

# **Water Resources of the Virgin River Basin**

**Michael Johnson, Chief Hydrologist  
Virgin Valley Water District**

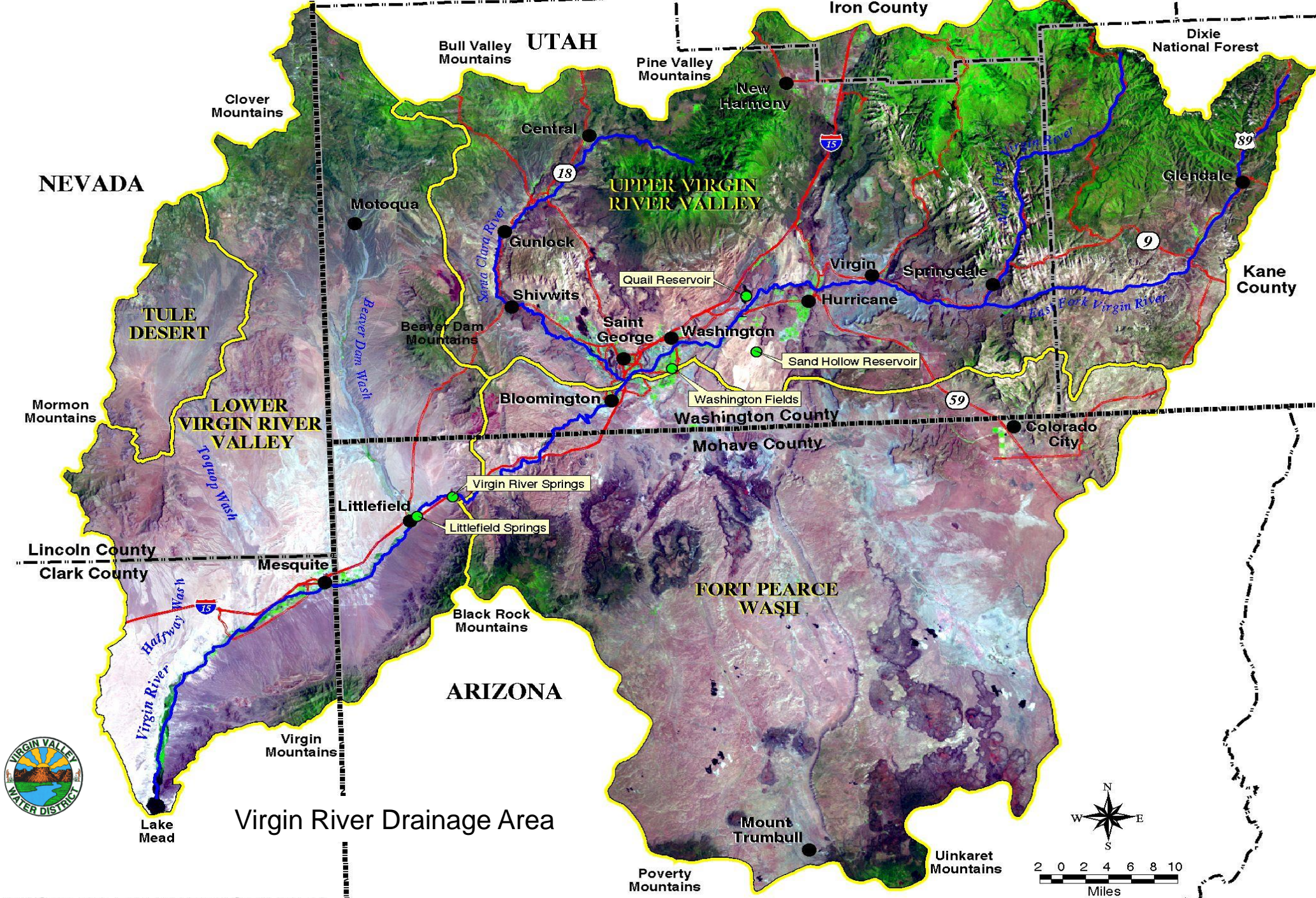
**for**

**Legislative Committee on Public Lands  
January 22, 2010  
Las Vegas, Nevada**



**EXHIBIT H – LANDS**  
Document consists of 21 slides.  
Entire Exhibit provided.  
Meeting Date: 01-22-10

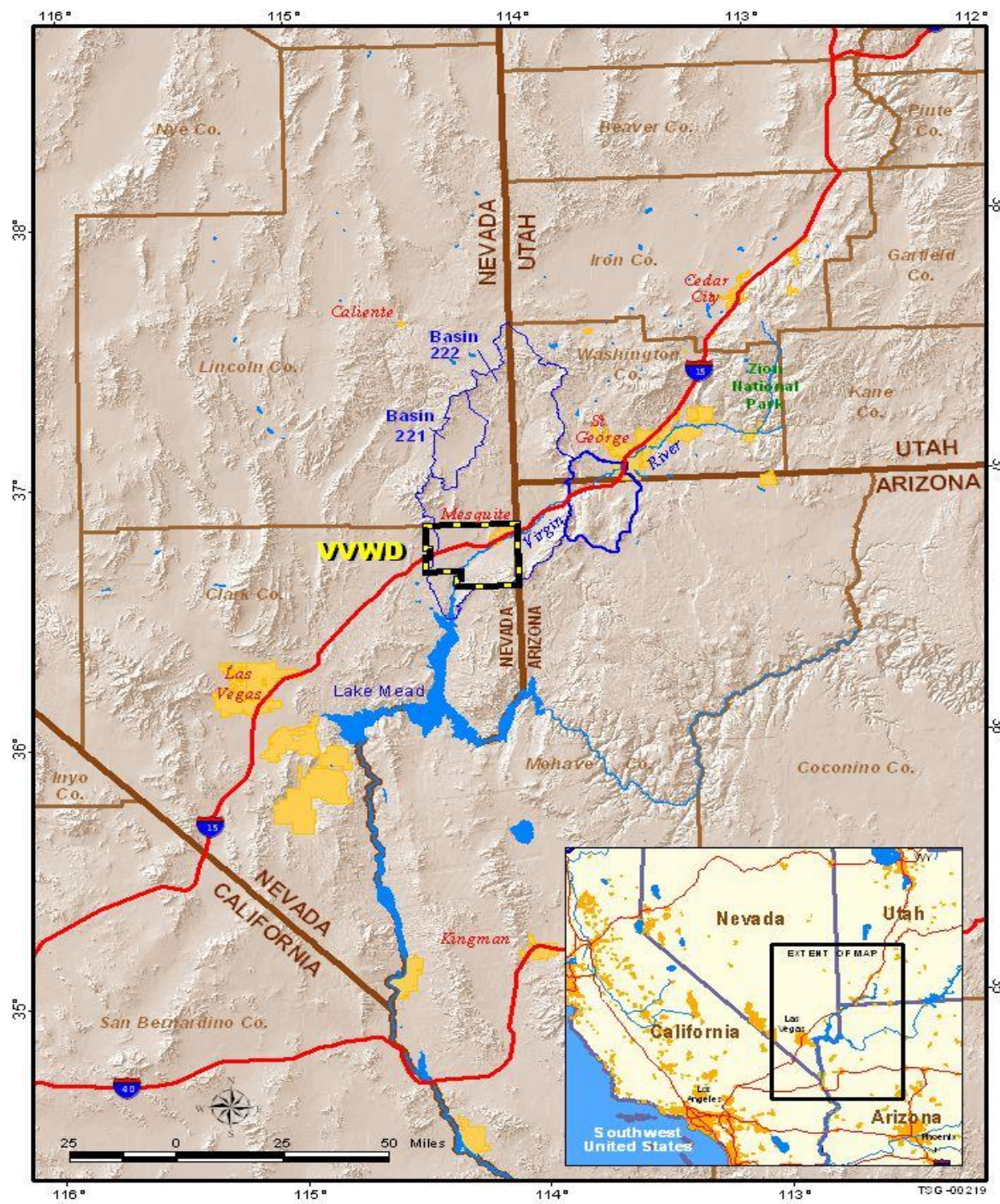






# Discussion

- Virgin River Basin
- VVWD municipal system
- Arsenic Treatment
- Ground Water Resources
- Surface Water Resources
- Population and Use
- Conservation
- Growth and Challenges



# Land Use and Demands on Virgin River

- Virgin River is not governed by any interstate compact
- Individual State water rights have been permitted
- Historical use of water was agriculture
- Virgin River Basin and adjacent area is a rapidly growing region
- Change from rural-agriculture to residential-municipal land and water use
- Greater demands for water imposed by urbanization
- Balance between sustainable water resource development and habitat/species conservation



# Virgin Valley Water District Ground Water Resources



- Nine Production Wells, Deepest Well 3300 feet, Additional production well planned
- Production rate 700 to 3,000 gallons per minute, total capacity 13,000 gpm 19 million gallons per day (mgd)
- Peak Usage 11.5 mgd, Storage 15 million gallons in 8 reservoirs
- Constructed new pump station, 2 total
- Constructed 5 Arsenic Treatment Plants  
Total Cost **\$23,279,873**



# VVWD Arsenic Removal Project

- Arsenic Pilot Treatment completed September 20, 2002
  - Bowen, Collins & Associates Coagulation filtration with ferric chloride
- Site Selection and treatment plant design
  - Design Engineer: Bowen, Collins & Associates
- Project Bid Date September 12, 2007
- Project Awarded September 19, 2007
  - Contractor; MMC Incorporated, License No. 0070211; Las Vegas, NV
- Notice to Proceed November 13, 2007
- Project Completion November 24, 2009



# VVWD Arsenic Removal Project Funding Sources

Actual Cost of Construction per  
arsenic treatment plant

U.S. Army Corp	\$14,972,816.00
U.S. EPA	\$2,390,500.00
Nevada AB 198	\$3,281,177.16
VVWD Bond	\$2,635,379.84

**Total Expenditure**  
**\$23,279,873.00**





# VVWD Arsenic Removal Project

## Treatment Plant Cost

### Actual Cost of Construction per Arsenic Treatment Plant



Plant No. 27    \$4,871,873.00

Plant No. 28    \$3,642,000.00

Plant No. 29    \$2,950,000.00

Plant No. 31    \$5,166,000.00

Plant No. 32    \$6,650,000.00

### Total Expenditure

**\$23,279,873.00**





# VVWD Arsenic Removal Project

## Arsenic Concentration

### Arsenic Concentration Prior to Treatment

micrograms per liter ( $\mu\text{g/L}$ )

VVWD Treatment Site	Average	High	Low
VVWD Plant No. 27	19.8	36	14
VVWD Plant No. 28	26.6	31	16
VVWD Plant No. 29	22.8	42	22
VVWD Plant No. 31	21.2	27	17
VVWD Plant No. 32	52.9	77	46

### Arsenic Concentration After Treatment

micrograms per liter ( $\mu\text{g/L}$ )

VVWD Treatment Site	Average	High	Low
VVWD Plant No. 27	1.7	2.7	1.1
VVWD Plant No. 28	2	2.9	1.1
VVWD Plant No. 29	2.2	4.3	1.6
VVWD Plant No. 31	1.9	2.8	0
VVWD Plant No. 32	4.4	6.8	2.6



# VVWD Distribution System upgrades

- Horizontal Directional Drilling (HDD) under the Virgin River associated NDOT Bunkerville Bridge, Bridge 89 replacement; Public Works Project PWP-CL-2008-441
  - No disturbance in the riparian area adjacent to the river
    - No Army Corp 404 permit for encroachment into water of the U.S.
  - Installed 16-inch C-905 PVC in 24-borehole, length 1,300 feet
  - Contract Award September 4, 2008 to Longview Construction & Development, Contract No. 0051988
  - Notice to Proceed September 29, 2008 completed January 6, 2009
  - Contract Cost \$605,500.00





# Ground Water Rights in Nevada for the Lower Virgin River Basin

## Permitted and Certificated Water Rights

### Type of Use

Municipal & Industrial  
Stockwater/Recreation

Virgin Valley Water District

12,039.0 afy  
76.9 afy

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**12,115.9 afy**

## Applications

### Type of Use

Municipal & Industrial

Virgin Valley Water District  
(from Southern Nevada Water Authority)

65,158 afy

(1989-1996)

Virgin Valley Water District

161,667 afy

Municipal

(1998)

Lincoln County Water District/  
Vidler Water Company, Inc.

14,480 afy  

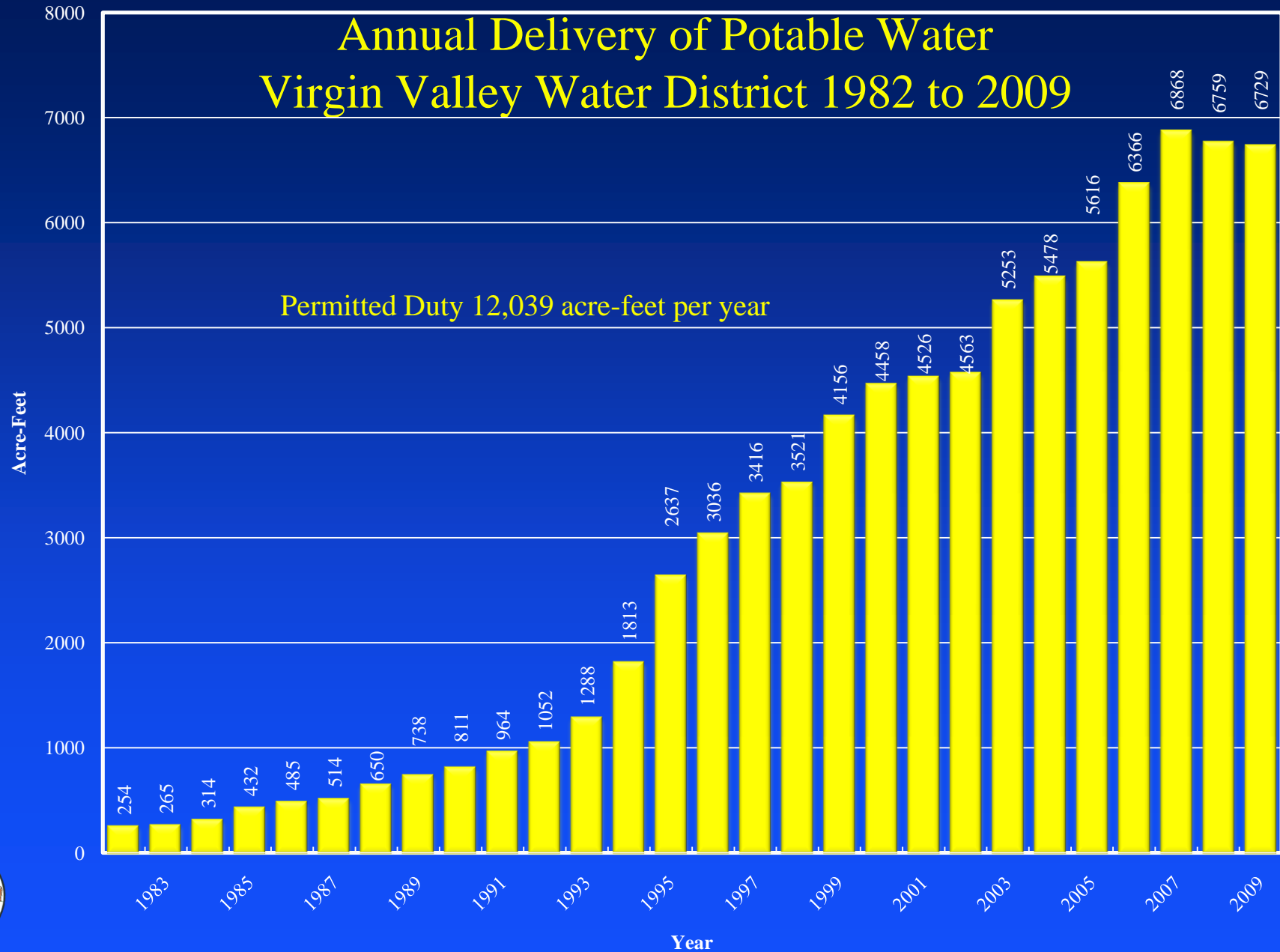
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241,305 afy

Data source Nevada Division of Water Resources

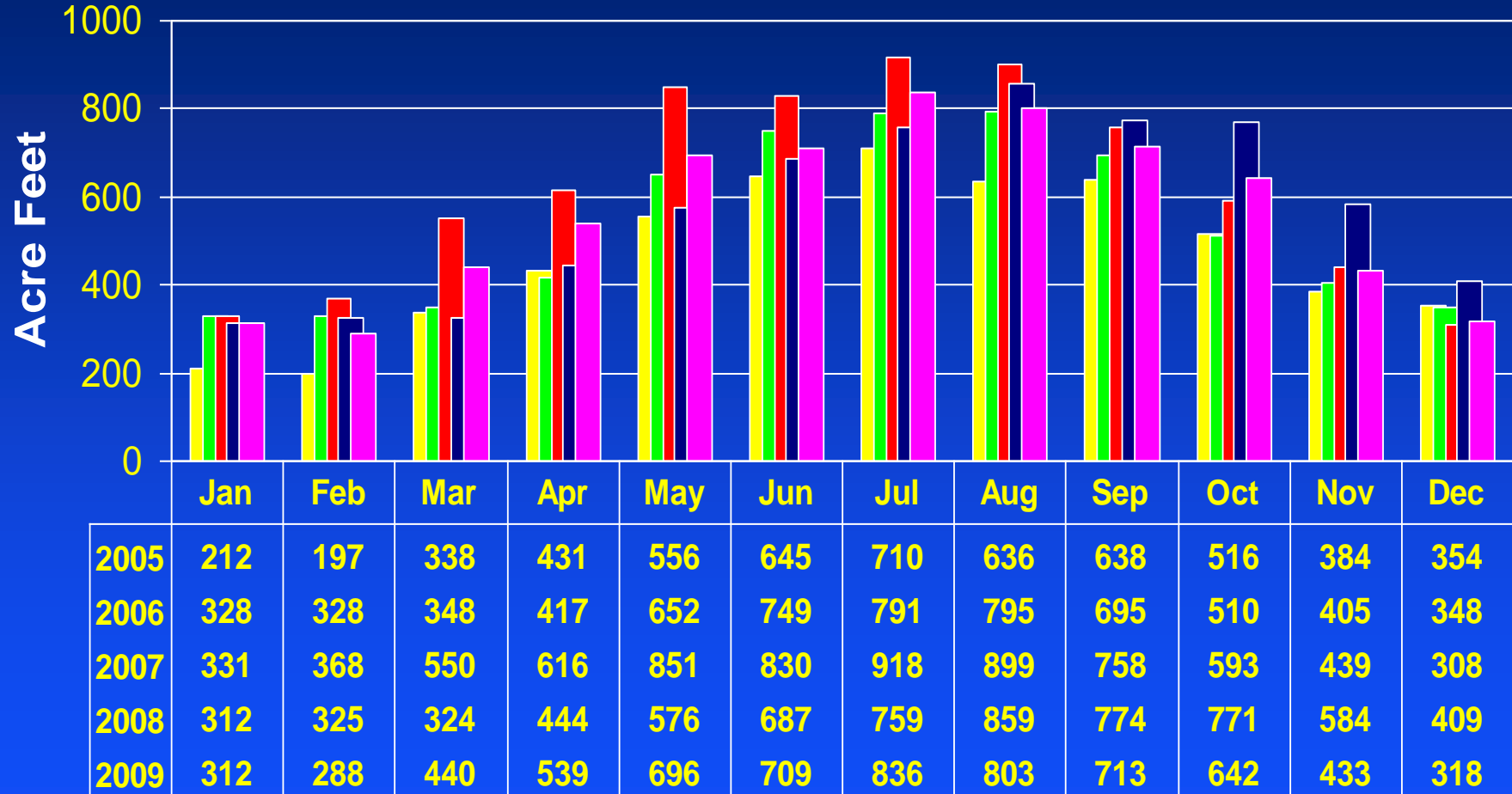


# Annual Delivery of Potable Water Virgin Valley Water District 1982 to 2009





# Virgin Valley Water District Water Production



■ 2005 
 ■ 2006 
 ■ 2007 
 ■ 2008 
 ■ 2009

# Surface Water Rights on Lower Virgin River

- Virgin River Decree – date 1927
  - Bunkerville Irrigation (BIC) 8,116 afy
  - Mesquite Irrigation (MIC) 9,670 afy
  - Priority Date 1905 17,786 afy
    - VVWD shares BIC 57 shares
    - VVWD shares MIC 402 shares
- Other NV permitted priority 1914 - 1956
  - Mesquite Irrigation 2,106 afy
  - Bunkerville Irrigation 1,496 afy
  - Riverside 1,916 afy5,518 afy
- SNWA; 1989 113,000 afy average annual diversion up to a maximum 190,000 afy; diverted seasonally October 1 through May 31 annually
  - Under agreement VVWD holds 5,000 acre-feet seasonally



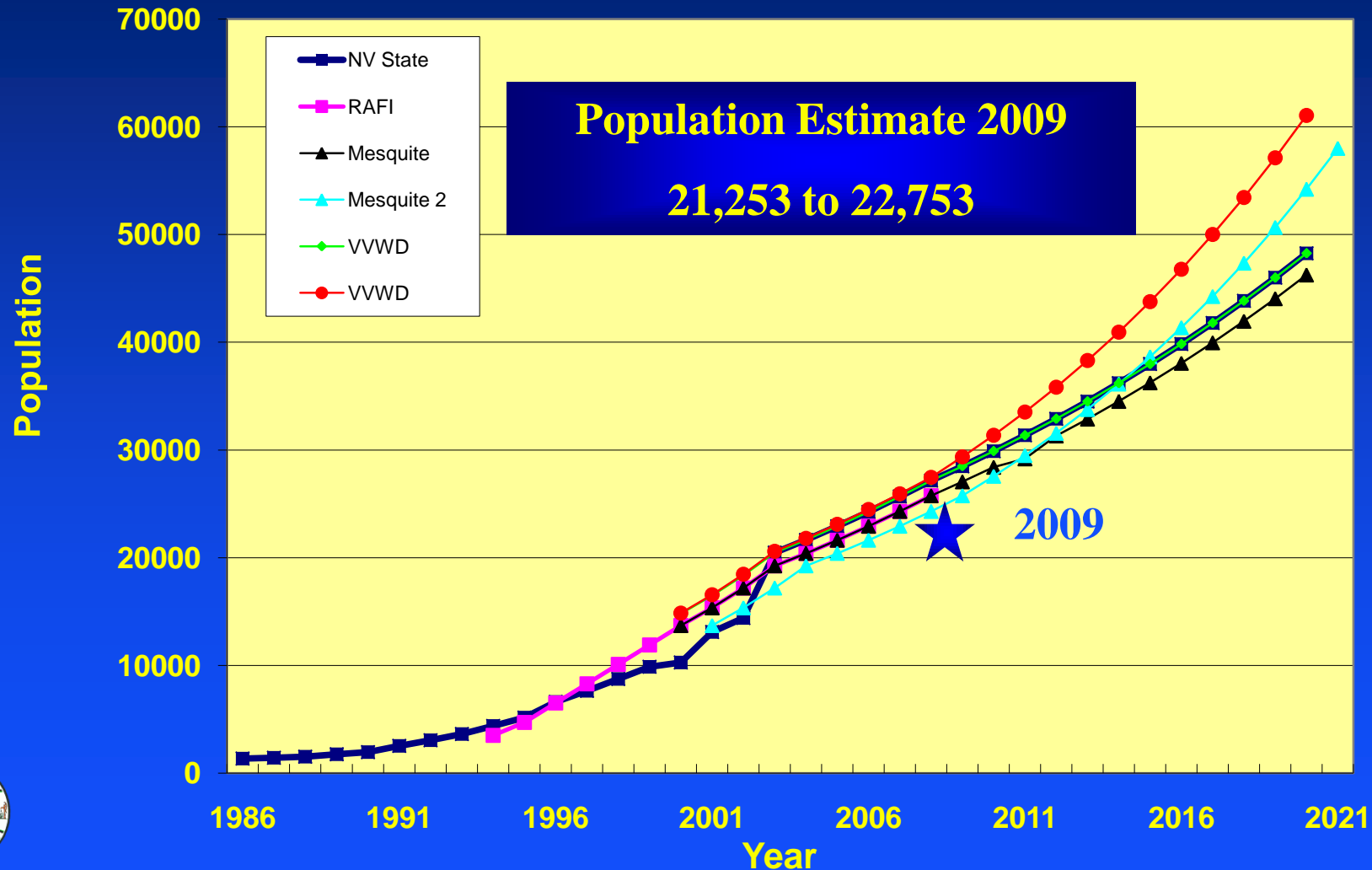


# Future use of VVWD Surface Water Rights on Lower Virgin River

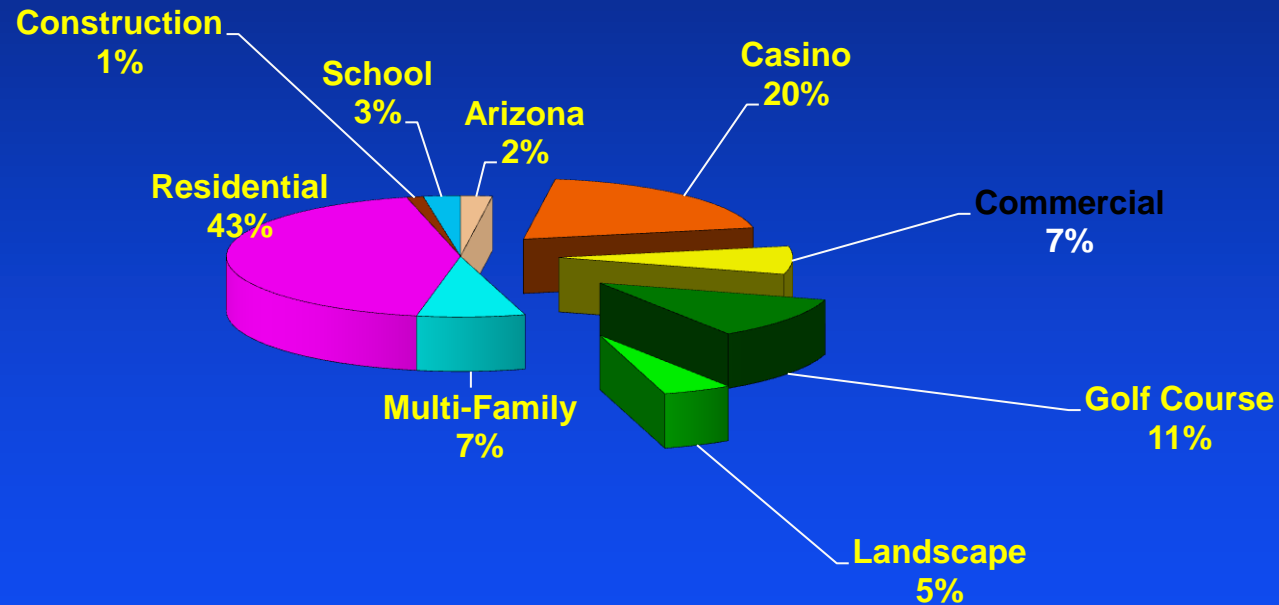
- Aquifer Recharge Project
  - Inject /Percolate Virgin River water rights held by VVWD into the subsurface for future use
  - Off-stream storage basin(s) for future use
  - Initiated Aquifer Recharge Feasibility Study
    - RFP sent out, Board approved April 21, 2009
    - Consultant selected: RBF Consulting; Las Vegas, NV
    - Draft report to be completed March 2010
- Halfway Wash Project
  - Cooperative project with Bureau of Reclamation
  - \$1,300,000.00 authorized
  - Installation of prototype Collector for river bed filtration of existing surface water rights held by VVWD
  - Anticipate construction Fall 2010??
  - Future Desalination Project



# Population Projections for the Service Area of the Virgin Valley Water District



# Water Use by Category in the Service Area of the Virgin Valley Water District in 2009





# Conservation



• Revised Conservation Plan submitted to Division of Water Resources in 2007

• Tiered Rate Structure to promote conservation and partially fund O&M for Arsenic Treatment Plants

6.6.1999  
• January 2008 increased rates by 10%

• January 2009 increased rates by 10%

• Virgin River/recycled water utilized at parks and golf courses, recycled water purveyed by City of Mesquite

• Secondary System for domestic irrigation use in Bunkerville, Clark County, Nevada

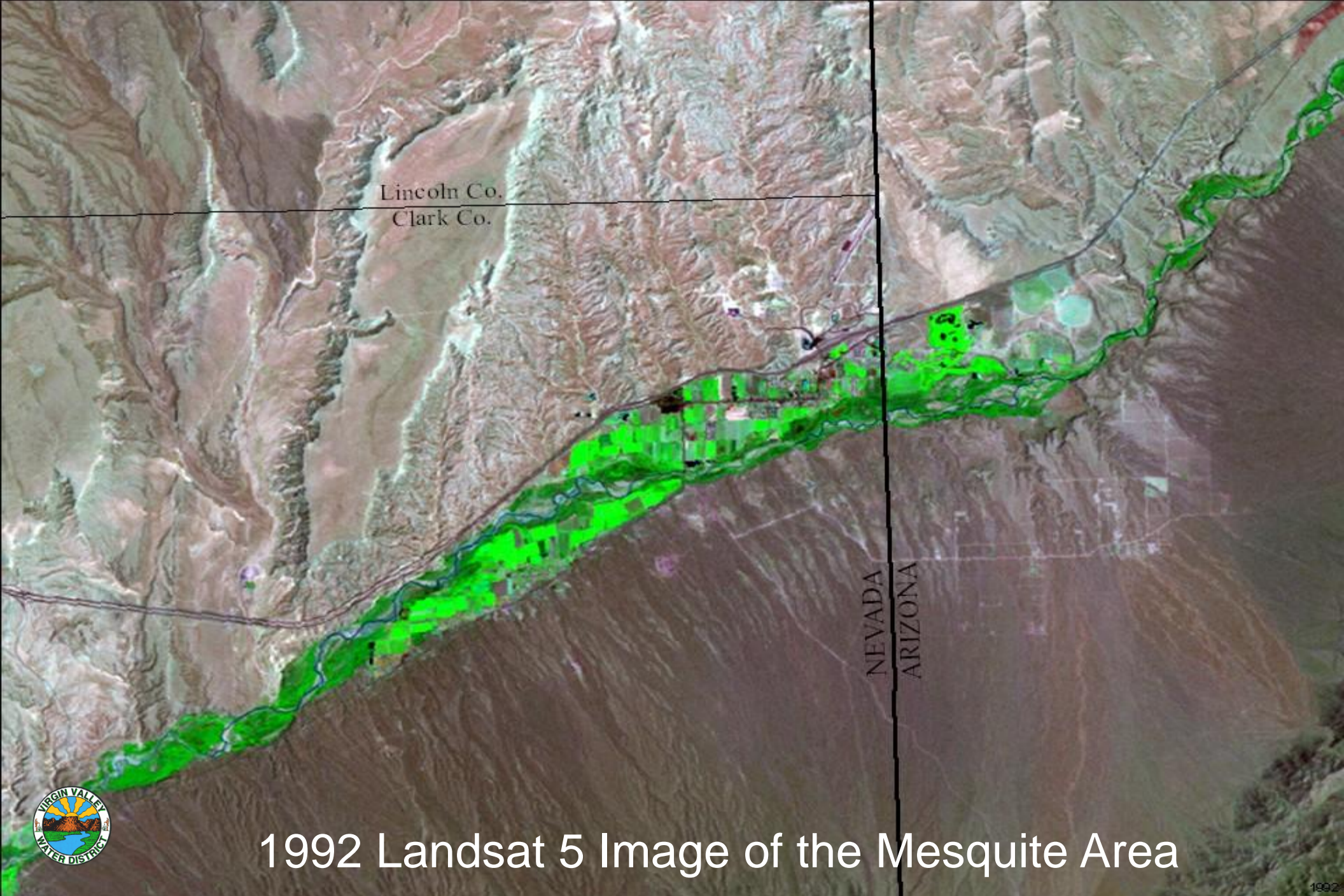


30.12.2003

17.7.2003

6.6.1999





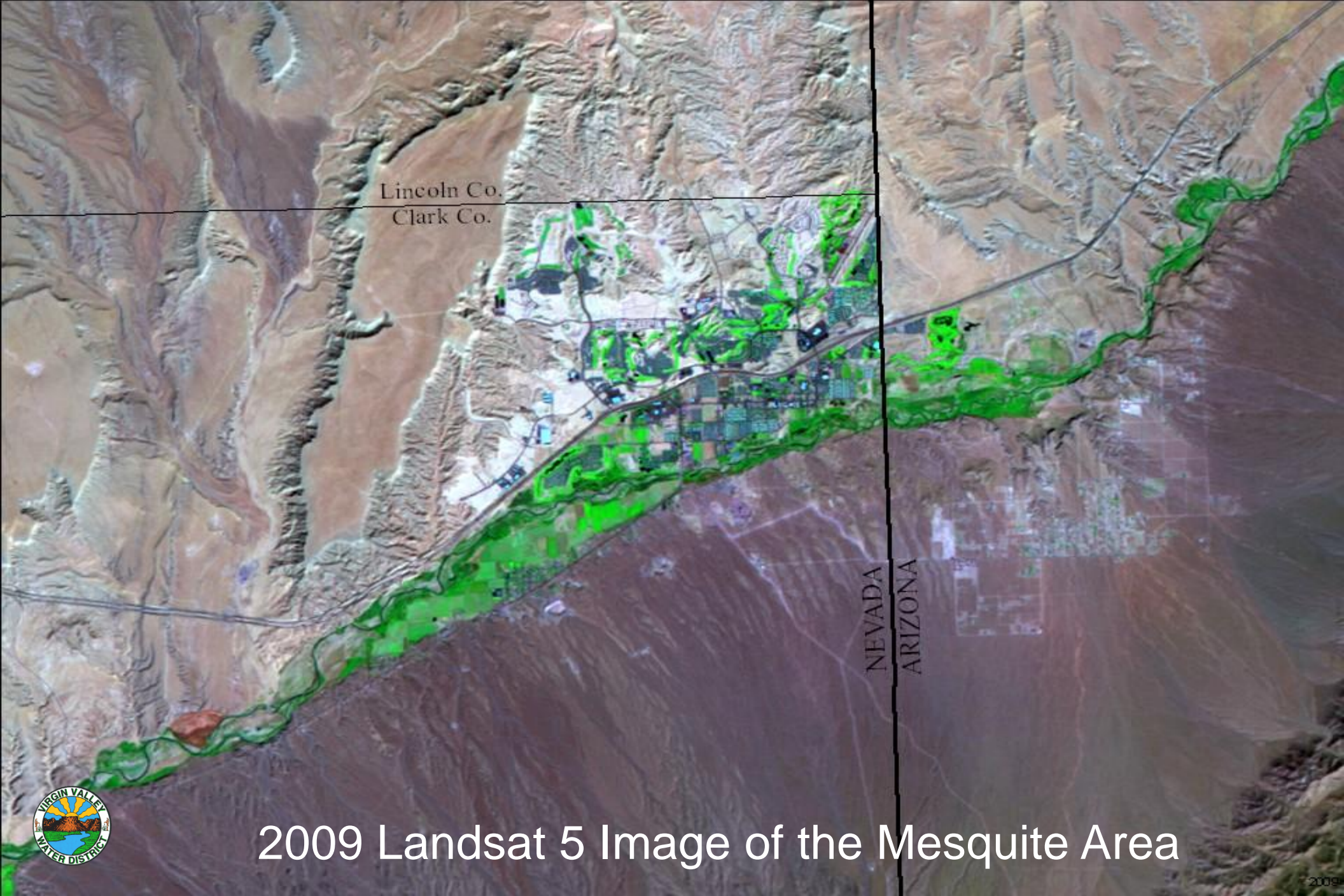
Lincoln Co.  
Clark Co.

NEVADA  
ARIZONA



1992 Landsat 5 Image of the Mesquite Area





Lincoln Co.  
Clark Co.

NEVADA  
ARIZONA



2009 Landsat 5 Image of the Mesquite Area

# Challenges for Development in the Lower Virgin River Valley

- Water Quality,
  - Arsenic standard of 10  $\mu\text{g/L}$ ,
  - Desalination of Virgin River water
- Growth and infrastructure development
- Environmental Issues, Virgin River Habitat Conservation and Recovery Program NEPA and ESA compliance associated with land acts
- Competing water resource demand with Arizona and Utah

