Hydrology, Connectivity, Biodiversity

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Biodiversity

- The Mojave Desert
  - 250 Mojave taxa of plants
  - During favorable years – more endemic plants per m² than any location in the United States.

- Ash Meadows
  - 24 plants and animals found nowhere else in the world
  - Four fish and one plant are currently listed as endangered
  - Greatest concentration of endemic species in the US
  - The second greatest in all of North America

- Amargosa River flows from Beatty, Nevada to Death Valley into Badwater at 282 feet below sea level

- Spring Mountains – Sky Island
  - 37 Tree species and 600 plus vascular plant species
Connectivity
Hydrology
Reality
Hydrology 101
Nevada State Water Law 101

• **NRS 533.025 Water belongs to public.** The water of all sources of water supply within the boundaries of the State whether above or beneath the surface of the ground, belongs to the public.
  
  [1:140:1913; 1919 RL p. 3225; NCL § 7890]

• **NRS 533.010 “Person” defined.** “Person” includes the United States, this State and any political subdivision of this State.
  
  [48:140:1913; 1919 RL p. 3235; NCL § 7933]—(NRS A 1985, 522; 2009, 596)

• **NRS 533.023 “Wildlife purposes” defined.** “Wildlife purposes” includes the watering of wildlife and the establishment and maintenance of wetlands, fisheries and other wildlife habitats.
  
  (Added to NRS by 1989, 1733; A 2009, 596)
Nevada Regulatory Statues

• **NRS 533.372  Approval or rejection of application to use water to generate energy for export.** Based upon the public interest and the economic welfare of the State of Nevada, the State Engineer may approve or disapprove any application of water to beneficial use or any application which contemplates a change in the place or beneficial use of water to a use involving the industrial purpose of generating energy to be exported out of this state.

  (Added to NRS by 1981, 210; A 1981, 1434; [1991, 296])
Nevada State Engineer dilemma?

• Nevada State Engineer does not regulate pumping from residences on lot sizes larger than 2.5 Acres as long as pumping does not exceed 2.0 afa for each residence.
WHEREAS, an administrative hearing was held on September 5-6, 2007, where evidence and testimony was received regarding the potential impacts of regional pumping on existing rights, particularly the federally reserved water right at Devils Hole? The federally reserved water right specifies a threshold water level at Devils Hole. Information provided at the hearing show the water level in Devils Hole is only 0.6 to 0.7 feet above the threshold level mandated by the U.S. District Court.

NOW THEREFORE, it is ordered that, with the following exceptions, any applications to appropriate additional underground water and any application to change the point of diversion of an existing ground-water right to a point of diversion closer to Devils Hole, described as being within a 25 mile radius from Devils Hole within the Amargosa Desert Hydrographic Basin, will be denied.
Order 1197A Exceptions

• Those applications filed which seek to appropriate 2.0 acre-feet per year or less, may be considered and shall be processed subject to NRS 533 and 534.

• For projects that require changes of multiple existing rights, the State Engineer may compare the net impact to Devils Hole of the proposed changes to the impacts to Devils Hole of the base rights. If the net impact of the proposed changes is the same or less than the base right impacts, as determined by the State Engineer, such change applications may be considered and shall be processed subject to NRS 533 and 534. In no such case shall new points of diversion be allowed within ten (10) miles of Devils Hole.
Land Uses and Land Management
BASE CASE: PAHRUMP TO LOWER AMARGOSA

- Bennetts Spring
- Manse Spring
- Shoshone
- Tecopa
- Amargosa Wild and Scenic River
GROUNDWATER-FLOW PATHS TO AWSR
2100: MAXIMUM PUMPING EXTENT

RED: 200+ FT drawdown
BLUE: 1+ FT drawdown
Flow Paths to Furnace Creek
WATER-LEVEL PROFILES

- Coarse basin fill abuts carbonate rocks
- Upwelling carbonate water supports radial flow in basin fill
- Well AD-4a corridor
  - $Q = 2,000$ acre-ft/yr (Fenelon et al., 2016)
  - Passes ~80% of interbasin flow
- Corridor defined by water levels & specific capacity in basin fill
- Pumping west of well AD-4a affects water levels in Devils Hole
- Significant hydraulic feature, Needs to be simulated correctly
Devils Hole Hydrograph

Water levels estimated from photographs


6,000 acre-feet/year

Water level recovering from Cappaert pumping 1976-88

Landsers Earthquake

Hector Mine Earthquake

Climatic Rise

Wet Winter

1937  1947