

# USGS Water Quantity Studies in Nevada

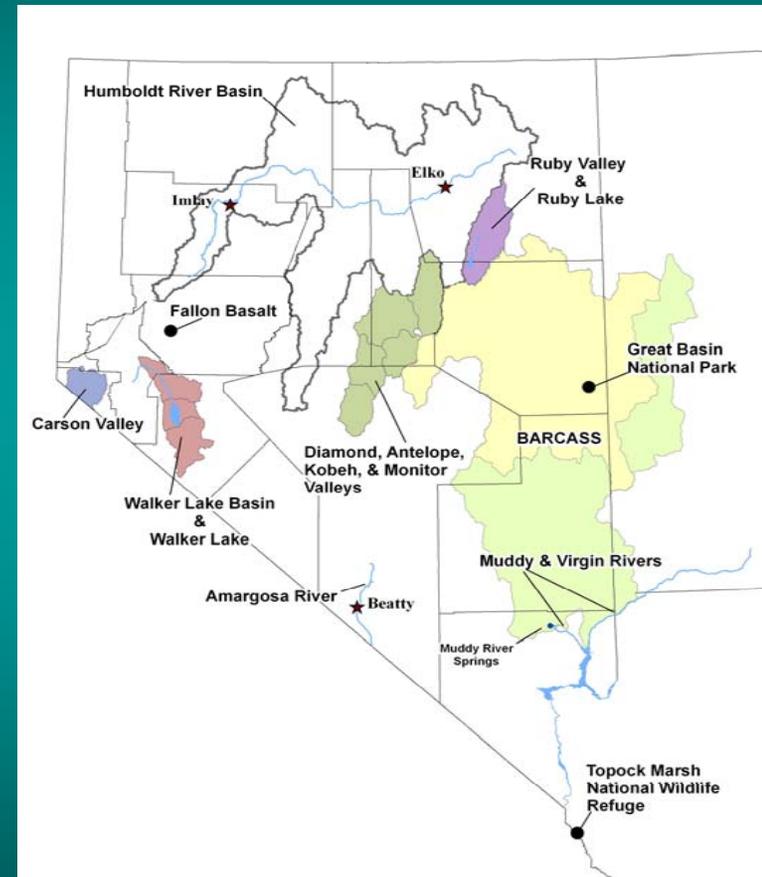
Major research programs currently underway  
throughout the State

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# USGS Studies in Nevada

- BARCASS
- Great Basin National Park
- Ruby Valley
- Humboldt River Basin
- Diamond Valley Flow System
- Fallon Basalt Aquifer
- Walker Lake
- Carson Valley
- Amargosa River
- Colorado River Ground-Water Flow System Discharge
- Lower Colorado River ET
- Data Collection Network



# Susceptibility of Water Resources in Great Basin National Park

- Purpose—Determine areas within GBNP where springs and streams could be affected by GW withdrawals from the adjacent valleys.
- Quantify discharge of major streams and springs within Park, assess natural variability in flow, and evaluate where streams and springs could be affected by GW withdrawals in the adjacent valleys.



# Water Resources of Ruby Valley

- Purpose – Describe the hydrogeologic framework of Ruby Valley and evaluate the water resources, including an updated water budget
- Recharge from precipitation
- Geology controls
- Subsurface inflow
- Relatively fresh conditions in Ruby Lake and associated marshes
- Most outflow from Ruby Valley is from ET
- GW flows NE toward Clover Valley



# Humboldt River Basin Studies

## Concern over Potential Effects of Mine Dewatering on Flow of the Humboldt River and Ground-Water Resources

### Completed Studies

1. Water Resources of the Maggie Creek Area
2. Water Resources of the Carlin Trend Area
3. Ground-Water Conditions, Middle Humboldt River Basin, 1982 and 1996
4. Simulation of Streamflow, Middle Humboldt River
5. Refined Water Budgets for 14 Basins of Middle Humboldt River Basin
6. Ground-Water Use, Middle Humboldt River Basin

### Studies Nearing Completion

1. Streamflow Trends, Humboldt River from Elko to Imlay, 1950-99
2. Carlin Trend Area Water-Level Changes, 1989-2003
3. Numerical Model of Linked Ground-Water/Surface-Water Flow, Middle Humboldt River Basin

# Diamond Valley Flow System

(Monitor, Kobeh, Antelope, and Diamond Valleys)

- **Concern that water resources may be a target for development**
- **Long-term objectives to:**
  1. Refine water budgets
  2. Quantify subsurface ground-water flow between basins
  3. Define effects of pumpage
  4. Define interactions between alluvial and carbonate-rock aquifers
- **Phase one—FY2005-2006**
  1. Define extent of alluvial aquifers
  2. Make preliminary estimates of subsurface flow
  3. Define occurrence and movement of ground water in alluvial aquifers
  4. Quantify water-level changes since 1960's

# Fallon Basalt Aquifer

- Problem - Water-level declines and increases in chloride concentrations in basalt aquifer are causing concern over continued viability of basalt aquifer. Aquifer is sole source of supply for the City of Fallon, NAS Fallon, and the Fallon Paiute-Shoshone Tribe
- Purpose - Determine pumping rates that would allow continued use of basalt aquifer
- Approach – (1) Define distribution of water quality and hydraulic properties within basalt and in surrounding and underlying aquifers with deep drilling, (2) Estimate effects of various pumping rates using ground-water flow model



# Walker Lake

- Problem - Lake salinity has steadily increased during the past 100 years. Eventually the lake will not be able to support the Lahontan Cutthroat Trout, a threatened species.
- Purpose - Refine the water budget for Walker Lake by quantifying inflow from streams and GW and outflow via ET from the lake and natural and agricultural vegetation.
- Develop the capability to predict how changing water use (primarily agriculture) will affect flows to the lake
- Develop a model based on the refined water budget and surface-water/ground-water relation studies.



# Carson Valley

- Carson Valley Water Budget
- Problem - Increasing growth is causing concern over water availability limiting growth
- Purpose - Update water budgets for input to refined GW flow model with emphasis on the effects of changes in land use
- Approach - Update estimates of precipitation and tributary inflow
- Refine estimates of ET, recharge from precipitation, Carson River gains and losses, and subsurface inflow from mountain blocks



# Carson Valley

- Carson Valley Flow Model
- Purpose - Refine existing GW flow model to evaluate water-budget estimates, and estimate effects of changes in land use and effects of pumping on Carson River outflow.
- Approach - Develop detailed histories of pumpage and effluent imports
- Develop distribution of aquifer properties
- Develop 3-dimensional representation of irrigation distribution system
- Calibrate to measured water levels and outflow of Carson River



# Ground-Water Recharge beneath the Amargosa River

- Purpose—Estimate frequency of flow, channel loss rates, and GW recharge beneath the Amargosa River (Beatty to Amargosa Farms)
- Approach— Estimate frequency of flows from sensors installed along channel of Amargosa River
- Estimate flows using standard slope-area measurements
- Collect cores and install subsurface temperature sensors
- Evaluate distribution of water in unsaturated zone beneath and adjacent to the channel at two locations using surface-geophysical surveys.



# Colorado River Ground-Water Flow System (CRFS)

- Muddy River Springs, Meadow Valley Wash, and Virgin River discharge GW and SW into Overton Arm
- Several applications filed by local municipalities and developers to acquire GW and SW from the CRFS to meet this demand.
- USFS, NPS, and BLM concerned that pumping of large quantities of GW will adversely impact local aquatic and riparian ecosystems
- Most GW discharged from ecosystems is as ET. However, much uncertainty concerning ET quantities
- Purpose: quantify GW discharged by phreatophytes as ET in riparian ecosystems.
- ET stations on Virgin and Muddy Rivers used to estimate ET rates. More planned for Meadow Valley Wash and Muddy Springs area
- The aerial extent of riparian ecosystems from satellite data and combined with ET rates to determine GW discharge as ET



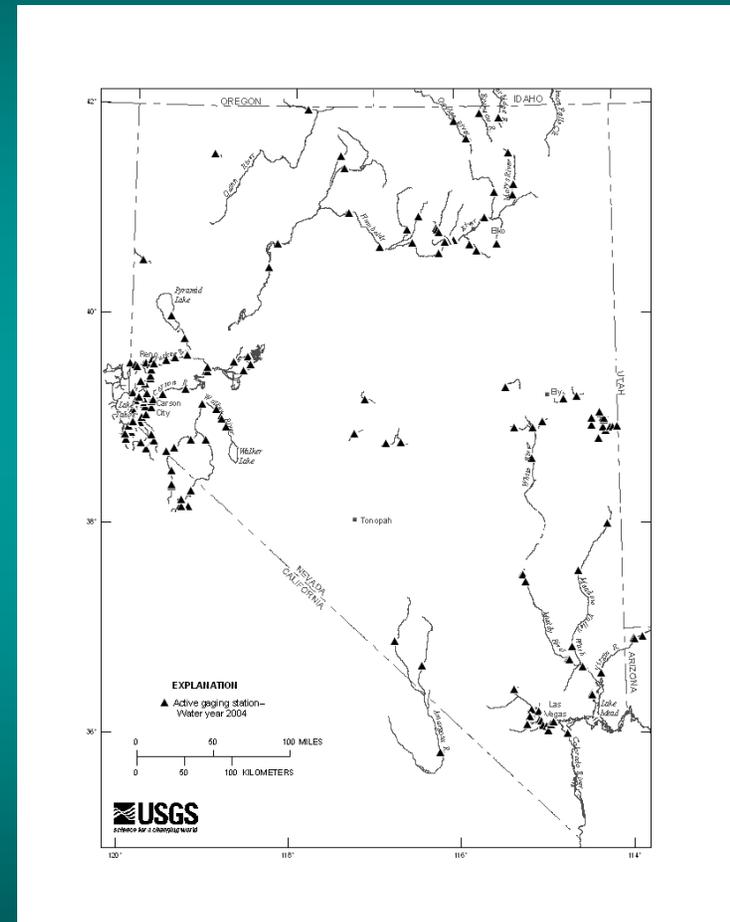
# Lower Colorado River Accounting System (LCRAS)

- BOR concerned that potential declines in the Colorado River may adversely affect future water availability. BOR is testing the LCRAS model to track consumptive uses and losses along the Colorado River between Hoover Dam and Mexico.
- 2 main losses are ET from crops and from riparian areas. BOR confident ET estimates from crops are accurate but less confident about ET estimates in riparian areas.
- Purpose: quantify ET losses from riparian vegetation along the Lower Colorado River in Topock Marsh NWR in Arizona.
- 3 micrometeorological data collection sites were installed: 1 - salt cedar, 2 - mixed willow /salt cedar/arrowweed, 3 - arrowweed.
- Aerial extent of riparian ecosystems from satellite data, combined with ET rates from the study sites used to determine consumptive use of Colorado River water from riparian vegetation by ET.



# Nevada District Data Network

- Surface water
  - 161 continuous record stations
  - 128 partial record stations
  - 7 continuous lake/reservoir stage
  - 5 partial lake/reservoir stage
  - 130 stations with DCPs
- Ground water
  - 32 continuous record
  - 820 periodic record
- Water quality
  - 73 surface water sites
  - 162 ground water sites
- Precipitation
  - 52 measurement sites



# Water Resources of the Basin and Range Carbonate Aquifer System in White Pine County Nevada, and adjacent areas in Nevada and Utah

BARCAS Study  
or  
BARCASS

# BARCASS

- Present study mandated by Lincoln County Conservation, Recreation, and Development Act of 2004 (short title)
- Funding of \$6 million provided by amendments to SNPLMA
- Draft Report – June 1, 2007
- Final Report – December 1, 2007

# Lincoln County Land Act

- “(1) IN GENERAL – The Secretary, acting through the United States Geological Survey, the Desert Research Institute, and a designee from the State of Utah shall conduct a study to investigate ground water quantity, quality, and flow characteristics in the deep carbonate and alluvial aquifers of White Pine County, Nevada, and any groundwater basins that are located in White Pine County, Nevada, or Lincoln County, Nevada, and adjacent areas in Utah”.

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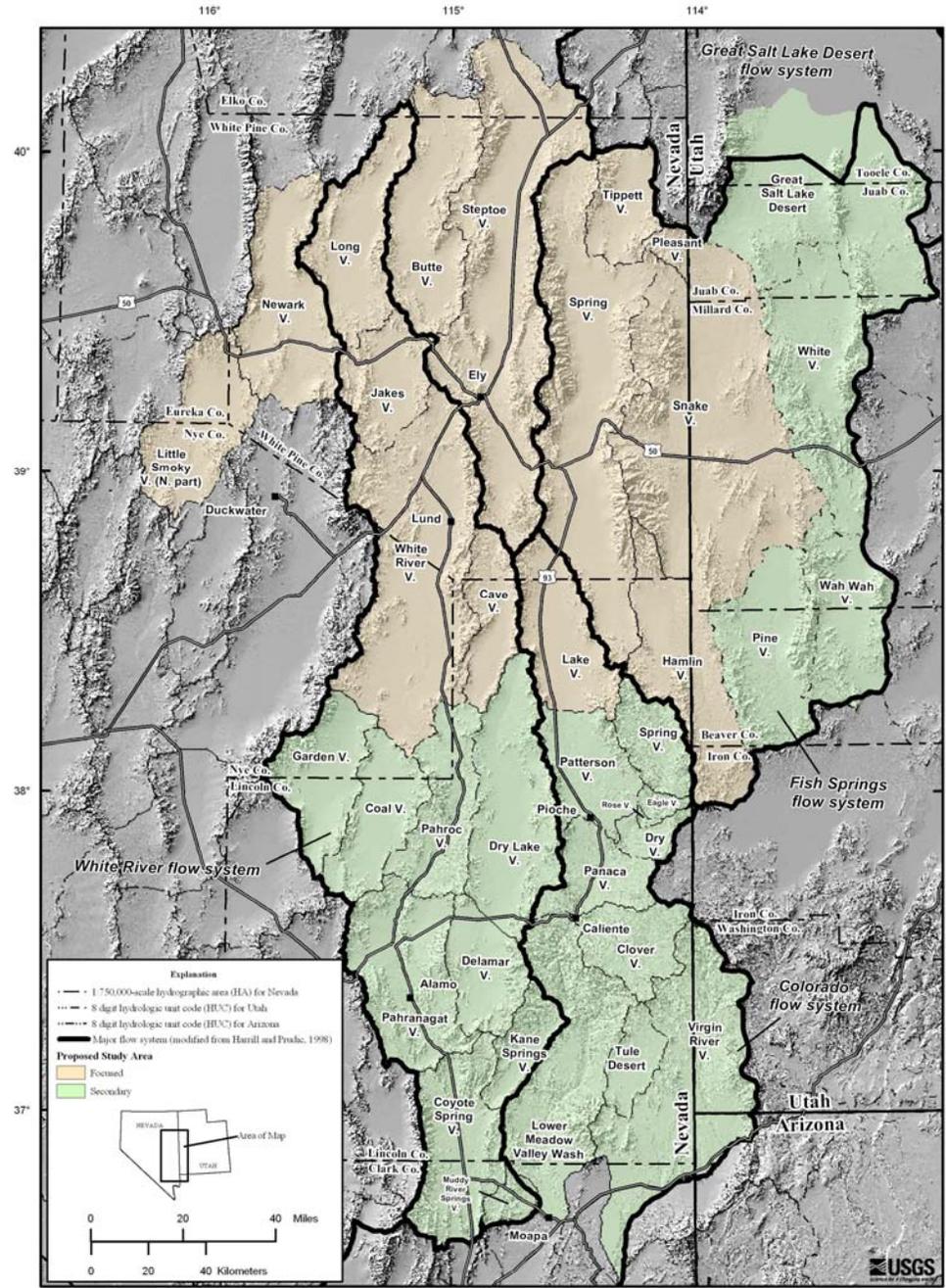
# Study Team Participants

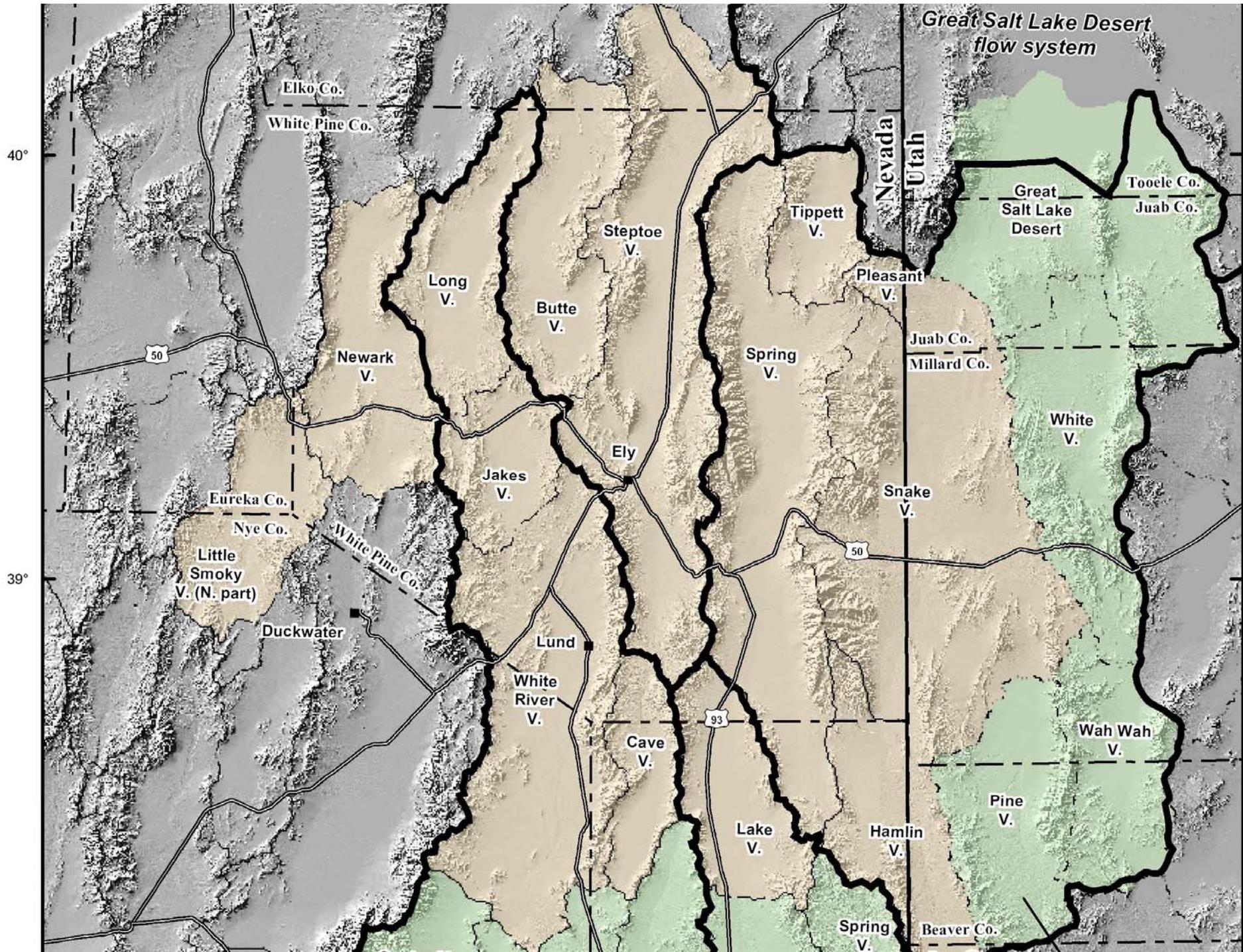
- United States Geological Survey
  - Water Resources Nevada District
  - Water Resources Utah District
  - Geology Denver
  - Geology Menlo Park
- Desert Research Institute
- Designee from Utah – Utah State Engineers Office

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# BARCASS Study Area





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# Lincoln County Land Act

- “The study shall–
  - (A) focus on a review of existing data and may include new data;
  - (B) determine the approximate volume of water stored in the aquifers in those areas;
  - (C) determine the discharge and recharge characteristics of each aquifer system;
  - (D) determine the hydrogeologic and other controls that govern the discharge and recharge of each aquifer system; and
  - (E) develop maps at consistent scale depicting aquifer systems and the recharge and discharge areas of such systems.”

# BARCASS Tasks

- (1) Consolidation of information and operation of a unified data collection network
- (2) Determination of the extent, thickness and hydrologic properties of the various aquifer units and estimation of the volume of ground water in storage.
- (3) Delineation of ground-water recharge areas and rates.
- (4) Delineation of ground-water discharge areas and rates.
- (5) Correlation and quantification of water budget components into conceptual regional flow systems.
- (6) Reporting of Results

# BARCASS Products

- Report to Congress
- Initiate construction of 3-D hydrogeologic framework
- Constrain water-budget estimates for all valleys in study area
- Establish long-term data networks and information delivery systems
- Institutionalize agency relations and public expectations

# BARCASS is/will Not

- An Environmental Impact Study
- Produce a calibrated ground-water flow model
- Answer all questions or alleviate all concerns

Additional information and  
data access on the Nevada  
Water Science Center  
website at  
<http://nevada.usgs.gov/>

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