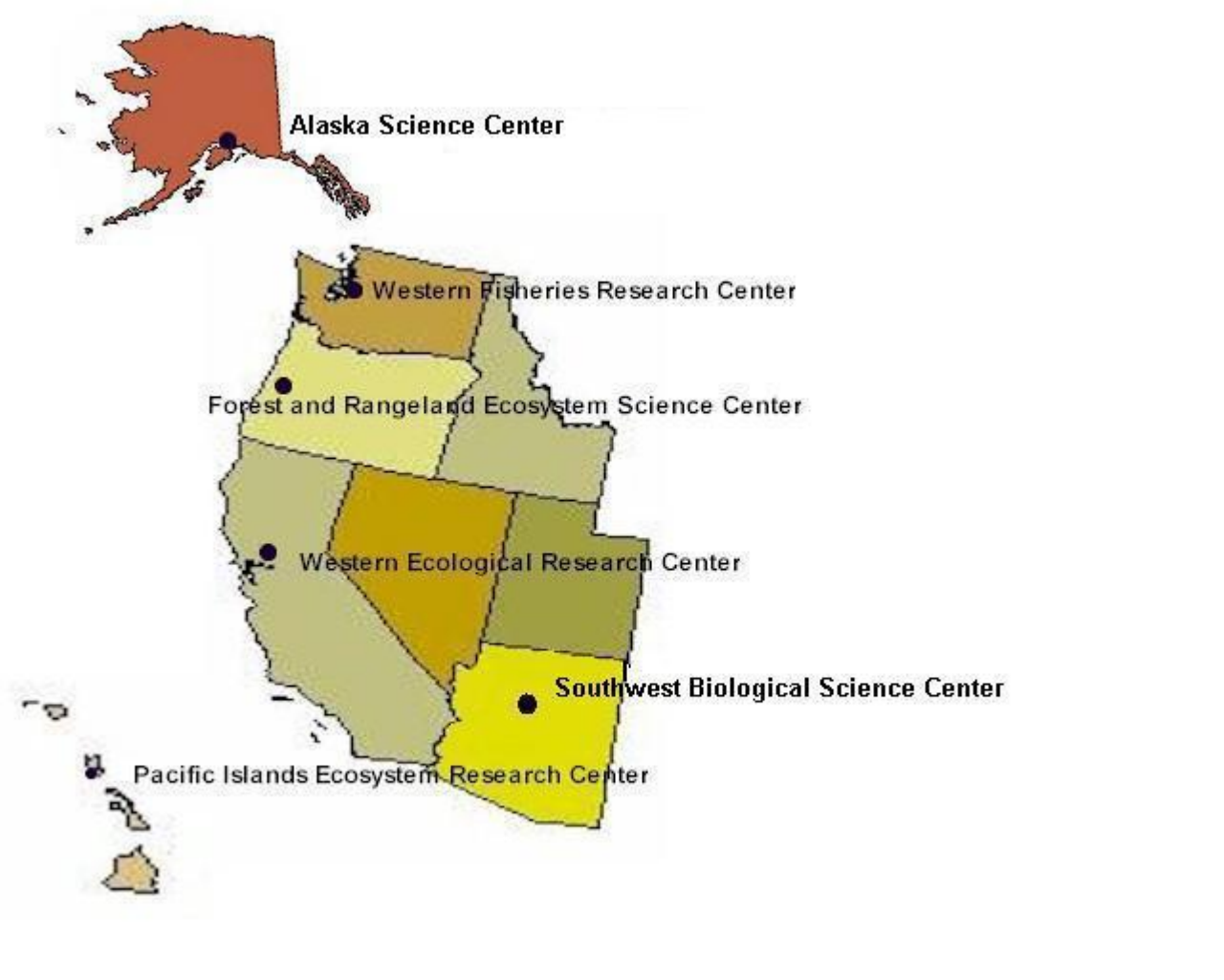
U.S. Geological Survey

Western Ecological Research Center

USGS
science for a changing world

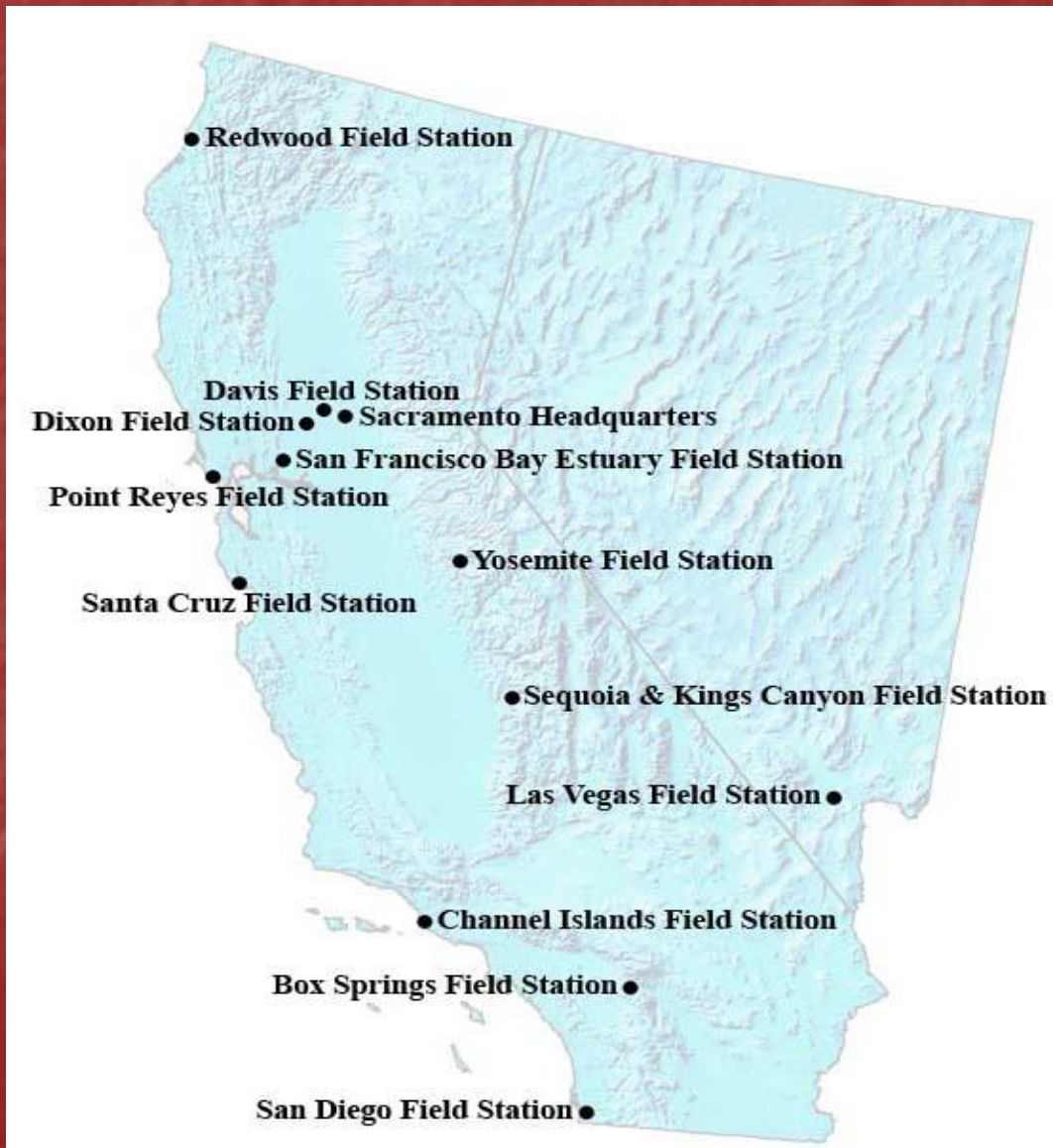
Western Region Science Centers



USGS
science for a changing world

WERC Field Stations

- Headquarters in Sacramento
- 12 Field stations
- ~190 employees



USGS
science for a changing world

San Diego Field Station

- Co-located with WRD
- Research areas:
  - Habitat Conservation Planning
    - covered species monitoring and reserve design
  - Endangered neotropical migrants
  - Conservation genetics

USGS
science for a changing world

WERC's Expertise

ZOOLOGY
- reptiles, amphibians, waterfowl, seabirds, ungulates, large carnivores, marine mammals

BOTANY
- plant ecology
- habitat restoration
- invasive species

METHODOLOGY
- habitat modeling
- monitoring protocols
- radio and satellite telemetry
- GIS

ECOLOGICAL DYNAMICS
- fire
- disease
- global change

CONSERVATION
- T&E species
- recovery monitoring
- reserve design
- genetics

HUMAN EFFECTS
- contaminants
- urbanization/recreational use
- habitat fragmentation
- erosion/sediment transport

USGS
science for a changing world

HPAI Asian H5N1

- Since 1959 there have been 24 major HPAI outbreaks
- All except H5N1 have been controlled by “stamping out”
- 23 million head of poultry involved
- 400 human cases, 1 death

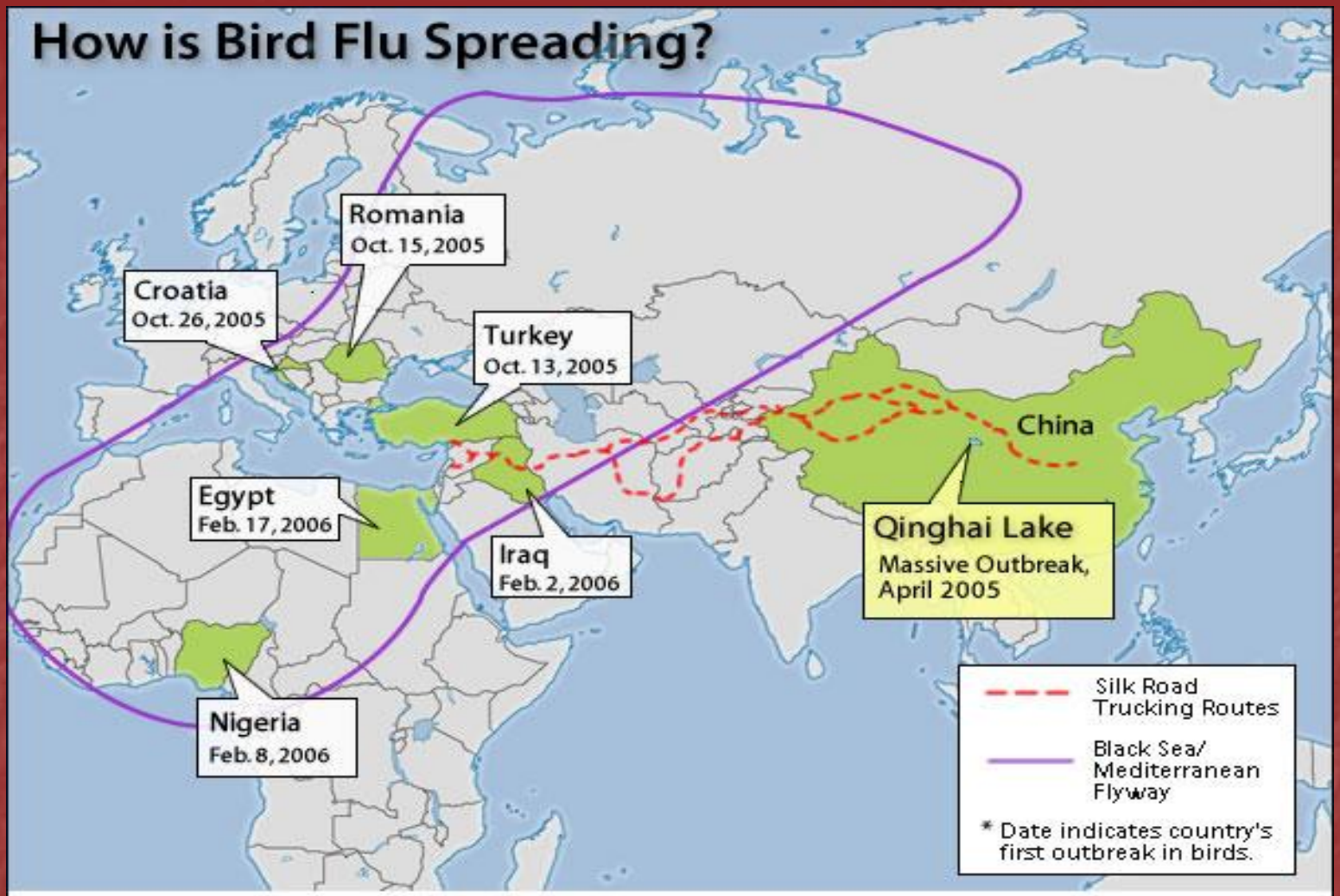
- Since 1999, > 250 million birds have died or been culled in an attempt to control H5N1
- 261 human cases, 157 deaths

ZonaEuropa

USGS Science Support

- Surveillance design
- Virological testing expertise (National Wildlife Health Center, Madison)
- Delineation of wild bird populations
- Ongoing efforts to capture and sample wild birds (shorebirds, ducks, geese, swans, seabirds)
- Local, state and international research on migratory birds

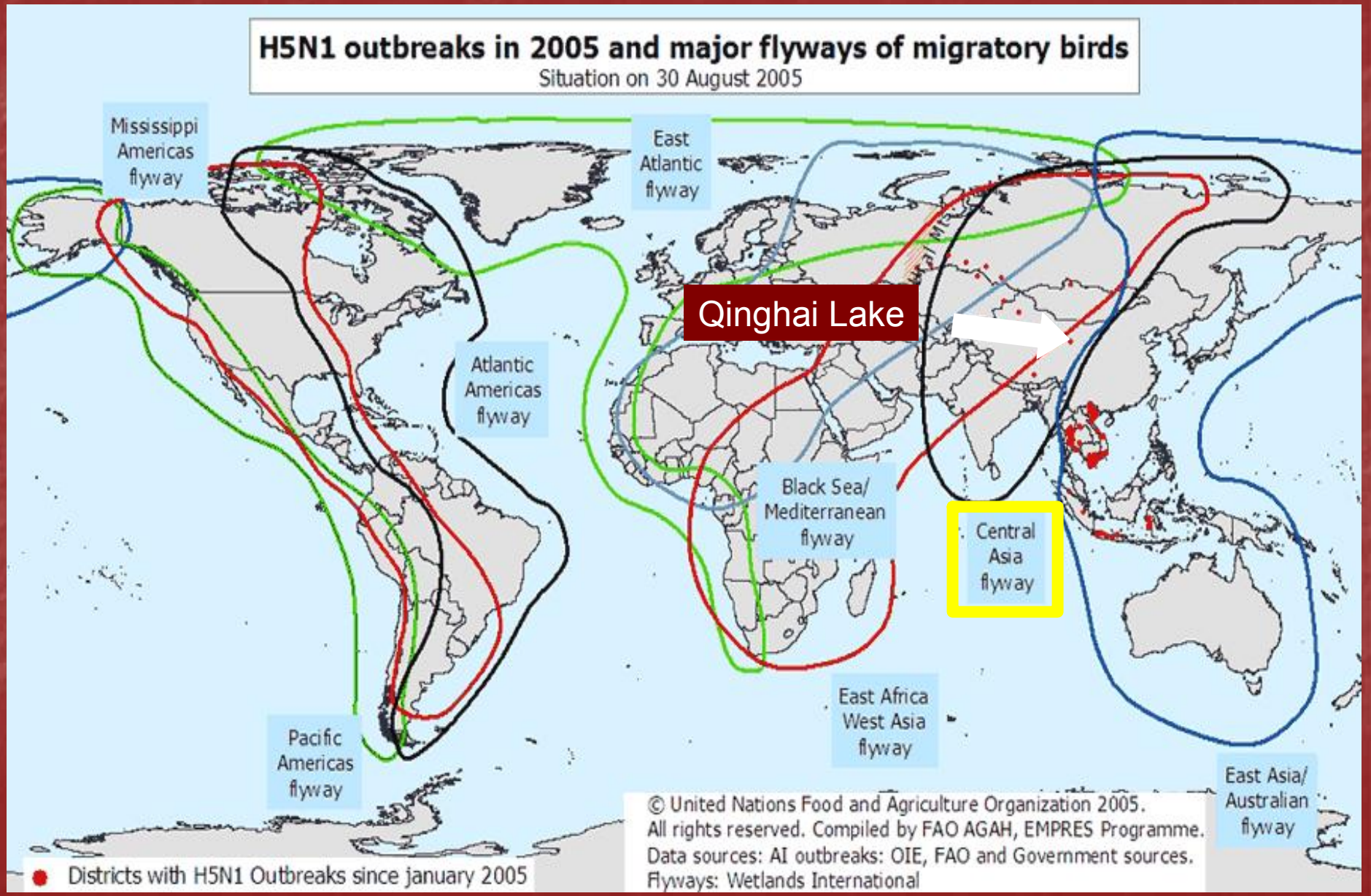
Can migratory birds carry the high pathogenic form of the H5N1 virus along migratory pathways?

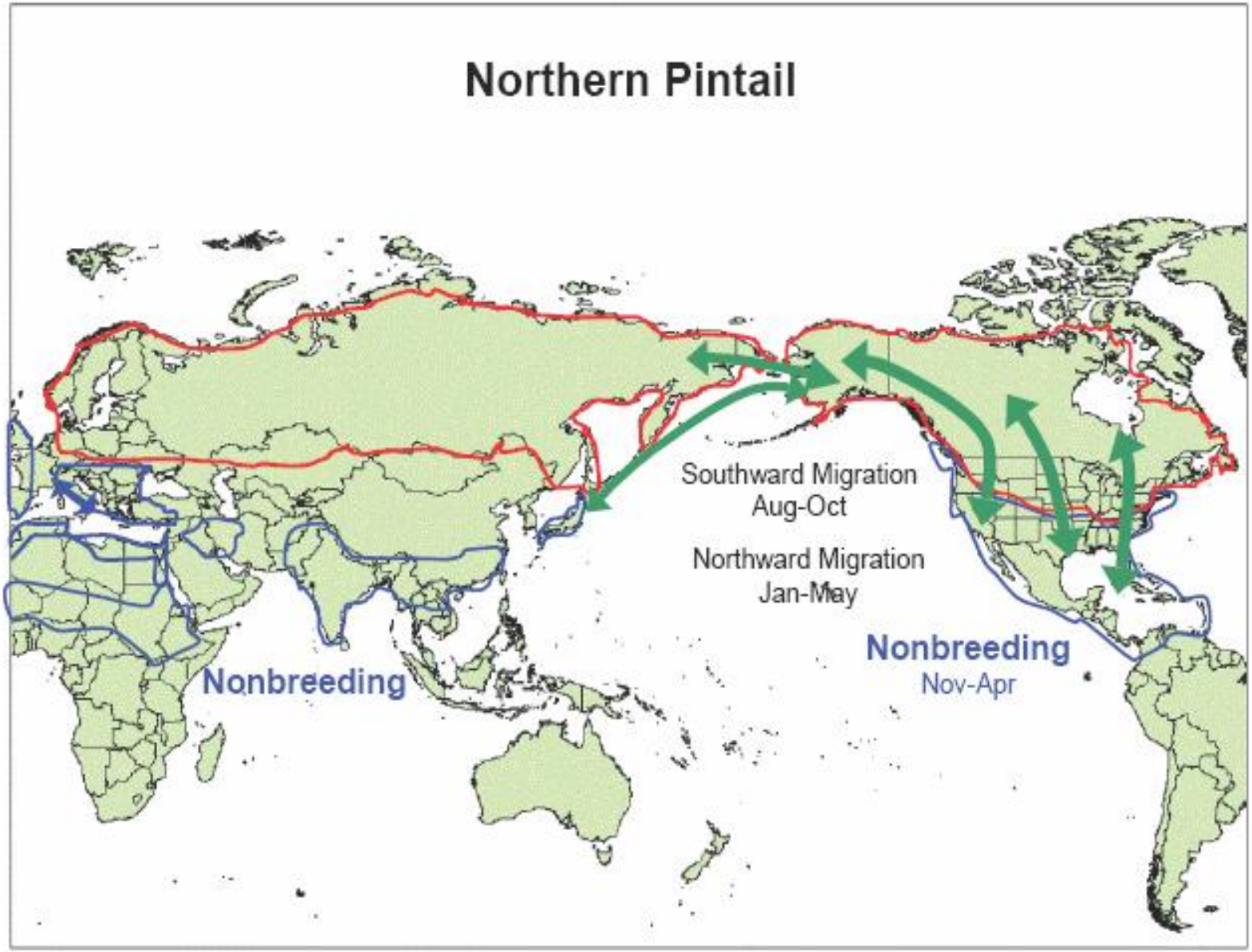


The virus responsible for a massive outbreak of bird flu at a Chinese lake in 2005 has the same genetic signature as the virus that caused outbreaks in Turkey, Croatia and Nigeria more than six months later. Some scientists say this and other genetic data point to migratory birds traveling along the Black Sea flyway as the culprit behind the disease's spread. Some bird experts disagree; they suggest a thriving black-market in asymptomatic birds as well as legal trade along Silk Road trucking routes might be responsible.

Source: FAO/WHO/WCS

Qinghai Lake – intersection of three flyways




Northern Pintail
Southward Migration
Aug-Oct
Northward Migration
Jan-May
Nonbreeding
Nonbreeding
Nov-Apr

Areas of Research Focus

Global change

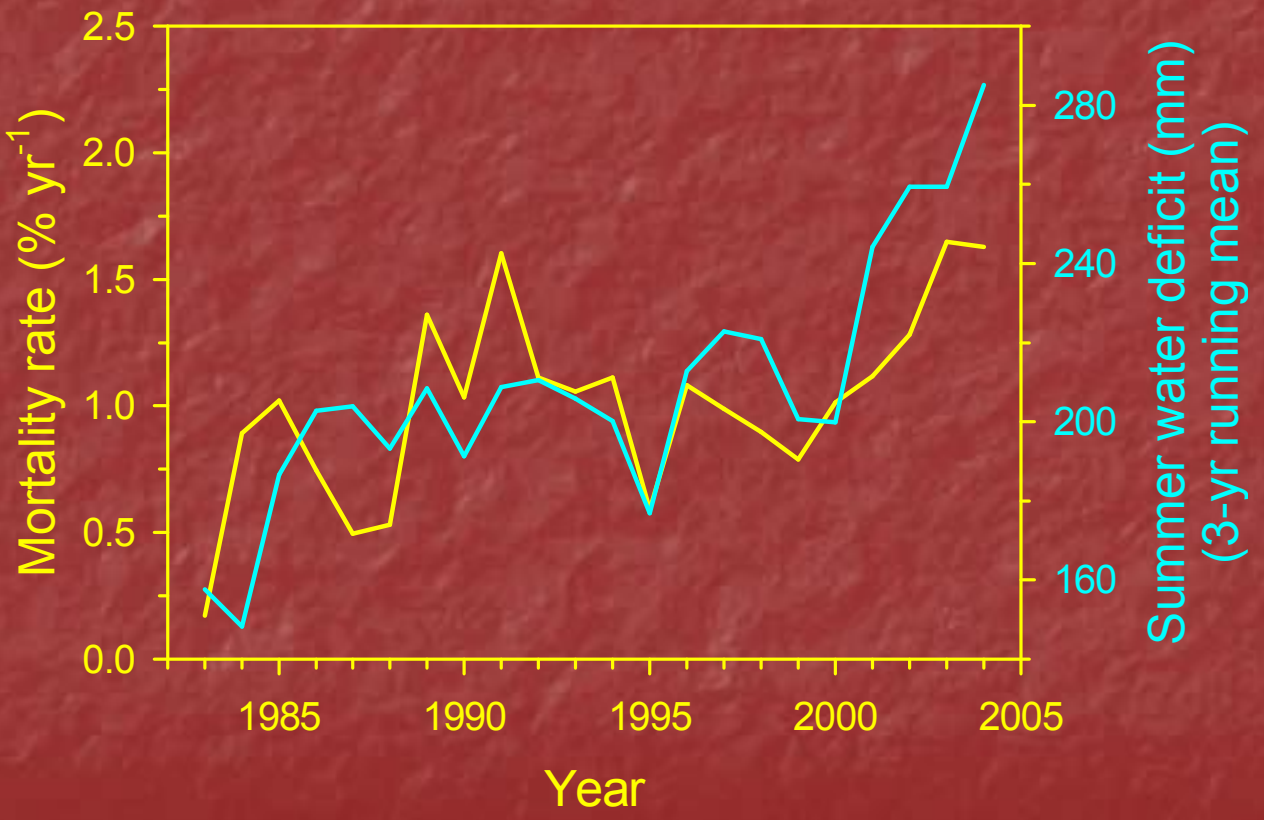
USGS
science for a changing world

Tree mortality rate is increasing in the Sierra Nevada

Photo: N. Stephenson

USGS

- Summer drought (water deficit) is increasing, due to increasing temperature (*not* decreasing precipitation).
- Increasing tree mortality rates are being driven by increasing deaths due to insects, pathogens, and stress.



van Mantgem & Stephenson, *submitted*

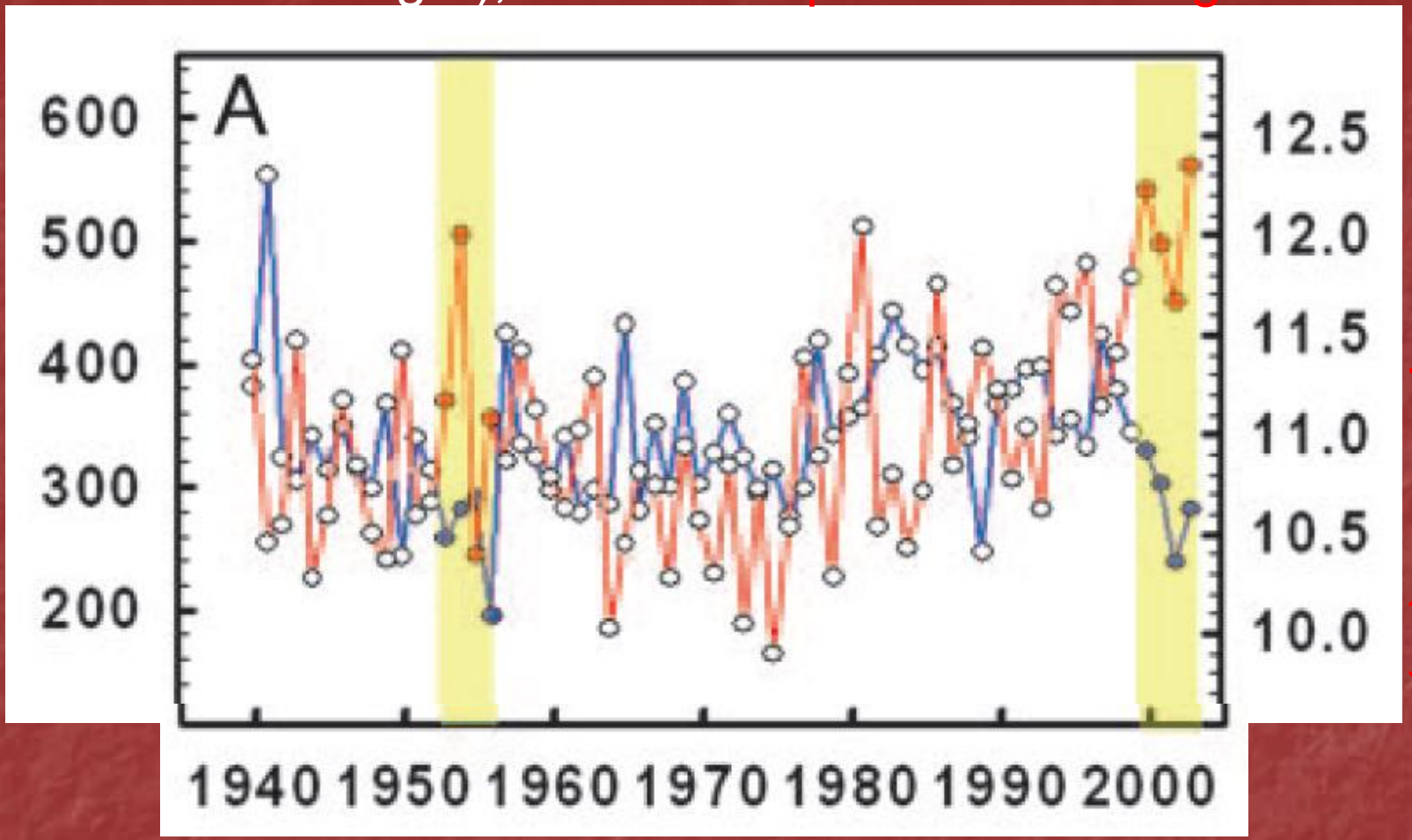
USGS

A recent example of a threshold response:
The massive pinyon pine die-off in the Southwest

Credit: Craig Allen & NSF

USGS

The drought was not exceptional (it was wetter than the 1950s drought), but the temperature was higher



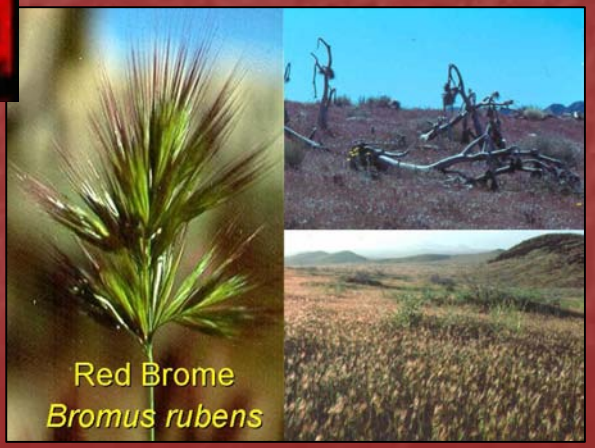
Breshears *et al.* 2005, *PNAS*

Areas of Research Focus

Forest

Chaparral

Desert/Great Basin



WILDFIRE

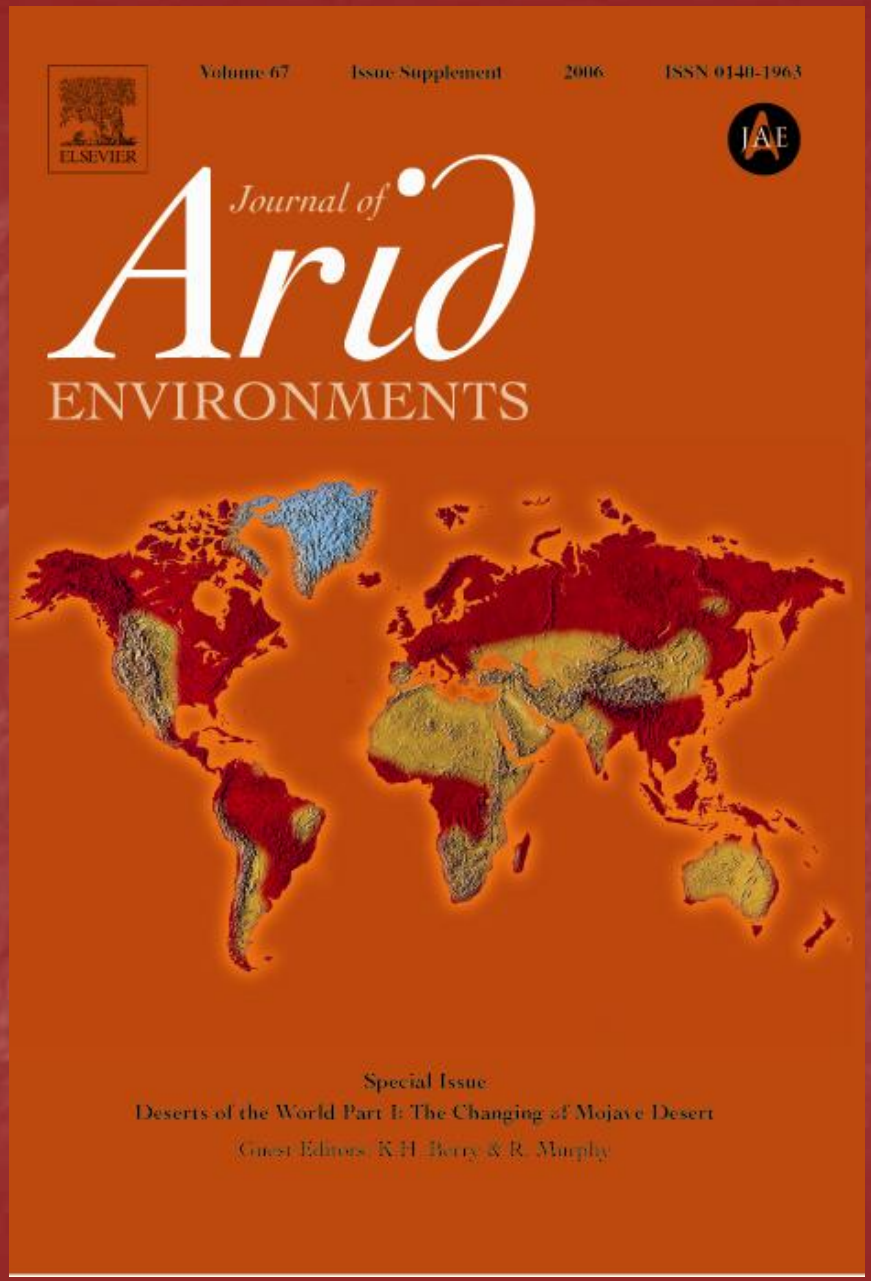
USGS
science for a changing world

Desert Research Update
January 2007

Western Ecological Research Center

USGS
science for a changing world

Special Issue of *Journal of Arid Environments*



First in Desert Series: The Changing Mojave Desert

Major Desert Research Areas

- Desert Tortoises
- Other Species of Concern
- Habitat
- Contaminants

- Technical assistance

USGS
science for a changing world

DT Research Areas

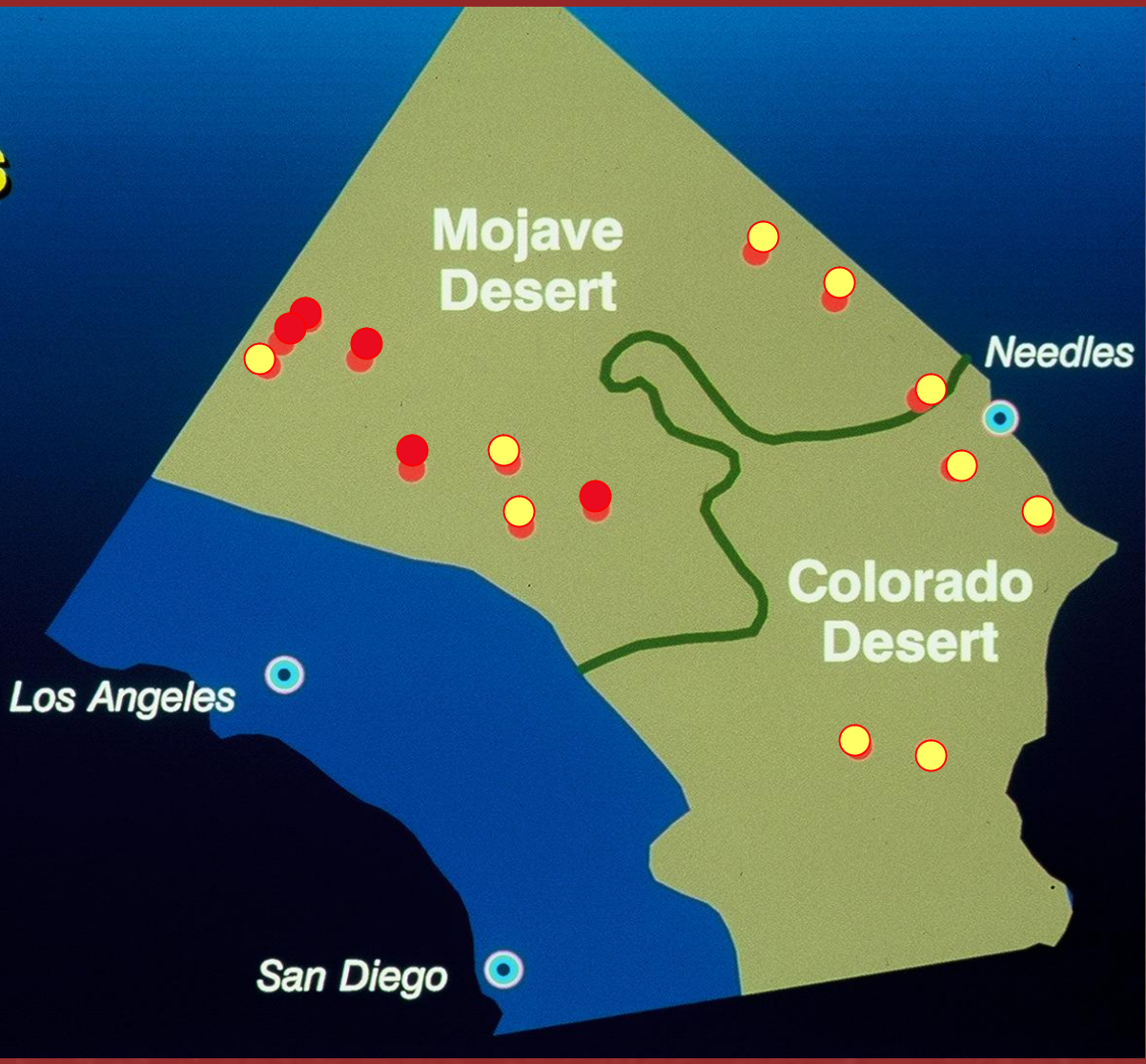
- Population attributes, status & trends
- Habitat studies
- Anthropogenic effects
- Health and disease

USGS
science for a changing world

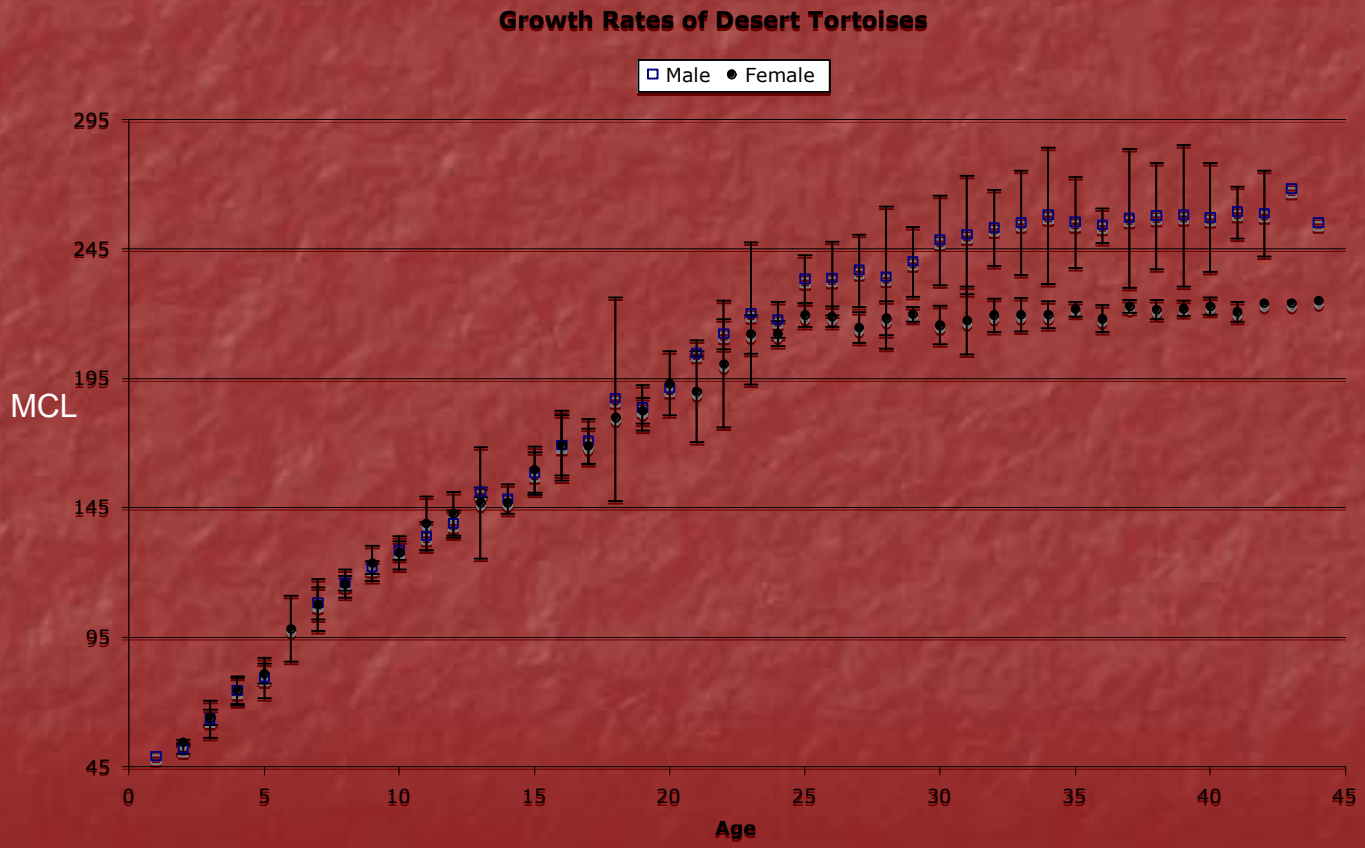
Long-Term Study Sites

- FY 2007/08 –

  Fremont Valley,
  Fremont Peak,
  Johnson Valley,
  Kramer Hills



Long-term growth of desert tortoises – Nevada Test Site



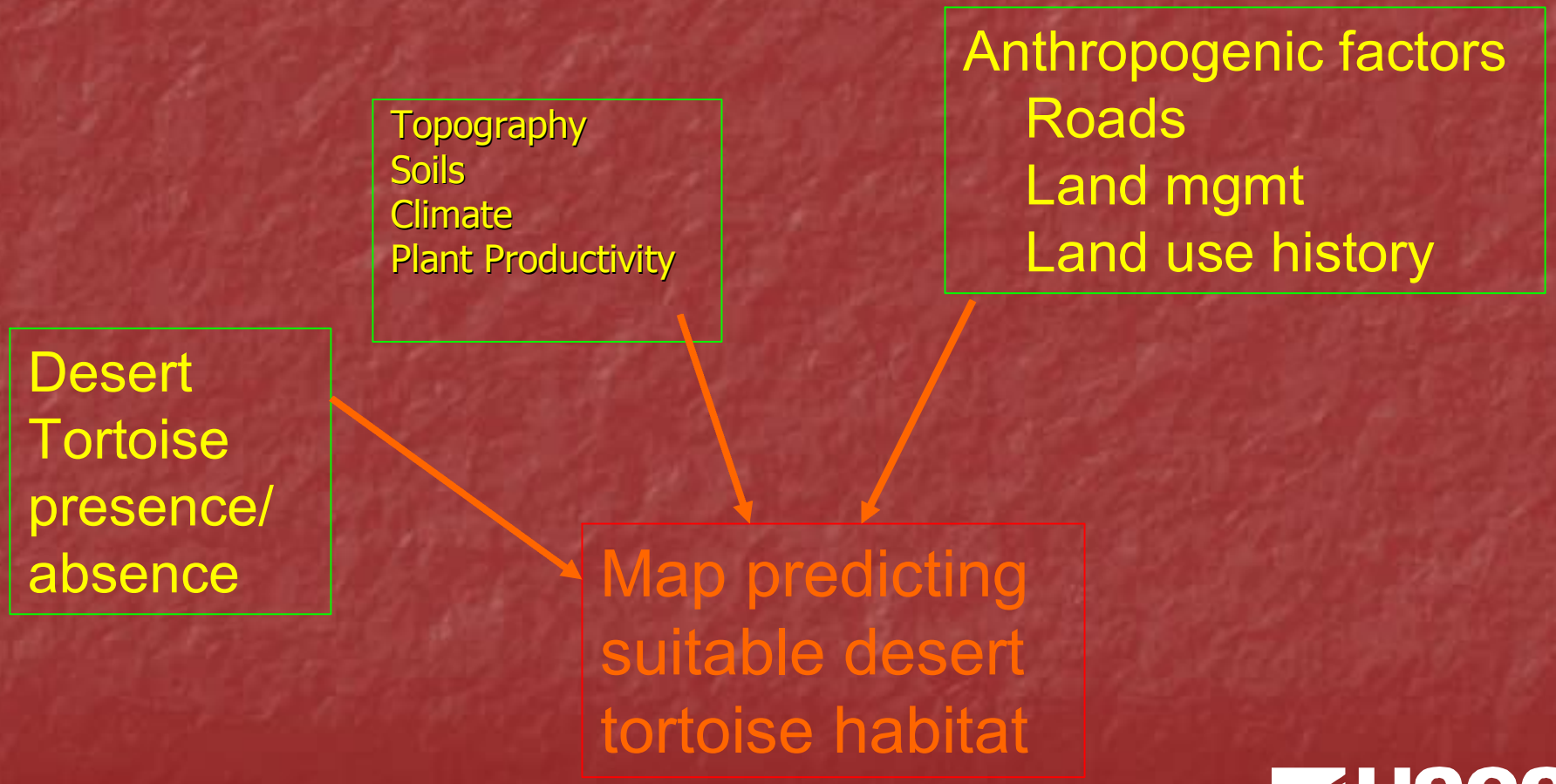
USGS
science for a changing world

Finding Tortoises

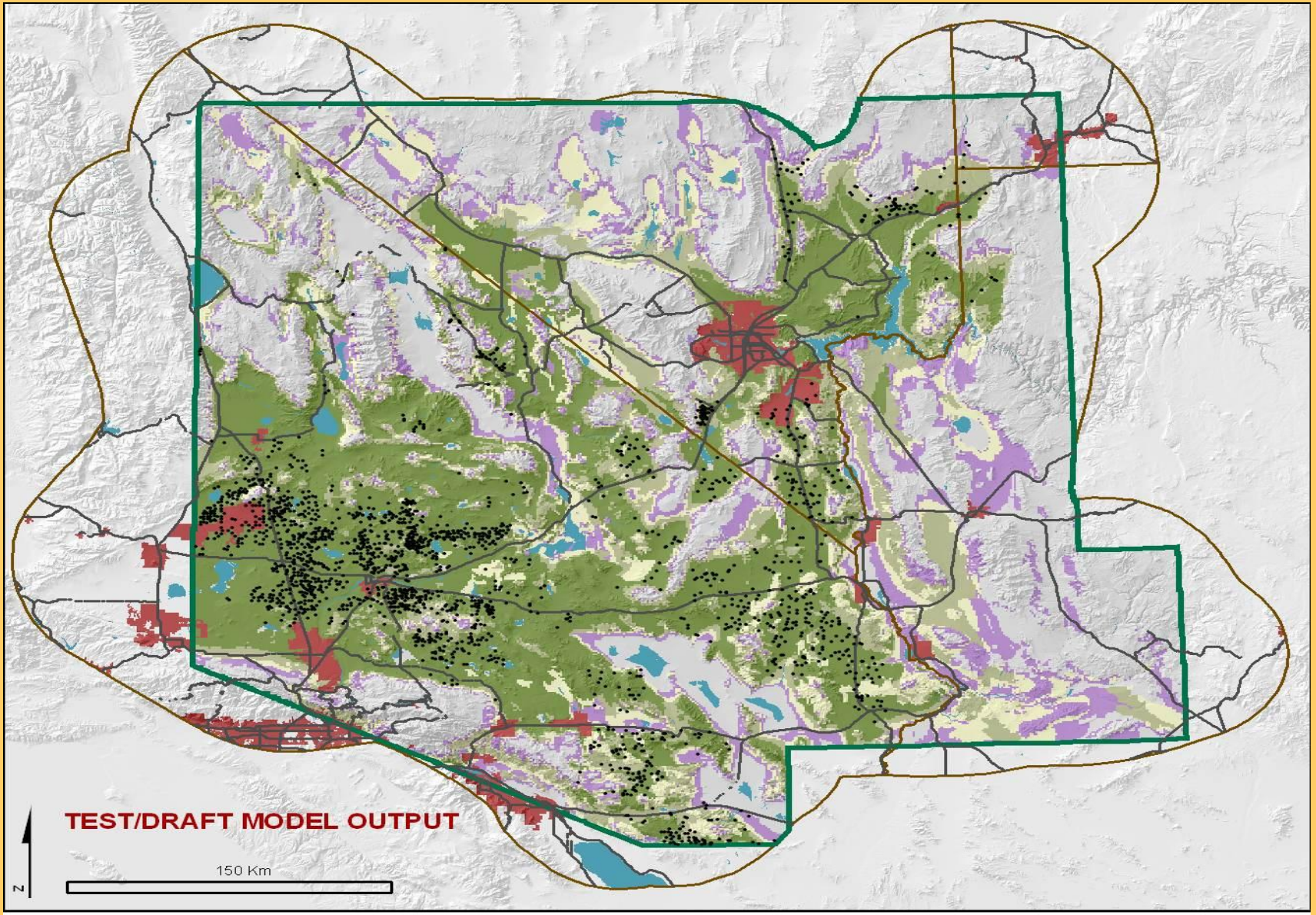
DT Research Areas

- Population attributes, status & trends
- Habitat studies
- Anthropogenic effects
- Health and disease

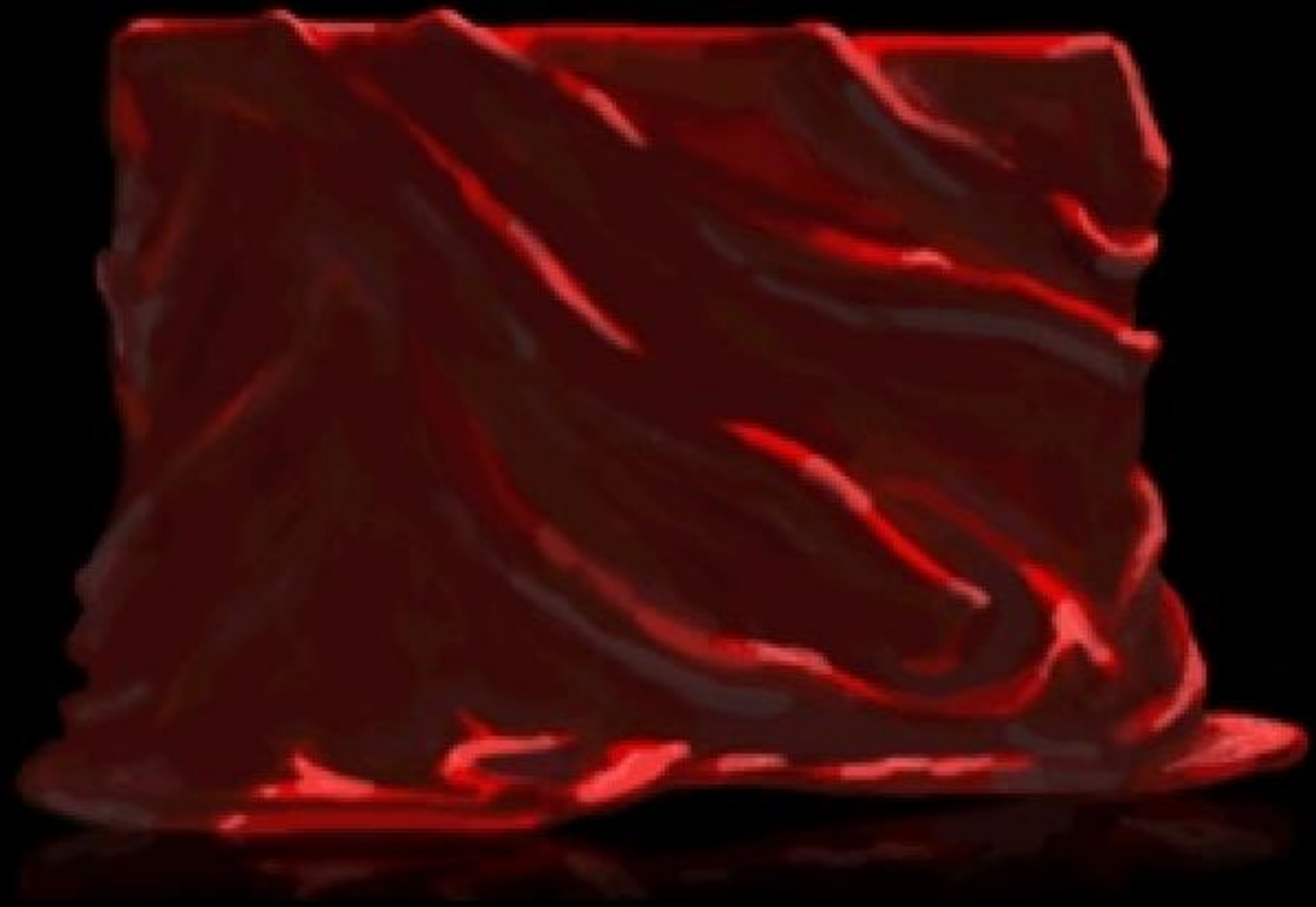
Modeling Desert Tortoise Habitat



USGS
science for a changing world

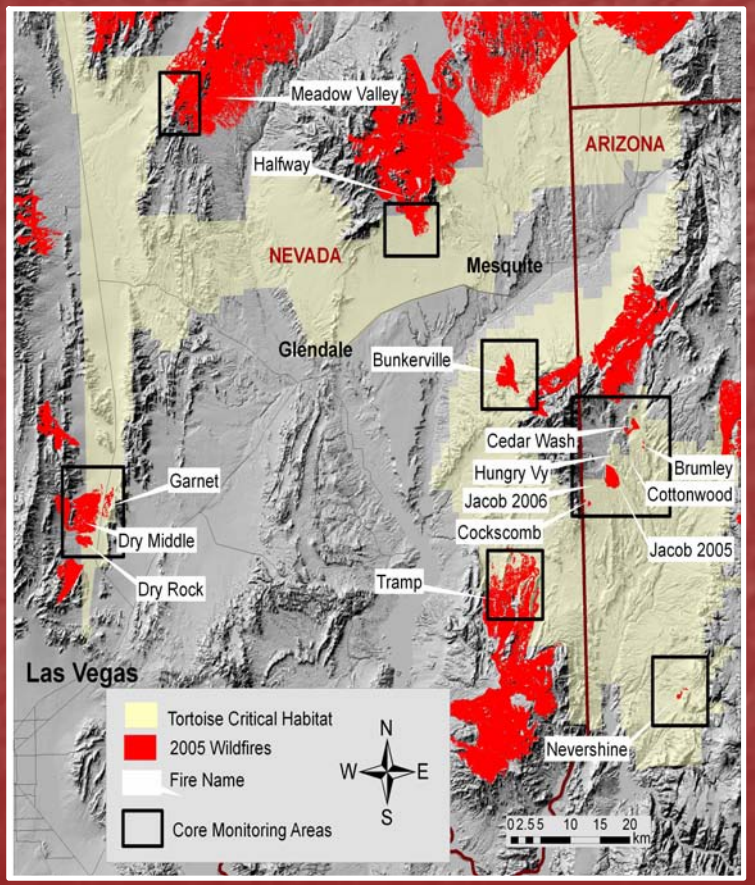

TEST/DRAFT MODEL OUTPUT
150 Km
N
No. of models predicting habitat
0
1 - 3
4 - 6
7 - 9
10
Major roads
Study area A
Mojave Ecosystem + state boundaries
Lakes and playas
Cities and towns
Tortoise occurrence data
All available environmental data used.
LDS, BLM TCS, and Death Valley
occurrence data used.

Tortoise Habitat Model

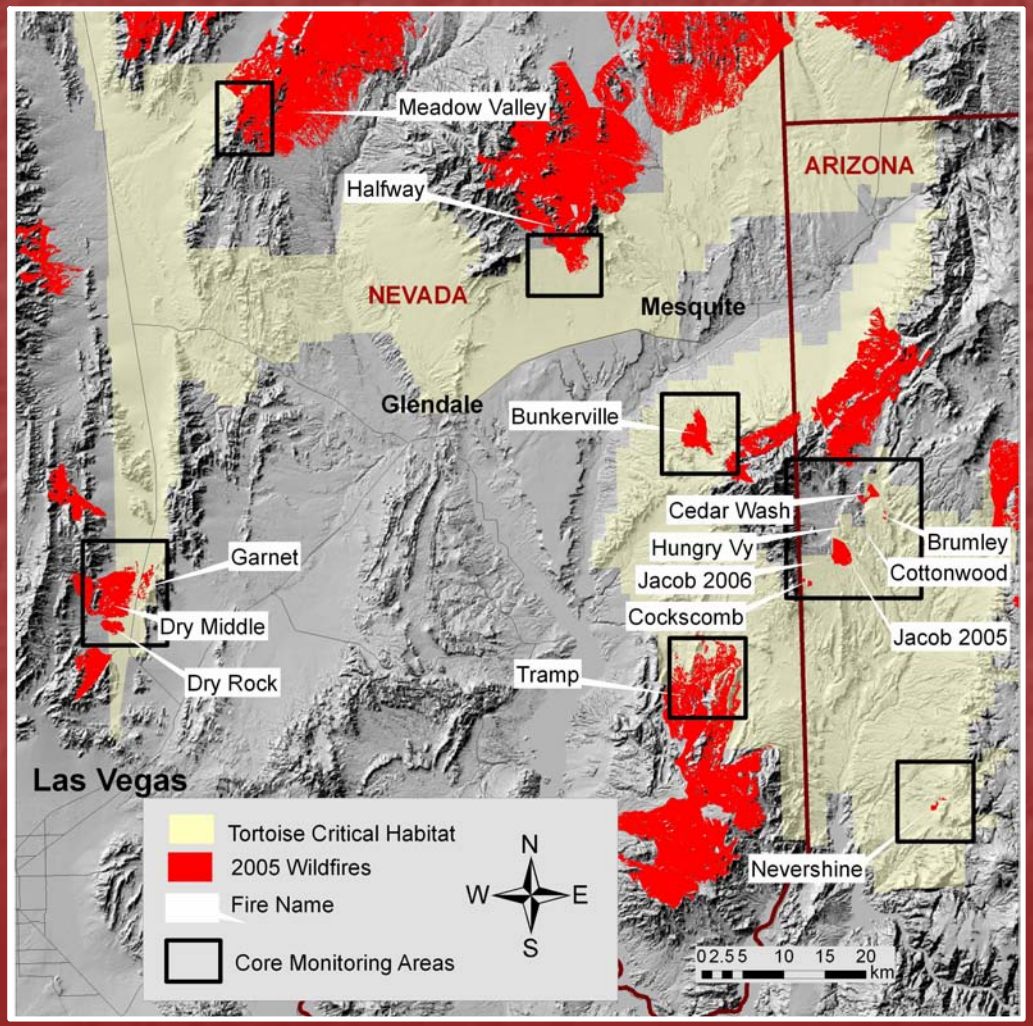


The USGS will be unveiling a new habitat model for the Mojave Desert Tortoise soon!

Effects of Fire on Desert Tortoises and Their Habitat



Seeding of Burned Desert Tortoise Habitat
Long-term Monitoring



- Monitoring will evaluate success of seeding burned habitat with native species
- Monitoring sites represent a range of rainfall and soil types

Seeding of Burned Desert Tortoise Habitat

Mechanistic Research

Field experiments

- Determine relative impacts of rainfall, granivores and alien annual plants on seeding success
- Determine if seeding in combination with soil surface mixing helps bury seeds intended for re-vegetation so that granivores cannot remove them
- Determine whether vegetative structure lost in fires can be artificially added to encourage restoration of fertile islands as well as encourage natural seed dispersal by small mammals

Desert Tortoise Response to Fire and Habitat Restoration

Using radio telemetry

Funding needed!!!!

DT Research Areas

- Population attributes, status & trends
- Habitat studies
- Anthropogenic effects
- Health and disease

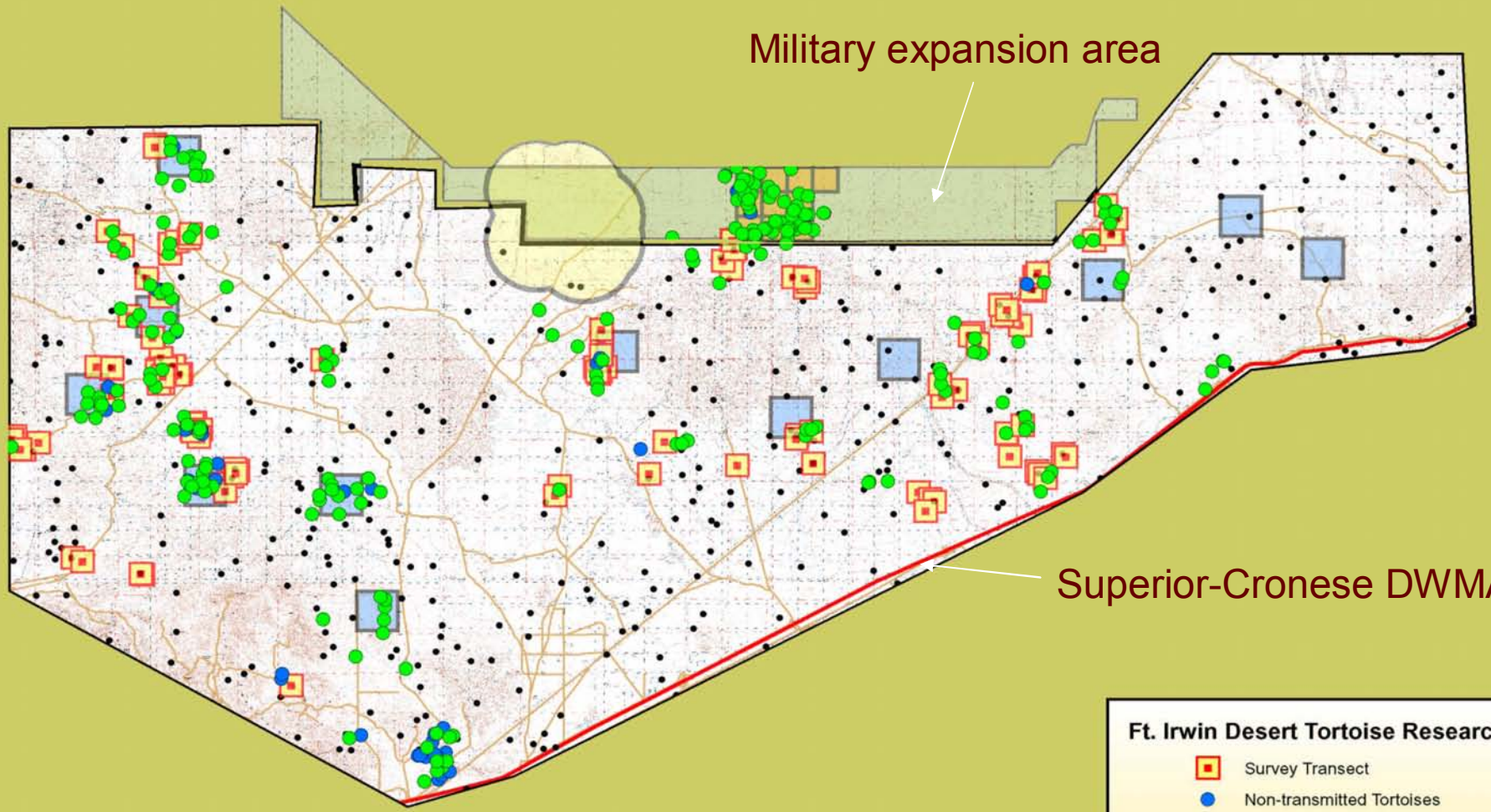
USGS
science for a changing world

The Stress of Translocation on Desert Tortoises

An estimated 600-800 desert tortoises will be translocated from Fort Irwin to the Superior Cronese DWMA

USGS

Fort Irwin Translocation Research



Domestic Dog Attacks on DT

Preliminary Results:

30 study sites in CA

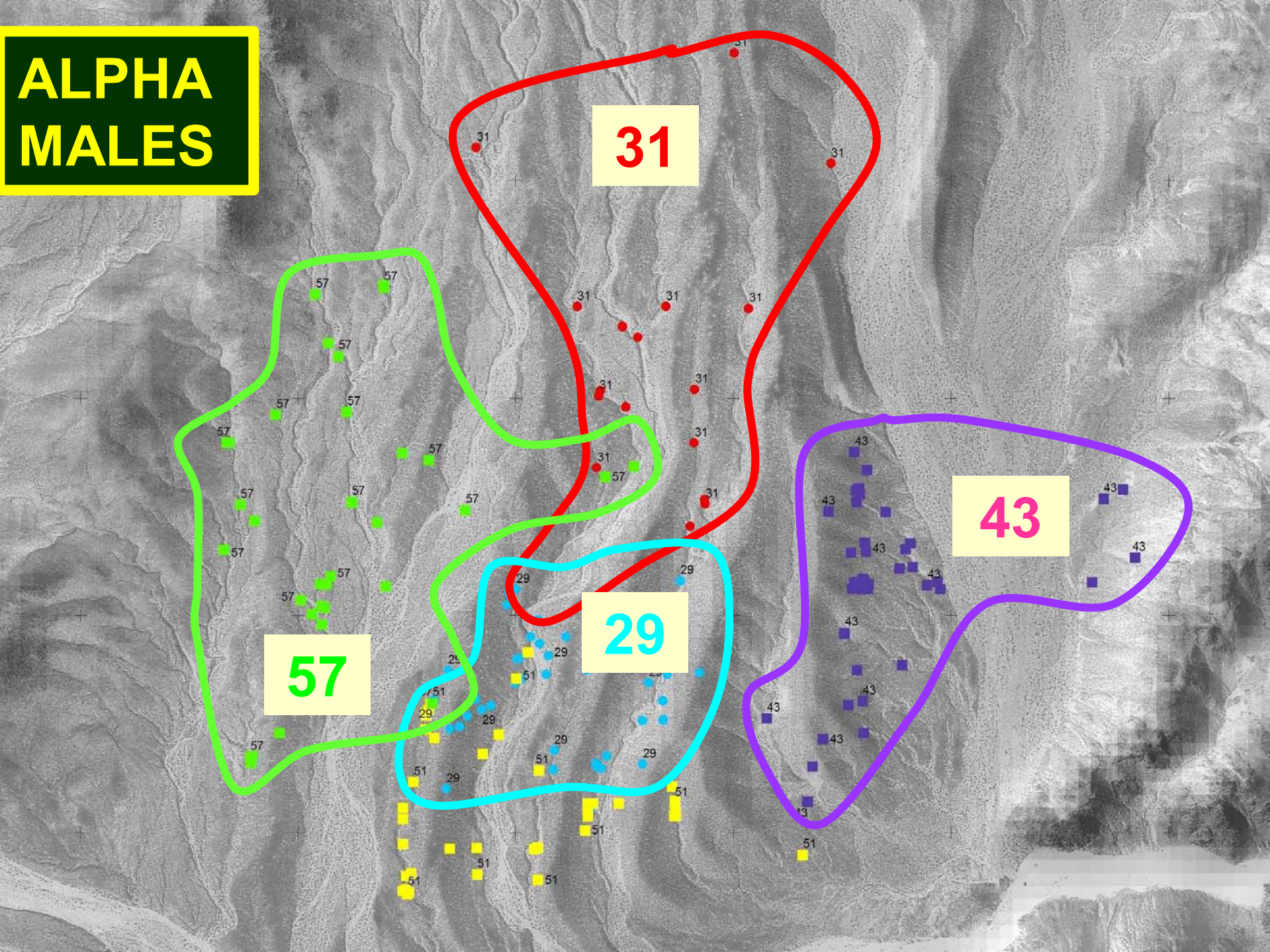
Attacks from dogs can be distinguished from those of wild predators

Moderate to severe trauma **decreases** as the distance from settlements **increases**

Severe trauma to tortoise shells (especially gular horns) is **higher near settlements**

Trauma **accumulates** over time

- Alpha males rarely meet
- Areas used by alpha males have minimal overlap


ALPHA MALES
31
57
29
43

DT Research Areas

- Population attributes, status & trends
- Habitat studies
- Anthropogenic effects
- Health and disease

USGS
science for a changing world

Ft. Irwin Translocation Project

- **Evaluate tortoises for health and infectious diseases**

  600-800 will be sampled

- **Develop epidemiological models, e.g., for URTD**

  at Daggett site where epidemic of URTD underway

  Provide info on transmission rates, infection thresholds, mortality etc.

Toxicants

Background chemical survey in se CA

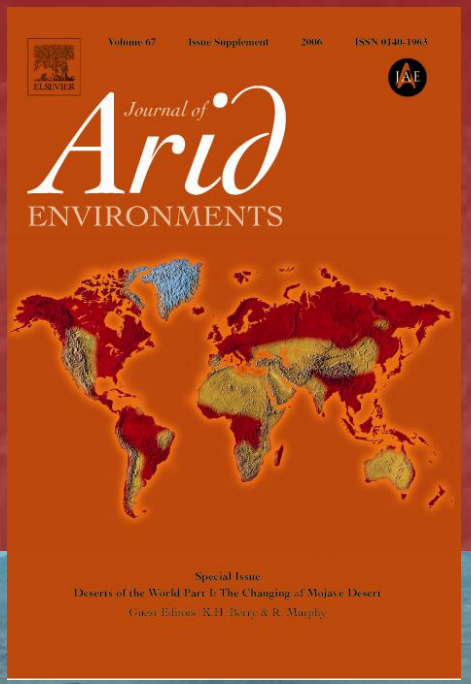
Found elevated levels of As and Hg up to 15 kms from mines

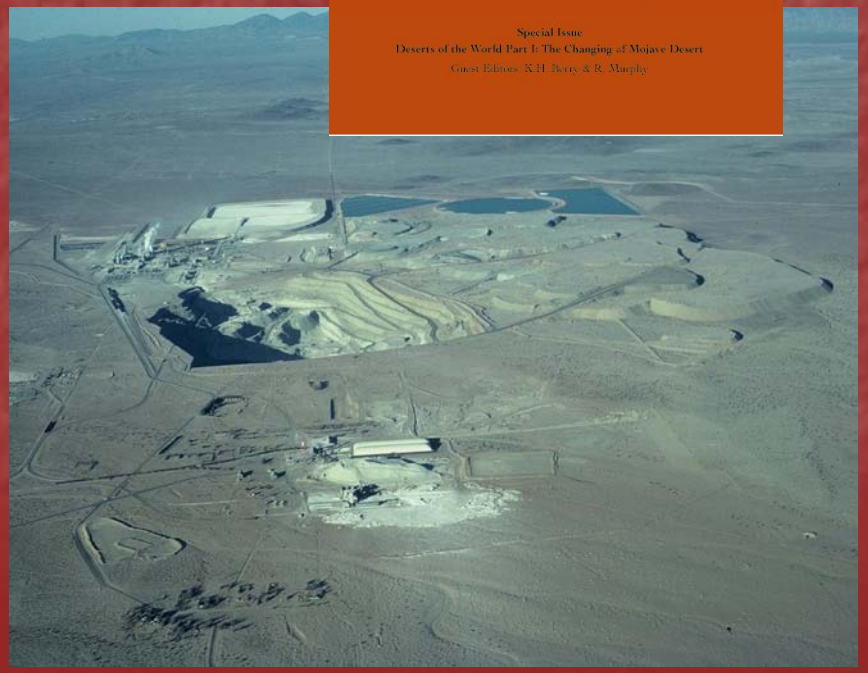
Suspect wind, rain and OHVs spread contaminants

Future research –

contaminant in food plants

effects on immune system





Major Desert Research Areas

- Desert Tortoises
- Other Species of Concern
- Habitat
- Contaminants

- Technical assistance

USGS
science for a changing world

ARMI Research

- Assessing susceptibility of desert springs and associated anurans to climate change and ground-water development

Western Toad
Darwin Falls
Death Valley NP

CaliforniaTreefrog
49 Palms Oasis
Joshua Tree NP

Deformed Red-spotted Toad
Piute Spring
Mojave NP

USGS
science for a changing world

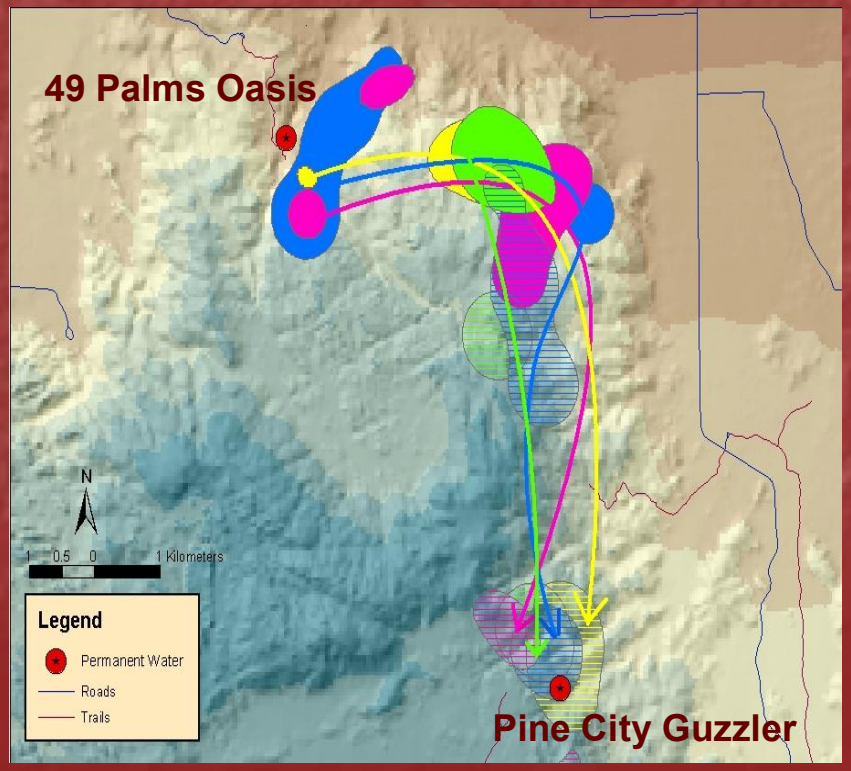
Mountain Yellow-legged Frog Recovery

USGS
science for a changing world

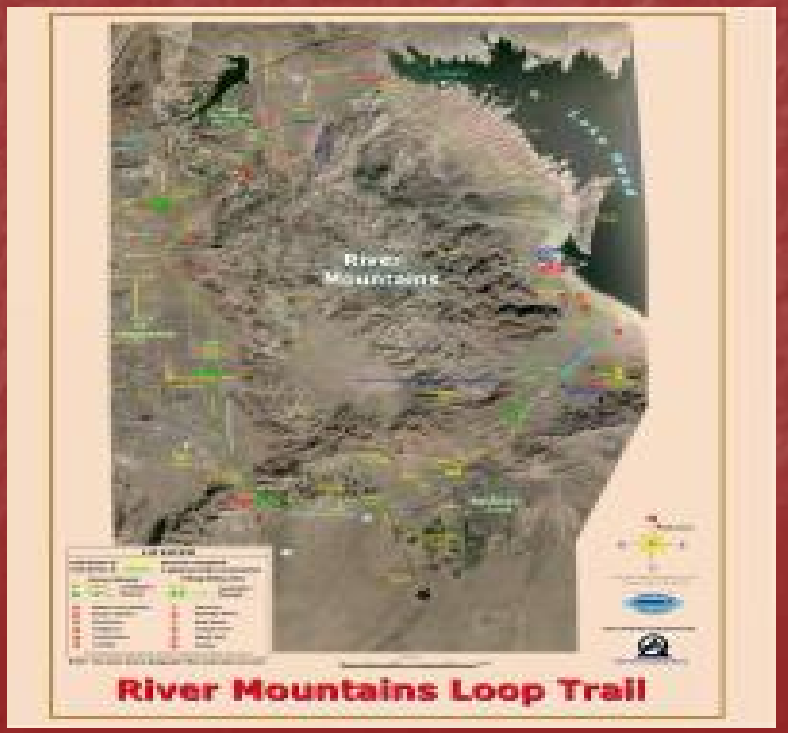
Tahquitz Canyon

Bighorn Sheep Research

Joshua Tree NP



River Mountains



Major Desert Research Areas

- Desert Tortoises
- Other Species of Concern
- Habitat
- Contaminants

- Technical assistance

USGS
science for a changing world

Desert Fire Research

Hackberry Fire – Mojave Preserve decided not to seed after the fire

This decision was hindered by a lack of information about how fires affect seed banks.

USGS
science for a changing world

Seed bank *density was much lower* in burned than unburned plots, for both natives and non-natives.

Seed bank *species richness was also lower* in burned (3 species/m2) than unburned plots (6 species).

If recent aerial seeding rates in the Mojave Desert (ranging from 140 to 646 seeds/m^2) were applied after the Hackberry Complex, they would have only reduced the seed bank depletion rate by 1% to 5%.

To completely ameliorate seed bank depletion rates on the Hackberry Complex, 9,966 seeds/m^2 would have to have been added (over 15x more than is typically seeded).

USGS
science for a changing world

Joshua Tree Research

Are Joshua trees in trouble???

Study objectives:

- establish Joshua tree demography plots to provide a snapshot and repeated view of population status

- conduct experiments to understand the natural range of variation on rates of germination and establishment

Development of Protocols for Desert Restoration Database

<u>In collaboration with SNRT and UNLV</u>

- Test the protocol to rapidly assess site stability of disturbances in Clark County, Nevada
- Establish a range of long-term monitoring sites based on the database, and develop the protocol for evaluating success of restoration

Retrospective Analysis of Historic Road Restoration Efforts

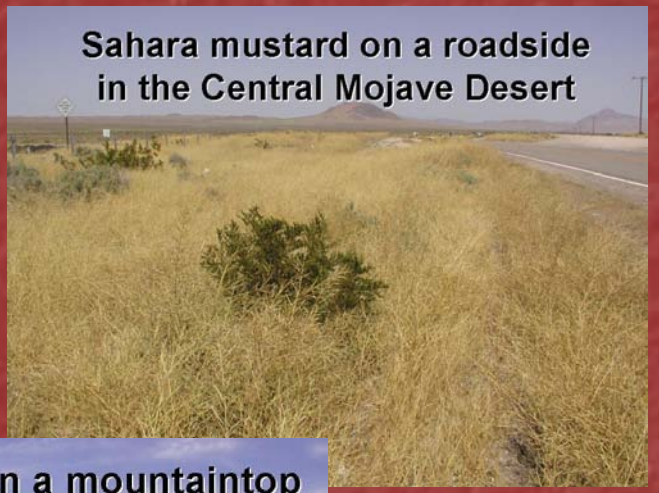
California Desert <u>District BLM</u>

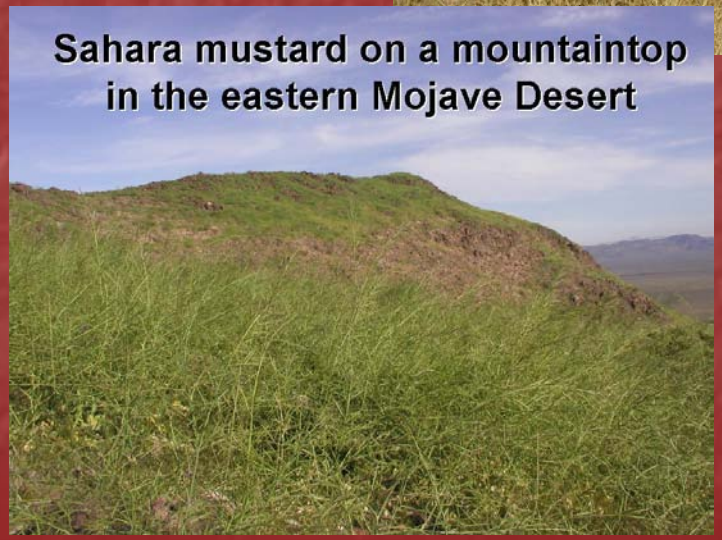
- To date, 95 routes inventoried for suitability in analysis
- Effectiveness monitoring will occur across sites that vary in rainfall and soil type
- Preliminary analysis demonstrates successful establishment of native perennials associated with mulching treatments

Brassica Control Research

Treatments to be tested:

- Chemical
- Mechanical
- Heat
- Cultural





USGS
science for a changing world

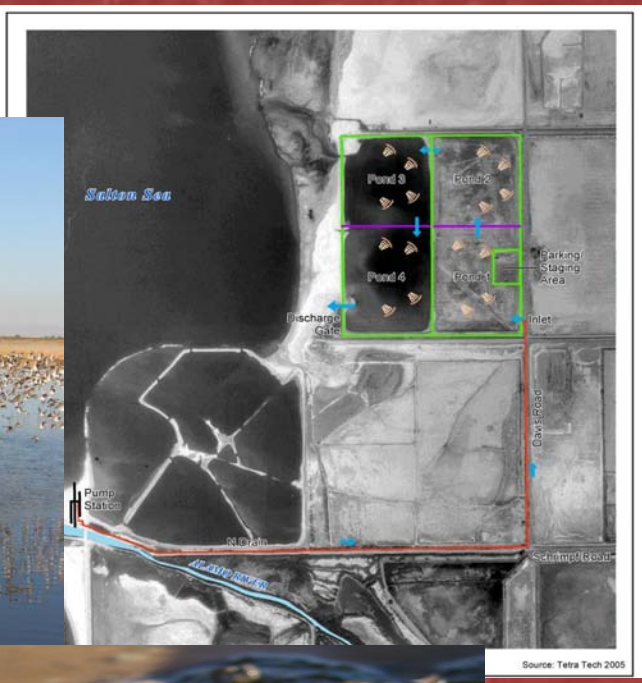
Major Desert Research Areas

- Desert Tortoises
- Other Species of Concern
- Habitat
- Contaminants

- Technical assistance

USGS
science for a changing world

Salton Sea Wetland Research



USGS
science for a changing world

Major Desert Research Areas

- Desert Tortoises
- Other Species of Concern
- Habitat
- Contaminants

- Technical assistance

USGS
science for a changing world

Technical Assistance

- FWS DT line-distance sampling
- Training

  - DT Health/Disease workshops
  - Identification of DT shell remains
  - DT Basic training
  - Workshop on Sahara mustard

USGS
science for a changing world

Visit our website at www.werc.usgs.gov

USGS
science for a changing world

Visit our website at www.werc.usgs.gov

Click on “Outreach”

Click on “Publication Briefs”

USGS
science for a changing world

Western Ecological Research Center
Publication Brief for Resource Managers

Release:	Contacts:	Phone:	Email:
March 2003	Dr. Matthew L. Brooks	702-564-4615	matt_brooks@usgs.gov
	Todd C. Esque	702-564-4506	todd_esque@usgs.gov

Las Vegas Field Station, USGS Western Ecological Research Center, 160 N. Stephanie, Henderson, NV 89074

Alien Plants and Fire in Desert Tortoise Habitat

Alien plants and fire have recently been recognized as significant land management problems in the Mojave and Colorado deserts, especially as they relate to management of the federally threatened desert tortoise. Very little information is currently available on the types of alien plants present and what their ecological effects may be, or on the characteristics and potential effects of the current fire regime in this region. To provide this information, USGS scientists Dr. Matt Brooks and Todd Esque published a state-of-knowledge synthesis on invasive plants and fire in the Mojave and Colorado deserts for a special journal issue focused entirely on North American tortoise research.

Management Implications:

- Management of alien plants and fire should be closely integrated, because alien plants produce some of the most hazardous fuels and fires promote alien plant dominance and may facilitate plant invasions.
- The best ways to reduce fire frequency are to minimize increases in fuel loads caused by alien annual plants and reduce the number of fires started by humans.
- Early detection and eradication of new alien species should be a land management priority, especially for those species that pose significant fire threats.
- Desert fires should be suppressed in most cases.

Surveys conducted among land managers and field scientists identified 116 species of alien plants in the Mojave and Colorado desert flora, and this is undoubtedly an underestimate of the actual number of species present. The vast majority of species were annuals, dominated by *Bromus rubens*, *Schismus* spp., and *Erodium cicutarium*, which are currently widespread and abundant. These species can compete with native plants, and *B. rubens*, in particular, has contributed to significant increases in fire frequency since the 1970s. Native desert plants are often poorly adapted to fire, and recurrent fire has converted native shrubland to alien annual grassland in some areas. Changes in plant communities caused by alien plants and recurrent fire may negatively affect native animals such as the desert tortoise by altering habitat structure and the species composition of their food plants.

Analyses of agency fire records indicate that there are regional hotspots of fire activity. Fire frequency and total area burned were greater in the Mojave than in the Colorado desert between 1980 and 1995. Although most fires occurred along roads and were caused by humans, the larger fires tended to be located in remote wildland areas and were caused by lightning. The annual number of fires increased in both deserts between 1980 and 1995, due to an increase in the number of fires caused by humans.

The dominance of alien annual plants and the frequency of fire may increase in the future, along with increased levels of urbanization and atmospheric nitrogen and carbon dioxide. Increases or decreases in rainfall could also cause changes in alien plant dominance and fire frequency. Additional information on the ecology and effects of invasive plants and fire in the Mojave and Colorado deserts are needed to develop effective management plans.

Brooks, M. L., and T. C. Esque. 2002. Alien plants and fire in desert tortoise (Gopherus agassizii) habitat of the Mojave and Colorado deserts. Chelonian Conservation Biology 4:330-340.

U.S. Department of the Interior
U.S. Geological Survey

USGS
science for a changing world