BARCASS Project Public Meetings

Ely and Baker, Nevada

Trout Creek, Utah

May 22 & 23, 2006

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BARCASS work packages

- Geology/Geohydrology
- Recharge/Discharge
- Ground-Water Flow
- Geochemistry
- Data Integration
- Synthesis and Evaluation (Report Production)

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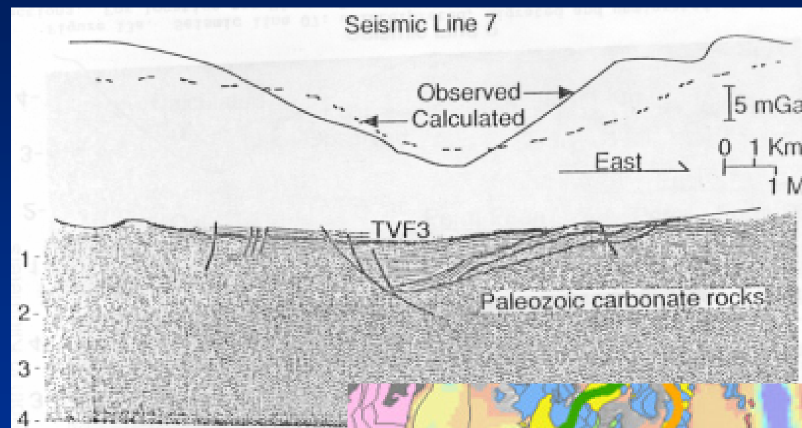
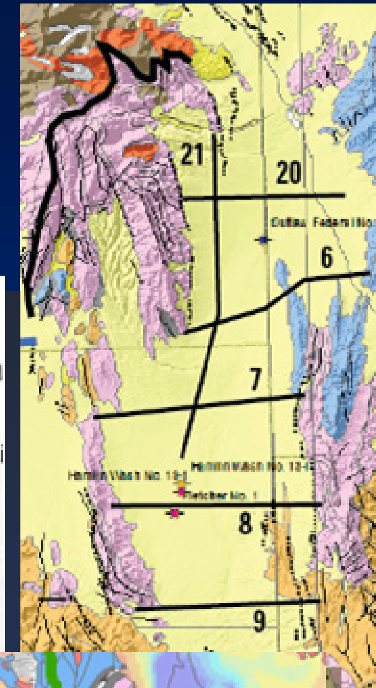
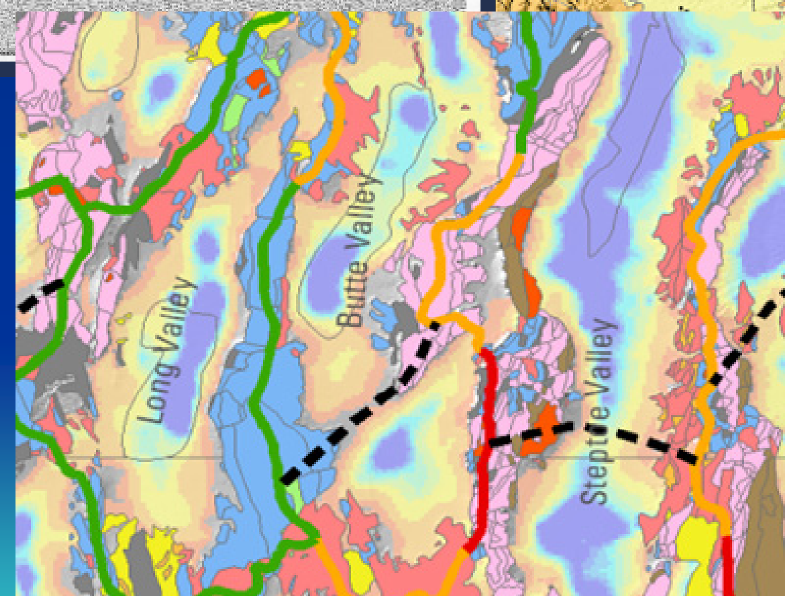
Objectives for Geology/Geohydrology

- Geologic framework configuration at important interbasin areas





- Overall conceptualization of geologic framework as it relates to flow



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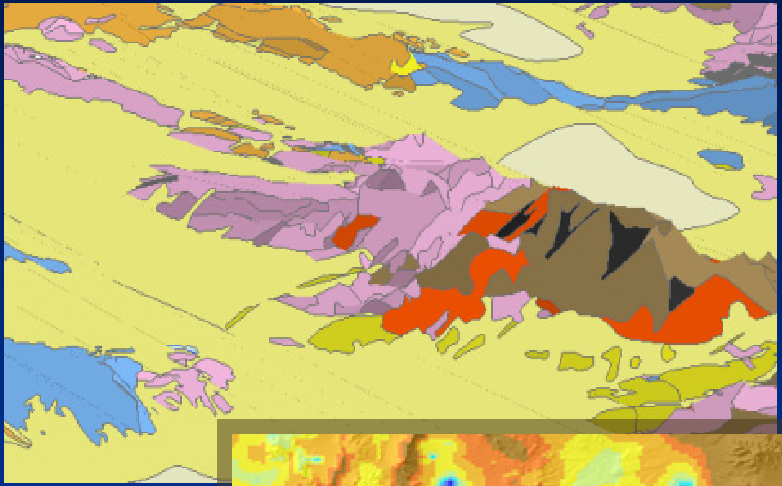
Geology - Main work components

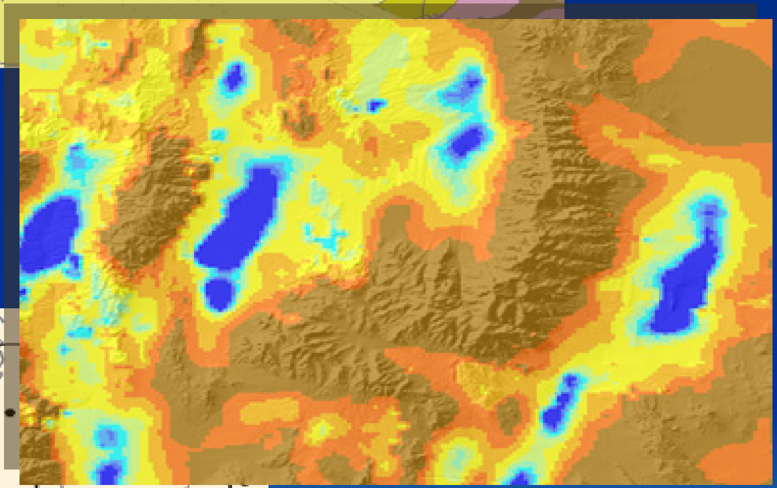
Geology/Geohydrology

- Character of basin fill
- Bedrock structure and subsurface framework



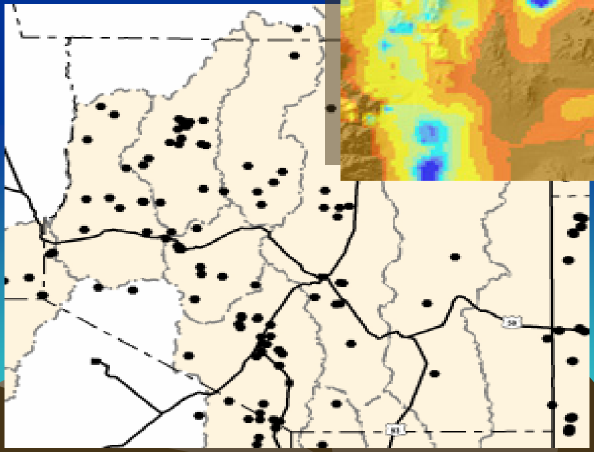
Geophysics

- Depth and shape of basins
- Locations of major faults
- Detailed studies at interbasin divides



Aquifer properties

- Well logs



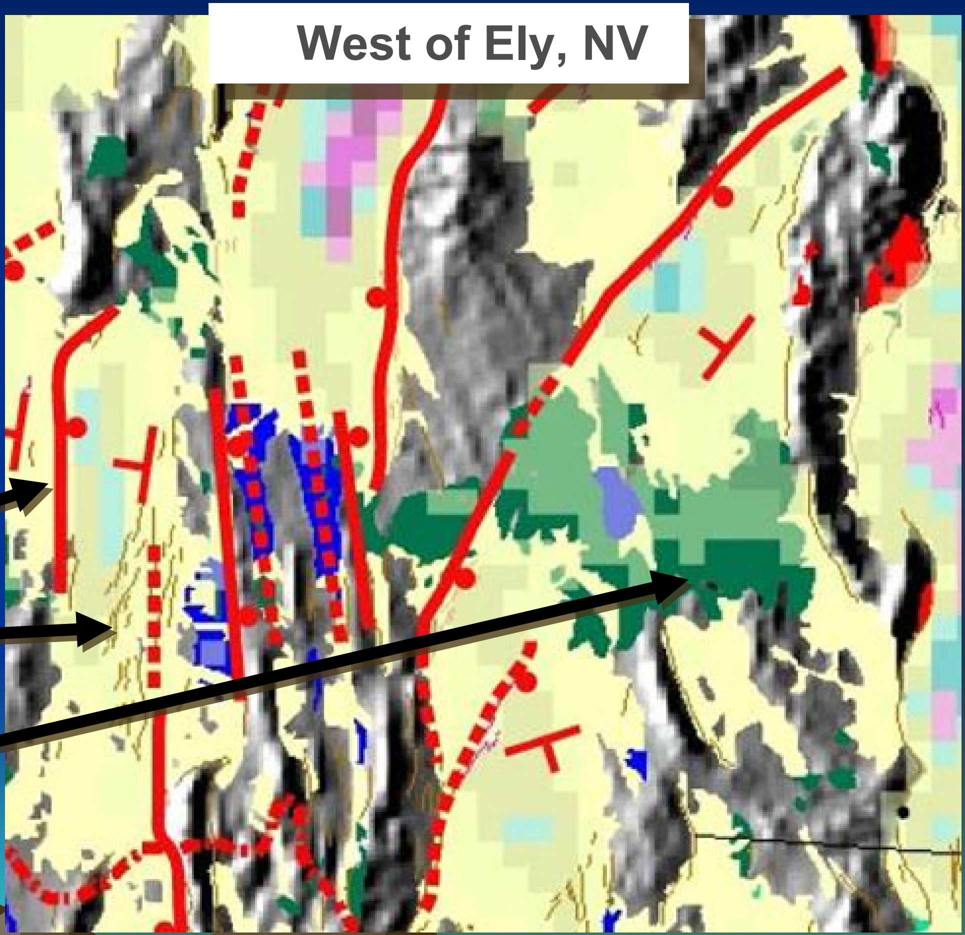
Sedimentary basin studies

- Basin-by-basin analysis of subsurface stratigraphy and structure in Cenozoic basins, based on
  - **Age of sediments**
  - **Presence of volcanic rocks**
  - **Late Cenozoic faulting**
  - **Thickness of basin fill**

Interpreted faults

Mapped young faults

Colors represent age of sediments



Preliminary data from Alan Wallace, USGS

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Volcanic rock studies

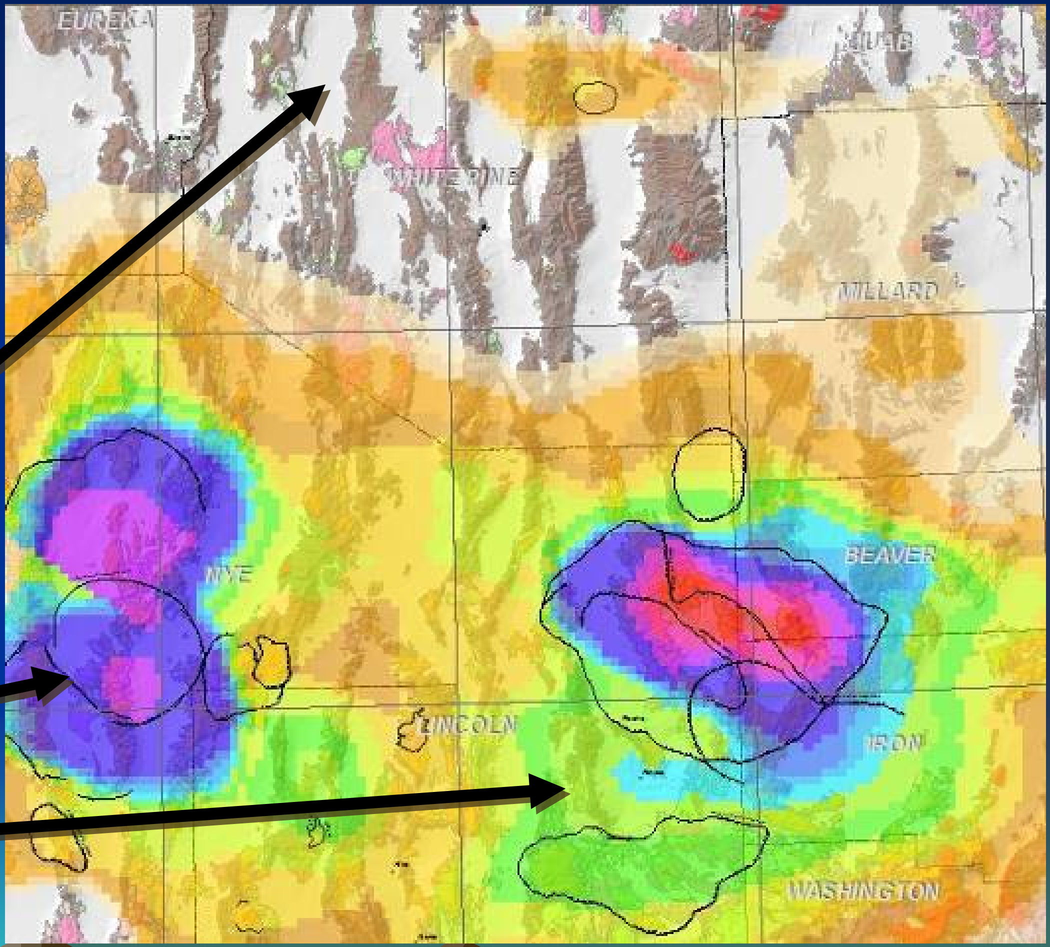
Construction of a thickness map of volcanic rocks

- Defines basins with sedimentary vs. volcanic basin fill
- Defines calderas
- Basins with different hydrologic properties

Basin with little volcanic component

Calderas

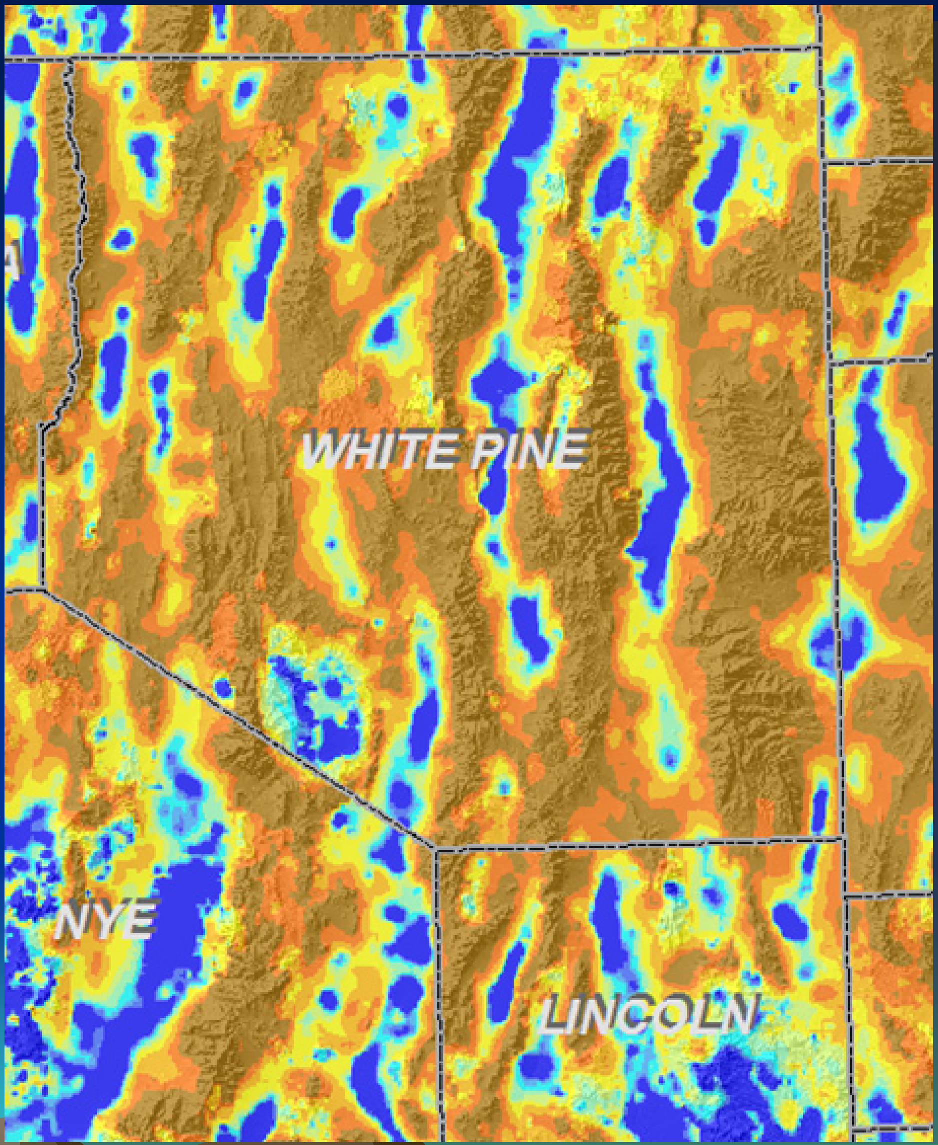
Colors represent thickness of volcanic rocks



Preliminary data from Ed du Bray and Don Sweetkind, USGS

Gravity data – thickness of basin fill

- Gravity data are used to compute basin shape and depth
- Over 500 new gravity stations
- In places, a 50% volumetric increase in basin size
- Currently being refined by comparison to seismic and other data

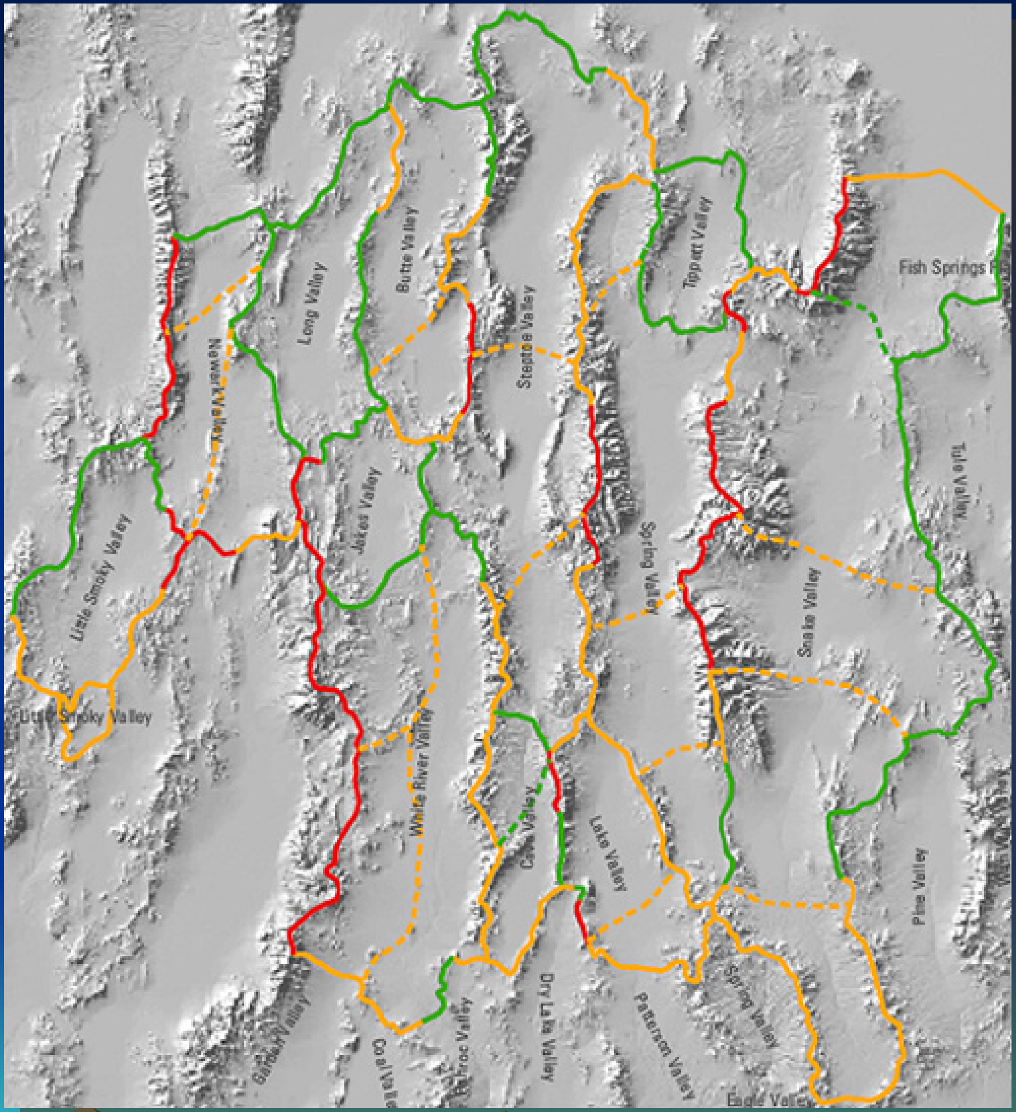


Preliminary data from Janet Tilden and David Ponce, USGS; data collection partly funded by SNWA

Attribution of HA boundaries

- Potential for flow across HA boundary based on subsurface geologic framework
- Geophysically defined intrabasin divides
- Component of water budget calculations

Code	Description
1	Impermeable bedrock at depth
2	Thick permeable Pz carbonates at depth
3	Thick Chainman shale present
4	Pluton present
5	Thick volcanic rocks, variable flow properties
6	Thick basin fill at boundary
7	Thick impermeable basin fill at boundary
8	Permeable rocks overlie shallow detachment
9	Thin Chainman shale present at depth
10	Structural disruption may allow flow



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Preliminary data from Don Sweetkind, USGS

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New geophysical work at basin divides

- •Gravity and high frequency MT data to be collected
- •Provide cross sections at critical interbasin divides
- •Suitable profile length and orientations
- •Crossing geologic structures

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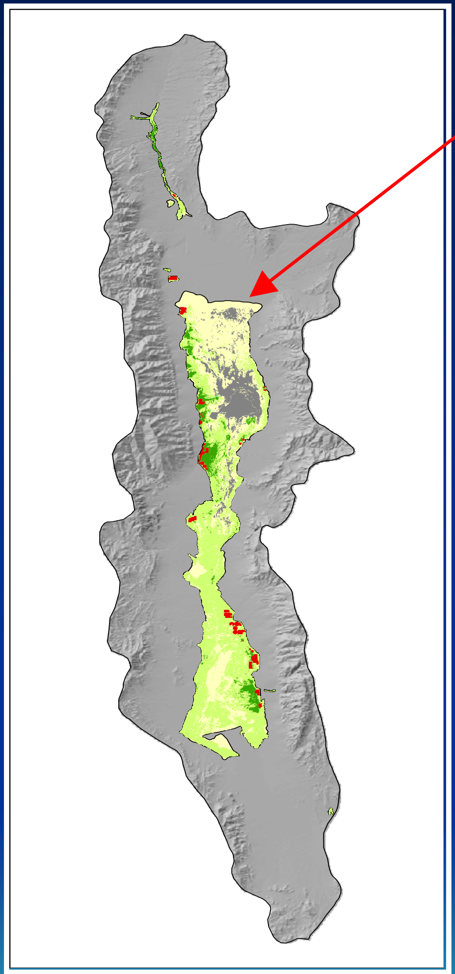
ET Task

- **Objective -** Estimate mean annual ground-water discharge from ET based on reported and project developed data for each hydrographic area

- **Constraints**
  - Limited time: “working” time April 2005 to September 2006
  - Large diverse area: > 1,000,000 acres of phreatophytic vegetation

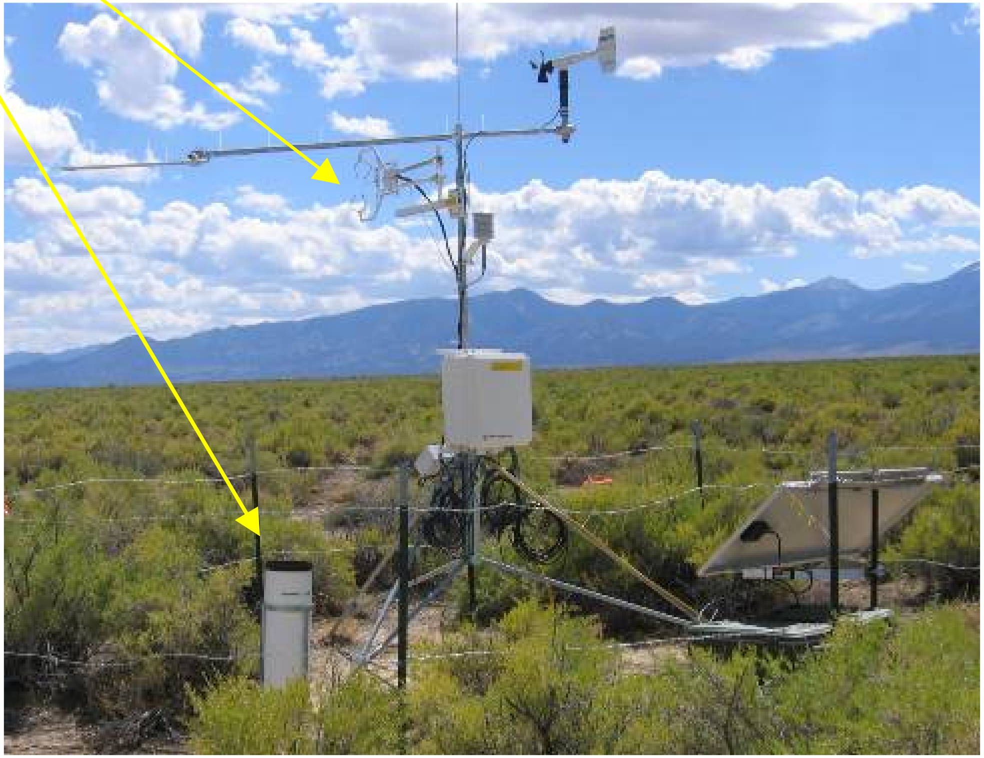
ET General Approach

Ground-water ET discharge
=
ET-unit area
X
ET rate
-
Precipitation rate



Areas grouped by similar vegetation and soil characteristics

Reported and project developed estimates



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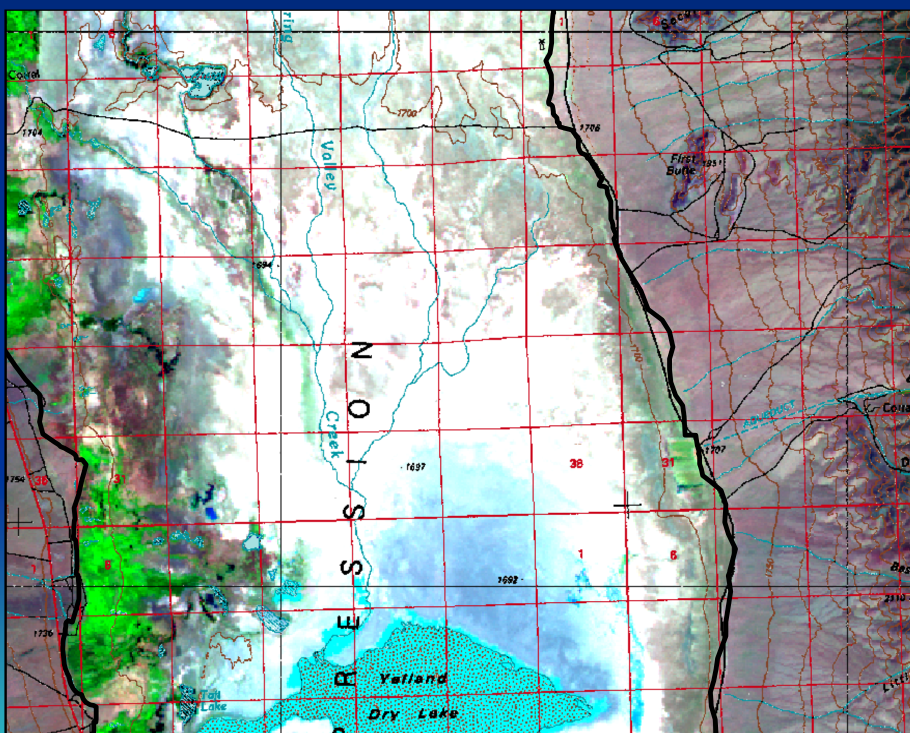
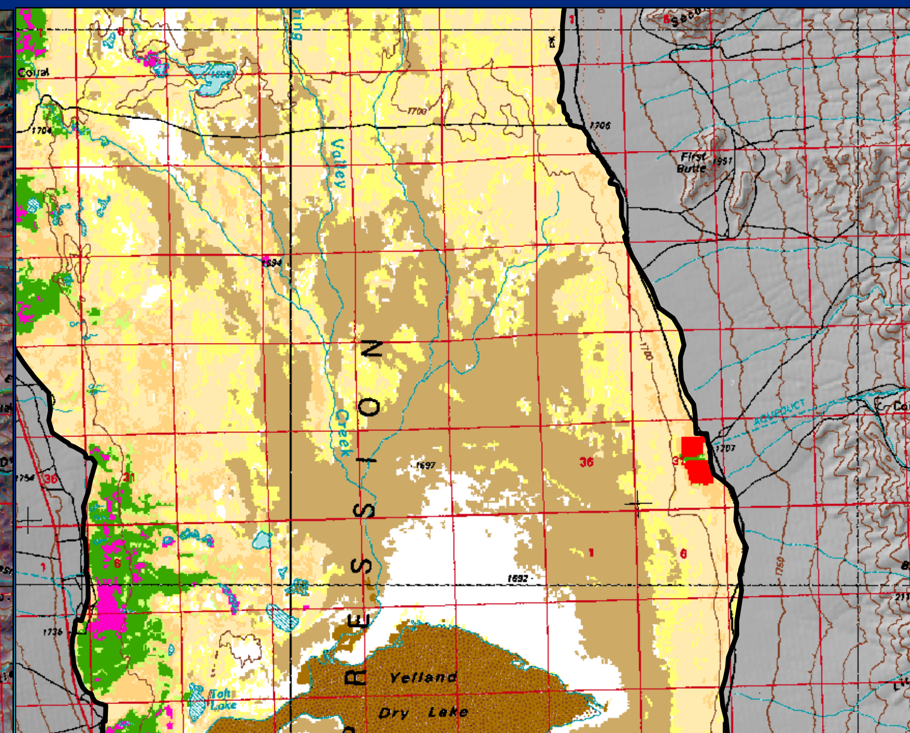
ET Area - Preliminary ET unit delineation

- ET units are areas of phreatophytic vegetation grouped by similar vegetation and soil characteristics
- ET units are delineated by spectral analysis of Landsat TM imagery and published land-cover classifications

Remotely-sensed false color composite



Preliminary ET-unit delineation



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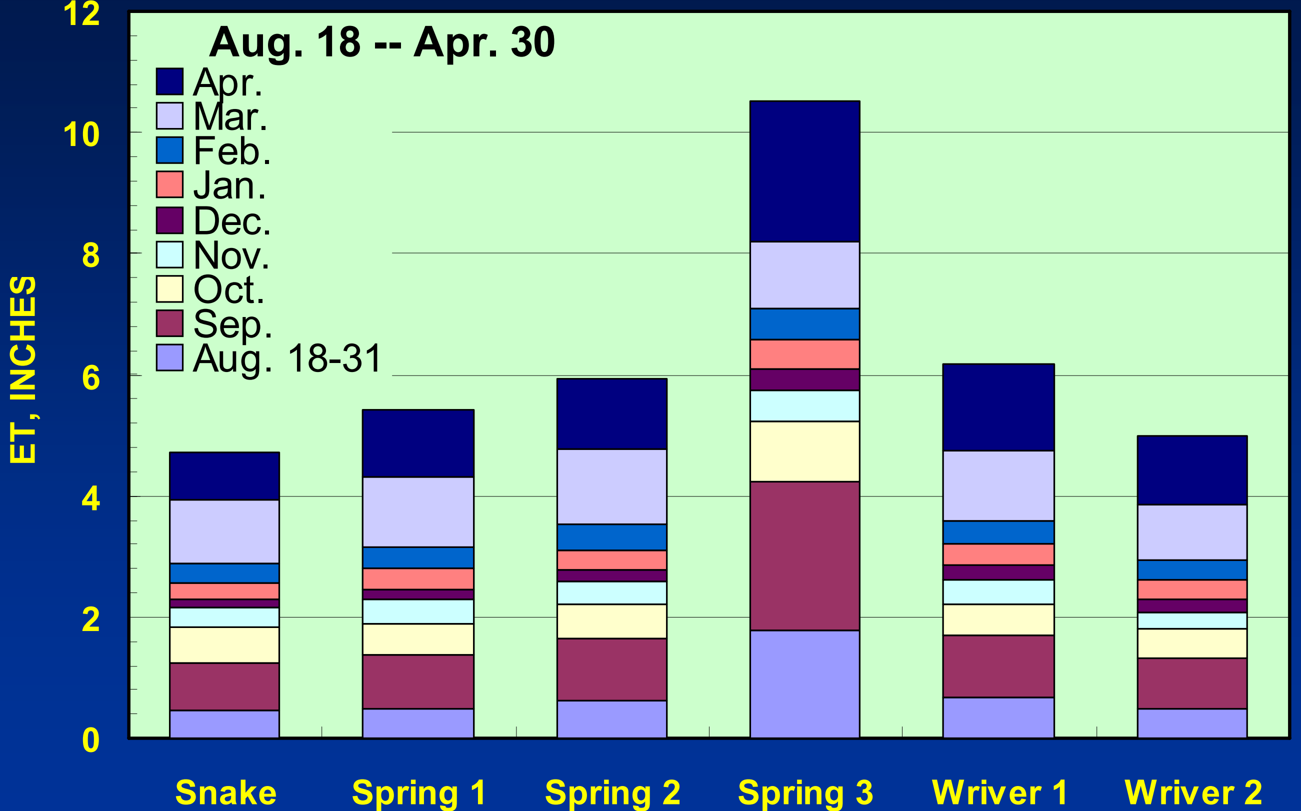
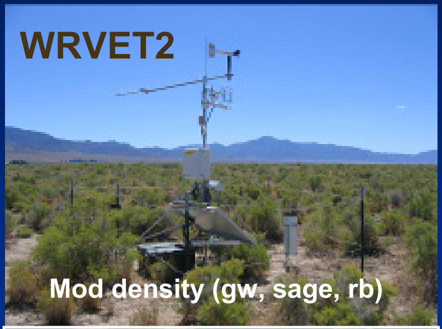
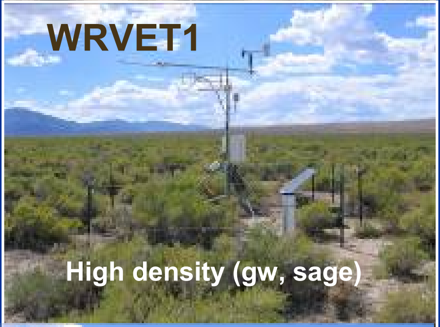
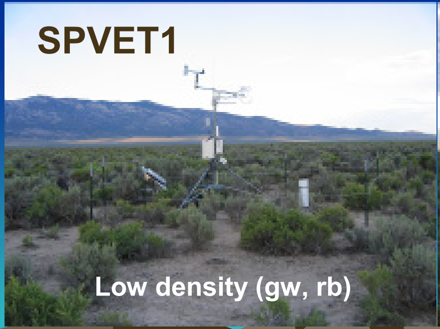
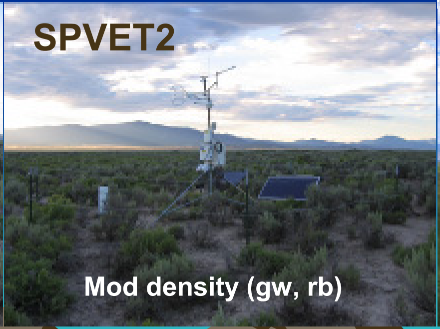
ET Rates - Preliminary results at tower sites











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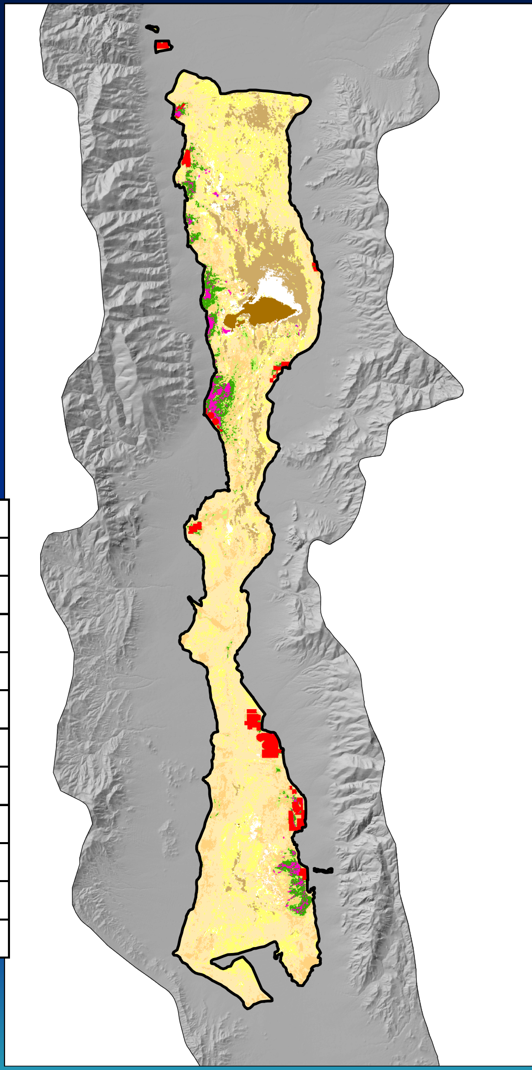
ET Discharge - Preliminary ET calculation

Example calculation of ground-water discharge for Spring Valley based on reported ET rates and preliminary ET-unit classifications

SPRING VALLEY					
ET Unit	Area (acres)	ET Rate (ft/yr)	ET (acre-ft/yr)	Precip. Rate (ft/yr)	Ground-Water Discharge (acre-ft/year)
Playa	18,362	0.95	17,444	0.8	2,754
Low density shrubs	37,159	0.9	33,443	0.8	3,716
Moderate density shrubs	80,887	1.2	97,064	0.8	32,355
High density shrubs	23,488	1.6	37,580	0.8	18,790
Moderate density grass	4,052	2.5	10,129	0.8	6,888
High density grass	5,980	3.3	19,733	0.8	14,949
Marsh	2,531	4.3	10,882	0.8	8,858
Open water	6	5.3	32	0.8	27
Total	172,463		208,864		85,582



Water Use Task

Objective: Estimate ground-water use from individual hydrographic areas and across study area

- Support development of estimates of total ground-water discharge
- Initiate development of a ground-water pumpage database that later may be used in ground-water flow models to assess impacts of past, ongoing, and proposed ground-water withdrawals

Water Use: General Approach

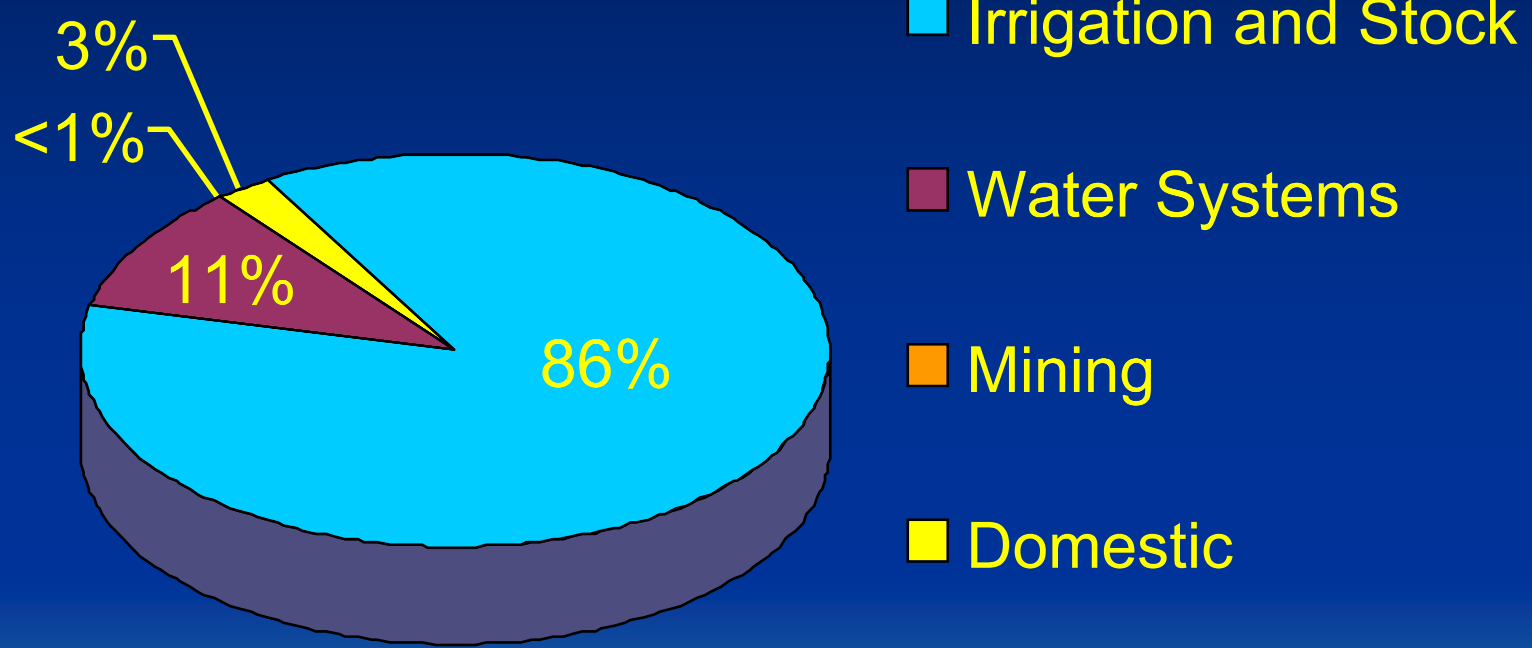
Estimate 2000, 2002, and 2005 ground-water use by making estimates for irrigation, public and commercial supply, mining, livestock, and domestic ground-water withdrawals

Irrigation use will be estimated as the product of irrigated acreage delineated from multi-spectral (or TM - Thematic Mapper) imagery and field application rates

Non-irrigation use will be estimated from available and reported data, using well locations, population, and water-use reports.

Water Use: Irrigation's Role in Ground-Water Use

Percentages of 2000 Groundwater Pumpage by Category for the BARCASS Study Area

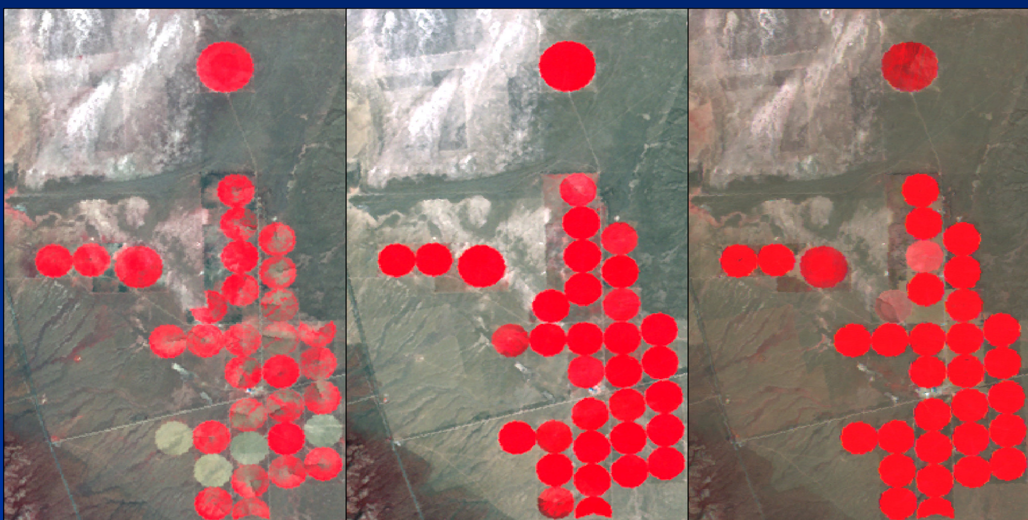


Sourced: Lopes and Evetts, 2004

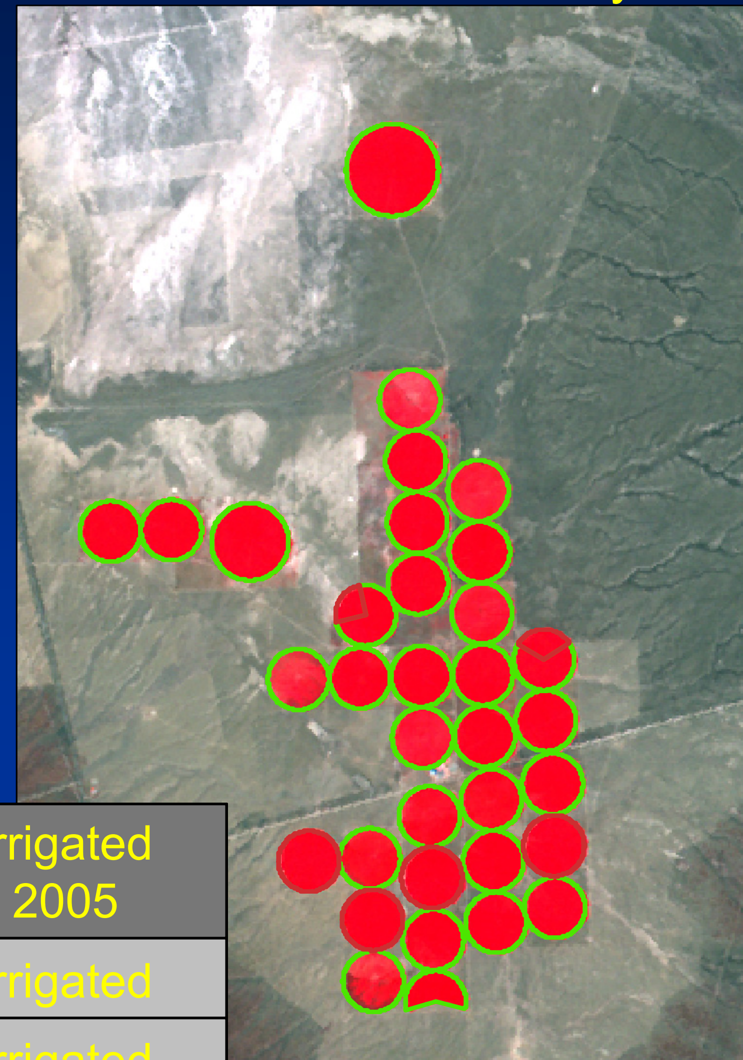
Water Use: Compile and Process Available TM Imagery

Spring-Summer Color-infrared composites (2000, 2002, and 2005)

2000 | 2002 | 2005



Southern Lake Valley



Symbology	Irrigated 2000	Irrigated 2002	Irrigated 2005
Red circle, dark red outline	Not Irrigated	Irrigated	Irrigated
Red circle, green outline	Irrigated	Irrigated	Irrigated

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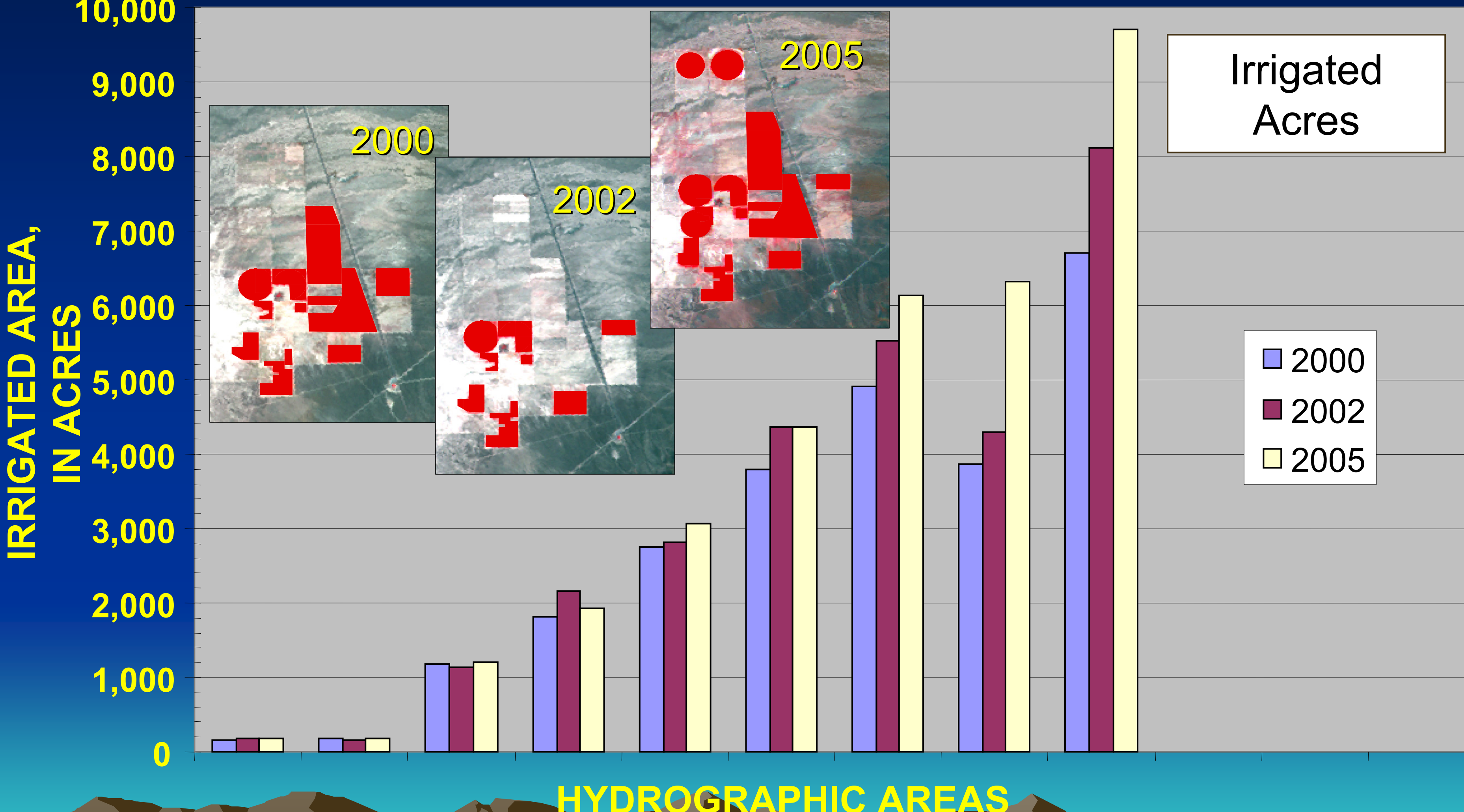
Water Use: Delineation of Irrigated Acreage by Hydrographic Area 2000, 2002, 2005 using remotely-sensed imagery



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Water Use: Estimate Application Rate for Irrigated Fields

DIRECT

- Crop type (Kc=Crop coefficient)
- Potential Evapotranspiration (PET)
- Irrigation method efficiency (sprinkle, flood)
- Length of growing season
- Precipitation amount

INDIRECT

- Early season runoff use
- Local irrigator input
- Power consumption records

Water Use: Estimates of Irrigation Applications, in acre-feet

(Preliminary data from Randy Laczniak and Mike Moreo, USGS)

HA	Acres Irrigated	Consumptive Use	Min Applied Irrigation	Max Applied Irrigation	Avg Application Rate
Newark	2,078	6,235	6,179	7,414	3.3
Little Smokey N.	1,207	3,741	4,216	5,003	3.8
Jakes	178	509	450	765	3.4
Long	0	0	0	0	
Butte	193	533	516	771	3.3
Steptoe	6,047	16,689	17,884	23,892	3.5
Cave	0	0	0	0	
Lake	4,360	13,342	13,181	15,064	3.2
Spring	3,200	9,600	10,560	12,800	3.7
Tippett	0	0	0	0	
Snake/Hamlin	9,600	28,991	31,950	39,841	3.7
White River	6,109	18,083	18,213	27,085	3.7
Total	**32,971**	**97,721**	**103,150**	**132,635**	

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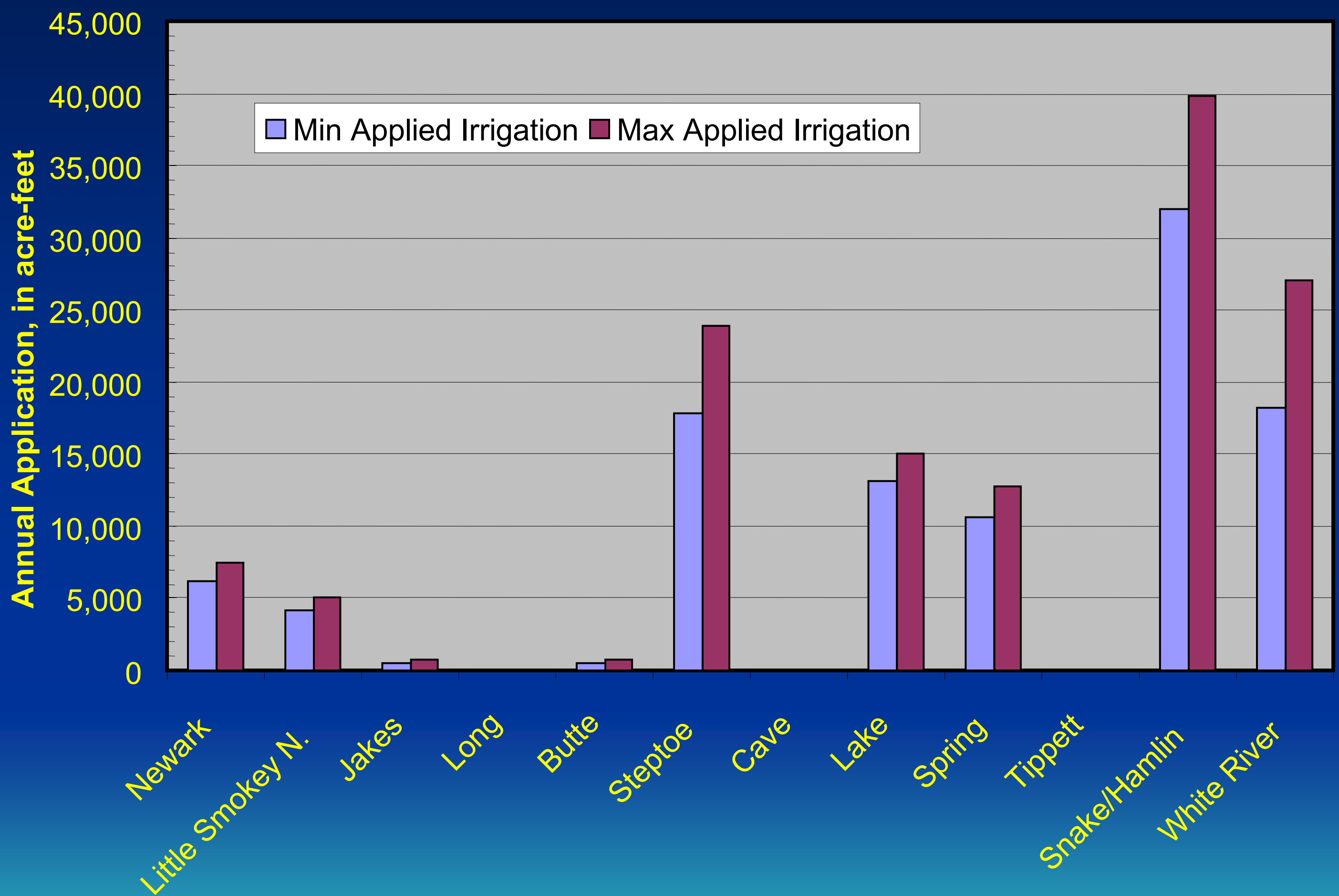
Water Use: Estimates of Irrigation Applications

(Preliminary data from Randy Laczniak and Mike Moreo, USGS)



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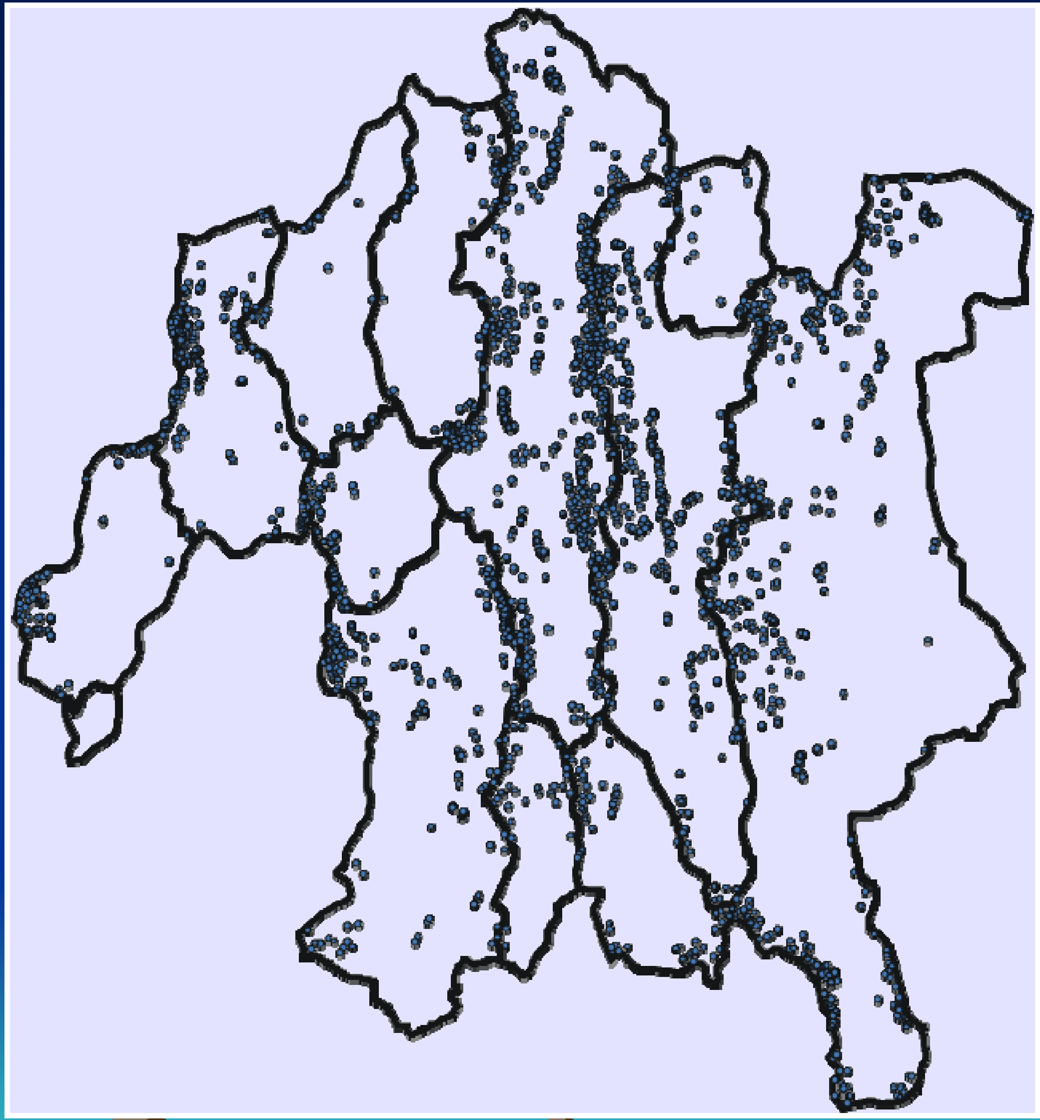
Water Use: Future Plans

- Finalize irrigation-use estimates
- Estimate withdrawals for non-irrigation uses (domestic, mining, public supply, etc.) using “other available” data
- Summarize of ground-water withdrawals by hydrographic area and use

Spring Task:

Objective - Develop a comprehensive spring database using available and project-generated data to help characterize springs and spring flows in individual hydrographic areas (qualitative evaluation of ground-water discharge)



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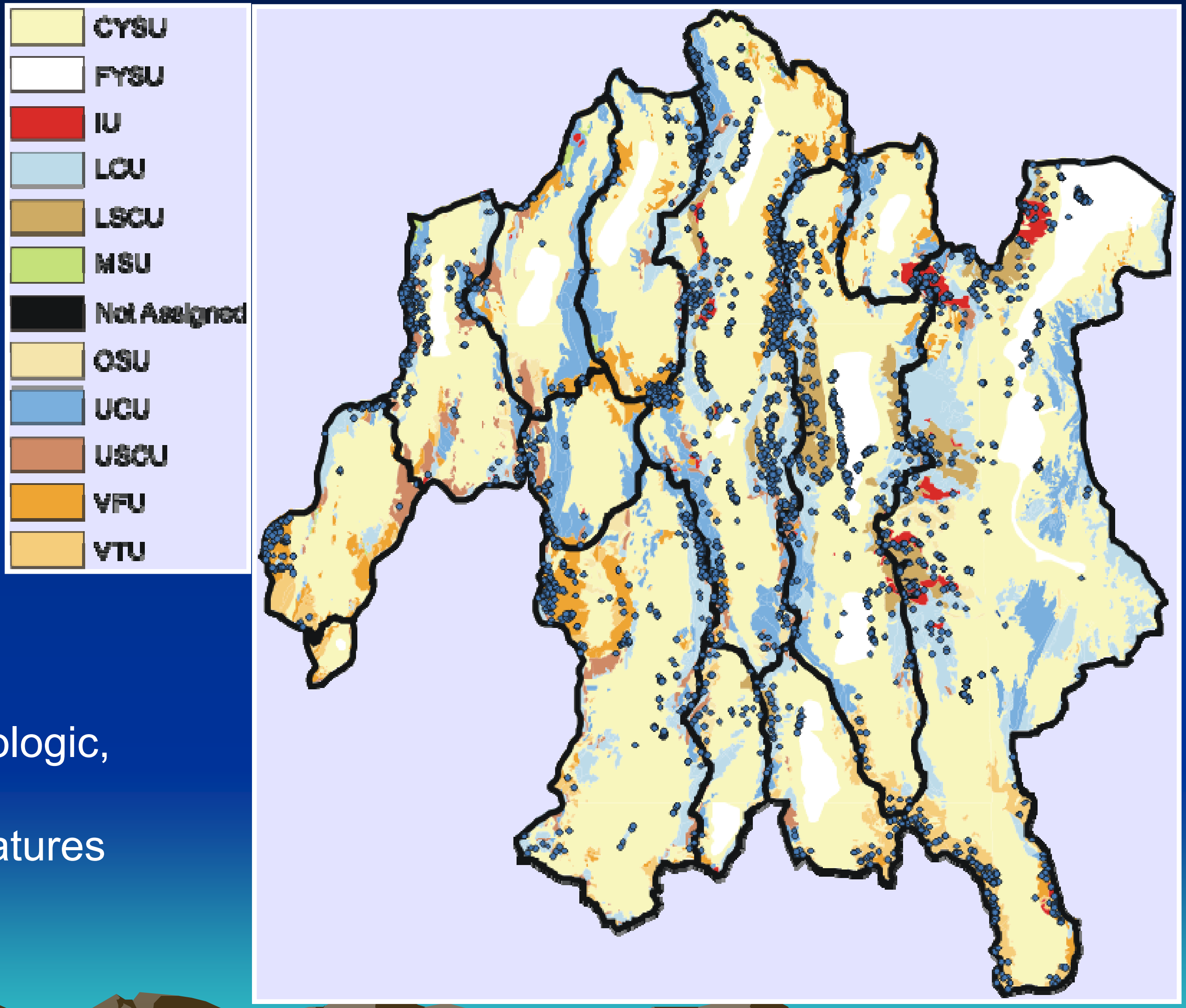
Springs: Relation to Surface Geology



Evaluate spring locations and geologic, hydrologic, physiographic features

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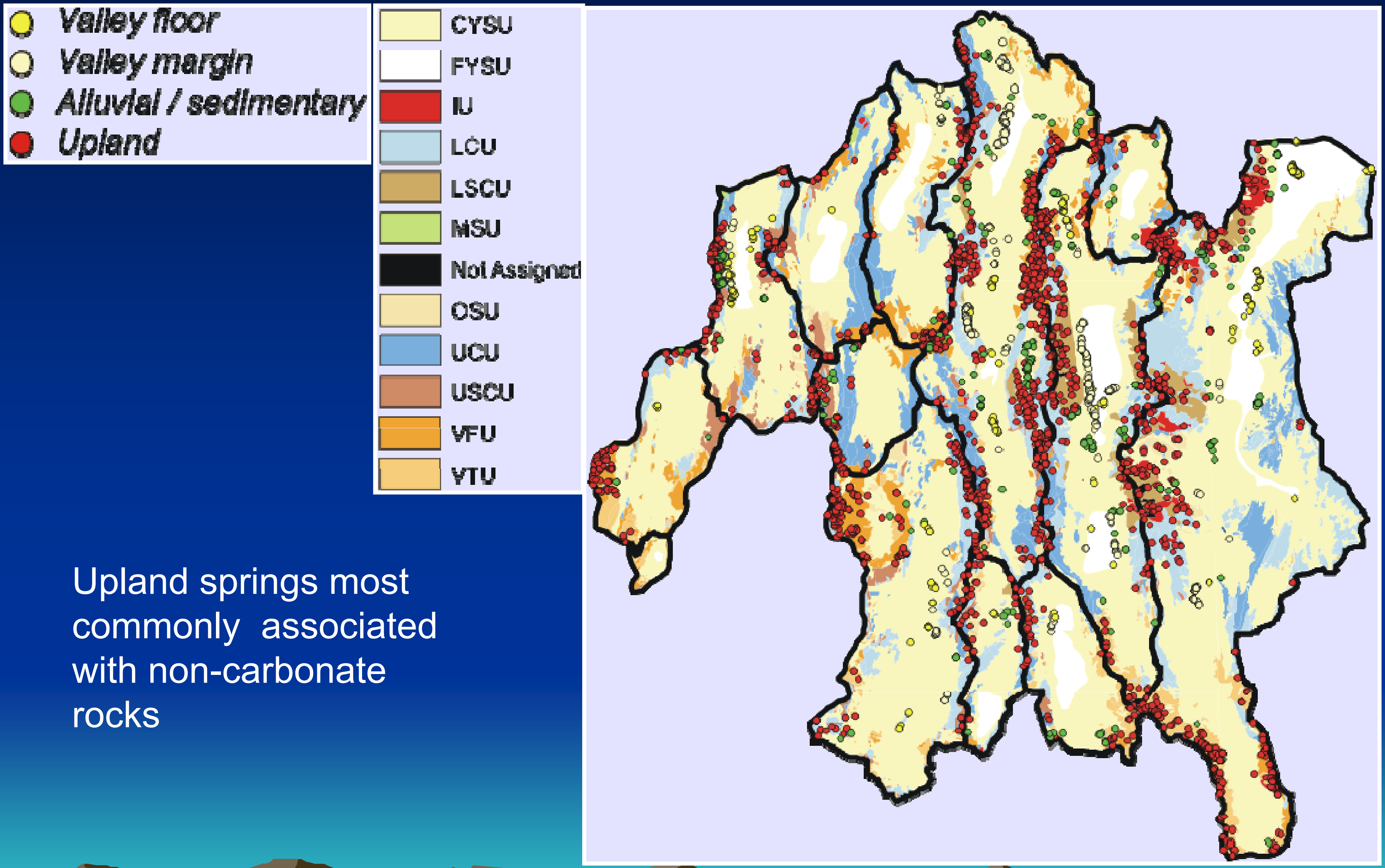
Springs: Map - Topographic Setting and Surface Geology

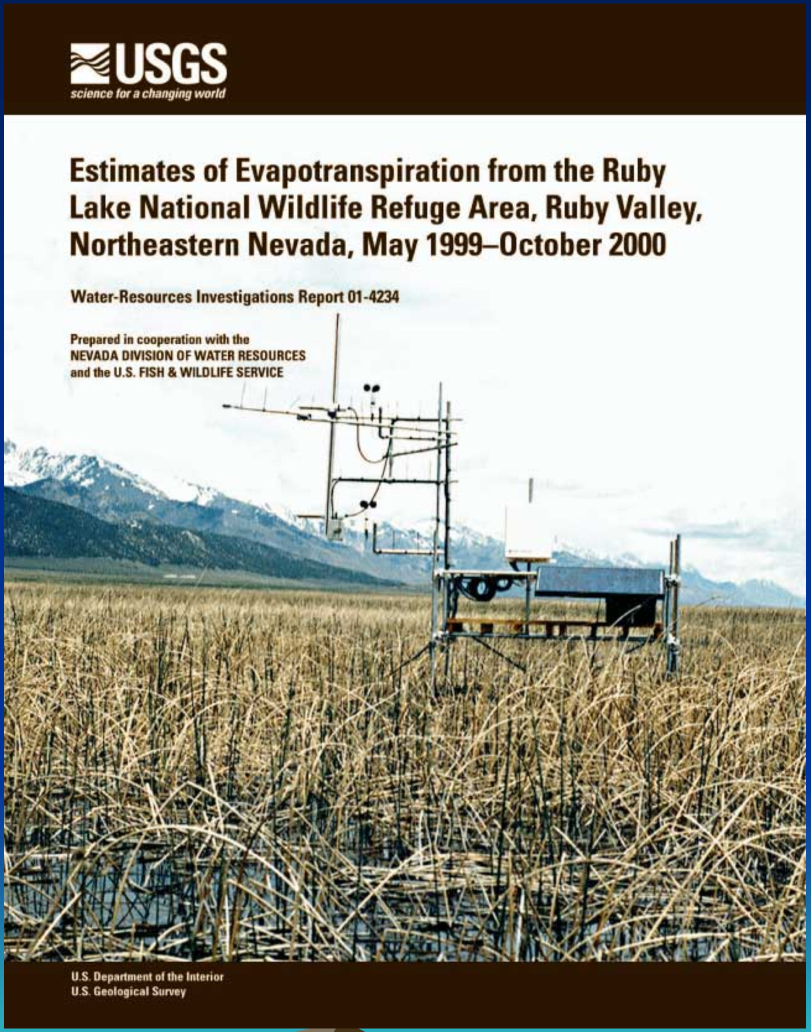


Upland springs most commonly associated with non-carbonate rocks

Data Synthesis and Evaluation

Report

- Document results of study
- Draft due June 2007
- Public comment period
- Final report due December 2007



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USGS Future Program Vision

- Statewide Ground-Water Monitoring Network (within cooperative water program, many partners)
- Develop and maintain public-sector ground-water models of Colorado and Great Salt Lake Regional Flow Systems following Death Valley Flow System example

Questions?

- Next – overview of regional ground-water modeling as a management tool