



SUPPLY & DEMAND

2025

DUNCAN VALLEY

ACKNOWLEDGMENTS

Thomas Buschatzke
Director

ADWR Employees Past and Present

Alexandra Garden
Alyssa Ainna
Amanda Long-Rodriguez
Amanda Overholt
Ben Calleros
Bradley Niska
Brandon Lofgreen
Bruce Hallin
Carl Job
Carol Ward
Catherine Riedel
Cera Linehan
Cole Pihl
Collin Wogenstahl
Colton Dodson
Daniela Kenny
David Keadle
David Lawlor
Dianne Yunker
Doug MacEachern
Emily LoDolce
Emily Petrick
Isabella Holt

Gwendolyn DeNeal
Haley Doran
James Dieckhoff
James Heffner
James Taylor
Jeff Heilman
John Riggins
Josephine Knab
Joshua Pallapati
Karen Nielsen
Keith Nelson
Kennedy Shepard
Kevin Hadder
Kevin Lane
Khayrun Nahar
Kimberly Parks
Kristen Johnson
Kyle Miller
Laleh Ranjbaran
Laney Meeker
Lauren Roberson
Leandra Marshall
Maggie Martin

Makenna Welsch
Lisa Williams
LuDean Stone
Madison Moreno
Mary Wuertz
Melissa Sikes
Michaela Jones
MirandaeRae Stusen
Natalie Mast
Nick Redendo
Nicole Klobas
Paul Alder
Paul Strong
Quinn Buzzard
Rachael King
Ryan Mitchell
Sarah Medeiros
Shannon Curtis
Sharon Scantlebury
Shauna Evans
Soujit Ray
Steven Legacki



2025 SUPPLY AND DEMAND ASSESSMENT DUNCAN VALLEY BASIN

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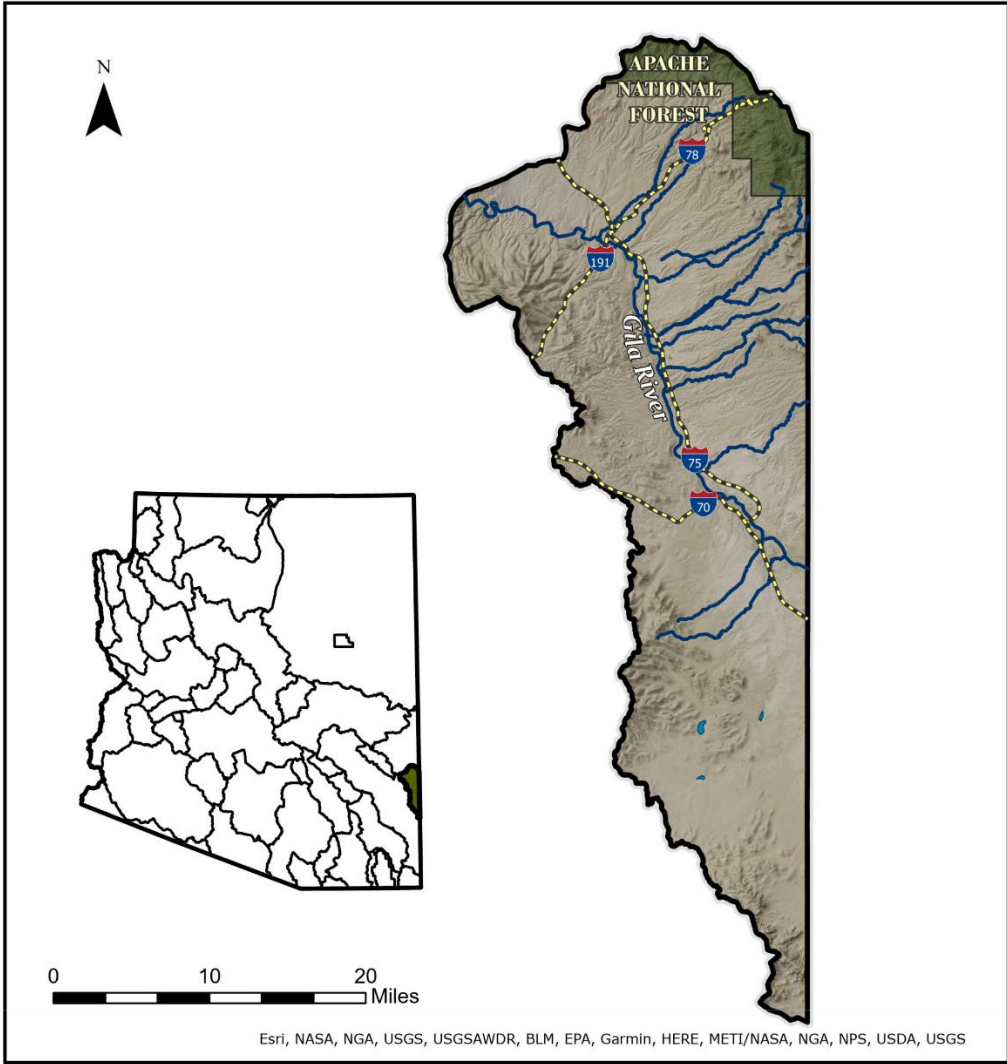


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1 INTRODUCTION

DUNCAN VALLEY BASIN



Highway
River

Groundwater Basin
National Forest
Lake

Figure 1. Map of the Duncan Valley Basin.



1.1 REPORT BACKGROUND AND PURPOSE

Preparing the Supply and Demand Reports (SDRs) is a duty of the Director of the Arizona Department of Water Resources (ADWR) required by statute, as stated in Arizona Revised Statutes (A.R.S.) § 45-105(B)(14).¹ Beginning in 2023, the Director must ensure that a water supply and demand assessment for at least six of Arizona's fifty-one groundwater basins are prepared and issued by December 1st of each year.

Although similar assessments have been completed periodically, 2023 was the first time ADWR was allocated dedicated funding and staff to conduct assessments of all of Arizona's groundwater basins on a recurring cycle. By the end of 2027, ADWR will complete assessments for all 51 groundwater basins throughout the state, and each basin will be reassessed at least every five years. The SDRs may be used to inform the Water Infrastructure Finance Authority on funding decisions in the future (see A.R.S. § 49-1304(A)(14)²). The SDRs may also be used as a planning tool for water resource management by ADWR, policymakers, community members, and other interested stakeholders.

The basins and subbasins assessed in 2025 include Aravaipa Canyon, Bill Williams (Alamo Reservoir, Burro Creek, Clara Peak, Santa Maria, and Skull Valley Subbasins), Bonita Creek, Coconino Plateau, Dripping Springs Wash, Duncan Valley, Hualapai Valley, Little Colorado River Plateau, Morenci, Sacramento Valley, Safford (San Carlos Valley, Gila Valley, and San Simon Valley Subbasins), Salt River (Black River, White River, Salt River Canyon, and Salt River Lakes Subbasins), and San Simon Wash.

¹ Arizona Revised Statutes § 45-105(B)(14). <https://www.azleg.gov/ars/45/00105.htm>

² Arizona Revised Statutes § 49-1304(A)(14). <https://www.azleg.gov/ars/49/01304.htm>



1.2 PROCEDURE AND SCOPE

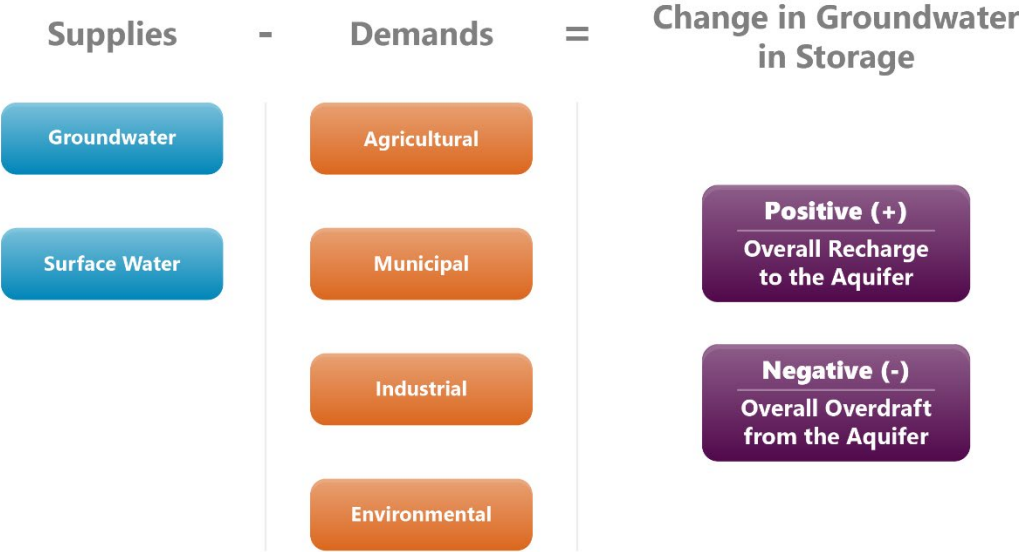


Figure 2. Depiction of the Duncan Valley basin water budget, including all available supplies and demands and how they contribute to changes in groundwater in storage.

The SDRs are structured as water budgets, focusing on total inflows and outflows at the basin scale. The SDRs estimate the volumes of water demands from all uses (categorized into sectors of Agricultural, Industrial, Municipal, and Other) and the volumes of water supplies (Surface Water, Groundwater, Effluent, Incidental Recharge, Transportation Water, and Moved Water) available to meet those demands. The reports also include projected demands and supplies under various influences of future scenarios.

The SDRs are not groundwater flow models with finer geographic results. The development of regional groundwater flow models for each basin is an extensive technical process and is not feasible within the time constraints of this project. Outside of Arizona’s regulated Active Management Areas (AMAs) and Irrigation Non-Expansion Areas (INAs), data is much more limited. In instances where data does exist, the data may be outdated or lack reliability. ADWR has endeavored to acquire local and specific data to generate the SDRs. However, when such information was not obtainable, staff utilized scientific literature estimates, averages, or assumptions to formulate water usage estimates.

The SDRs attempt to answer the following questions:

1. What is the estimated annual volume of water demand?
2. What is the estimated annual volume of available water supply?
3. Is there sufficient available water supply to balance water demand annually?

The water budget was calculated by subtracting the estimated annual demand from the estimated annual available supply. If demand exceeds supply in a year, the difference is subtracted from the



estimated aquifer storage. If supply exceeds demand, the difference is added to estimated aquifer storage. In this manner, the process is like balancing a checkbook, totaling the credits and debits made to the account through the year to understand how much estimated groundwater is available in storage.

The SDRs are designed to be understandable to the general public. The Methods Appendix includes specific technical information and additional details regarding data and methods: [[Methods Appendix](#)]. Additional SDRs and an interactive dashboard are available for further information: [[Dashboards](#)].

1.3 METHODOLOGY AND LIMITATIONS

This study reviewed and compiled data for two primary purposes:

1. Estimate supply and demand volumes in the basin.
2. Project changes in supply and demand from possible future scenarios.

ADWR developed and compiled baseline data for the period from 1990 to 2024. Staff then developed scenarios based on the most likely impacts on water demands and supplies over 51 years (from 2025 to 2075), and then projections were generated from the baseline data. The results from these scenarios and the combined baseline data were used to estimate whether supply could meet demand each year from 1990 to 2075. ADWR independently developed both the supply and demand estimates.

Due to the limited reported water data available outside Arizona's AMAs and INAs, the supplies and demands outlined in the SDRs are estimates only. When available, ADWR used high-quality data from credible sources. Due to the need to focus staff bandwidth on developing initial methods for analysis of all 51 groundwater basins by the December 1, 2027, statutory deadline, outreach was limited to major water users in the basin. When data could not be obtained, research into existing literature and the use of representative data were necessary to develop estimates.

Please see the Methods Appendix for an in-depth discussion of the methodologies and assumptions ADWR applied to create each estimate: [[Methods Appendix](#)].

2 RESULTS

2.1 BASIN SUMMARY

The Duncan Valley Basin encompasses 550 square miles on the southeastern edge of the state. The basin is characterized by mid-elevation mountain ranges, with the Blue Lue Mountains alongside the northern boundary, and the Peloncillo Mountains alongside the basin boundary west of the Town of Duncan, Arizona. The land in the Duncan Valley basin is comprised of State Trust land (44.5%), Bureau of Land Management (BLM) land (37.8%), and National Forest land (5.8%). The basin has an estimated population of 3,272 people, and 11.9% of the basin is privately owned. The major aquifers in the basin are recent stream alluvium, consisting of gravel and sand underlain by clay, and Gila Formation sedimentary rock, consisting of poorly consolidated sand,



silt, and gravel. Groundwater storage was previously estimated to be 9,000,000 to 19,000,000 acre-feet (AF) to a depth of 1,200 feet.³ The Gila River is the one perennial stream located in the northern portion of the basin, flowing north from New Mexico near Duncan, Arizona, and exiting the Basin west of Guthrie, Arizona. Cold Creek, Linden Creek, Apache Creek and Bitter Creek run northeast of Duncan.

2.1.1 Surface Water

ADWR examined all water sources defined as surface water in each basin. Surface water includes all water flowing in streams, canyons, ravines, or other natural channels, or in definite underground channels, whether perennial or intermittent, floodwater, wastewater, or surplus water, and of lakes, ponds, and springs discharging to the surface (A.R.S. § 45-141).⁴ After examining these sources and deducting any existing surface water diversions (stockponds, reservoirs, and agricultural diversions) from the resulting volumes, ADWR generated a final estimate of the remaining water available for diversion or use. When possible, streamgage data were used to estimate surface water volumes. Where active streamgages were absent, which often applies to areas with intermittent and ephemeral streamflow, the Drainage-Area Ratio (DAR) method (see the Methods Appendix) was used to estimate surface water volume.

2.1.2 Groundwater

This report refers to the “inflow to” and “outflow from” the aquifer each year as groundwater. This volume is distinct from the volume of groundwater considered to be available in storage. “Inflow to” represents the annual recharge or replenishment of groundwater through processes such as the percolation of precipitation or surface water into the subsurface, which is observed through processes such as streamflow infiltration, groundwater inflow, and mountain-front recharge. “Outflow from,” the movement of water leaving the system, is represented by such processes as baseflow and groundwater outflow. See the Methods Appendix for more information on how streamflow, baseflow, groundwater inflow/outflow, and mountain-front recharge estimates were obtained.

The total groundwater storage volume provided in this report reflects the volume of groundwater reasonably accessible at the average depth of the wells in the basin, rather than at the 1,200 feet groundwater storage depth used in previous ADWR reports. The water level falling below the basin’s average well depth suggests that wells will have begun to go dry. Using this approach to estimate groundwater storage effectively illustrates the impact of declining water levels on the current existing infrastructure of property owners, residents, and other water users in each basin. Please note that this report does not address potential subsidence or permanent loss of aquifer storage that could occur if the estimated water volume in storage were to be removed from the

³ ADWR (2009). Arizona Water Atlas, Volume 3, Section 3.7, pg. 272, Table 3.7-6. https://infoshare.azwater.gov/docushare/dsweb/Get/Document-10428/Volume_3_final.pdf

⁴ Arizona Revised Statutes § 45-141. <https://www.azleg.gov/ars/45/00141.htm>



basin. See the Methods Appendix for more information on how groundwater storage was estimated.

2.1.3 Effluent

Effluent is defined as “water that has been collected in a sanitary sewer for subsequent treatment in a facility that is regulated pursuant to Title 49, Chapter 2.”⁵ ADWR used effluent data provided by the Arizona Department of Environmental Quality (ADEQ) to estimate the amounts of effluent available for reuse. These effluent estimates are based on effluent volumes produced from wastewater treatment plants designated for reuse. These volumes do not include wastewater discharged from the treatment plants. Effluent volumes also do not include septic tanks or other wastewater collection systems. Recharge from septic tanks is included in the Incidental Recharge estimation.

2.1.4 Incidental Recharge

Incidental recharge is defined as water from human use that replenishes groundwater supplies. Incidental recharge is associated with agricultural, industrial, and municipal water demands. ADWR used data derived from demand analyses to estimate incidental recharge volumes.

2.1.5 Transportation Water

Certain basins have been identified in A.R.S. Title 45, Chapter 2, Article 8.1⁶ as basins from which groundwater may be withdrawn for transportation to an AMA. Where such transportation has been authorized, that groundwater is referred to as “Transportation Water” in this report.

2.1.6 Moved Water

Any water that crosses basin boundaries through artificial means and that does not fall under the Transportation Water definition is referred to as “Moved Water” in this report. Moved Water includes groundwater that is transported between basins that are not AMAs, pursuant to A.R.S. Title 45, Chapter 2, Article 8.⁷

2.2 SUPPLY RESULTS

This subsection contains ADWR’s estimates of annual supplies available to the Duncan Valley Basin.

⁵ Arizona Revised Statutes § 45-101(4). <https://www.azleg.gov/ars/45/00101.htm>

⁶ Arizona Revised Statutes Title 45, Chapter 2, Article 8.1.
<https://www.azleg.gov/arsDetail/?title=45>

⁷ Arizona Revised Statutes Title 45, Chapter 2, Article 8.
<https://www.azleg.gov/arsDetail/?title=45>



2.2.3 Surface Water

In the Duncan Valley Basin, ADWR identified the following surface water conveyances (USGS streamgages in parentheses):

- Apache Creek
- Bitter Creek
- Burro Wash
- Cold Creek
- Cottonwood Creek
- Gila River (09439000 and 09442000)
- Greaser Wash
- Kaywood Wash
- Rainville Wash
- Sand Wash
- Sanders Wash
- Soapbox Canyon
- Wampoo Wash
- Willow Creek

Flows on the Gila River are measured with two streamgages (09439000 and 09442000). For streams without streamgage data, the DAR method was applied to estimate streamflow volumes. The streamflow volume estimates provided in the table below are composites of the streamgage and DAR estimation methods.

Table 1. Estimated Surface Water Volumes in the Duncan Valley Basin for 1990-2024. (SDR 2025)

Basin	Streamflow Minimum	Streamflow Maximum	Average Streamflow (Streamgage Method)	Average Streamflow (DAR Method)	Total Average Streamflow	Median Streamflow
Duncan Valley	7,678(1995)	117,963(1998)	10,187	23,547	33,733	25,182

All values are shown in AF. Parentheses indicate the year streamflow volume was recorded.

Surface water is estimated to contribute 25,182 AF to the supplies in the basin in a typical year. However, there are years with extremely high or low surface water inflows. Due to the extremely high flow years associated with floods, the average surface water supply in the basin is much higher than the median of 25,180 AF per year.

Table 2. Estimated Surface Water Volumes Diverted for Use in the Duncan Valley Basin for 1990-2024. (SDR 2025)

Year	Diverted Streamflow
1990	14,276
2007	14,371
2024	6,296
Average Annual Diverted Streamflow from 1990-2024	9,989

All values are shown in AF.



The estimated surface water volumes were diverted from the Little Colorado River Plateau Basin for use, either for storage in reservoirs or for agricultural uses.

2.2.4 Groundwater

The following groundwater volumes were estimated in the Duncan Valley Basin:

Table 3. Estimated Streamflow Infiltration Volumes in the Duncan Valley Basin for 1990-2024. (SDR 2025)

Basin	Average Annual Streamflow Infiltration (Perennial)	Average Annual Streamflow Infiltration (Intermittent & Ephemeral)	Total Average Annual Streamflow Infiltration
Duncan Valley	866	15,069	15,935

All values are shown in AF.

- Streamflow Infiltration: Infiltration for perennial streams was estimated using the fixed percentage listed in the Methods Appendix. Infiltration for intermittent and ephemeral streams was estimated using infiltration rates from the United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS) Soil Quality Indicators.⁸ The predominant soil type was fine-silty.⁹ The standard storm duration utilized was 1.5 hours.¹⁰ Total streamflow infiltration peaked in 1998 at approximately 24,994 AF and was lowest in 1995 at 7,678 AF.

Table 4. Estimated Groundwater Volumes in the Duncan Valley Basin for 1990-2024. (SDR 2025)

Basin	Average Annual Baseflow	Average Annual Groundwater Inflow	Average Annual Groundwater Outflow	Average Annual Mountain-Front Recharge	Calculated Initial Groundwater Storage
Duncan Valley	-72,200	12,000	-200	48,737	690,233 ⁽²⁰²⁴⁾

All values are shown in AF. Negative numbers indicate demands or water flows leaving the basin. Parentheses indicate the representative year chosen to calculate initial storage.

⁸ USDA NRCS. (2008). Soil Quality Indicators. United States Department of Agriculture Natural Resource Conservation Service. <https://www.nrcs.usda.gov/sites/default/files/2022-10/Infiltration.pdf>

⁹ Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture (NRCS, USDA). (2016). Web Soil Survey (STATSGO2). <http://websoilsurvey.nrcs.usda.gov/>

¹⁰ Food and Agriculture Organization of the United States (FAO). (2024). Annex 2 Infiltration Rate and Infiltration Test. <https://www.fao.org/4/s8684e/s8684e0a.htm>



- Baseflow: ADWR estimated baseflow using the USGS Hydrologic Toolbox in ArcGIS.¹¹ Streamgauge data were utilized when available. Any gaps in the data were filled using precipitation data from PRISM¹² and the USGS StreamStats website.¹³
- Groundwater Inflow/Outflow: Inter-basin underflow volumes were based on USGS predevelopment maps and scientific literature estimates.¹⁴
- Mountain-Front Recharge: The mountain-front recharge estimates were calculated using precipitation data, model data, scientific literature estimates for groundwater inflows/outflows,¹⁵ and a water budget accounting for the inflows/outflows that affected the mountain-front recharge volume.
- Groundwater Storage: Storage was calculated using either a model data plus water budget method, if model data were available for the basin, or a GIS-based geological data non-model method, if model data were unavailable for the basin (Section 2.5.4, Methods Appendix). Initial groundwater storage was calculated using wells located within alluvial aquifer boundaries in the basin. If no representative year contained enough well measurements to calculate groundwater storage, which was the case with Duncan Valley Basin, a composite of all water level measurements from any year was utilized. The estimated storage volume was calculated to the basin's average well depth, 181 feet.

2.2.5 Effluent

None of the effluent produced in the Duncan Valley Basin has been allocated for reuse, so no effluent is categorized as a water supply.

¹¹ Barlow, P.M. et al. (2022). U.S. Geological Survey Hydrologic Toolbox — A graphical and mapping interface for analysis of hydrologic data: U.S. Geological Survey Techniques and Methods, book 4, chap. D3, 23 p. <https://doi.org/10.3133/tm4D3>

¹² PRISM Climate Group. (2024). 30-Year Normals [dataset] <https://prism.oregonstate.edu/explorer/>

¹³ USGS. (n.d.-b). StreamStats [dataset]. <https://www.usgs.gov/streamstats>

¹⁴ Tillman, F. et al. (2011). Water Availability and Use Pilot: Methods Development for a Regional Assessment of Groundwater Availability, Southwest Alluvial Basins, Arizona (Scientific Investigations Report 2011–5071). United States Geological Survey. https://media.kjzz.org/s3fs-public/field/docs/2011/09/21/sir2011-5071_text.pdf

¹⁵ Tillman, F. et al. (2011). Water Availability and Use Pilot: Methods Development for a Regional Assessment of Groundwater Availability, Southwest Alluvial Basins, Arizona (Scientific Investigations Report 2011–5071). United States Geological Survey. https://media.kjzz.org/s3fs-public/field/docs/2011/09/21/sir2011-5071_text.pdf

2.2.6 Incidental Recharge

Sources of incidental recharge in the Duncan Valley Basin are agricultural, municipal, and industrial.

Table 5. Estimated Incidental Recharge Volumes in the Duncan Valley Basin for 1990-2024. (SDR 2025)

Sector	1990	2007	2024
Agricultural	6,263	5,336	2,127
Municipal	57	48	44
Industrial	22	21	21

All values are shown in AF.

- **Agricultural Incidental Recharge:** Agricultural incidental recharge is determined based on total irrigation withdrawals and irrigation efficiency within a basin. The estimated volume of agricultural incidental recharge has decreased over the baseline period by 4,136 AF. This is due to the overall decline in agricultural water use in the 2010s and 2020s; see the Demand Results section below for more information.
- **Municipal Incidental Recharge:** Municipal incidental recharge is a byproduct of lost and unaccounted for (L&U) water from water providers and seepage from septic tanks. The estimated volume of municipal incidental recharge has decreased 23% over the baseline period.
- **Industrial Incidental Recharge:** Industrial incidental recharge occurs from the irrigation of turf facilities and is influenced by irrigation systems' total withdrawals and efficiency. The estimated volume of industrial incidental recharge has decreased by 1 AF from 1990 to 2024.

2.2.7 Transportation Water

Certain basins have been identified in A.R.S. Title 45, Chapter 2, Article 8.1 as basins from which groundwater may be withdrawn for transportation to an AMA. Where such transportation has been authorized, that groundwater is referred to as "Transportation Water" in this report.

The Duncan Valley Basin was not identified as a transportation water basin.

2.2.8 Moved Water

Any water that crosses basin boundaries through artificial means and that does not fall under the Transportation Water definition is referred to as "Moved Water" in this report. Moved Water includes groundwater that is transported between basins that are not AMAs, pursuant to A.R.S. Title 45, Chapter 2, Article 8.

The Duncan Valley Basin was not identified as a basin with moved water.



2.3 DEMAND RESULTS

The Demand subsection contains ADWR’s estimates of annual demands in the Duncan Valley Basin.

Table 6. Estimated Demand Volumes for the Duncan Valley Basin by Sector for 1990-2024. (SDR 2025)

Sector	Subsector/Water Type	Year		
		1990	2007	2024
Agricultural	Agriculture	-20,361	-18,089	-7,291
Municipal	Residential Provider	-178	-149	-136
	Residential Non-Provider	-196	-163	-150
	Non-Residential	-6	-6	-7
	L&U	-26	-22	-20
Industrial	Dairies	-38	-38	0
	Grazing	-60	-60	-60
	Sand and Gravel	-41	-41	-41
	Turf	-179	-177	-189
Environmental	Riparian	-2,427	-2,427	-2,427

Negative numbers indicate demands or waterflows leaving the basin—all values in AF.

2.3.1 Agricultural

Agricultural demand is water applied to two or more acres of land to produce plants or parts of plants for sale for human consumption or use as feed for livestock, range livestock, or poultry.

There are currently an estimated 2,440 acres of cultivated land within the Duncan Valley Basin. Alfalfa has been the predominant crop type, accounting for approximately 62% of the total acreage as of 2013. Over 90% of acreage in the basin is flood irrigated. Overall irrigation efficiency is estimated at approximately 78% from 2007 to the present.

Agricultural water use is estimated to have declined in the Duncan Valley Basin since the 2000s. Historical USGS data and satellite observations confirm that a greater proportion of fields have been fallowed in the 2010s and 2020s, compared to past decades.

2.3.2 Municipal

Municipal demand is defined as the non-agricultural and non-industrial uses of water supplied by a city, town, private water company, irrigation district, domestic water improvement district, water cooperative, or private domestic well.

The Duncan Valley Basin has an estimated 3,272 residents, with the largest population centers being the Town of Duncan and the unincorporated community of Sheldon. The basin experiences minimal tourism and has limited transient populations.



- Residential Provider: Residential provider use is supplied by a municipal provider, or a Community Water System (CWS) as defined in A.R.S. 45-341.¹⁶ The Duncan Valley Basin has approximately 1,558 residents served by a CWS. Between 1990 to 2007, residential provider water demand declined at an average rate of approximately 2 AF per year. From 2007 to 2024, the rate of decline slowed to about 1 AF per year. Overall, the demand decreased by an estimated 24% over the baseline period.
- Residential Non-Provider: Residential non-provider use is any residential water use that is not supplied by a municipal provider but rather by a non-public water system or domestic well. An estimated 1,714 residents in the basin rely on self-supplied water resources. Similar to residential providers, the water demand for residential non-providers declined over the baseline period by approximately 24%, with an average decrease of about 2 AF per year from 1990 to 2007, followed by a slower decline of roughly 1 AF per year from 2007 to 2024.
- Non-Residential: Non-residential use is defined as municipal water not used for residential purposes but instead used for commercial, institutional, recreational, or transitory uses. Over the baseline period, there was a slight increase in non-residential water demand from 6 AF in 1990 to 7 AF in 2024.
- Lost and Unaccounted for Water: Lost and Unaccounted for (L&U) water is defined as the total quantity of water from any source that enters a water distribution system minus the total amount of authorized deliveries from the distribution system during the calendar year. L&U does not account for water loss from a non-public water system or domestic well. Consistent with the overall reduction in water usage across both residential provider and non-provider sectors, the volumes of L&U water declined over the baseline period from 26 AF in 1990 to 20 AF by 2024. This reflects a 23% total decline in L&U water demand.

2.3.3 Industrial

Industrial demand is water used by an industrial facility, such as a golf course, dairy, feedlot, power plant, mine, or paper mill.

The current industrial water demands in the Duncan Valley Basin come from grazing, sand and gravel, and turf.

- Dairies: Water that is consumed on the site of a dairy for the purposes of animal husbandry or dust control is considered dairy demand. During the baseline period, one dairy facility operated in the basin. The facility used an estimated 38 AF of water per year until it ceased operations in 2020.

¹⁶ Arizona Revised Statutes § 45-341. <https://www.azleg.gov/ars/45/00341.htm>

- **Grazing:** Grazing is defined as the water used to maintain stock ponds for the sole purpose of watering livestock. An estimated 3,577 animals, including both cattle and horses, graze in the Duncan Valley Basin.
- **Sand and Gravel:** Sand and gravel demand accounts for the water use of any facility or establishment that produces or refines aggregates or quarried materials. Water use for sand and gravel facilities has remained consistent over the baseline period with annual withdrawals estimated to be 41 AF.
- **Turf:** Turf demand is defined as the irrigation or maintenance of any area of landscaping that is not part of a private residence. The total acreage of irrigated turf remained consistent from 1990-2024. Over this period, the average estimated water use was 180 AF per year.

2.3.4 Environmental

Environmental demand is quantified within this report as evapotranspiration along streams, rivers, lakes, and drainage ways. Most riparian habitat in the Duncan Valley Basin is along the Gila River outside of agricultural land. The riparian demand values in the SDRs represent a high-end estimate of the potential water needs of riparian plants within a basin. In the absence of site-specific data, these estimates assume an average value for riparian plants' water needs, which does not consider local environmental conditions. Please see the Methods Appendix for an in-depth explanation of the methodologies.

- Annual net water requirements for the riparian plants are estimated to be 2,427 AF.

3 COMBINING SUPPLY AND DEMAND

The water budget in the Duncan Valley Basin shows a positive trend throughout the baseline period, with both supply and demand showing fluctuations. Supply averaged 78,328 AF per year but ranged in values from the minimum of 25,001 AF in 1995, to a maximum of 150,185 AF in 2017. Overall, demand values varied but saw a significant decrease beginning in 2018 due to lower Agricultural demands. Groundwater storage saw increases over time because supply values consistently exceeded demand values.



Table 7. Summary of Total Estimated Demand and Supply Values from 1990-2024 in the Duncan Valley Basin. (SDR 2025)

	1990	2007	2024
Supply	63,076	86,375	79,062
Demand	-23,510	-21,172	-10,320
Balance	39,565	65,203	68,742
Resulting Water Available in Storage	-1,318,758	-432,212	690,233

Negative numbers indicate demands or water flows leaving the basin—all values in AF.

4 RESULTS OF PROJECTION SCENARIOS

Staff developed scenarios based on the most likely impacts on water demands and supplies over 51 years (from 2025 to 2075). Projections were then generated from the baseline data.

The projection scenarios developed are:

1. Status Quo: baseline volumes were carried forward through the projection period.
2. Growth: volumes were assumed to increase within specific parameters throughout the projection period.
3. Conservation: volumes were assumed to be influenced by specific conservation practices through the projection period.
4. Technology: volumes were assumed to be influenced by technological advancements through the projection period.
5. Climate: volumes were adjusted for three different climate scenarios, using a 1-degree Fahrenheit temperature increase in the mean annual temperature for the projection period, following a lower emissions pathway for Arizona; a 5-degree Fahrenheit temperature increase, following a medium emissions pathway; and a 10-degree Fahrenheit temperature increase, following a high emissions pathway.

4.1 SUPPLY PROJECTION RESULTS

4.1.1 Surface Water

For the Status Quo scenario, the estimated projected volume of surface water will remain constant until 2075.

Table 8. Estimated Surface Water Status Quo Projection Volumes for the Duncan Valley Basin for 2025-2075. (SDR 2025)

Basin	Volume
Duncan Valley	25,005

All values are shown in AF.



Due to ongoing projection scenario improvements, no other projection scenarios were applied to surface water for this report.

4.1.2 Groundwater Storage

For the Status Quo scenario, the estimated projected balance between Supply and Demand will remain constant at 77,411 AF through 2075. However, a limitation of the Non-Model Groundwater Storage Method is that a physical upper storage limit is not recognized. This results in projected groundwater storage calculations, if in a positive balance, to unnaturally increase indefinitely. This limitation will be explored in future Method improvements.

Table 9. Estimated Groundwater Storage Status Quo Projection Volumes for the Duncan Valley Basin for 2025-2075. (SDR 2025)

Scenario	2025	2050	2075
Status Quo	767,644	2,702,925	4,638,206

All values are shown in AF.

Due to ongoing projection scenario improvements, no other projection scenarios were applied to groundwater storage for this report.

4.1.3 Effluent

In the Duncan Valley Basin, no effluent produced has been allocated for reuse. Therefore, no effluent is used as a water supply, and no supply projections were applied to the data.

4.1.4 Incidental Recharge

Table 10. Estimated Agricultural Incidental Recharge Projection Volumes for the Duncan Valley Basin for 2025-2075. (SDR 2025)

Sector	Scenario	2025	2050	2075
Agricultural	Status Quo	2,193	2,193	2,193
	Climate – Low	2,193	2,209	2,225
	Climate – Medium	2,193	2,272	2,352
	Climate - High	2,193	2,350	2,508
	Conservation	2,193	2,008	2,008
	Growth	2,193	2,184	2,175
	Technology	2,193	1,484	775

All values are shown in AF.

- Status Quo: The Status Quo scenario estimated projected volume will remain constant through 2075.
- Climate: The Climate scenario is expected to result in rising temperatures and increased evapotranspiration, leading to larger irrigation withdrawals. Incidental recharge would be expected to increase with irrigation withdrawals. The projected increase in incidental



recharge is about 1.5% for a 1° F rise in average temperature, 7.2% for a 5° F rise, and 14.4% for a 10° F rise.

- **Conservation:** The Conservation scenario implements requirements similar to those found in the AMAs’ 5th Management Plan. In this scenario, irrigation efficiency is expected to improve, which reduces the amount of incidental recharge from system losses. The reduction in agricultural incidental recharge is projected to be approximately eight percent in the Duncan Valley Basin.
- **Growth:** The Growth scenario considers historical growth trends and the land available for potential agricultural growth. In this scenario, incidental recharge is assumed to change proportionally to withdrawals. Remote sensing data shows agricultural consumptive use has remained constant in the basin from 2016 to 2023. Projecting the observed trend to 2075 results in a one percent decrease in agricultural incidental recharge.
- **Technology:** Irrigation systems are assumed to be upgraded with available technology to reduce overall water use. As in the Conservation scenario, this results in lower incidental recharge due to reduced system losses. Technology improvements are projected to have a large impact on the flood-irrigated alfalfa fields that make up a large proportion of agriculture in the basin. This may greatly reduce agricultural incidental recharge in the Duncan Valley Basin by as much as 65%.

Table 11. Estimated Municipal Incidental Recharge Projection Volumes for the Duncan Valley Basin for 2025-2075. (SDR 2025)

Sector	Scenario	2025	2050	2075
Municipal	Status Quo	190	190	190
	Climate – Low	174	174	174
	Climate – Medium	174	176	178
	Climate - High	174	178	183
	Conservation	173	151	130
	Growth	174	195	211
	Technology	173	156	139

All values are shown in AF.

- **Status Quo:** The Status Quo scenario estimated projected volume will remain constant through 2075.
- **Climate:** The Climate scenario anticipates that rising temperatures and increased evaporation rates will elevate water usage demands in the Duncan Valley Basin. Projected incidental recharge volumes by 2075 are estimated to stay the same under the low emissions scenario, increase by approximately two percent in the medium emissions scenario, and five percent in the high emissions scenario.



- Conservation: The Conservation scenario assumes implementation of requirements similar to those in the AMA 5th Management Plans. Under the scenario, the incidental recharge is expected to decrease 20% by 2075.
- Growth: Under the Growth scenario, population projections from the Arizona Commerce Authority of Economic Opportunity (ACA OEO) ¹⁷ were used to estimate that incidental recharge will increase by 21% by 2075 due to the basin’s population growth.
- Technology: The Technology scenario assumes widespread adoption of water monitoring technologies, such as advanced metering infrastructure (AMI) or home-based devices, with active leak detection and customer response. Estimated savings of 14,000 gallons per household per year reflect reductions from leaks and improved water use efficiency. This reduction is projected to result in a decrease in incidental recharge of 20% by 2075.

Table 12. Estimated Industrial Incidental Recharge Projection Volumes for the Duncan Valley Basin for 2025-2075. (SDR 2025)

Sector	Scenario	2025	2050	2075
Industrial	Status Quo	21	21	21
	Climate – Low	21	21	21
	Climate – Medium	21	22	23
	Climate - High	21	23	24
	Conservation	21	20	20
	Growth	21	21	21
	Technology	21	20	20

All values are shown in AF.

- Status Quo: The Status Quo scenario estimated projected volume will remain constant through 2075.
- Climate: The Climate scenario assumes that rising temperatures will increase irrigation needs for turf. Increased irrigation is estimated to increase incidental recharge by 2 AF in the medium emissions scenario and 3 AF in the high emissions scenario. The low emissions scenario is not projected to have an impact on incidental recharge.
- Conservation: The Conservation scenario assumes that turf facilities will increase irrigation efficiency over time. As irrigation efficiency increases, total irrigation is expected to drop, resulting in a reduction in incidental recharge. By the end of the projection period, the Conservation scenario is estimated to decrease incidental recharge by 1 AF.

¹⁷ Arizona Commerce Authority (ACA). (2022a). Population Estimates. Arizona Commerce Authority. <https://www.azcommerce.com/oEO/population/population-estimates/>



- Growth: Status Quo projection volumes were applied in the absence of a defined Growth scenario.
- Technology: The Technology scenario assumes that eligible acres of natural turf will be replaced with synthetic turf. Synthetic turf requires less water to maintain than natural grass and reduces groundwater recharge. As a result of increased synthetic turf, incidental recharge is projected to decrease by 1 AF by 2075.

4.2 DEMAND PROJECTION RESULTS

4.2.1 Agricultural

Table 13. Estimated Projected Demand Volumes for the Agricultural Sector for the Duncan Valley Basin for 2025-2075. (SDR 2025)

Scenarios	Year		
	2025	2050	2075
Status Quo	-7,520	-7,520	-7,520
Climate - Low	-7,520	-7,580	-7,640
Climate – Medium	-7,520	-7,820	-8,120
Climate - High	-7,520	-8,120	-8,720
Conservation	-7,520	-7,348	-7,348
Growth	-7,520	-7,489	-7,459
Technology	-7,520	-6,860	-6,201

Negative numbers indicate demands or waterflows leaving the basin—all values in AF.

- Status Quo: The Status Quo scenario estimated projected volume will remain constant through 2075.
- Climate: The Climate scenario is expected to result in rising temperatures and increased evapotranspiration, leading to increased irrigation withdrawals. Irrigation needs in the Duncan Valley Basin are estimated to increase by about 1.6% percent for a 1° F rise in average temperature, 8% percent for a 5° F rise, and 16% for a 10° F rise.
- Conservation: The Conservation scenario assumes the implementation requirements similar to those in the AMAs’ 5th Management Plan. This would decrease irrigation withdrawals in the Duncan Valley Basin by an estimated two percent by improving overall irrigation efficiency.
- Growth: The Growth scenario considers historical growth trends and the land available for potential agricultural growth. Remote sensing data shows agricultural consumptive use in the basin from 2016 to 2023 has remained constant. Projecting the trend out to 2075 results in a one percent decrease in irrigation withdrawals. See Methods Appendix for more information.
- Technology: Irrigation systems are assumed to be upgraded with available technology to reduce overall water use. Technology improvements are projected to have a large impact



on the flood-irrigated alfalfa fields that make up a large proportion of agriculture in the basin. This may reduce agricultural water needs in the Duncan Valley Basin by as much as 17.5%.

4.2.2 Municipal

Table 14. Estimated Projected Demand Volumes for the Municipal Sector for Duncan Valley Basin for 2025-2075. (SDR 2025)

	Residential Provider			Residential Non-Provider		
	2025	2050	2075	2025	2050	2075
Status Quo	-149	-149	-149	-164	-164	-164
Climate – Low	-136	-136	-137	-150	-150	-150
Climate – Medium	-136	-138	-140	-150	-152	-154
Climate - High	-136	-140	-143	-150	-154	-158
Conservation	-135	-119	-102	-149	-130	-112
Growth	-137	-153	-165	-150	-168	-182
Technology	-135	-122	-109	-149	-134	-120

All values are shown in AF.

	Non-Residential			L&U		
	2025	2050	2075	2025	2050	2075
Status Quo	-7	-7	-7	-22	-22	-22
Climate – Low	-7	-7	-7	-26	-26	-26
Climate – Medium	-7	-7	-7	-26	-26	-26
Climate - High	-7	-7	-7	-26	-26	-27
Conservation	-7	-7	-7	-20	-13	-11
Growth	-7	-7	-8	-20	-22	-24
Technology	-7	-7	-7	-20	-18	-16

Negative numbers indicate demands or waterflows leaving the basin—all values in AF.

- Status Quo: The Status Quo scenario estimated projected volume will remain constant through 2075.
- Climate: Under the Climate scenario, rising temperatures and increased evaporation rates are expected to increase water demands. By 2075, Residential provider demand is projected to increase by approximately one percent under the low emissions scenario, three percent under the medium scenario, and five percent under the high emission scenario. Residential non-provider demand under the low emissions scenario is anticipated to remain unchanged, while the basin is expected to see a projected rise of three percent under the medium emissions scenario and a five percent increase under the high emissions scenario. Non-residential demand is expected to remain unchanged across all scenarios.



Lost and Unaccounted for (L&U) water is anticipated to show no change under the low and medium emissions scenario, with a slight increase of four percent under the high emissions scenario.

- **Conservation:** Under the Conservation scenario, additional water-saving measures and requirements similar to those in the initial AMAs’ 5th Management Plan are implemented. By 2075, the Duncan Valley Basin is projected to see a decrease in residential provider water demand by 24% and residential non-provider demand by 25%. Non-residential demand is expected to remain constant throughout the projection period. The total L&U water volume is projected to decline by 45%.
- **Growth:** Under the Growth scenario, population projections produced by the Arizona Commerce Authority Office of Economic Opportunity (ACA OEO)¹⁷ were used to estimate the growth in the basin. Residential provider water demand is projected to increase steadily, resulting in a 20% rise by 2075. Residential non-provider demand is expected to follow a similar trajectory, with a projected 21% increase in water demand over the projected period. Non-residential demand in the basin is anticipated to grow by 14%, while the total volume of L&U water is projected to increase 20% by 2075.
- **Technology:** The Technology scenario assumes widespread adoption of water monitoring technologies, such as AMI or home-based devices, with active leak detection and customer response. Estimated savings of 14,000 gallons per household per year reflect reductions from leaks and improved water use efficiency. By 2075, residential provider and non-provider demand is anticipated to decrease by 19%. Non-residential water demand will remain constant throughout the projected period. The total volume of L&U water is estimated to decline 20% by 2075.

4.2.3 Industrial

Table 15. Estimated Projected Demand Volumes for the Industrial Sector for Duncan Valley Basin for 2025-2075. (SDR 2025)

	Dairies	Grazing	Sand and Gravel
Status Quo	0	-60	-41

Status Quo projections were the only projection scenarios that were applied to dairies, grazing, and sand and gravel.

Negative numbers indicate demands or water flows leaving the basin—all values in AF.

Due to ongoing projection scenario improvements, no other projection scenarios were applied to the dairies, grazing, and sand and gravel subsectors for this report.



	Turf		
	2025	2050	2075
Status Quo	-185	-185	-185
Climate – Low	-189	-190	-192
Climate – Medium	-189	-196	-203
Climate - High	-189	-204	-218
Conservation	-189	-179	-179
Growth			
Technology	-185	-183	-181

Status Quo projection values were applied in the absence of a defined scenario for a subsector.

This is indicated by a gray cell.

Negative numbers indicate demands or water flows leaving the basin—all values in AF.

- Status Quo: The estimated projected volume of dairies, grazing, and sand and gravel will remain constant through 2075.
- Climate
 - Turf: Increased temperatures and evapotranspiration are expected to raise overall turf irrigation requirements in the Climate scenarios. Irrigation is estimated to increase by 3 AF in the low emissions scenario, 14 AF in the medium emissions scenario, and 29 AF in the high emissions scenario.
- Conservation
 - Turf: Under the Conservation scenario, increased irrigation efficiency requirements are expected to have a minor impact on total water use. Total water use is projected to fall by five percent, or 10 AF.
- Technology
 - Turf: In the Technology scenario, it is assumed that eligible acres of natural turf will be converted to synthetic turf. This scenario is not projected to have a significant impact on total water use in the Duncan Valley Basin. By 2075, estimated irrigation withdrawals are projected to decrease by 4 AF.



4.2.4 Environmental

Table 16. Estimated Projected Environmental Demand Volumes for Duncan Valley Basin for 2025-2075. (SDR 2025)

	Environmental		
	2025	2050	2075
Status Quo	-2,427	-2,427	-2,427
Climate – Low	-2,427	-2,437	-2,447
Climate – Medium	-2,427	-2,476	-2,520
Climate – High	-2,427	-2,522	-2,598

Negative numbers indicate demands or waterflows leaving the basin—all values in AF.

- Status Quo: The Status Quo scenario estimated projected volume will remain constant through 2075.
- Climate: The Climate scenarios for riparian use consider the impact of increased temperatures, increased evapotranspiration, and habitat transition. Under the set parameters of these scenarios, riparian use is expected to increase in the Duncan Valley Basin as the higher temperatures increase evapotranspiration from riparian plants. Riparian water use is estimated to increase by one percent in the low emissions scenario, four percent in the medium emissions scenario, and seven percent in the high emissions scenario.

5 CONCLUSION

During the baseline period, the balance between water supply and demand in the Duncan Valley Basin has been positive primarily due to mountain-front recharge, which on average contributed just under 50,000 AF per year. However, if groundwater levels were to drop below the basin's average well depth of 181 feet, approximately 66% of existing wells would become dry. The average recorded water level of wells in the basin is 85 feet.

Supply values fluctuated greatly but overall trended upwards. Streamflow supplies encompassed a wide range of values, with both the minimum of 7,678 AF in 1995 and the maximum of 117,963 AF in 1998 occurring within a few years of each other. Agricultural incidental recharge contributed more supplies early in the baseline period but decreased due to reduced agricultural demand, falling by approximately 67% from beginning to end of the baseline period.

Overall, demand values throughout the baseline period remained consistent or decreased, with turf being the only sector to see a slight increase. Throughout the baseline period demand values across most sectors remained stable or trended towards decline, with turf being the only sector to slightly increase. The largest portion of demand in the basin was Agricultural, comprising 87% of all demand in 1990, and 63% in 2024. Overall, Agricultural demand significantly decreased by approximately 13,000 AF over the baseline period.



The Duncan Valley Basin maintained a positive water balance throughout the baseline period, with supplies consistently exceeding demand.

5.1 ATTACHMENTS

- [Acronyms and Definitions](#)
- [References \(Sources\) – general](#)

