# Chapter 3

# Evaluation of Current Water Supplies in the Region

Under regional water planning guidelines, each region is to identify currently available water supplies to the region by 1) source and 2) user. The supplies available by source are based on the supply available during drought-of-record conditions. Surface water and groundwater represent the primary types of water supply sources. Reuse of treated wastewater (i.e., water reuse) is also considered a source of supply. However, water reuse in the East Texas Regional Water Planning Area (ETRWPA) is small as compared to groundwater and surface water supplies.

Existing water supplies that are available to each user include those that have been permitted or contracted, with infrastructure in place to transport and treat (if necessary). Some water supplies are permitted or are contracted for use, but the infrastructure is not yet in place or some other water supply limitation exists. Water supply limitations considered in this analysis include raw water source availability, well field production capacities, permit limits, contract amounts, water quality, transmission infrastructure, and water treatment capacities. In this case, connecting such supplies is considered a water management strategy for future use. The following sections discuss the water supplies available in the ETRWPA on a regional basis by water source type with water available through surface water included in Section 3.2, groundwater in Section 3.3, and reuse in Section 3.4. Discussions are also included for existing supplies by water user group (WUG) (Section 3.5), and by major water provider (MWP) (Section 3.6). The Texas Water Development Board (TWDB) data reports pertaining to water availability and water supplies are included in Appendix 3-A and 3-B respectively. These reports include a listing of total available supply by source, existing supplies available to water users, and the amount of water by source that may be available for future use.

Most of the available water in the ETRWPA is surface water. Approximately 11 percent of the total freshwater supply is groundwater. However, groundwater is a very important resource in the region and is used to supply much of the municipal and rural water needs of the region.

Groundwater resources in the region consist of two major aquifers and three minor aquifers. The two major aquifers are the Gulf Coast aquifer and the Carrizo Wilcox aquifer (Figure 3.1). The three minor aquifers are the Sparta, Queen City, and Yegua-Jackson (Figure 3.2). A small amount of water is also available from "non-relevant" and "other" local aquifers that have not been designated as major or minor aquifers by the TWDB.

Surface water includes reservoirs, run-of-river supplies, and local surface water (such as stock ponds). For surface water reservoirs, the reliable supply by source is the equivalent of firm yield supply or permitted amount (whichever is lower). For run-of-the-river supplies, this is the minimum supply available in a year over the historical hydrologic record. For both of these types of surface water supplies, the water availability models (WAMs) are used to determine reliable supplies. For local surface water, estimates of historical use as reported by the TWDB are the basis for these supply quantities. Figure 3.3 presents the major surface water sources in the ETRWPA, including river basins and water supply reservoirs.

Other water supplies considered for planning purposes include reuse of treated wastewater and saline or brackish surface water sources. Reuse supplies are assessed based on historical and current use. Saline or brackish surface water is based on water right permits granted by the Texas Commission on Environmental Quality (TCEQ). Generally, saline or brackish surface water is not distributed to water users because the demands developed in Chapter 2 are freshwater demands. However, in the ETRWPA several industries use these brackish water supplies for manufacturing processes. These demands are not included in the region's manufacturing demands. Generally, the brackish supplies in ETRWPA are run-of-river supplies associated with tidally influenced segments of river and are not based on brackish groundwater supplies.

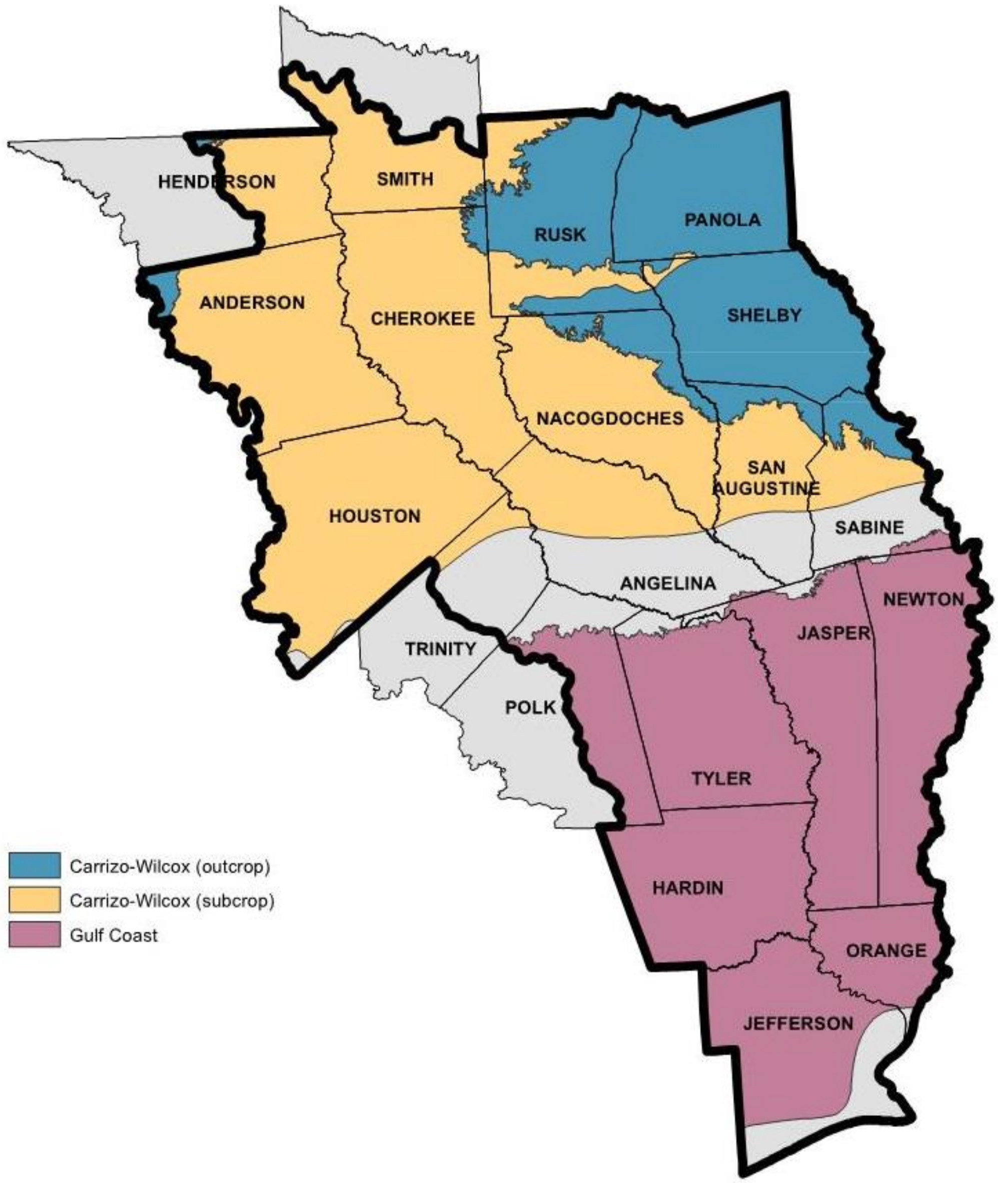


**Figure 3.1: Major Aquifers**

SOURCE: TEXAS WATER DEVELOPMENT BOARD

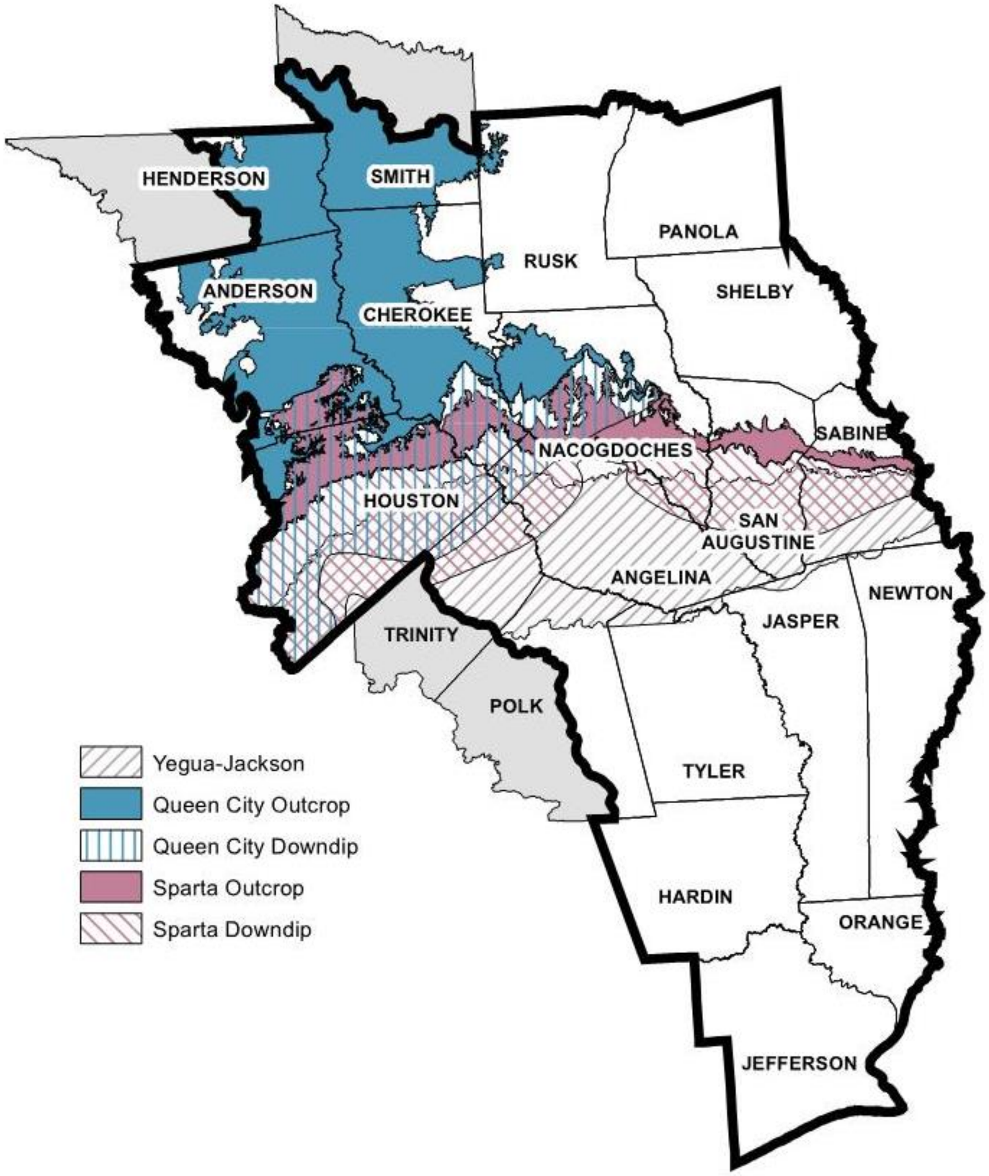


**Figure 3.2: Minor Aquifers**

SOURCE: TEXAS WATER DEVELOPMENT BOARD

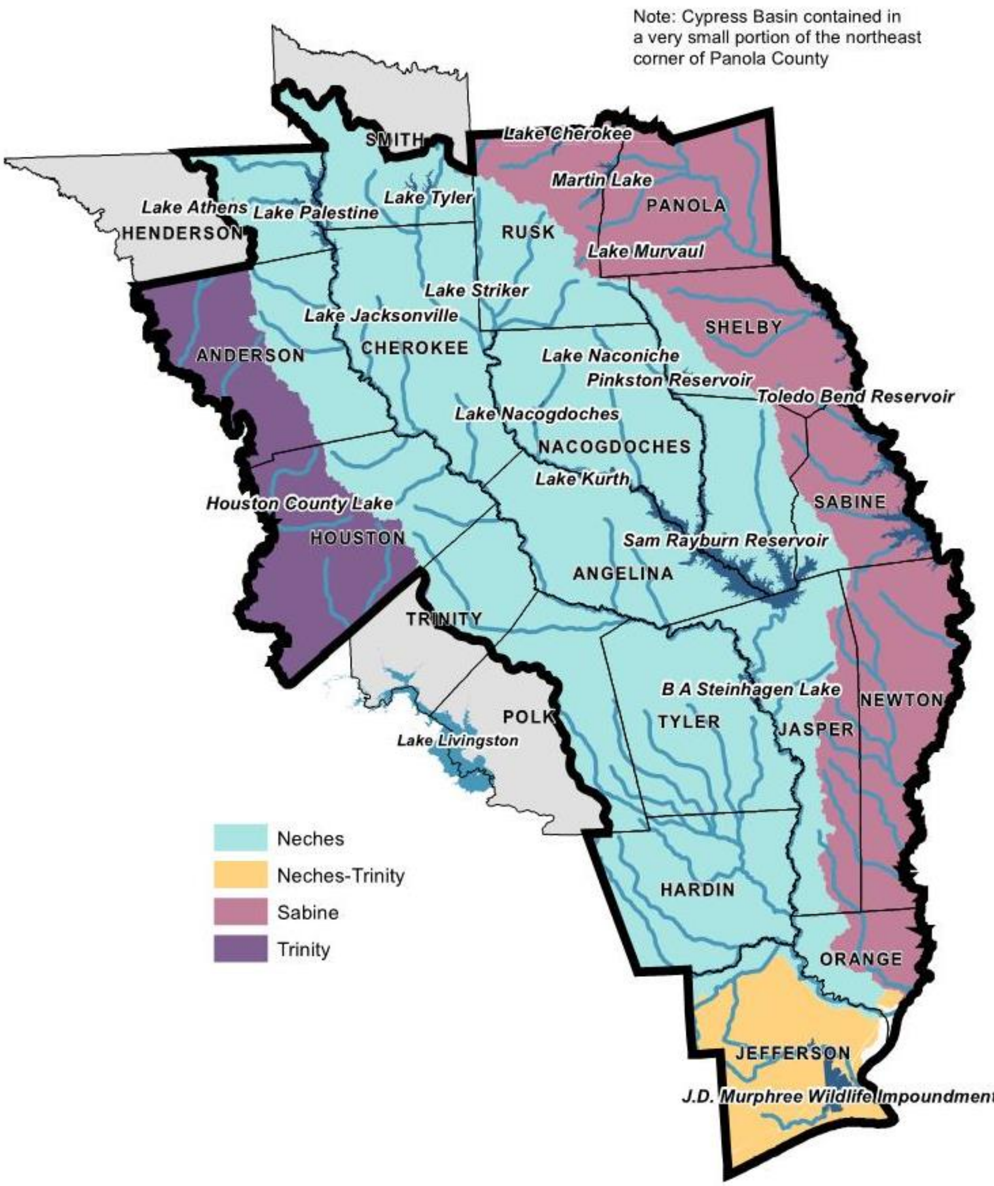


**Figure 3.3: Surface Water Sources**

SOURCE: TEXAS WATER DEVELOPMENT BOARD & U.S. CENSUS BUREAU

Table 3.1 and Figure 3.4 summarize overall water supply availability in the ETRWPA. Approximately 4.5 million ac-ft per year of surface water supplies are available in the region. Of this amount, approximately 3.4 million ac-ft per year is considered to be freshwater supplies. Groundwater availability in ETRWPA is slightly more than 549,000 ac-ft per year. Reuse supplies total approximately 14,000 ac-ft per year.

**Table 3.1 Summary of Currently Available Water Supplies in the East Texas Regional Water Planning Area (ac-ft/yr)**

| Source of Supply | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|
| Reservoirs (permitted) | 2,255,265 | 2,251,402 | 2,247,600 | 2,243,702 | 2,239,008 | 2,233,125 |
| Run-of-the-River (freshwater) | 588,603 | 589,402 | 590,340 | 591,547 | 592,977 | 594,258 |
| Run-of-the-River (brackish) | 1,036,462 | 1,036,462 | 1,036,462 | 1,036,462 | 1,036,462 | 1,036,462 |
| Groundwater | 548,868 | 548,258 | 548,121 | 547,520 | 546,379 | 545,543 |
| Local Supplies | 21,783 | 21,783 | 21,783 | 21,783 | 21,783 | 21,783 |
| Reuse | 13,986 | 13,999 | 14,012 | 14,023 | 14,037 | 14,052 |
| **Total** | **4,464,967** | **4,461,306** | **4,458,318** | **4,455,037** | **4,450,646** | **4,445,223** |

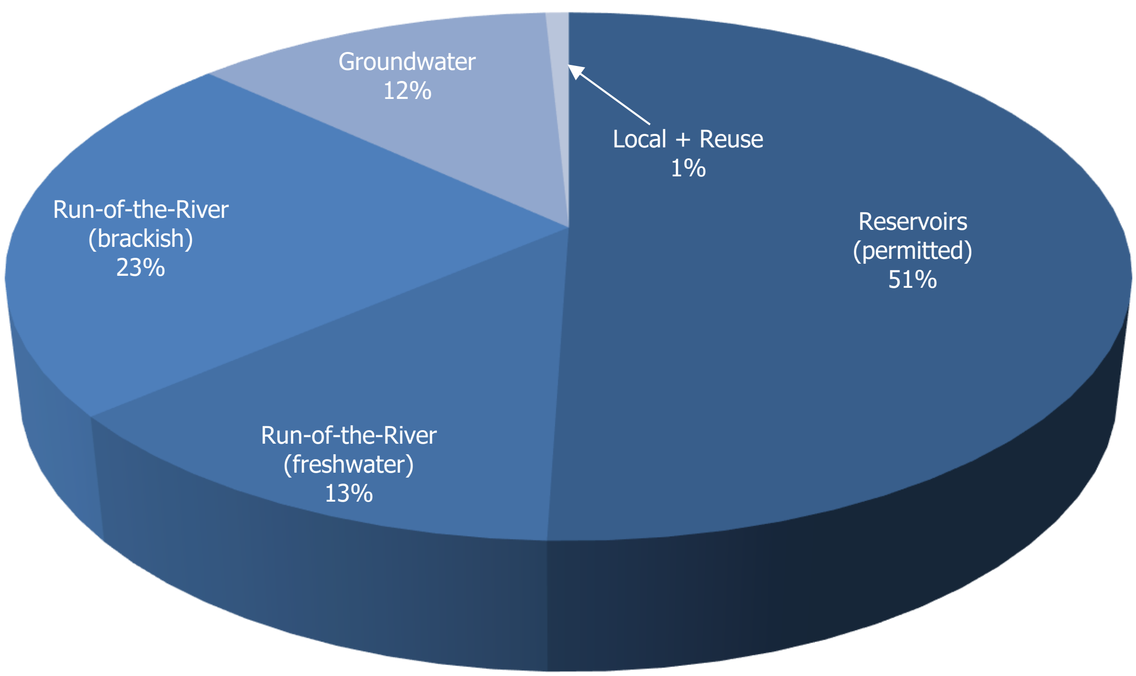


**Figure 3.4 Year 2020 Available Supplies by Source Type**

# 3.1 Surface Water Availability

In accordance with established procedures of the TWDB, the surface water supplies for the regional water plans were determined using the WAMs. In the ETRWPA, four basins were evaluated: Neches, Neches-Trinity, Trinity, and Sabine (See Figure 3.3).

The WAMs were developed for the purpose of reviewing and granting new surface water rights permits using a hypothetical repetition of historical hydrology. The results from the modeling for regional water planning are used for planning purposes only and do not affect the right of an existing water right holder to divert and use the full amount of water authorized by its permit. The assumptions in the WAMs are based in part on the legal interpretation of water rights, and in some cases do not accurately reflect current operations. For planning purposes, adjustments were made to the TCEQ WAMs to better reflect current and future surface water conditions in the region. WAM Run 3, as modified below, was used to assess surface water supplies. The principal assumptions of Run 3 are that all water right holders divert the full permitted amount of their right by priority date order and do not return any of the diversion to the watershed unless an amount is specified in the permit. This assumption provides a conservative estimate of surface water supplies in the ETRWPA. For the 2021 Regional Water Plan (2021 Plan), a hydrologic variance request was submitted to use modified versions of the WAM Run 3 for the Trinity River, Neches River, and Sabine River Basins to develop supplies. Changes to the TCEQ WAMs generally include the following:

- Assessment of reservoir sedimentation rates, and the calculation of area-capacity conditions for current (2000) and future (2060) conditions. Reservoir supplies for 2070 conditions were estimated using a straight line interpolation of the reservoir yields for 2050 to 2060.
- Inclusion of subordination agreements that are currently in place
- Inclusion of system operations where appropriate
- Basin-specific modifications

### 3.1.1 Trinity Basin WAM

For the Trinity River Basin, Region I adopted the updated Trinity Basin WAM developed by the Region C Water Planning Group. These changes are documented in Region C's hydrologic variance request to the TWDB. Region I also includes part of the Neches-Trinity Coastal Basin. No changes were proposed by Region I to the Neches-Trinity WAM, therefore surface water supplies in that basin were developed using the unmodified Neches-Trinity Coastal Basin WAM Run 3.

### 3.1.2 Neches River Basin WAM for the 2021 Plan

Changes to the Neches River Basin WAM for the 2021 Plan are based on changes in previous cycles, as well as the inclusion of updated sedimentation of major reservoirs, as specified by Exhibit C ("Second Amended General Guidelines for Fifth Cycle of Regional Water Plan Development"). The following subsections describe all changes made to the TCEQ Neches WAM Run 3 (2012) to develop the modified Neches WAM, which was used to determine existing supplies in the Neches River Basin in the 2021 Plan.

**Area-Capacity Relationships.** Exhibit C requires RWPGs to include anticipated sedimentation of all major reservoirs (those with a capacity greater than 5,000 ac-ft) in the WAM model runs. There are 12 such permitted reservoirs in the Neches Basin; information related to sedimentation of these reservoirs is shown in Table 3.2.

Lake Columbia has not yet been constructed, so to be conservative, Lake Columbia's full design capacity and original area-capacity curve was used when evaluating firm yields for all other reservoirs. Conversely, to estimate the yield from Lake Columbia, it was assumed that the reservoir would be built in 2020 and begin collecting sediment at that time.

**Table 3.2 Sedimentation Rates and Projected Storage Capacity of Major Reservoirs in the Neches River Basin**

| Reservoir | Most Recent Survey | | Sediment-Contributing Drainage Area ($mi^2$) | Sedimentation Rate (ac-ft/yr/$mi^2$) | Projected 2070 Capacity (ac-ft) |
|---|---|---|---|---|---|
| | Year | Conservation Pool Capacity (ac-ft) | | | |
| Lake Athens | 1998 | 29,475 | 22 | 4.35 | 22,719 |
| Lake Columbia** | * | 195,500 | 277 | 0.19 | 192,910 |
| Lake Jacksonville | 2006 | 25,732 | 34 | 2.88 | 19,508 |
| Lake Kurth | 1996 | 14,769 | 4 | 8.57 | 12,265 |
| Lake Nacogdoches | 1994 | 39,523 | 89 | 1.75 | 27,664 |
| Lake Naconiche | * | 9,072 | 27 | 0.19 | 8,750 |
| Lake Palestine | 2012 | 367,310 | 817 | 0.76 | 331,689 |
| Pinkston Lake | * | 7,380 | 14 | 0.19 | 7,130 |
| Sam Rayburn Reservoir | 2004 | 2,876,033 | 3,010 | 0.18 | 2,839,698 |
| Lake B. A. Steinhagen | 2011 | 69,259 | 3,251 | 0.06 | 58,731 |
| Lake Striker | 1996 | 22,865 | 182 | 0.85 | 11,561 |
| Lake Tyler | 2013 | 77,284 | 107 | 1.00 | 71,192 |

** No survey available. Conservation pool capacity reflects design capacity.*
*** Permitted but not yet constructed. Projected 2070 capacity based on assumption of sedimentation beginning 1/1/2020.*

**Subordination of Sam Rayburn Reservoir and B. A. Steinhagen Lake**. Special conditions 5C and 5D of Certificate of Adjudication 06-4411 require subordination of LNVA's rights in the Rayburn-Steinhagen system to (a) water rights upstream of the proposed Weches and Ponta Dam sites and (b) intervening municipal rights above Sam Rayburn Reservoir. These conditions were last amended in Amendment H, filed August 14, 2008, and granted July 20, 2010, which limited subordination to rights with priority dates between November 1963 and April 2008.

Several changes were implemented in the WAM related to dual simulation, output, and the refilling of Rayburn and Steinhagen:

a) Water rights benefiting from subordination were updated to run in both the first and second WRAP simulation.
b) Additional rights were added for each water right benefiting from Rayburn/Steinhagen subordination, such that the original right does not have subordination, and the added right applies the subordination and backs up the original without subordination. In doing so, the effects of subordination can be distinguished in the model output.
c) Subordination rights at Rayburn and Steinhagen to back up other rights were modeled to not refill storage (Type 2 water rights) so that Rayburn and Steinhagen would not be refilling between multiple subordinations.
d) The 1963 rights for impoundment at Rayburn and Steinhagen were reordered so that Rayburn, the upstream reservoir, would be filled from available streamflow before Steinhagen is refilled.

**Reservoir System Operations.** Two additional reservoir system operations were identified and implemented within the Neches River Basin WAM Run 3:

(1) **UNRMWA – Lake Palestine and Rocky Point Dam**. The Upper Neches River Municipal Water Authority operates Lake Palestine in conjunction with its downstream dam on the Neches River in Anderson and Cherokee Counties. The 2012 WAM Run 3 allows rights associated with the downstream dam to draw from both reservoirs, which limits the firm yield of Lake Palestine when it is used to back up the downstream dam. This set of rights was modified so that downstream diversions would first be backed up by the subordination agreement at Steinhagen Lake, and any remaining shortages would be backed up by Lake Palestine.

(2) **LNVA – Sam Rayburn Backup of Pine Island Bayou**. The modified WAM approved by TWDB for the development of supplies in the 2011 Regional Water Plan included "operation of LNVA's water rights […] as a system by including backup of LNVA's Pine Island water rights with storage from Sam Rayburn."

**Minimum Elevations – Sam Rayburn and B.A. Steinhagen**. WS and OR records were used to set inactive pool capacity for Sam Rayburn Reservoir. The top elevation of inactive pool is 149 ft msl, and the inactive pool capacity was updated each decade based on updated area-capacity-elevation curves. The City of Lufkin has a right to a lakeside diversion of up to 28,000 ac-ft/yr from Sam Rayburn Reservoir; no inactive pool capacity was applied for this right. This diversion is lakeside and does not generate hydropower, so it is not limited by the inlet elevation.

A dead pool capacity was also set for B. A. Steinhagen using an inactive pool elevation of 81 ft msl. Inactive pools were not applied to subordination-related backup rights for either reservoir.

**Lake Tyler**. For the 2021 Region I WAM, Lake Tyler was modeled as a single reservoir, and associated water rights were adjusted accordingly. This is consistent with the development of the original Neches WAM, which treated this source as one reservoir.

**Environmental Flows Standard for Permit 5585**. The TCEQ Run 3 WAM included an incorrect target value for the instream flow record at Lake Naconiche (5585A) due to a unit conversion error. The target was corrected to 4744 ac-ft/yr (see `IF` record at 5585A).

### 3.1.3 Sabine River Basin WAM for the 2021 Plan

The following subsections describe all changes made to the TCEQ Sabine WAM Run 3 (2015) to develop the modified Sabine WAM, which was used to determine existing supplies from the Sabine River Basin in the 2021 Plan.

**Area-Capacity Relationships.** Exhibit C requires RWPGs to include anticipated sedimentation of all major reservoirs (those with a capacity greater than 5,000 ac-ft) in the WAM model runs. There are 12 such permitted reservoirs in the Sabine Basin; information related to sedimentation of these reservoirs is shown in Table 3.3. For each of the 12 reservoirs, sedimentation conditions were estimated based on an average annual sedimentation rate and the number of years since the last survey.

**Table 3.3 Sedimentation Rates and Projected Storage Capacity of Major Reservoirs in the Sabine River Basin**

| Reservoir | Most Recent Survey | | Sediment-Contributing Drainage Area (mi2) | Sedimentation Rate (ac-ft/yr/mi2) | Projected 2070 Capacity (ac-ft) |
|---|---|---|---|---|---|
| | Year | Conservation Pool Capacity (ac-ft) | | | |
| Lake Tawakoni | 2009 | 871,693 | 756 | 2.96 | 736,428 |
| Lake Fork Reservoir | 2009 | 636,504 | 493 | 3.83 | 522,671 |
| Lake Gladewater | 2000 | 4,738 | 35 | 1.33 | 1,480 |
| Lake Cherokee | 2015 | 44,475 | 158 | 0.26 | 42,230 |
| Brandy Branch Reservoir | * | 29,513 | 4 | 0.24 | 29,429 |
| Martin Lake | 2014 | 75,726 | 130 | 0.37 | 73,097 |
| Murvaul Lake | 1998 | 38,284 | 115 | 1.64 | 24,873 |
| Toledo Bend Reservoir | * | 4,477,000 | 5,384 | 0.12 | 4,410,291 |
| Lake Hawkins | 1962 | 11,890 | 30 | 0.24 | 11,117 |
| Lake Holbrook | * | 7,990 | 15 | 0.24 | 7,604 |
| Lake Quitman | * | 7,440 | 31 | 0.24 | 6,639 |
| Lake Winnsboro | * | 8,100 | 27 | 0.24 | 7,403 |

** No recent survey available. Conservation pool capacity reflects design capacity.*

**Firm Yield of Toledo Bend Reservoir.** Hydropower operations at Toledo Bend were excluded during the determination of total available supply from the lake. However, hydropower operations were included in the evaluation of supplies for all other reservoirs and run-of-river supplies. The canal water rights owned by Sabine River Authority (SRA) in the lower basin modeled as being subordinate to diversions from Toledo Bend Reservoir for the purposes of determining firm yield. The remainder of the yield of Toledo Bend was evaluated assuming all diversions were taken lakeside. Within the WAM, all diversions from the lake are shared equally between SRA-Texas and SRA-Louisiana, including the additional unpermitted yield.

### 3.1.4 Reservoir Availability

Reservoirs in the ETRWPA with over 5,000 ac-ft of conservation storage (i.e., major reservoirs) were evaluated, as were some smaller reservoirs that are used for municipal supply. The available water supply from reservoirs is limited to currently permitted diversions or firm yield. The firm yield is the greatest amount of water a reservoir could have supplied on an annual basis without shortage during a repeat of historical hydrologic conditions, particularly the drought of record.

Both Sam Rayburn and Toledo Bend Reservoirs were constructed for multiple purposes, and include hydropower generation. Hydropower is not considered a consumptive use of water, but it is an operational consideration. The inclusion of hydropower in the firm yield analyses was an operating decision by the reservoir owner. As mentioned above, hydropower is not considered in the yield determination of Toledo Bend Reservoir. Hydropower is included for the Sam Rayburn/Lake B. A. Steinhagen System; however, the actual operation of hydropower may differ from the assumptions in the WAM models. A summary of the available supplies for reservoirs in the ETRWPA is shown in Table 3.4.

**Table 3.4 Currently Available Supplies from Permitted Reservoirs Serving the East Texas Regional Water Planning Area (ac-ft/yr)**

| Reservoir | Water Right Numbers | Priority Date | Basin | County | Permitted Diversion | Currently Available Supply | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
| Lake Athens | CA- 3256 | 1/17/1955 | Neches | Henderson | 8,500 | 5,950 | 5,864 | 5,778 | 5,692 | 5,606 | 5,520 |
| Bellwood Lake | CA-3237 | 11/10/1915 10/10/1978 | Neches | Smith | 2,200 | 996 | 996 | 996 | 996 | 996 | 996 |
| Lake Kurth | CA-4393 | 9/1/1957 | Neches | Angelina | 19,100 | 18,500 | 18,500 | 18,500 | 18,500 | 18,500 | 18,500 |
| Lake Columbia | CA-4537 | 1/22/1985 | Neches | Cherokee | 85,507 | 75,800 | 75,720 | 75,640 | 75,560 | 75,480 | 75,400 |
| Lake Jacksonville | CA-3274 | 6/13/1955 | Neches | Cherokee | 6,200 | 6,200 | 6,200 | 6,200 | 6,200 | 6,200 | 6,200 |
| Lake Nacogdoches | CA-4864 | 5/24/1988 | Neches | Nacogdoches | 22,000 | 16,200 | 15,800 | 15,400 | 15,000 | 14,600 | 14,200 |
| Lake Palestine system | CA-3254 | 01/05/1970 06/27/1977 | Neches | Anderson | 238,110 | 197,710 | 196,110 | 194,610 | 193,010 | 191,310 | 189,010 |
| Lake Tyler/Tyler East | CA-4853 | Multiple | Neches | Smith | 40,325 | 34,830 | 34,666 | 34,502 | 34,338 | 34,174 | 34,010 |
| Pinkston Reservoir | CA-4404 | 2/7/1972 | Neches | Shelby | 3,800 | 3,800 | 3,800 | 3,800 | 3,800 | 3,800 | 3,800 |
| Rusk City Lake | CA-4219 | 6/1/1982 | Neches | Cherokee | 160 | 40 | 40 | 40 | 40 | 40 | 40 |
| San Augustine City Lake | CA-4409 | 11/1/1957 | Neches | San Augustine | 1,285 | 1,285 | 1,285 | 1,285 | 1,285 | 1,285 | 1,285 |
| Sam Rayburn & Steinhagen System | CA-4411 | Multiple | Neches | Jasper | 820,000 | 820,000 | 820,000 | 820,000 | 820,000 | 820,000 | 820,000 |

**Table 3.4 Currently Available Supplies from Permitted Reservoirs Serving the East Texas Regional Water Planning Area (ac-ft/yr) (Cont.)**

| Reservoir | Water Right Numbers | Priority Date | Basin | County | Permitted Diversion | Currently Available Supply | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
| Lake Striker | CA-4847 | 1/10/1984 | Neches | Rusk | 20,600 | 20,340 | 19,635 | 18,890 | 18,150 | 16,715 | 14,690 |
| Lake Timpson | A-4399 | 5/9/1955 | Neches | Shelby | 350 | 350 | 350 | 350 | 350 | 350 | 350 |
| Lake Cherokee[1] | CA-4642 | 10/5/1946 | Sabine | Cherokee/ Gregg | 62,400 | 31,456 | 31,309 | 31,162 | 31,015 | 30,867 | 30,720 |
| Lake Center | CA-4657 | 08/04/1922 08/14/1952 | Sabine | Shelby | 1,460 | 1,874 | 1,874 | 1,874 | 1,874 | 1,874 | 1,874 |
| Lake Murvaul | CA-4654 | 7/19/1956 | Sabine | Panola | 22,400 | 21,367 | 20,686 | 20,006 | 19,325 | 18,644 | 17,963 |
| Martin Lake | CA-4649 | 7/19/1971 | Sabine | Rusk | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 |
| Toledo Bend | CA-4658 | 03/05/1958 01/22/1986 | Sabine | Sabine | 970,067 | 970,067 | 970,067 | 970,067 | 970,067 | 970,067 | 970,067 |
| Houston County Lake | CA-5097 | 03/03/0965 | Trinity | Houston | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 |
| **Total – Permitted Reservoirs** | | | | | | **2,255,265** | **2,251,402** | **2,247,600** | **2,243,702** | **2,239,008** | **2,233,125** |

### 3.1.5 Run-of-the-River Diversion Availability

Table 3.5 presents the run-of-the-river supplies by county and basin. The run-of-the-river supplies were calculated using the TCEQ WAM Run 3. The firm supply was determined as the minimum annual diversion from the river for all use types (municipal, industrial, mining, recreational, and irrigation). Since all municipal users in ETRWPA have multiple sources of water, it was assumed that the run-of-the-river supplies would be used conjunctively with these sources and a monthly analysis was not appropriate to determine availability. The run of river supplies associated with City of Beaumont (WR 4415) increase over time because of this reason. Appendix 3-D includes a memorandum summarizing the WAM analysis for this municipal water right. Generally, brackish run-of-the-river water supplies are located in tidally influenced river segments and are not expected to be developed beyond current levels of use. These supplies are shown in red italics on Table 3.5.

**Table 3.5 Summary of the Available Supply from Run-of-River Diversions (ac-ft/yr)**

| County | Basin/ River | Use | Water Right Number | Owner | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|---|---|---|
| Anderson | Neches | Irrigation | Multiple | Multiple | 162 | 162 | 162 | 162 | 162 | 162 |
| Anderson | Trinity | Irrigation | Multiple | Multiple | 1,290 | 1,290 | 1,290 | 1,290 | 1,290 | 1,290 |
| Angelina | Neches | Industrial | 4384 | Georgia-Pacific Panel Products LLC | 32 | 32 | 32 | 32 | 32 | 32 |
| Angelina | Neches | Irrigation | Multiple | Multiple | 14 | 14 | 14 | 14 | 14 | 14 |
| Cherokee | Neches | Irrigation | Multiple | Multiple | 108 | 108 | 108 | 108 | 108 | 108 |
| Hardin | Neches | Irrigation | 4432 | Idylwild Golf Club, Inc. | 57 | 57 | 57 | 57 | 57 | 57 |
| Henderson | Neches | Irrigation | 3248, 3250 | Multiple | 0 | 0 | 0 | 0 | 0 | 0 |
| Houston | Neches | Irrigation | Multiple | Multiple | 208 | 208 | 208 | 208 | 208 | 208 |
| Houston | Trinity | Irrigation | Multiple | Multiple | 2,522 | 2,522 | 2,522 | 2,522 | 2,522 | 2,522 |
| Jasper | Neches | Industrial | 4412 | TPWD (hatchery) | 548 | 548 | 548 | 548 | 548 | 548 |
| Jasper | Neches | Industrial | 5027 | Louisiana Pacific | 6 | 6 | 6 | 6 | 6 | 6 |
| Jasper | Neches | Irrigation | 4413, 4414 | Tin LLC, Crown Pine Timber | 123 | 123 | 123 | 123 | 123 | 123 |
| Jefferson | Neches | Multiple | 4411 | LNVA | 381,876 | 381,876 | 381,876 | 381,876 | 381,876 | 381,876 |
| Jefferson | Neches | Industrial | 4437 | Huntsman Corp., TPC LLC | *434,400* | *434,400* | *434,400* | *434,400* | *434,400* | *434,400* |
| Jefferson | Neches | Industrial | 4436 | Jefferson Railport Terminal I LLC | *2,700* | *2,700* | *2,700* | *2,700* | *2,700* | *2,700* |
| Jefferson | Neches | Industrial | 4415 | Beaumont | 526 | 552 | 583 | 623 | 670 | 712 |

**Table 3.5 Summary of the Available Supply from Run-of-River Diversions (ac-ft/yr) (Cont.)**

| County | Basin/ River | Use | Water Right Number | Owner | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|---|---|---|
| Jefferson | Neches | Industrial | 4435 | Union Oil Company | *4,300* | *4,300* | *4,300* | *4,300* | *4,300* | *4,300* |
| Jefferson | Neches | Industrial | 4434 | Exxon Mobil Oil | *17,922* | *17,922* | *17,922* | *17,922* | *17,922* | *17,922* |
| Jefferson | Neches | Industrial | 4433, 5206, 5213 | Multiple | *319* | *319* | *319* | *319* | *319* | *319* |
| Jefferson | Neches | Industrial | 3879 | Motiva Enterprises LLC | *12,900* | *12,900* | *12,900* | *12,900* | *12,900* | *12,900* |
| Jefferson | Neches | Industrial | 3860 | Entergy Texas, Inc. | *279,131* | *279,131* | *279,131* | *279,131* | *279,131* | *279,131* |
| Jefferson | Neches | Industrial | - | Premcor Refining Group, Inc. | *480* | *480* | *480* | *480* | *480* | *480* |
| Jefferson | Neches-Trinity | Industrial | 4441, 4479 | Kansas City Southern Railway Co.; Veolia ES Technical Solutions | 586 | 586 | 586 | 586 | 586 | 586 |
| Jefferson | Neches-Trinity | Irrigation | Multiple | Multiple | 40,194 | 40,194 | 40,194 | 40,194 | 40,194 | 40,194 |
| Jefferson | Neches-Trinity | Irrigation | 4475 | M Half Circle Ranch Company | 5,139 | 5,139 | 5,139 | 5,139 | 5,139 | 5,139 |
| Jefferson | Neches-Trinity | Irrigation | 4477 | Joe E. Broussard, II | 5,321 | 5,321 | 5,321 | 5,321 | 5,321 | 5,321 |
| Jefferson | Neches-Trinity | Mining | 4442 | Premcor Pipeline Co | 34 | 34 | 34 | 34 | 34 | 34 |
| Jefferson | Neches | Municipal | 4415 | Beaumont | 15,407 | 16,180 | 17,087 | 18,254 | 19,637 | 20,876 |

**Table 3.5 Summary of the Available Supply from Run-of-River Diversions (ac-ft/yr) (Cont.)**

| County | Basin/ River | Use | Water Right Number | Owner | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|---|---|---|
| Nacogdoches | Neches | Industrial | 4401 | George B Frederick Et Al | 2 | 2 | 2 | 2 | 2 | 2 |
| Nacogdoches | Neches | Irrigation | Multiple | Multiple | 67 | 67 | 67 | 67 | 67 | 67 |
| Orange | Neches | Industrial | 5091 | Enterprise Refined Products Company LLC | *100* | *100* | *100* | *100* | *100* | *100* |
| Orange | Neches | Industrial | 4438 | Entergy Texas, Inc. | *17,210* | *17,210* | *17,210* | *17,210* | *17,210* | *17,210* |
| Rusk | Neches | Industrial | 4839, 5314 | CR Kelley Estate & CD Josh Ham | 1 | 1 | 1 | 1 | 1 | 1 |
| Rusk | Neches | Irrigation | 4839, 4840, 4841, 5629 | Multiple | 80 | 80 | 80 | 80 | 80 | 80 |
| Sabine | Neches | Industrial | 4410 | Georgia-Pacific Wood Products LLC | 178 | 178 | 178 | 178 | 178 | 178 |
| Smith | Neches | Irrigation | 3224 | Multiple | 50 | 50 | 50 | 50 | 50 | 50 |
| Smith | Neches | Mining | 3230, 3231 | Bell Sand Company | 0 | 0 | 0 | 0 | 0 | 0 |
| Trinity | Neches | Irrigation | 4380 | Temple Boggy Slough, LLC | 3 | 3 | 3 | 3 | 3 | 3 |
| Tyler | Neches | Irrigation | Multiple | Multiple | 88 | 88 | 88 | 88 | 88 | 88 |
| Newton | Sabine | Industrial | 4659 | Weirgate Lumber Company, Inc. | 135 | 135 | 135 | 135 | 135 | 135 |
| Newton | Sabine | Industrial | 4662 | SRA | 93,987 | 93,987 | 93,987 | 93,987 | 93,987 | 93,987 |
| Newton | Sabine | Irrigation | 4662 | SRA | 38,956 | 38,956 | 38,956 | 38,956 | 38,956 | 38,956 |
| Newton | Sabine | Irrigation | 4660 | Crown Pine Timber 1, L.P. | 50 | 50 | 50 | 50 | 50 | 50 |
| Orange | Sabine | Industrial | 4664 | Performance Materials NA, Inc. | *267,000* | *267,000* | *267,000* | *267,000* | *267,000* | *267,000* |
| Orange | Sabine | Irrigation | 4663 | J A Heard Et Al | 28 | 28 | 28 | 28 | 28 | 28 |
| Panola | Sabine | Industrial | 4652 | Hills Lake Fishing Club | 114 | 114 | 114 | 114 | 114 | 114 |

## Table 3.5 Summary of the Available Supply from Run-of-River Diversions (ac-ft/yr) (Cont.)

| County | Basin/ River | Use | Water Right Number | Owner | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|---|---|---|
| Panola | Sabine | Industrial | 5219 | Luminant Mining Company LLC | 254 | 254 | 254 | 254 | 254 | 254 |
| Panola | Sabine | Irrigation | 4226, 4238, 4653, 4656 | Multiple | 152 | 152 | 152 | 152 | 152 | 152 |
| Panola | Sabine | Mining | 5747 | Luminant Mining Company LLC | 168 | 168 | 168 | 168 | 168 | 168 |
| Rusk | Sabine | Irrigation | 4627, 4638, 4639, 4640 | Multiple | 127 | 127 | 127 | 127 | 127 | 127 |
| Rusk | Sabine | Municipal | 5578 | Henderson | 10 | 10 | 10 | 10 | 10 | 10 |
| **TOTAL** | | | | | **1,625,065** | **1,625,864** | **1,626,802** | **1,628,009** | **1,629,439** | **1,630,720** |
| **Subtotal Freshwater** | | | | | **588,603** | **589,402** | **590,340** | **591,547** | **592,977** | **594,258** |
| **Subtotal Brackish water** | | | | | ***1,036,462*** | ***1,036,462*** | ***1,036,462*** | ***1,036,462*** | ***1,036,462*** | ***1,036,462*** |

*Supplies shown in red italics are brackish water supplies and are generally not considered to meet the projected demands.

### 3.1.6 Local Supply Availability

Local supply generally includes small surface water supplies that are not associated with a water right. Most of the local supply is surface water used from livestock ponds. A small amount of local supply is for mining purposes. These stock ponds are generally filled using groundwater supplies or recycled water captured from surface flow that has not entered the waters of the State. The maximum recent historical use from these sources (according to TWDB records) is assumed to be available in the future. Local supplies are listed on

**Table 3.6 Summary of Available Local Supply (ac-ft/yr)**

| County | Basin | Use | Supply (acre-ft/yr) |
|---|---|---|---|
| **Local Supplies** | | | |
| Anderson | Neches | Livestock | 333 |
| Anderson | Trinity | Livestock | 684 |
| Angelina | Neches | Livestock | 661 |
| Cherokee | Neches | Livestock | 1,555 |
| Cherokee | Neches | Mining | 19 |
| Hardin | Neches | Livestock | 155 |
| Hardin | Trinity | Livestock | 0 |
| Henderson | Neches | Livestock | 770 |
| Houston | Neches | Livestock | 1,007 |
| Houston | Trinity | Livestock | 783 |
| Jasper | Neches | Livestock | 332 |
| Jasper | Sabine | Livestock | 215 |
| Jefferson | Neches-Trinity | Other | 1,000 |
| Jefferson | Neches-Trinity | Livestock | 800 |
| Jefferson | Neches | Mining | 110 |
| Nacogdoches | Neches | Livestock | 2,386 |
| Nacogdoches | Neches | Mining | 494 |
| Newton | Sabine | Livestock | 155 |
| Newton | Sabine | Mining | 158 |
| Orange | Neches | Livestock | 56 |
| Orange | Sabine | Livestock | 42 |
| Orange | Sabine | Mining | 178 |
| Panola | Cypress | Livestock | 30 |
| Panola | Sabine | Livestock | 1,224 |
| Polk | Neches | Livestock | 396 |
| Polk | Neches | Other | 20 |
| Rusk | Neches | Livestock | 808 |

**Table 3.6 Summary of Available Local Supply (ac-ft/yr) (Cont.)**

| County | Basin | Use | Supply (acre-ft/yr) |
|---|---|---|---|
| **Local Supplies (cont.)** | | | |
| Rusk | Sabine | Livestock | 308 |
| Rusk | Sabine | Other | 1,230 |
| Sabine | Neches | Livestock | 71 |
| Sabine | Sabine | Livestock | 634 |
| San Augustine | Neches | Livestock | 465 |
| San Augustine | Sabine | Livestock | 71 |
| Shelby | Neches | Livestock | 334 |
| Shelby | Sabine | Livestock | 2,998 |
| Smith | Neches | Livestock | 605 |
| Trinity | Neches | Livestock | 449 |
| Tyler | Neches | Livestock | 239 |
| Tyler | Neches | Other | 8 |
| | | **Total Local Supply** | **21,783** |

## 3.2 Groundwater Availability

Chapter 36 of the Texas Water Code generally describes how groundwater conservation districts (GCDs) are the preferred entities to manage groundwater resources in Texas and that chapter contains provisions that require the GCDs to prepare management plans. Consistent with the Texas Water Code, the TWDB has also created 16 Groundwater Management Areas (GMAs), which are based largely on hydrogeologic and aquifer boundaries instead of political boundaries. One of the purposes for GMAs is to manage groundwater resources on a more aquifer-wide basis. GCDs within each GMA are responsible executing joint groundwater planning as described in Chapter 36 to develop the amount of groundwater available for use and/or development by the Regional Water Planning Groups. To accomplish this, all GCDs within each GMA determine the Desired Future Conditions (DFCs) for the groundwater resources within the GMA boundaries at least once every 5 years. Figure 3.5 shows the regulatory boundaries of the GCDs and GMAs within the ETRWPA.

DFCs are defined by statute as "the desired, quantified condition of groundwater resources (such as water levels, spring flows, or volumes) within a management area at one or more specified future times as defined by participating groundwater conservation districts within a groundwater management area as part of the joint groundwater planning process." DFCs are quantifiable management goals that reflect what metrics the GCDs will use to manage groundwater in each GCD and throughout the GMA. The most common DFCs are based on the volume of groundwater in storage over time, water levels (limiting decline within the aquifer), water quality (limiting deterioration of quality) or spring flow (defining a minimum flow to sustain).

After the DFCs are determined by the GMAs, the TWDB performs quantitative analysis to determine the amount of groundwater available for production to meet the DFC. For aquifers where a Groundwater Availability Model (GAM) exists, the GAM is used to develop the Modeled Available Groundwater (MAG). For aquifers without a GAM, other quantitative approaches or models are used to estimate the MAG.

TWDB technical guidelines establish that the MAG (within each aquifer, county, and river basin) is the maximum amount of groundwater that can be used for existing uses and new strategies in Regional Water Plans. In other words, the MAG volumes are a cap on groundwater production for TWDB planning purposes.

### 3.2.1 Model Assumptions

In the ETRWPA, GAM Run 17-024 for GMA-11 and GAM Run 16-024 for GMA-14 were used to develop the MAG volumes. Both models meet the desired future conditions adopted by the members of each groundwater management area. The TWDB Reports documenting the Desired Future Conditions (DFCs) and Modeled Available Groundwater (MAGs) for aquifers in Region I are included in Appendix 3-C.

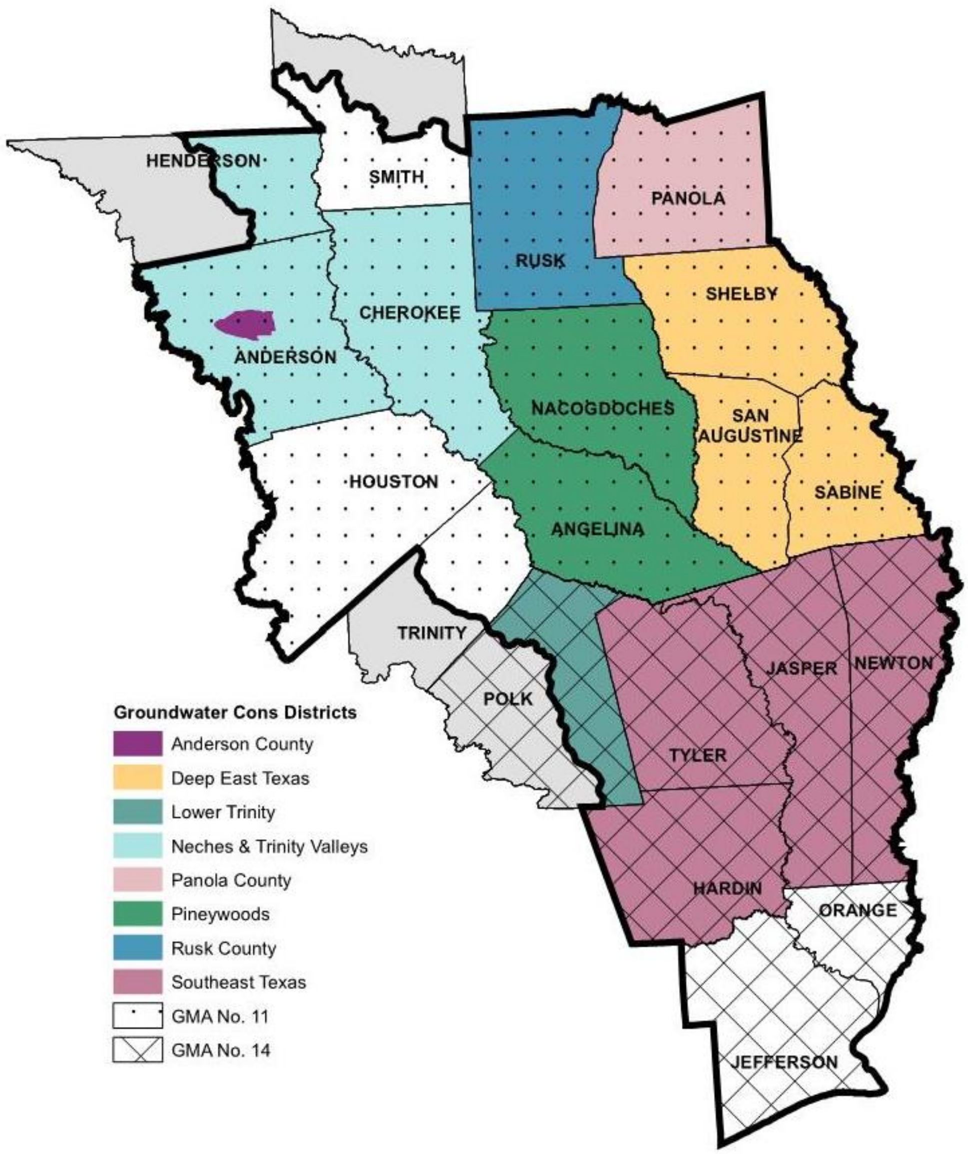


**Figure 3.5: Groundwater Conservation Districts and Groundwater Management Areas**

SOURCE: TEXAS WATER DEVELOPMENT BOARD

**GAM Run 17-024.** One model was used for the northern portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers (Fryar and others, 2003; Kelley and others, 2004). The Trinity, Nacatoch, Yegua-Jackson and Gulf Coast aquifers were declared non-relevant in GMA-11. GMA-11 adopted the DFCs in Table 3.7 for each county within the ETRWPA.

**Table 3.7 Desired Future Conditions in Groundwater Management Area-11 Modeled Drawdowns (in feet) by County and Aquifer**

| County | Carrizo-Wilcox | Queen City | Sparta |
|---|---|---|---|
| Anderson | 90 | 9 | NRS |
| Angelina | 48 | 16 | NRS |
| Cherokee | 99 | 14 | NRS |
| Henderson | 50 | 5 | NP |
| Houston | 80 | 6 | 3 |
| Nacogdoches | 29 | 4 | 5 |
| Panola | 3 | NP | NP |
| Rusk | 23 | NRS | NP |
| Sabine | 9 | NP | 1 |
| San Augustine | 7 | NP | 2 |
| Shelby | 1 | NP | NP |
| Smith | 119 | 17 | NP |
| Trinity | 51 | NRS | 9 |

NP = Not present
NRS = Not relevant due to size (less than 200 square miles**)**

On January 11, 2017, GMA-11 adopted DFCs intended to protect and conserve groundwater resources within the GMA, while allowing for anticipated growth in the area. Model runs were conducted to determine an amount and distribution of pumping that would stimulate the adopted DFC; this pumping amount was then reported as the MAG for the GMA, RWPA, Districts, counties and river basins.

**GAM Run 16-024 MAG.** Resolution No. 2016-01-01 by GMA-14 provided the DFCs for each county in the GMA as the average modeled drawdown in the Chicot, Evangeline, and Jasper aquifers, as well as the Burkeville confining unit. On April 29, 2016, GMA-14 adopted the DFCs in Table 3.8 for each county within the ETRWPA.

Prior to the resolution by GMA-14, the TWDB had conducted several model runs using the GAM for the northern part of the Gulf Coast Aquifer. The DFCs presented in the resolution are the simulated drawdown in each aquifer at the end of the year 2070 from year 2009.

**Table 3.8 Desired Future Conditions in Groundwater Management Area-14 Modeled Drawdowns (in feet) by County and Aquifer***

| County | Chicot Aquifer | Evangeline Aquifer | Burkeville Confining Unit | Jasper Aquifer |
|---|---|---|---|---|
| Hardin | 21 | 27 | 29 | 89 |
| Jasper | 23 | 41 | 46 | 40 |
| Jefferson | 15 | 17 | 0 | 0 |
| Newton | 35 | 45 | 44 | 37 |
| Orange | 14 | 16 | 0 | 0 |
| Polk | 26 | 10 | 15 | 73 |
| Tyler | 42 | 35 | 30 | 62 |

* Simulated drawdown in feet after 61 years of pumping.

### 3.2.2 Regional Groundwater Availability

Groundwater supplies in the ETRWPA may be divided into the northern and southern regions. The northern region is generally consistent with GMA-11 and the southern region is generally consistent with GMA-14. The conditions and available information for each region are presented separately. A limited supply of groundwater in the region is also found in what are known as "non-relevant" portions of known aquifers and "other" aquifers. These local supplies are addressed at the end of this section.

**Northern Region.** The Carrizo-Wilcox Aquifer provides the majority of the groundwater supply in the northern region. Minor aquifers in the northern region include the Queen City, Sparta, and Yegua-Jackson. In some areas, the Queen City aquifer provides a significant quantity of water, although the well yields are typically smaller than in the underlying Carrizo-Wilcox aquifer. Because it has a relatively large surface area, the Queen City aquifer also receives a significant volume of recharge from precipitation and thus provides significant baseflow to creeks and rivers in the region. The Yegua-Jackson aquifer provides water in the area between the downdip extent of the Carrizo-Wilcox and the outcrop area of the Gulf Coast aquifer (See Figures 3.1 and 3.2).

The modeled available groundwater volumes for the counties in the northern region are provided in Table 3.9. MAG volumes are the largest amount of water that can be withdrawn from a given source without violating DFCs. Table 3.9 presents the total MAG volumes by aquifer in the ETRWPA. The Trinity, Nacatoch, Yegua-Jackson and Gulf Coast aquifers were declared non-relevant in GMA-11.

**Southern Region.** The Gulf Coast Aquifer provides most of the groundwater supply in the southern region (Figure 3.1) and has the largest amount of modeled available groundwater in the ETRWPA (Table 3.9). The Southeast Texas GCD (Jasper, Newton, Tyler, and Hardin Counties), is the only groundwater conservation district located in the southern region. Table 3.9 also contains a summary of modeled available groundwater volume in the southern region.

**Table 3.9 Modeled Available Groundwater by Aquifer (ac-ft/yr)**

| County | Aquifer | Basin | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|---|
| **Northern Region** | | | | | | | | |
| Anderson | Carrizo-Wilcox | Neches | 23,335 | 23,335 | 23,335 | 23,335 | 23,335 | 23,335 |
| | | Trinity | 5,753 | 5,753 | 5,753 | 5,753 | 5,753 | 5,753 |
| | Queen City | Neches | 11,828 | 11,828 | 11,828 | 11,828 | 11,828 | 11,828 |
| | | Trinity | 7,274 | 7,274 | 7,274 | 7,274 | 7,274 | 7,274 |
| | Sparta | Neches | Non-Relevant | | | | | |
| | | Trinity | | | | | | |
| Angelina | Carrizo-Wilcox | Neches | 27,591 | 27,591 | 27,591 | 27,591 | 27,591 | 27,591 |
| | Queen City | Neches | Non-Relevant | | | | | |
| | Sparta | Neches | 371 | 371 | 371 | 371 | 371 | 371 |
| | Yegua-Jackson | Neches | Non-Relevant | | | | | |
| Cherokee | Carrizo-Wilcox | Neches | 20,933 | 20,933 | 20,933 | 20,933 | 20,933 | 20,470 |
| | Queen City | Neches | 23,211 | 23,211 | 23,211 | 23,211 | 23,039 | 22,866 |
| | Sparta | Neches | Non-Relevant | | | | | |
| Henderson | Carrizo-Wilcox | Neches | 6,036 | 6,036 | 6,036 | 6,036 | 6,036 | 6,036 |
| | Queen City | Neches | 12,067 | 12,067 | 12,067 | 12,067 | 12,067 | 12,067 |
| Houston | Carrizo-Wilcox | Neches | 22,488 | 22,488 | 22,488 | 22,488 | 22,488 | 22,488 |
| | | Trinity | 3,806 | 3,806 | 3,806 | 3,806 | 3,806 | 3,806 |
| | Queen City | Neches | 2,043 | 2,043 | 2,043 | 2,043 | 2,043 | 2,043 |
| | | Trinity | 258 | 258 | 258 | 258 | 258 | 258 |
| | Sparta | Neches | 477 | 477 | 477 | 477 | 477 | 477 |
| | | Trinity | 977 | 977 | 977 | 977 | 977 | 977 |
| | Yegua-Jackson | Neches | Non-Relevant | | | | | |
| | | Trinity | | | | | | |
| Nacogdoches | Carrizo-Wilcox | Neches | 24,181 | 24,181 | 24,181 | 24,181 | 24,181 | 24,181 |
| | Queen City | Neches | 2,985 | 2,985 | 2,985 | 2,985 | 2,985 | 2,985 |
| | Sparta | Neches | 365 | 365 | 365 | 365 | 365 | 365 |
| | Yegua-Jackson | Neches | Non-Relevant | | | | | |

**Table 3.9 Modeled Available Groundwater by Aquifer (ac-ft/yr) (Cont.)**

| County | Aquifer | Basin | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|---|
| **Northern Region (Cont.)** | | | | | | | | |
| Panola | Carrizo-Wilcox | Cypress | 6 | 6 | 6 | 6 | 6 | 6 |
| | | Sabine | 8,370 | 8,212 | 8,212 | 8,212 | 8,062 | 8,062 |
| | Queen City | Sabine | 0 | 0 | 0 | 0 | 0 | 0 |
| Rusk | Carrizo-Wilcox | Neches | 11,769 | 11,769 | 11,769 | 11,750 | 11,750 | 11,750 |
| | | Sabine | 9,068 | 9,068 | 9,068 | 9,068 | 9,068 | 9,068 |
| | Queen City | Neches | Non-Relevant | | | | | |
| | | Sabine | | | | | | |
| | Sparta | Neches | 0 | 0 | 0 | 0 | 0 | 0 |
| Sabine | Carrizo-Wilcox | Neches | 356 | 356 | 356 | 356 | 356 | 356 |
| | | Sabine | 3,249 | 3,249 | 3,249 | 3,249 | 3,249 | 3,249 |
| | Queen City | Neches | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Sabine | 0 | 0 | 0 | 0 | 0 | 0 |
| | Sparta | Neches | 37 | 37 | 37 | 37 | 37 | 37 |
| | | Sabine | 160 | 160 | 160 | 160 | 160 | 160 |
| | Yegua-Jackson | Neches | Non-Relevant | | | | | |
| | | Sabine | | | | | | |
| San Augustine | Carrizo-Wilcox | Neches | 1,149 | 1,149 | 1,149 | 1,149 | 1,149 | 1,149 |
| | | Sabine | 290 | 290 | 290 | 290 | 290 | 290 |
| | Queen City | Neches | 7 | 7 | 7 | 7 | 7 | 7 |
| | | Sabine | 0 | 0 | 0 | 0 | 0 | 0 |
| | Sparta | Neches | 163 | 163 | 163 | 163 | 163 | 163 |
| | | Sabine | 3 | 3 | 3 | 3 | 3 | 3 |
| | Yegua-Jackson | Neches | Non-Relevant | | | | | |
| | | Sabine | | | | | | |
| Shelby | Carrizo-Wilcox | Neches | 2,577 | 2,288 | 2,151 | 2,018 | 2,018 | 2,018 |
| | | Sabine | 8,317 | 8,154 | 8,154 | 7,705 | 7,269 | 7,081 |
| | Queen City | Sabine | 0 | 0 | 0 | 0 | 0 | 0 |

**Table 3.9 Modeled Available Groundwater by Aquifer (ac-ft/yr) (Cont.)**

| County | Aquifer | Basin | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|---|
| **Northern Region (Cont.)** | | | | | | | | |
| Smith | Carrizo-Wilcox | Neches | 22,705 | 22,705 | 22,705 | 22,705 | 22,705 | 22,693 |
| | Queen City | Neches | 30,692 | 30,692 | 30,692 | 30,692 | 30,692 | 30,692 |
| | Sparta | Neches | 0 | 0 | 0 | 0 | 0 | 0 |
| Trinity | Carrizo-Wilcox | Neches | 269 | 269 | 269 | 269 | 269 | 269 |
| | Queen City | Neches | Non-Relevant | | | | | |
| | Sparta | Neches | 154 | 154 | 154 | 154 | 154 | 154 |
| | Yegua-Jackson | Neches | Non-Relevant | | | | | |
| **Southern Region** | | | | | | | | |
| Hardin | Gulf Coast | Neches | 34,789 | 34,789 | 34,789 | 34,789 | 34,789 | 34,789 |
| | | Trinity | 138 | 138 | 138 | 138 | 138 | 138 |
| Jasper | Gulf Coast | Neches | 37,630 | 37,630 | 37,630 | 37,630 | 37,630 | 37,630 |
| | | Sabine | 29,854 | 29,854 | 29,854 | 29,854 | 29,854 | 29,854 |
| Jefferson | Gulf Coast | Neches | 803 | 803 | 803 | 803 | 803 | 803 |
| | | Neches-Trinity | 1,722 | 1,722 | 1,722 | 1,722 | 1,722 | 1,722 |
| Newton | Gulf Coast | Neches | 176 | 176 | 176 | 176 | 176 | 176 |
| | | Sabine | 34,043 | 34,043 | 34,043 | 34,043 | 34,043 | 34,043 |
| Orange | Gulf Coast | Neches | 3,287 | 3,287 | 3,287 | 3,287 | 3,287 | 3,287 |
| | | Neches-Trinity | 256 | 256 | 256 | 256 | 256 | 256 |
| | | Sabine | 15,821 | 15,821 | 15,821 | 15,821 | 15,821 | 15,821 |
| Polk | Gulf Coast | Neches | 14,897 | 14,897 | 14,897 | 14,897 | 14,897 | 14,897 |
| Tyler | Gulf Coast | Neches | 38,211 | 38,211 | 38,211 | 38,211 | 38,211 | 38,211 |

Table 3.10 presents the total MAG volumes by aquifer for planning years 2020 through 2070. The Gulf Coast aquifer has the largest volume of modeled available groundwater at 211,627 ac-ft per year in the ETRWPA.

**Table 3.10 Modeled Available Groundwater Aquifer Totals (ac-ft/yr)**

| Region | Carrizo-Wilcox | Queen City | Sparta | Gulf Coast |
|---|---|---|---|---|
| **TOTAL** | 202,248 | 90,358 | 2,707 | N/A |
| **TOTAL** | N/A | N/A | N/A | 211,627 |

SOURCE: DATA PROVIDED BY TWDB GAM RUN 16-024 MAG; GAM RUN 17-024 MAG

**Groundwater Local Supplies (Non-Relevant Aquifer) Availability.** Non-relevant aquifers are areas determined by the GCDs that have aquifer characteristics, groundwater demands, and current groundwater uses that do not warrant adoption of a DFC for purposes of joint groundwater planning. Declaring an area non-relevant does not preclude a GCD from managing the groundwater in the area through other means available to the district as outlined in Chapter 36 of the Texas Water Code. In some cases, an area is determined non-relevant because declaring a DFC for the aquifer or portion of the aquifer would not affect other GCDs or GMAs. Generally, if a groundwater conservation district determines an aquifer (or portions of an aquifer) to be non-relevant, it is anticipated that there will be no large-scale production from in the area prior to the next round of joint groundwater planning. Additionally, it is assumed that what production does occur will not affect conditions in relevant portions of the aquifer(s) or other GCDs or GMAs. Regional Water Planning Groups and the TWDB work together to establish groundwater volumes available from non-relevant aquifers by evaluating modeling data and local hydrogeologic information.

**Groundwater Local Supplies (Other Aquifer) Availability.** Groundwater from 'other aquifer' local supplies refers to groundwater that originates from an alluvial aquifer or has not been classified as either a major or a minor aquifer of the state. These areas are generally small but can be locally significant. Some may originate from a major or minor aquifer but have historically been classified incorrectly.

The 2021 Plan estimate of 12,482 acre-feet is based upon average historical pumping data for years 2007 through 2011. These estimates have not been increased to account for future pumping because some of the pumping would be subjected to a MAG if it were classified correctly. Table 3.11 includes availability estimates for supplies in 'other aquifer.'

**Table 3.11 Groundwater Availability from Other Undifferentiated Aquifers**

| County | Basin | Amount (ac-ft/yr) |
|---|---|---|
| Anderson | Trinity | 298 |
| Angelina | Neches | 812 |
| Cherokee | Neches | 268 |
| Henderson | Neches | 5 |
| Henderson | Trinity | 680 |
| Houston | Neches | 378 |
| Houston | Trinity | 888 |
| Nacogdoches | Neches | 1,131 |
| Rusk | Neches | 270 |
| Rusk | Sabine | 469 |
| Sabine | Neches | 336 |
| San Augustine | Neches | 1,395 |
| Smith | Neches | 922 |
| Trinity | Neches | 700 |
| **TOTAL** | | **8,552** |

## 3.3 Reuse Availability

There are two types of reuse: direct reuse and indirect reuse. Direct reuse is treated wastewater effluent that is beneficially reused directly from the treatment facility and is not discharged to a State water course. Indirect reuse is treated effluent that is discharged to a State water course and then re-diverted by the owner for beneficial use. The reuse listed as available to the region is for existing projects based on current permits and authorizations. Categories of reuse include (1) currently operating indirect reuse projects for non-industrial purposes, in which water is reused after being returned to the stream; and (2) authorized direct reuse projects for which facilities are already developed. The specific reuse projects are listed in Table 3.12. The indirect reuse project in Jefferson County is associated with irrigation tail water that is returned to the basin for subsequent irrigation use.

**Table 3.12 Summary of Available Reuse Supply (ac-ft/yr)**

| County | Basin | Use | Supply (ac-ft/yr) |
|---|---|---|---|
| **Direct Reuse Supplies** | | | |
| Sabine | Neches | Manufacturing | 20 |
| Orange | Sabine | Irrigation | 15 |
| Shelby | Sabine | Irrigation | 82 |
| Shelby | Sabine | Manufacturing | 151 |
| **Indirect Reuse Supplies** | | | |
| Jefferson | Neches-Trinity | Irrigation | 13,687 |
| | | **Total Reuse Supply** | **13,955** |

# 3.4 Impacts on Availability

### 3.4.1 Imports and Exports

There are several small imported supplies to the ETRWPA from adjoining regions and Louisiana. Water from Lake Fork in the Northeast Region is used by the Cities of Henderson and Kilgore and their customers. Other surface water imports include water from Lake Livingston to Trinity County-Other, the TRWD Reservoir System to Henderson County-Other, and surface water for the City of Joaquin and Shelby County-Other from the City of Logansport, Louisiana. The specific source for this import is the Louisiana portion of the Toledo Bend Reservoir.

There are also uses of groundwater from sources located outside of the ETRWPA. Most are associated with entities that extend over multiple regions. Groundwater from the Carrizo-Wilcox Aquifer in the Northeast Region (Region D) is provided to Jackson WSC and Southern Utilities, while groundwater from this aquifer in Region C is provided to Bethel Ash WSC and Henderson County-Other. A small amount of groundwater from the Yegua-Jackson Aquifer in Trinity County (Region H) is provided to Pennington WSC, Trinity County-Other, and irrigation, livestock, and mining industries within Trinity County. Groundwater from the Gulf Coast Aquifer System supplies Trinity County-Other and manufacturing in Polk County, and the Queen City aquifer supplies livestock in Smith County.

Some water from the ETRWPA is exported to users outside of the region. This supply is included in the total available supply in the ETRWPA but is not available to water users in the region. Water from the ETRWPA is used to supply the City of Tyler's customers in the Northeast Region, City of Athens in Region C and several customers of the LNVA in Region H. There is also an existing contract to supply water to Dallas from Lake Palestine for an amount 114,337 ac-ft per year. The infrastructure for this supply has not been constructed. A summary of exports and imports is provided in Table 3.13.

**Table 3.13 Summary of Existing Exports and Imports in East Texas Regional Water Planning Area (ac-ft/yr)**

| Source | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|
| **Exports** | | | | | | |
| Lake Athens – Region C | 4,787 | 5,041 | 5,146 | 5,316 | 5,215 | 5,048 |
| Carrizo-Wilcox – Region C | 0 | 0 | 0 | 964 | 1,758 | 1,790 |
| Sam Rayburn/B.A. Steinhagen – Region H | 66,737 | 66,737 | 66,737 | 66,737 | 66,737 | 66,737 |
| Trinity Run-of-River – Region H | 2,173 | 2,173 | 2,173 | 2,173 | 2,173 | 2,173 |
| Lake Palestine – Region C | 82 | 73 | 64 | 57 | 51 | 51 |
| Lake Palestine – Region D | 100 | 100 | 100 | 100 | 100 | 100 |
| Lake Tyler – Region D | 113 | 113 | 113 | 113 | 113 | 113 |
| Carrizo-Wilcox – Region D | 26 | 26 | 26 | 26 | 26 | 26 |
| **TOTAL** | **74,018** | **74,263** | **74,359** | **75,486** | **76,173** | **76,038** |
| **Imports** | | | | | | |
| Carrizo-Wilcox Aquifer – Region C | 376 | 376 | 376 | 376 | 376 | 376 |
| Carrizo-Wilcox Aquifer – Region D | 2,529 | 2,744 | 3,021 | 3,473 | 3,943 | 4,503 |
| Yegua-Jackson Aquifer – Region H | 581 | 577 | 574 | 570 | 571 | 570 |
| Queen City Aquifer – Region D | 514 | 514 | 514 | 514 | 514 | 514 |
| Gulf Coast Aquifer – Region H | 28 | 27 | 23 | 18 | 23 | 22 |
| TRWD Reservoir System – Region D | 251 | 146 | 134 | 59 | 0 | 35 |
| Lake Fork – Region D | 1,500 | 4,548 | 4,499 | 4,453 | 4,403 | 4,353 |
| Lake Livingston – Region H | 270 | 270 | 270 | 270 | 270 | 270 |
| Trinity Run-of-River – Region H | 34 | 34 | 34 | 34 | 34 | 34 |
| Toledo Bend - Louisiana | 343 | 343 | 343 | 343 | 343 | 343 |
| **TOTAL** | **6,426** | **9,579** | **9,788** | **10,110** | **10,477** | **11,020** |

### 3.4.2 Impacts of Water Quality on Supplies

The quality of a surface water body or groundwater aquifer can be a significant factor in the ability to use the water for specific purposes. Water quality dictates the level of treatment necessary to render a water body available for its intended use, which can affect the quantity of produced water. In cases of severe contamination, it is possible that a water supply source could be considered untreatable and, hence, unusable for some specific uses. The water quality impacts for sources within the ETRWPA are generally minor with respect to their effect on availability and treatability.

Key water quality parameters for the ETRWPA are identified and discussed in Chapter 6. These parameters are generally a consideration for surface waters. Some of these parameters could be an issue for groundwater as well. The key water quality parameters identified include the following:

- Total Dissolved Solids (TDS)
- Dissolved Oxygen
- Nutrients
- Metals

- Turbidity

These parameters can potentially affect some aspect of aquatic life or the use of the water for recreation. However, in some cases they could affect its availability for water supply as well. Water quality impacts for surface water and groundwater as they relate to availability and treatment requirements are discussed below. Overall, surface water quality in the ETRWPA is addressed in Chapter 1.

Generally, the water quality impairments identified for surface water sources through the TCEQ's Clean Rivers Program does not limit the availability of surface water or the treatability of these sources. The brackish or saline run-of-the-river water rights are limited to uses that are compatible with high TDS water. This plan assumes that these water rights are being used for such purposes.

Based on water quality data for aquifers within the ETRWPA the limitations on water supply availability or treatability are rare for groundwater supplies in the ETRWPA. The most prevalent of the primary drinking water contaminants was found to be arsenic, which exceeded the standard of 0.10 mg/L in about nine percent of samples collected between 1981 and 2019 in the Carrizo-Wilcox, Gulf Coast, Queen City and Sparta aquifers. However, the median concentration of arsenic is 2.0 mg/L and the average is 5.8 mg/L. Arsenic can be removed from water using advanced treatment processes such as iron removal (adsorption and co-precipitation in high iron waters), coagulation and filtration, filters, or ion exchange. Given the relatively low incidence of arsenic contamination, it is unlikely that it would become a significant issue for the ETRWPA.

Secondary drinking water contaminants evaluated included copper, fluoride, chloride, iron, manganese, pH, sulfate, and TDS. Of these, copper, iron, manganese, and pH were commonly found in excess of secondary standards in some samples from all four aquifers. Iron and manganese are naturally occurring constituents in groundwater. In excess, they can cause taste and odor problems in drinking water, but not significant health problems. This is commonly treated by aeration. Industrial users of water with excessive levels of iron or manganese may require significant removal prior to using the water in industrial processes.

The well data also indicated that it is relatively common for pH concentrations in groundwater to be outside the allowable range (i.e., 6.5 to 8.5 standard units) for the four aquifers evaluated. However, neither the median nor the average values were found outside the range for any of the aquifers. Control of pH is easily accomplished through the addition of pH adjusting chemicals. This indicates that the pH concerns for groundwater in the ETRWPA are not a significant limiting factor in availability or treatability.

TDS was found to exceed the Texas secondary standard of 1,000 mg/L in only five percent of the samples. The average concentration for samples in the Carrizo-Wilcox and Gulf Coast aquifers is 392 mg/L. In the Queen City and Sparta samples, the average TDS is 429 mg/L.

### 3.4.3 Impact of Environmental Flow Policies on Water Rights, water Availability, and Water Planning

With the passage of Senate Bill 3 in the 2007 80th Regular Session, the State created a basin-by-basin process for developing recommendations to meet the instream flow needs of rivers as well as freshwater inflow needs of affected bays and estuaries and required TCEQ to adopt the recommendations in the form of environmental flow standards. Standards for the Neches and Sabine River Basins were adopted by the TCEQ on April 20, 2011. These standards are utilized in the decision-making process for new water right applications and in establishing an amount of unappropriated water to be set aside for the environment. Existing water rights at the time of the adoption are not subject to the environmental flow standards. These water rights were evaluated on a case by case basis to assess the effect of authorizing a new use of water with the need for that water to maintain a sound ecological system as part of the water rights permitting process. The environmental flow requirements set forth through Senate Bill 3 do not impact the region's currently available supplies shown in previous sections.

The implementation of environmental flow recommendations will result in a need to more carefully consider environmental flow needs during the development of surface water management strategies. Environmental flow requirements are one component that is considered when assessing the long-term protection of the region's water resources in Chapter 6.

## 3.5 Existing Water Supplies by Water User Group

The water availability by WUG is limited by the ability to deliver and/or use the water. These limitations include firm yield of reservoirs, well field capacity, aquifer characteristics, water quality, water rights, permits, contracts, regulatory restrictions, raw water delivery infrastructure and water treatment capacities where appropriate. Appendix 3-B presents the current water supplies for each WUG by county. (WUGs are cities, water supply corporations, county-other municipal users and county-wide manufacturing, irrigation, mining, livestock, and steam electric uses.) For county-wide user groups, historical use was considered in the determination of currently available supplies.

The table in Appendix 3-B shows the amount of supply available to each user group from each source by decade based on existing facilities. The supplies by county are shown in Table 3.15.

**Table 3.14 Summary of Existing Water Supplies of Water User Groups by County (ac-ft/yr)**

| County | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|
| Anderson | 19,164 | 19,326 | 19,290 | 19,183 | 19,140 | 19,120 |
| Angelina | 38,612 | 39,004 | 39,301 | 39,640 | 40,009 | 40,349 |
| Cherokee | 17,563 | 17,965 | 18,381 | 18,966 | 19,641 | 20,297 |
| Hardin | 8,022 | 8,223 | 8,356 | 8,479 | 8,606 | 8,710 |
| Henderson* | 7,457 | 7,518 | 7,581 | 7,796 | 7,075 | 6,565 |
| Houston | 11,692 | 11,670 | 11,589 | 11,518 | 11,445 | 11,412 |
| Jasper | 85,173 | 96,446 | 96,282 | 96,177 | 96,129 | 96,117 |
| Jefferson | 368,771 | 359,445 | 360,495 | 360,859 | 361,398 | 362,053 |
| Nacogdoches | 31,947 | 32,716 | 33,499 | 34,400 | 35,427 | 36,601 |
| Newton | 16,846 | 16,876 | 16,915 | 16,973 | 17,037 | 17,109 |
| Orange | 74,632 | 74,688 | 74,713 | 74,770 | 74,840 | 74,900 |
| Panola | 16,925 | 17,251 | 17,104 | 16,680 | 17,375 | 17,612 |
| Polk* | 2,671 | 2,747 | 2,822 | 2,902 | 2,975 | 3,041 |
| Rusk | 61,526 | 65,287 | 65,656 | 66,106 | 66,633 | 67,180 |
| Sabine | 5,488 | 5,501 | 5,495 | 5,493 | 5,493 | 5,493 |
| San Augustine | 4,294 | 4,303 | 4,314 | 4,326 | 4,340 | 4,340 |
| Shelby | 16,149 | 16,044 | 15,924 | 16,132 | 15,355 | 15,570 |
| Smith* | 39,562 | 41,768 | 43,842 | 46,406 | 49,285 | 52,121 |
| Trinity* | 1,571 | 1,581 | 1,575 | 1,567 | 1,576 | 1,584 |
| Tyler | 10,940 | 10,928 | 10,831 | 10,757 | 10,703 | 10,676 |
| **TOTAL** | **839,003** | **849,286** | **853,964** | **859,128** | **864,482** | **870,849** |

***** County is split between two planning regions. The available supply presented in this table represents only the portion of the county within the Region I boundary.

## 3.6 Existing Water Supplies by Major Water Provider

There are 16 designated MWPs in the ETRWPA. The ETRWPG has designated an MWP as a WUG or WWP that has wholesale water contracts for 1,000 ac-ft per year or is expected to contract for 1,000 ac-ft per year or more during at least one decade in the planning period. Similar to the available supply to WUGs, the water availability for each MWP is limited by the ability to deliver the raw water. These limitations include firm yield of reservoirs, well field capacity, aquifer characteristics, water quality, water rights, permits, contracts, regulatory restrictions, and infrastructure. Total available supply by decade for each wholesale provider is shown in Table 3.15.

**Table 3.15 Summary of Existing Water Supplies for Major Water Provider (ac-ft/yr)**

| Water Provider | Currently Available Supply | | | | | |
|---|---|---|---|---|---|---|
| | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** |
| Angelina and Neches River Authority | 65 | 70 | 70 | 70 | 70 | 70 |
| Angelina-Nacogdoches Water Control & Improvement District (WCID) No. 1 | 20,340 | 19,635 | 18,890 | 18,150 | 16,715 | 14,690 |
| Athens Municipal Water Authority | 8,203 | 8,117 | 8,031 | 7,945 | 7,859 | 7,773 |
| Beaumont | 34,469 | 36,451 | 37,525 | 37,525 | 37,525 | 37,525 |
| Carthage | 5,564 | 5,564 | 5,564 | 5,564 | 5,565 | 5,565 |
| Center | 5,260 | 5,260 | 5,260 | 5,260 | 5,260 | 5,260 |
| Houston Co. WCID 1 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,501 |
| Jacksonville | 7,391 | 7,391 | 7,391 | 7,391 | 7,391 | 7,391 |
| Lower Neches Valley Authority | 1,201,876 | 1,173,876 | 1,173,876 | 1,173,876 | 1,173,876 | 1,173,876 |
| Lufkin | 38,727 | 38,727 | 38,727 | 38,727 | 38,727 | 38,727 |
| Nacogdoches | 22,692 | 22,292 | 21,892 | 21,492 | 21,092 | 20,692 |
| Panola Co. Freshwater Supply District No. 1 | 21,367 | 20,686 | 20,006 | 19,325 | 18,644 | 17,963 |
| Port Arthur | 25,684 | 25,655 | 25,434 | 25,389 | 25,370 | 25,369 |
| Sabine River Authority of Texas | 1,103,010 | 1,103,010 | 1,103,010 | 1,103,010 | 1,103,010 | 1,103,010 |
| Tyler | 41,056 | 41,056 | 41,056 | 41,056 | 41,056 | 41,056 |
| Upper Neches River Municipal Water Authority | 197,710 | 196,110 | 194,610 | 193,010 | 191,310 | 189,010 |
| **Major Water Provider Totals** | **2,736,915** | **2,707,401** | **2,704,843** | **2,701,291** | **2,696,970** | **2,691,479** |

A brief description of the supply sources for each MWP is presented below. The analyses of the available supplies by source were determined using the assumptions outlined in Section 3.1.1. The results of these analyses are for planning purposes and do not affect the right of a water holder to divert and use the full amount of water authorized by its permit.

### 3.6.1 Angelina and Neches River Authority

Angelina and Neches River Authority has a state water right permit to construct Lake Columbia on Mud Creek in the Neches River Basin and divert 85,507 ac-ft per year. No currently available supply is shown since the reservoir is not constructed. The estimated firm yield using the modified Neches WAM Run 3 is 75,800 ac-ft per year in 2020. The supply shown in Table 3.15 for Angelina and Neches River Authority is groundwater for the Holmwood Utility.

### 3.6.2 Angelina-Nacogdoches Water Control Improvement District No 1

The Angelina-Nacogdoches Water Control & Improvement District No. 1 owns and operates Lake Striker in Rusk and Cherokee Counties. The firm yield from Lake Striker in 2020 is estimated at 20,340 ac-ft per year, which is expected to decrease to 14,690 ac-ft per year by 2070.

### 3.6.3 Athens Municipal Water Authority

Athens Municipal Water Authority (AMWA) has 8,500 ac-ft per year of water rights in Lake Athens. The firm yield of the lake using the modified Neches WAM Run 3 was estimated at 5,950 ac-ft per year in 2020. AMWA has one existing groundwater well near the WTP with a capacity of 886 ac-ft per year that they are planning to use as a current supply. The AMWA also has a wastewater reuse permit for 2,677 ac-ft per year, but the infrastructure is not in place to utilize this source. The City of Athens and AMWA continue to study indirect reuse as a supplement to the yield of Lake Athens. The AMWA is also proposing to develop additional groundwater supplies to supplement the surface water, but these supplies are not available at this time.

### 3.6.4 City of Beaumont

The City of Beaumont obtains water from the Neches River, groundwater wells from the Gulf Coast Aquifer in Hardin County and a contract with LNVA for surface water. The City currently uses about 9,500 ac-ft per year of groundwater with a current well capacity of about 23 million gallons per day (MGD). However, due to aquifer availability, the estimated reliable groundwater supply for Beaumont is limited to 9,500 ac-ft per year. The reliable Neches River supplies are estimated at 15,933 ac-ft per year for 2020 based on the daily analysis of the City's run-of-the-river water rights. This supply increases over time as demands increase, whereby additional surface water is utilized during periods with sufficient flows. By 2070, the amount of available run-of-the-river water is 21,588 ac-ft per year. The City also has a contract with LNVA to supplement its surface water supplies with releases from the Sam Rayburn/Steinhagen system. It is assumed that the LNVA contract is used to meet the remainder of the City's projected demands, provided the City has available treatment capacity. The City's current water treatment system is rated for 50 MGD, limiting the available treated surface water to 28,025 ac-ft per year. Considering both its groundwater and surface water sources the City's currently available treated water supplies total 34,469 ac-ft per year for 2020.

### 3.6.5 City of Carthage

The City of Carthage obtains its water from groundwater from the Carrizo-Wilcox Aquifer and surface water from Panola County Freshwater Supply District. The City has a contract with Panola County Freshwater Supply District for 12 MGD of water from Lake Murvaul. Considering its current water system capacities, the city of Carthage has approximately 5,565 ac-ft per year of reliable supply.

### 3.6.6 City of Center

The City of Center currently obtains water from Lake Center and Lake Pinkston for use within the City and for distribution to its municipal and industrial customers. The City owns and operates Lake Center, with a firm yield of 1,460 ac-ft of municipal water. Water from Lake Pinkston is pumped from the Neches River Basin to the City, located in the Sabine River Basin. The City holds rights to 3,800 ac-ft per year of water in Lake Pinkston. The total available supply for the City of Center is 5,260 ac-ft per year.

### 3.6.7 Houston County Water Control Improvement District (WCID) No. 1

Houston County WCID No. 1's water rights to Houston County Lake include a right to divert 3,500 ac-ft per year at a rate not to exceed 6,300 gallons per minute. The entity originally had a right to divert 7,000 ac-ft per year, which was reduced to the current right of 3,500 ac-ft per year. Houston County WCID No. 1 has applied for a water right permit to access the additional 3,500 ac-ft per year supplies in 2007. Supplies to Houston County WCID No. 1 are limited to its permitted diversions.

### 3.6.8 City of Jacksonville

The City of Jacksonville obtains water supplies from Lake Jacksonville and the Carrizo-Wilcox Aquifer. The City holds 6,200 ac-ft per year in water rights in Lake Jacksonville. The ability to use this water for municipal purposes is limited by the City's water treatment capacity (estimated at 5,173 ac-ft per year). The groundwater supplies are estimated at 2,218 ac-ft per year based on current well field production. The total supply available to Jacksonville is 7,391 ac-ft per year.

### 3.6.9 Lower Neches Valley Authority

The LNVA maintains water rights from Lake Sam Rayburn/Lake B.A. Steinhagen and run-of-the-river diversion from the Neches River. LNVA has an agreement to use full amount of Lufkin's share of supplies (28,000 ac-ft per year) from Lake Sam Rayburn/Lake B.A. Steinhagen through the 2020-2030 decade. LNVA's water rights total 1,201,876 ac-ft per year in 2020 and 1,173,876 ac-ft per year after 2030. The LNVA currently possesses the infrastructure to divert these water rights to its municipal, manufacturing, mining, and irrigation users.

### 3.6.10 City of Lufkin

The City of Lufkin presently obtains groundwater from the Carrizo-Aquifer in Angelina County and surface water from Lake Kurth. Groundwater supplies for the City of Lufkin are estimated to be 20,277 ac-ft throughout the planning horizon (2020-2070), based on its well field pumping capacity. The City has water rights to divert from 16,200 ac-ft per year from Lake Kurth, plus run-of-river diversions. Lufkin also has a water right for 28,000 ac-ft per year of water from Lake Sam Rayburn. Currently there are no transmission facilities from Lake Sam Rayburn to use this water.

### 3.6.11 City of Nacogdoches

The City of Nacogdoches obtains groundwater from the Carrizo-Wilcox aquifer and surface water from Lake Nacogdoches. The groundwater supply of 6,492 ac-ft per year is based on the average annual current well field pumping capacity. The City currently has water rights to divert 22,000 ac-ft per year of water from Lake Nacogdoches. The modified Neches WAM Run 3 shows the current firm yield of this lake to be 16,200 ac-ft per year in 2020 and reducing to 14,200 ac-ft per year by 2070. The total supply to Nacogdoches in 2020 is 22,692 ac-ft per year.

### 3.6.12 Panola County Freshwater Supply District No. 1

The Panola County Freshwater Supply District No. 1 owns and operates Lake Murvaul in the ETRWPA. The estimated firm yield of Lake Murvaul using the modified Sabine WAM Run 3 is 21,367 ac-ft per year in year 2020, decreasing to 17,963 ac-ft per year by 2070.

### 3.6.13 City of Port Arthur

The City of Port Arthur receives raw water supply from the LNVA. Treated water is supplied to industrial users in addition to its citizens. It is assumed that LNVA will provide for 100% of the City's demands. The projected supply from LNVA is 25,684 ac-ft per year in 2020, decreasing to 25,367 ac-ft per year by 2070.

### 3.6.14 Sabine River Authority of Texas

The SRA owns and operates Lake Tawakoni, Lake Fork, and the Toledo Bend Reservoir. In addition, the SRA maintains run-of-the-river rights from the Sabine in Newton and Orange County. The SRA provides water to municipal and industrial customers in Region C and Region D from Lake Fork and Lake Tawakoni, located outside of the ETRWPA. Some customers in the ETRWPA receive water from Lake Fork through downstream releases and riverine diversions. Most of the water in the ETRWPA from SRA is provided from Toledo Bend Reservoir and diversions from the Sabine River through the SRA Canal System. SRA holds water rights of 238,100 ac-ft per year from Lake Tawakoni, 188,660 ac-ft per year from Lake Fork, 970,067 ac-ft per year from Toledo Bend Reservoir and 147,100 ac-ft per year from the Sabine River. The reliable supply from SRA's Lower Basin sources (Toledo Bend Reservoir and the Canal System) is 1,103,010 ac-ft per year.

### 3.6.15 City of Tyler

The City of Tyler receives raw water supply from Lake Tyler and Tyler East with a firm yield of 34,830 ac-ft per year in 2020. Supply from these reservoirs is limited to 19,057 ac-ft per year by the water treatment plant capacity (34 MGD). The City also has a contract with the UNRMWA for 60 MGD from Lake Palestine. The City of Tyler has constructed a 30 MGD treatment facility at the lake and currently can use 16,815 ac-ft per year from Lake Palestine. The City possesses water rights to Lake Bellwood; however, the raw water from this source is used only for irrigation. Water is not treated by the City from this source. The City also obtains water from the Carrizo-Wilcox aquifer. The estimated reliable supply from groundwater is 4,484 ac-ft per year, which was reduced from its production capacity due to limited aquifer availability. Collectively, the City has a total of 40,356 ac-ft per year of treated water and an additional 400 ac-ft per year of raw water from Lake Bellwood.

### 3.6.16 Upper Neches River Municipal Water Authority

The UNRMWA maintains a total water right of 238,110 ac-ft per year for diversions from Lake Palestine and a downstream location at Rocky Point Dam. The UNRMWA operates these rights as a system. Available supply using the modified Neches WAM Run 3 is estimated at 197,710 ac-ft per year in year 2020, decreasing to 189,010ac-ft per year by 2070.