SUPPLY & DEMAND

2025

MORENCI

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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
MORENCI BASIN

1 INTRODUCTION

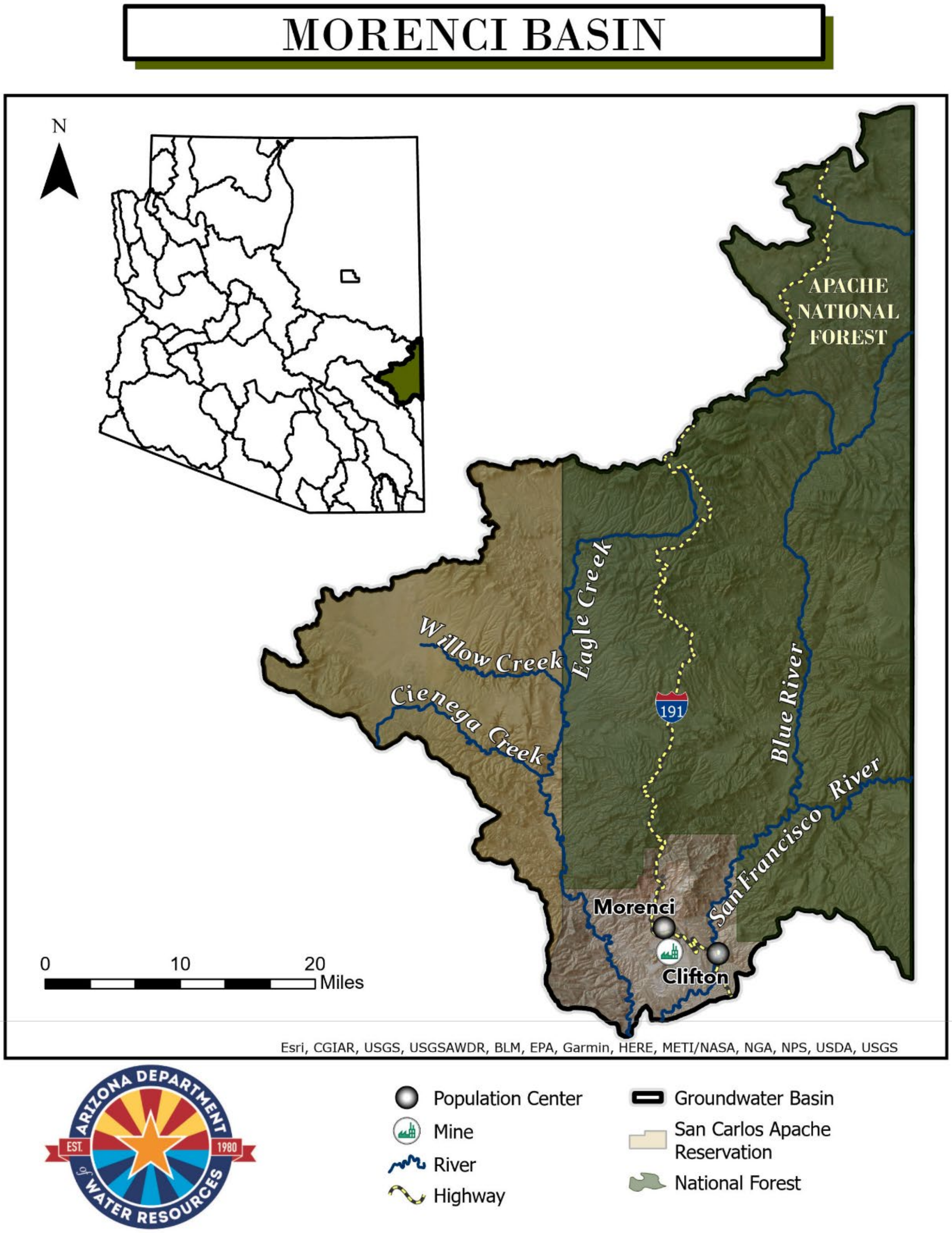

Figure 1. Map of the Morenci Basin.

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.

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[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 Morenci 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 Morenci Basin encompasses 1,599 square miles in the southeastern portion of the state. The basin is characterized by high-elevation mountain ranges, including the Mogollon Rim. The land in the basin is comprised of National Forest land (67.6%), the San Carlos Apache Indian Reservation (21.7%), U.S. Bureau of Land Management (BLM) lands (3.3%), and State Trust lands (1.6%). The basin has an estimated population of 4,254 people, and 5.8% of land in the basin is privately owned. The major aquifers in this basin are recent stream alluvium and volcanic rock.

Groundwater storage was previously estimated to be 3,000,000 acre-feet (AF).[3] The basin includes the San Francisco River, which runs from west to east in Apache county, and east to south near the Town of Clifton. Eagle Creek flows near the boundary between Graham and Greenlee counties. The Blue River is just south of the Apache county line, flowing south through the basin to join the San Francisco River.

2.2 SUPPLIES

2.2.1 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.

2.2.2 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

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[3] ADWR (2009). Arizona Water Atlas, Volume 3, Section 3.9, pg. 349, Table 3.9-6. 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

storage that could occur if the estimated water volume in storage were to be removed from the basin. See the Methods Appendix for more information on how groundwater storage was estimated.

2.2.3 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.

2.2.4 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.

2.2.5 Transportation Water

Certain basins have been identified in A.R.S. Title 45, Chapter 2, Article 8.1[6] 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.

2.2.6 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]

2.3 SUPPLY RESULTS

This subsection contains ADWR's estimates of annual supplies available to the Morenci Basin.

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[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

2.3.1 Surface Water

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

- Blue River (09444200)
- Bush Creek
- Campbell Blue Creek
- Cienega Creek
- Clear Creek
- Coal Creek
- Coleman Creek
- Dry Prong Creek
- Eagle Creek (09447000)
- Foote Creek
- Grant Creek
- Jackson Creek
- KP Creek
- Little Blue Creek
- Little Creek
- Pace Creek
- Pigeon Creek
- Pipestem Creek
- Raspberry Creek
- Romero Creek
- Rousensock Creek
- Sardine Creek
- San Francisco River (09444500)
- Sheep Wash
- Stone Creek
- Strayhorse Creek
- Turkey Creek
- Willow Creek

Flows on the Blue River, Eagle Creek, and the San Francisco River are measured with streamgages (09444200, 09447000, 09444500). For streams without streamgage data, the DAR method was applied to estimate streamflow volumes. The streamflow volume estimates provided in the table above are composites of the streamgage and DAR estimation methods.

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

Basin	Streamflow Minimum	Streamflow Maximum	Average Streamflow (Streamgage Method)	Average Streamflow (DAR Method)	Total Average Streamflow	Median Streamflow
Morenci	48,851 (2017)	637,911 (1993)	126,598	68,875	195,473	169,609

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

Surface water is estimated to contribute 169,609 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 169,909 AF per year.

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

Year	Diverted Streamflow
1990	4,507
2007	4,857
2024	5,240
Average Annual Diverted Streamflow from 1990-2024	4,815

All values are shown in AF.

The estimated surface water volumes were diverted from the Morenci Basin for use, either for storage in reservoirs or for industrial or municipal uses.

2.3.2 Groundwater

The following groundwater volumes were estimated in the Morenci Basin:

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

Basin	Average Annual Streamflow Infiltration (Perennial)	Average Annual Streamflow Infiltration (Intermittent & Ephemeral)	Total Average Annual Streamflow Infiltration
Morenci	10,761	NA	10,761

All values are shown in AF. NA, or Not Applicable, applies to fields without estimates.

- Streamflow Infiltration: Infiltration for perennial streams was estimated using the fixed percentage listed in the Methods Appendix. Infiltration for intermittent and ephemeral streams was not estimated due to the lack of available data. The predominant soil type was fine-loamy.[8] The standard storm duration utilized was 1.5 hours.[9] Total estimated streamflow infiltration for perennial streams peaked in 1993 at approximately 47,077 AF and was lowest in 2009 at 3,156 AF.

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

[9] Food and Agriculture Organization of the United Nations (FAO). (2024). Annex 2 Infiltration Rate and Infiltration Test. https://www.fao.org/4/s8684e/s8684e0a.htm

Table 4. Estimated Groundwater Volumes in the Morenci 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
Morenci	-88,952	0	-200	83,467	NA

All values are shown in AF.
Negative numbers indicate demands or water flows leaving the basin.
NA, or Not Applicable, applies to fields without estimates.

- Baseflow: ADWR estimated baseflow using the USGS Hydrologic Toolbox in ArcGIS.[10] Streamgage data were utilized when available. Any gaps in the data were filled using precipitation data from PRISM[11] and the USGS StreamStats website.[12]
- Groundwater Inflow/Outflow: Inter-basin underflow volumes were based on USGS predevelopment maps and scientific literature estimates.[13]
- Mountain-Front Recharge: The mountain-front recharge estimates were calculated using precipitation data, model data, scientific literature estimates for groundwater inflows/outflows, 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. A representative year was selected containing the most water level measurements at those wells. Groundwater storage was not calculated for Morenci Basin due to the low number of water level measurements available within aquifer boundaries.

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[10] 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

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

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

[13] 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

2.3.3 Effluent

Table 5. Estimated Effluent Reuse Volumes in the Morenci Basin for 1990-2024. (SDR 2025)

Year	Quantity
1990	0
2007	0
2009	NEGL
2010	NEGL
2011	NEGL
2024	0

All values are shown in AF.
Negligible (NEGL) refers to values less than 1 AF.

Between 1990 and 2024, effluent reuse only occurred in the years 2009, 2010, and 2011 through the Alpine Sanitary District WWTS, as shown in the table above. The permitted maximum average monthly flow is approximately 0.24 AF, which implies nearly all the effluent produced by the treatment system in those years was for reuse. The average estimated annual effluent reuse was 0.25 AF from 2009 to 2011.

2.3.4 Incidental Recharge

Sources of incidental recharge in the Morenci Basin are municipal and industrial.

Table 6. Estimated Incidental Recharge Volumes in the Morenci Basin for 1990-2024. (SDR 2025)

Sector	1990	2007	2024
Agricultural	0	0	0
Municipal	89	79	85
Industrial	19	19	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. Since there is no agricultural water use in the Morenci Basin, no agricultural incidental recharge is present.
- 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 fluctuated over the baseline period from 89 AF in 1990 to 79 AF in 2007, before rising to 85 AF in 2024.
- 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 increased by 2 AF over the baseline period.

2.3.5 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 Morenci Basin was not identified as a transportation water basin.

2.3.6 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.

The Morenci basin was identified as a basin with moved water.

Table 7. Estimated Moved Water Volumes from the Salt River Basin (Black River Subbasin) to the Morenci Basin for 1990 - 2024. (SDR 2025)

Year	Volume
1990	6,074
2007	241
2024	8,180

All values are shown in AF.

Due to the lack of available data, ADWR estimated diversions from the Black River from 1990 to 1997 using reported data from the period 1998-2002. From 1990 to 2024, an average of 6,353 AF was moved annually from the Salt River Basin (Black River Subbasin) to the Morenci Basin. Freeport-McMoRan diverts Black River water for use at the Morenci Mine pursuant to a lease agreement with the San Carlos Apache Tribe.

2.4 DEMAND RESULTS

The Demand subsection contains ADWR's estimates of annual demands in the Morenci Basin.

Table 8. Estimated Demand Volumes for the Morenci Basin by Sector for 1990-2024. (SDR 2025)

Sector	Subsector/Water Type	Year		
		1990	2007	2024
Agricultural	Agriculture	0	0	0
Municipal	Residential Provider	-423	-351	-345
	Residential Non-Provider	-18	-15	-15
	Non-Residential	-192	-197	-242
	L&U	-86	-77	-82
Industrial	Dairies	0	0	0
	Feedlots	0	0	0
	Grazing	-47	-47	-47
	Mining	-5,103	-13,577	-6,624
	Power	0	0	0
	Sand and Gravel	0	-13	-13
	Turf	-152	-162	-185
	Other	0	0	0
Environmental	Riparian	-6,679	-6,679	-6,679

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

2.4.1 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 is no agricultural water use in the Morenci Basin.

2.4.2 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 Morenci Basin has an estimated 4,254 residents, with the largest centers being the Town of Clifton and the unincorporated community of Morenci. The basin experiences elevated housing vacancy rates, largely attributed to the presence of major mining operations. A portion of the San Carlos Apache Reservation lies within the basin boundary. Population fluctuations, along with municipal water use from transitory residents and limited tourism, may also influence overall water consumption patterns.

- 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.[14] The Morenci Basin has approximately 4,079 residents served by a CWS. Between 1990 and 2007, residential provider demand in the basin increased at a higher average rate of approximately 4 AF per year. However, water demand significantly slowed in the following years, ultimately resulting in an overall decline of 18% by 2024.
- 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 175 residents in the basin rely on self-supplied water resources. The Morenci Basin experienced an estimated 17% decline in residential non-provider demand from 1990 to 2007, after which demand remained relatively constant through 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. Between 1990 and 2007, the basin experienced a modest three percent increase in water demand, followed by a notable rise averaging 0.3 AF per year through 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. The Morenci Basin has experienced fluctuations in L&U water volumes over the baseline years. From 1990 to 2007, L&U water demand declined by approximately 11%, followed by a seven percent increase through 2024. These variations reflect shifts in water demand patterns in residential provider and non-residential use over time.

2.4.3 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 Morenci Basin come from mining, grazing, sand and gravel operations, and from irrigation of turf facilities.

- Grazing: Grazing demand is defined as the water used to maintain stock ponds for the sole purpose of watering livestock. An estimated 2,289 animals graze in the Morenci basin, consuming 47 AF annually.
- Mining: Mining demand is defined as water use that is consumed for the purposes of extracting or processing ores or minerals. The Morenci mine, operated by Freeport-McMoRan, is the largest copper producing mine in the country and is among the largest copper producing mines in the world. The Morenci mine uses a combination of Black River

[14] Arizona Revised Statutes § 45-341. https://www.azleg.gov/ars/45/00341.htm

water (see Moved Water), groundwater, and tributary waters of the Gila River. Over the baseline period, the average annual demand was approximately 14,000 AF.

- Sand and Gravel: Sand and gravel demand accounts for the water use of any facility or establishment that produces aggregates or quarried materials. Sand and gravel demand peaked at 26 AF during the period from 2017-2022, before dropping to 13 AF in 2023.
- Turf: Turf demand is defined as the irrigation or maintenance of any area of landscaping that is not part of a private residence. From 1990 to 2024, the estimated annual irrigation for turf facilities increased by 22%. The increase in irrigation can be attributed to the addition of new turf acreage in the basin.

2.4.4 Environmental

Environmental demand is quantified within this report as evapotranspiration along streams, rivers, lakes, and drainage ways. Most riparian habitat in the Morenci Basin is along the Blue River, San Francisco River, Eagle Creek, Willow Creek, and Cienega Creek. 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 6,679 AF.

3 COMBINING SUPPLY AND DEMAND

Due to a lack of available water level measurements, ADWR has not estimated the amount of groundwater in storage for this basin. However, other water supply components have been assessed, such as streamflow, streamflow infiltration, and mountain-front recharge, alongside various demand sectors. Despite these estimates, the lack of groundwater storage data prevents the complete combination of supply and demand results, limiting the ability to present a comprehensive picture of the basin’s overall water budget.

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 9. Estimated Surface Water Status Quo Projection Volumes for the Morenci Basin for 2025-2075. (SDR 2025)

Basin	Volume
Morenci	174,359

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

In the Morenci Basin, groundwater storage was not estimated due to a lack of available water level measurements. Therefore, no projection scenarios were applied for groundwater storage.

4.1.3 Effluent

Between 1990 and 2024, effluent reuse only occurred in the Morenci Basin in the years 2009, 2010, and 2011 through the Alpine Sanitary District Wastewater Treatment Facility. The permitted maximum average monthly flow is about 0.24 acre-feet, which implies nearly all the effluent produced by the treatment system in those years was for reuse. After 2011, no effluent was used as a water supply in the Morenci Basin. Therefore, no supply projections were applied to the data.

4.1.4 Incidental Recharge

Table 10. Estimated Municipal Incidental Recharge Projection Volumes for the Morenci Basin for 2025-2075. (SDR 2025)

Sector	Scenario	2025	2050	2075
Municipal	Status Quo	18	18	18
	Climate – Low	17	17	17
	Climate – Medium	17	17	18
	Climate - High	17	18	18
	Conservation	17	15	13
	Growth	17	19	21
	Technology	17	16	14

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 Lower Colorado River Plateau Basin. Projected incidental recharge volumes by 2075 are estimated to remain unchanged under the low emissions scenario. Under the medium and high emissions scenario, the basin will see demand rise by six percent by 2075.
- Conservation: The Conservation scenario assumes implementation of requirements similar to those in the AMA 5th Management Plans. Under the scenario, water demand is expected to decrease 24% by 2075.
- Growth: Under the Growth scenario, population projections from the Arizona Commerce Authority Office of Economic Opportunity (ACA OEO)[15] were used to estimate that incidental recharge will rise by 24% by 2075.
- 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 18% by 2075.

[15] Arizona Commerce Authority (ACA). (2022a). Population Estimates. Arizona Commerce Authority. https://www.azcommerce.com/oeo/population/population-estimates/

Table 11. Estimated Industrial Incidental Recharge Projection Volumes for the Morenci Basin for 2025-2075. (SDR 2025)

Sector	Scenario	2025	2050	2075
Industrial	Status Quo	20	20	20
	Climate – Low	21	21	21
	Climate – Medium	21	22	22
	Climate - High	21	22	24
	Conservation	20	20	20
	Growth	20	20	20
	Technology	20	19	18

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, which in turn will increase incidental recharge. The low emissions scenario is expected to have a negligible impact on incidental recharge in the Morenci basin. The medium emissions scenario is estimated to increase incidental recharge by 1 AF by 2075, and the high emissions scenario is estimated to increase incidental recharge by 3 AF by 2075.
- Conservation: The Conservation scenario assumes that turf facilities will increase irrigation efficiency over time. Impacts to incidental recharge are expected to be negligible in this scenario.
- 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 in the basin, the Technology scenario is estimated to decrease incidental recharge by 2 AF by 2075.

4.1.5 Agricultural Incidental Recharge

There is no estimated agricultural incidental recharge in the Morenci Basin. Therefore, no projection scenarios were estimated.

4.2 DEMAND PROJECTION RESULTS

4.2.1 Agricultural

There is no estimated agricultural demand in the Morenci Basin. Therefore, no projection scenarios were estimated.

4.2.2 Municipal

Table 12. Estimated Projected Demand Volumes for the Municipal Sector for Morenci Basin for 2025-2075. (SDR 2025)

	Residential Provider			Residential Non-Provider		
	2025	2050	2075	2025	2050	2075
Status Quo	-365	-365	-365	-16	-16	-16
Climate – Low	-345	-346	-347	-15	-15	-15
Climate – Medium	-345	-350	-355	-15	-15	-15
Climate - High	-345	-355	-365	-15	-15	-16
Conservation	-343	-299	-256	-15	-13	-11
Growth	-347	-388	-419	-15	-17	-18
Technology	-344	-313	-283	-15	-13	-12

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

	Non-Residential			L&U		
	2025	2050	2075	2025	2050	2075
Status Quo	-242	-242	-242	-85	-85	-85
Climate – Low	-242	-242	-242	-291	-291	-291
Climate – Medium	-242	-242	-242	-291	-291	-292
Climate - High	-242	-242	-242	-291	-292	-293
Conservation	-242	-242	-242	-82	-54	-50
Growth	-243	-272	-294	-83	-92	-100
Technology	-242	-242	-242	-82	-78	-74

Negative numbers indicate demands or water flows 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 approximately one percent under the low emissions scenario, three percent under the medium scenario, and six percent under the high scenario. Residential non-provider demand is anticipated to remain constant under the low and medium scenarios, while the high scenario shows a seven percent increase by 2075. Non-residential demand

is expected to remain unchanged across all scenarios. Lost and Unaccounted for (L&U) water is projected to show no change under the low emissions scenario, a slight increase under the medium scenario, and a one percent increase 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. Residential provider demand in the Morenci Basin is projected to decline steadily by approximately 3 AF per year, resulting in a 25% reduction by 2075. Residential non-provider demand is expected to decrease by 27% over the projected period. Non-residential demand is anticipated to remain constant through 2075. The total volume of L&U water is projected to decline by 39%.
- Growth: Under the Growth scenario, population projections produced by the Arizona Commerce Authority Office of Economic Opportunity (ACA OEO)[16] were used to estimate the growth in the basin. Projected demand for residential providers, non-residential, and L&U are each projected to increase by 21% by 2075. Residential non-provider demand is also expected to rise by 21% over the same period.
- 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 demand is projected to decline by 18%, and residential non-providers demand by 20%. Non-residential demand is expected to remain constant throughout the projection period. The total volume for L&U water demand is estimated to decline by 10% by 2075.

4.2.3 Industrial

Table 13. Estimated Projected Demand Volumes for the Industrial Sector for Morenci Basin for 2025-2075. (SDR 2025)

	Grazing	Mining	Sand and Gravel
Status Quo	-47	-7,094	-21

Status Quo projections were the only projection scenarios that were applied to grazing, mining, and sand and gravel. Negative numbers indicate demands or water flows leaving the basin—all values in AF.

Projections were not developed for the grazing, mining, or sand and gravel subsectors due to limited data or the limited expected impact of a given scenario on the subsectors.

	Turf		
	2025	2050	2075
Status Quo	-181	-181	-181
Climate – Low	-185	-187	-188
Climate – Medium	-186	-193	-200
Climate - High	-186	-200	-214
Conservation	-179	-174	-174
Growth			
Technology	-177	-170	-163

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 grazing, mining, and sand and gravel water demand will remain constant through 2075.
- Climate
    - Turf: Increased temperatures and higher evapotranspiration rates 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 28 AF in the high emissions scenario.
- Conservation
    - Turf: Under the Conservation scenario, increased irrigation efficiency requirements are expected to have a modest impact on total water use. Irrigation is projected to decrease by less than three percent by 2075.
- Technology
    - Turf: Conversion of eligible natural turf acres to synthetic turf is estimated to result in a moderate reduction in total irrigation needs in the Morenci Basin. By 2075, estimated irrigation withdrawals are projected to decrease by approximately eight percent, or 14 AF.

4.2.4 Environmental

Table 14. Estimated Projected Environmental Demand Volumes for Morenci Basin for 2025-2075. (SDR 2025)

	Environmental		
	2025	2050	2075
Status Quo	-6,679	-6,679	-6,679
Climate – Low	-6,679	-6,709	-6,739
Climate – Medium	-6,679	-6,828	-6,960
Climate - High	-6,679	-6,965	-7,193

Negative numbers indicate demands or water flows 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 Morenci 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 eight percent in the high emissions scenario.

5 CONCLUSION

ADWR has assessed various supply and demand components in the Morenci Basin. However, ADWR was unable to calculate a comprehensive water budget due to the lack of available water level measurements needed to estimate groundwater storage, limiting a complete assessment of the basin. No determination can be made about the percentage of wells that would become dry if the water elevation was lowered to the average well depth since no groundwater storage calculation is currently possible for the basin.

Streamflow values showed great variability during the baseline period, ranging from 48,851 AF in 2017 to 637,911 AF in 1993. Mountain-front recharge was a major portion of the basin's supplies, averaging 83,467 AF per year. Demand values were largely comprised of mining and Environmental, with mining varying greatly, with a minimum demand value of 2,941 AF in 2010, and a maximum of 13,577 AF in 2007. Various Municipal demands, alongside grazing and turf, made up the remainder of the demand for the basin.

A complete water budget for the Morenci Basin is unable to be produced at this time.

5.1 ATTACHMENTS

- **Acronyms and Definitions**
- **References (Sources) – general**