



Invasive Species/Ecological Sites Descriptions and The Conservation Effects Assessment Project

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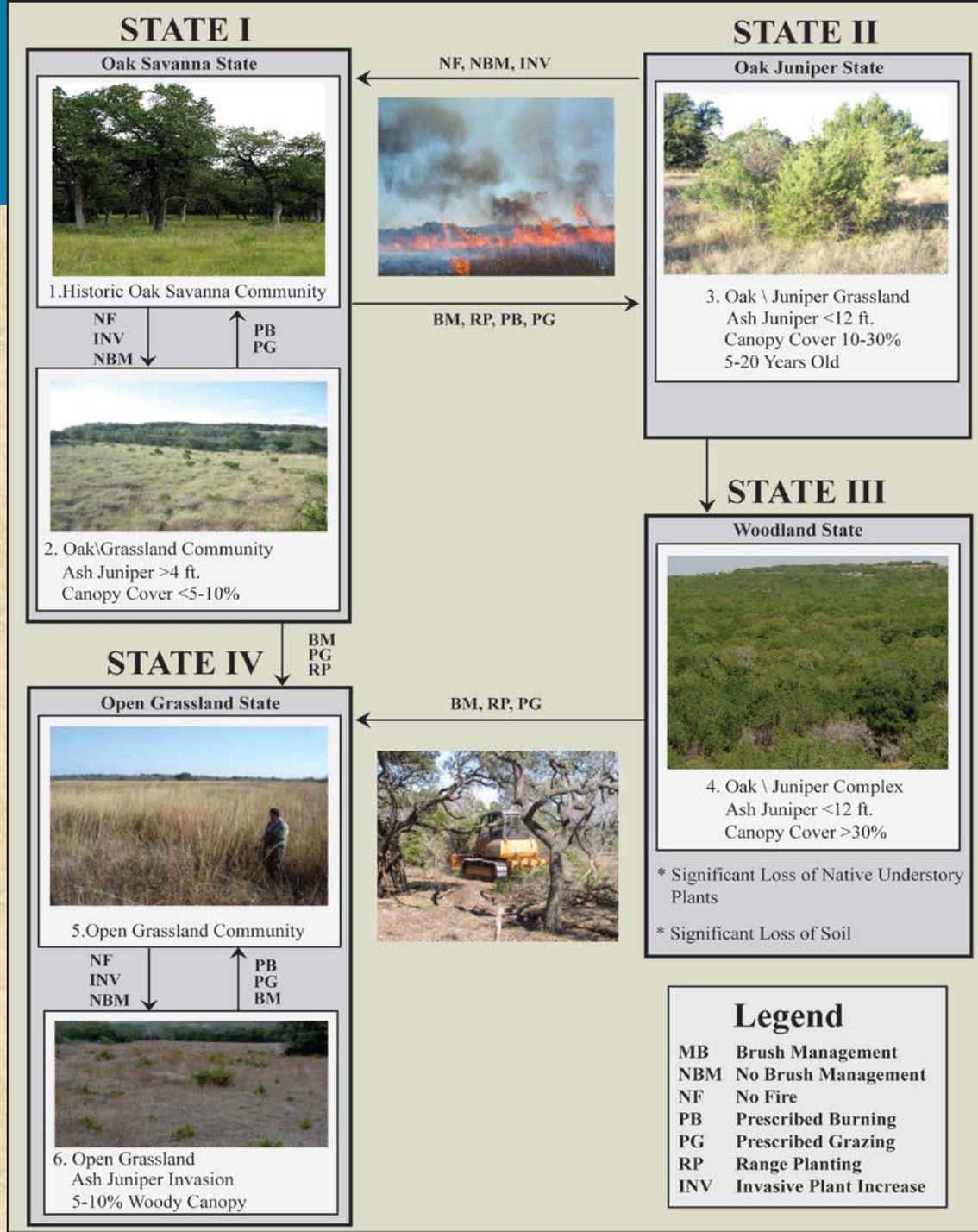
Reno, Nevada



Ecological Site Descriptions

Ecological Sites provide foundation for all resource assessments.

**Example:
Deep Redland Ecological Site in MLRA 81c –
Eastern portion of
Edwards Plateau in Texas**

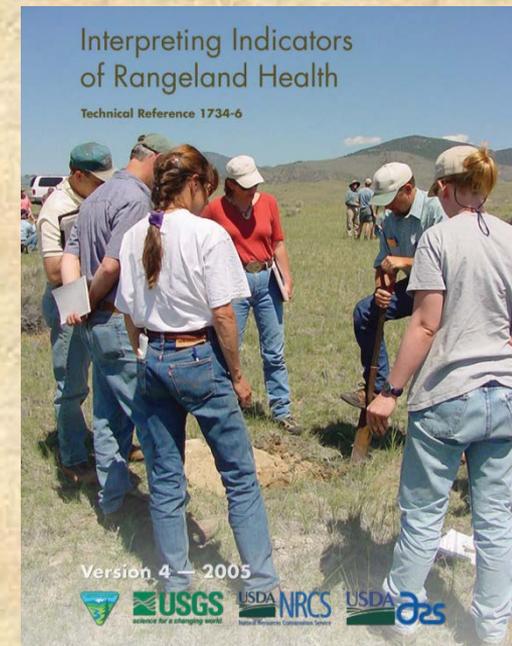
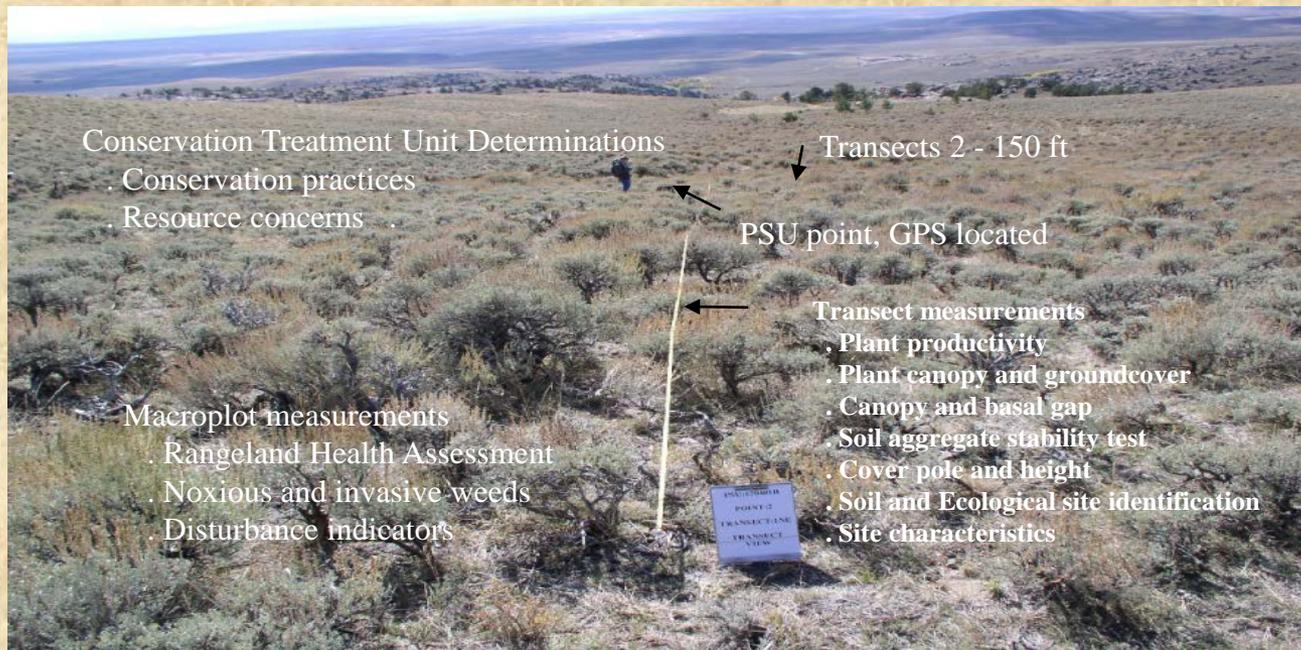


Monitoring and Sampling Protocols



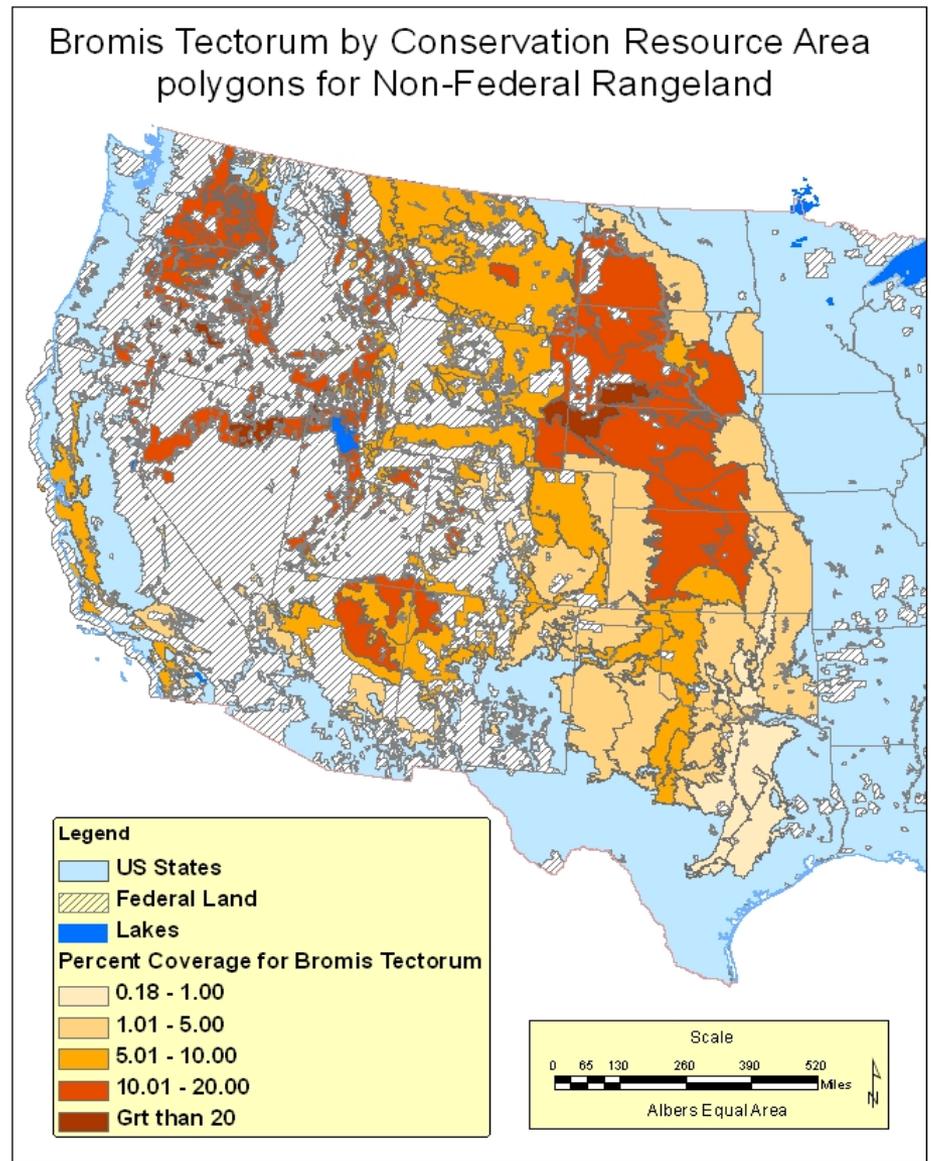
New sampling protocols for National Resources Inventory on rangelands and pasture lands

New Indicators of Rangeland Health adopted and implemented by NRCS, BLM, and USGS



National Resources Inventory

National Resources Inventory does provide national assessment of invasive plants



Ecological Site Assessment



NRI Site Data

Plant community
Cover
Biomass
Plant Height
Soil Series
Slope
Management
Practices



RHEM Requirements

Plant community
Soil Series
Slope
Climate
Cover

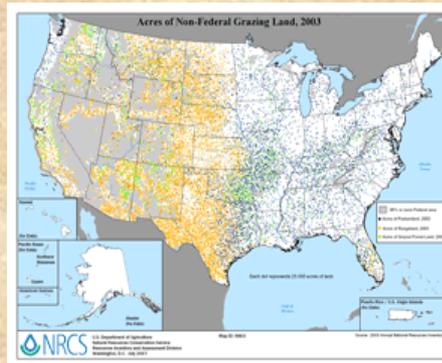


Output

Runoff
Soil loss



Individual Site



or

Aggregate Sites
Regional/National Scale

Phase I Risk Assessment:
2, 5, 10, 25, 50, 100 storms

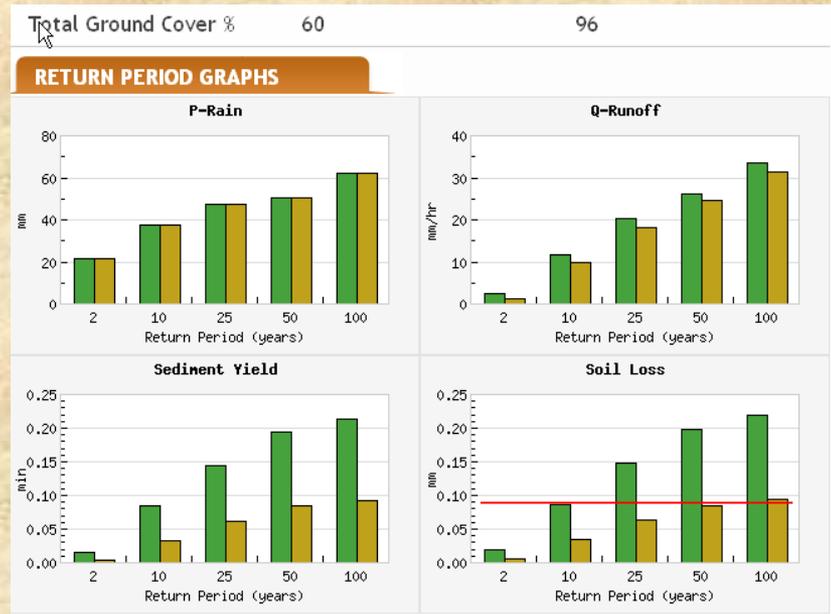
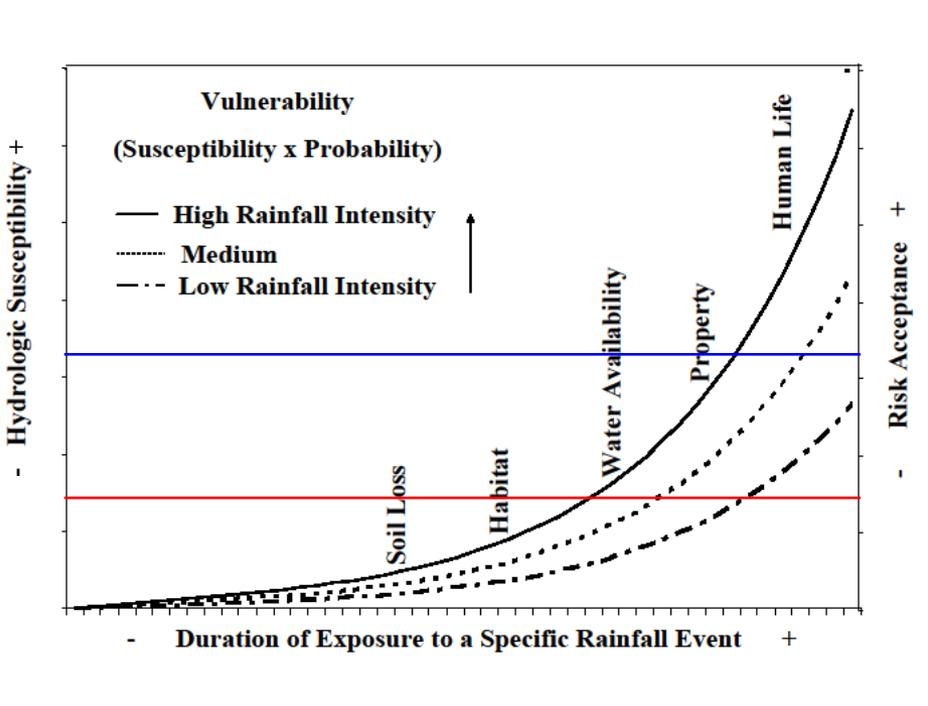
Rangeland Hydrology and Erosion Model



RHEM is designed to:

- Estimates runoff, erosion, and sediment delivery rates and volumes at
 - the spatial scale of the hillslope
 - the temporal scale of a single rainfall event
 - use input from National Res. Inventory

Risk Assessment Framework



2 YEAR RETURN PERIOD RESULTS

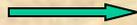
	MARK1	MARK2
Rain (mm)	21.80	21.80
Runoff (mm)	2.31	1.10
Sediment Yield (ton/ha)	0.02	0.00
Soil Loss (ton/ha)	0.02	0.00

Ecological Site Assessment: Impact of practices



NRI Site Data

Plant community
Cover
Biomass
Plant Height
Soil Series
Slope
Management
Practices



RHEM Requirements

Plant community
Soil Series
Slope
Climate
Cover



Output

Runoff
Soil loss

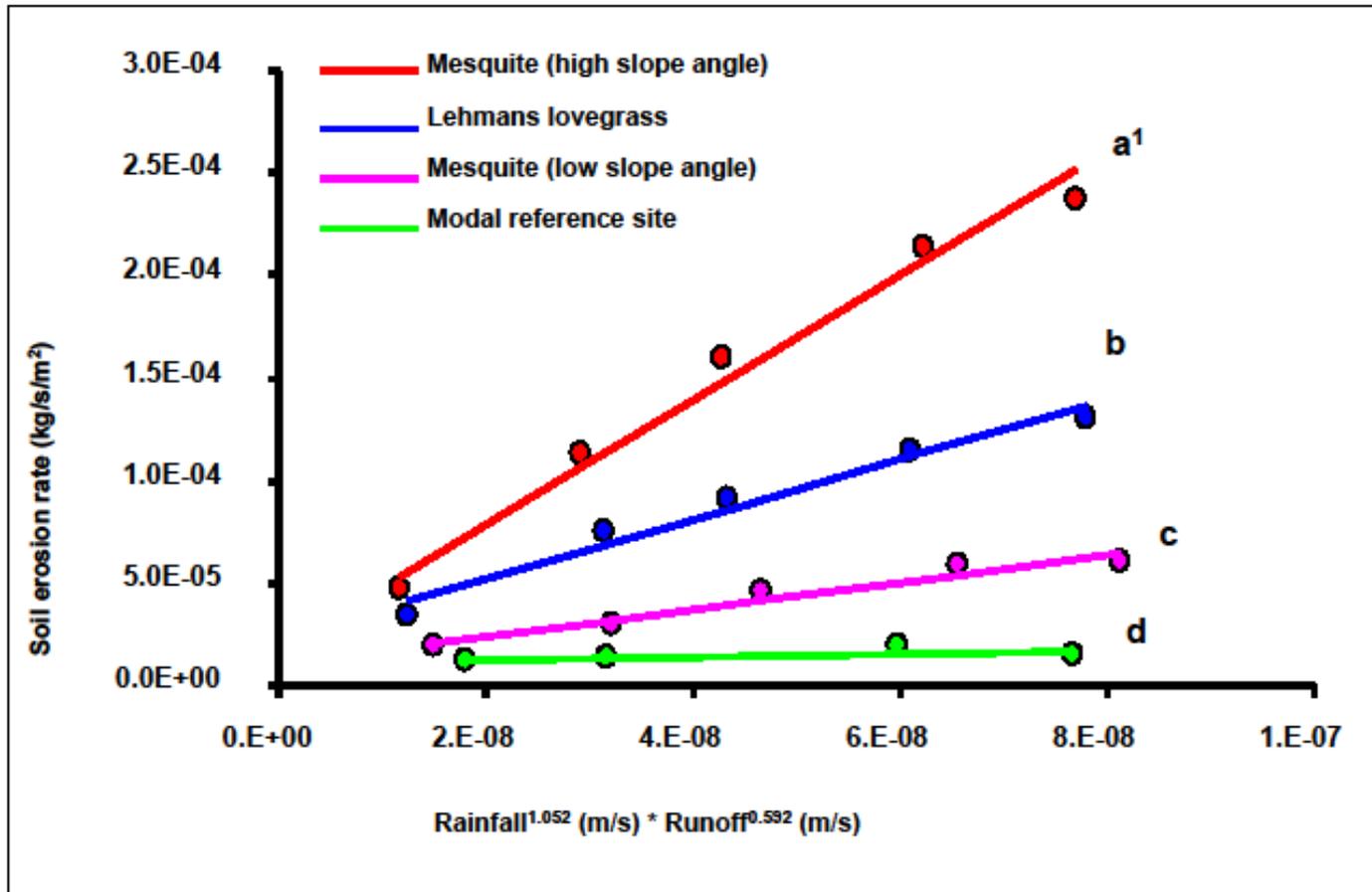
**Environmental & Economic
Assessment at Site Scale -
Phase II: Risk Assessment**
2, 5, 10, 25, 50, 100 storms



Manual Change in State



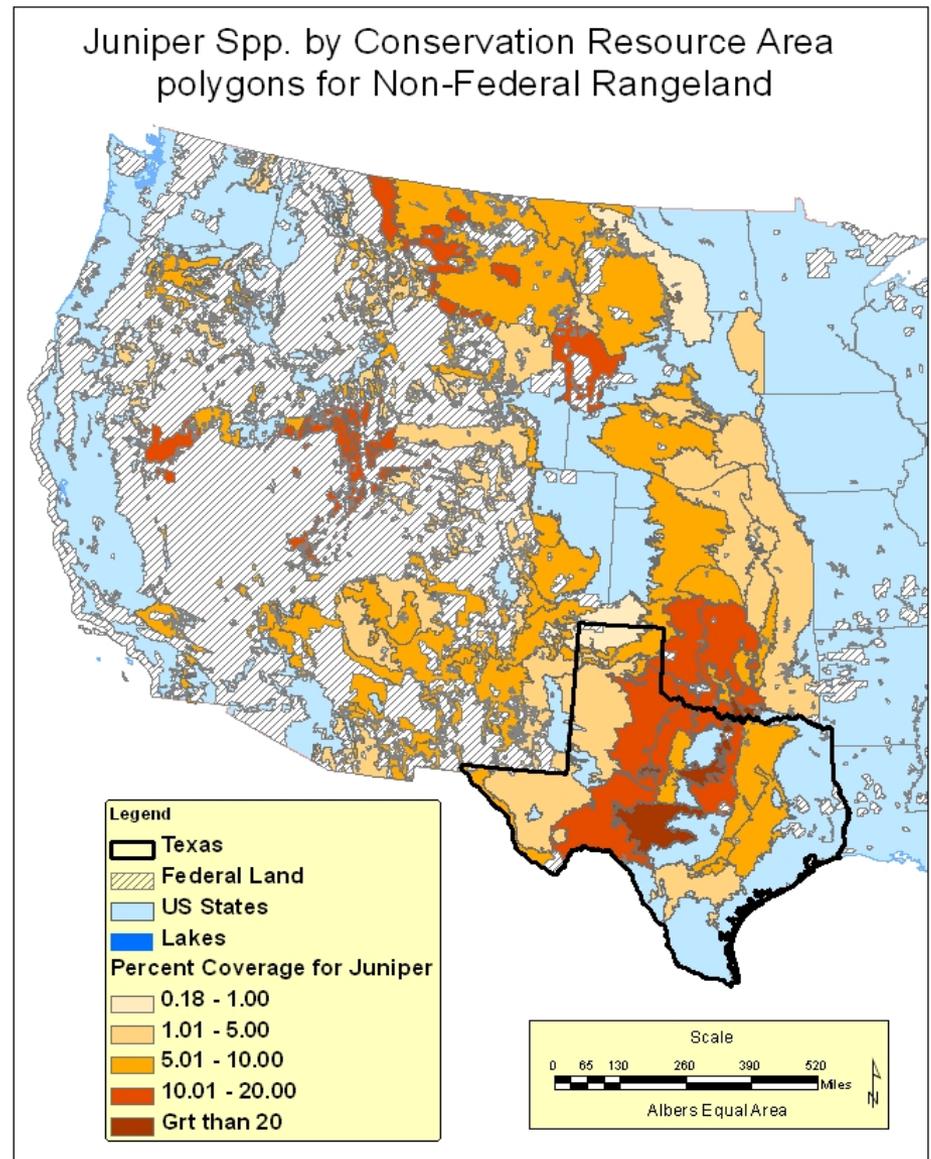
Ecological Site Assessment: State and Transition Responses - Hydrology



Estimated raindrop splash and sheet flow erosion for a single ecological site in various states in southern Arizona. Hydrologic information by State within an Ecological Site Description is now possible.

National Resources Inventory

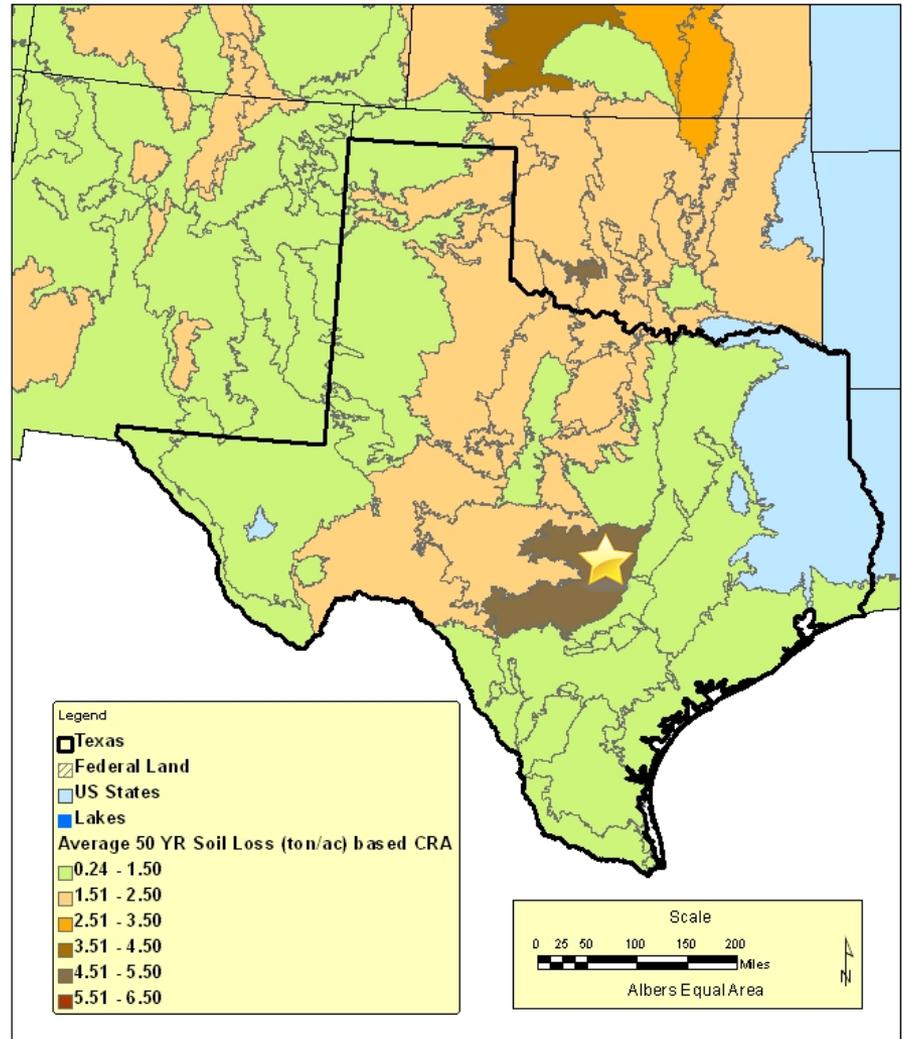
National Resources Inventory does provide regional assessment of invasive plants and allows us to target conservation.



National Resources Inventory

National Resources Inventory does provide national assessment of invasive plant and soil erosion interactions at regional and National scale to target conservation.

50YR Erosion by Conservation Resource Area polygons for Non-Federal Rangeland



Distribution of estimated of raindrop splash and sheet flow erosion ($\text{ton ha}^{-1} \text{event}^{-1}$) for hillslopes in Texas for 50 year return period storm.

Ecological Site Assessment: State and Transition Responses - Plants



NRI site data

Plant community
Cover
Biomass
Plant Height
Soil Series
Slope
Management
Practices

Output

→ **Cover – Biomass** →
Relationships

ALMANAC Requirements

Plant community
Soil Series
Slope
Climate
Management
Practices

Output

Soil Water Content **Canopy cover**
Litter cover **Plant height**
Plant density **Biomass-Forage**
Habitat **Fuel load**



Change is Modeled and Predicted



Ecological Site Assessment: State and Transition Responses - Plants



Functional Plant Type?

Native or Introduced

Annual, Short lived perennials, or Long lived perennial

Warm Season, Cool Season, or All Season

Broadleaf, Narrowleaf, or Stem sunlight capture

Evergreen or Deciduous

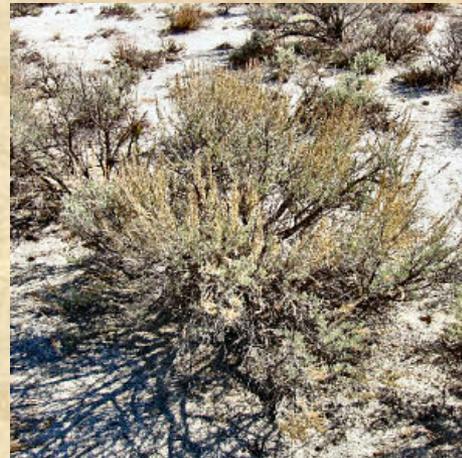
Vegetative or Seed propagated

Intensive or Extensive Exploiter water

Grass, Forb, Half Shrub, Shrub,
Tree, or Succulent



Native, perennial, cool
season, narrowleaf,
deciduous, seed
reproduced, intensive
exploiter, grasses

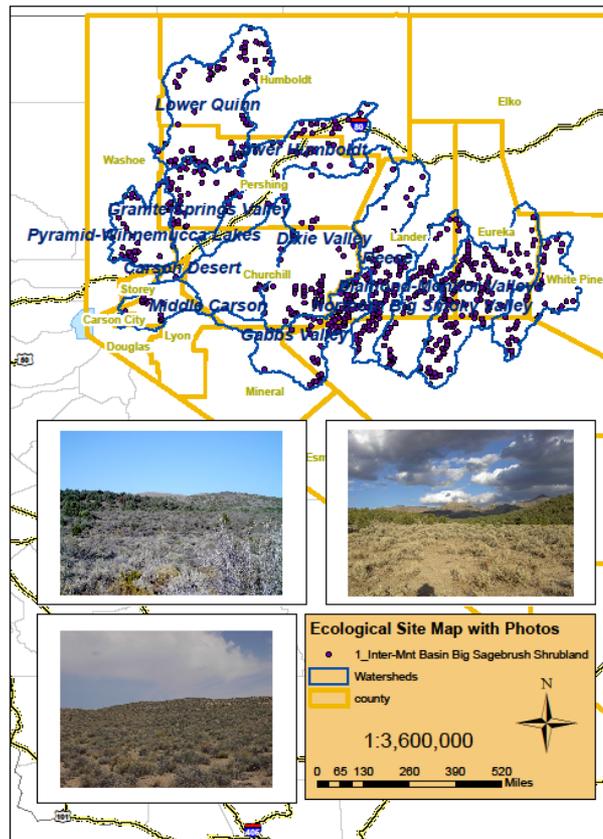


Native, perennial, cool
season, narrowleaf,
evergreen, seed reproduced,
intensive exploiter, shrub

Representative Plant Communities:



Remote Sensing from Gap or LANDFIRE



JUOS	<i>Juniperus osteosperma</i>	Utah juniper	Tree	
PIMO	<i>Pinus monophylla</i>	singleleaf pinyon	Tree	
ARTRW8	<i>Artemisia tridentata</i>	wyoming big agebrush	Shrub	
ARTRT	<i>Artemisia tridentata</i>	basin big sagebrush	Shrub	
ERNA10	<i>Ericameria nauseosa</i>	goldenbush	Shrub	
BRTE	<i>Bromus tectorum</i>	cheatgrass	Grass	
POSE	<i>Poa secunda</i>	big bluegrass	Grass	
PHHO	<i>Phlox hoodii</i>	spiny phlox	Polemoniaceae	Forb
SAKA	<i>Salsola kali</i>	Russian thistle	Chenopodiaceae	Forb

We can use NRI and Ecological Site Descriptions data to verify remote sensing estimates of land cover and land use

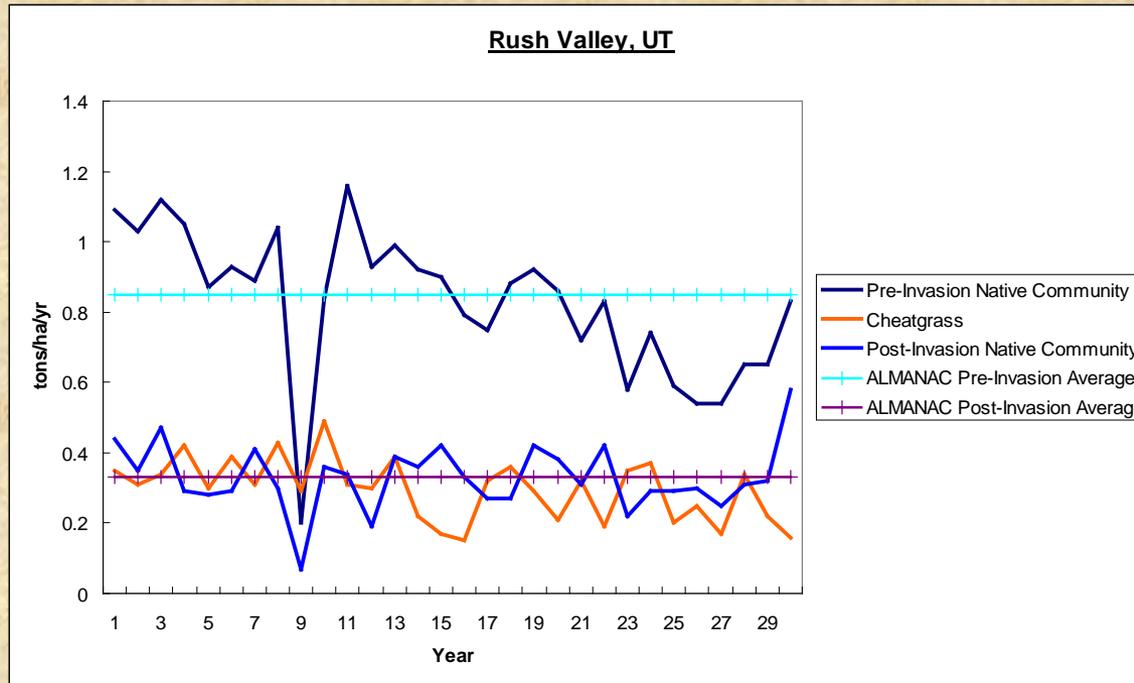
Representative Plant Communities: Remote Sensing



Unmanned Aerial Vehicles offers cost-effective means of sampling vegetation at local scale

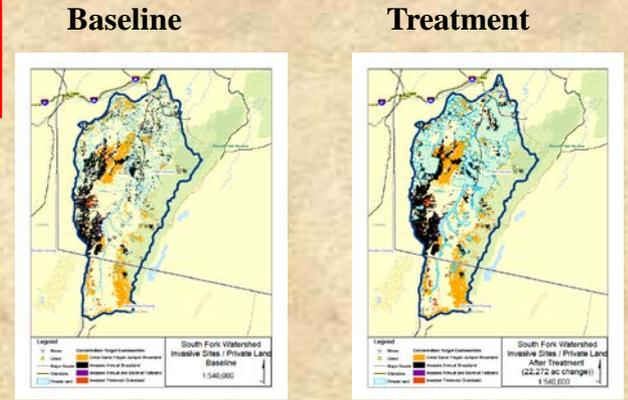
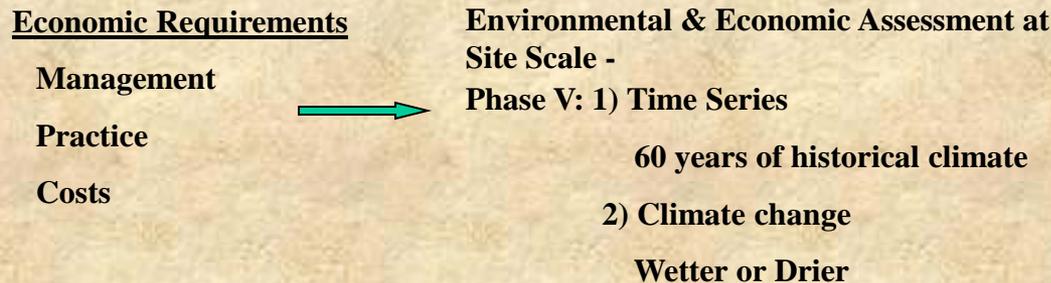
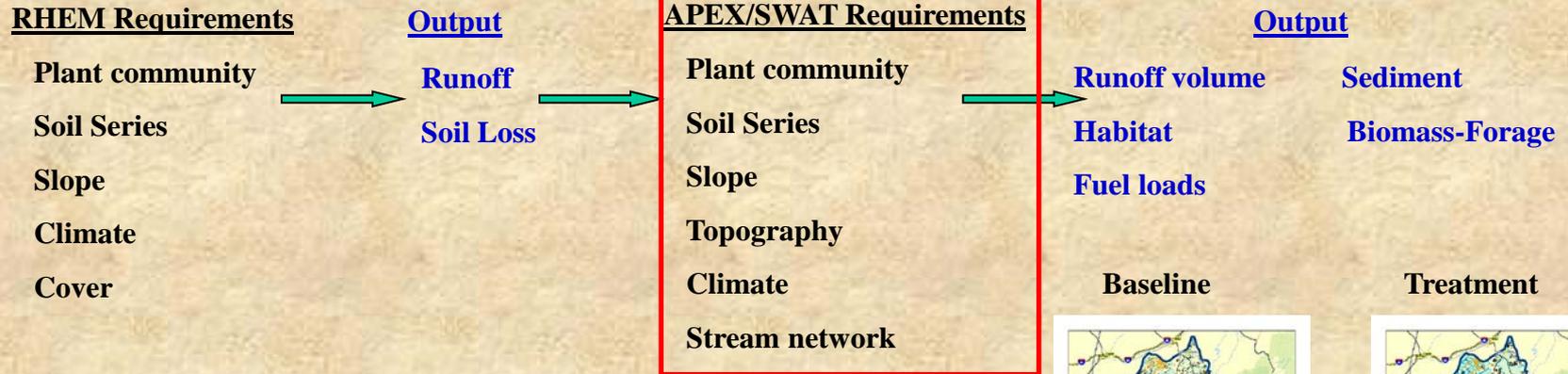
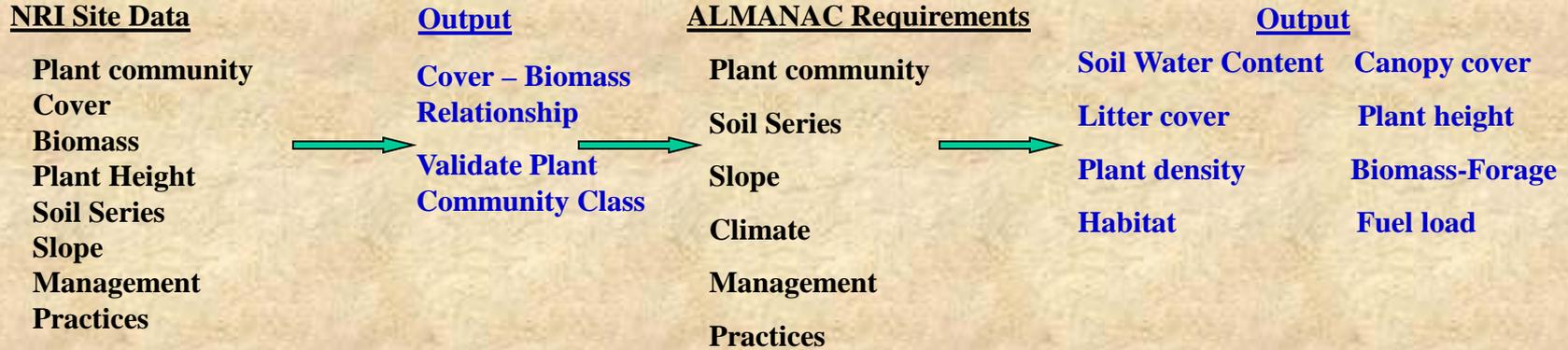


Ecological Site Assessment: State and Transition Responses - Plants



ALMANAC yield simulations by Community Type at Rush Valley, UT with cheatgrass invasion. According to ESDs, plant communities were very similar at each site, dominated by Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*), Thurber's needlegrass (*Achnatherum thurberianum*) and bluebunch wheatgrass (*Pseudoroegneria spicata ssp. spicata*). The same plant parameters were used at each site in order to test the applicability of simulating by community type instead of by species. A hypothetical cheatgrass invasion was simulated, without inclusion of potential for cheatgrass invasion to alter fire and nitrogen dynamics.

Watershed & Cumulative Effects



Change is Modeled and Predicted

National Databases:



Impact of practices in shifting states

Develop a rangeland land cover database so regional and national estimates of Ecological Site Descriptions can monitored

Develop rangeland conservation practice database so local, regional, and national estimates of environmental benefits can be estimated with NRCS, BLM, and USGS historical data. ESD's to define alternative States and practices required to achieve the desired change

Develop techniques to estimate unmeet conservation needs to reach targeted goals for watersheds



USGS
United States Geological Survey

Land Treatment Digital Library

A dynamic system to collect, store, retrieve, and analyze Federal land-treatment data. Many information and access to data available at <http://egsweb.cr.usgs.gov>

Overview of the Land Treatment Digital Library

Across the country, public land managers make thousands of decisions each year that influence landscapes and ecosystems within the lands they manage. Many of these decisions involve vegetation management actions in land treatment. Land treatments include activities such as removal of unwanted plant biomass, seeding burned areas, and herbicide applications. Data on these land treatments are usually stored at local offices, and gathering information across large spatial areas can be difficult. There is a need to consolidate and store treatment data for Federal agencies involved in land treatment because these data are useful in land managers for policy and management and in researchers for developing sampling designs and studies.

The Land Treatment Digital Library (LTDL) was created by the U.S. Geological Survey (USGS) to compile information about land treatment on Federal lands in the western United States for all interested parties. The flexible framework of the library allows for the storage of a wide variety of data in different formats. The LTDL currently stores processed remote-sensed land treatment or water effect are called legacy data. The project was developed and has been funded based on feedback from partner agencies and individuals, with responsibility for the library holdings to expand as new information becomes available. The library contains data in text, tables, spreads, and image formats. Specific examples include project plans and implementation reports, monitoring data, spatial data from geographic information systems, digitized paper maps, and digital images of land treatments. The data are stored by USGS employees and are accessible through a searchable web site. The LTDL can be used to respond to information requests, conduct analyses and other forms of information systems, produce maps, and generate reports for CD/DVD managers and scientists and other authorized users.

STEP 1: Paper files are scanned and computer files are created. Metadata are added to files with project ID data.

STEP 2: Data and maps are checked for accuracy with field office personnel.

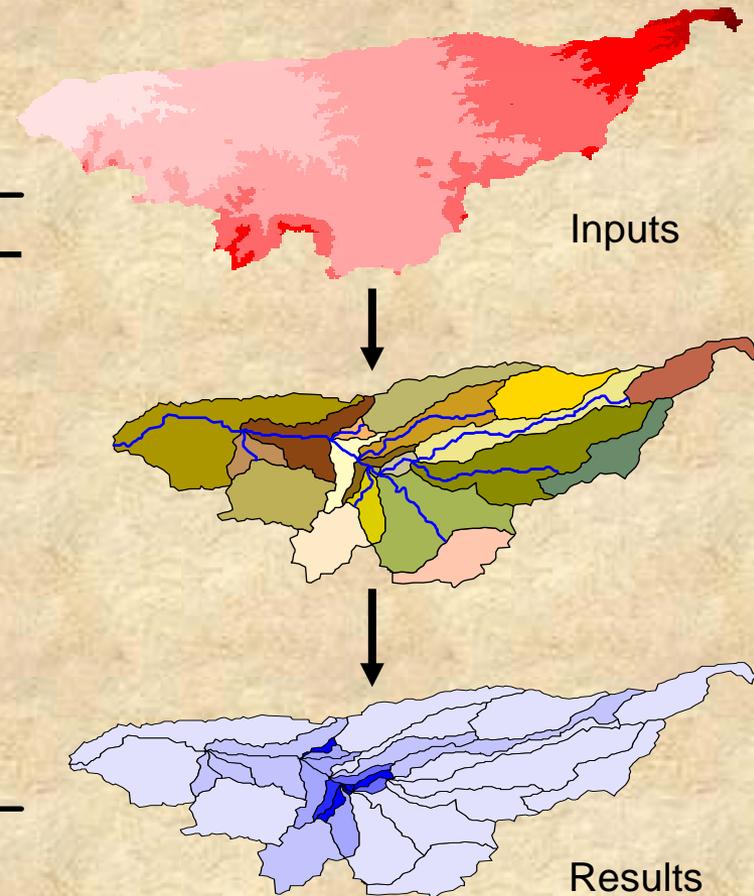
STEP 3: Paper files are scanned and computer files are created. Metadata are added to files with project ID data.

STEP 4: Project and treatment data sets to be stored, queried, or displayed as tables or maps.

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

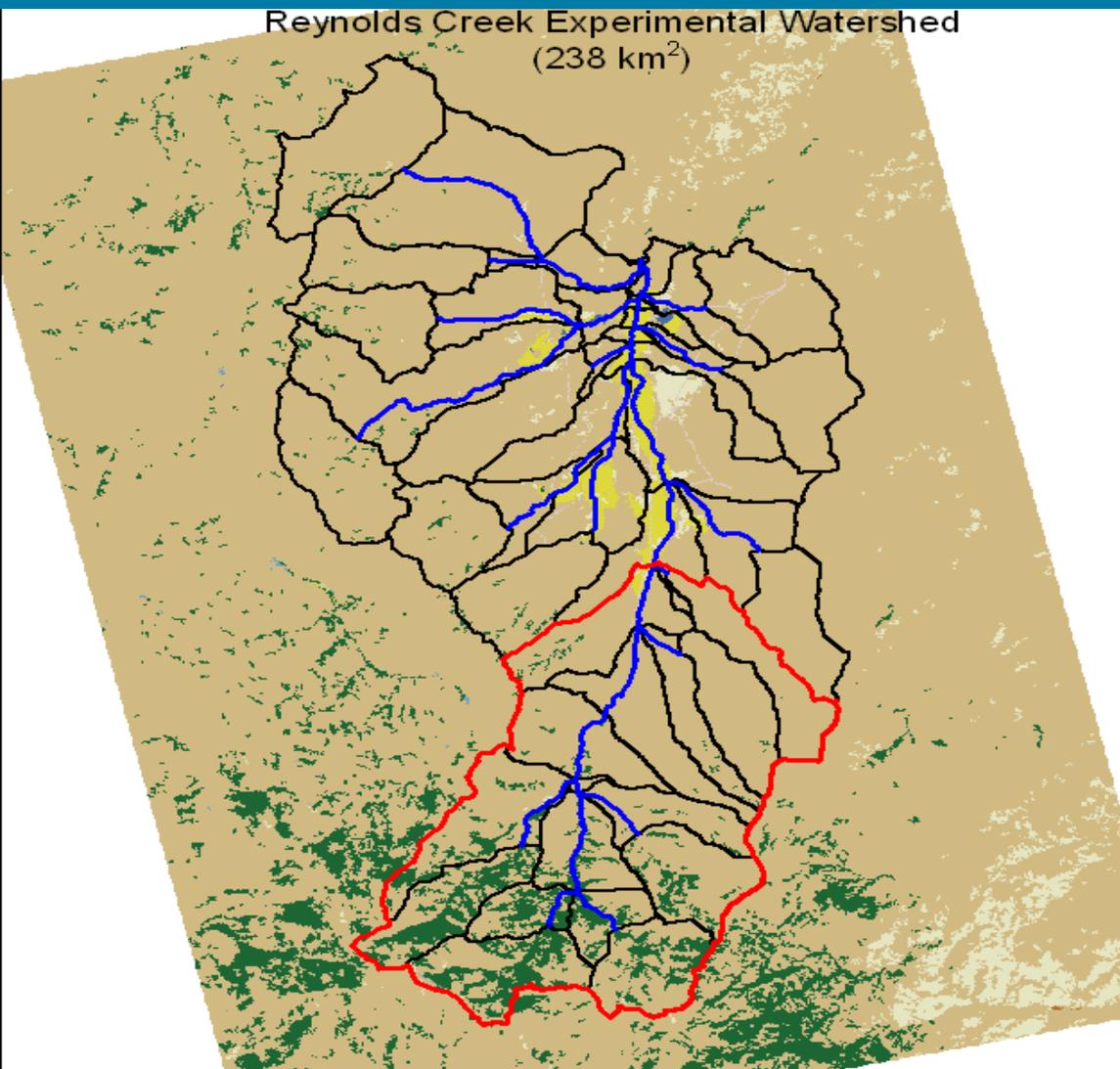
Output results that can be displayed in AGWA

<i>KINEROS Outputs</i>	<i>SWAT Outputs</i>
Channel Infiltration (m ³ /km)	Precipitation (mm)
Plane Infiltration (mm)	ET (mm)
Runoff (mm or m ³)	Percolation (mm)
Sediment yield (kg)	Channel Discharge (m ³ /day)
Peak flow (m ³ /s or mm/hr)	Transmission loss (mm)
Channel Scour (mm)	Water yield (mm)
Sediment discharge (kg/s)	Sediment yield (t/ha)
	Nitrogen (kg)
	Phosphorus (kg)



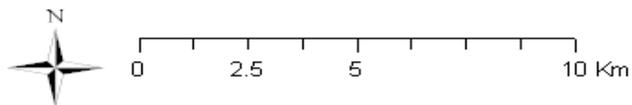
Watershed Assessment:

Impacts of Fire



Legend

- | | | | |
|---|------------------------------|---|--------------------|
|  | Open Water |  | Channels |
|  | Developed, Open Space |  | Watershed Elements |
|  | Barren Land |  | Fire Boundary |
|  | Evergreen Forest | | |
|  | Scrub/Shrub | | |
|  | Grasslands/Herbaceous | | |
|  | Pasture/Hay | | |
|  | Cultivated Crops | | |
|  | Woody Wetlands | | |
|  | Emergent Herbaceous Wetlands | | |

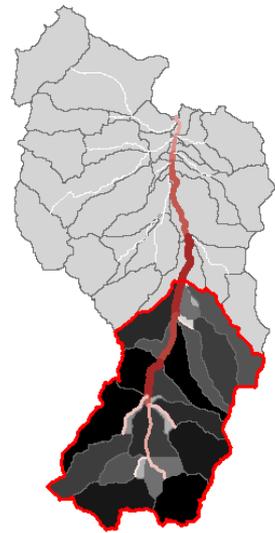


Watershed Assessment:

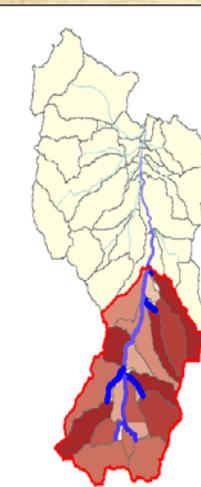
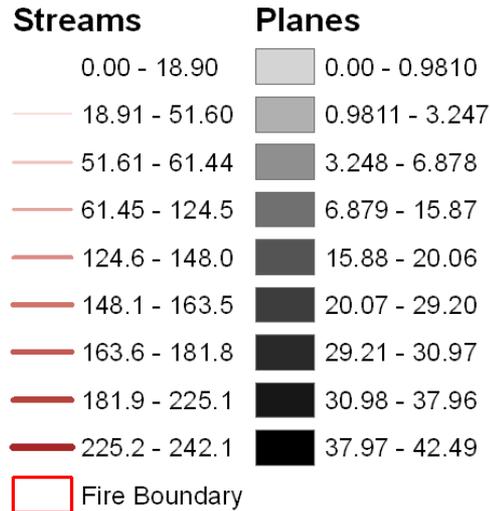


Impact of Fire

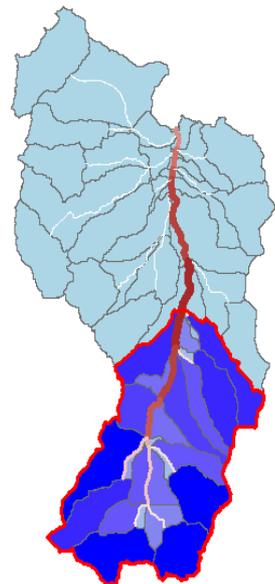
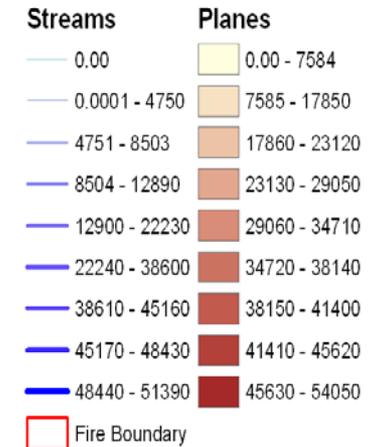
Impact from burning lower portion of the watershed



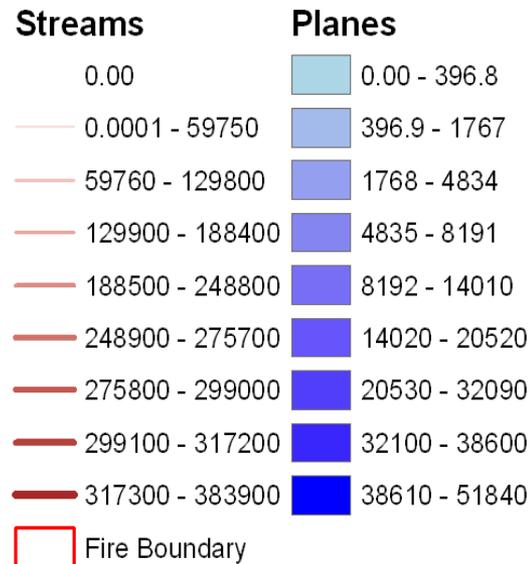
Peak Flow (m³/s) - Absolute Change

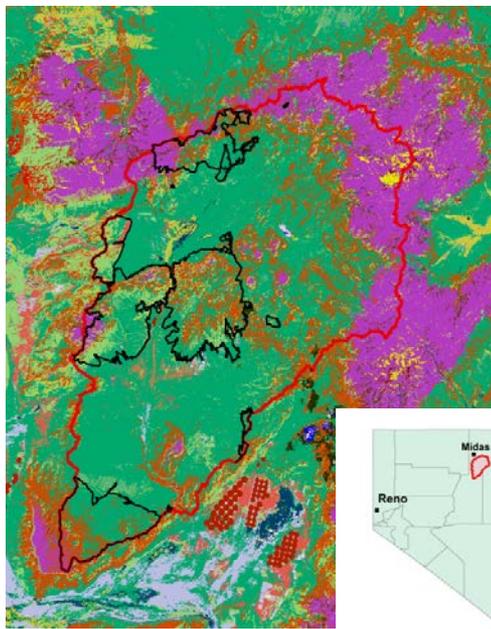


Sediment Yield (kg/ha) - Absolute Change



Total Runoff (m³) - Absolute Change



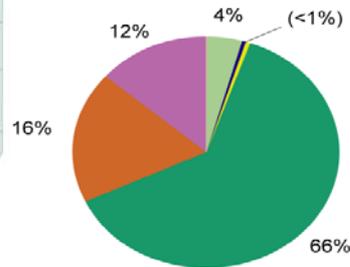
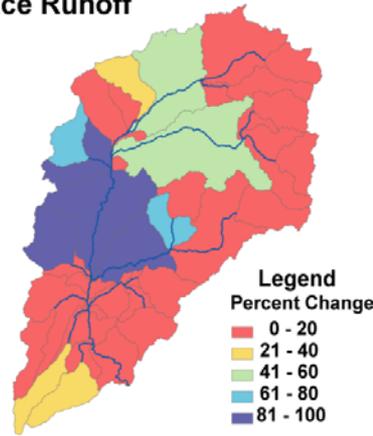


Drainage Area = 2237 km²
 Burn Area = 236 km²

Legend

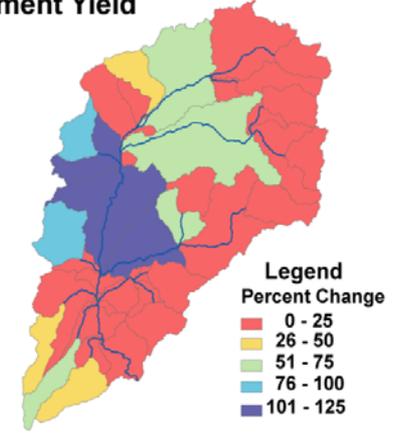
- Fire Area
- Inter-Mountain Basins Big Sagebrush Shrubland
- Inter-Mountain Basins Montane Sagebrush Steppe
- Invasive Annual Grassland
- Great Basin Xeric Mixed Sagebrush Shrubland
- Invasive Annual and Biennial Forbland
- Invasive Perennial Grassland
- Rocky Mountain Aspen Forest and Woodland

Surface Runoff



Pre-fire land cover distribution

Sediment Yield



Sediment Load



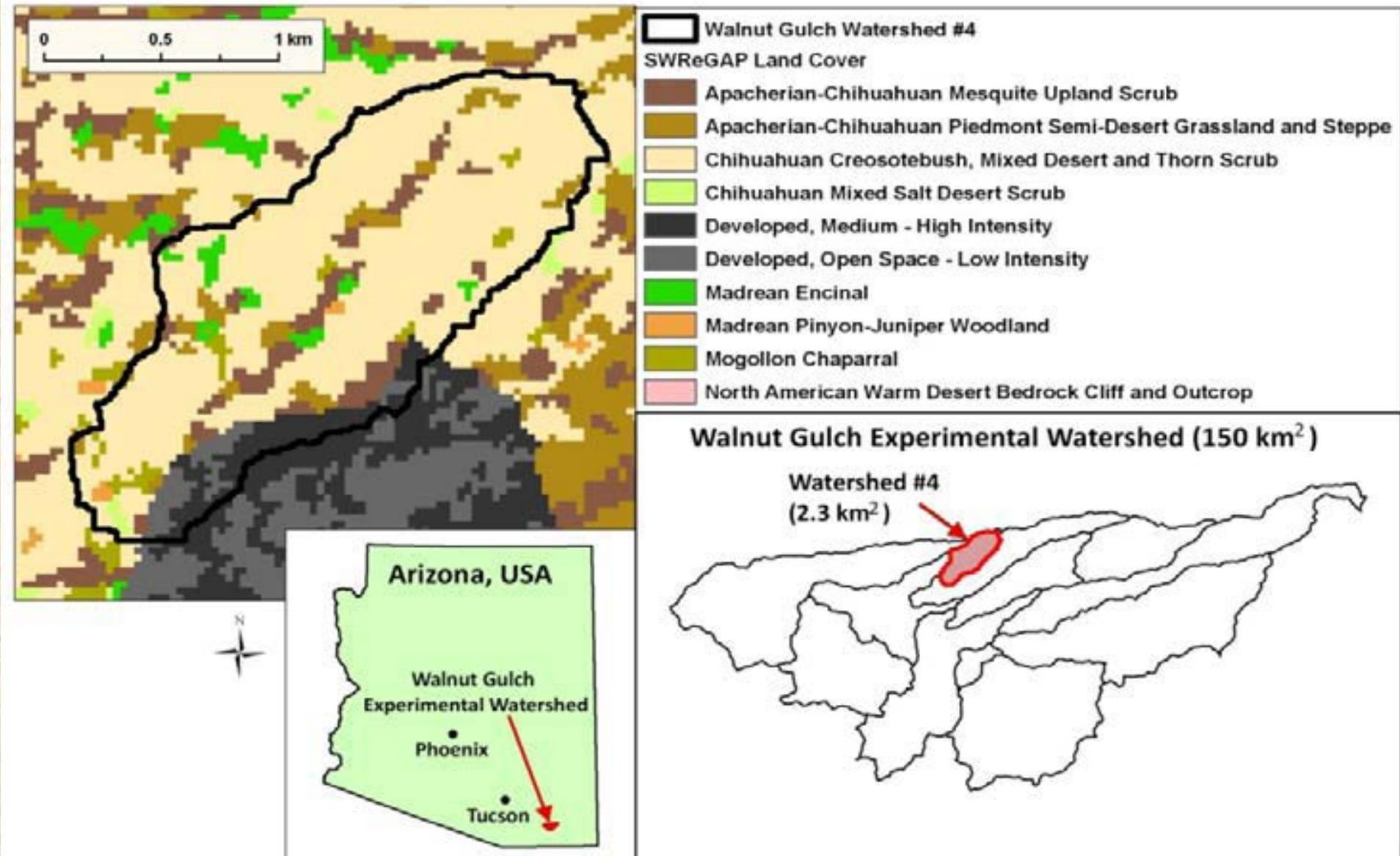
- Annual runoff volume in post-fire conditions can be up to 100% greater than pre-fire conditions
- Sediment yield / load can be up to 125% / 50% greater than pre-fire conditions, respectively
- Northern burn area has a disproportionate affect on sediment in adjacent channel

Spatially distributed first year post-fire watershed response in percent change from pre-fire response for the Rock Creek watershed near Battle Mountain, Nevada from the August of 2001 Hot Lakes and Buffalo wildfires.

Watershed Assessment:

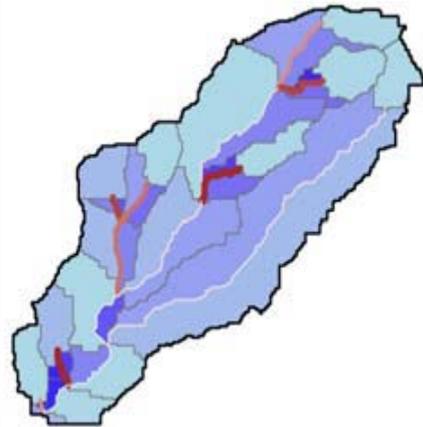


Impact of Brush Control

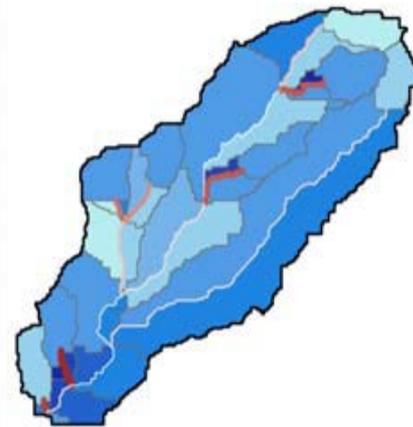
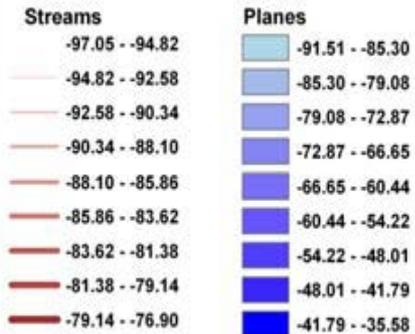


Watershed Assessment:

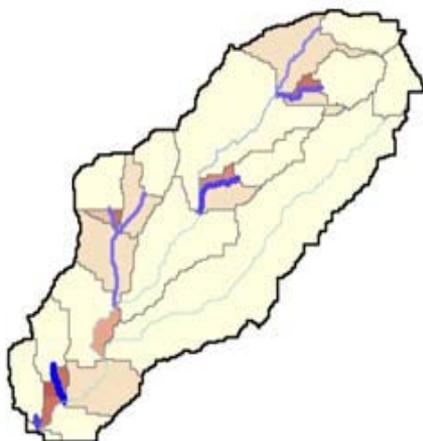
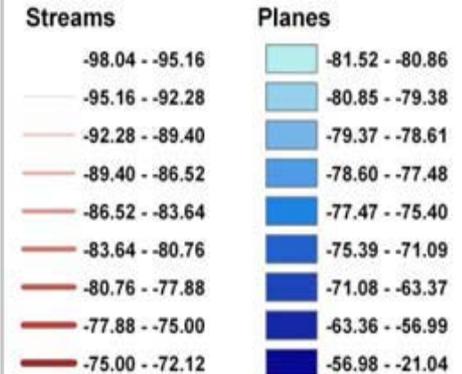
Impact of Brush Control



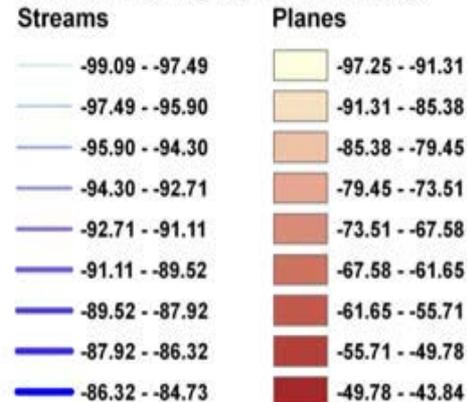
Average Annual Runoff (m3) - Percent Change



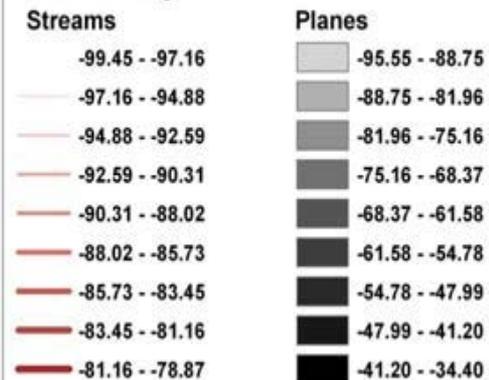
Peak Flow (mm/hr) - Percent Change



Sediment Yield (kg/ha) - Percent Change



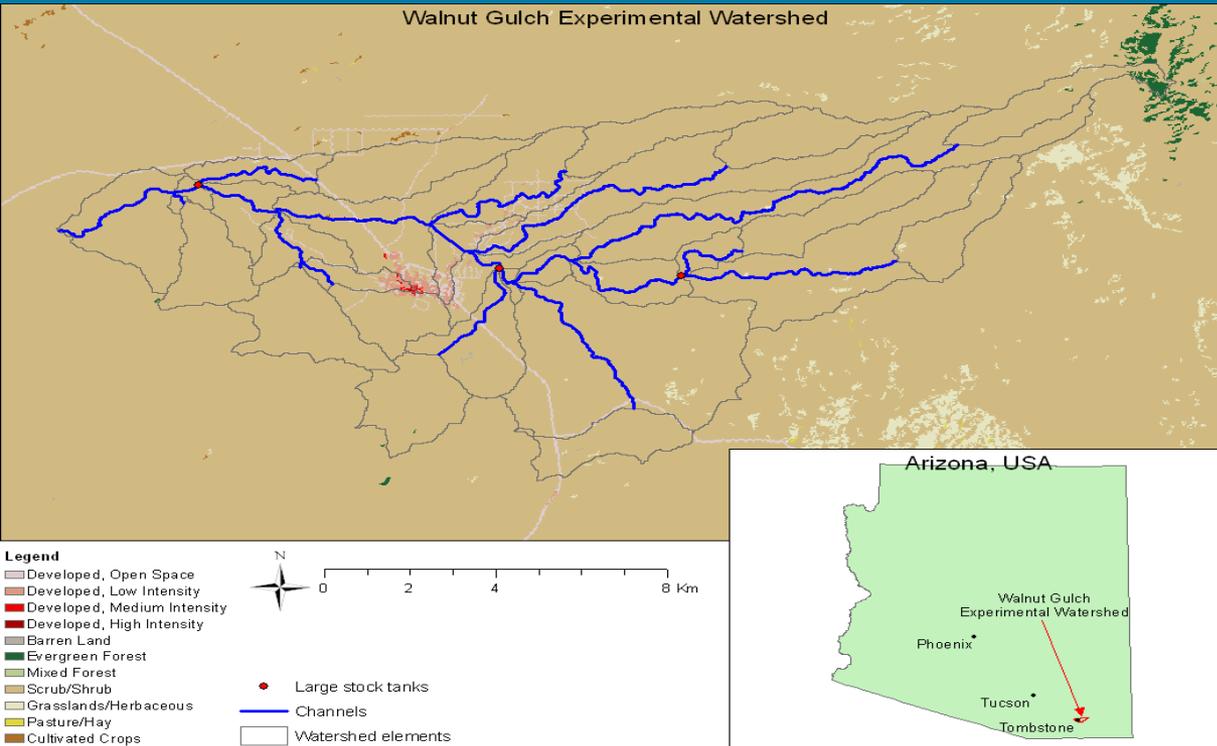
Peak Sediment Discharge (kg/s) - Percent Change



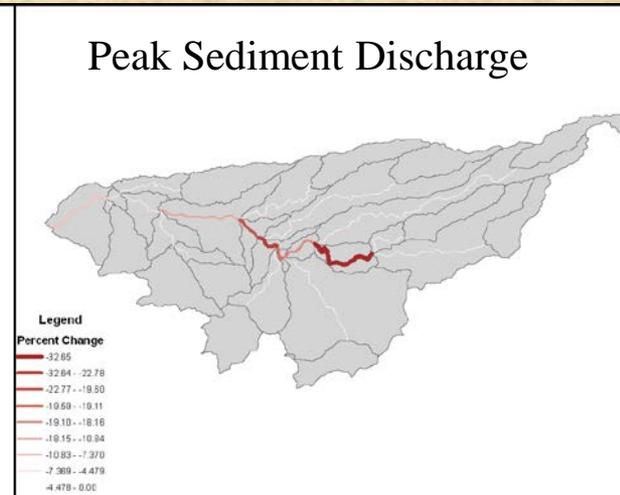
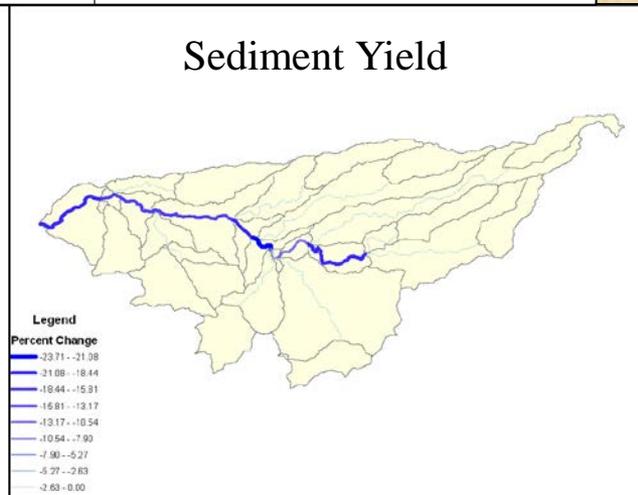
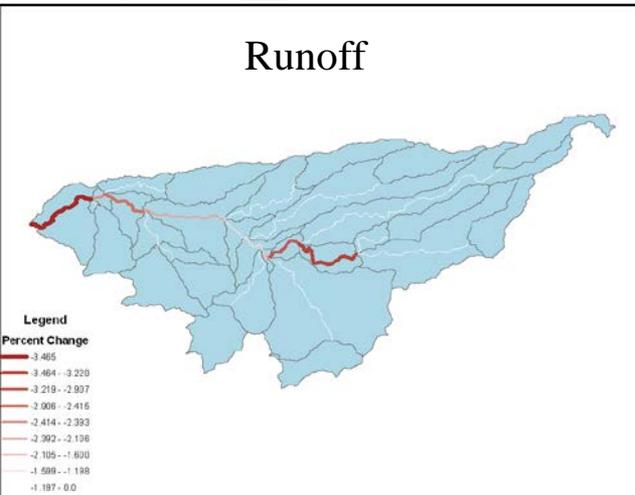
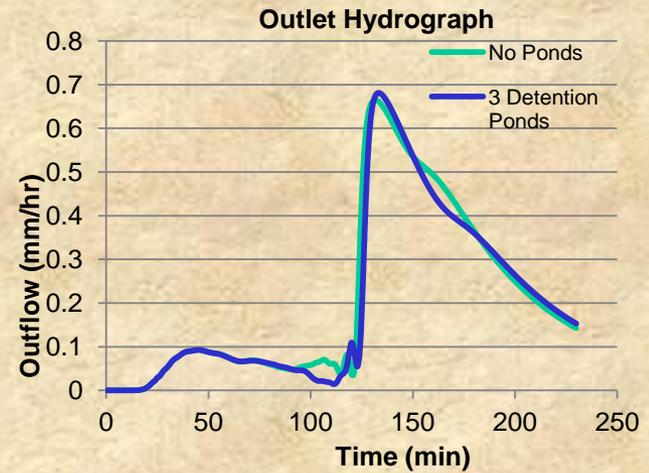
Watershed Assessment:



Impact of Stock Ponds



- ### 3 large stock ponds
- Ponds designed for up to 15 acre-feet of detention
 - 22.6% of watershed behind ponds
 - At outlet:
 - 3.46% reduction in runoff
 - 18.56% reduction in sediment yield
 - 7.67% reduction in peak sediment discharge



We appreciate and welcome partners in developing tools and techniques to enhance our nations rangelands

