acres; designate Ord-Mountain allotment as unavailable)	8,200
Install + maintain tortoise fencing	
a. State Route 247 (~20 miles)	2,000
b. Interstate 40 (~25 miles)	4,000
Restoration of 100 miles of closed routes (vertical-mulching)	2,400
Install + maintain human barrier fencing	
b. Camp Rock Road (both sides through DWMA, on DWMA side along DWMA boundary)	1,100
a. south DWMA boundary and Johnson OHV area	600
Install + maintain open route signs	1,300
Install + maintain environmental education kiosks at Ord-Rodman access points	1,000
Mine closure (close Azucar mine)	100
TOTAL	38,700

Change in overall risk is calculated for a suite of actions within a given area, actions can then be prioritized according to total risk reduction

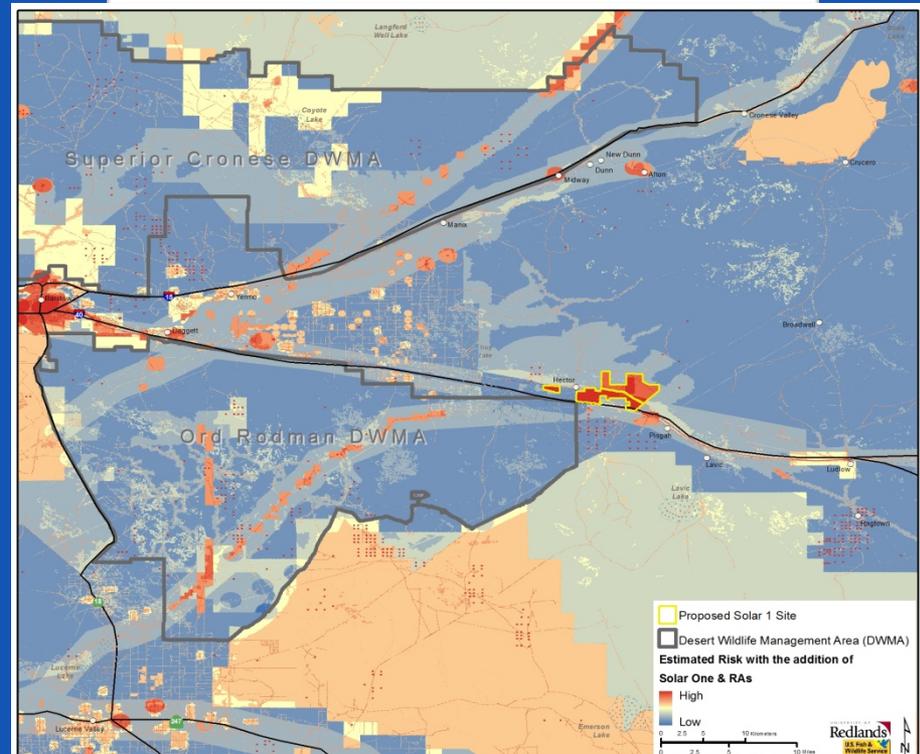
Spatial Decision Support System

***Increased Risk with Addition
of Solar Project***



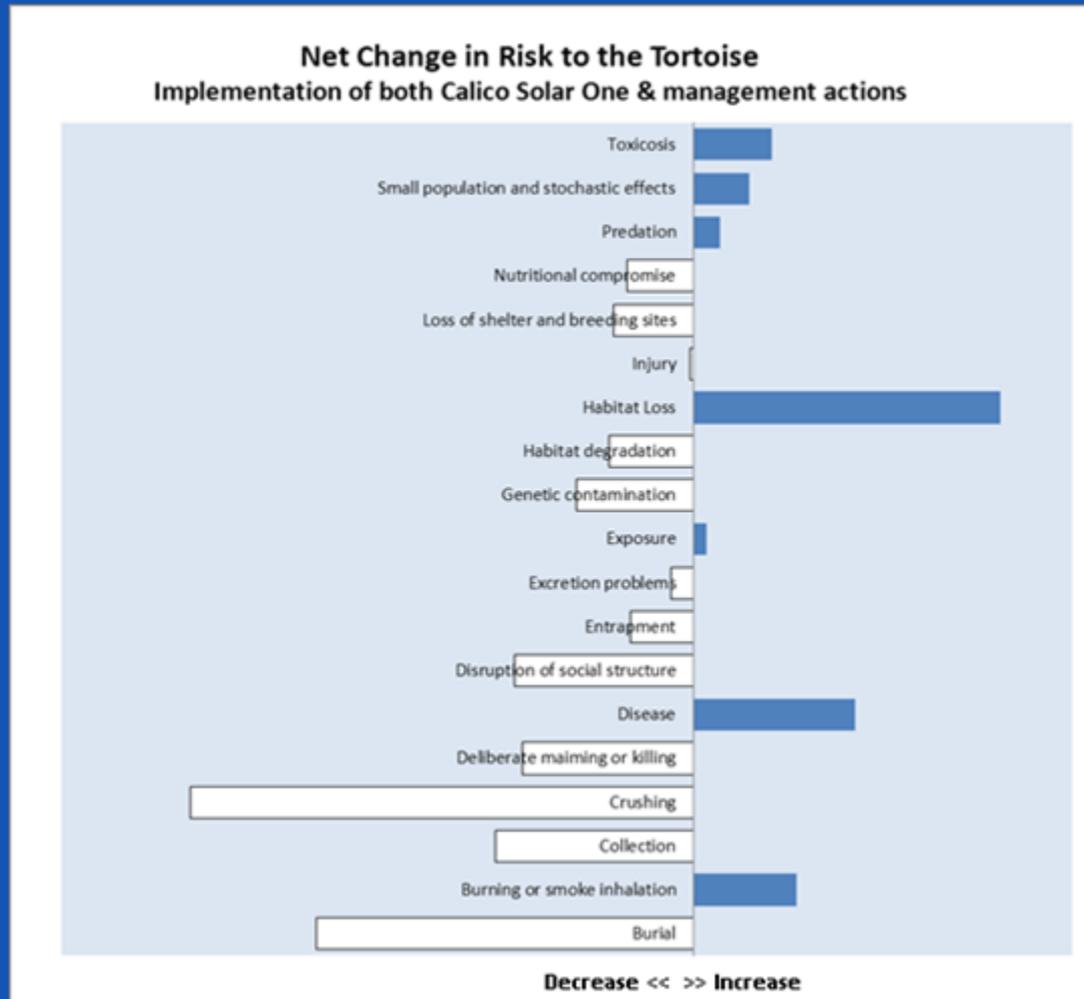
*overall risk to the
tortoise = 21,000*

***Decreased Risk after Completion
of Recovery Actions***



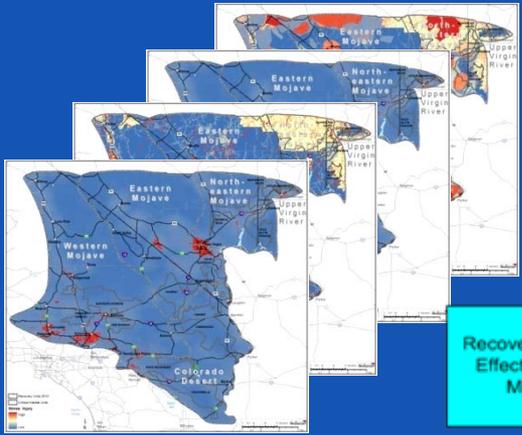
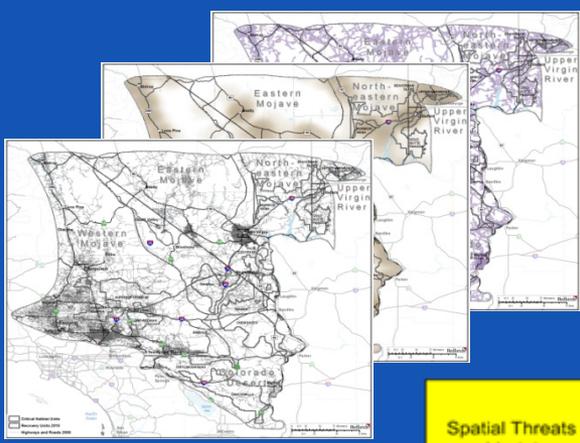
*overall risk to the
tortoise = 38,700*

Spatial Decision Support System



Some stresses are increased, while others are decreased as a result of implementing both the project and the management actions

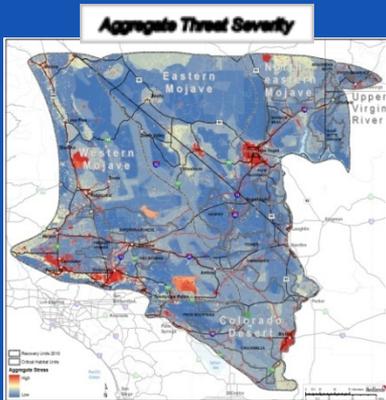
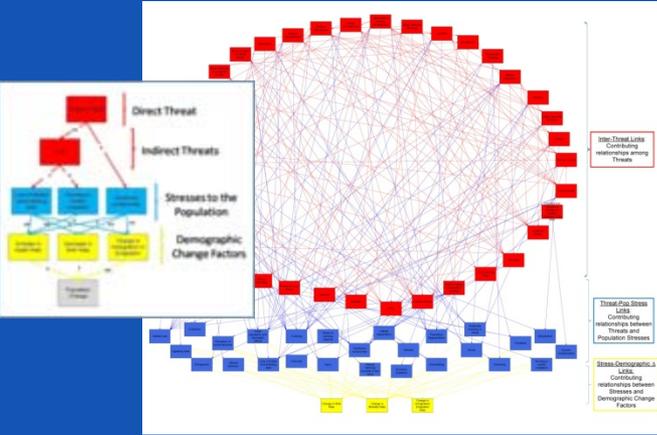
Spatial data processing and management system designed to help the RITs prioritize, track and evaluate recovery efforts



Recovery Action/Threat	Disease	OVH routes	Collection	Cattle Grazing	Air Pollution
Close roads	1	3	2	0	0.5
Connect Functional Habitat	1	0	0	0	0
Environmental Education	2	3	3	0	1
Control Ravens	0	0	0	0	0
Fence Roads	0	0	3	0	0
Increase law enforcement	0	3	3	0	0
Revegetation	0	3	0	0	1



Upper Virgin River Recovery Unit		
Action	Δ overall threat	Rank
Increase law enforcement	6.60	1
Close-roads	5.32	2
Environmental education	4.58	3
Control ravens	2.23	4
Connect functional habitat	1.54	5
Conduct revegetation	0.07	6



Post-action Aggregate Risk Model (for each action)



Partnerships

California Mojave RIT: Workgroups

