ARIZONA DEPARTMENT OF WATER RESOURCES

YAVAPAI COUNTY ARIZONA 1865

Water Advisory Committee

Central Yavapai Highlands Water Resources Management Study

Water Advisory Committee Update on Phase 2

Wednesday November 16, 2011

Yavapai County Water Advisory Committee

Arizona Department of Water Resources

Bureau of Reclamation

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Structure for today's presentation

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- Background
- Phase 1 brief recap
- Phase 2 draft results (Report sent out)
- Discuss Phase 3 objectives

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The Study

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- A cooperative regional study including communities in three Verde Sub-basins (Big Chino, PrAMA, and Verde Valley)
- This is a three phase study. Today we are briefly reviewing study and looking at Phase 2.
- The Technical Working Group (TWG) has worked together to produce these draft results

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Need for the Study was Identified in Previous Reports

- **Yavapai County Water Advisory Committee Report on Options for Water Management Strategies (YCWAC, 2004)**

"*A key objective of the WAC is to develop regional water management and conservation strategies. The lack of integrated planning for water resources is an item of concern for the WAC and Yavapai County.*"

- ***Verde River Watershed Report (ADWR, 2000)***
- ***Prescott Active Management Area 2003-2004 Hydrologic Monitoring Report (ADWR, 2005)***
- ***Verde Comprehensive River Basin Study Summary Report (VWA, NRCD, USDA, NRCS and Cooperating Agencies, 1996***

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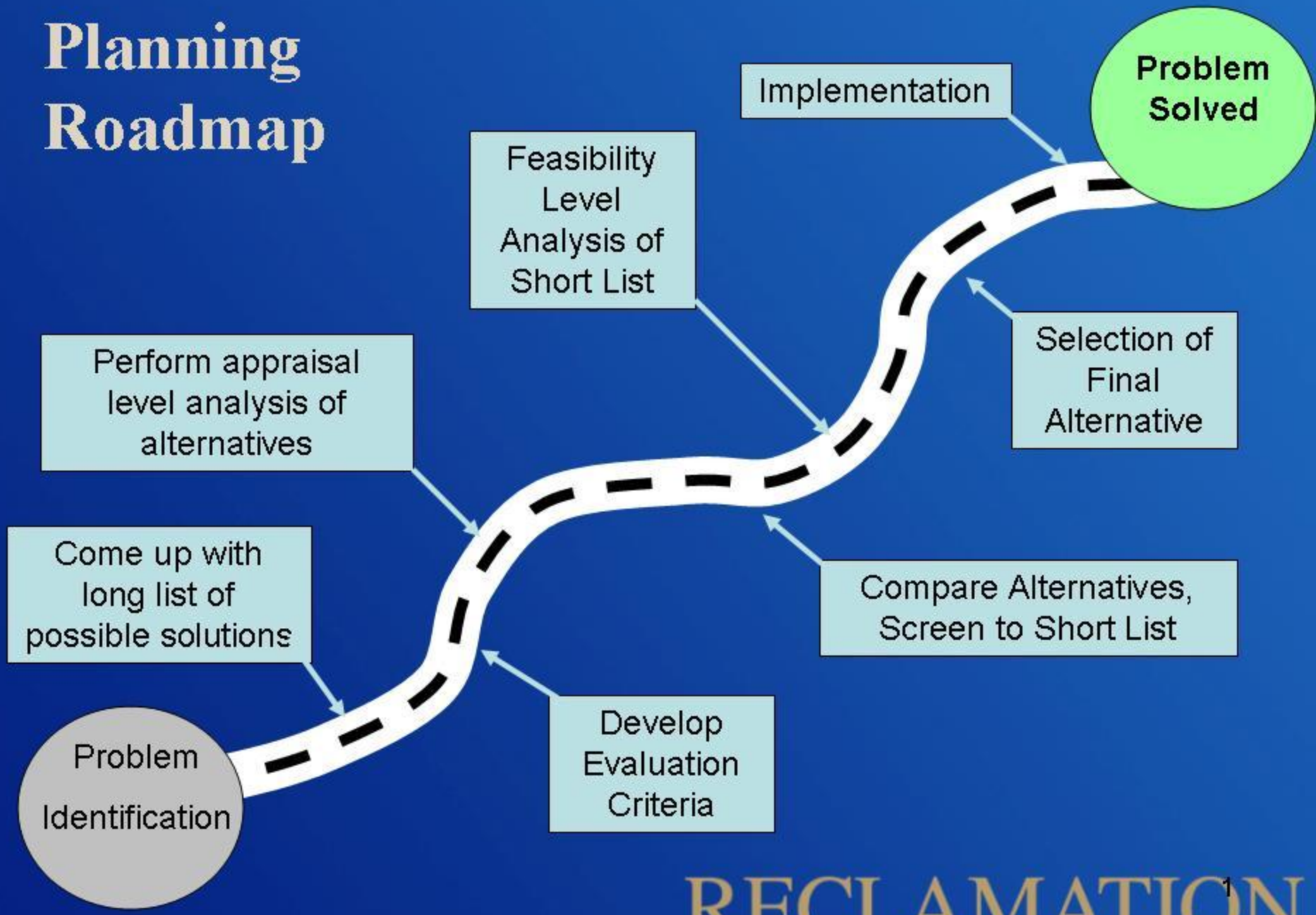
Planning Roadmap



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Tasks – Phase I

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- Define Area
- Develop list of water providers

  Water Demand (evaluated for each Water Provider)
- Present Population
- Future Population
- Present Water Demands
- Present Water Resources (source and amount)
- Future Demands

Questions:

Are there demands that will be unmet in 2050?

Where?

How much?

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Phase 1 Bottom Line:

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- **Yes - Phase 1 has identified unmet future demands.**
- **The unmet demands are detailed in a table (Demand Analysis Table) and several supporting documents.**
- **They are expressed as a range based on a range of approaches used in the phase 1 analysis (a "status quo" and a "water balance" approach).**
- **The total, overall study area unmet 2050 demands range from about 45,000 acft/yr (status quo method) to about 80,000 acft/yr (water budget method 1).**

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Study Area

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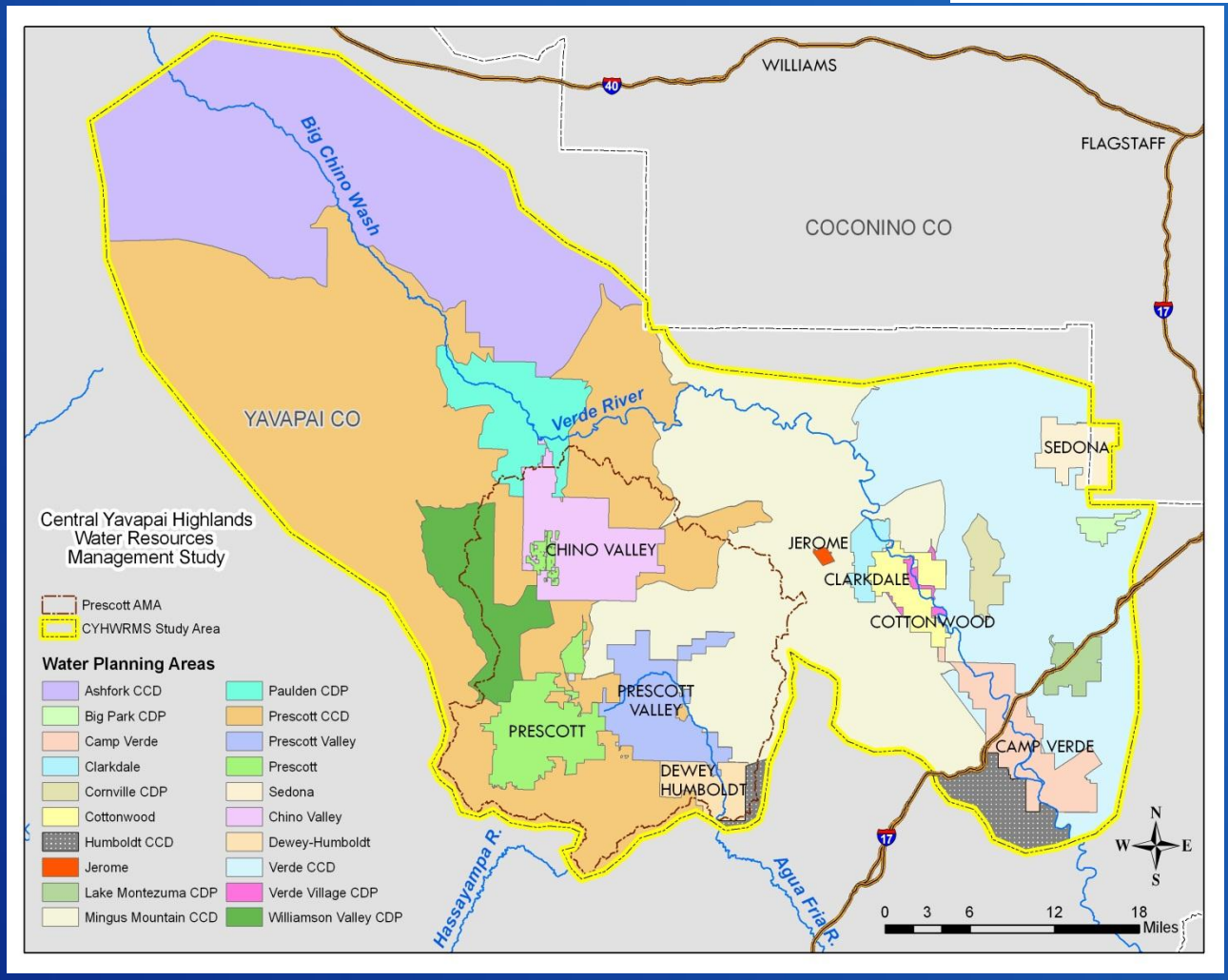
- **STUDY AREA:**
  - Big Chino, PrAMA, and Verde Valley
  - High Potential Growth Areas
  - With increased water demands



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Do we have unmet demands in 2050?

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- **Unmet 2050 demand for the entire study area = - 46,472 AF**
- **If the study area is broken down into groundwater sub-basins**

	Verde Valley	PrAMA (Little Chino and Upper Agua Fria)	Big Chino
Status Quo	-11,886	-31,677	-2,909
Water Budget 1	-25,658	-54,182	-201
Water Budget 2	-21,898	-41,085	3,119

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How did the TWG get to these figures?

Main Document - Demand Analysis Table

Central Yavapai Highlands Water Resources Management Study - Phase I

Demand Analysis

Draft

A	B	C	D (C-B)	E	F	G	H (E+F+G)	I (E/B)	J Estimated	K	L (C*K)	M	N	O (L+M+N)	P (J-O)
Water Planning Area	2006 Population[1]	2050 Population[1]	Pop. Change	2006 Mun/Dom Demand[2]	2006 Com/Ind Demand[2]	2006 AG Demand[2]	Total 2006 Demand	2006[3]	Available Water Supply[4]	2050[5]	2050 Mun/Dom Demand[5]	2050 Com/Ind Demand[6]	2050 AG Demand[7]	Total 2050 Demand	2050 Water Supply +/-
				(AF/yr)	(AF/yr)	(AF/yr)		GPPD	(AF/yr)	GPPD	(AF/yr)	(AF/yr)	(AF/yr)	(AF/ry)	(AF/yr)
Camp Verde	12,497	23,277	10,780	1,597	887	9,320	11,804	114	11,804	112	2,920	887	6,215	10,022	1,782
Dewey Humboldt	4,134	6,943	2,809	607	38	569	1,214	131	1,214	120	933	722	37	1,692	-478
Clarkdale	3,999	22,460	18,461	478	3	31	512	107	512	75	1,887	300	31	2,218	-1,706
Cottonwood	20,400	77,630	57,230	3,370	1,782	1,137	6,289	147	6,289	125	10,870	1,782	760	13,412	-7,123
Jerome	510	800	290	282	0	0	282	494	282	255	229	53	0	282	0
Prescott Valley	44,000	146,000	102,000	6,215	551	55	6,821	126	6,821	121	19,790	906	0	20,696	-13,875
Chino Valley	12,690	63,690	51,000	1,294	552	1,691	3,537	91	2,755	75	5,351	4,222	158	9,731	-6,976
Prescott	49,072	100,000	50,928	10,524	8	375	10,907	191	10,907	125	14,003	3,231	375	17,609	-6,702
Sedona	11,080	17,100	6,020	3,794	40	278	4,112	306	4,112	361	6,915	40	185	7,140	-3,028
Paulden CDP	5,342	14,099	8,757	778	148	1,346	2,272	130	2,272	120	1,895	148	962	3,005	-733
Big Park CDP	7,731	8,810	1,079	1,361	1,153	0	2,514	157	2,514	198	1,954	1,153	0	3,107	-593
Cornville CDP	4,075	7,448	3,373	927	31	2,823	3,781	203	3,781	185	1,544	31	1,880	3,455	326
Lake Montezuma CDP	4,237	8,308	4,071	631	751	537	1,919	133	1,919	120	1,117	751	360	2,228	-309
Ctn-Verde Village CDP	3,373	11,706	8,333	118	1	1,124	1,243	31	1,243	125	1,639	1	750	2,390	-1,147
Verde CCD	1,700	4,525	2,825	501	731	1,322	2,554	263	2,554	235	1,191	731	880	2,802	-248
Prescott CCD	16,120	42,909	26,789	2,756	78	4,936	7,770	153	7,770	135	6,489	86	2,556	9,131	-1,361
Mingus Mtn CCD	1,700	4,525	2,825	459	749	487	1,695	241	1,695	215	1,090	749	325	2,164	-469
Humboldt CCD	230	612	382	49	5	759	813	190	813	170	117	5	506	628	185
Ashfork CCD	470	36,250	35,780	28	8	2,796	2,832	53	2,832	134	5,441	8	1,400	6,849	-4,017
Total	203,360	597,092	393,732	35,769	7,516	29,586	72,871		72,089		85,375	15,806	17,380	118,561	-46,472

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Demand Analysis – Total 2050 Demand (column 0)

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- Total of 2050 Demands (add columns L, M, N)

- Total year 2050 Study Area Demand = 118,561 AF/yr

(Total 2006 = 72,880 AF/yr)

Water Planning Area	Total 2050 Demand (AF/ry)
Camp Verde	10,022
Dewey Humboldt	1,692
Clarkdale	2,218
Cottonwood	13,412
Jerome	282
Prescott Valley	20,696
Chino Valley	9,731
Prescott	17,609
Sedona	7,140
Paulden CDP	3,005
Big Park CDP	3,107
Cornville CDP	3,455
Lake Montezuma CDP	2,228
Ctn-Verde Village CDP	2,390
Verde CCD	2,802
Prescott CCD	9,131
Mingus Mtn CCD	2,164
Humboldt CCD	628
Ashfork CCD	6,849
Total	118,561

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Bottom Line (column P): 2050 Water Supply +/-

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- Phase 1 has identified unmet future demands.
- The unmet demands are detailed the Demand Analysis Table (with several supporting documents).
- They are expressed as a range based on a range of approaches used in the phase 1 analysis (a "status quo" and a "water balance" approach).
- The total, overall study area unmet 2050 demands range from about 45,000 acft/yr (status quo method) to about 80,000 acft/yr (water budget method 1).

Water Planning Area	2050 Water Supply +/- (AF/yr)
Camp Verde	1,782
Dewey Humboldt	-478
Clarkdale	-1,706
Cottonwood	-7,123
Jerome	0
Prescott Valley	-13,875
Chino Valley	-6,976
Prescott	-6,702
Sedona	-3,028
Paulden CDP	-733
Big Park CDP	-593
Cornville CDP	326
Lake Montezuma CDP	-309
Ctn-Verde Village CDP	-1,147
Verde CCD	-248
Prescott CCD	-1,361
Mingus Mtn CCD	-469
Humboldt CCD	185
Ashfork CCD	-4,017
Total	-46,472

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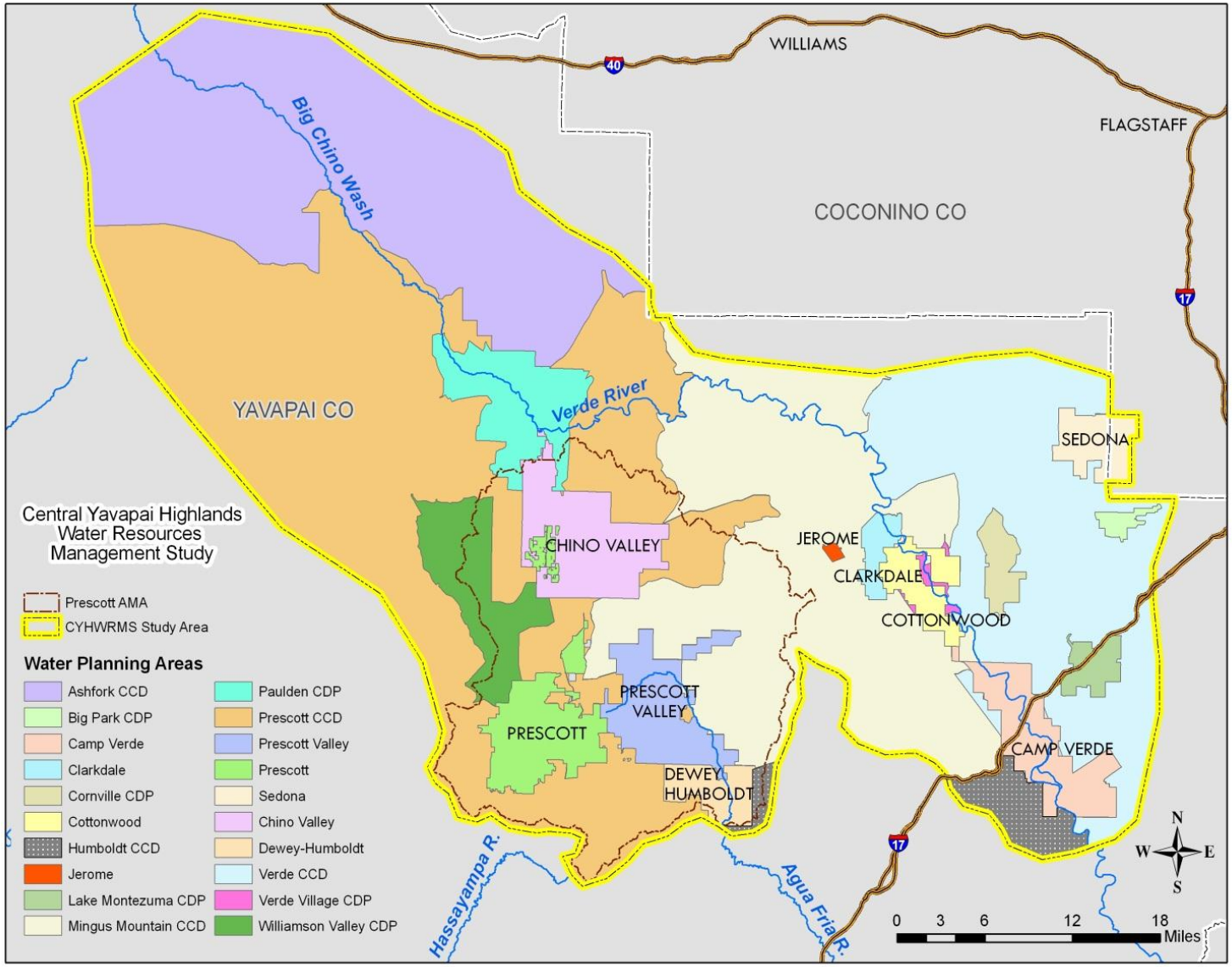
Study Area Map



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Phase 2 – Water Resources Inventory

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- The purpose of Phase 2 (Water Resource Inventory) is to identify potential sources of water to satisfy unmet demands in the Study Planning Areas.

- Phase 3 (Alternative Development and Evaluation) will identify, describe and analyze various potential alternatives to meet the future unmet demands identified in Phase 1 (using the Phase 2 water sources).

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Phase 2 – Summary

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- **Purpose: locate and describe water resources that could be included in various portfolio(s) to meet future unmet demands**
- **Look at possibilities both within the Study Area and outside of the Study Area**
- **Consider both quantity and quality**
- **Consider several types of water (surface, ground, effluent, reservoirs, impaired waters, demand management, waste water, flood, and others)**
- **Summary Report and Tables: Represent appraisal level analysis based on available information and input from the Technical Working Group.**

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Table 1: Water Resource Availability within Study Area

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	Big Chino Sub-Basin	Little Chino and Upper Agua Fria Sub-Basin (Prescott AMA)	Verde Valley Sub-Basin
Surface Water	No	No	No
Groundwater	Yes	Yes	Yes
Wastewater			
Septic	Yes	Yes	Yes
Mine Drainage	No	No	No
Brackish/Saline	No	No	No
Flood Water	Yes	Yes	Yes
Storm Water	Yes	Yes	Yes
Effluent	Yes	Yes	Yes

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Table 2: Surface Water Resource Availability outside the Study Area

River Basin	Surface Water
Agua Fria	No
Colorado	Yes
Little Colorado	No
Salt	No
Middle Gila	No
Bill Williams	Yes
Verde	No

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Table 3: Water Resource Availability outside the Study Area

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Groundwater Basins	Groundwater	Wastewater	Flood Water	Storm Water	Effluent
Coconino Plateau	Yes	No	No	No	No
Little Colorado Plateau	Yes	No	No	No	No
Agua Fria	Yes	No	No	No	No
Salt River	Yes	No	No	No	No
Tonto Creek	Yes	No	No	No	No
Upper Hassayampa	Yes	No	No	No	No
Verde River	Yes	No	No	No	No
Phoenix AMA	Yes	No	No	No	No
Prescott AMA	Yes	No	No	No	No
Big Sandy	Yes	No	Yes	No	No
Bill Williams	Yes	No	Yes	No	No
Peach Springs	Yes	No	No	No	No
Shivwits Plateau	Yes	No	No	No	No

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Within Study Area

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- **<u>Surface Water</u>: Rivers and Streams**
- **The analysis of Statements of Claimant (SOCs) and surface water filings in the Verde and Agua Fria Watersheds concludes that existing claims for surface water far exceed available supply. Therefore, with the exception of major flood events (see Flood water section); new sources of surface water are not available within the study area to meet new water demands.**

Sierra Club; USFS

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Within Study Area

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- **Surface Water: Springs**
- **As with other surface water claims, the amount of water claimed for beneficial use from each spring exceeds the amount physically available. Additionally, it is assumed that all surface water produced from springs in the study area today is either fully consumed or contributes to stream flow, therefore, it may be concluded that there is no new surface water available in the study area from springs.**

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Within Study Area

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- **Surface Water: Lakes and Reservoirs Water supply from the larger lakes and reservoirs is quantified; however, data is very limited for smaller reservoirs. Willow Creek Reservoir and Watson Lake are the largest lakes in the study area. All water from these two lakes is claimed for use and already accounted for in the CYHWRMS Demand Analysis by the city of Prescott. Based on the best available data, it is assumed that no new water is available within the study area from lakes and reservoirs.**

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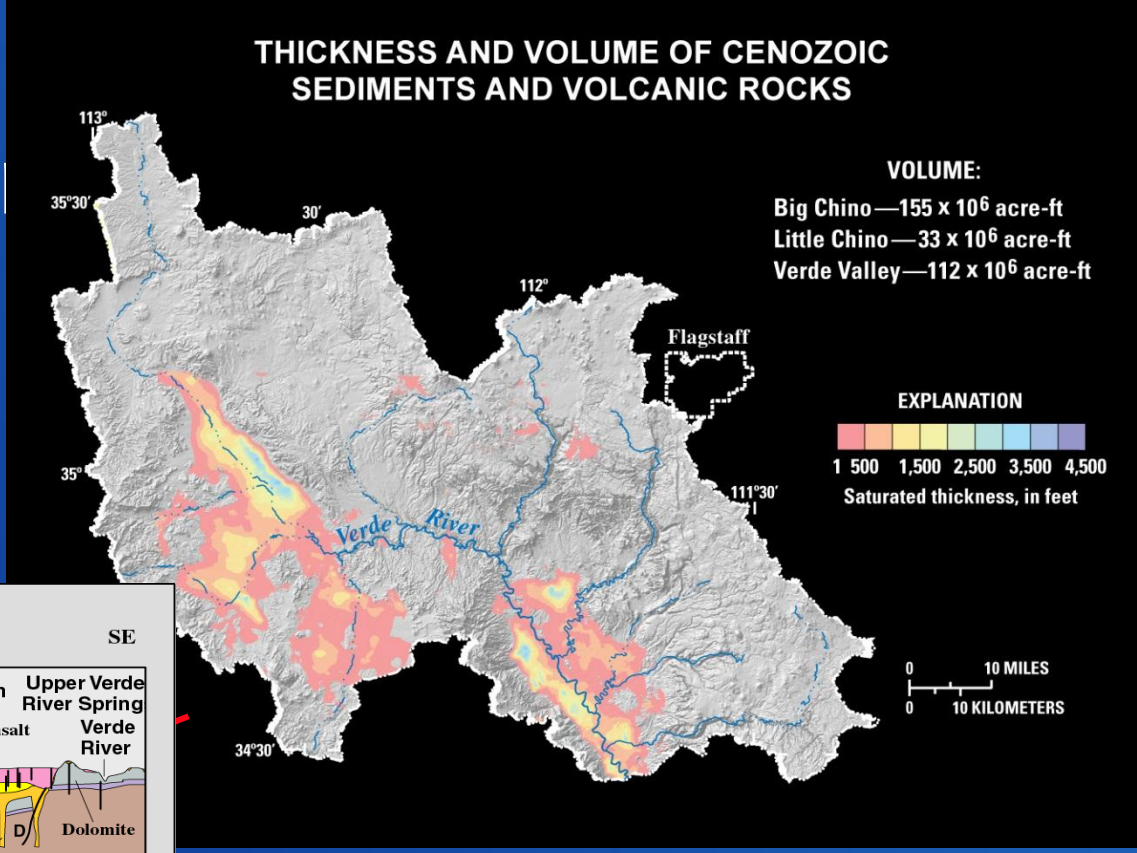
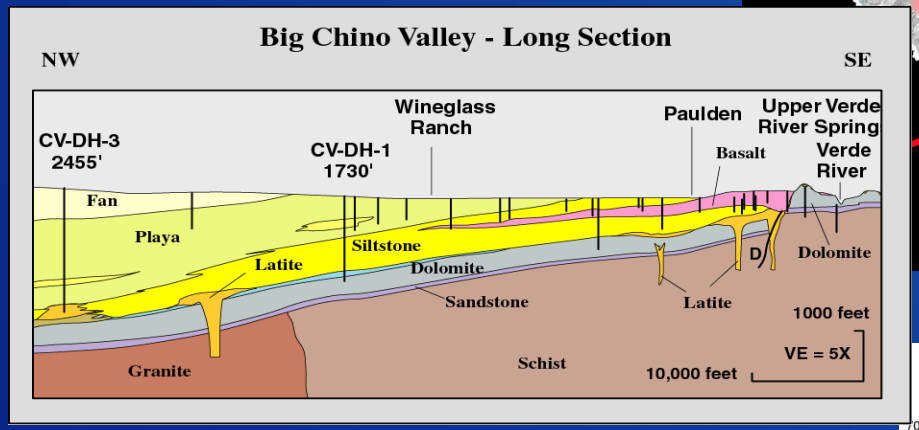
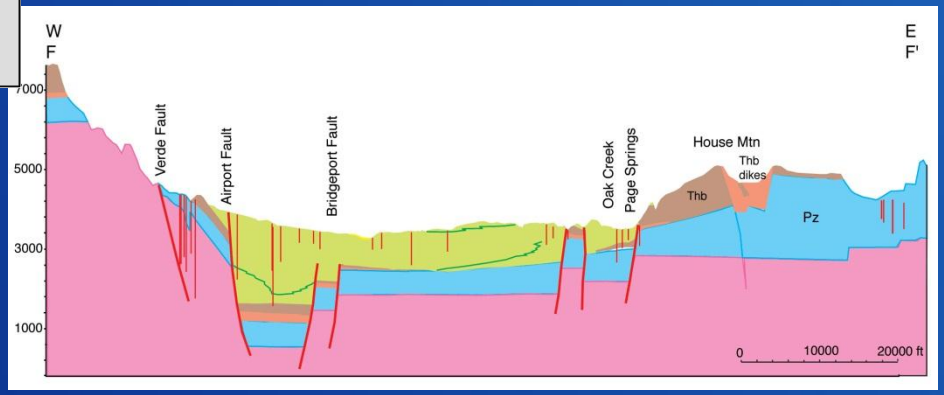
Withi

- **Ground Water**:
- Basin Fill Aquifers
- Paleozoic Aquifers







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Within Study Area

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- **Septic - The volume of water estimated to be available in urban areas (water served by a provider) from septic tank storage is 3,368 afy. An additional 2,766 afy of wastewater may be available in rural areas. This source of water would require high levels of treatment and the construction of a significant infrastructure system, both sewer and WWTFs, to make this water supply available to incorporate into any water supply budget.**

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Within Study Area

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- **Mine Drainage** -While there are many mines in the study area; there appears to be little or no data to quantify mine drainage water volumes available for use anywhere in the study area. Drainage from mines does not appear to be a viable option as source water for local or regional supply.

- **Brackish/Saline** - There is little or no brackish/saline water within the study area, therefore, brackish/saline waters are not considered to be available for development as either a local or regional water supply.

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Within Study Area

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- **Flood water is generated in tributaries in each of the sub-basins and is available to be developed as an additional supply in the study area. Water supply developed from the collection and storage of unappropriated flood water is dependent on high flow events and will be relatively unreliable. Additionally, this supply will likely be quite expensive and may have many issues associated with location of diversion and potential exchanges on the Verde River.**

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Within Study Area

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- **Storm water may have the potential to produce large volumes of surface runoff within any given developed community and, potentially, on a larger landscape scale, however, information relating to storm water runoff volumes is limited.**

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Within Study Area

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- **Effluent**: There are three sources of effluent development in the study area. The first is the conversion of existing septic to sewer systems. This alternative could produce more than 3,000 afy. The second effluent development alternative assumes that all new growth would be provided access to a sewer system. This assumption could produce 30,000 afy of new supply within the study area by 2057. The third alternative is effluent not currently utilized by treatment facilities. There are almost 1,896 afy of unutilized effluent within the study area in 2010.

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Table 1: Water Resource Availability within Study Area

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	Big Chino Sub-Basin	Little Chino and Upper Agua Fria Sub-Basin (Prescott AMA)	Verde Valley Sub-Basin
Surface Water	No	No	No
Groundwater	Yes	Yes	Yes
Wastewater			
Septic	Yes	Yes	Yes
Mine Drainage	No	No	No
Brackish/Saline	No	No	No
Flood Water	Yes	Yes	Yes
Storm Water	Yes	Yes	Yes
Effluent	Yes	Yes	Yes

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Outside Study Area

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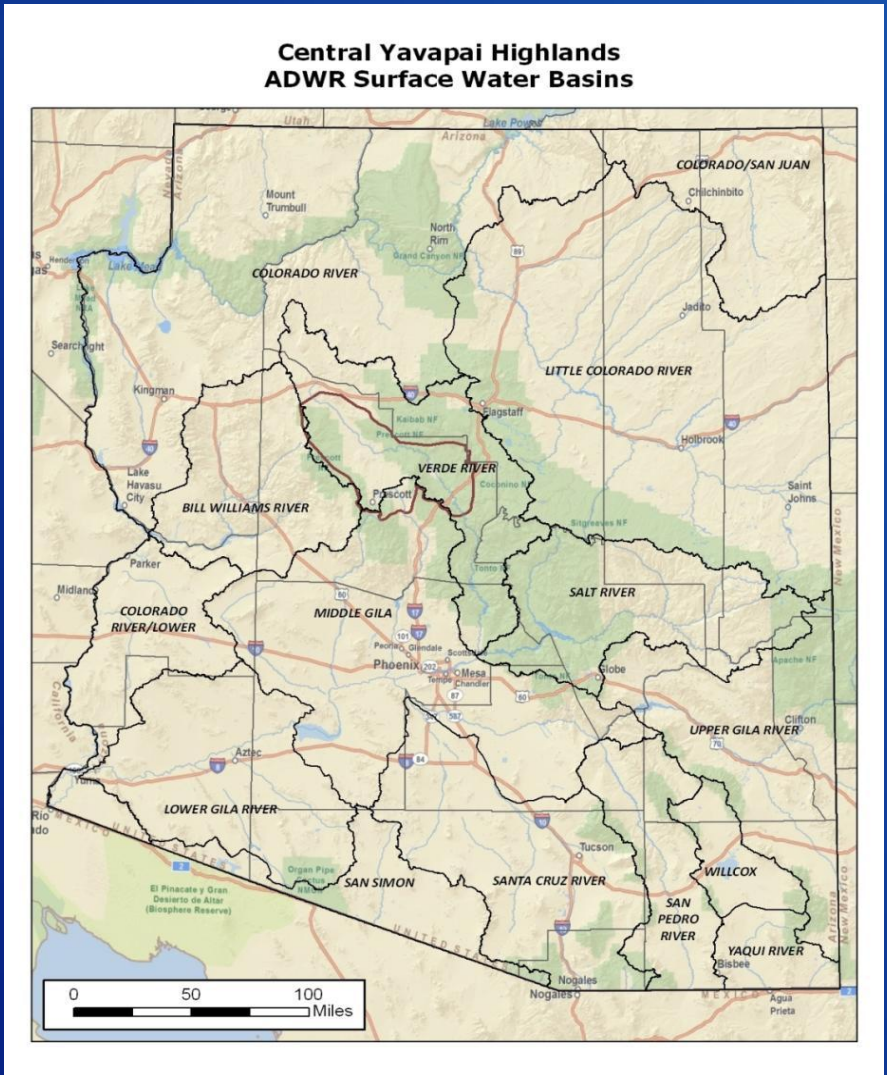

- **Surface Water** -For the purpose of this study, it is assumed that the most likely sources of surface water outside of the study area are the Colorado and Bill Williams Rivers. Although the Verde River has many SOCs, legal and environmental concerns, unappropriated flood water may be available for development outside of the study area (i.e. Horseshoe and Bartlett Dams).

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Table 2: Surface Water Resource Availability outside the Study Area

River Basin	Surface Water
Agua Fria	No
Colorado	Yes
Little Colorado	No
Salt	No
Middle Gila	No
Bill Williams	Yes
Verde	No

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Outside Study Area

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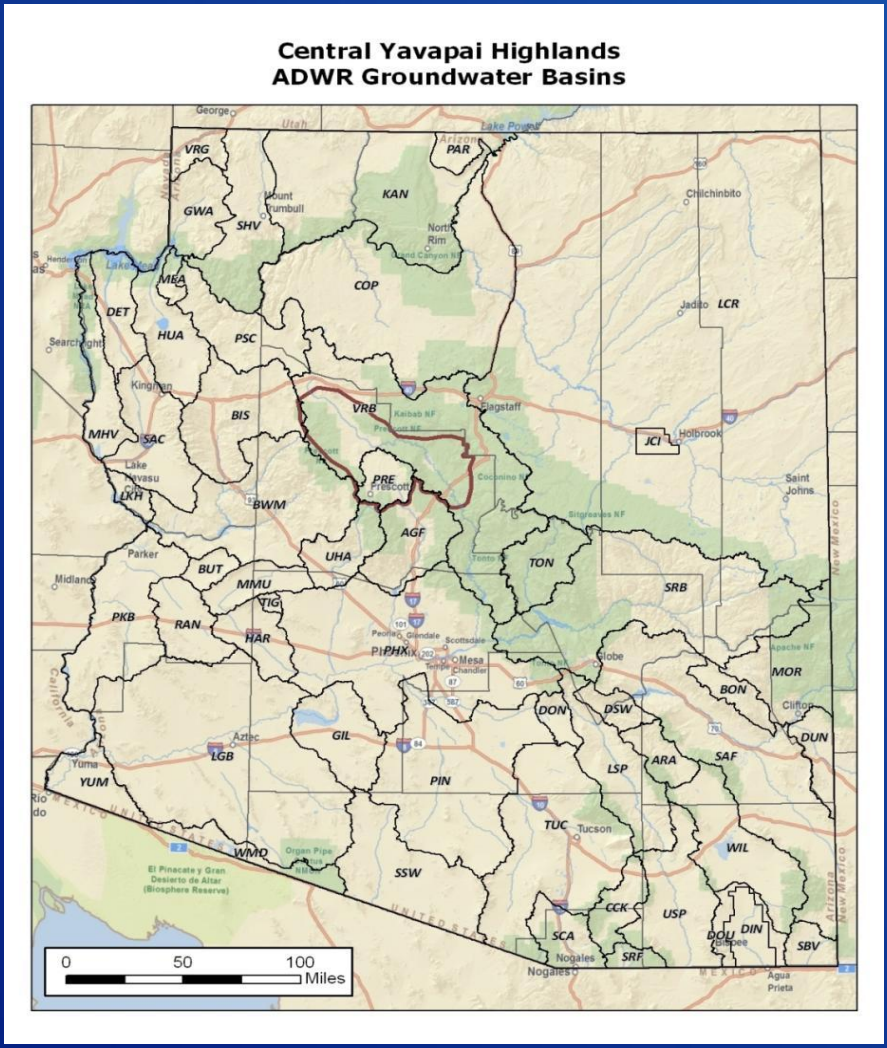

Groundwater

There are 12 groundwater basins that touch one or more sub-basins of the study area. Groundwater is the main source of water supply in the Yavapai County Water Resources Management Study area and throughout much of rural Arizona.

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Outside Groundwater

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- It is possible that groundwater may be available for development in the study area from basins to the west (i.e. Bill Williams Basin) or in any basin on a groundwater mining basis. Due to the relative proximity and potential sustainability of groundwater development, the Agua Fria, Upper Hassayampa, Big Sandy and Bill Williams basins were identified as potential sources of groundwater development outside of the study area.

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Table 3: Water Resource Availability outside the Study Area

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Groundwater Basins	Groundwater	Wastewater	Flood Water	Storm Water	Effluent
Coconino Plateau	Yes	No	No	No	No
Little Colorado Plateau	Yes	No	No	No	No
Agua Fria	Yes	No	No	No	No
Salt River	Yes	No	No	No	No
Tonto Creek	Yes	No	No	No	No
Upper Hassayampa	Yes	No	No	No	No
Verde River	Yes	No	No	No	No
Phoenix AMA	Yes	No	No	No	No
Prescott AMA	Yes	No	No	No	No
Big Sandy	Yes	No	Yes	No	No
Bill Williams	Yes	No	Yes	No	No
Peach Springs	Yes	No	No	No	No
Shivwits Plateau	Yes	No	No	No	No

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What's Next

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Phase II

- Review Final report
- Additional Summary Tables (with amounts)

Phase III (current priority)

- Alternative Formulation
- Alternative Analysis
- Alternative Evaluation

Question: Is there at least one alternative that can meet the unmet demands?

Question: Is there a Federal Interest in the identified alternatives?

Phase IV

- Final Report Formulation

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Water Supply	Alternative #	Alternative	Planning Area
Inside the Study Area			
Groundwater	1	Local Groundwater Development	1-20
	2	Regional Groundwater Development	(3,4)(2,7,8)(2)(7,8)
Waste Water (Septic Only)	3	Conversion of Existing Systems (Urban)	1,2,3,4,5,6,7,8,9,10,11,13, 14,15
	4	Conversion of Existing Systems (Rural)	1-20
Flood Water	5	Capture and Store Verde (or Trib) Flood Water	Water Providers Only 1-20
Storm Water	6	Macro Rainwater Harvesting	By Sub-Basin 1-20
Effluent	7	Existing Unused Effluent and/or Capacity	1,2,3,4,5,6,7,8,9,10,11,13, 14,15
	8	New Effluent from Septic (See 3/4 above)	1-20
	9	New Effluent from new population	1-20
Conservation	10	Implement Conservation (i.e. Rainwater Harvesting, educational programs, etc.)	1-20
Outside the Study Area			
Surface Water	11	Alamo Lake	1-20
	12	Colorado River (via (a)Alamo Lake, (b)Lake Powell, (c)Diamond Creek, (d)Lake Mead, (e)Lake Havasu, (f)Lake Mohave)	1-20
Ground Water	13	(a)Big Sandy, (b)Bill Williams (Santa Maria Creek), (c) Bill Williams (Burro Creek), (d)Agua Fria	1-20
Other	14	Weather Modification	1-20
	15	Watershed Management	1-20

WPA #	Water Planning Area	WPA #	Water Planni
1	Camp Verde	11	Cornville CDP
2	Chino Valley	12	Ctn-Verde Villa CDP
3	Clarkdale	13	Lake Montezu
4	Cottonwood	14	Paulden CDP
5	Dewey Humboldt	15	Williamson CD
6	Jerome	16	Ashfork CCD
7	Prescott	17	Humboldt CCD
8	Prescott Valley	18	Mingus Mtn C
9	Sedona	19	Prescott CCD
10	Big Park CDP	20	Verde CCD

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Demand Analysis – Estimated Supplies, using components from existing water budgets

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SUB-BASIN "Water Balance 1" APPROACH -

<u>Verde Valley Sub-basin</u>:
Inflow (167,000) – Outflow (baseflow out 144,100) = 22,900 AF available
22,900 – 48,558 (2050 Demand) = -25,658 (unmet 2050 demand)

<u>Little Chino/Upper Agua Fria (PrAMA):</u>
Inflow Natural Recharge (8,070) – Outflow (4,850) = 3,220 AF available
3,220 – 57,402 (2050 Demand) = -54,182 (unmet 2050 demand)

<u>Big Chino Sub-basin</u>:
Inflow (30,300) – Outflow (17,900 baseflow out) = 12,400 AF available
12,400 – 12,601 (2050 Demand) = -201 (unmet 2050 demand)

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