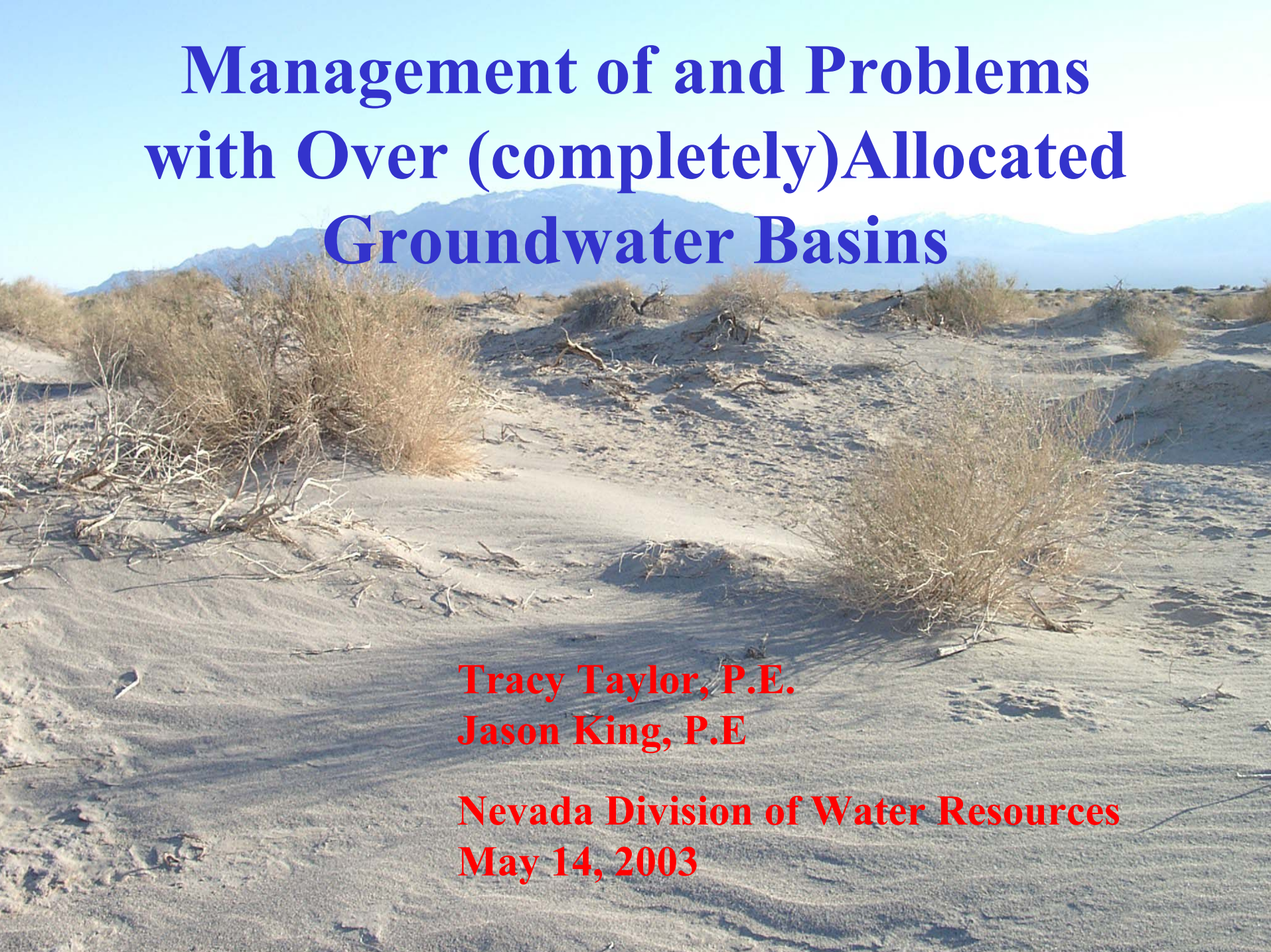
Management of and Problems with Over (completely)Allocated Groundwater Basins



Tracy Taylor, P.E.
Jason King, P.E

Nevada Division of Water Resources
May 14, 2003


SLG

DUTIES OF THE STATE ENGINEER

- Appropriation
- Adjudication
- Distribution & Regulation
- Water Planning
- Subdivision Review & Approval

Water Law in Nevada

Prior Appropriation Doctrine

- ✓First in time, first in right,
- ✓Beneficial use is the limit of the water right,
- ✓Use it or lose it

vs.

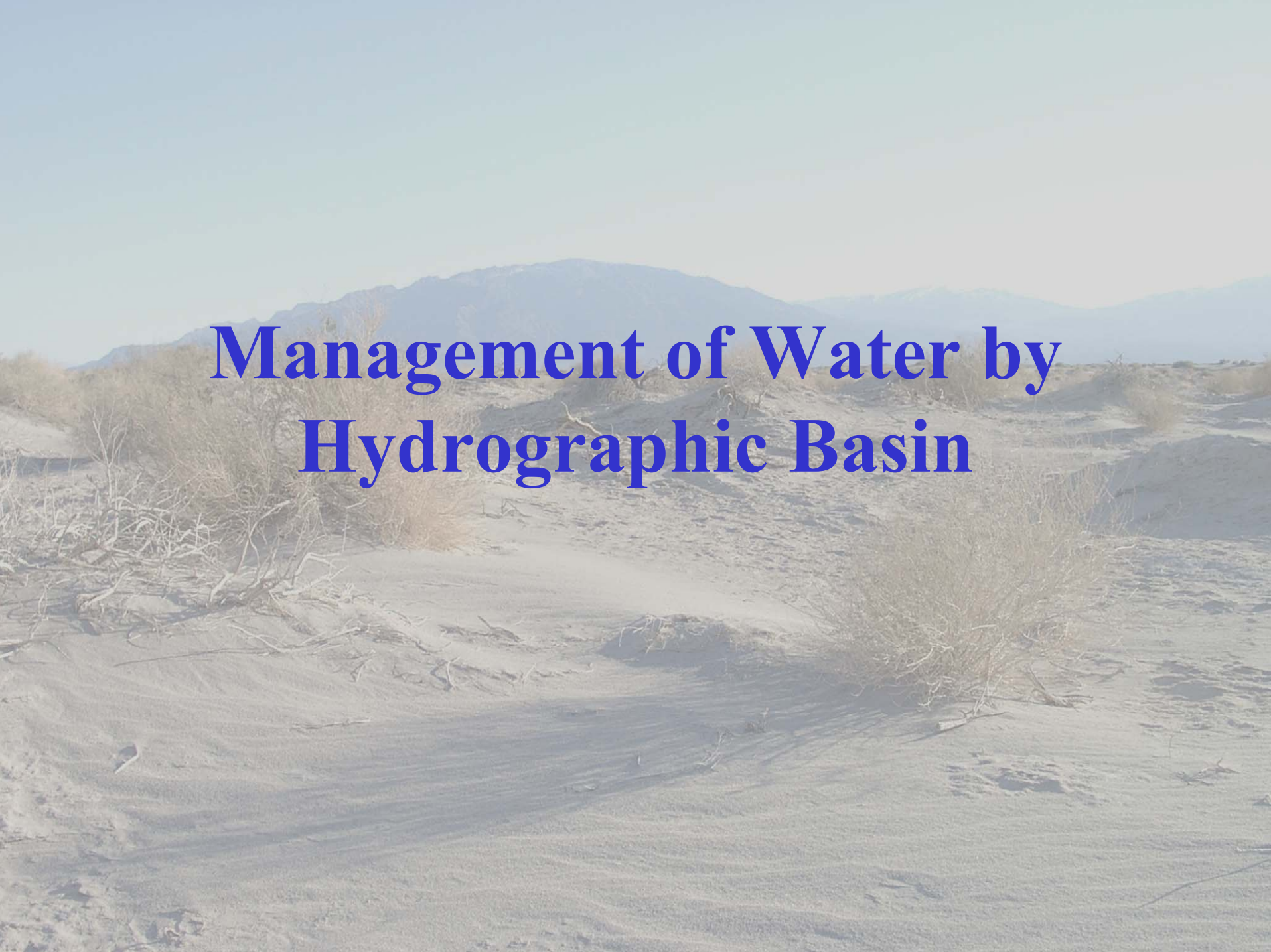
Riparian Doctrine

S.E. Criteria for Approving An Application

- 4 criteria
  - Water available from proposed source
  - Does not conflict with existing rights
  - Cannot prove detrimental to the public interest
  - Protectible interest in domestic wells - 2001

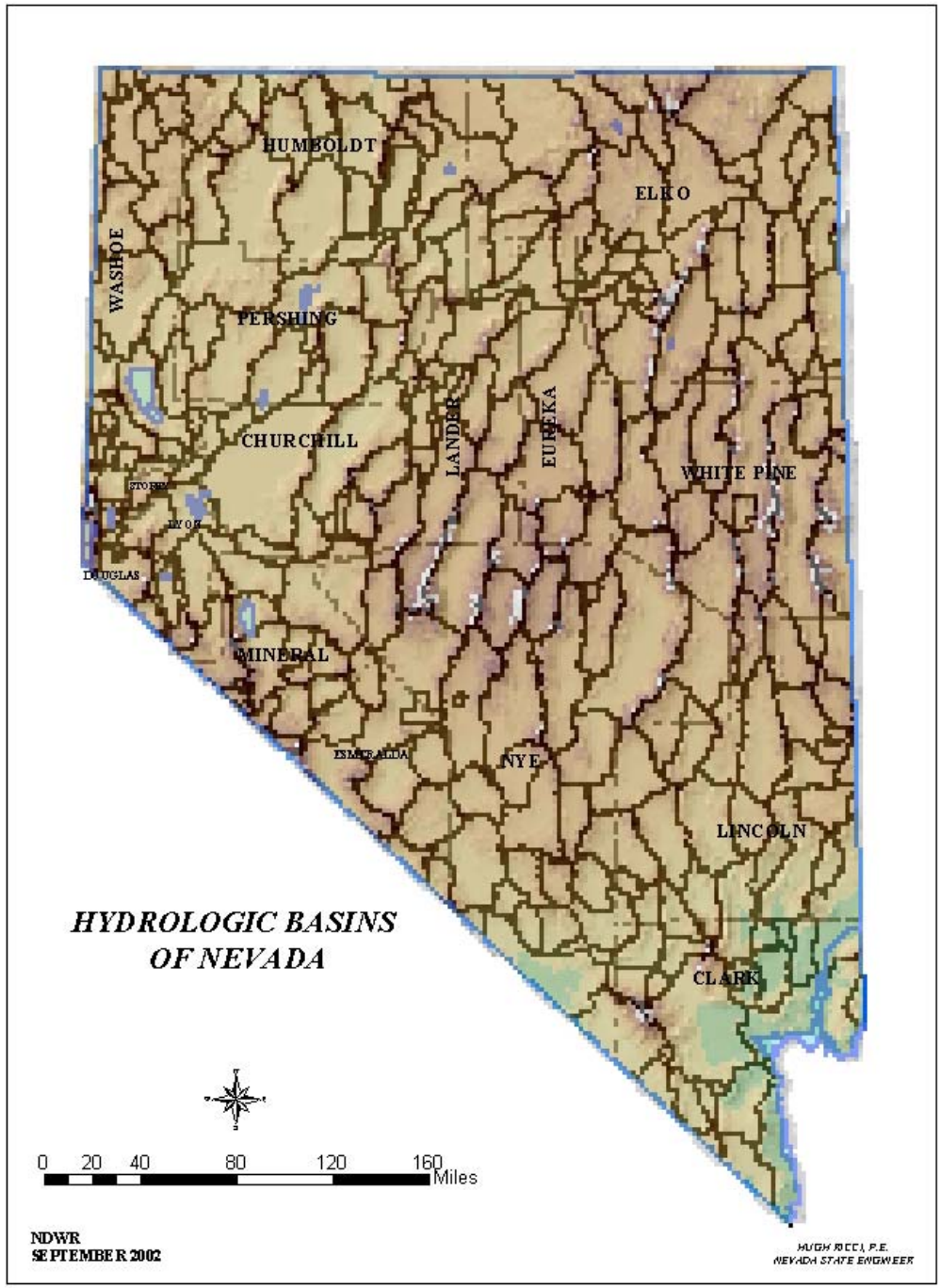
Nevada Regulates both Surface Water and Ground Water

- Understand that there may be a connection between the two but administers them separately – actually has worked out well.



Management of Water by Hydrographic Basin

232 Groundwater Basins



Perennial Yield

- Can be defined as the maximum amount of ground water than can be salvaged each year over the long term without depleting the ground water reservoir

Perennial Yield

- **Beginning in the early 1950's, Water Resources and the USGS entered into a series of cooperative agreements whereby the USGS studied every basin and produced a reconnaissance report that estimated the perennial yield of that basin.**

Perennial Yield

- **Original analysis based on the Maxey-Eakin Method using precipitation-elevation data.**

- **New method of analysis is called the 'Prism' Method of determining precipitation. Greater perennial yields have been our experience with this method (2 to 3 times greater).**

DOMESTIC WATER WELLS

- A water right application and permit are **not** required in order to drill a domestic well
  - Domestic purposes as defined under our statutes extends to culinary and household purposes, in a single family dwelling, the watering of a family garden, lawn and the watering of domestic animals
- The maximum daily draught is limited to 1,800 gallons per day (2.02 acre-feet per year)
- Don't approve parcel maps just subdivisions

EXAMPLES
of
Completely Appropriated Basins

HYDROGRAPHIC AREA SUMMARY
NEVADA DIVISION OF WATER RESOURCES

5/13/2005

Hydrographic Area Number 153 **Hydrographic Area Name** Diamond Valley

Subarea Name

Hydrographic Region Number 10 **Hydrographic Region Name** Central Region

Area (square miles) 752

Counties within the Hydrographic Area Eureka, Elko, White Pine

Nearest Communities to Hydrographic Area Eureka, Austin

Designated? (Y/N, Order #) Y, O-815 **For All or Portion of Basin?** All

Preferred Use None **For All or Portion of Basin?**

Irrigation Denied by SEO Orders? (Y/N) Y O-717 **For All or Portion of Basin?** Portion

Previous Denials (Ruling # (Use)) R-3004 (MM), R-3217 (QM)

Pumpage Inventory Status None **Crop Inventory Status** Ongoing

NDWR Water Level Collection Status Ongoing

Yield Values

Perennial Yield (AFY) 30,000

System Yield (AFY)

Yield Reference(s) USGS Bulletin 35

Total Committed Groundwater Resources (AFY) 133,661 **Date** 9/26/2003

Source of Committed Data NDWR Computer Database

Supplemntal Adj. No

Irrigation (AFY)	129,456	**Stock (AFY)**	949
Mun, QM (AFY)	2,156	**Mining (AFY)**	1,064
Commercial (AFY)	3	**Industrial (AFY)**	0
Other (AFY)	0	**Construction (AFY**	0
Environmental (AFY)	0	**Domestic (AFY)**	34
Power (AFY)	0	**Recreation (AFY)**	0
Storage (AFY)	0	**Wildlife (AFY)**	0

Related Reports

USGS Reconnaissance 6 **USGS Bulletin** 35

Other References

Comments

HYDROGRAPHIC AREA SUMMARY
NEVADA DIVISION OF WATER RESOURCES

5/13/2005

Hydrographic Area Number 85 **Hydrographic Area Name** Spanish Springs Valley

Subarea Name

Hydrographic Region Number 6 **Hydrographic Region Name** Truckee River Basin

Area (square miles) 76

Counties within the Hydrographic Area Washoe

Nearest Communities to Hydrographic Area Sparks, Reno

Designated? (Y/N, Order #) Y, O-533 **For All or Portion of Basin?** All

Preferred Use None **For All or Portion of Basin?**

Irrigation Denied by SEO Orders? (Y/N) **For All or Portion of Basin?**

Previous Denials (Ruling # (Use)) R-2813 (IRR), R-4601 (QM), R-4641 (REC)

Pumpage Inventory Status None **Crop Inventory Status** None

NDWR Water Level Collection Status None

Yield Values

Perennial Yield (AFY) 1,000

System Yield (AFY)

Yield Reference(s) USGS Recon. 43

Total Committed Groundwater Resources (AFY) 6,351 **Date** 9/26/2003

Source of Committed Data NDWR Computer Database

Supplemntal Adj. Yes

Irrigation (AFY)	1,666	**Stock (AFY)**	37
Mun, QM (AFY)	4,474	**Mining (AFY)**	22
Commercial (AFY)	134	**Industrial (AFY)**	0
Other (AFY)	0	**Construction (AFY**	0
Environmental (AFY)	0	**Domestic (AFY)**	18
Power (AFY)	0	**Recreation (AFY)**	0
Storage (AFY)	0	**Wildlife (AFY)**	0

Related Reports

USGS Reconnaissance 43 **USGS Bulletin** None

Other References

Comments

HYDROGRAPHIC AREA SUMMARY
NEVADA DIVISION OF WATER RESOURCES

5/13/2005

Hydrographic Area Number 105 **Hydrographic Area Name** Carson Valley

Subarea Name

Hydrographic Region Number 8 **Hydrographic Region Name** Carson River Basin

Area (square miles) 419

Counties within the Hydrographic Area Douglas, Carson City

Nearest Communities to Hydrographic Area Minden, Gardnerville

Designated? (Y/N, Order #) Y, O-684 **For All or Portion of Basin?** All

Preferred Use O-904 No new apps in Johnson Lane sub-area; No Changes in POD to sub-area **For All or Portion of Basin?** Portion

Irrigation Denied by SEO Orders? (Y/N) Y O-904 **For All or Portion of Basin?** Portion

Previous Denials (Ruling # (Use)) R-3168 (IRR)

Pumpage Inventory Status Ongoing **Crop Inventory Status** None

NDWR Water Level Collection Status Discontinued

Yield Values

Perennial Yield (AFY) 49,000 Recharge

System Yield (AFY)

Yield Reference(s) USGS Water Resource Invest. 86-4328

Total Committed Groundwater Resources (AFY) 97,768 **Date** 9/26/2003

Source of Committed Data NDWR Computer Database

Supplemntal Adj. Yes

Irrigation (AFY)	53,850	**Stock (AFY)**	424
Mun, QM (AFY)	34,672	**Mining (AFY)**	45
Commercial (AFY)	76	**Industrial (AFY)**	1,001
Other (AFY)	222	**Construction (AFY**	0
Environmental (AFY)	1,239	**Domestic (AFY)**	283
Power (AFY)	0	**Recreation (AFY)**	206
Storage (AFY)	0	**Wildlife (AFY)**	5,750

Related Reports

USGS Reconnaissance 59 **USGS Bulletin** None

Other References USGS Water Resource Invest. 86-4328

Comments Basin is Shared in Common with California

HYDROGRAPHIC AREA SUMMARY
NEVADA DIVISION OF WATER RESOURCES

5/13/2005

Hydrographic Area Number 107 **Hydrographic Area Name** Smith Valley

Subarea Name

Hydrographic Region Number 9 **Hydrographic Region Name** Walker River Basin

Area (square miles) 479

Counties within the Hydrographic Area Lyon, Douglas

Nearest Communities to Hydrographic Area Wellington

Designated? (Y/N, Order #) Y, O-245 **For All or Portion of Basin?** Portion

Preferred Use O-1126 Preferred Uses COM, IND, STK <=1,800 gpd; Except ENV and GEO **For All or Portion of Basin?** Portion

Irrigation Denied by SEO Orders? (Y/N) Y O-245 **For All or Portion of Basin?** Portion

Previous Denials (Ruling # (Use)) R-3566 (IRR)

Pumpage Inventory Status Ongoing **Crop Inventory Status** None

NDWR Water Level Collection Status Ongoing

Yield Values

Perennial Yield (AFY) 17,000 Recharge

System Yield (AFY) 62,000

Yield Reference(s) USGS Bulletin 43

Total Committed Groundwater Resources (AFY) 61,279 **Date** 9/26/2003

Source of Committed Data NDWR Computer Database

Supplemntal Adj. Yes

Irrigation (AFY)	59,287	**Stock (AFY)**	467
Mun, QM (AFY)	188	**Mining (AFY)**	227
Commercial (AFY)	725	**Industrial (AFY)**	58
Other (AFY)	17	**Construction (AFY**	1
Environmental (AFY)	0	**Domestic (AFY)**	309
Power (AFY)	0	**Recreation (AFY)**	0
Storage (AFY)	0	**Wildlife (AFY)**	0

Related Reports

USGS Reconnaissance None **USGS Bulletin** 43

Other References

Comments Basin is Shared in Common with California. O-1159 requires meters on all permitted wells

HYDROGRAPHIC AREA SUMMARY
NEVADA DIVISION OF WATER RESOURCES

5/13/2005

Hydrographic Area Number 108 **Hydrographic Area Name** Mason Valley

Subarea Name

Hydrographic Region Number 9 **Hydrographic Region Name** Walker River Basin

Area (square miles) 516

Counties within the Hydrographic Area Lyon, Mineral, Douglas

Nearest Communities to Hydrographic Area Yerington, Mason

Designated? (Y/N, Order #) Y, O-691 **For All or Portion of Basin?** All

Preferred Use O-1125 Preferred Uses COM, IND, STK <=1,800 gpd; Except ENV and GEO **For All or Portion of Basin?** All

Irrigation Denied by SEO Orders? (Y/N) Y O-1125 **For All or Portion of Basin?** All

Previous Denials (Ruling # (Use)) R-3828 (IRR), R-4143 (MM)

Pumpage Inventory Status Ongoing **Crop Inventory Status** None

NDWR Water Level Collection Status Ongoing

Yield Values

Perennial Yield (AFY) 25,000

System Yield (AFY) 100,000

Yield Reference(s) USGS Open File Report 78-768

Total Committed Groundwater Resources (AFY) 158,083 **Date** 9/26/2003

Source of Committed Data NDWR Computer Database

Supplemntal Adj. No

Irrigation (AFY)	121,258	**Stock (AFY)**	356
Mun, QM (AFY)	5,976	**Mining (AFY)**	9,820
Commercial (AFY)	355	**Industrial (AFY)**	11,401
Other (AFY)	0	**Construction (AFY**	0
Environmental (AFY)	219	**Domestic (AFY)**	18
Power (AFY)	0	**Recreation (AFY)**	6,146
Storage (AFY)	0	**Wildlife (AFY)**	2,534

Related Reports

USGS Reconnaissance None **USGS Bulletin** 38

Other References

Comments O-1158 requires meters on all permitted wells

HYDROGRAPHIC AREA SUMMARY
NEVADA DIVISION OF WATER RESOURCES

5/13/2005

Hydrographic Area Number 106 **Hydrographic Area Name** Antelope Valley

Subarea Name

Hydrographic Region Number 9 **Hydrographic Region Name** Walker River Basin

Area (square miles) 115

Counties within the Hydrographic Area Douglas

Nearest Communities to Hydrographic Area Topaz, Wellington

Designated? (Y/N, Order #) Y, O-714 **For All or Portion of Basin?** All

Preferred Use None **For All or Portion of Basin?**

Irrigation Denied by SEO Orders? (Y/N) **For All or Portion of Basin?**

Previous Denials (Ruling # (Use)) R-5128 (COM)

Pumpage Inventory Status None **Crop Inventory Status** None

NDWR Water Level Collection Status None

Yield Values

Perennial Yield (AFY) 2,600

System Yield (AFY) 190,000

Yield Reference(s) USGS Open File Report 78-768

Total Committed Groundwater Resources (AFY) 6,513 **Date** 9/26/2003

Source of Committed Data NDWR Computer Database

Supplemntal Adj. Yes

Irrigation (AFY)	5,328	**Stock (AFY)**	0
Mun, QM (AFY)	993	**Mining (AFY)**	0
Commercial (AFY)	159	**Industrial (AFY)**	0
Other (AFY)	0	**Construction (AFY**	0
Environmental (AFY)	0	**Domestic (AFY)**	2
Power (AFY)	0	**Recreation (AFY)**	32
Storage (AFY)	0	**Wildlife (AFY)**	0

Related Reports

USGS Reconnaissance 53 **USGS Bulletin** None

Other References

Comments Basin is Shared in Common with California

HYDROGRAPHIC AREA SUMMARY
NEVADA DIVISION OF WATER RESOURCES

5/13/2005

Hydrographic Area Number 212 **Hydrographic Area Name** Las Vegas Valley

Subarea Name

Hydrographic Region Number 13 **Hydrographic Region Name** Colorado River Basin

Area (square miles) 1564

Counties within the Hydrographic Area Clark

Nearest Communities to Hydrographic Area Las Vegas, Henderson

Designated? (Y/N, Order #) Y, O-833 **For All or Portion of Basin?** All

Preferred Use O-1054 Preferred Uses COM, IND <=1,800 gpd **For All or Portion of Basin?** All

Irrigation Denied by SEO Orders? (Y/N) Y O-1054 **For All or Portion of Basin?** All

Previous Denials (Ruling # (Use))

Pumpage Inventory Status Ongoing **Crop Inventory Status** None

NDWR Water Level Collection Status Ongoing

Yield Values

Perennial Yield (AFY) 25,000

System Yield (AFY)

Yield Reference(s) USGS Bulletin 29

Total Committed Groundwater Resources (AFY) 64,581 **Date** 9/26/2003

Source of Committed Data NDWR Computer Database

Supplemntal Adj. Yes

Irrigation (AFY)	11,726	**Stock (AFY)**	7
Mun, QM (AFY)	31,350	**Mining (AFY)**	2,249
Commercial (AFY)	2,004	**Industrial (AFY)**	2,397
Other (AFY)	677	**Construction (AFY**	0
Environmental (AFY)	6,866	**Domestic (AFY)**	477
Power (AFY)	0	**Recreation (AFY)**	6,664
Storage (AFY)	0	**Wildlife (AFY)**	164

Related Reports

USGS Reconnaissance None **USGS Bulletin** 3, 4, 5, 6, 18, 23, 29, 44

Other References

Comments Part of Basin in Desert National wildlife Range.

HYDROGRAPHIC AREA SUMMARY
NEVADA DIVISION OF WATER RESOURCES

5/13/2005

Hydrographic Area Number 184 **Hydrographic Area Name** Spring Valley

Subarea Name

Hydrographic Region Number 10 **Hydrographic Region Name** Central Region

Area (square miles) 1661

Counties within the Hydrographic Area White Pine, Lincoln

Nearest Communities to Hydrographic Area Ely, Baker

Designated? (Y/N, Order #) N **For All or Portion of Basin?**

Preferred Use None **For All or Portion of Basin?**

Irrigation Denied by SEO Orders? (Y/N) **For All or Portion of Basin?**

Previous Denials (Ruling # (Use))

Pumpage Inventory Status None **Crop Inventory Status** None

NDWR Water Level Collection Status Discontinued

Yield Values

Perennial Yield (AFY) 100,000

System Yield (AFY)

Yield Reference(s) USGS Recon. 33

Total Committed Groundwater Resources (AFY) 24,876 **Date** 9/26/2003

Source of Committed Data NDWR Computer Database

Supplemntal Adj. No

Irrigation (AFY)	23,027	**Stock (AFY)**	394
Mun, QM (AFY)	75	**Mining (AFY)**	1,361
Commercial (AFY)	0	**Industrial (AFY)**	0
Other (AFY)	0	**Construction (AFY**	0
Environmental (AFY)	0	**Domestic (AFY)**	0
Power (AFY)	0	**Recreation (AFY)**	0
Storage (AFY)	0	**Wildlife (AFY)**	20

Related Reports

USGS Reconnaissance 33 **USGS Bulletin** None

Other References

Comments

HYDROGRAPHIC AREA SUMMARY
NEVADA DIVISION OF WATER RESOURCES

5/13/2005

Hydrographic Area Number 21 **Hydrographic Area Name** Smoke Creek Desert

Subarea Name

Hydrographic Region Number 2 **Hydrographic Region Name** Black Rock Desert Region

Area (square miles) 980

Counties within the Hydrographic Area Washoe

Nearest Communities to Hydrographic Area Gerlach, Smoke Creek

Designated? (Y/N, Order #) N **For All or Portion of Basin?**

Preferred Use None **For All or Portion of Basin?**

Irrigation Denied by SEO Orders? (Y/N) **For All or Portion of Basin?**

Previous Denials (Ruling # (Use))

Pumpage Inventory Status None **Crop Inventory Status** None

NDWR Water Level Collection Status None

Yield Values

Perennial Yield (AFY) 16,000

System Yield (AFY)

Yield Reference(s) USGS Recon. 44

Total Committed Groundwater Resources (AFY) 9,946 **Date** 9/26/2003

Source of Committed Data NDWR Computer Database

Supplemntal Adj. Yes

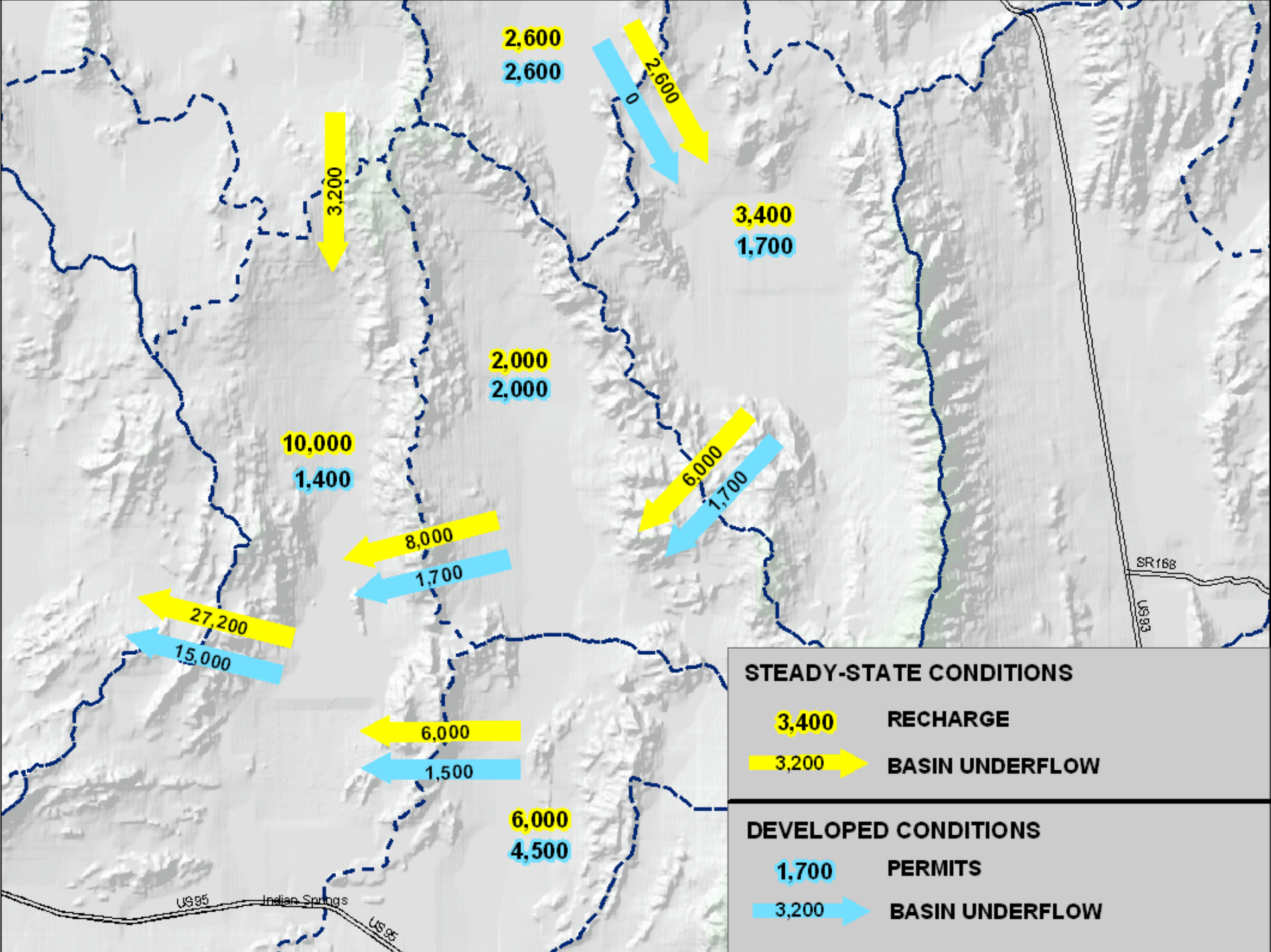
Irrigation (AFY)	9,074	**Stock (AFY)**	64
Mun, QM (AFY)	0	**Mining (AFY)**	0
Commercial (AFY)	8	**Industrial (AFY)**	0
Other (AFY)	0	**Construction (AFY**	0
Environmental (AFY)	0	**Domestic (AFY)**	0
Power (AFY)	0	**Recreation (AFY)**	0
Storage (AFY)	0	**Wildlife (AFY)**	800

Related Reports

USGS Reconnaissance 44 **USGS Bulletin** None

Other References

Comments Basin is Shared in Common with California


2,600
2,600
2,600
0
3,200
3,400
1,700
2,000
2,000
10,000
1,400
6,000
1,700
8,000
1,700
27,200
15,000
6,000
1,500
6,000
4,500
SR168
US93
US95
Indian Springs
US95
STEADY-STATE CONDITIONS
3,400 RECHARGE
3,200 BASIN UNDERFLOW
DEVELOPED CONDITIONS
1,700 PERMITS
3,200 BASIN UNDERFLOW

Mine Dewatering

- Groundwater must be pumped in order to mine the ore body at great depths
  - Consumptive Use + Dewater was ~279,000 ac-ft in 2000

Truckee Meadows
(Reno/Sparks Area)

- PY is 35,000 AFA
- Permits issued slightly above PY

- Sub-basin Problem
  - Mt. Rose Fan Area has ~ 18,000 AF appropriated in that one area.
  - Large concentration of domestic wells.
  - Only pumping ~4000 AF and experiencing severe declines in the water table.

Tools

- Designate ground water basins
  - Preferred uses
  - Allows the State Engineer to impose additional conditions and restrictions on water use e.g. well depths, meters, sanitary seals
  - A water right permit is required to drill a well (other than domestic) in a designated basin.
- Forfeiture
- Grant changes of irrigation use for consumptive portion only.
- Permit Terms and S.E.'s Orders requiring meters on diversions.
- Substitutive uses in the case of mine dewatering.
- Exchange of treated effluent for potable water

Tools

- T-Finite Term
- Conjunctive Use through banking (TMWA)
- Recharge
- Have the ability to regulate pumping based on priorities
- Request local water purveyors and governments to further restrict parceling and water dedication
- Monitor the Basins
  - Pumpage inventories
  - Groundwater level measurements
  - Public Input

IRRESPONSIBILITY

No Single Raindrop Believes it is to Blame for the Flood.


Thank You,
Questions?
http://water.nv.gov

GROUNDWATER

* 1.7 Million Acre – Feet

232 Groundwater Basins

EFFLUENT

GEOTHERMAL

* Perennial Yield of Valley-Fill Reservoirs

SURFACE WATER

* 4.5 Million Acre-Feet

Federal Decrees | **State Decrees** | **Civil Decrees** | **** Colorado River**

* Excluding Colorado River, Nevada has approximately 3.2 million acre-feet of runoff within the state, plus 1.3 million acre-feet flowing into the state.

** Colorado River allocation is administered by the Colorado River Commission through the Bureau of Reclamation (BoR)

Nevada Water Law 101

Surface Water Slide

- All major surface water sources are decreed and are regulated pursuant to those decrees.
- The decreed surface water is overappropriated with the understanding that the return flow component from irrigation makes up the difference.
  - Changes of decreed surface water from irrigation to municipal where there is no return flow, are limited to the consumptive portion of the right only.

Other Important Concepts

- **Supplemental Rights** – two or more rights used together for an intended use.
- **Comingled Rights** – where more than one source, e.g. s.w. and g.w. or g.w. and effluent, are used together simultaneously for an intended use
- **Preferred Uses** – Manner of uses designated as such by the State Engineer, e.g. Municipal, Commercial etc.

How Did the Basins get Overdrafted?

- Some were already overappropriated prior to the USGS data available (keep in mind that P.Y's are as low as 200 acre-feet).
- New data changed PY's
- Popular thinking that not all rights would be put to their maximum beneficial use.
- In the case of Las Vegas Valley, purposely allowed to overdraft (revocables) with the hope that infrastructure would eventually be in-place to deliver Colorado River water and the over pumping would be curtailed.

Staffing

- ~80 people in 3 offices – main office in Carson City
  - ~60 engineers/technicians
  - ~20 clerical/support staff
  - Seasonal help for water distribution
- Hearing Section Chief is an attorney
- 2 Deputy Attorney Generals

How Did the Basins get Overdrafted?

- On paper, some basins are 'over appropriated' but that may be due to the issuance of supplemental groundwater to existing surface water sources. Only overdrafting in drought years.
- Additional allocation of the source may be allowed based on the estimated recharge to the basin from irrigation (~30%)

Carson Valley

- PY is 45,000 AFA
- GW permits total 100,000 AFA
- 60,000 AF supplemental to SW (Carson River)
- Actual pumpage in drought years is ~29,000 AF and ~20,000 in wet years.

Las Vegas Valley

		Units in Acre-feet			
Calendar Year	Pumpage	Total Recharge	Net Pumpage	Periennal yield *	Overdraft
1992	68,486	17,000	51,486	25,000	26,486
1993	67,354	24,535	42,819	25,000	17,819
1994	68,872	21,900	46,972	25,000	21,972
1995	72,538	19,172	53,366	25,000	28,366
1996	75,908	13,464	62,444	25,000	37,444
1997	75,852	18,925	56,927	25,000	31,927
1998	73,040	27,563	45,477	25,000	20,477
1999	72,968	32,361	40,607	25,000	15,607
2000	73,605	29,721	43,884	25,000	18,884
2001	79,376	21,376	58,000	25,000	33,000
2002	79,540	2,254	77,286	25,000	52,286
Total		**228,271**			**304,268**

*** PY of Las Vegas Valley DOES NOT include secondary recharge from the 300,000 AF of Colorado River brought into the basin.**

Las Vegas Valley

- Of the pumpage, ~6000 AF are revocable
- ~5000 AF are from domestic wells

Important to Note:

- SNWA Cooperative Water Project (CWP)
  - Filed 146 applications in 1989 in 27 basins for the appropriation of 180,000 acre-feet of groundwater
  - Four permits have been granted
    - Virgin River – 130,000 afa
    - Garnet and Hidden Valleys – 2200 afa
    - California Wash – 2500 afa
  - Remaining 114 applications have over 3,000 protests

Gold Mining

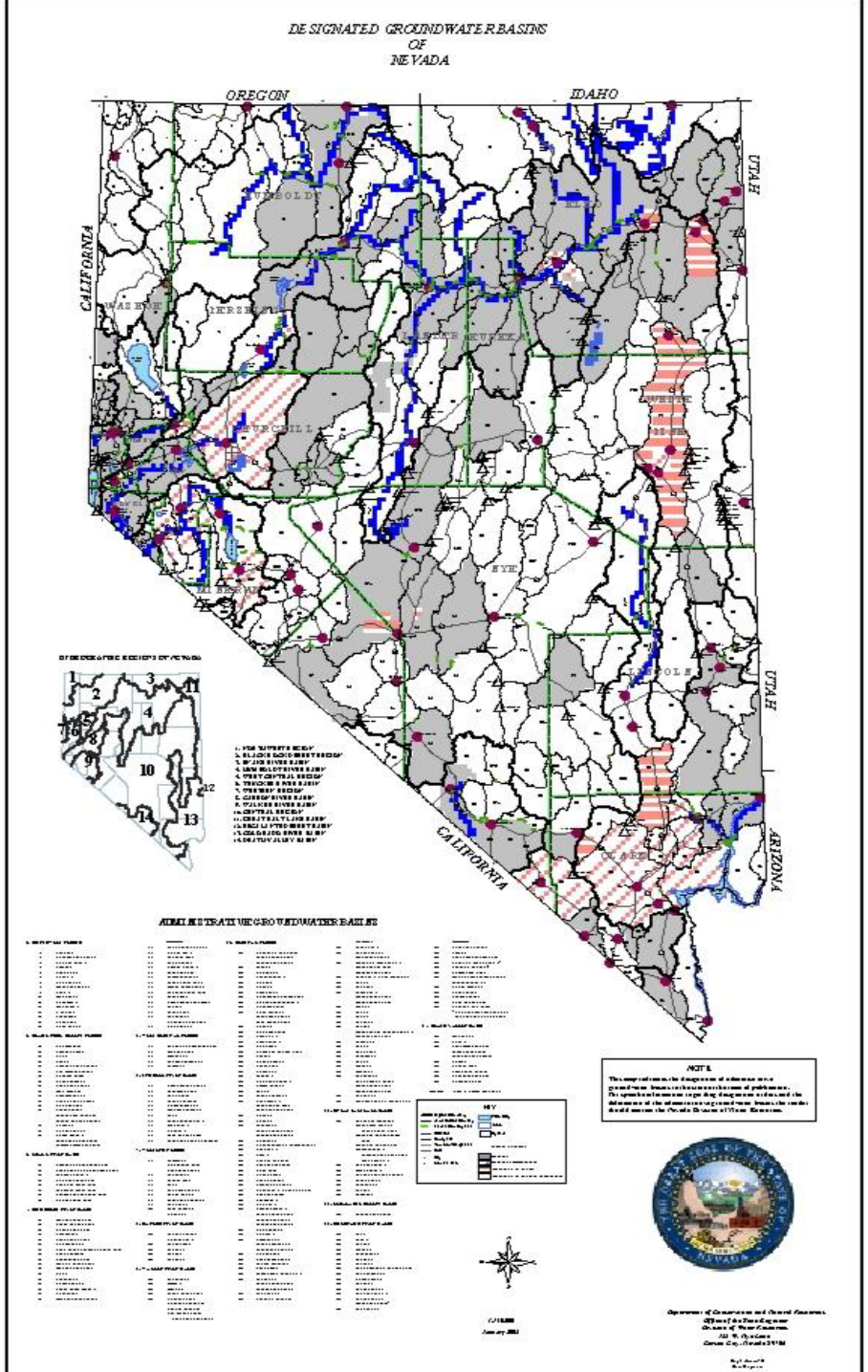
- Nevada ranks 3rd in the world in gold production behind Australia and South Africa.
- Nevada's gold reserves are over 75% of the total known U.S. Gold resources.
- April of 2002, Nevada Mining celebrated the production of the 50 millionth troy ounce of gold produced from the Carlin Trend.

Others

- **Nevada Land and Resource**
  - **Appropriated to the extent of the estimated secondary recharge in the basin due to irrigation.**

Management Tools

119 Groundwater Basins of the 232 are Designated or Partially Designated



What's Hot

- Colorado River
- Cooperative Water Project
- Walker Lake
- TROA
- Mine Dewatering
- Yucca Mountain
- BLM Stockwatering Issues
- Power Plants
- Interbasin Transfers
- Domestic Well Issues

Nevada Division of Water Resources

- Tracy Taylor – Deputy State Engineer
- Brief description of the State Engineers permitting and decision making process.
- NRS 533 – Surface Water
- NRS 534 – Ground water

State Engineers Responsibilities

- Ownership – Report of Conveyance
- Application to change POD, POU and/or MOU - Carson River
- Ground Water new appropriation and change applications

Other Duties

- Artificial Recharge
- Primary and Secondary Applications
- Groundwater basin pumpage inventories
- Carson River mapping project
- Adjudication of west side streams
- Water Planning
- Subdivision Review
- Well logs and Well regulations
- Dam Safety

Application Process

- File Application with supporting map
- Send for publication
- Protest Period
- Hearing if required

Approving An Application

- 4 criteria
  - Water available from proposed source
  - Does not conflict with existing rights
  - Cannot prove detrimental to the public interest
  - Protectible interest in domestic wells

Water Available

- Surface Water
  - Historic measurements
  - Decreed
- Groundwater
  - Manage by 232 Groundwater basins
  - Perennial Yield or Safe Yield

Perennial Yield

- Can be defined as the maximum amount of ground water than can be salvaged each year over the long term without depleting the ground water reservoir.
- USGS Recon and Bulletin Reports calculated Perennials yields starting in the 1940's

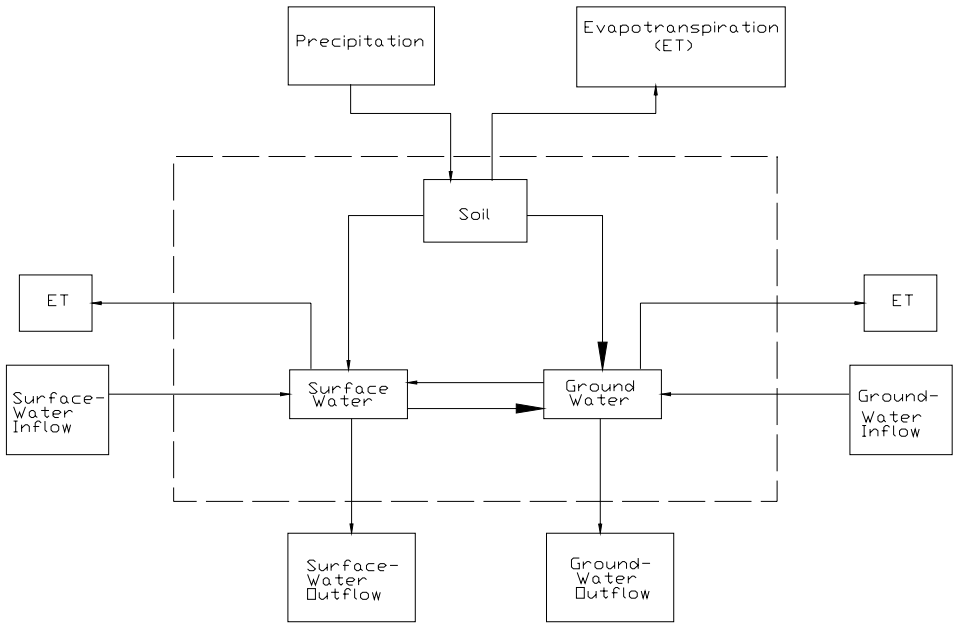
Safe Yield

- Has as many definitions as people that have defined it.
- One Definition
  - The amount of ground water one can withdraw without getting into trouble.

Trouble

- Running out of water
- Drawing in undesirable water
- Getting shot, or shot at, by an irate nearby well owner or landowner
- Getting sued by a less irate neighbor
- Getting sued for depleting the flow of a nearby stream.

Generalized Water Budget



Groundwater Management Tools

- Grant permits where actual pumpage will be at or near the perennial yield
- Designate ground water basins for preferred uses only
- Monitor the Basins
  - Pumpage inventories
  - Groundwater level measurements
  - Public Input

State Engineer depends on local governments to assist in the planning and monitoring of the water resources in its area.

Estimated potential groundwater recharge data for average long term conditions for Carson Valley were found in studies by: 1) Douglas K. Maurer, U.S. Geological Survey (1986) and 2) Glancy and Katzer, U.S. Geological Survey (1975).

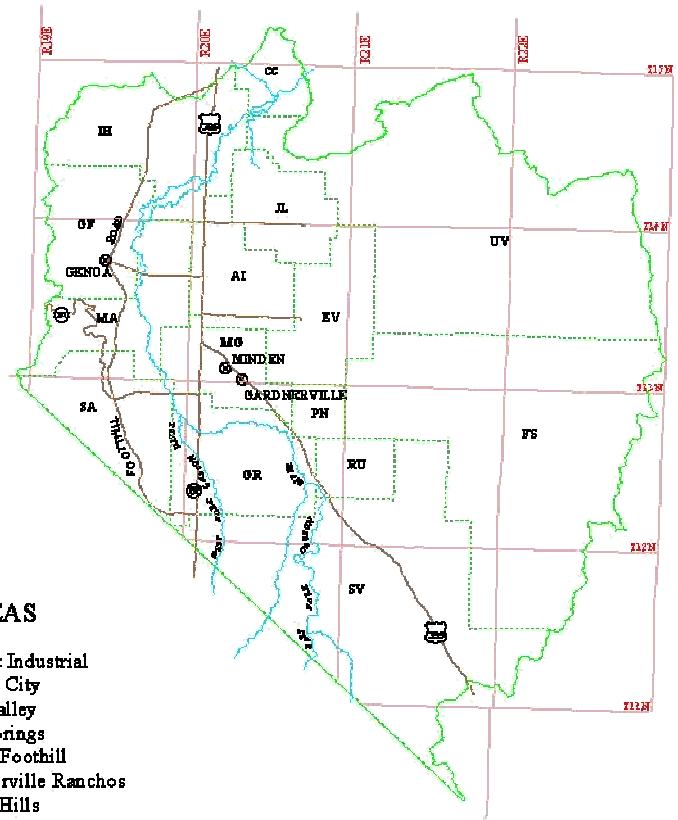
Maurer 1986	Precipitation Area (Acres)		Acre-Feet Per Year
East Side	143,780		24,000
West Side	46,230		23,000
Valley Floor	93,540		2,100
TOTAL	**283,550**	**CA & NV**	**49,000**

Glancy & Katzer 1975	Precipitation Area (Acres)		Acre-Feet Per Year
East Side	242,900		19,400
West Side	99,000		21,600
Valley Floor	-		-
TOTAL	**342,000**	**CA & NV**	**41,000**

Treated sewage effluent is imported into the Carson Valley Groundwater Basin, which may influence the basin recharge. Treated effluent is delivered by the Incline Village General Improvement District, Douglas County Sewer Improvement District (South Tahoe) and Carson City. These sewer districts reported the following amounts of treated sewage effluent exported to the Carson Valley Groundwater Basin from October 1, 2000 to September 30, 2001.

	Acre-Feet	Delivered To
Douglas County SID	2,270	Settelmeyer Ranch and Buckeye
(Zephyr Cove)		Storage Ponds
Incline Village GID	1,491	Schneider Ranch, Wetlands
Carson City	1,608	Nevada State Prison Farm
TOTAL DELIVERIES	**5,369**	

SUBAREAS OF CARSON VALLEY
HYDROGRAPHIC BASIN 8-105



SUBAREAS

AI	Airport Industrial
CC	Carson City
EV	East Valley
FS	Fish Springs
GF	Genoa Foothill
GR	Gardnerville Ranchos
IH	Indian Hills
JL	Johnson Lane
MA	Mid-Area
MG	Minden Gardnerville
PN	Pine Nut
RU	Ruhenstroh
SA	Sheridan Acres
SV	South Valley
UV	Upper Valley

Basin Boundary

Subarea Boundary

N

2 0 2 4 Miles

NEVADA DIVISION OF WATER RESOURCES
SEPTEMBER 2002

CARSON VALLEY GROUNDWATER PUMPAGE INVENTORY

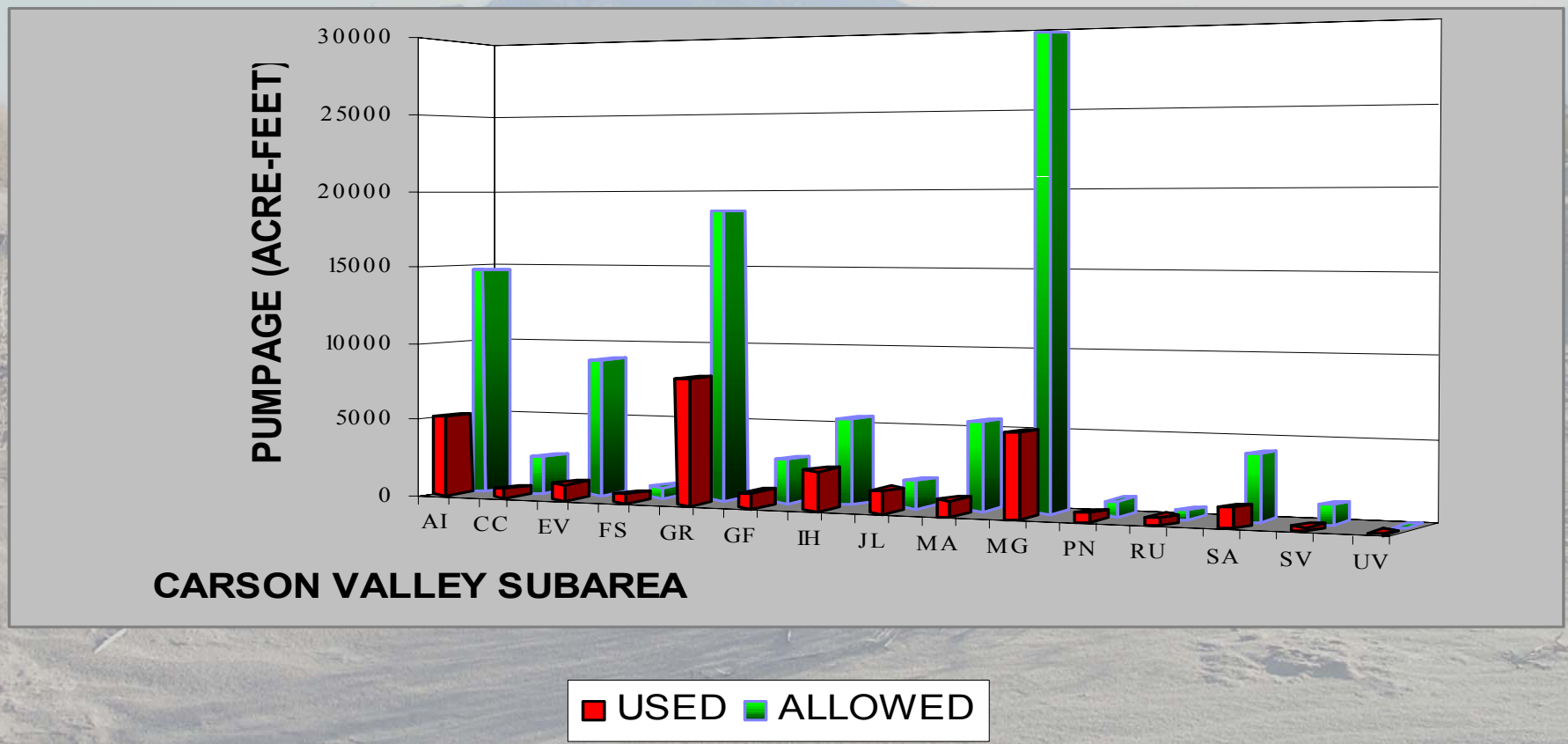
WATER YEAR 2001 SUMMARY

(ACRE-FEET)

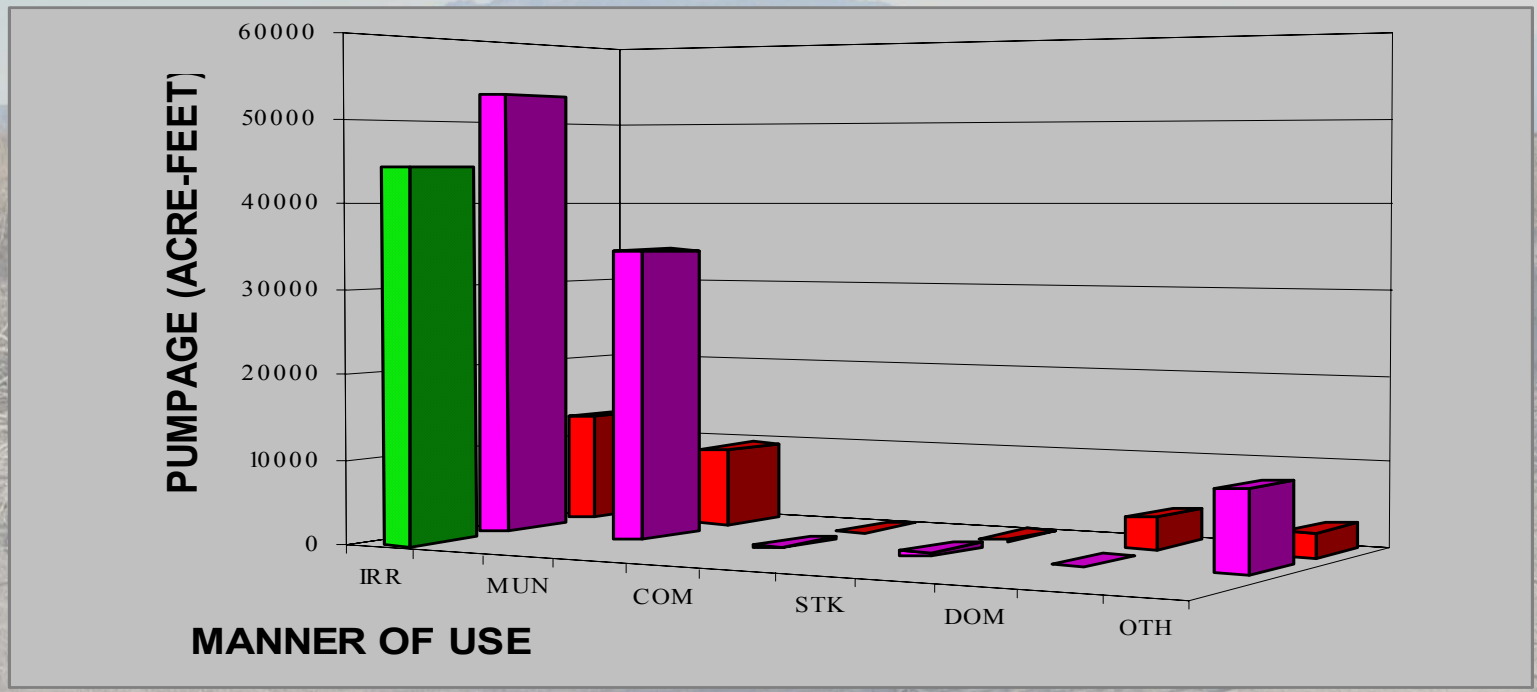
SUBAREA	IRRIGATION		MUNICIPAL		COMMERCIAL		STOCKWATER		DOMESTIC		OTHER		SUPP.	TOTAL	TOTAL
	PERMITTED	USED	PERMITTED	USED	PERMITTED	USED	PERMITTED	USED	PERMITTED	USED*	PERMITTED	USED+	SURFACE	USED	PERMITTED
AIRPORT INDUSTRIAL	12314	4412	1092	435	4	0	119	44	0	41	1162	237	7153	5169	14690
CARSON CITY	632	0	1576	520	6	1	20	0	0	62	180	0	594	582	2413
EAST VALLEY	5920	604	2892	39	20	20	45	9	0	352	1	0	5323	1023	8878
FISH SPRINGS	644	269	4	3	0	0	1	0	2	247	45	3	62	522	695
GARDNERVILLE RANCHOS	7028	1634	4938	3790	1	1	82	24	0	349	6605	2295	7929	8093	18653
GENOA FOOTHILLS	1839	363	915	383	47	42	7	0	4	153	27	27	1779	968	2839
INDIAN HILLS	2823	1113	2219	836	6	5	53	3	0	245	338	286	1248	2487	5438
JOHNSON LANE	628	149	1098	286	0	0	2	1	5	993	0	7	0	1436	1732
MID AREA	5454	952	0	0	0	0	29	26	0	27	144	3	5214	1007	5627
MINDEN-GARDNERVILLE	10169	2209	18730	2839	3	4	1	4	2	91	812	88	10181	5235	29717
PINE NUT	740	319	163	28	41	3	0	0	0	199	0	0	690	549	945
RUHENSTROTH	183	103	365	16	0	0	1	1	0	342	0	0	53	462	550
SHERIDAN ACRES	3752	625	361	190	0	0	14	13	19	400	0	0	2983	1229	4145
SOUTH VALLEY	1172	148	9	5	0	0	10	2	0	131	0	0	1115	286	1190
UPPER EAST VALLEY	62	0	0	0	0	0	0	0	0	43	0	0	0	43	62
TOTAL	53359	12899	34359	9368	128	76	384	126	32	3675	9313	2946	44327	29090	97576

* AMOUNT INCLUDES INDIVIDUAL DOMESTIC WELLS

CARSON VALLEY GROUNDWATER USE 2001
PERMITTED AND ACTUAL USAGE BY SUBAREA

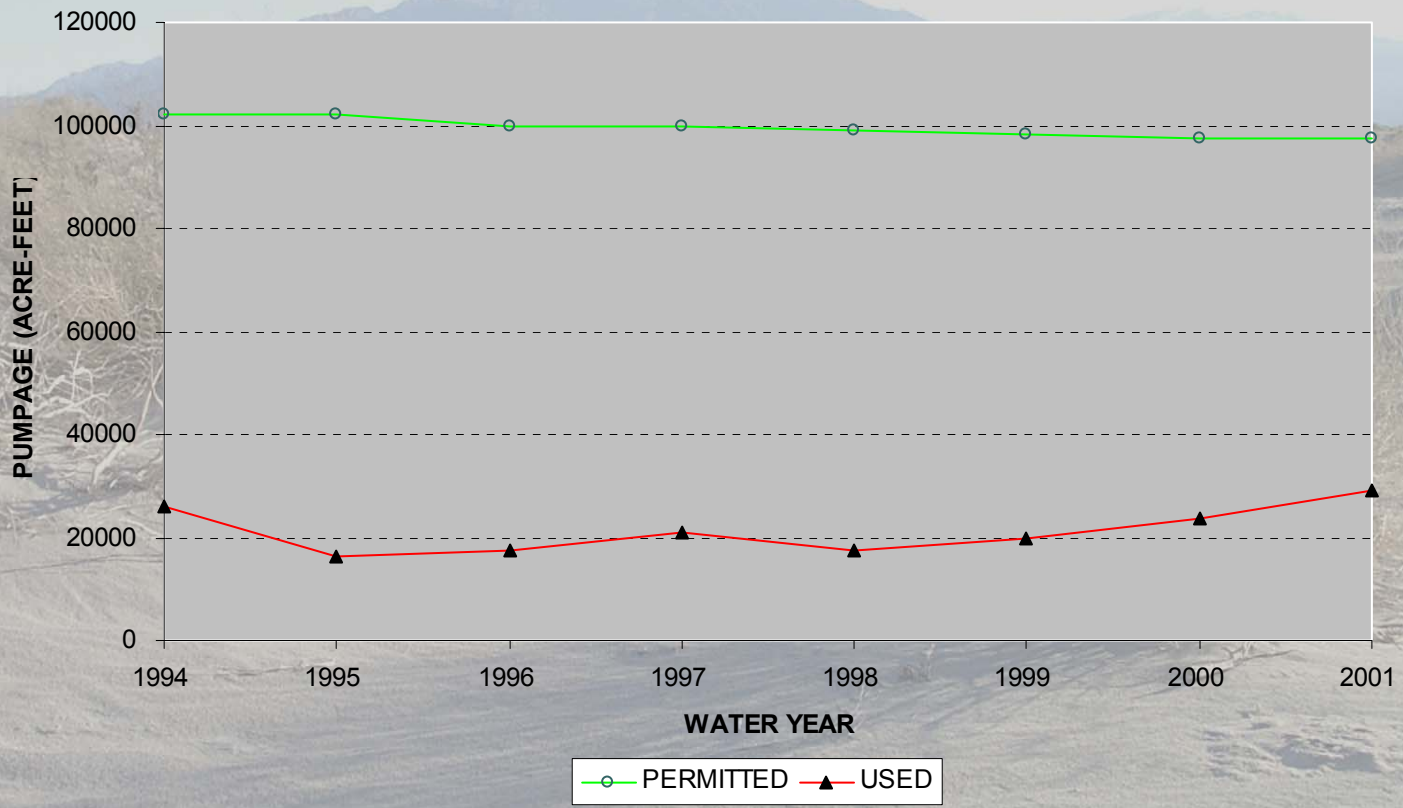


CARSON VALLEY GROUNDWATER USE 2001
MANNER OF USE

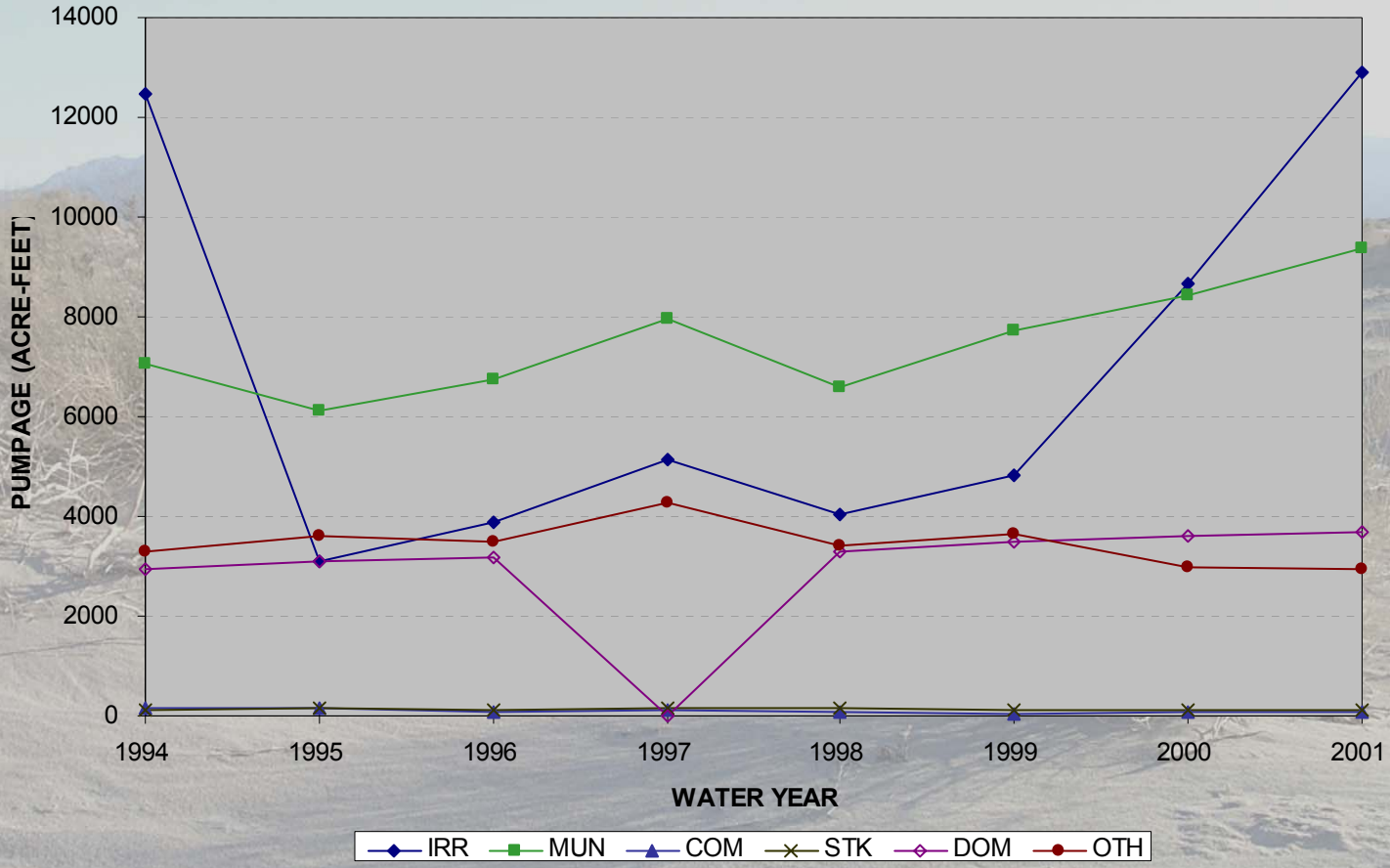


CARSON VALLEY GROUNDWATER USE 1994 through 2001

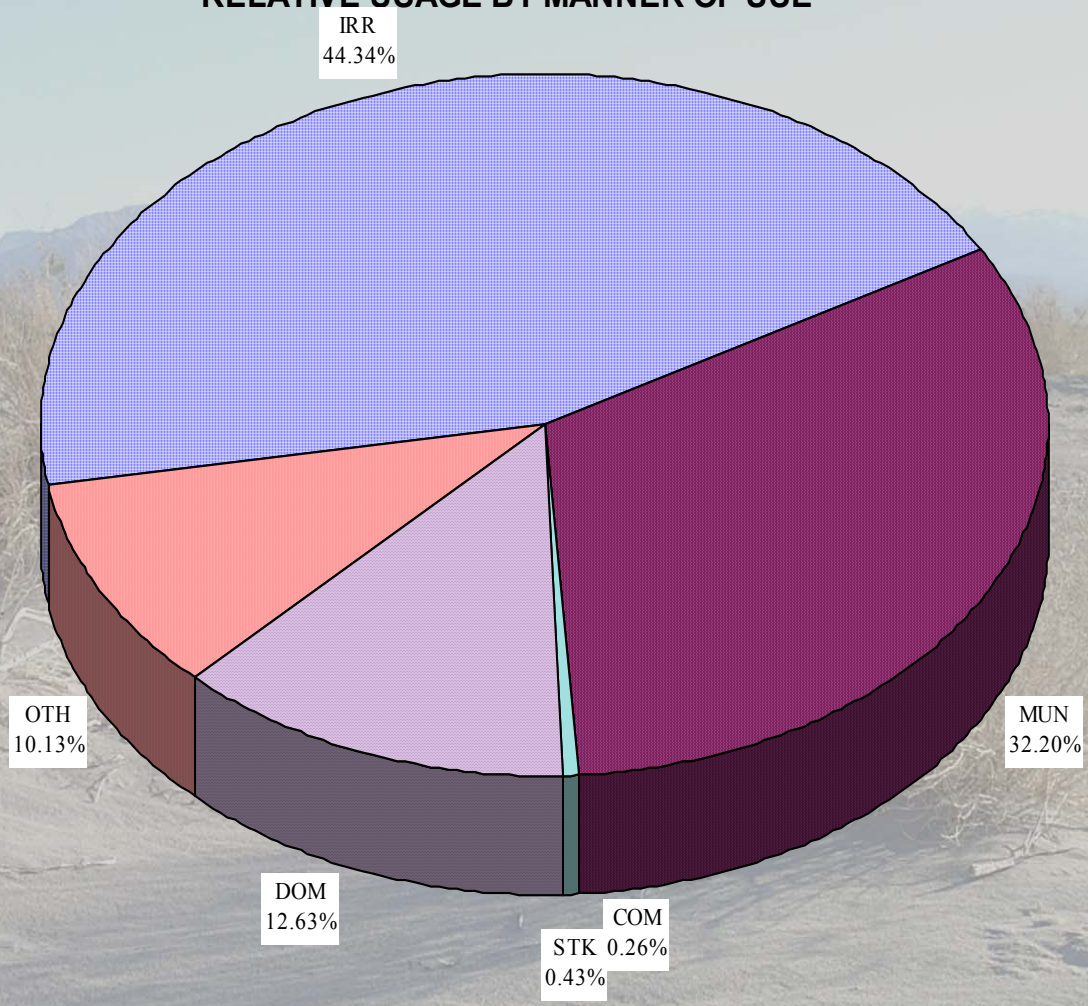
TOTAL QUANTITY PERMITTED AND USED



CARSON VALLEY GROUNDWATER USE 2001
VARIATIONS BY YEAR



CARSON VALLEY GROUNDWATER USE 2001
RELATIVE USAGE BY MANNER OF USE



TOTAL PUMPED BY WATER YEAR
ACRE-FEET

Water Company	**95**	**96**	**97**	**98**	**99**	**00**	**01**
Gardnerville Ranchos G.I.D.	2309	2373	2954	2161	2778	3468	3700
Mountain View	276	291	408	274	153	352	286
Indian Hills G.I.D.	712	774	685	772	742	930	760
North Valley G.I.D.	87	125	92	76	30	16	4
Sheridan Acres	80	64	62	56	61	102	66
Town of Gardnerville	901	1019	1308	1039	1238	1324	1259
Town of Minden	1044	1114	1291	1298	1376	1465	1580
Douglas County	152	226	260	284	520	514	464

Columbia River at The Dalles

- Averages ~ 200,000 cfs

- Enough water passes that gauging station in ~ 16 days to supply all the surface and ground water in Nevada.


Water Supply Overview
Ground Water
Surface Water