



Technical Note 21-01

# **Evaporative Losses from Major Reservoirs in Texas**

by

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## Executive Summary

This report provides computed reservoir evaporation losses from 2001 through 2018 for 114 monitored major water supply and cooling reservoirs in Texas. A major reservoir in Texas is defined as to having original conservation storage greater than 5,000 acre-feet. The study period was set at 2001 through 2018 to ensure complete maximum data availability on reservoir water level. Total annual gross evaporation from these 114 reservoirs has been relatively stable during the period from 2001 to 2018, ranging from 5.85 to 7.96 million acre-feet with an average value of 6.88 million acre-feet. Annual net evaporation, which factors in precipitation over the lake, ranges from a net gain of approximately 115 thousand acre-feet in 2015 to a net loss of 5.42 million acre-feet in 2011 with an average net loss value of 1.91 million acre-feet per year. We extrapolated these results to the 188 major water supply reservoirs in Texas based on the proportional total surface area at the conservation pool level and found an average total annual gross evaporation of 7.38 million acre-feet per year and an average annual net evaporation loss of 2.04 million acre-feet per year. A key finding of the study is that annual reservoir evaporative loss in drought years, such as 2011, can exceed total annual municipal water use, highlighting the fact that reservoir evaporative loss should ideally factored into the regional water planning process either as a water demand factor or as a factor that affects future surface water availability. Further consideration to technologies for preventing reservoir evaporation loss as a future water management strategy in the regional water planning processes.

## Introduction

Evaporation is a major source of water loss from Texas reservoirs. Evaporative loss rates are greater during summer than other seasons and are greater in the drier and hotter western half of the state than in the eastern half. Reservoir evaporation is an important factor to consider in reservoir operations and in the development of new water management strategies such as building new reservoirs. The drought of 2011 raised awareness about the significance of evaporative losses from Texas' water supply reservoirs. Because of this renewed awareness, and to quantify the magnitude of reservoir evaporation loss in Texas, we computed the volumetric loss due to evaporation for every monitored reservoir in the state and developed a statewide estimate of total volumetric loss for all major water supply reservoirs. In so doing, we specifically computed monthly gross reservoir evaporation volumetric loss and net reservoir evaporation volumetric loss or gain for 114 monitored reservoirs from 2001 through 2018 based on observed reservoir water level, evaporation data, and precipitation data. We then extrapolated evaporative losses for the 188 major water supply reservoirs (114 monitored reservoirs are included) listed in the State Water Plan (TWDB, 2012; 2017)<sup>1</sup> since the rest 74 reservoirs do not have water stage information.

## Background

Historically, evaporation from reservoirs has been estimated by using pan evaporation data (Lowry 1960, Kane 1967, Dougherty 1975). The Texas Water Development Board (TWDB) has collected daily pan evaporation data through a cooperative program of approximately 18–50 evaporation stations (number of cooperators varies from year to year). In addition to cooperator data, TWDB staff acquires daily Class A pan evaporation data from the National Weather Service and National Centers for Environmental Information (NCEI) for another 60 to 80 stations in Texas and from four surrounding 4 states (Arkansas, Louisiana, New Mexico, and Oklahoma). The data are summed up to monthly dataset and subjected to quality assurance and quality control procedures. The monthly station data are used to

<sup>1</sup> There is no list of reservoirs in the 2017 State Water Plan [TWDB, 2017], but the default number for all water supply reservoirs is still 188 as shown in page 62.

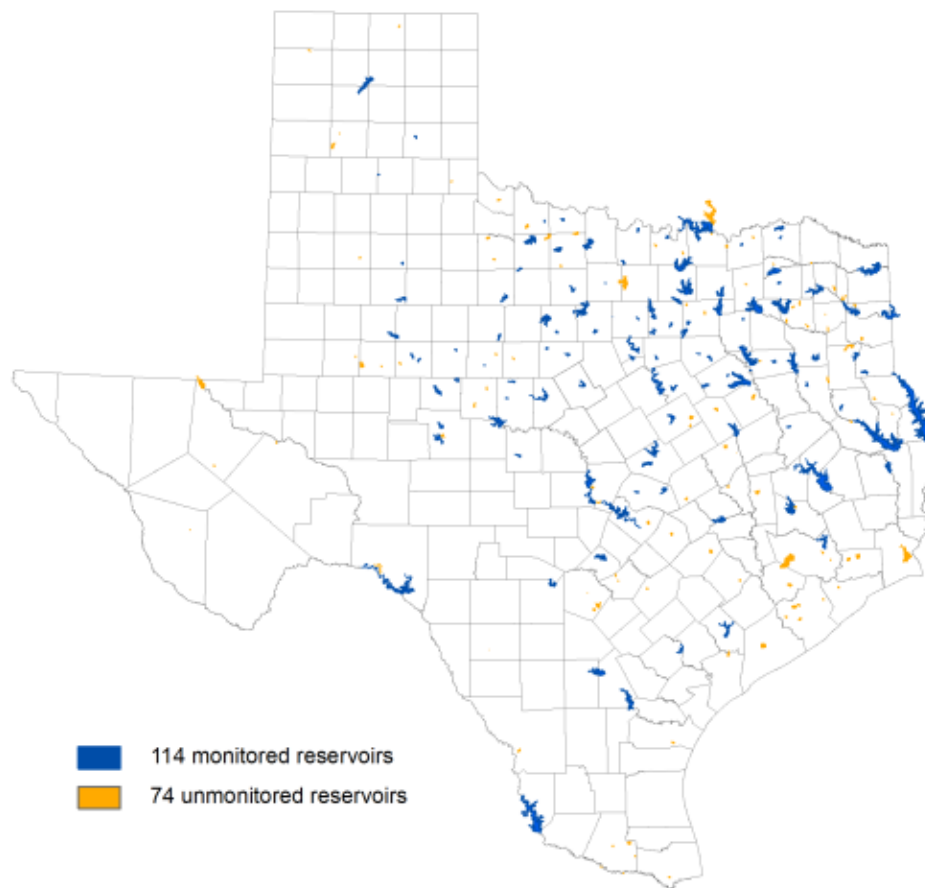
produce monthly Thiessen polygons covering the entire territory of Texas and surrounding areas. The monthly data value for each polygon area is distributed to one-degree longitude by one-degree latitude quadrangle (grids) through an area-weighted method. Precipitation data are processed in the same way. The quadrangular monthly gross lake surface evaporation rate (after applying by pan-to-lake coefficient), precipitation rates, and net reservoir evaporation rates (i.e., gross evaporation minus precipitation) are published at:

<https://www.waterdatafortexas.org/lake-evaporation-rainfall>.

## Methodology

Out of 188 major water-supply reservoirs in Texas, 114 are monitored daily for water level or storage capacity. We computed volumetric evaporation loss for these 114 water-supply or cooling reservoirs (Figure 1 and Appendix A). Monthly volumetric reservoir evaporation loss is computed by multiplying the evaporation rate (gross or net) by a monthly mean reservoir surface area. The net evaporation rate equals gross evaporation rate less the precipitation rate. When an evaporation pan station is beside a lake, the station data (after applying pan-to-lake coefficient) is used in the computation for that reservoir, since it provides higher spatial accuracy than using quadrangular data; otherwise, quadrangular data are used. The reservoir's surface area is not directly measured but instead derived using the latest reservoir-specific elevation–area rating curve and a measured water level. In this study, monthly mean reservoir surface area is the average of daily surface areas for a month, which is derived from daily mean water level observations. When a reservoir's water level exceeds its conservation pool elevation, thus going beyond the regular range of the elevation-area rating curve, a linear extrapolation of the rating curve is applied for computing surface area. When there is no observed water level data for a (or a couple of) month, an average monthly water level is interpolated from observed data of nearest months. For reservoirs bordering other states (e.g., Lake Texoma and Toledo Bend Reservoir) or Mexico (e.g., Amistad and Falcon reservoirs), we used the entire surface area in the computation.

At conservation pool elevation, these 114 reservoirs represent approximately 93 percent of the total surface area and about 98 percent of the total conservation capacity of 188 major water supply reservoirs in Texas as listed in 2012 State Water Plan (TWDB, 2012). Therefore, the computed evaporation loss from the 114 reservoirs was extrapolated to that for the 188 major water-supply reservoirs by dividing by a factor of 0.93 – a factor corresponding to the surface area represented by the 114 reservoirs.



**Figure 1.** Location of 188 major reservoirs in Texas

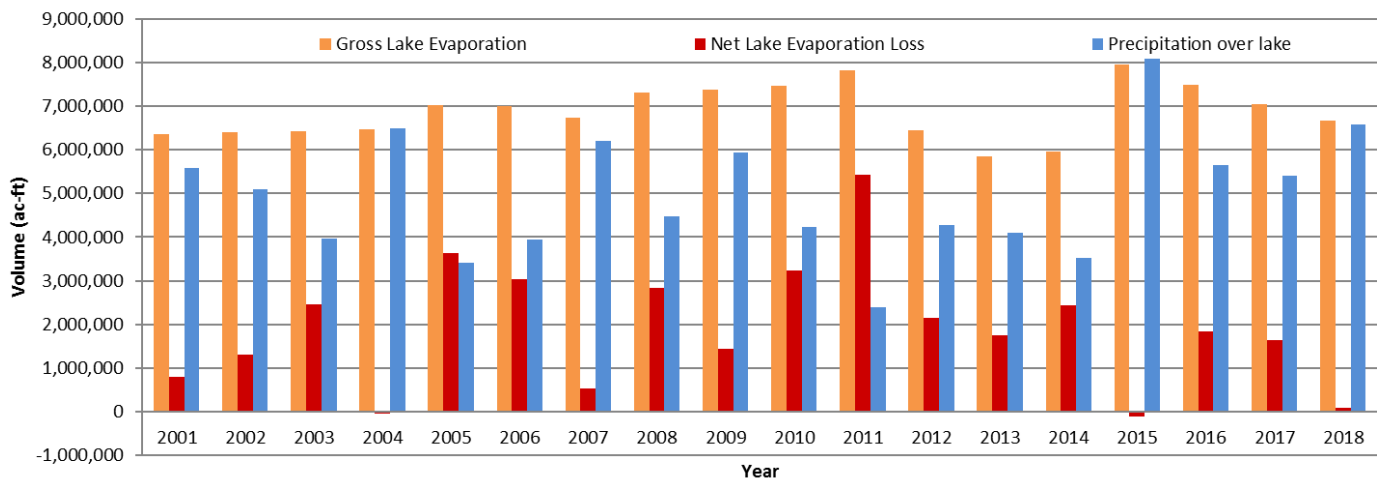
## Results

### Evaporation Losses Computed from 114 Monitored Reservoirs

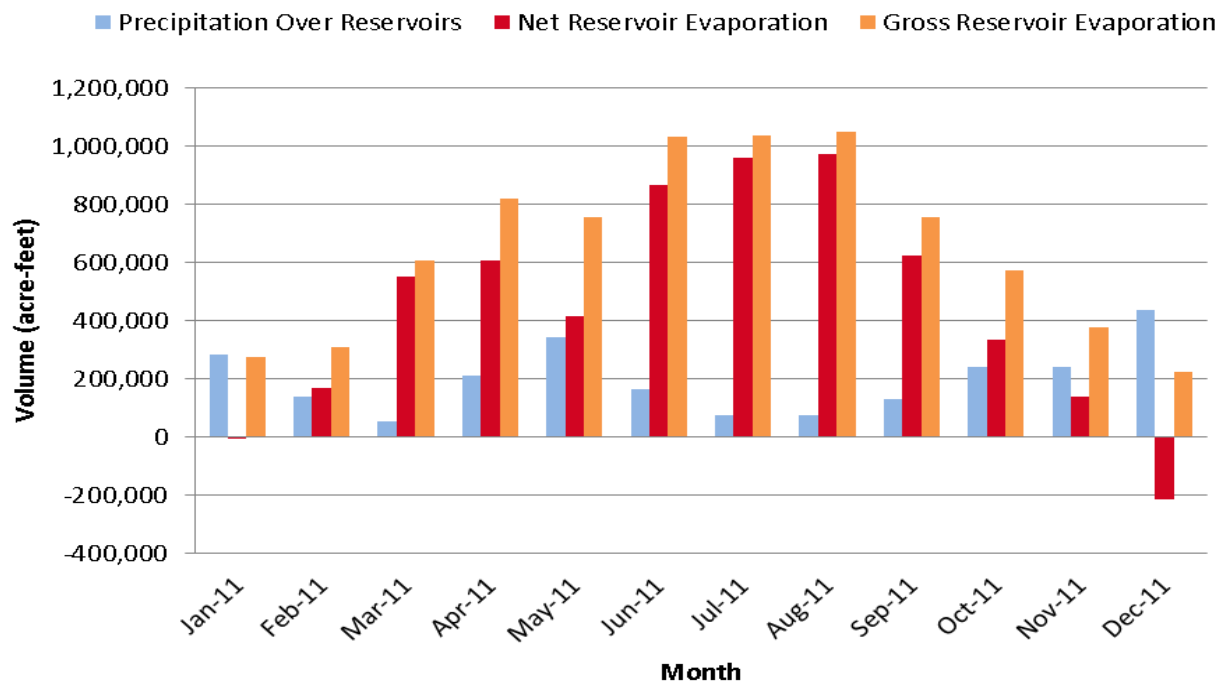
Total annual gross lake evaporation, precipitation, net lake evaporation, together with the reservoir surface area are computed (Table 1 and Figure 2). The annual gross lake evaporation, precipitation, and net lake evaporation from 114 monitored reservoirs during 2001–2018 period ranged from 5.85 to 7.96, 2.39 to 8.08, and -0.12 to 5.42, all in million acre-feet, respectively. The corresponding average annual gross evaporation, precipitation, and net evaporation are 6.88, 4.96, and 1.91, all in million acre-feet, respectively. Year 2011 has the second highest annual gross lake evaporation (7.81 million acre-feet), lowest annual precipitation (2.39 million acre-feet), therefore highest net evaporation, 5.42 million acre-feet. The net evaporation of 2011 is 3.51 million acre-feet greater than the average net evaporation of 1.91 million acre-feet. The result is consistent with reported record high temperature from March to November 2011 and record low rainfall from December 2010 through August 2011 from the State Climatologist (Nielsen-Gammon, 2011). Figure 3 presents the monthly gross evaporation, precipitation, and net evaporation in 2011 from our computation.

**Table 1.** Annual reservoir evaporation, precipitation, reservoir surface area, and evaporation rate for 114 Reservoirs

| Year           | Gross Reservoir Evaporation (million acre-feet) | Precipitation Over Reservoirs (million acre-feet) | Net Reservoir Evaporation (million acre-feet) | Average Monthly Total Surface Area (million acres) | Average Annual Gross Evaporation Rate (feet) |
|----------------|-------------------------------------------------|---------------------------------------------------|-----------------------------------------------|----------------------------------------------------|----------------------------------------------|
| 2001           | 6.36                                            | 5.57                                              | 0.79                                          | 1.48                                               | 4.31                                         |
| 2002           | 6.40                                            | 5.09                                              | 1.32                                          | 1.46                                               | 4.39                                         |
| 2003           | 6.42                                            | 3.97                                              | 2.45                                          | 1.46                                               | 4.42                                         |
| 2004           | 6.46                                            | 6.50                                              | -0.03                                         | 1.51                                               | 4.29                                         |
| 2005           | 7.03                                            | 3.40                                              | 3.63                                          | 1.48                                               | 4.75                                         |
| 2006           | 7.00                                            | 3.95                                              | 3.04                                          | 1.35                                               | 5.19                                         |
| 2007           | 6.73                                            | 6.19                                              | 0.54                                          | 1.58                                               | 4.27                                         |
| 2008           | 7.31                                            | 4.47                                              | 2.84                                          | 1.52                                               | 4.82                                         |
| 2009           | 7.38                                            | 5.94                                              | 1.44                                          | 1.52                                               | 4.86                                         |
| 2010           | 7.47                                            | 4.23                                              | 3.23                                          | 1.53                                               | 4.88                                         |
| 2011           | 7.81                                            | 2.39                                              | 5.42                                          | 1.32                                               | 5.91                                         |
| 2012           | 6.44                                            | 4.28                                              | 2.16                                          | 1.32                                               | 4.86                                         |
| 2013           | 5.85                                            | 4.11                                              | 1.74                                          | 1.24                                               | 4.73                                         |
| 2014           | 5.96                                            | 3.53                                              | 2.43                                          | 1.26                                               | 4.59                                         |
| 2015           | 7.96                                            | 8.08                                              | -0.12                                         | 1.61                                               | 4.96                                         |
| 2016           | 7.49                                            | 5.66                                              | 1.83                                          | 1.64                                               | 4.57                                         |
| 2017           | 7.05                                            | 5.40                                              | 1.65                                          | 1.51                                               | 4.67                                         |
| 2018           | 6.67                                            | 6.59                                              | 0.08                                          | 1.52                                               | 4.96                                         |
| <b>Average</b> | <b>6.88</b>                                     | <b>4.96</b>                                       | <b>1.91</b>                                   | <b>1.46</b>                                        | <b>4.57</b>                                  |

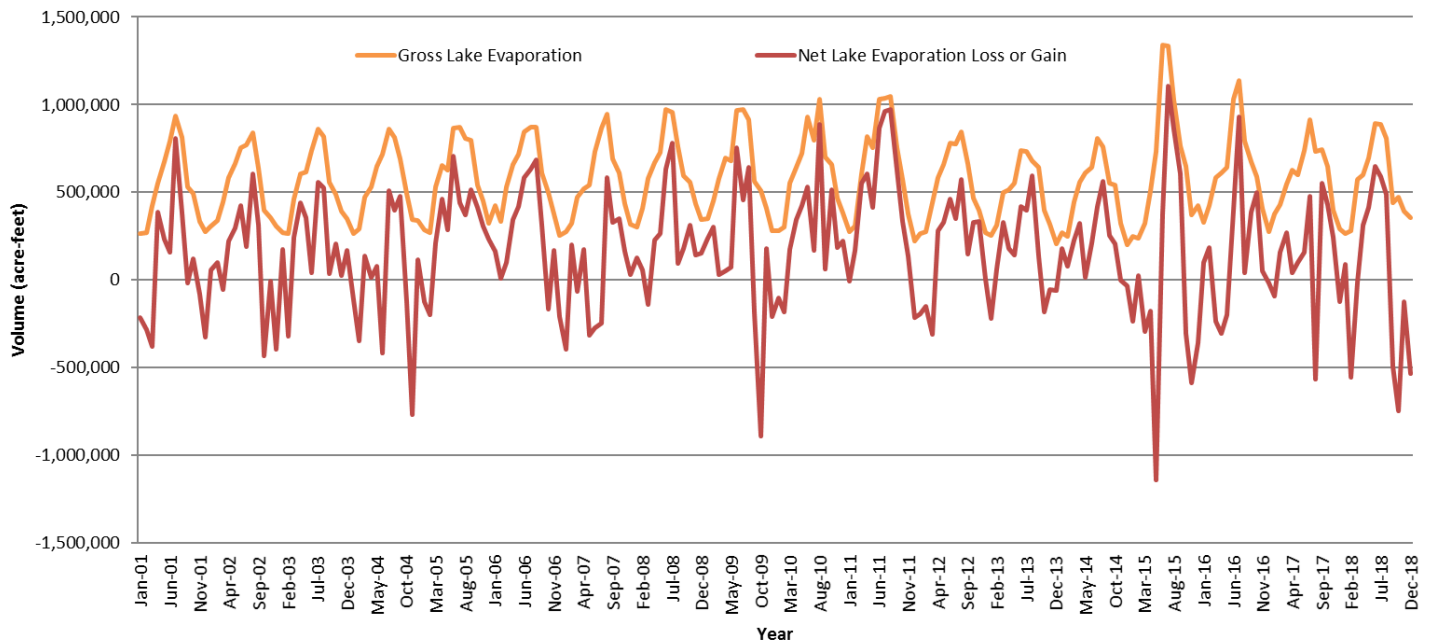


**Figure 2.** Annual reservoir gross and net evaporations and precipitation for the 114 monitored reservoirs

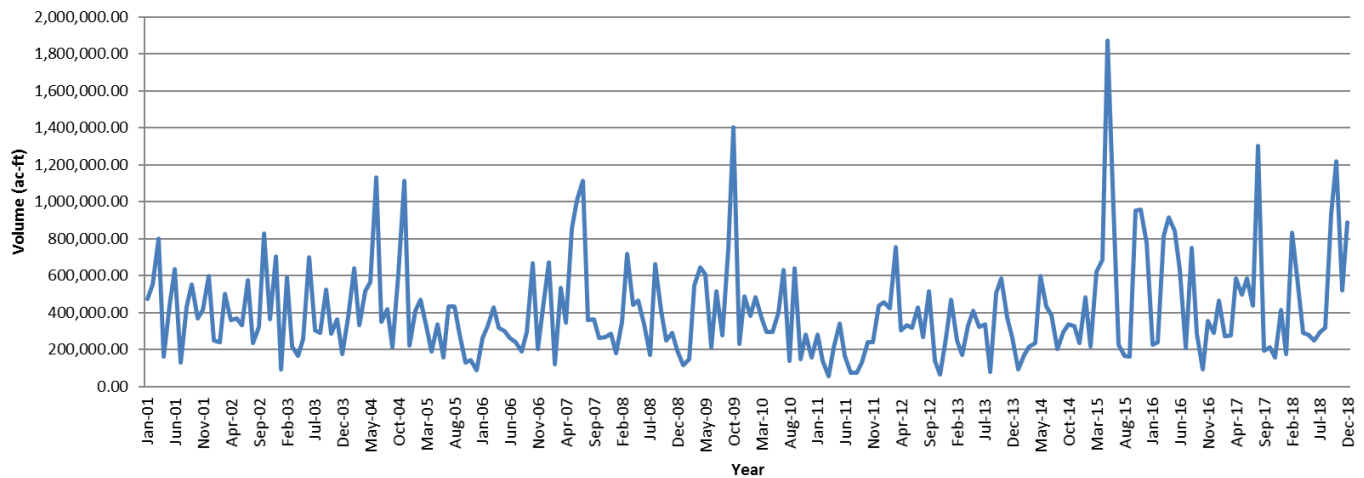


**Figure 3.** Monthly gross reservoir evaporation, net reservoir evaporation, and precipitation for 114 reservoirs in 2011 (negative net evaporation in December means net gain. This could be due to rainfall in December 2011 that ended the meteorological drought in most areas of the state).

Total monthly gross reservoir evaporation of these 114 reservoirs varies seasonally throughout a year with winter lows and summer highs (Figure 4 orange color). The minimum value was 198,637 acre-feet recorded in the winter of 2014 (December) and the maximum value was 1.34 million acre-feet recorded in summer of 2015 (June). The average monthly gross evaporation was approximately 573,131 acre-feet per month from January 2001 through December 2018. Total monthly reservoir precipitation on the 114 monitored reservoirs ranged from 54,988 acre-feet in March 2011 to 1.87 million acre-feet in May 2015 (Figure 5), with an average value of approximately 413,678 acre-feet per month. Precipitation has large interannual variability as depicted in Figure 5. Large values of rainfall over reservoirs (over a million acre-feet per month) were recorded in 2004, 2007, 2009, 2015, 2017, and 2018 (see peaks in figure 5). Total monthly net evaporation (dark-red line in figure 4) has a large monthly variability due to large intra-annual variations in rainfall. Large rainfall events as mentioned early led to large negative monthly net reservoir evaporation during those times (low drops of dark-red line in Figure 4). Total monthly net reservoir evaporation ranged from a net gain of 1.14 million acre-feet in May 2015 to a net loss of 1.11 million acre-feet in July 2015. The average total monthly net reservoir evaporation was approximately 159,453 acre-feet per month from 2001 through 2018.



**Figure 4.** Monthly gross and net reservoir evaporation for 114 reservoirs



**Figure 5.** Monthly total precipitation over 114 reservoirs

### Estimated Evaporation Losses from 188 Reservoirs

Extrapolated by the method discussed above (page 3), annual gross reservoir evaporation loss for all 188 reservoirs for the period from 2001 through 2018 are estimated to range from 6.29 to 8.56 million acre-feet per year with an average of 7.38 million acre-feet per year (Table 2). Annual estimated net evaporation loss ranged from a net gain of approximately 130,000 acre-feet (2015) to a net loss of 5.83 million acre-feet (2011) with an average net loss of approximately 2.04 million acre-feet per year. It should be noted that this estimation is to estimate the evaporative loss from those 74 unmonitored major water supply reservoirs. The computed loss for the 114 monitored reservoirs has not been revised.

**Table 2.** Estimated Annual Gross and Net Evaporation for 188 Reservoirs

| <b>Year</b>    | <b>Gross Reservoir Evaporation<br/>(million acre-feet)</b> | <b>Net Reservoir Evaporation<br/>(million acre-feet)</b> |
|----------------|------------------------------------------------------------|----------------------------------------------------------|
| 2001           | 6.84                                                       | 0.85                                                     |
| 2002           | 6.88                                                       | 1.42                                                     |
| 2003           | 6.90                                                       | 2.63                                                     |
| 2004           | 6.95                                                       | -0.03                                                    |
| 2005           | 7.56                                                       | 3.90                                                     |
| 2006           | 7.53                                                       | 3.27                                                     |
| 2007           | 7.24                                                       | 0.58                                                     |
| 2008           | 7.86                                                       | 3.05                                                     |
| 2009           | 7.94                                                       | 1.55                                                     |
| 2010           | 8.03                                                       | 3.47                                                     |
| 2011           | 8.40                                                       | 5.83                                                     |
| 2012           | 6.92                                                       | 2.32                                                     |
| 2013           | 6.29                                                       | 1.87                                                     |
| 2014           | 6.22                                                       | 2.22                                                     |
| 2015           | 8.56                                                       | -0.13                                                    |
| 2016           | 8.05                                                       | 1.97                                                     |
| 2017           | 7.58                                                       | 1.77                                                     |
| 2018           | 7.17                                                       | 0.09                                                     |
| <b>Average</b> | <b>7.38</b>                                                | <b>2.04</b>                                              |

## Discussion

In 2014, Wurbs and Ayala (2014) published a study on the statewide reservoir evaporation. They used the Texas Water Availability Model (WAM, Run 8) to estimate total net evaporation volumes from 3,435 major and minor reservoirs included in the WAM. The study simulates the evaporation from the water bodies as if the reservoirs existed during the period of 1940–1998 with a latest capacity before 2000. The model uses the maximum diversion during the 10-year period before 2000. They reported total average net evaporation to be between 5 to 6 million acre-feet per year during 1940s–1990s. This is a much larger number than our estimate of 2.04 million acre-feet per year from 188 major water supply reservoirs.

Several differences in methodology contribute to the difference in the two studies. First, our study is based on the observed evaporation, precipitation, and reservoir water level data from 2001–2018 while the Wurbs and Ayala (2014) study is based on WAM simulation for period of 1940s–1990s which include 1950s megadrought in Texas. Although our computation period includes a one-year recorded drought in Texas in 2011, there several wet years (2004, 2007, 2015, and 2018) are involved. Second, our study is for 188 major water supply reservoirs, while Wurbs and Ayala (2014) study includes many other minor reservoirs and water ponds, for a total of 3,435 water bodies. Therefore, the Wurbs and Ayala (2014) could have a higher estimate of total evaporation loss because they included all permitted surface water bodies in Texas.

Other factors that may contribute to the discrepancy include:

1. The reservoir surface areas in Wurbs and Ayala (2014) are calculated from area-capacity rating curves developed before 2000 that have large incremental intervals of water elevation, and do not include storage above the conservation pool. We used the latest and detailed elevation-area rating curves available that report on all observed water levels, including beyond the conservation pool. Therefore, it is not surprising that the average total surface area for water bodies in the Wurbs and Ayala (2014) study is less than the average total surface area for the monitored 114 major reservoirs included in our study.
2. The reservoir storage in the Wurbs and Ayala (2014) study was simulated using an unchanged maximum annual diversion target, based on 1990–2000 values rather than actual recorded diversion values. Using the maximum diversion target may cause simulated storage to be lower than observed storage.
3. According to U.S. Census Bureau unpublished data from the MAF/TIGER database (<http://www.census.gov/geo/reference/state-area.html>), the total surface area of perennially open water bodies (excluding bays and estuaries) in Texas is approximately 4.46 million acres. If we extrapolate our average annual net evaporation from 114 reservoirs to all water bodies with 4.46 million acres of surface area, the total will be 5.83 million acre-feet ( $1.914 * 4.46/1.46$ ). Based on this information, it seems that the result from Wurbs and Ayala (approximately 5-6 million acre-feet per year) might be a slight over-estimate on per area basis, because the number of permitted water bodies may be much less than the perennial open water bodies from the U. S. Census Bureau (some may not have water permit).
4. The difference may also be largely be due to the difference of time periods we considered. It also should be noted that the net reservoir evaporation rate from the 1940s through 1953 in the WAM models are no longer supported by the TWDB. This is because these rates were derived from observations taken at multiple types of evaporation pans and are considered to over-estimate the evaporation rate (TWDB, 1998, internal report, page 13) for that period. TWDB no longer publishes reservoir evaporation rate data prior to 1954.

To quantify the scale of evaporation losses from major reservoirs in Texas for audience, we compared net reservoir evaporation loss with the total municipal water use in Texas. The TWDB estimated that annual statewide municipal water use (from all types of source including groundwater) from 2001 through 2018 was less than five million acre-feet per year (Table 3, average was 4.32 million acre-feet). This value is typically greater than the statewide net reservoir evaporation of 188 reservoirs (average was 2.04 million acre-feet) for the same period. During the period of 2001–2018, statewide total municipal use as a percentage of net evaporation ranged from -3 percent to 117.3 percent, or an average of 47.1 percent.

Of interest is the fact that the net reservoir evaporation loss in 2011 (5.83 million acre-feet) was higher than the municipal water use (4.97 million acre-feet) in 2011, although the maximum annual water use was recorded in 2011. This result highlights the fact that during drought years evaporative water loss from reservoirs is significant in Texas.

**Table 3.** Comparison of Reservoir Evaporation Loss and Municipal Water Use (million acre-feet).

| Year           | Total Municipal Water Use | Net Reservoir Evaporation | Net Reservoir Evaporation as Percent of Municipal Water Use (%) |
|----------------|---------------------------|---------------------------|-----------------------------------------------------------------|
| 2001           | 4.19                      | 0.85                      | 20.3                                                            |
| 2002           | 4.12                      | 1.42                      | 34.5                                                            |
| 2003           | 4.03                      | 2.63                      | 65.3                                                            |
| 2004           | 3.99                      | -0.03                     | -0.8                                                            |
| 2005           | 4.53                      | 3.90                      | 86.1                                                            |
| 2006           | 4.81                      | 3.27                      | 68.0                                                            |
| 2007           | 4.35                      | 0.58                      | 13.3                                                            |
| 2008           | 4.17                      | 3.05                      | 73.1                                                            |
| 2009           | 4.18                      | 1.55                      | 37.1                                                            |
| 2010           | 4.21                      | 3.47                      | 82.4                                                            |
| 2011           | 4.97                      | 5.83                      | 117.3                                                           |
| 2012           | 4.47                      | 2.32                      | 51.9                                                            |
| 2013           | 4.22                      | 1.87                      | 44.3                                                            |
| 2014           | 4.01                      | 2.22                      | 55.4                                                            |
| 2015           | 4.28                      | -0.13                     | -3.0                                                            |
| 2016           | 4.41                      | 1.97                      | 44.7                                                            |
| 2017           | 4.42                      | 1.77                      | 40.0                                                            |
| 2018           | 4.44                      | 0.09                      | 2.0                                                             |
| <b>Average</b> | <b>4.32</b>               | <b>2.04</b>               | <b>47.1</b>                                                     |

(Statewide municipal water use data available for up to 2018

[https://www3.twdb.texas.gov/apps/reports/WU/SumFinal\\_BasinReport](https://www3.twdb.texas.gov/apps/reports/WU/SumFinal_BasinReport) and  
[https://www3.twdb.texas.gov/apps/reports/WU/SumFinal\\_BasinReportWithReuse](https://www3.twdb.texas.gov/apps/reports/WU/SumFinal_BasinReportWithReuse)

## Conclusions

This study reports on gross and net reservoir evaporation loss for 114 monitored major water supply and cooling reservoirs in Texas for the period 2001 through 2018 using observed water level, evaporation, and precipitation data. Further, the study extrapolates the evaporation losses from the 114 reservoirs to all 188 major water supply reservoirs in Texas.

Total annual gross evaporation loss from the 114 reservoirs ranges from 5.85 to 7.96 million acre-feet per year with an average of 6.88 million acre-feet per year from 2001 through 2018. Total annual gross reservoir evaporation estimated for the 188 reservoirs ranges from 6.29 to 8.56 million acre-feet per year, with an average loss of 7.38 million acre-feet per year for the same period. Total annual net evaporation loss for the same period and for the 114 reservoirs ranges from a net gain of approximately 115,000 acre-feet in 2015 to a net loss of 5.42 million acre-feet in 2011, with an average loss of 1.91 million acre-feet per year for the same period.

Total annual estimated net evaporation loss from the 188 major water supply reservoirs ranges from a gain of 130,000 acre-feet in 2015 to a loss of 5.83 million acre-feet in 2011, with an average loss of 2.04 million acre-feet per year for the same period.

The result of this study reveals that a significant volume of water evaporates from our reservoirs, especially during droughts, such as seen in 2011. The net reservoir evaporation loss (5.83 million acre-feet) in 2011 was higher than municipal water use (4.97 million acre-feet) that year, even though 2011 had the maximum recorded annual water use.

We have demonstrated that reservoir evaporation is a source of major water loss from surface water sources. This loss is currently not accounted for as a water demand factor or as a factor leading to a reduction in future available reservoir supply in the regional water planning process in Texas. We draw attention to the need to factor evaporative loss when estimating future available surface water in Texas. Such accounting for evaporative loss can guide decisions on whether investments to reduce reservoir evaporation as a potential water management strategy will be needed in the future.

## Acknowledgements

We sincerely thank to former employees who supported this project and provided guidance for the compilation of this report. These include: Dr. Yujuin Yang, Dr. Ruben Solis, and Dr. Robert E. Mace.

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**Appendix A: List of 114 Monitored Reservoirs Used in the Analysis**

| USGS Gage ID | Reservoir Name  | Year of Completion | Conservation Capacity (acre-feet) | Surface Area at Top of Conservation Pool (acres) |
|--------------|-----------------|--------------------|-----------------------------------|--------------------------------------------------|
| 8083270      | Abilene         | 1921               | 6,099                             | 595                                              |
| 8079700      | Alan Henry      | 1994               | 94,808                            | 2,741                                            |
| 8888888      | Amistad         | 1969               | 3,275,532                         | 65,597                                           |
| 8043700      | Amon G Carter   | 1956               | 27,500                            | 1,489                                            |
| 8093350      | Aquilla         | 1983               | 44,566                            | 3,066                                            |
| 8049200      | Arlington       | 1957               | 40,188                            | 1,926                                            |
| 7314800      | Arrowhead       | 1966               | 235,997                           | 14,506                                           |
| 8031290      | Athens          | 1963               | 29,475                            | 1,799                                            |
| 8154900      | Austin          | 1939               | 24,644                            | 1,589                                            |
| 8040000      | B.A. Steinhagen | 1951               | 66,972                            | 10,235                                           |
| 8063700      | Bardwell        | 1965               | 46,472                            | 3,138                                            |
| 8102000      | Belton          | 1954               | 435,225                           | 12,135                                           |
| 8046500      | Benbrook        | 1950               | 85,648                            | 3,635                                            |
| 7344489      | Bob Sandlin     | 1978               | 201,733                           | 8,703                                            |
| 7332610      | Bonham          | 1969               | 11,038                            | 1,012                                            |
| 8144900      | Brady Creek     | 1963               | 30,430                            | 2,020                                            |
| 8043000      | Bridgeport      | 1931               | 366,236                           | 11,712                                           |
| 8143000      | Brownwood       | 1933               | 131,429                           | 6,814                                            |
| 8148000      | Buchanan        | 1938               | 883,308                           | 22,137                                           |
| 7346310      | Caddo           | 1968               | 129,000                           | 26,800                                           |
| 8167700      | Canyon          | 1964               | 378,852                           | 8,308                                            |
| 8063010      | Cedar Creek     | 1966               | 644,785                           | 32,873                                           |
| 8123600      | Champion Creek  | 1959               | 42,500                            | 1,560                                            |
| 8206900      | Choke Canyon    | 1982               | 695,271                           | 25,438                                           |
| 8086215      | Cisco           | 1923               | 26,000                            | 1,050                                            |
| 8140770      | Coleman         | 1966               | 38,094                            | 1,811                                            |
| 8177400      | Coleta Creek    | 1980               | 31,040                            | 3,100                                            |
| 8123000      | Colorado City   | 1949               | 31,085                            | 1,612                                            |
| 8067600      | Conroe          | 1973               | 416,228                           | 19,640                                           |
| 8210500      | Corpus Christi  | 1958               | 257,260                           | 18,700                                           |
| 7335600      | Crook           | 1923               | 9,210                             | 1,060                                            |
| 7344484      | Cypress Springs | 1971               | 66,756                            | 3,252                                            |
| 8086600      | Daniel          | 1948               | 9,515                             | 924                                              |
| 8123950      | E.V. Spence     | 1969               | 517,272                           | 14,640                                           |
| 8045000      | Eagle Mountain  | 1932               | 179,880                           | 8,494                                            |

| USGS Gage ID | Reservoir Name    | Year of Completion | Conservation Capacity (acre-feet) | Surface Area at Top of Conservation Pool (acres) |
|--------------|-------------------|--------------------|-----------------------------------|--------------------------------------------------|
| 7312180      | Electra           | 1950               | 5,626                             | 731                                              |
| 9999999      | Falcon            | 1954               | 2,645,693                         | 85,195                                           |
| 7315600      | Farmers Creek     | 1960               | 21,749                            | 1,362                                            |
| 8018800      | Fork              | 1980               | 636,504                           | 26,889                                           |
| 8083500      | Fort Phantom Hill | 1938               | 70,036                            | 4,213                                            |
| 8104650      | Georgetown        | 1979               | 36,904                            | 1,287                                            |
| 8088400      | Graham            | 1958               | 45,302                            | 2,444                                            |
| 8090900      | Granbury          | 1969               | 129,011                           | 7,945                                            |
| 8105600      | Granger           | 1979               | 50,779                            | 4,159                                            |
| 8054500      | Grapevine         | 1952               | 164,703                           | 6,707                                            |
| 7299840      | Greenbelt         | 1968               | 60,400                            | 2,025                                            |
| 8064510      | Halbert           | 1921               | 6,033                             | 603                                              |
| 8141000      | Hords Creek       | 1948               | 8,112                             | 510                                              |
| 8065330      | Houston County    | 1966               | 17,665                            | 1,330                                            |
| 8072000      | Houston           | 1954               | 133,990                           | 10,160                                           |
| 8086400      | Hubbard Creek     | 1962               | 324,983                           | 14,922                                           |
| 7315950      | Hubert H. Moss    | 1966               | 24,155                            | 1,140                                            |
| 8148100      | Inks              | 1938               | 14,074                            | 793                                              |
| 8118000      | J.B. Thomas       | 1952               | 200,604                           | 7,282                                            |
| 8032200      | Jacksonville      | 1957               | 25,732                            | 1,164                                            |
| 7342495      | Jim Chapman       | 1991               | 298,930                           | 17,958                                           |
| 8049800      | Joe Pool          | 1991               | 176,895                           | 7,470                                            |
| 7312000      | Kemp              | 1923               | 245,434                           | 15,357                                           |
| 7314000      | Kickapoo          | 1945               | 85,825                            | 5,864                                            |
| 8060500      | Lavon             | 1953               | 456,526                           | 20,559                                           |
| 8099000      | Leon              | 1954               | 27,290                            | 1,590                                            |
| 8052800      | Lewisville        | 1955               | 598,902                           | 27,175                                           |
| 8110470      | Limestone         | 1978               | 208,017                           | 12,486                                           |
| 8066190      | Livingston        | 1969               | 1,741,900                         | 83,277                                           |
| 8042820      | Lost Creek        | 1991               | 11,950                            | 413                                              |
| 8152500      | Lyndon B. Johnson | 1951               | 133,090                           | 6,273                                            |
| 7298100      | Mackenzie         | 1974               | 46,454                            | 896                                              |
| 8022060      | Martin            | 1974               | 75,116                            | 4,981                                            |
| 8179500      | Medina            | 1913               | 254,823                           | 6,066                                            |
| 7227900      | Meredith          | 1965               | 817,970                           | 16,411                                           |
| 8082800      | Millers Creek     | 1974               | 29,171                            | 2,212                                            |
| 8090700      | Mineral Wells     | 1920               | 7,065                             | 440                                              |

| USGS Gage ID | Reservoir Name           | Year of Completion | Conservation Capacity (acre-feet) | Surface Area at Top of Conservation Pool (acres) |
|--------------|--------------------------|--------------------|-----------------------------------|--------------------------------------------------|
| 7344488      | Monticello               | 1973               | 34,740                            | 2,001                                            |
| 8050050      | Mountain Creek           | 1936               | 22,840                            | 2,710                                            |
| 8022200      | Murvaul                  | 1958               | 38,285                            | 3,507                                            |
| 8036700      | Nacogdoches              | 1977               | 39,523                            | 2,212                                            |
| 8063050      | Navarro Mills            | 1963               | 49,827                            | 4,736                                            |
| 8062730      | New Terrell City         | 1955               | 8,594                             | 849                                              |
| 7312380      | North Fork Buffalo Creek | 1964               | 15,400                            | 1,500                                            |
| 8134500      | O.C. Fisher              | 1951               | 115,743                           | 5,440                                            |
| 8136600      | O.H. Ivie                | 1989               | 554,340                           | 19,149                                           |
| 7345900      | O the Pines              | 1958               | 241,363                           | 17,638                                           |
| 8125500      | Oak Creek                | 1952               | 39,360                            | 2,375                                            |
| 8031400      | Palestine                | 1971               | 373,204                           | 22,656                                           |
| 7233550      | Palo Duro                | 1991               | 61,239                            | 2,413                                            |
| 8090300      | Palo Pinto               | 1964               | 27,215                            | 2,176                                            |
| 8091900      | Pat Cleburne             | 1964               | 26,008                            | 1,568                                            |
| 7335390      | Pat Mayse                | 1967               | 117,844                           | 5,638                                            |
| 8088500      | Possum Kingdom           | 1941               | 540,340                           | 16,716                                           |
| 8099400      | Proctor                  | 1963               | 55,457                            | 4,615                                            |
| 8061550      | Ray Hubbard              | 1969               | 452,040                           | 20,963                                           |
| 8051100      | Ray Roberts              | 1987               | 788,490                           | 28,646                                           |
| 8064550      | Richland-Chambers        | 1987               | 1,112,764                         | 43,384                                           |
| 8039300      | Sam Rayburn              | 1965               | 2,876,032                         | 112,590                                          |
| 8109900      | Somerville               | 1967               | 147,104                           | 11,395                                           |
| 8091730      | Squaw Creek              | 1977               | 151,418                           | 3,169                                            |
| 8084500      | Stamford                 | 1953               | 51,573                            | 5,124                                            |
| 8104050      | Stillhouse Hollow        | 1968               | 227,825                           | 6,484                                            |
| 7343460      | Sulphur Springs          | 1973               | 17,838                            | 1,340                                            |
| 8083200      | Sweetwater               | 1930               | 11,582                            | 630                                              |
| 8017400      | Tawakoni                 | 1960               | 871,693                           | 37,325                                           |
| 8164525      | Texana                   | 1981               | 159,845                           | 9,676                                            |
| 7331500      | Texoma                   | 1944               | 2,384,823                         | 74,686                                           |
| 8025350      | Toledo Bend              | 1969               | 4,477,000                         | 181,600                                          |
| 8154500      | Travis                   | 1942               | 1,134,863                         | 19,297                                           |
| 8131200      | Twin Buttes              | 1963               | 186,200                           | 9,082                                            |
| 8034000      | Tyler                    | 1967               | 80,198                            | 4,737                                            |
| 8095550      | Waco                     | 1965               | 199,277                           | 8,190                                            |
| 8063600      | Waxahachie               | 1956               | 11,386                            | 656                                              |

| USGS Gage ID | Reservoir Name | Year of Completion | Conservation Capacity (acre-feet) | Surface Area at Top of Conservation Pool (acres) |
|--------------|----------------|--------------------|-----------------------------------|--------------------------------------------------|
| 8045800      | Weatherford    | 1957               | 17,812                            | 1,112                                            |
| 8080910      | White River    | 1963               | 31,846                            | 1,642                                            |
| 8092500      | Whitney        | 1951               | 554,203                           | 23,220                                           |
| 8045400      | Worth          | 1914               | 33,495                            | 3,458                                            |
| 7344200      | Wright Patman  | 1954               | 308,020                           | 18,247                                           |

## Appendix B: Minimum, Average, and Maximum Annual Gross Evaporation Loss from 114 Monitored Reservoirs

| USGS Gage ID | Reservoir Name  | Minimum Annual Gross Evaporation Loss (acre-feet) | Average Annual Gross Evaporation Loss (acre-feet) | Maximum Annual Gross Evaporation Loss (acre-feet) |
|--------------|-----------------|---------------------------------------------------|---------------------------------------------------|---------------------------------------------------|
| 8083270      | Abilene         | 69                                                | 1,665                                             | 3,056                                             |
| 8079700      | Alan Henry      | 9,707                                             | 14,940                                            | 21,676                                            |
| 8888888      | Amistad         | 160,482                                           | 292,180                                           | 466,064                                           |
| 8043700      | Amon G Carter   | 5,172                                             | 6,717                                             | 7,930                                             |
| 8093350      | Aquilla         | 11,765                                            | 14,031                                            | 16,170                                            |
| 8049200      | Arlington       | 7,714                                             | 8,685                                             | 10,339                                            |
| 7314800      | Arrowhead       | 31,853                                            | 60,425                                            | 77,267                                            |
| 8031290      | Athens          | 6,821                                             | 7,861                                             | 8,713                                             |
| 8154900      | Austin          | 5,430                                             | 6,539                                             | 8,227                                             |
| 8040000      | B.A. Steinhagen | 15,841                                            | 32,368                                            | 43,149                                            |
| 8063700      | Bardwell        | 13,321                                            | 14,848                                            | 16,727                                            |
| 8102000      | Belton          | 49,996                                            | 58,347                                            | 68,323                                            |
| 8046500      | Benbrook        | 14,059                                            | 15,277                                            | 17,299                                            |
| 7344489      | Bob Sandlin     | 31,045                                            | 34,998                                            | 39,743                                            |
| 7332610      | Bonham          | 3,983                                             | 4,345                                             | 4,872                                             |
| 8144900      | Brady Creek     | 4,826                                             | 7,518                                             | 9,571                                             |
| 8043000      | Bridgeport      | 38,133                                            | 51,179                                            | 61,326                                            |
| 8143000      | Brownwood       | 25,255                                            | 31,880                                            | 40,103                                            |
| 8148000      | Buchanan        | 52,299                                            | 79,284                                            | 102,380                                           |
| 7346310      | Caddo           | 52,145                                            | 91,551                                            | 131,833                                           |
| 8167700      | Canyon          | 29,671                                            | 37,977                                            | 56,726                                            |
| 8063010      | Cedar Creek     | 135,307                                           | 148,578                                           | 170,775                                           |
| 8123600      | Champion Creek  | 299,018                                           | 365,287                                           | 482,404                                           |
| 8206900      | Choke Canyon    | 62,607                                            | 104,849                                           | 134,326                                           |
| 8086215      | Cisco           | 2,099                                             | 2,651                                             | 3,285                                             |
| 8140770      | Coleman         | 4,823                                             | 7,791                                             | 10,760                                            |
| 8177400      | Coleto Creek    | 7,803                                             | 9,708                                             | 14,834                                            |
| 8123000      | Colorado City   | 3,496                                             | 6,334                                             | 8,905                                             |
| 8067600      | Conroe          | 74,725                                            | 82,944                                            | 94,407                                            |
| 8210500      | Corpus Christi  | 37,626                                            | 73,151                                            | 95,430                                            |
| 7335600      | Crook           | 3,755                                             | 4,365                                             | 5,321                                             |
| 7344484      | Cypress Springs | 12,137                                            | 13,691                                            | 16,065                                            |
| 8086600      | Daniel          | 80                                                | 2,017                                             | 4,656                                             |

| USGS<br>Gage ID | Reservoir Name    | Minimum Annual<br>Gross Evaporation<br>Loss (acre-feet) | Average Annual Gross<br>Evaporation Loss<br>(acre-feet) | Maximum Annual<br>Gross Evaporation Loss<br>(acre-feet) |
|-----------------|-------------------|---------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------|
| 8123950         | E.V. Spence       | 3,915                                                   | 15,338                                                  | 27,601                                                  |
| 8045000         | Eagle Mountain    | 33,001                                                  | 37,517                                                  | 45,691                                                  |
| 7312180         | Electra           | 7                                                       | 686                                                     | 1,536                                                   |
| 9999999         | Falcon            | 97,254                                                  | 270,461                                                 | 437,423                                                 |
| 7315600         | Farmers Creek     | 4,051                                                   | 6,010                                                   | 6,932                                                   |
| 8018800         | Fork              | 105,677                                                 | 117,589                                                 | 134,244                                                 |
| 8083500         | Fort Phantom Hill | 10,684                                                  | 16,052                                                  | 23,824                                                  |
| 8104650         | Georgetown        | 3,212                                                   | 4,270                                                   | 5,785                                                   |
| 8088400         | Graham            | 8,504                                                   | 11,717                                                  | 14,608                                                  |
| 8090900         | Granbury          | 22,829                                                  | 32,552                                                  | 39,992                                                  |
| 8105600         | Granger           | 17,015                                                  | 21,799                                                  | 45,685                                                  |
| 8054500         | Grapevine         | 24,599                                                  | 32,871                                                  | 56,668                                                  |
| 7299840         | Greenbelt         | 3,060                                                   | 4,917                                                   | 5,987                                                   |
| 8064510         | Halbert           | 1,954                                                   | 2,342                                                   | 2,601                                                   |
| 8141000         | Hords Creek       | 101,007                                                 | 127,779                                                 | 160,213                                                 |
| 8065330         | Houston County    | 5,753                                                   | 6,114                                                   | 7,003                                                   |
| 8072000         | Houston           | 32,333                                                  | 42,991                                                  | 51,344                                                  |
| 8086400         | Hubbard Creek     | 25,630                                                  | 47,736                                                  | 75,895                                                  |
| 7315950         | Hubert H. Moss    | 4,482                                                   | 5,381                                                   | 6,029                                                   |
| 8148100         | Inks              | 2,814                                                   | 3,402                                                   | 4,071                                                   |
| 8118000         | J.B. Thomas       | 2,851                                                   | 10,806                                                  | 20,129                                                  |
| 8032200         | Jacksonville      | 4,755                                                   | 5,202                                                   | 6,125                                                   |
| 7342495         | Jim Chapman       | 46,707                                                  | 63,125                                                  | 75,045                                                  |
| 8049800         | Joe Pool          | 30,749                                                  | 34,743                                                  | 42,993                                                  |
| 7312000         | Kemp              | 23,901                                                  | 54,415                                                  | 85,245                                                  |
| 7314000         | Kickapoo          | 14,277                                                  | 23,943                                                  | 30,566                                                  |
| 8060500         | Lavon             | 60,892                                                  | 84,424                                                  | 97,023                                                  |
| 8099000         | Leon              | 5,351                                                   | 6,421                                                   | 8,074                                                   |
| 8052800         | Lewisville        | 94,207                                                  | 111,420                                                 | 129,760                                                 |
| 8110470         | Limestone         | 52,577                                                  | 58,085                                                  | 62,620                                                  |
| 8066190         | Livingston        | 230,901                                                 | 339,530                                                 | 374,933                                                 |
| 8042820         | Lost Creek        | 1,337                                                   | 1,614                                                   | 1,920                                                   |
| 8152500         | Lyndon B. Johnson | 21,710                                                  | 26,587                                                  | 32,035                                                  |
| 7298100         | Mackenzie         | 888                                                     | 1,535                                                   | 1,928                                                   |
| 8022060         | Martin            | 16,431                                                  | 18,367                                                  | 20,371                                                  |
| 8179500         | Medina            | 2,240                                                   | 15,319                                                  | 22,659                                                  |

| USGS<br>Gage ID | Reservoir Name              | Minimum Annual<br>Gross Evaporation<br>Loss (acre-feet) | Average Annual Gross<br>Evaporation Loss<br>(acre-feet) | Maximum Annual<br>Gross Evaporation Loss<br>(acre-feet) |
|-----------------|-----------------------------|---------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------|
| 7227900         | Meredith                    | 10,701                                                  | 27,841                                                  | 54,259                                                  |
| 8082800         | Millers Creek               | 2,948                                                   | 7,540                                                   | 11,712                                                  |
| 8090700         | Mineral Wells               | 1,503                                                   | 2,547                                                   | 3,251                                                   |
| 7344488         | Monticello                  | 7,204                                                   | 8,571                                                   | 10,762                                                  |
| 8050050         | Mountain Creek              | 12,098                                                  | 13,203                                                  | 15,129                                                  |
| 8022200         | Murvaul                     | 13,312                                                  | 14,506                                                  | 15,910                                                  |
| 8036700         | Nacogdoches                 | 7,483                                                   | 8,640                                                   | 10,771                                                  |
| 8063050         | Navarro Mills               | 19,636                                                  | 23,669                                                  | 26,868                                                  |
| 8062730         | New Terrell City            | 1,938                                                   | 3,472                                                   | 4,324                                                   |
| 7312380         | North Fork Buffalo<br>Creek | 344                                                     | 2,224                                                   | 4,379                                                   |
| 8134500         | O C. Fisher                 | 1,175                                                   | 3,243                                                   | 6,350                                                   |
| 8136600         | O H. Ivie                   | 27,383                                                  | 57,689                                                  | 94,222                                                  |
| 7345900         | O the Pines                 | 63,882                                                  | 83,093                                                  | 115,637                                                 |
| 8125500         | Oak Creek                   | 2,136                                                   | 6,212                                                   | 13,640                                                  |
| 8031400         | Palestine                   | 89,859                                                  | 101,571                                                 | 115,074                                                 |
| 7233550         | Palo Duro                   | 914                                                     | 2,112                                                   | 5,209                                                   |
| 8090300         | Palo Pinto                  | 3,428                                                   | 8,765                                                   | 11,618                                                  |
| 8091900         | Pat Cleburne                | 6,381                                                   | 6,970                                                   | 8,308                                                   |
| 7335390         | Pat Mayse                   | 0                                                       | 21,810                                                  | 26,406                                                  |
| 8088500         | Possum Kingdom              | 54,303                                                  | 72,051                                                  | 88,775                                                  |
| 8099400         | Proctor                     | 7,860                                                   | 17,216                                                  | 22,438                                                  |
| 8061550         | Ray Hubbard                 | 79,030                                                  | 95,882                                                  | 112,966                                                 |
| 8051100         | Ray Roberts                 | 104,569                                                 | 138,086                                                 | 155,020                                                 |
| 8064550         | Richland-Chambers           | 183,209                                                 | 208,382                                                 | 252,569                                                 |
| 8039300         | Sam Rayburn                 | 411,792                                                 | 446,758                                                 | 551,510                                                 |
| 8109900         | Somerville                  | 44,997                                                  | 55,012                                                  | 87,553                                                  |
| 8091730         | Squaw Creek                 | 12,939                                                  | 14,942                                                  | 18,374                                                  |
| 8084500         | Stamford                    | 6,504                                                   | 20,560                                                  | 30,764                                                  |
| 8104050         | Stillhouse Hollow           | 23,636                                                  | 30,581                                                  | 52,975                                                  |
| 7343460         | Sulphur Springs             | 208,708                                                 | 277,750                                                 | 332,027                                                 |
| 8083200         | Sweetwater                  | 681                                                     | 1,806                                                   | 3,517                                                   |
| 8017400         | Tawakoni                    | 126,492                                                 | 160,689                                                 | 193,291                                                 |
| 8164525         | Texana                      | 27,737                                                  | 34,835                                                  | 40,341                                                  |
| 7331500         | Texoma                      | 272,934                                                 | 338,238                                                 | 475,729                                                 |
| 8025350         | Toledo Bend                 | 631,322                                                 | 716,278                                                 | 833,781                                                 |

| <b>USGS<br/>Gage ID</b> | <b>Reservoir Name</b> | <b>Minimum Annual<br/>Gross Evaporation<br/>Loss (acre-feet)</b> | <b>Average Annual Gross<br/>Evaporation Loss<br/>(acre-feet)</b> | <b>Maximum Annual<br/>Gross Evaporation Loss<br/>(acre-feet)</b> |
|-------------------------|-----------------------|------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------|
| 8154500                 | Travis                | 37,425                                                           | 60,452                                                           | 76,091                                                           |
| 8131200                 | Twin Buttes           | 3,642                                                            | 9,505                                                            | 22,745                                                           |
| 8034000                 | Tyler                 | 17,343                                                           | 20,653                                                           | 23,845                                                           |
| 8095550                 | Waco                  | 32,917                                                           | 42,645                                                           | 51,817                                                           |
| 8063600                 | Waxahachie            | 2,740                                                            | 2,968                                                            | 3,278                                                            |
| 8045800                 | Weatherford           | 4,084                                                            | 4,548                                                            | 5,341                                                            |
| 8080910                 | White River           | 2,381                                                            | 3,847                                                            | 6,708                                                            |
| 8092500                 | Whitney               | 75,189                                                           | 87,645                                                           | 102,697                                                          |
| 8045400                 | Worth                 | 13,530                                                           | 15,044                                                           | 18,187                                                           |
| 7344200                 | Wright Patman         | 88,748                                                           | 108,547                                                          | 130,835                                                          |

## Appendix C: Minimum, Average, and Maximum Annual Net Evaporation Loss / Gain<sup>2</sup> from 114 Monitored Reservoirs Used in the Analysis

| USGS Gage ID | Reservoir Name  | Minimum Annual Net Evaporation Loss/Gain (acre-feet) | Average Annual Net Evaporation Loss/Gain (acre-feet) | Maximum Annual Net Evaporation Loss (acre-feet) |
|--------------|-----------------|------------------------------------------------------|------------------------------------------------------|-------------------------------------------------|
| 8083270      | Abilene         | 61                                                   | 1,048                                                | 2,142                                           |
| 8079700      | Alan Henry      | 6,115                                                | 10,642                                               | 20,349                                          |
| 8888888      | Amistad         | 117,059                                              | 225,833                                              | 440,437                                         |
| 8043700      | Amon G Carter   | 431                                                  | 2,980                                                | 4,772                                           |
| 8093350      | Aquilla         | -806                                                 | 5,636                                                | 11,825                                          |
| 8049200      | Arlington       | -311                                                 | 3,523                                                | 7,412                                           |
| 7314800      | Arrowhead       | 12,641                                               | 34,896                                               | 64,226                                          |
| 8031290      | Athens          | -597                                                 | 2,003                                                | 5,165                                           |
| 8154900      | Austin          | -967                                                 | 2,342                                                | 6,292                                           |
| 8040000      | B.A. Steinhagen | -25,270                                              | -5,550                                               | 19,732                                          |
| 8063700      | Bardwell        | -488                                                 | 5,250                                                | 10,262                                          |
| 8102000      | Belton          | -2,055                                               | 23,898                                               | 47,470                                          |
| 8046500      | Benbrook        | -910                                                 | 5,916                                                | 12,450                                          |
| 7344489      | Bob Sandlin     | -14,307                                              | 6,875                                                | 21,056                                          |
| 7332610      | Bonham          | -634                                                 | 1,155                                                | 2,961                                           |
| 8144900      | Brady Creek     | 2,477                                                | 4,752                                                | 7,126                                           |
| 8043000      | Bridgeport      | 3,156                                                | 22,989                                               | 37,379                                          |
| 8143000      | Brownwood       | 11,080                                               | 20,001                                               | 29,751                                          |
| 8148000      | Buchanan        | -3,749                                               | 34,169                                               | 68,588                                          |
| 7346310      | Caddo           | -43,274                                              | 7,056                                                | 70,794                                          |
| 8167700      | Canyon          | -17,077                                              | 12,756                                               | 32,989                                          |
| 8063010      | Cedar Creek     | -7,064                                               | 53,190                                               | 108,304                                         |
| 8123600      | Champion Creek  | 136,304                                              | 254,591                                              | 449,658                                         |
| 8206900      | Choke Canyon    | 7,263                                                | 58,269                                               | 114,606                                         |
| 8086215      | Cisco           | 186                                                  | 1,345                                                | 2,107                                           |
| 8140770      | Coleman         | 2,698                                                | 4,716                                                | 7,692                                           |
| 8177400      | Coleto Creek    | -4,255                                               | 2,118                                                | 5,973                                           |
| 8123000      | Colorado City   | 2,594                                                | 4,311                                                | 6,569                                           |
| 8067600      | Conroe          | -27,517                                              | 9,368                                                | 63,347                                          |
| 8210500      | Corpus Christi  | 4,477                                                | 33,602                                               | 79,880                                          |
| 7335600      | Crook           | -1,800                                               | 857                                                  | 2,589                                           |

<sup>2</sup> Negative value in table means water gain in reservoir when precipitation exceeds evaporation.

| USGS<br>Gage ID | Reservoir Name    | Minimum Annual Net<br>Evaporation Loss/Gain<br>(acre-feet) | Average Annual Net<br>Evaporation Loss/Gain<br>(acre-feet) | Maximum Annual Net<br>Evaporation Loss<br>(acre-feet) |
|-----------------|-------------------|------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------|
| 7344484         | Cypress Springs   | -5,787                                                     | 2,618                                                      | 8,154                                                 |
| 8086600         | Daniel            | 78                                                         | 1,008                                                      | 2,918                                                 |
| 8123950         | E.V. Spence       | 3,183                                                      | 10,211                                                     | 21,544                                                |
| 8045000         | Eagle Mountain    | -764                                                       | 15,422                                                     | 32,914                                                |
| 7312180         | Electra           | 4                                                          | 437                                                        | 1,077                                                 |
| 9999999         | Falcon            | 68,455                                                     | 188,967                                                    | 397,242                                               |
| 7315600         | Farmers Creek     | 429                                                        | 2,652                                                      | 4,214                                                 |
| 8018800         | Fork              | -10,732                                                    | 30,043                                                     | 79,391                                                |
| 8083500         | Fort Phantom Hill | 3,531                                                      | 9,897                                                      | 16,728                                                |
| 8104650         | Georgetown        | -1,886                                                     | 935                                                        | 2,901                                                 |
| 8088400         | Graham            | 2,309                                                      | 6,797                                                      | 12,087                                                |
| 8090900         | Granbury          | -2,248                                                     | 13,193                                                     | 29,213                                                |
| 8105600         | Granger           | -5,829                                                     | 6,684                                                      | 16,014                                                |
| 8054500         | Grapevine         | -226                                                       | 13,737                                                     | 25,679                                                |
| 7299840         | Greenbelt         | 2,121                                                      | 3,328                                                      | 4,341                                                 |
| 8064510         | Halbert           | -100                                                       | 802                                                        | 1,444                                                 |
| 8141000         | Hords Creek       | 30,668                                                     | 79,486                                                     | 119,615                                               |
| 8065330         | Houston County    | -1,377                                                     | 1,166                                                      | 4,402                                                 |
| 8072000         | Houston           | -21,742                                                    | -1,771                                                     | 25,822                                                |
| 8086400         | Hubbard Creek     | 6,103                                                      | 24,169                                                     | 47,634                                                |
| 7315950         | Hubert H. Moss    | 331                                                        | 2,347                                                      | 3,841                                                 |
| 8148100         | Inks              | -236                                                       | 1,508                                                      | 3,194                                                 |
| 8118000         | J.B. Thomas       | 2,353                                                      | 7,745                                                      | 15,421                                                |
| 8032200         | Jacksonville      | -997                                                       | 1,097                                                      | 3,854                                                 |
| 7342495         | Jim Chapman       | -34,703                                                    | 10,187                                                     | 37,010                                                |
| 8049800         | Joe Pool          | -2,157                                                     | 11,905                                                     | 26,829                                                |
| 7312000         | Kemp              | 16,183                                                     | 34,899                                                     | 59,875                                                |
| 7314000         | Kickapoo          | 5,390                                                      | 13,863                                                     | 25,491                                                |
| 8060500         | Lavon             | -8,314                                                     | 23,951                                                     | 59,164                                                |
| 8099000         | Leon              | 239                                                        | 3,211                                                      | 5,033                                                 |
| 8052800         | Lewisville        | -16,680                                                    | 28,699                                                     | 78,451                                                |
| 8110470         | Limestone         | -3,463                                                     | 20,543                                                     | 41,244                                                |
| 8066190         | Livingston        | -110,165                                                   | 37,287                                                     | 260,873                                               |
| 8042820         | Lost Creek        | -276                                                       | 561                                                        | 1,455                                                 |
| 8152500         | Lyndon B. Johnson | -1,715                                                     | 11,832                                                     | 24,939                                                |
| 7298100         | Mackenzie         | 598                                                        | 1,115                                                      | 1,645                                                 |

| USGS<br>Gage ID | Reservoir Name              | Minimum Annual Net<br>Evaporation Loss/Gain<br>(acre-feet) | Average Annual Net<br>Evaporation Loss/Gain<br>(acre-feet) | Maximum Annual Net<br>Evaporation Loss<br>(acre-feet) |
|-----------------|-----------------------------|------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------|
| 8022060         | Martin                      | -6,504                                                     | 1,500                                                      | 9,010                                                 |
| 8179500         | Medina                      | -2,647                                                     | 5,837                                                      | 14,357                                                |
| 7227900         | Meredith                    | 7,972                                                      | 20,486                                                     | 43,518                                                |
| 8082800         | Millers Creek               | 1,968                                                      | 4,864                                                      | 8,716                                                 |
| 8090700         | Mineral Wells               | 90                                                         | 1,237                                                      | 1,873                                                 |
| 7344488         | Monticello                  | -3,349                                                     | 1,741                                                      | 5,259                                                 |
| 8050050         | Mountain Creek              | -670                                                       | 4,594                                                      | 9,023                                                 |
| 8022200         | Murvaul                     | -5,420                                                     | 1,011                                                      | 8,209                                                 |
| 8036700         | Nacogdoches                 | -4,770                                                     | 355                                                        | 5,744                                                 |
| 8063050         | Navarro Mills               | -1,095                                                     | 8,283                                                      | 17,787                                                |
| 8062730         | New Terrell City            | -85                                                        | 1,212                                                      | 2,681                                                 |
| 7312380         | North Fork Buffalo<br>Creek | 87                                                         | 1,295                                                      | 3,239                                                 |
| 8134500         | O.C. Fisher                 | 750                                                        | 2,183                                                      | 4,982                                                 |
| 8136600         | O.H. Ivie                   | 17,773                                                     | 37,345                                                     | 69,969                                                |
| 7345900         | O the Pines                 | -55,881                                                    | 2,779                                                      | 46,483                                                |
| 8125500         | Oak Creek                   | 1,417                                                      | 4,418                                                      | 9,873                                                 |
| 8031400         | Palestine                   | -8,558                                                     | 25,770                                                     | 68,011                                                |
| 7233550         | Palo Duro                   | 701                                                        | 1,651                                                      | 3,850                                                 |
| 8090300         | Palo Pinto                  | 436                                                        | 4,380                                                      | 7,964                                                 |
| 8091900         | Pat Cleburne                | -259                                                       | 2,834                                                      | 5,992                                                 |
| 7335390         | Pat Mayse                   | -9,948                                                     | 4,098                                                      | 13,854                                                |
| 8088500         | Possum Kingdom              | 2,947                                                      | 36,294                                                     | 58,624                                                |
| 8099400         | Proctor                     | 696                                                        | 7,771                                                      | 15,076                                                |
| 8061550         | Ray Hubbard                 | -4,922                                                     | 34,117                                                     | 69,906                                                |
| 8051100         | Ray Roberts                 | 6,332                                                      | 60,759                                                     | 98,479                                                |
| 8064550         | Richland-Chambers           | -7,627                                                     | 78,582                                                     | 171,405                                               |
| 8039300         | Sam Rayburn                 | -221,027                                                   | 24,104                                                     | 297,250                                               |
| 8109900         | Somerville                  | -28,569                                                    | 10,828                                                     | 35,895                                                |
| 8091730         | Squaw Creek                 | -467                                                       | 6,155                                                      | 13,171                                                |
| 8084500         | Stamford                    | 4,344                                                      | 13,231                                                     | 27,689                                                |
| 8104050         | Stillhouse Hollow           | -2,101                                                     | 10,869                                                     | 21,825                                                |
| 7343460         | Sulphur Springs             | -45,330                                                    | 76,015                                                     | 168,087                                               |
| 8083200         | Sweetwater                  | 429                                                        | 1,297                                                      | 2,989                                                 |
| 8017400         | Tawakoni                    | -16,217                                                    | 40,512                                                     | 114,721                                               |
| 8164525         | Texana                      | -13,964                                                    | 6,278                                                      | 21,533                                                |

| USGS<br>Gage ID | Reservoir Name | Minimum Annual Net<br>Evaporation Loss/Gain<br>(acre-feet) | Average Annual Net<br>Evaporation Loss/Gain<br>(acre-feet) | Maximum Annual Net<br>Evaporation Loss<br>(acre-feet) |
|-----------------|----------------|------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------|
| 7331500         | Texoma         | -72,362                                                    | 83,172                                                     | 213,635                                               |
| 8025350         | Toledo Bend    | -326,054                                                   | 5,578                                                      | 452,721                                               |
| 8154500         | Travis         | -14,015                                                    | 19,273                                                     | 44,262                                                |
| 8131200         | Twin Buttes    | 1,391                                                      | 6,459                                                      | 16,890                                                |
| 8034000         | Tyler          | -1,400                                                     | 5,351                                                      | 14,138                                                |
| 8095550         | Waco           | 1,233                                                      | 19,415                                                     | 38,955                                                |
| 8063600         | Waxahachie     | -230                                                       | 1,019                                                      | 2,038                                                 |
| 8045800         | Weatherford    | -116                                                       | 1,849                                                      | 3,839                                                 |
| 8080910         | White River    | 1,510                                                      | 2,784                                                      | 6,306                                                 |
| 8092500         | Whitney        | -5,808                                                     | 33,835                                                     | 58,516                                                |
| 8045400         | Worth          | -517                                                       | 6,108                                                      | 13,054                                                |
| 7344200         | Wright Patman  | -106,900                                                   | -12,949                                                    | 50,475                                                |