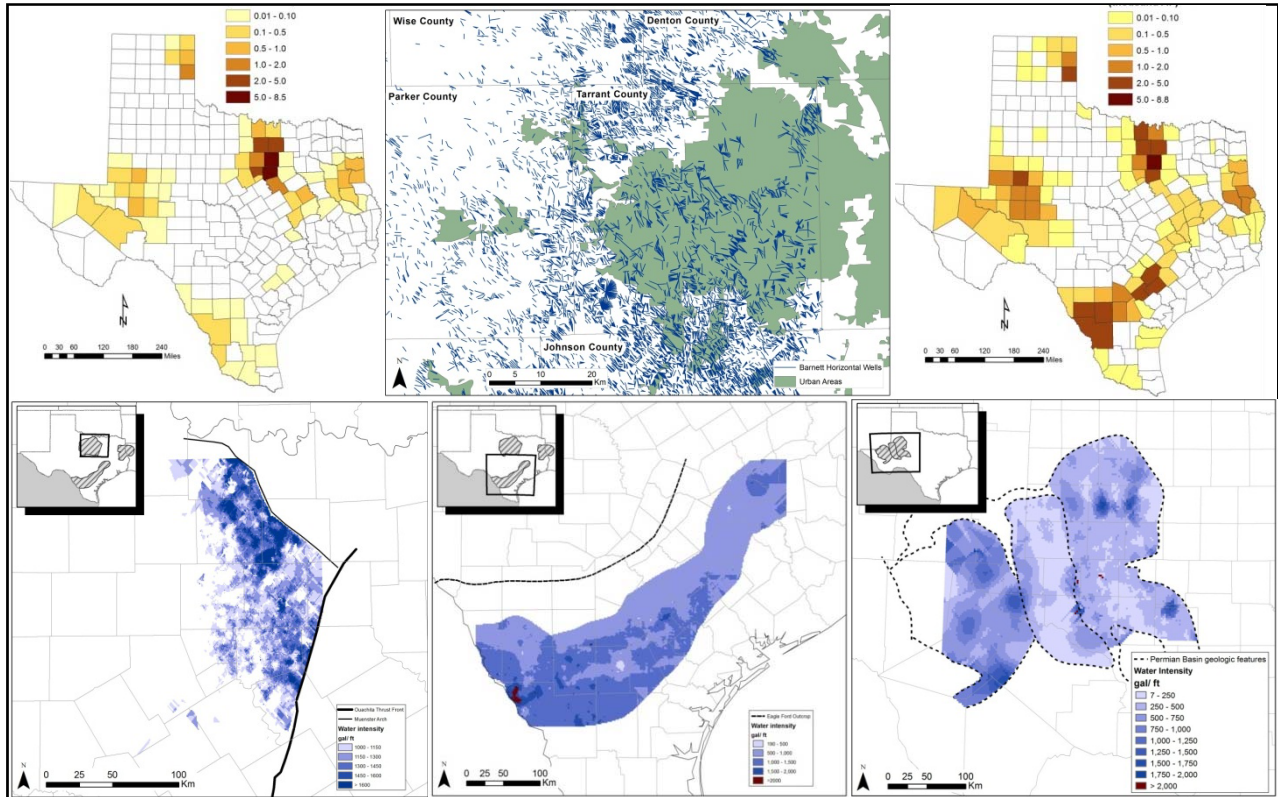


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Oil & Gas Water Use in Texas: Update to the 2011 Mining Water Use Report



Prepared for
Texas Oil & Gas Association, Austin, Texas

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A handwritten signature in black ink, appearing to read "Jean-Philippe Nicot", written in a cursive style below the seal.

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Executive Summary

In Spring 2012, we undertook an update of the hydraulic fracturing sections of the TWDB-sponsored report titled “Current and Projected Water Use in the Texas Mining and Oil and Gas Industry” that we published in June 2011 (Nicot et al., 2011). The 2011 report provided estimated county-level water use in the oil and gas industry in 2008 and projections to 2060. This 2012 update was prompted by two main events: (1) a major shift of the oil and gas industry from gas to oil production, displacing production centers across the state and impacting county-level amounts; (2) rapid development of technological advances, resulting in more common reuse and in the ability to use more brackish water. The timely update was enabled by a faster than anticipated development, translating into abundant statistical data sets from which to derive projections, and by an increased willingness of the industry to participate in providing detailed information about water use in its operations. This document follows the same methodology as the 2011 report but differs from it in two ways. Our current update clearly distinguishes between water use and water consumption. The 2011 report does not include reuse from neighboring hydraulic fracturing jobs, recycling from other industry operations or other treatment plants, and use of brackish water. Our update also presents three scenarios: high, low, and most likely water use and consumption with a focus on water consumption. This update has been reviewed by the TWDB and should supersede oil and gas industry projections from the 2011 report.

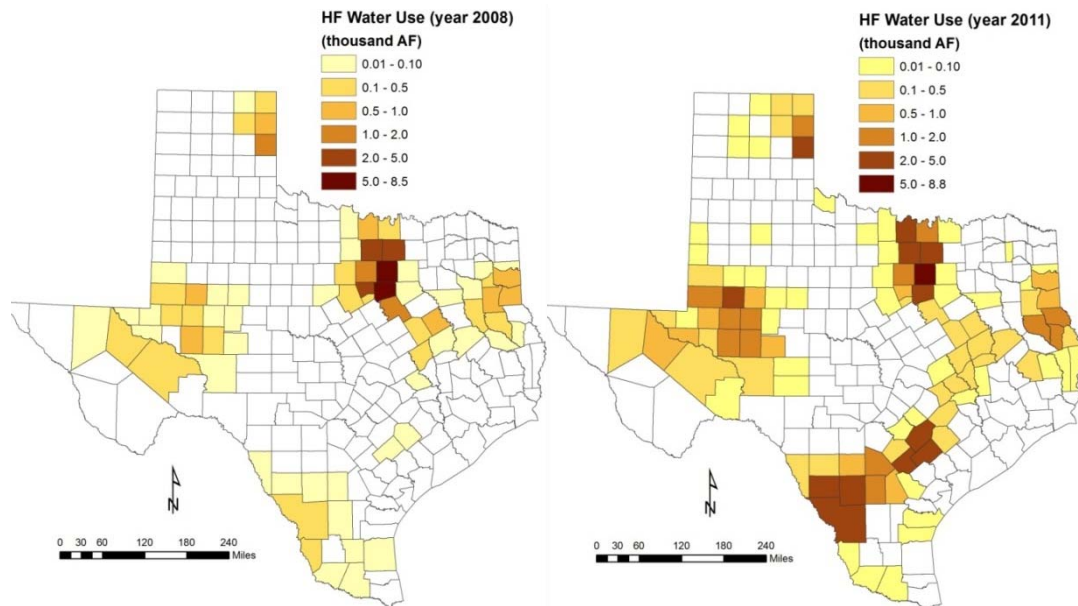


Figure ES1. Spatial distribution of hydraulic fracturing water use in 2008 (~36,000 AF) and 2011 (~81,500 AF).

Overall we find that, if the total water use for hydraulic fracturing has increased from 36,000 AF in 2008 to ~81,500 AF in 2011 (Figure ES1), the amount of recycling/reuse and the use of brackish water have also increased (~17,000 AF in 2011, or 21%). Hydraulic fracturing has expanded to the southern and western, drier parts of the state and, by necessity, the industry has had to adapt to those new conditions. Collected information tends to suggest that the industry has

been decreasing its fresh-water consumption despite the increase in water use. Total water use information is relatively easy to access (through the private database vendor IHS), but true consumption is harder to gauge.

The updated hydraulic fracturing projections at the state level do not show a major departure from and are essentially consistent with the previous report but have a more subdued peak and a longer tail (Figure ES2). This is due to the increased likelihood that the industry has hydraulically fractured more formations that can be placed into the tight oil and gas category. The annual peak water use previously estimated at 145,000 AF in the early 2020's is now thought to be a broad peak plateauing at ~125,000 AF/yr during the 2020's. However, fresh water consumption is estimated to stay at the general level of ~70,000 AF/yr and to decrease in future decades. Adding other oil and gas industry water uses, such as waterflooding and drilling, brings projected maximum water use up to ~180,000 AF/yr during the 2020-2030 decade with a much lower consumption which brings the total mining water use to a maximum of ~340,000 AF/yr around the year 2030. These values remain small compared to the state water use (Figure ES3). In 2010, hydraulic fracturing water use represented about 0.5% of the water use in the state. However, the hydraulic fracturing water use is unevenly distributed across the state and may represent locally a higher fraction of the total water use.

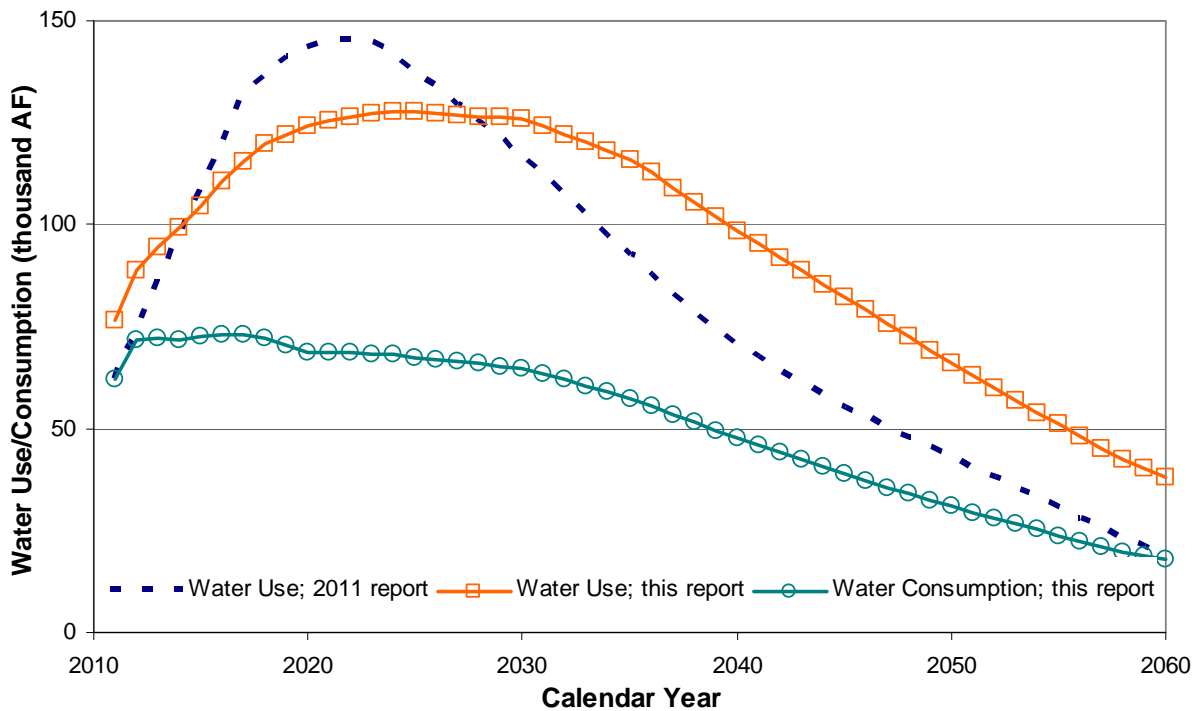


Figure ES2. State-level projections to 2060 of hydraulic fracturing water use and fresh-water consumption and comparison to earlier water projections.

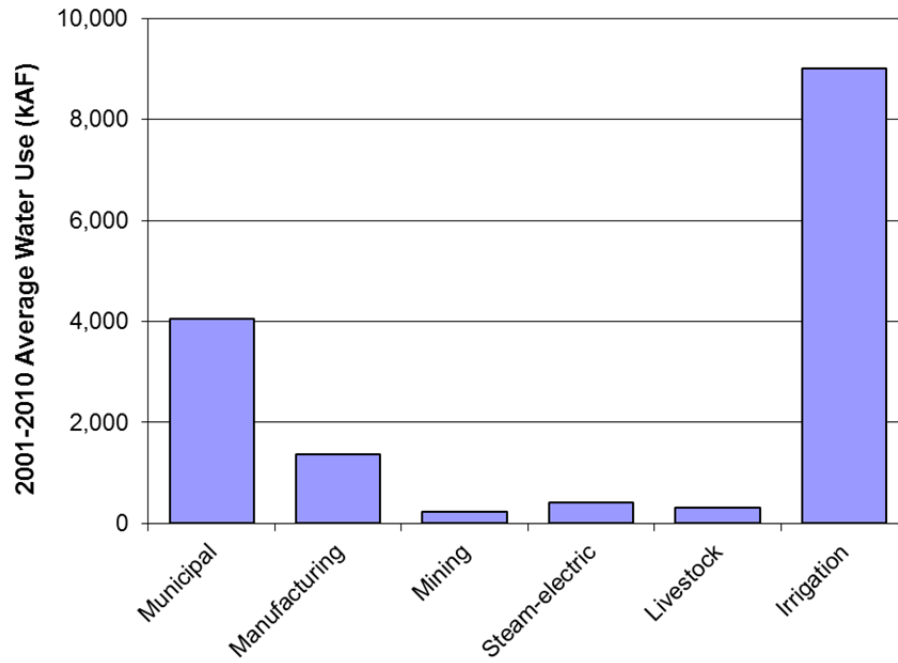


Figure ES3. Average state level water use (all categories) in 2001-2010.

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Acronyms

| | |
|-------|---|
| AF | Acre-foot |
| BEG | Bureau of Economic Geology |
| EOR | Enhanced Oil Recovery |
| Fm. | Formation |
| GW | Groundwater |
| HF | Hydraulic fracturing |
| kAF | Thousand acre-feet |
| Mgal | Million gallons |
| PSD | Powell Shale Digest |
| RRC | Railroad Commission (of Texas) |
| SW | Surface water |
| TCEQ | Texas Commission on Environmental Quality |
| TDS | Total dissolved solids |
| TWDB | Texas Water Development Board |
| TXOGA | Texas Oil & Gas Association |

I. Introduction

This work is an update of the “Current and Projected Water Use in the Texas Mining and Oil and Gas Industry” (Nicot et al., 2011) report released in 2011 by the Texas Water Development Board (TWDB) and prepared by the Bureau of Economic Geology (BEG). The 2011 report documents future and projected water use in all segments of the mining industry: oil and gas, aggregates, coal, and other industrial and metallic substances. In particular, it looked at three main water categories in the upstream segment of the oil and gas industry: drilling, waterflooding and enhanced oil recovery (EOR), and hydraulic fracturing (HF).

How is this report different from the 2011 Report?

This report focuses on HF water use and associated drilling; the information in the 2011 report relating to waterflooding and EOR water use as well as drilling not associated with hydraulically-fractured wells did not require updating. This update also benefited from more participation from the industry, especially for information not typically available or easily extractable from state records. We also have a longer record for many plays, indicating trends and allowing for better future projections. In addition, we presented three scenarios for water use and water consumption for each play (high, medium, low) as was done in Bené et al. (2007) but not in the 2011 report. Furthermore we made the distinction between water use and water consumption more explicit. Water use is the amount of water used in an operation regardless of the water source provided; water is either fresh or brackish. Fresh water is defined as any water with a total dissolved solids (TDS) content of <1,000 mg/L; the upper limit for brackish water is 35,000 mg/L, but often in this document the limit will be <10,000 mg/L. Water consumption is fresh water use excluding recycling and reuse. Reuse is understood as the water originating from previous HF operations whereas recycling is more general and could include, for example, produced water from conventional wells or waste water obtained from other industries or municipalities.

Scope of work

As in the 2011 report, this update’s scope of work includes two main tasks: (1) documenting current (year 2011) and past water use from HF; and (2) estimating projected water use. Both tasks are completed at the county level for the entire state of Texas. Task 1 consists of gathering water use data and establishing statistics needed for the projection phase in the spirit of what was done in the 2011 report but with a more detailed processing of the data. Task 2 is to produce a projection of county- level water use to 2060 using previously derived statistics and input from the industry.

This current document is organized in the following way. We first describe the methodology and its caveats as well as the challenges to making projections. We then examine the 2011 water use and compare our new findings to the 2011 projections made in 2008 as a way to validate our approach. We then present projections to 2060 according to three scenarios: high estimates, most likely estimates, and low estimates.

II. Methodology

II-1. Historical and Current Water Use

We followed a methodology similar to that used in the 2011 report, making use of the IHS Enerdeq database (<http://www.ih.com/products/oil-gas-information/data-access/enerdeq/browser.aspx>). The IHS data were cross-checked with information from individual companies (number of oil/gas wells, of vertical/horizontal wells, amount of proppant) through discussion with company experts. In addition to production data, the Enerdeq database contains completion information submitted by operators to the Railroad Commission (RRC) of Texas through the W-2 and G-1 forms for oil and gas, respectively. In the best cases, and as noted by statistics provided in forthcoming sections of this report, the database contains all information of interest to us: API number, location of the well, well geometry, amount of water used, and amount of proppant used. Because, across plays, the completeness of the data is variable and because typographical errors are not infrequent, we developed several indicators for quality control: water intensity (amount of water used per unit length of lateral or useful vertical section) and proppant loading (amount of proppant per unit water volume). When either water intensity or proppant loading for a given well is out of range, the well is flagged and obvious errors corrected (for example, reporting water use in gal but displaying bbl as the unit instead of gal). Details on the approach follow.

The three primary data types used to estimate HF water volumes include reported values of fluid and proppant used to fracture each well and the total well length over which fracturing procedures were performed. Data were extracted separately from the IHS database for individual producing formations having a significant number ($> \sim 100$ to 200) of wells located in Texas that were completed between January 1, 2005 and December 31, 2011 that upon preliminary accounting had been fractured using $> 100,000$ gal of fluids. These include the Barnett, Eagle Ford, Haynesville, Cotton Valley, and Olmos formations, and several formations in the Anadarko Basin (Granite Wash, Cleveland, Marmaton) and the Permian Basin (Wolfcamp, Spraberry, Canyon, Clear Fork, San Andres, and Grayburg). For this analysis, the Wolfcamp and Spraberry were combined and the San Andres and Grayburg were combined.

As we did in the 2011 report we relied on the IHS database to recognize the currently active plays by downloading basic information on all wells drilled in Texas since 2010 (included early 2012 but with many gaps in the reporting). Our interest was not in computing water use but in determining those plays with enough activity to warrant a more detailed study. Many additional wells were fractured in other plays and did count toward the total water use in 2011, but they were not part of the detailed analyses of those plays cited earlier. Those minor plays are, however, accounted for in the general Gulf Coast and Permian Basin count.

II-1-1 Indicator for Quality Control

For producing formations having a sufficient number of wells completed during this period, the data were analyzed by annual intervals. Wells having actual or estimated total HF water use of $< 100,000$ gal (i.e., small-scale traditional fracturing performed primarily on vertical/directional wells) were omitted from calculations as they account for comparatively insignificant water volumes compared to the fracturing currently being practiced in many plays. This minimum

volume distinction was applied to vertical/directional wells only, and all horizontal wells were included in the estimates.

Critical evaluation and editing of the raw data was required. The purpose of the editing process was, through a step-wise logical procedure, to exclude wells that used or (in the absence of accurate data) were likely to have used <100,000 gal of HF fluids while retaining and accounting for wells that used or (again, in the absence of accurate data) were likely to have used \geq 100,000 gal of HF fluids. For many wells, one or more of the reported data values is absent, incomplete, or inaccurate, due either to clerical errors or to partial reporting (omission errors). Clerical errors include the incorrect assignment of units (gal vs. bbl, lb vs. ton, etc.) and/or typographical errors. Omission errors primarily include the non-reporting or under-reporting of fluid volumes (proppant amounts seem to be accurately reported much more consistently than fluid volumes).

The data were screened for errors by examining ratios between the different values, including the total reported volume of fluids used per linear foot of the total fractured well depth interval (water use intensity, gal/ft), the total mass of proppant per total volume of HF fluids (proppant loading, lb/gal), and the total mass of proppant per linear foot of the total fractured well depth interval (proppant intensity, lb/ft). These ratios were examined for outliers and inaccuracies by sorting hierarchically through the data based on the various ratios. Edits were performed on the raw data where rectifiable errors could be identified, the most prevalent consisting of modifying units where such changes resulted in ratios consistent with other similar wells. In some cases, sufficient details were reported in the data comments to correct inaccurate data values, although this type of edit was extremely limited.

In general, proppant loading (lb/gal) was used as the primary data screening ratio because of the generally consistent reporting of total proppant amounts. HF fluid volumes resulting in proppant loading values (average of all stages) >5 lb/gal were deemed as under-reported. Barring a unit's error, these values generally reflect reported fluid volumes that include only acid treatments and in some cases raw gel product volumes and do not also include the volumes of water used. For vertical/directional wells having reported proppant amounts and with absent or under-reported HF volumes, wells with <100,000 lb of proppant were excluded from the estimates based on an assumed 1.0 lb/gal loading ratio.

A finer level of resolution in the water use data could be achieved by binning the hydraulic fracturing stages into slickwater, gel, and cross-linked gel systems with the latter two having a smaller water use intensity. Unfortunately the database does not allow for an accurate count in each category. The information, however, was used in a qualitative way, checking its consistency with common practices in a play.

Following the data screening and editing procedures, the data were classified into two main groups: 1) wells judged to have accurately reported fluid volumes and 2) wells judged to have inaccurately reported fluid volumes. The average (annual) water use intensity (gal/ft) values of the Group 1 wells were multiplied by the (annual) sum total fractured length (ft) of the Group 2 wells to produce annual estimates of the total water use of the Group 2 wells. The average intensity values represent truncated averages based on 90% of the data that were calculated by eliminating values less than the 5th percentile or greater than the 95th percentile of the Group 1 population to reduce the impacts of extreme values. The Group 2 annual total estimates were then added to the Group 1 annual total values to produce estimates of actual annual total water

use. Values are reported for the major producing formations listed above by year and by county. County locations were assigned based on the wellhead coordinates.

A separate estimate using the same procedures was calculated for the HF water used during 2011 for all wells meeting the minimum 100,000 gal criteria but that were not completed in one of the producing formations listed above and for which insufficient data exist for temporal trend analysis.

II-1-2 Hydraulically-fractured Length

HF lengths for individual wells were determined using five approaches, each relying on different information in the database. All five approaches were applied to varying degrees to determine horizontal well HF lengths while only the first two were applied to vertical/directional wells. The first approach used the difference between the minimum and maximum reported test treatment depths and is referred to as the “test” length. This was the primary length used in an estimated minimum of 95% of all wells. The second approach used the difference between the minimum and maximum perforation depths, which was identical in most cases to that of the test length and is referred to as the “perf” length. The “perf” length was used in place of the test length in a few cases that resulted in more realistic use intensity values. The test and “perf” lengths are considered to be the most accurate length information available for most wells.

A third approach utilized the survey information and is referred to as the “survey” length. In this approach, the angle relative to the horizontal plane between successive well survey points was calculated. The horizontal length of the well was determined as the difference between the minimum depth at which that angle became less than 2.5 degrees and the maximum well depth. This approach also provided the average depth of the horizontal well section and additionally the beginning and ending X-Y coordinate locations of the horizontal well section used to map well density in GIS for the various plays. If no information was available to calculate a test or perf length, the survey length was considered to be the next-best available length information. In most cases where all three were available, the survey length is in good agreement with both the test and perf lengths. This value was used only in a few cases where neither a test nor a perf length was available.

A fourth length value was calculated as the difference between the reported driller’s well depth and the bottom hole true depth, referred to as the “true value” or “TV” length and a fifth length value was calculated as the simple horizontal linear distance between the X-Y coordinates of the well surface and bottom hole coordinates (“GIS” length). Both of these values are considered to be only general estimates of the horizontal section length and were used in a very limited number of instances where more accurate information was not available. For a very few instances (<<1%) no length values were available for a given well. In these cases, the annual (truncated) average well length for that producing formation was assigned.

The fourth and fifth approaches, simpler to use, were adopted in the 2011 report. The HF water intensity for horizontal wells is computed slightly differently from the approach in the 2011 report. Instead of using the distance between the wellhead of the toe of the lateral, we used a shorter distance defined by the operator-defined “test length” more representative of the true length of the lateral. The test length is consistent with the “test” length but consistently smaller by 10 to 25%. The lateral length value matters as it used to compute water intensity, itself used to make projections. There is relatively little difference between the different approaches (Figure 1)

but the “test” approach used in this document is systematically smaller than the “GIS” approach used in the 2011 document, that is, water intensity values reported in this document are systematically greater than those in the 2011 report. The median value of water intensity using the “test” and “survey” approaches are 26% and 23% larger than the “GIS” median value (Figure 2) in the Barnett Shale play. The “test” water intensity median in the Eagle Ford play is 16% larger than the “GIS” median value (Figure 2d).

II-1-3 Beyond the Database

In the 2011 report we made the explicit distinction between shale plays and tight gas plays. Although, as explained in the 2011 report, there are real differences between them, from an operational standpoint the difference is blurred (for example, wells tapping Wolfcamp shale oil and Spraberry tight oil) and, in this update, we did not try systematically to assign one of either category to some plays.

For each of the plays with sufficient data we extracted yearly information, presented in the Results Section, about:

- Total number of wells
- Total water use, including estimation of data gaps
- Average/median length of laterals
- Water use in Mgal/ft
- Water intensity in gal/ft
- Proppant loading in lb/gal

The IHS database provides only water use, that is, the amount of water used during a given HF job regardless of the water source(s). In actuality, water can come from several sources. It can be “new” water or it can also be recycled or reused water. “New” water can be surface water or groundwater or it can be from an alternative source such as municipal water or treated waste water. Water also be fresh (<1,000 mg/L) and its use can directly compete with other more conventional users (municipal use, irrigation use). It can be brackish or even more saline than sea water (that is, >~35,000 mg/L). Water consumption is simply defined as the water use which is not from recycled or reused water and from which brackish and saline water use is taken out. Note, however, that this simple definition does not capture a more complex reality. Use of brackish water in areas with limited fresh water supplies could compete with conventional users. This document does not try to sort out such issues; we simply define water consumption as water use minus recycled/reused water volumes and minus brackish or saline water volumes.

Access to detailed information about water sources on the provider side is difficult. Large water suppliers do not necessarily track the ultimate usage of their water. Groundwater conservation districts (GCD’s) do not always collect information about withdrawal amounts and eventual use of the water. A request to the Texas Commission on Environmental Quality (TCEQ) on reuse of treatment water yielded a helpful list of facilities but not the amount of water transferred, and further this does not account for direct reuse at a site. The demand side, that is, operators, is very fragmented.

We collected information not present in the IHS database but of interest to TWDB and the general public about: (1) nature of the water source (river, lake, city water, groundwater, stock pond/gravel pit / quarry, wholesaler, treated industrial waste water) and its status (private, public). The ultimate goal is to determine the groundwater and surface water (GW/SW) split. Optimally,

this issue would be resolved at the county level but it may not be possible; (2) amount of water injected from reuse of flow back water, recycled water can include water from commercial and municipal waste water treatment facilities; (3) TDS of the new water [fresh (<1000 mg/L), slightly brackish (1000-3000 mg/L), brackish (3000-10,000 mg/L or 10,000-35,000 mg/L), saline (>35,000 mg/L)].

In this document, we applied to all counties within a play / region the same brackish water use, recycling/reuse fraction, and GW/SW split. Undoubtedly, this is an approximation but the amount of information available does not allow accurate assessments at the county level.

II-2. Future Water Use Projections

The 2011 report followed a mixed approach to estimate projected water use, the so-called resource-based and production-based approaches. Although both approaches are somehow interdependent, we believe that the resource-based approach gives the best results and is used in this document. As described in more details in the 2011 report, it consists of four steps:

- (1) Gather historical data in terms of average well water use and average well spacing. It is important to establish these elements through time to see trends rather than just focusing on the past few months.
- (2) Estimate ultimate well density across the play; it is a function of several factors, such as geological prospectivity (for example, within play core or not, shale thickness) and cultural features (urban/rural). In this step, ultimate boundaries of the play are identified.
- (3) Compute approximate total number of wells needed.
- (4) Distribute through time and space, constrained by the assumed number of drilling rigs available (see earlier comment).

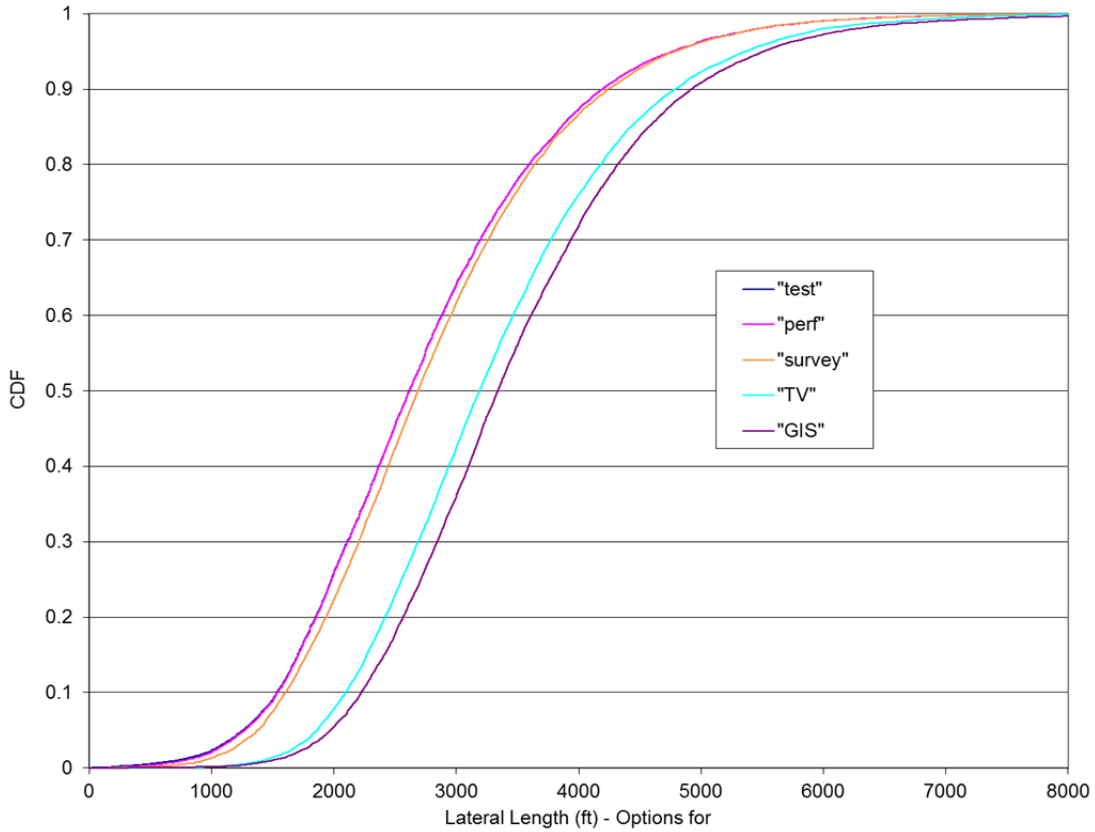
After obtaining water use, correction factors to account for recycling/reuse and use of non-fresh water are applied. We asked industry operators for projected recycling/reuse, brackish water use, and groundwater / surface water split in 2020. Given the rapid pace of change in the industry, the values obtained are somewhat speculative. Although not a guarantee for accuracy, those values are, however, consistent with what industry observers report and consistent with our own knowledge of treatment techniques and state of surface water and groundwater withdrawals across the state. The basic reporting unit for the water use projections is the county. Projections for recycling / reuse, brackish water use beyond 2020 to 2060, were made accounting for the typical current volume of flow back (limiting reuse) and for brackish water resources / lack of fresh water in the area of interest.

As discussed in the 2011 report, despite our best efforts, it is likely that the projected water use amounts will be more accurate at the play than at the county level. As done in the 2011 report, we did not assume any repeat HF, as discussions with industry experts and recent publications (Sinha and Ramakrishnan, 2011) suggest that little repeat HF will take place.

The 2011 report provides only one annual estimate. However, in an earlier report on the Barnett Shale only (Nicot and Potter, 2007; Bené et al, 2007), BEG made use of high, medium, and low water use scenarios. The different scenarios were based on various level of prospectivity and anticipated gas price. This update also makes use of three scenarios, high, most likely, and low water use, but in addition to prospectivity and gas price, they take into account level of recycling/reuse and use of brackish and saline water.

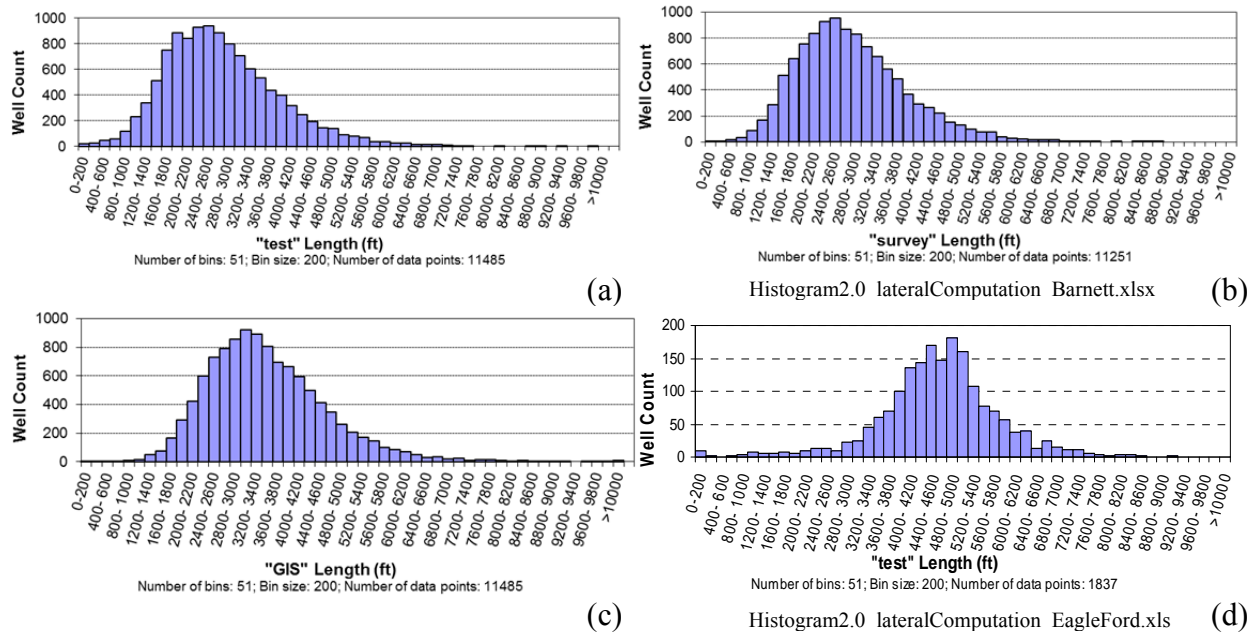
II-3. Notes on Collected Information

We obtained information on all the major plays, some with better coverage, by contacting operators. Fraction of HF wells drilled by contacted operators in the 2010-2012 period is documented by play and provides an estimate of the uncertainty. The coverage (Table 1) was calculated by adding the number of wells completed in the 2010-early 2012 period by contacted operators and normalizing that sum by the total number of wells completed during the same period. We collected information about recycling/reuse, use of brackish water, surface water/groundwater split. Coverage varies from 40% (Barnett Shale) to 10.5% (Permian Far West). Consistency in information from operators in a given play suggests that even low percentages are representative of the industry as a whole in that play despite some variability among operators (Figure 3). The figure shows a slight overall increase in water use intensity with increasing depth but it also shows that operators can have different approaches.



Histogram2.0 lateralComputation Barnett.xlsx

Figure 1. Comparison of five approaches to computing lateral length (Barnett Shale play).



(a)

Histogram2.0 lateralComputation Barnett.xlsx

(b)

(c)

Histogram2.0 lateralComputation EagleFord.xls

(d)

Figure 2. Histograms of lateral lengths according to various approaches: (a) “test”; (b) “survey”; (c) “GIS” (Barnett Shale play); and (d) “test” (Eagle Ford Shale play).

Table 1. Representivity of collected information

| Play/Region | Consumption information (%) |
|------------------|-----------------------------|
| Permian Far West | 10.5% |
| Permian Midland | 23% |
| Anadarko Basin | 11% |
| Barnett Shale | 40% |
| Eagle Ford Shale | 31.2% |
| East Texas Basin | 14.5% |
| All Plays | 27.2% |

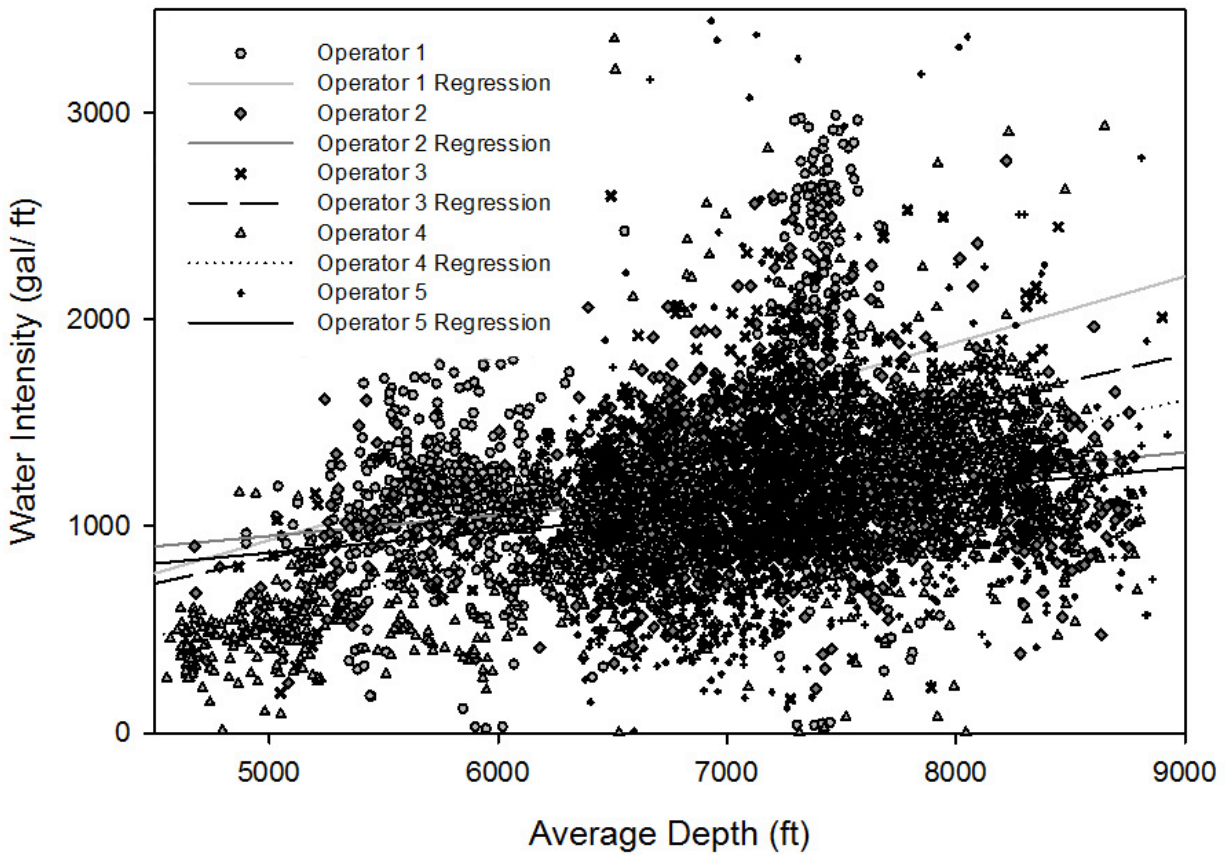


Figure 3. Water use intensity in the Barnett Shale play, showing comparison among between top operators in the play.

III. Historical and Current Water Use

After a short description of the major HF plays in Texas (Section III-1), we present water use and consumption numbers (Section III-2) that we compare to findings of the 2011 report (Section III-3). We also briefly address drilling water use (Section III-4).

III-1. Play Description

In this section we describe relevant features of each play which will then be used in the Projections Section (Section IV). Note that water use intensity and proppant loading values represent an average of the sometimes time-varying mix of slickwater / gel systems applied to the play at a given time. For example, a decrease in water use intensity may mean a better water efficiency in a technique or a move to a more water-efficient technique.

III-1-1 Barnett Shale

The Barnett Shale is the first in Texas and around the world to submit to intense slick-water HF since the mid-1990's, first using vertical wells. After a transition period, Barnett Shale operators use currently horizontal wells almost exclusively. After a strong growth in the mid-2000's (>2000 wells completed per year), the play has seen a relative decrease in the total number of wells completed in a year (Figure 4a) because of the reduced demand following the economic slump and the decreasing price of gas. Although drilling activity has abated at the edges of the play core, it is very vigorous in the core itself (Denton, Johnson, Tarrant, and Wise counties) and has considerably picked up in the so-called combo play in the northern confines of the play in Cooke and Montague counties. A weekly newsletter, the Powell Shale Digest (PSD; May 29, 2012) noted a sharp increase in oil production since mid-2010. Substantial amounts of oil and condensate have made those counties attractive to operators. Overall the total amount of water used is relatively steady at 25 kAF/yr (Figure 4b). The Barnett play is the Texas play with the highest degree of reporting water use at >90% (Table 2). Note that the bottom four plots of composite Figure 4 (as well as on similar figures in this document) show the fraction of wells used to compute the parameter on the secondary axis. High well reporting, allied with the large number of wells, gives us confidence that the water use values are particularly accurate in this play. The length of the laterals has been slowly increasing in the past few years (~3,500 ft in 2011) with a concomitant water use increase (Figure 4c and d). However water intensity (water amount per unit length) has stayed steady at ~1,200 gal/ft (Figure 4e). Note that the water intensity as reported in this document is higher than that reported in the 2011 report because of a slight change in computing it (see Section II-1-2). In contrast to water intensity, proppant loading has been increasing slightly over time to ~0.8 lb/gal in 2011 (Figure 4f).

In order to better understand water intensity and in an effort to modulate it across a play, we plotted water intensity against depth and thickness (Figure 5a and c). The trend seems upwards with increasing depth and thickness but is very noisy and tenuous at best. Water intensity appears to be rather dependent on the well operator (Figure 5b) and, thus, somehow difficult to vary across a play. Nevertheless, spatial distribution of water intensity shows a higher intensity in Denton County and in the eastern half of Wise County, areas in which the Barnett is the deepest as well as in Montague County in the oil window (Figure 6a).

In agreement with our methodology, it is also useful to understand the cumulative length of laterals in a given area or within a county. A key input to the projected water use is to assume

that the entire county will be hypothetically drilled up by parallel laterals extending from one side of the county to the other side and at regularly spaced intervals (at, for example, a 1,000- ft interval [see Nicot et al., 2011 for details]). Figure 6b displays such density of well laterals, which is fairly high in Johnson County and the southern half of Tarrant County. The average lateral spacing, which is simply the inverse of the lateral density, is shown in Figure 7 and detailed in Table 3 (it is calculated in those sections of the county with an actual shale footprint). The county with the highest relative cumulative length of laterals (Johnson County) yields an average spacing between assumed parallel laterals of ~1,700 ft. This is still removed from the operational distance between laterals of 1,000 ft or even 500 ft, suggesting that this county, despite its past activity will still see further significant activity as illustrated by the coverage gaps in Figure 8. The decrease in well completion activity in Johnson County as seen in Figure 9a is more related to price gas than to a true depletion of the resource in the county.

III-1-2 Eagle Ford Shale

The Eagle Ford Shale play has seen tremendous development in the past 2 years. Initially started as a new Barnett Shale, it quickly turned into a different type of play when the extent of the oil window became clear. In addition to the fast increase in wells completed (~1,400 in 2011) (Figure 10a) and the subsequent increase in water use at ~24 kAF in 2011 (Figure 10b), the Eagle Ford Shale has the unique feature among all the plays examined in this document to experience a sharp decrease in water intensity (Figure 10e) decreasing almost in half in 4 years to ~850 gal/ft in 2011. This is seemingly due to operational changes moving from high-volume slick water HF operations to gel fracs that can carry as much proppant with much less water. The use of cross-link gels for oil production requires a higher proppant loading (Fan et al., 2011). This decrease in water intensity combined with an increase in average lateral length (~5,000 ft, Figure 10c) still translates into a decrease in water use per well to ~5 million gallons/well (Figure 10d). Not surprisingly, the proppant loading has considerably increased to 1 lb/gal in 2011 (Figure 10f). The question we will not try to answer despite its relevance to water use projection is how transferable to other plays is this switch to gel fracs and whether it could happen elsewhere on a large scale. The percentage of wells with consistent data sets is only ~47% (Table 2), making the Eagle Ford data set more uncertain than that of the Barnett Shale.

The cross-plots of water intensity vs. depth and thickness are inconclusive and even misleading (Figure 11a and b). They show no real trend except perhaps a decrease in water intensity with depth. However, Figure 12a clearly shows a higher water intensity in the down dip sections of the play, suggesting an intensity as high as 1400 gal/ft in the gas-rich area and 800 gal/ft in the oil-rich area. Densities of lateral (Figure 12b) and average lateral spacing (Figure 13, Table 4) suggest that the Eagle Ford Shale play has two cores: next to the Mexican border in Dimmit, LaSalle, and Zavala Counties and south of San Antonio in Karnes and De Witt Counties. The low average lateral spacing (>10,000 ft) suggests that many more wells will be drilled and completed there in the future.

III-1-3 TX-Haynesville Shale and East Texas Basin

This document deals only with the Texas section of the Haynesville Shale. In East Texas the Haynesville is a deep gas play, despite a report that one company has located a liquid-rich area in the Haynesville in Panola County with 350 horizontal drill sites (PSD, May 29, 2012). These are expensive wells, but they are located in an area with multiple stacked formations amenable to

HF. The Texas section of the play has seen a quick increase in the number of wells drilled (~250 in 2011, Figure 14a) and a subsequent increase in water use (~1.6 kAF, Figure 14b). This play, with the Cotton Valley Fm., also in East Texas, has the smallest fraction of wells with usable data (32% in 2011, Table 2). Lateral length (~5,00 ft), well water use (~8 million gal/well), and water intensity (~1,400 gal/ft in 2011) have all increased in the past 3 years (Figure 14c, d, and e) whereas proppant loading has stayed stable at 0.8 lb/gal (Figure 14f). Water intensity as a function of depth and thickness does not show any reliable pattern (Figure 15). Water intensity (Figure 16b) and density of lateral (Figure 16c) are spatially correlated. The highest correlations are in Harrison County and where Shelby and San Augustine counties meet (Harrison, Shelby, San Augustine, and Panola counties are all in the TX-Haynesville core area). County-level average lateral spacing (Figure 17 and Table 5) with a minimum value at ~24,000 ft suggests that many more wells will be completed in this play.

III-1-4 Permian Basin

The Permian Basin, comprising the Midland Basin to the East and the Delaware Basin to the West, with the Central Platform in between, has a long history of mostly oil production. It has also received much attention recently because of hydraulically fractured vertical wells in the so-called Wolfberry play (Wolfcamp and Spraberry, Figure 18). More recently, attention has shifted to horizontal wells in the Wolfcamp Shales (Figure 19), one of the source rocks of the many oil accumulations in the Permian Basin. Several other plays are also being hydraulically fractured in the basin such as the Canyon Formation (Figure 20), the Clear Fork Formation (Figure 21), and the San Andres (Figure 22 and Figure 23) among others.

The Wolfberry was the first play in the Permian Basin to benefit from the technological progress made in the Barnett Shale play. The wells are vertical and have grown from <500 wells/yr to >1,500 wells in 2011 (Figure 18a). The annual amount of water use had also increased to almost 8 kAF in 2011 (Figure 18b). Approximately 80% of the wells have consistently good data. As the length of the productive vertical section has increased from 1,500 ft to >2,500 ft in the past few years (Figure 18c), so has the average water use per well which is >1 million gal/well in 2011, relatively small volume compared to that of horizontal wells in shale plays. As productive sections become longer, the water intensity increased slightly to ~400 gal/ft (Figure 18e), but proppant loading remained constant at ~0.9 lb/gal (Figure 18f). Water intensity seems to be higher in the Wolfberry of the Delaware Basin (Figure 24a), but that basin contains very few wells (Figure 25a), (and they might even be misnamed). The well density is the highest in Glasscock and Reagan Counties.

Slick water horizontal wells have been jumped in 2011 from a low level of <50 wells/yr to 160 wells (Figure 19a), with a concomitant increase in total water use (~1.5 kAF in 2011, Figure 19b). Lateral length (~5,000 ft in 2011), well water use (~5 million gal/well in 2011), and water intensity (800 gal/ft in 2011) all increased too (Figure 19c, d, and e), but average proppant loading stayed steady at ~1 lb/gal (Figure 19f). Water intensity is higher in the center of the Midland Basin (Figure 24b), and the density of lateral is the highest in Ward County (Figure 25b) but the average lateral spacing is still very high at ~23,000 ft (Figure 26), which suggests that many wells remain to be drilled and completed.

Other, less publicized plays also received increased interest, as shown by water intensity rising or remaining steady (Figure 20e, Figure 21e, Figure 22e, and Figure 23e). Other plays, not targeted for the same scrutiny, have also seen a development of HF. They were included in a

miscellaneous file that included all fractured wells not included in a targeted play. Overall the Permian Basin has a high fraction (~85%) of wells with a consistent data set (Table 2), thus giving us confidence that the water use values are relatively accurate (especially for those formations hosting a large number of wells).

III-1-5 Anadarko Basin

The Anadarko Basin contains several formations of interest, in particular the Granite Wash (Figure 27) but also the Cleveland and Marmaton formations (Figure 28 and Figure 29). Similarly to the development of the horizontal wells in the Wolfcamp in an area where HF was done on mostly vertical wells, the Anadarko Basin is seeing a shift toward horizontal wells. The Granite Wash has seen an increase from a few horizontal wells in 2006 to >300 in 2011 (Figure 27a) with a parallel increase in water use to <4 kAF in 2011 (Figure 27b). In the same time the length of the lateral has grown to ~4,500 ft (in 2011) (Figure 27c) and the average well water use to >5 million gallons (Figure 27d). Water intensity has reached a value of ~1,200 gal/ft (Figure 27e), but the proppant loading has remained steady at ~0.6 lb/gal (Figure 27f). The Cleveland and Marmaton horizontal wells display a similar evolution but for a smaller number of wells (~150 and ~40, respectively) and smaller water intensity at ~300 gal/ft (Figure 28e and Figure 29e). The fraction of wells with directly usable information was calculated at ~70% (Table 2). Water intensity as a function of depth failed to show a clear trend (Figure 30 and Figure 31).

Spatial distribution of Granite Wash water intensity (Figure 32a) and density of lateral (Figure 32b) confirms that Wheeler County is the most attractive county. At the county level, Wheeler County shows the smallest lateral spacing and plenty of room for additional wells (Figure 33 and Table 6). HF activities in the Cleveland and Marmaton Formations are focused on Hemphill, Lipscomb, and Ochiltree Counties (Figure 34 and Figure 35). Combining information from the three plays illustrates that the county with the smallest average lateral spacing (Lipscomb County) still allows for significant development at ~11,000 ft (Figure 36), as illustrated in Figure 37.

III-1-6 East Texas Basin

The East Texas Basin contains many formations susceptible to being hydraulically fractured. This section focuses on the Cotton Valley Fm., but, as was done for the Permian Basin and the Gulf Coast Basin, all water use data from wells in formations that were not part of the plays targeted for detailed study were still added to the total water use.

The Cotton Valley Fm. has been producing for decades and has been subjected to HF for almost as long. However, as observed in the rest of the state, there is a general shift from vertical to horizontal wells. Annual completions of vertical wells have been decreasing from ~1500 wells per year in 2007 to ~300 in 2011 (Figure 38a), whereas horizontal wells have been increasing from almost none in 2005 to ~100 in 2011 (Figure 39a). Total water use has followed the same path from ~1.5 kAF/yr to ~0 and from ~0 to 0.6 kAF/yr, respectively (Figure 38b and Figure 39b). In 5 years, the length of lateral has increased from ~1,000 ft to ~4,000 ft in 2011 (Figure 39c) with the associated water use increase to 4 million gallons per well in 2011 (Figure 39d). In the same period, water intensity has stayed steady at ~1,000 gal/ft (Figure 39e) and proppant loading has remained at ~0.8 lb/gal (Figure 39f). The overall representivity of the usable data set is at a steady ~70% for the horizontal wells but decreasing to only 25% for the vertical wells. A water intensity vs. depth cross-plot (Figure 40) displays no obvious trends but maps of well

density (Figure 41 and Figure 42) show that horizontal wells are being completed in the same areas as where the vertical wells were drilled and that there is a good overlap of the high density values.

III-1-7 Gulf Coast Texas

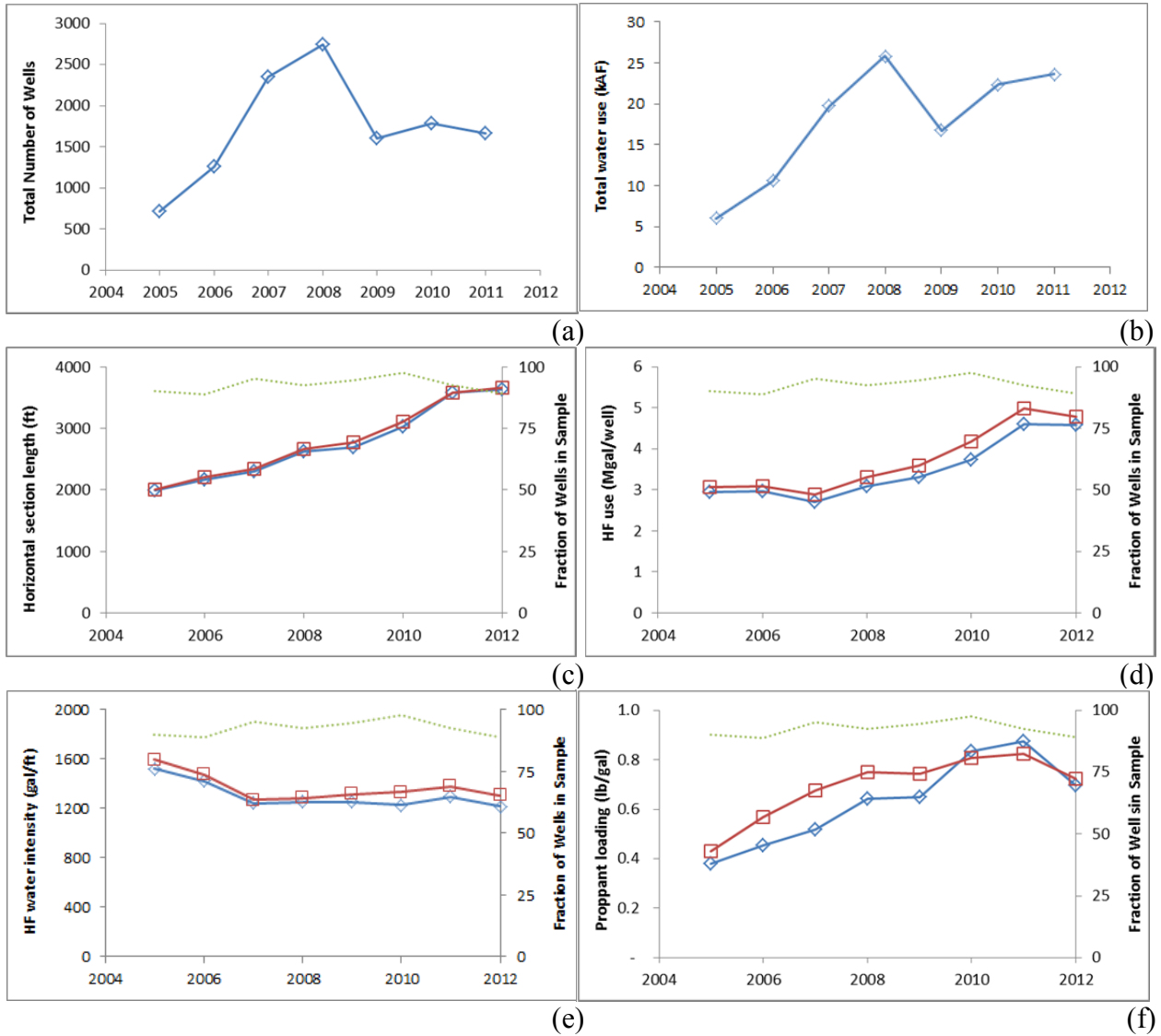
Similarly to the Permian Basin and the East Texas Basin, the Gulf Coast Basin, which includes many counties from the Mexican border to the Louisiana state line, contains several formations amenable to being hydraulically fractured. Each of these formations is not described here (for example, the Austin Chalk), but their water use is included in the total reported below. In this section, we document the Olmos Sands, where HF is taking place through horizontal wells. The annual number of completion is still low at 70 completions a year (Figure 43a) but growing and the total water use displays the same growth (~0.5 kAF in 2011, Figure 43b). Average lateral length has reached ~4,000 ft in 2011 (Figure 43c), and the average water use per well has increased to 4 million gal/well (Figure 43d). Although irregular through the years, water intensity has reached a value of ~1,000 gal/ft (Figure 43e) consistent with what has been observed elsewhere.

Table 2. Percentage of wells in each play or region that yielded a complete and consistent data set (water, proppant, length) from year 2011.

| Play / Region | Percent |
|----------------------|----------------|
| Barnett | 92.7% |
| Eagle Ford | 46.9% |
| Haynesville | 31.8% |
| Cotton Valley | 31.4% |
| Anadarko | 69.4% |
| Permian Basin | 84.9% |

ResultsSummary_year2011.xlsx

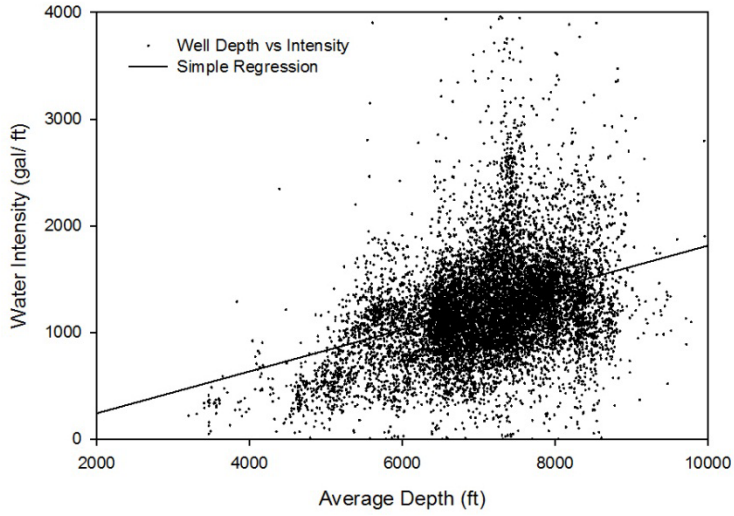
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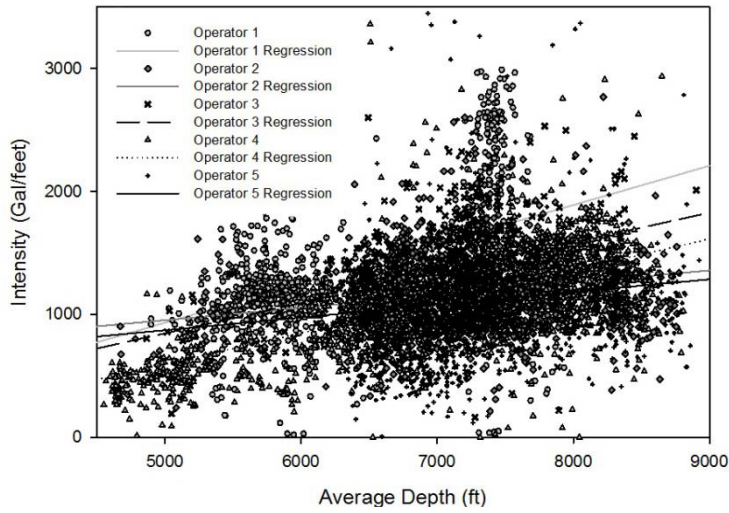
Note: red squares represent average ; blue diamonds represent median; only partial data for 2012

Figure 4. Barnett Shale horizontals, various historical parameters and coefficients for reported and estimated water use as a function of time: (a) number of wells; (b) water use; (c) average/median lateral length; (d) average/median water use per well; (e) average/median water use intensity; (f) average/median proppant loading.

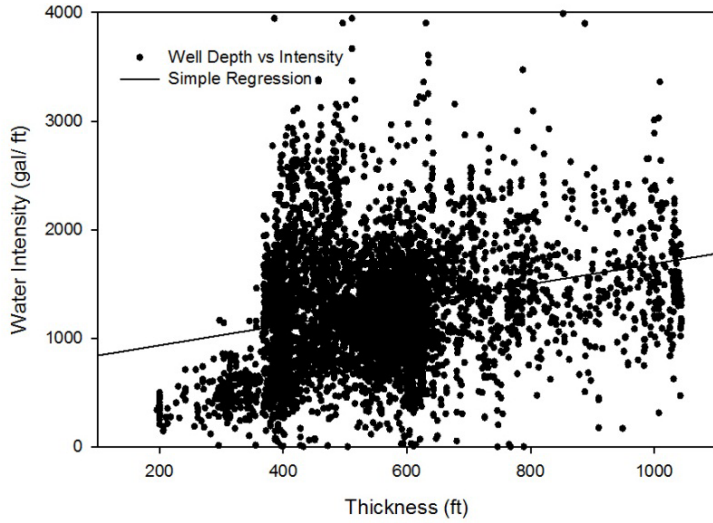
Barnett Shale:



(a)



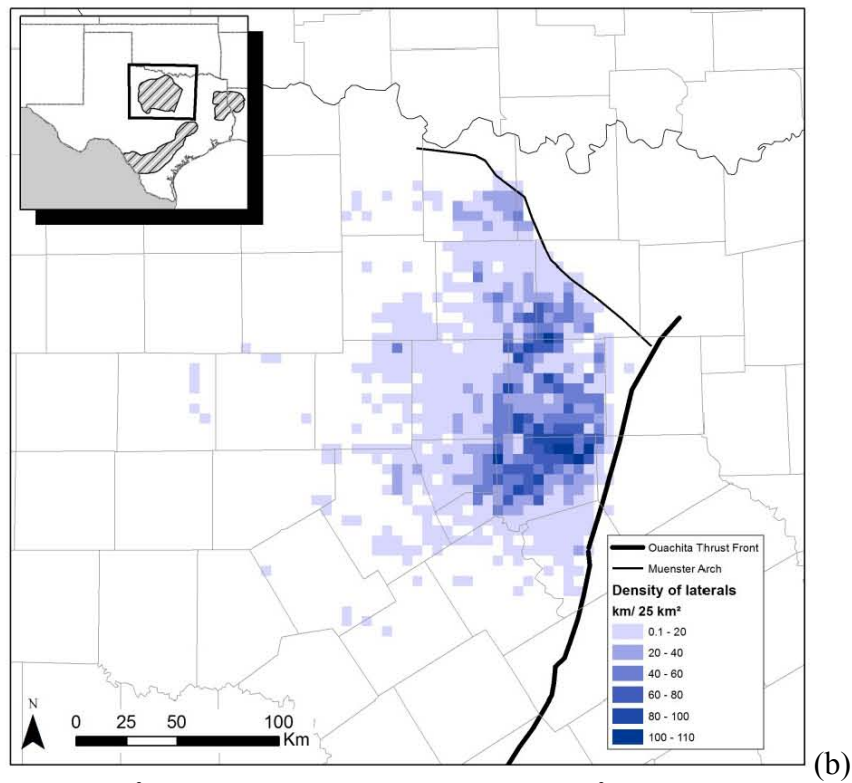
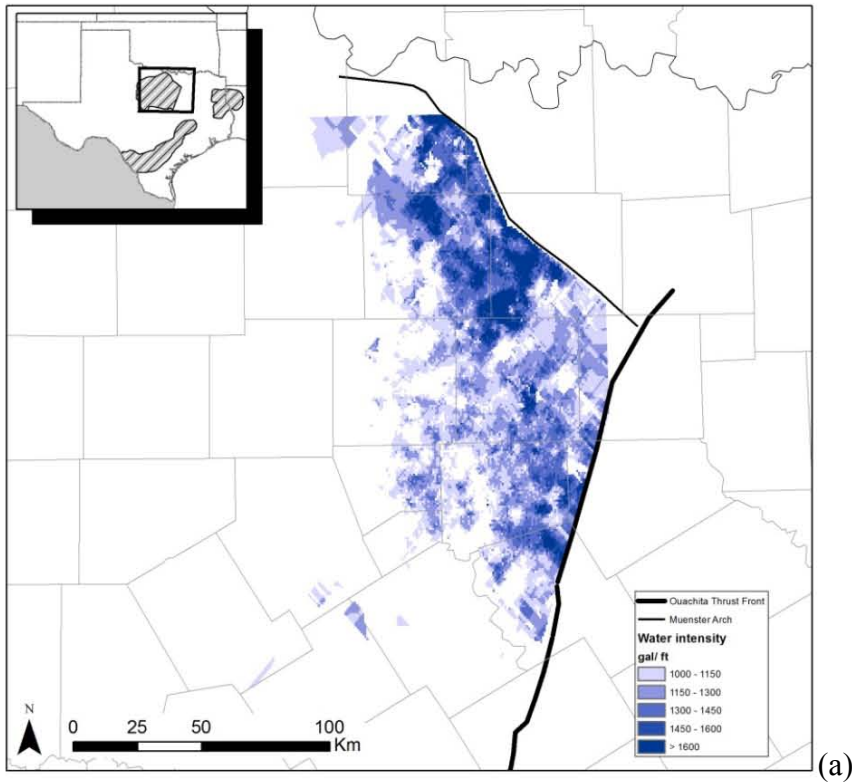
(b)



(c)

Figure 5. Barnett Shale horizontal water use intensity as a function of (a) depth; (b) operator and depth; and (c) formation thickness.

Barnett Shale:



Note: $25 \text{ km}^2 = 154 \times 40$ acres, that is, $154 \text{ wells}/25 \text{ km}^2 = 1 \text{ well}/40$ acres

Figure 6. Barnett Shale spatial distribution of (a) water intensity; and (b) density of lateral (cumulative length per area).

Barnett Shale:

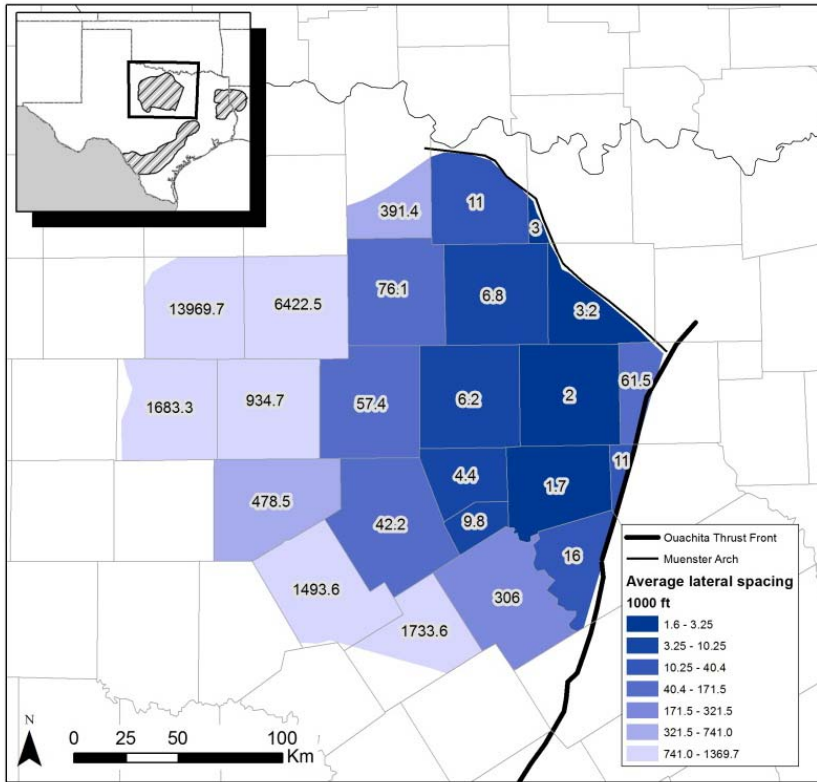


Figure 7. Barnett Shale county-level average lateral spacing.

Table 3. Barnett Shale county-level average lateral spacing for top producing counties.

| County Name | Sum lateral length / county area (km/km ²) | Average Lateral Spacing (1000 ft) |
|-------------|--|-----------------------------------|
| Johnson | 1.94 | 1.69 |
| Tarrant | 1.66 | 1.98 |
| Hood | 0.75 | 4.35 |
| Parker | 0.53 | 6.20 |
| Wise | 0.48 | 6.77 |
| Denton | 0.47 | 6.99 |
| Somervell | 0.34 | 9.76 |
| Others | | >10×10 ³ ft |

Note: Average spacing = 1/ (lateral length density);
 Counties are sorted by decreasing lateral length density

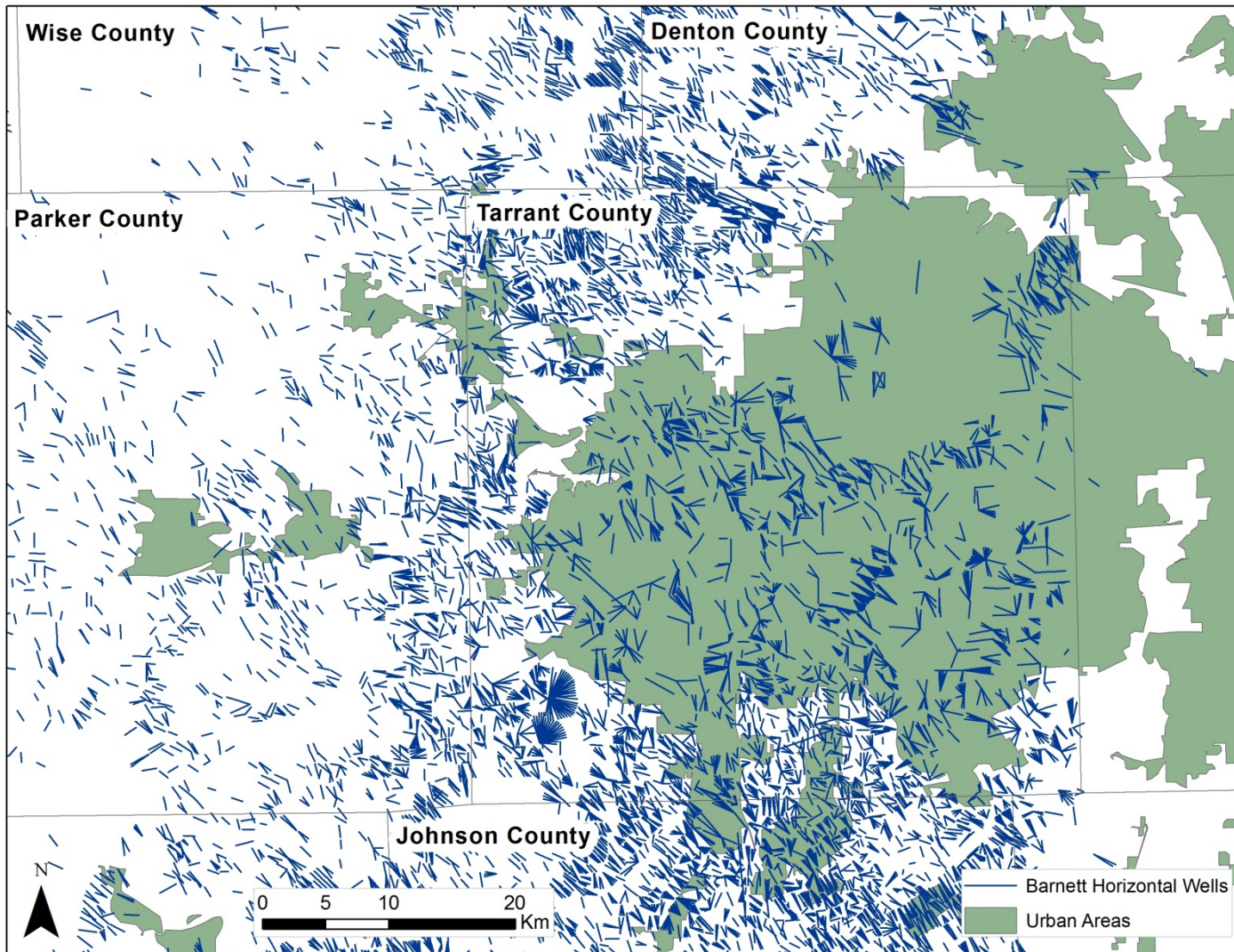


Figure 8. Map view of lateral expression of horizontal wells in the Barnett Shale centered on Tarrant County.

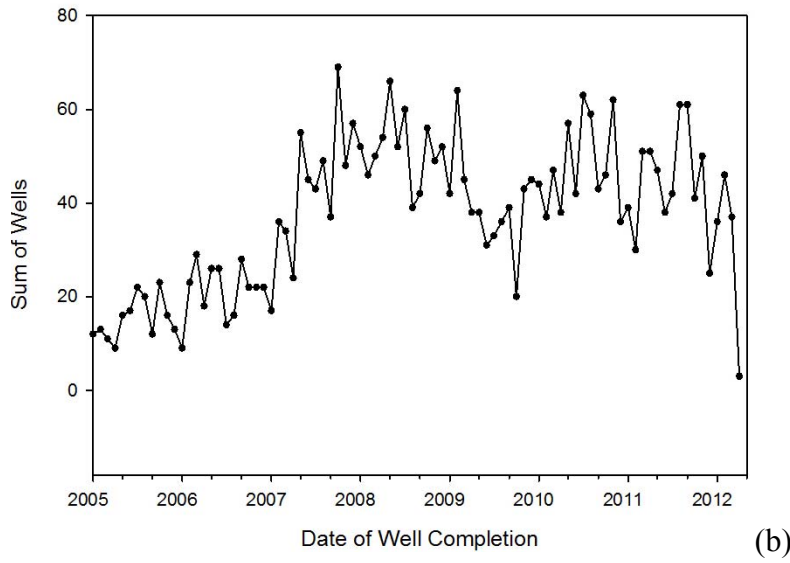
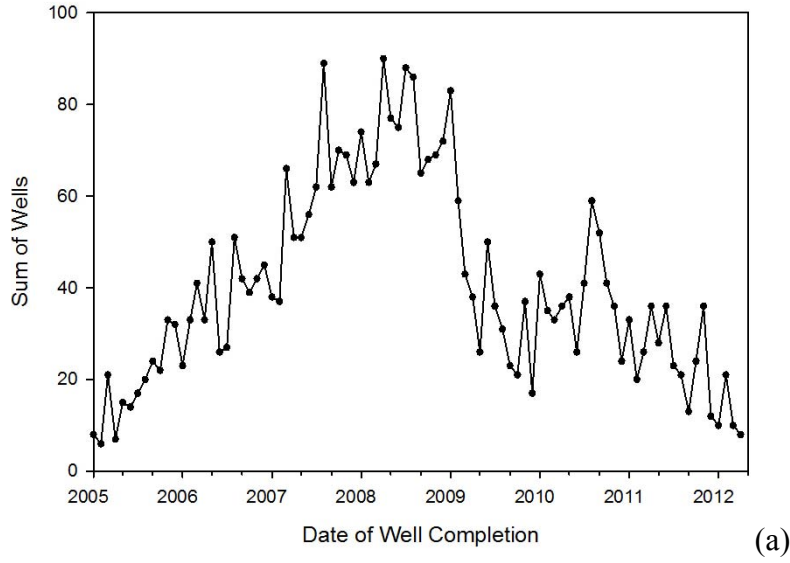
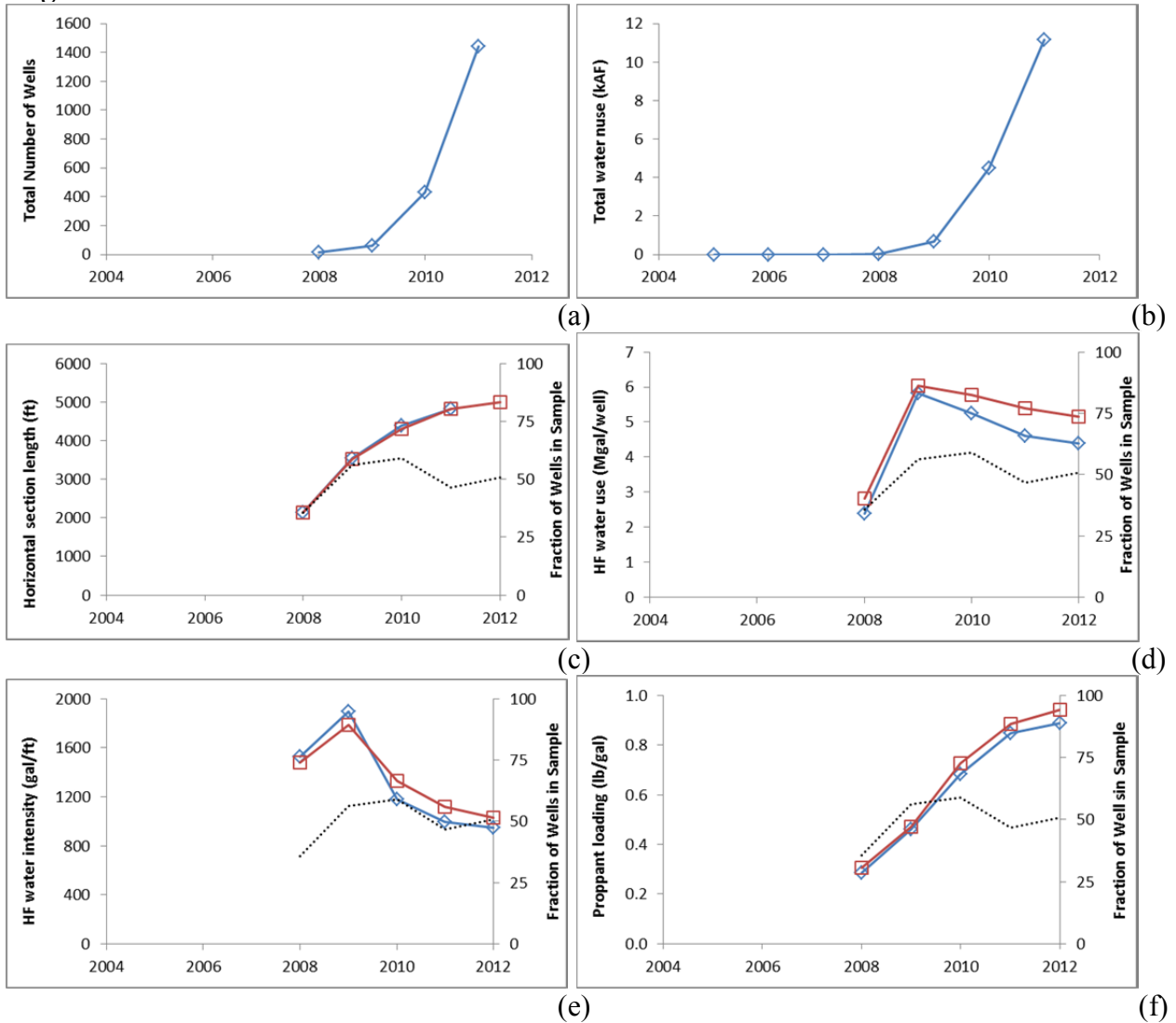


Figure 9. Annual well count in Johnson (a) and Tarrant (b) counties.

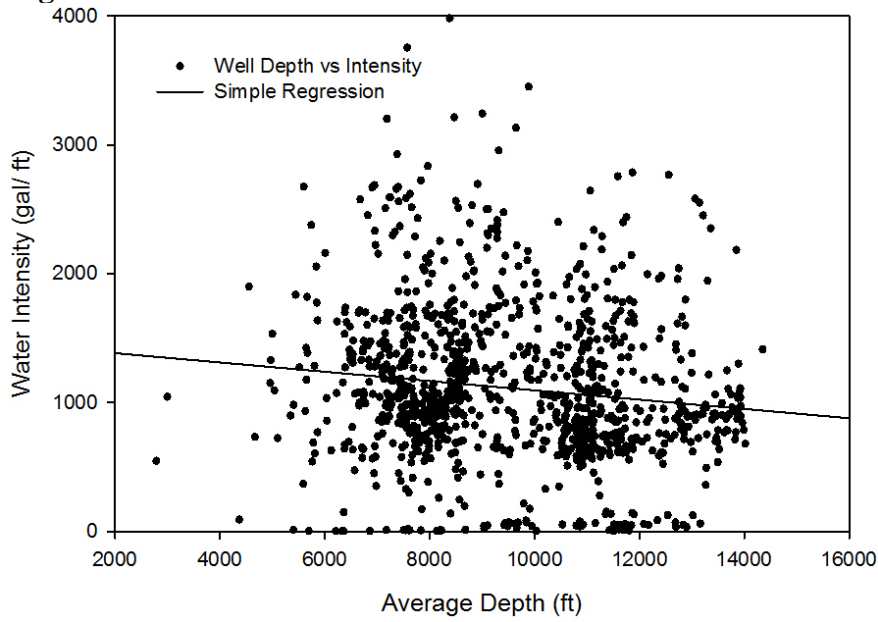
Eagle Ford Shale:



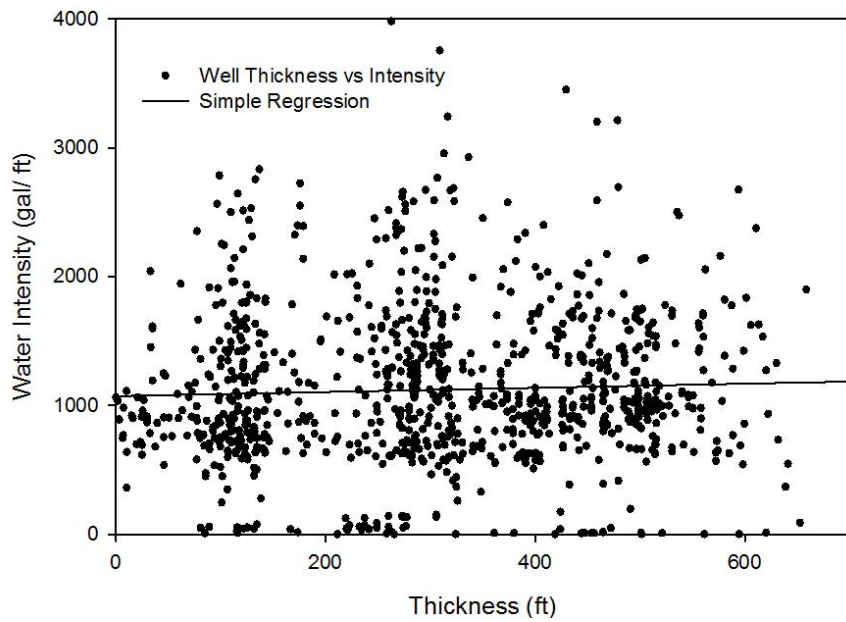
Note: red squares represent average ; blue diamonds represent median; only partial data for 2012

Figure 10. Eagle Ford horizontals, various historical parameters and coefficients for reported and estimated water use as a function of time: (a) number of wells; (b) water use; (c) average/median lateral length; (d) average/median water use per well; (e) average/median water use intensity; (f) average/median proppant loading.

Eagle Ford Shale:



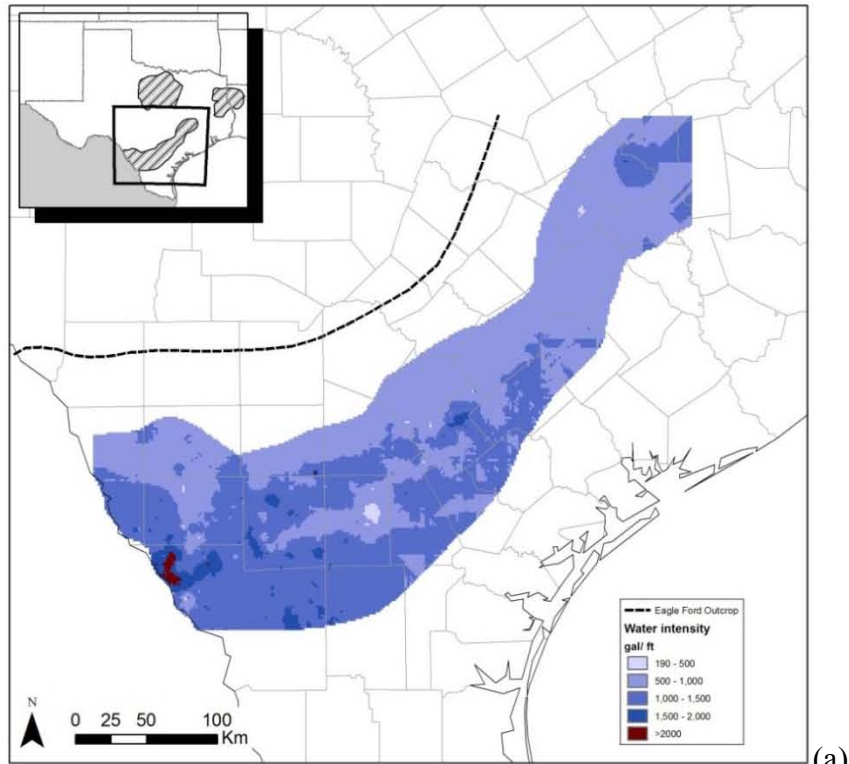
(a)



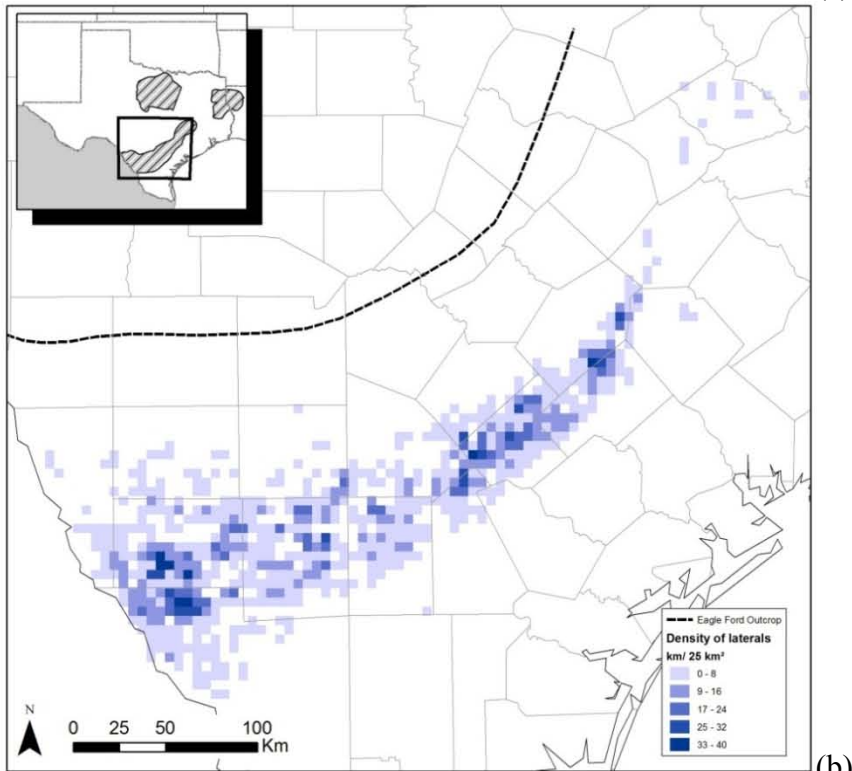
(b)

Figure 11. Eagle Ford Shale horizontal wells' water use intensity as a function of (a) depth; and (b) formation thickness.

Eagle Ford Shale:



(a)



(b)

Note: $25 \text{ km}^2 = 154 \times 40$ acres, that is, $154 \text{ wells}/25 \text{ km}^2 = 1 \text{ well}/40$ acres

Figure 12. Eagle Ford Shale spatial distribution of (a) water intensity; and (b) density of lateral (cumulative length per area).

Eagle Ford Shale:

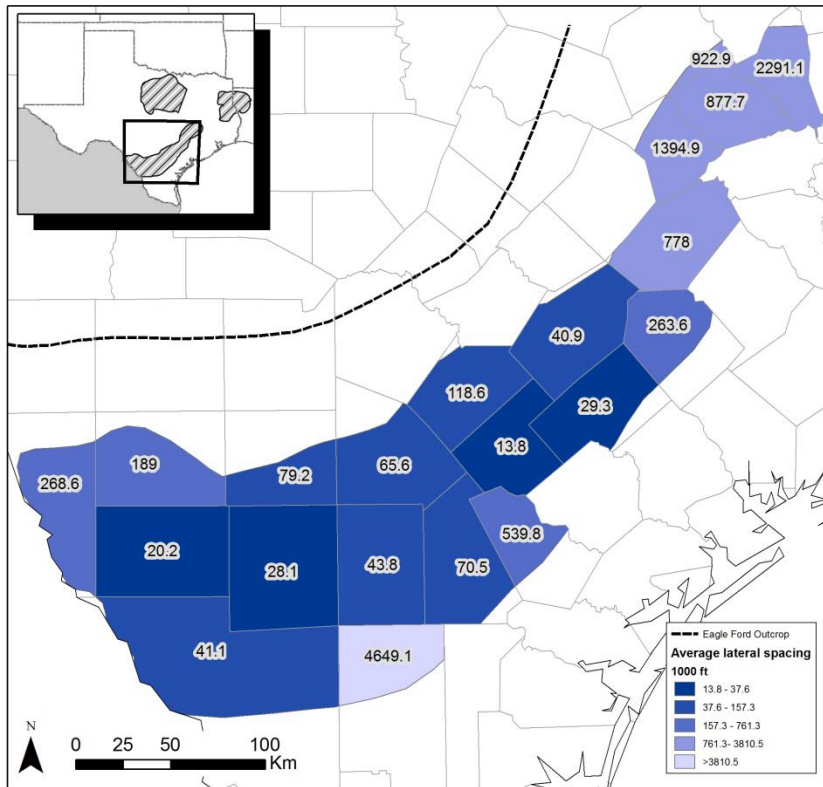
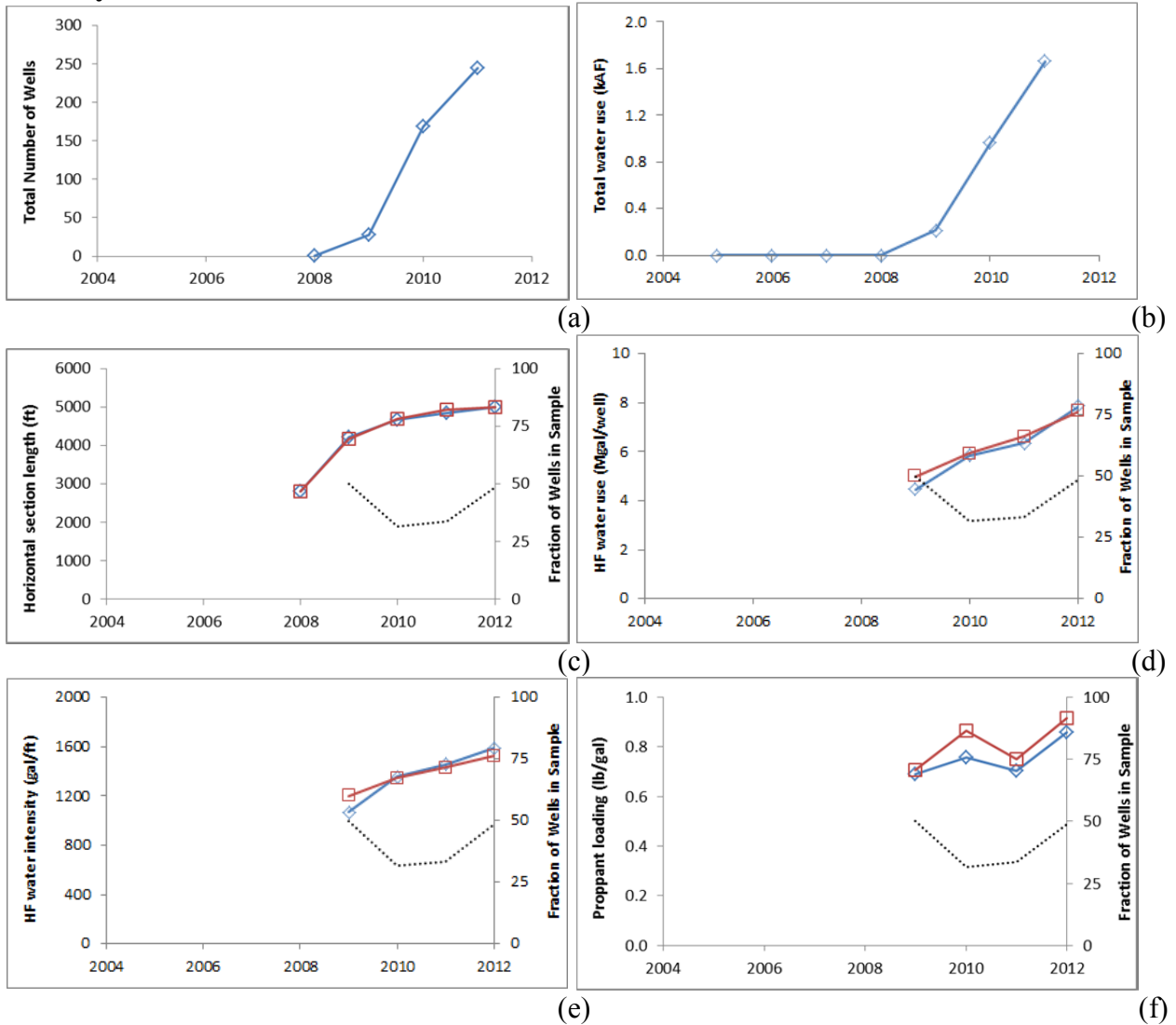


Figure 13. Eagle Ford Shale county-level average lateral spacing.

Table 4. Eagle Ford Shale county-level average lateral spacing for top producing counties.

| County Name | Sum lateral length / county area (km/km ²) | Average Lateral Spacing (1000 ft) |
|-------------|--|-----------------------------------|
| Karnes | 0.236 | 13.93 |
| Dimmit | 0.162 | 20.30 |
| La Salle | 0.116 | 28.20 |
| De Witt | 0.111 | 29.63 |
| Gonzales | 0.080 | 41.01 |
| McMullen | 0.075 | 43.79 |
| Webb | 0.080 | 41.11 |

TX-Haynesville Shale:



Note: red squares represent average ; blue diamonds represent median; only partial data for 2012

Figure 14. TX-Haynesville Shale horizontals, various historical parameters and coefficients for reported and estimated water use as a function of time: (a) number of wells; (b) water use; (c) average/median lateral length; (d) average/median water use per well; (e) average/median water use intensity; (f) average/median proppant loading.

TX-Haynesville Shale:

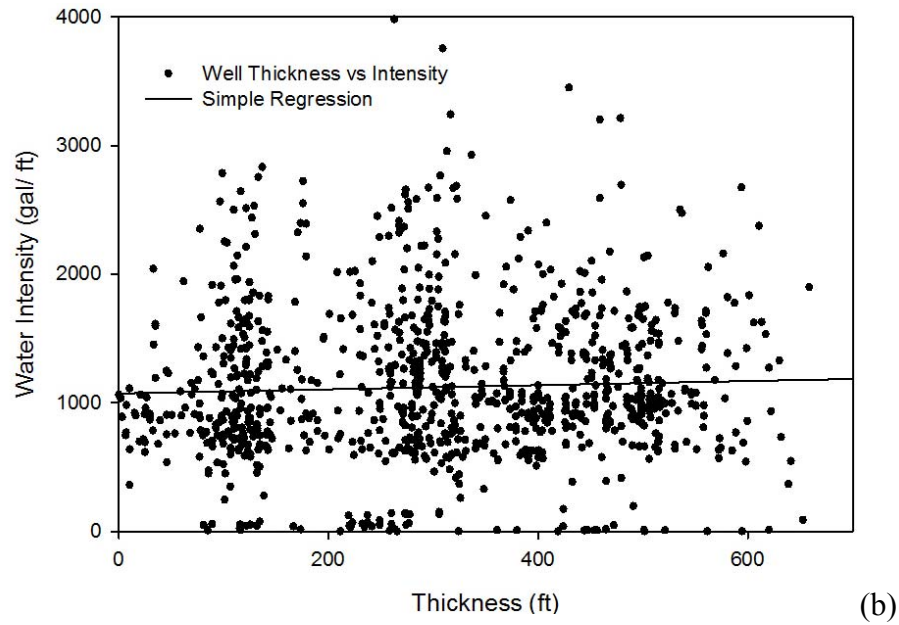
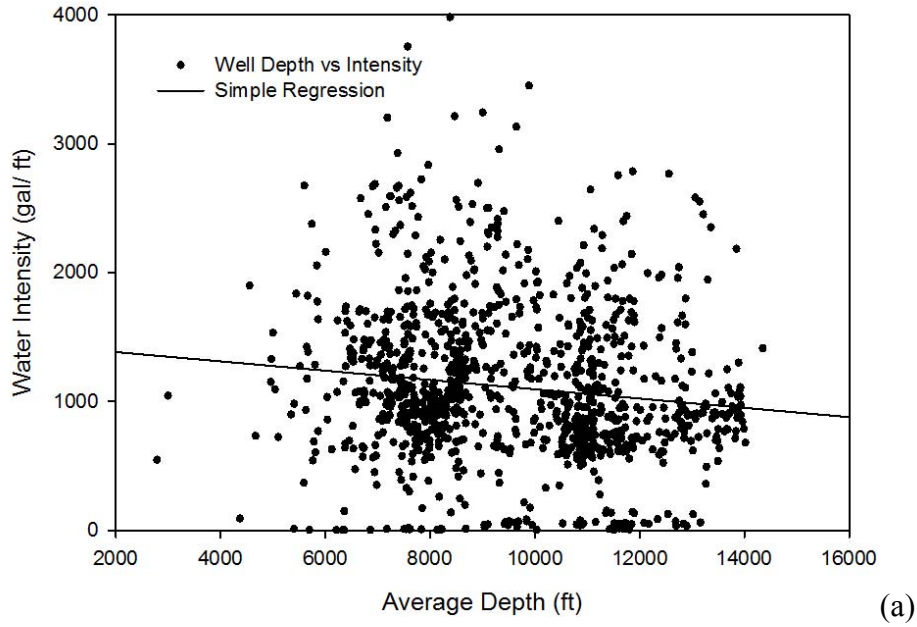
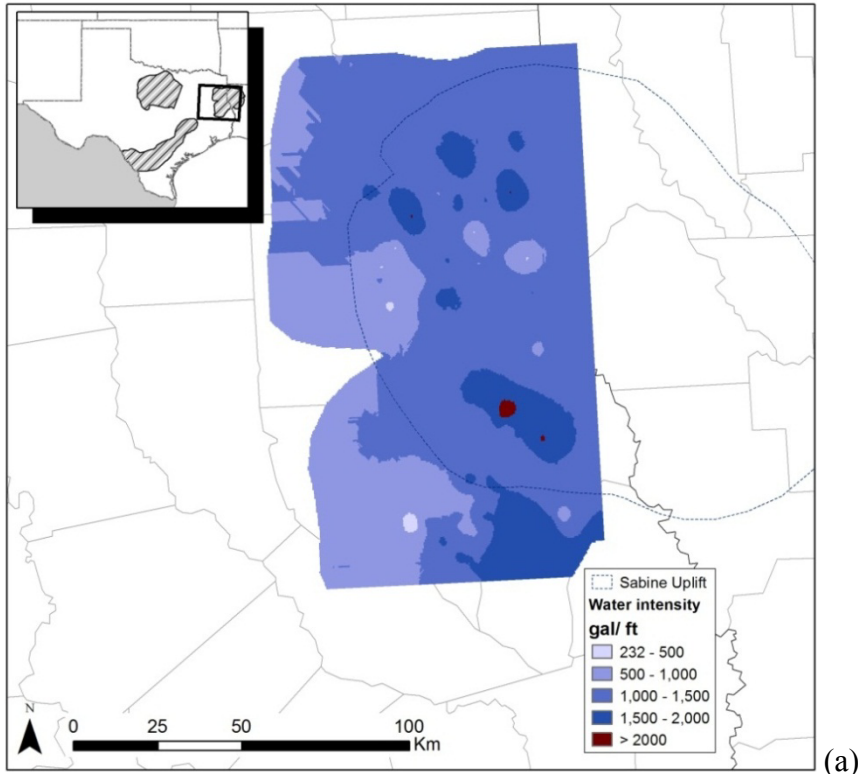
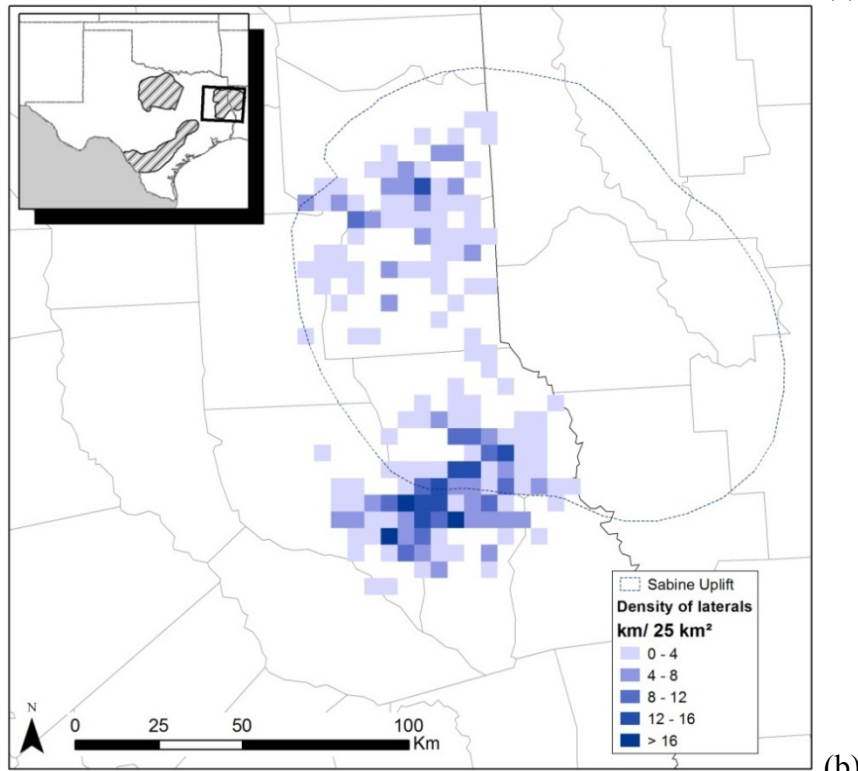


Figure 15. TX-Haynesville Shale horizontal water use intensity as a function of (a) depth; and (b) formation thickness.

TX-Haynesville Shale:



(a)



(b)

Note: $25 \text{ km}^2 = 154 \times 40$ acres, that is, $154 \text{ wells}/25 \text{ km}^2 = 1 \text{ well}/40$ acres

Figure 16. TX-Haynesville Shale spatial distribution of (a) water intensity; and (b) density of lateral (cumulative length per area).

TX-Haynesville Shale:

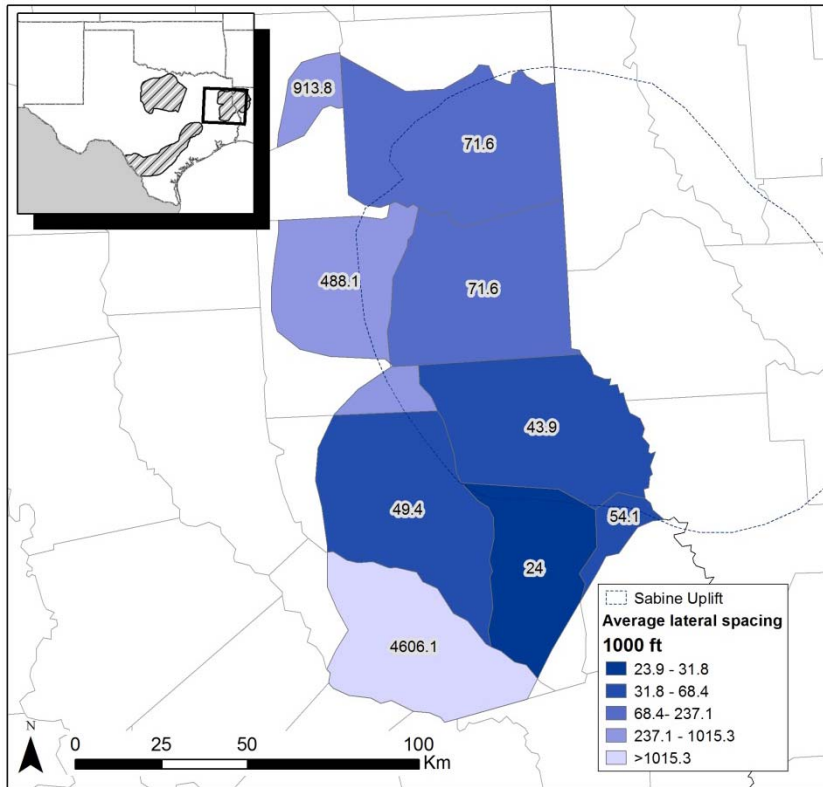
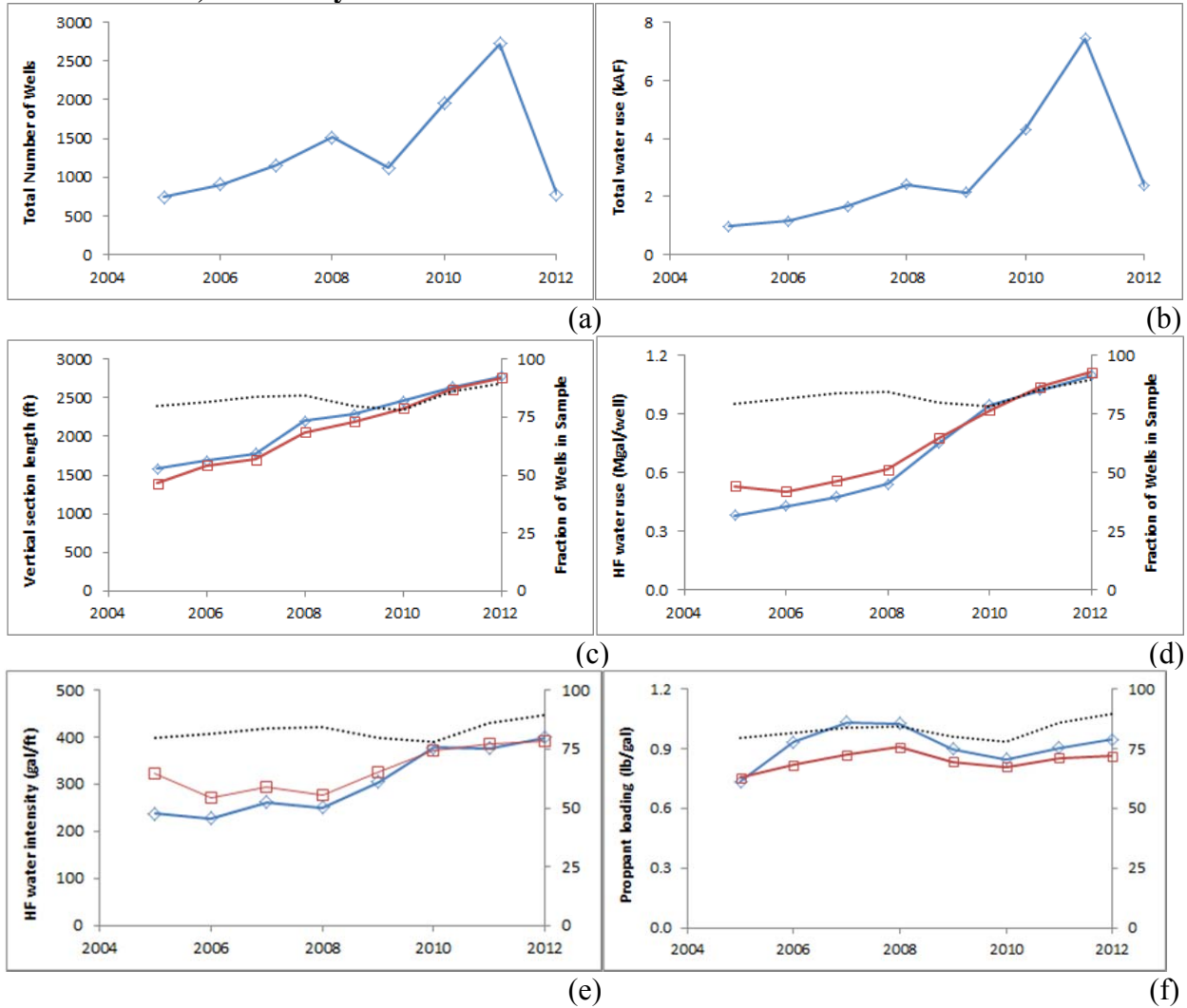


Figure 17. TX-Haynesville Shale county-level average lateral spacing.

Table 5. TX-Haynesville Shale county-level average lateral spacing for top producing counties.

| County Name | Sum lateral length / county area (km/km ²) | Average Lateral Spacing (1000 ft) |
|---------------|--|-----------------------------------|
| San Augustine | 0.137 | 23.97 |
| Shelby | 0.074 | 44.24 |
| Nacogdoches | 0.065 | 50.78 |
| Sabine | 0.061 | 54.11 |
| Panola | 0.046 | 72.03 |
| Harrison | 0.045 | 72.84 |

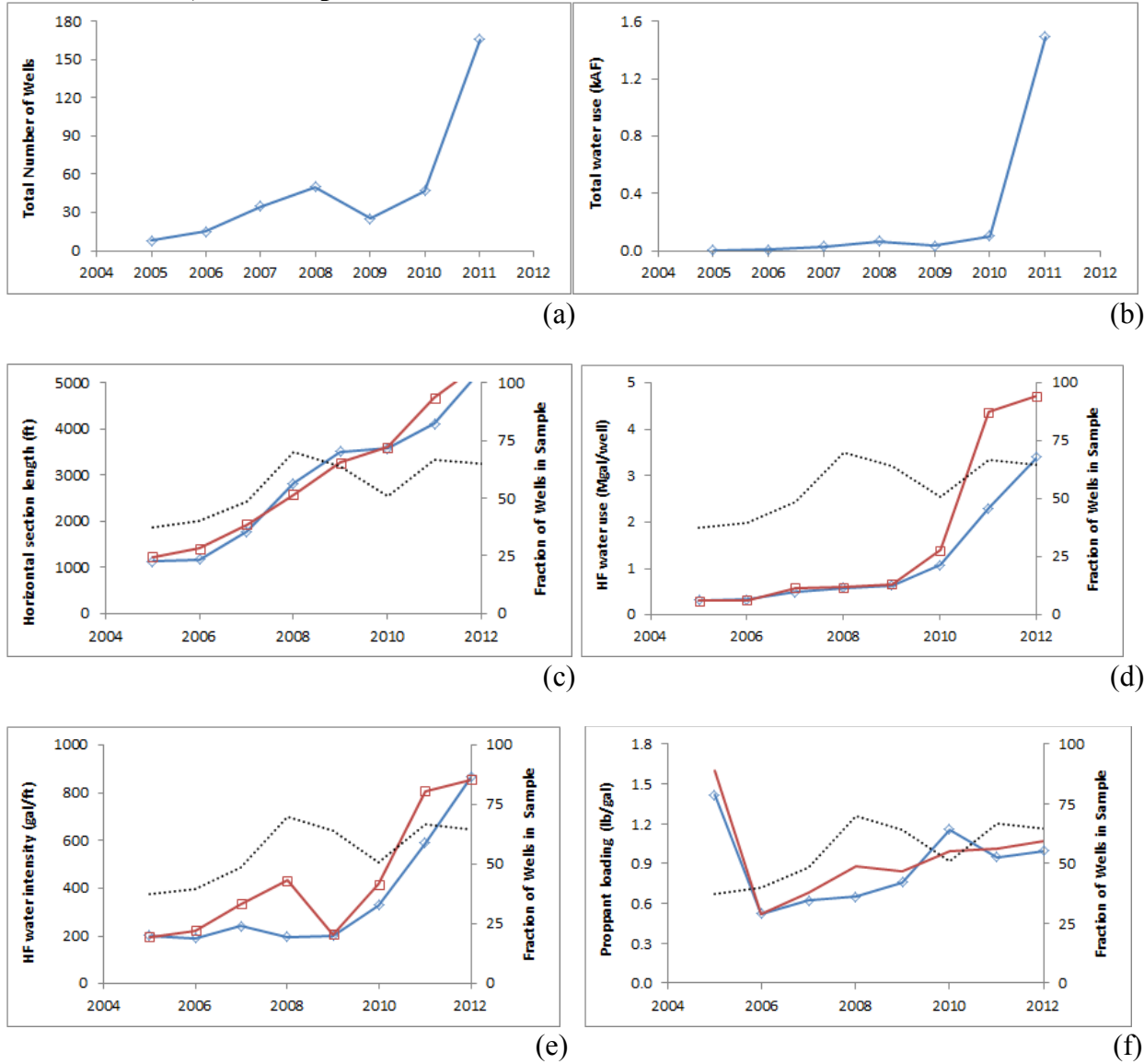
Permian Basin, Wolfberry Verticals:



Note: red squares represent average ; blue diamonds represent median; only partial data for 2012

Figure 18. Wolfberry verticals, various historical parameters and coefficients for reported and estimated water use as a function of time: (a) number of wells; (b) water use; (c) average/median vertical productive section length; (d) average/median water use per well; (e) average/median water use intensity; (f) average/median proppant loading.

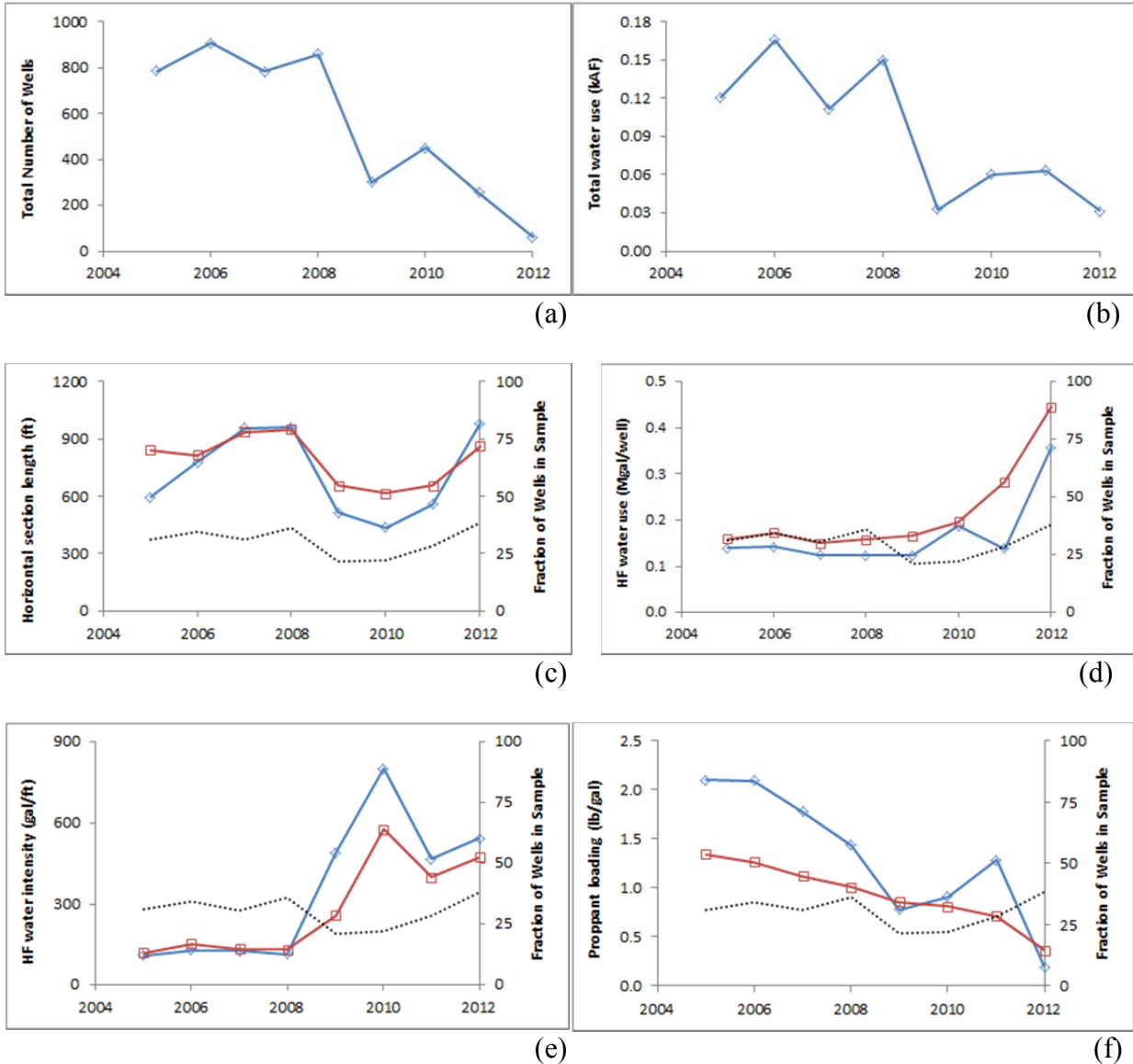
Permian Basin, Wolfcamp Horizontals:



Note: red squares represent average ; blue diamonds represent median; only partial data for 2012

Figure 19. Wolfcamp horizontals, various historical parameters and coefficients for reported and estimated water use as a function of time: (a) number of wells; (b) water use; (c) average/median lateral length; (d) average/median water use per well; (e) average/median water use intensity; (f) average/median proppant loading.

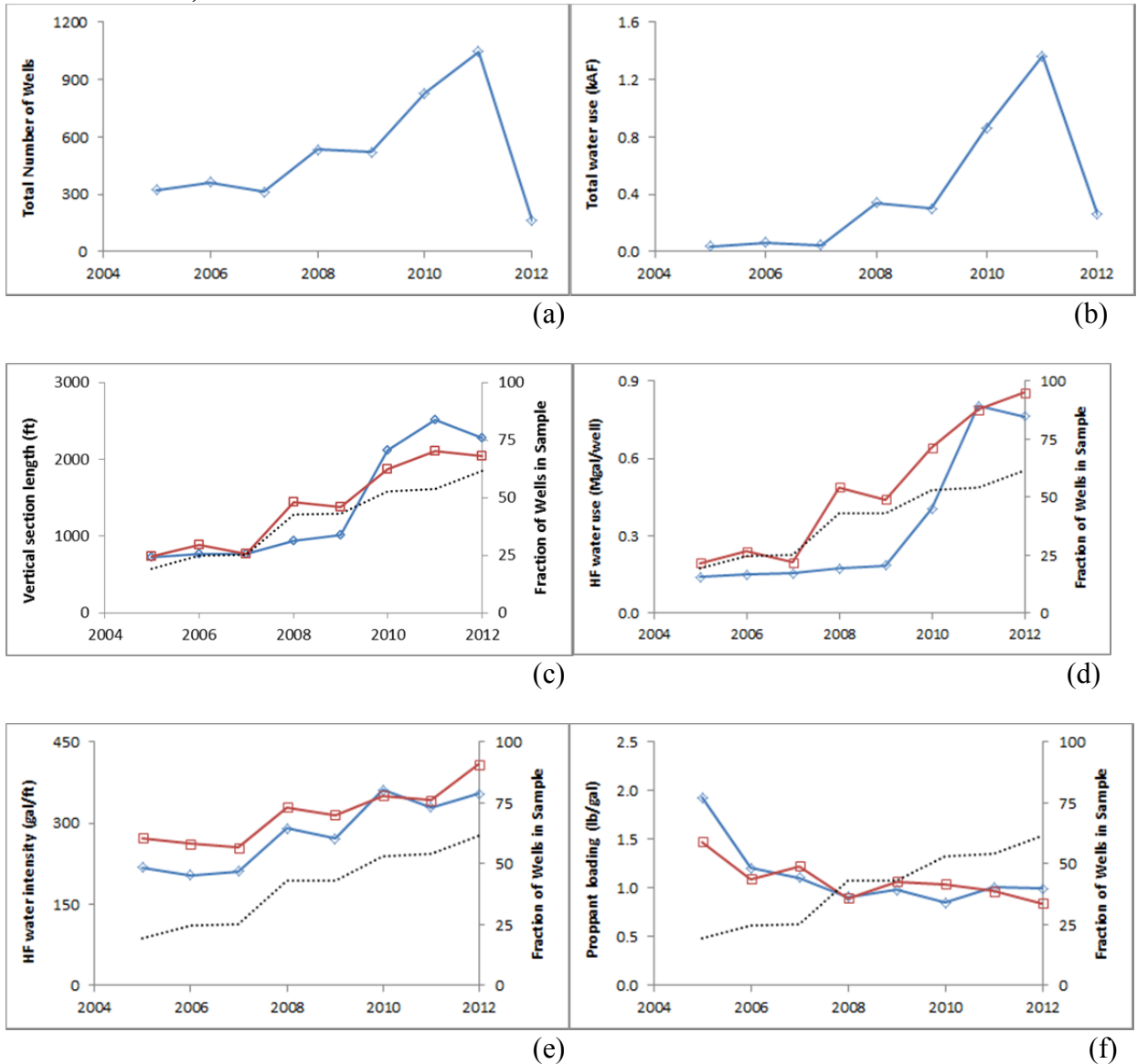
Permian Basin, Canyon – Horizontals:



Note: red squares represent average ; blue diamonds represent median; only partial data for 2012

Figure 20. Canyon Sand horizontals, various historical parameters and coefficients for reported and estimated water use as a function of time: (a) number of wells; (b) water use; (c) average/median lateral length; (d) average/median water use per well; (e) average/median water use intensity; (f) average/median proppant loading.

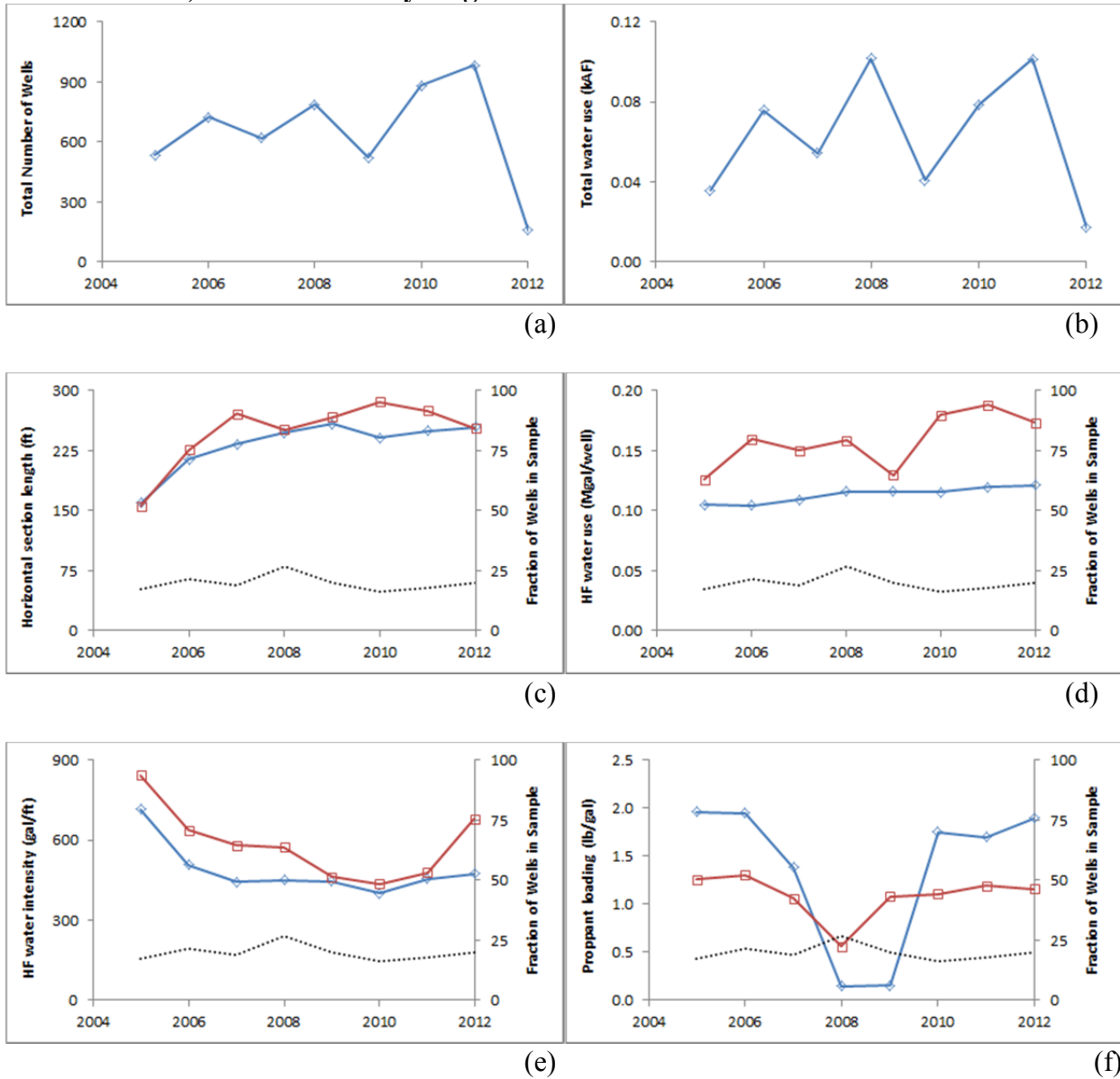
Permian Basin, Clearfork - Verticals



Note: red squares represent average ; blue diamonds represent median; only partial data for 2012

Figure 21. Clearfork verticals, various historical parameters and coefficients for reported and estimated water use as a function of time: (a) number of wells; (b) water use; (c) average/median vertical productive section length; (d) average/median water use per well; (e) average/median water use intensity; (f) average/median proppant loading.

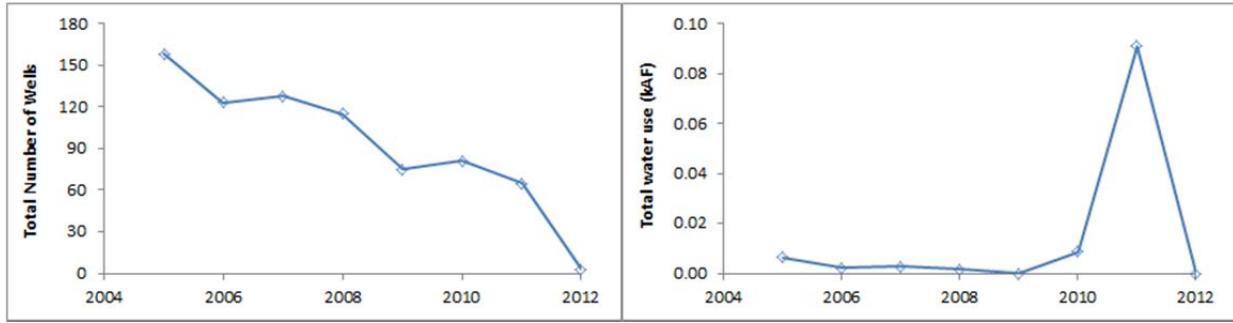
Permian Basin, San Andres-Grayburg -Verticals



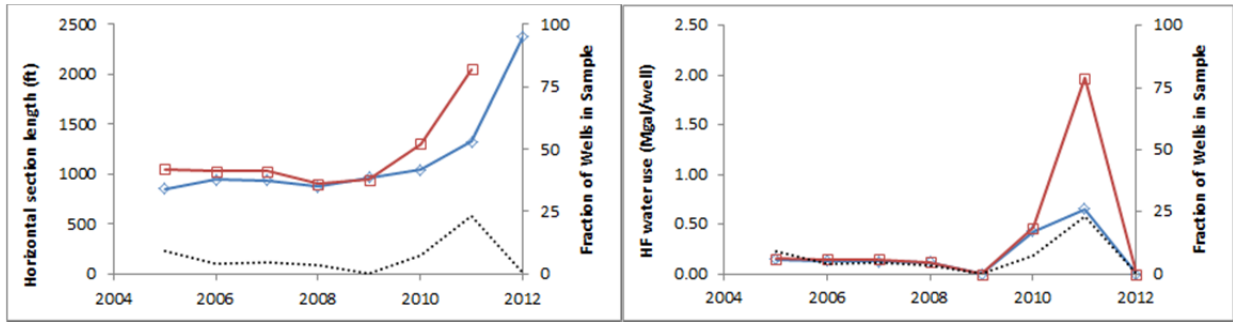
Note: red squares represent average ; blue diamonds represent median; only partial data for 2012

Figure 22. San Andres-Grayburg verticals, various historical parameters and coefficients for reported and estimated water use as a function of time: (a) number of wells; (b) water use; (c) average/median vertical productive section length; (d) average/median water use per well; (e) average/median water use intensity; (f) average/median proppant loading.

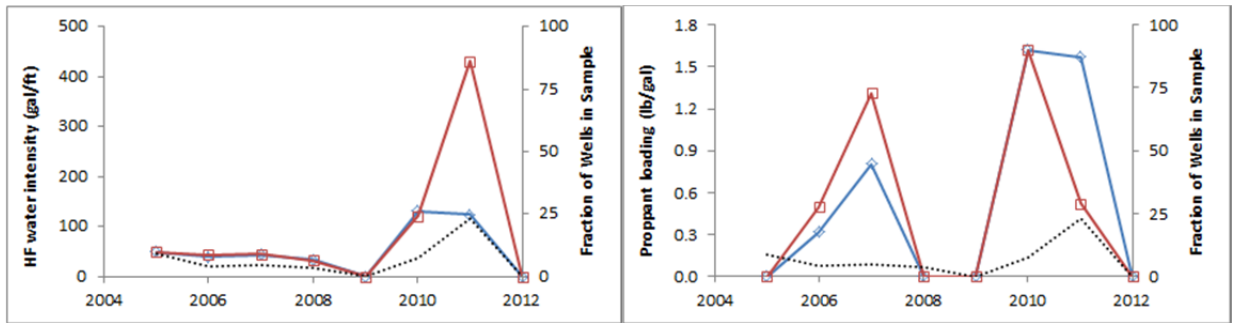
Permian Basin, San Andres-Grayburg -Horizontals



(a) (b)



(c) (d)



(e) (f)

Note: red squares represent average ; blue diamonds represent median; only partial data for 2012

Figure 23. San Andres-Grayburg horizontals, various historical parameters and coefficients for reported and estimated water use as a function of time: (a) number of wells; (b) water use; (c) average/median lateral length; (d) average/median water use per well; (e) average/median water use intensity; (f) average/median proppant loading.

Permian Basin:

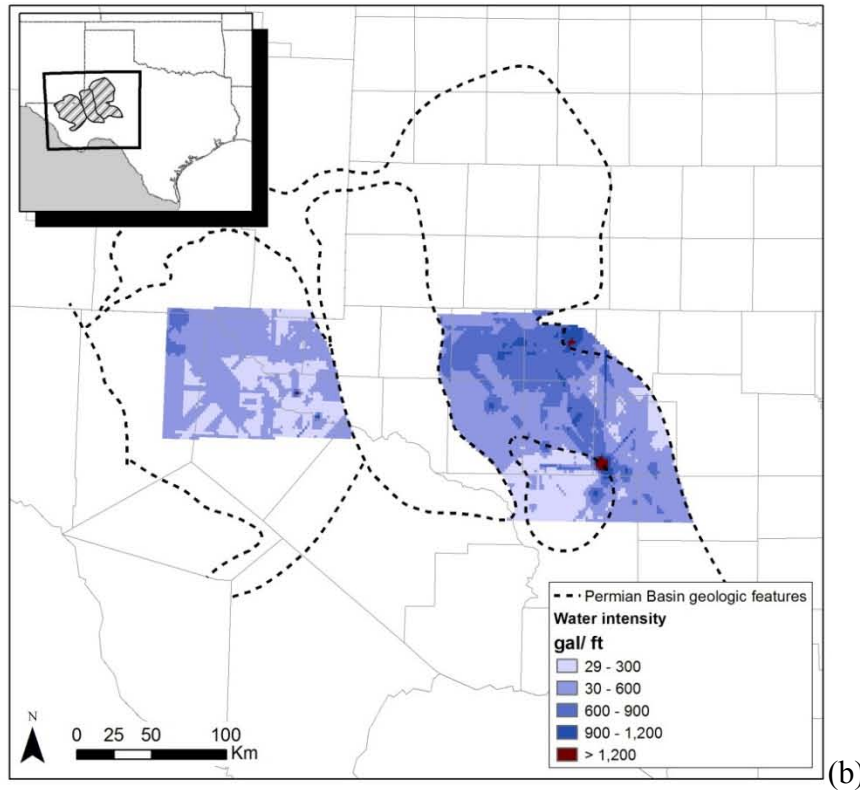
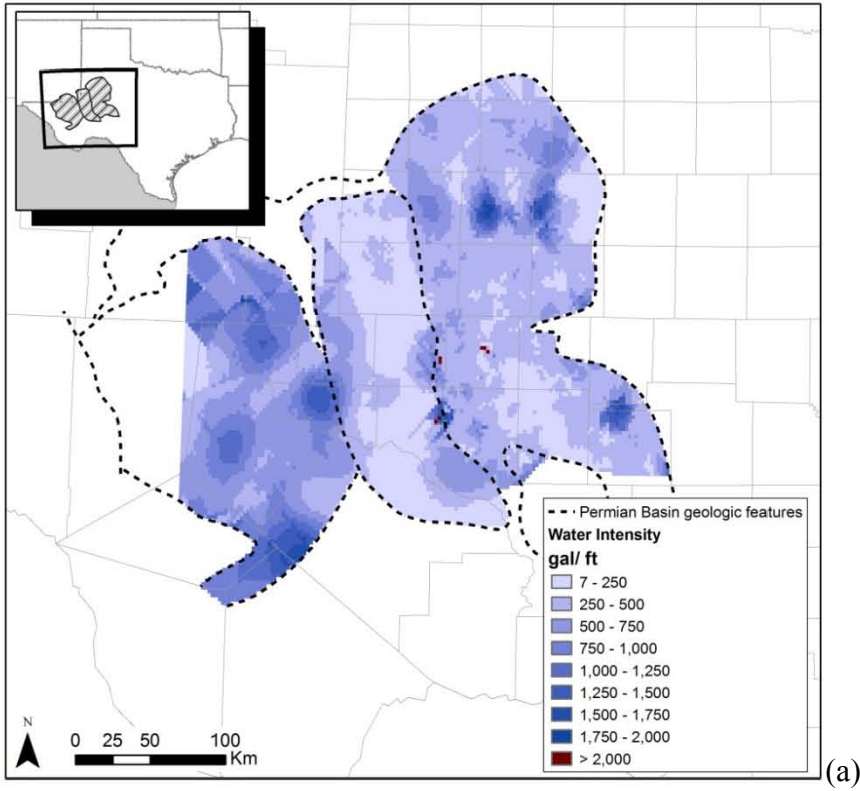
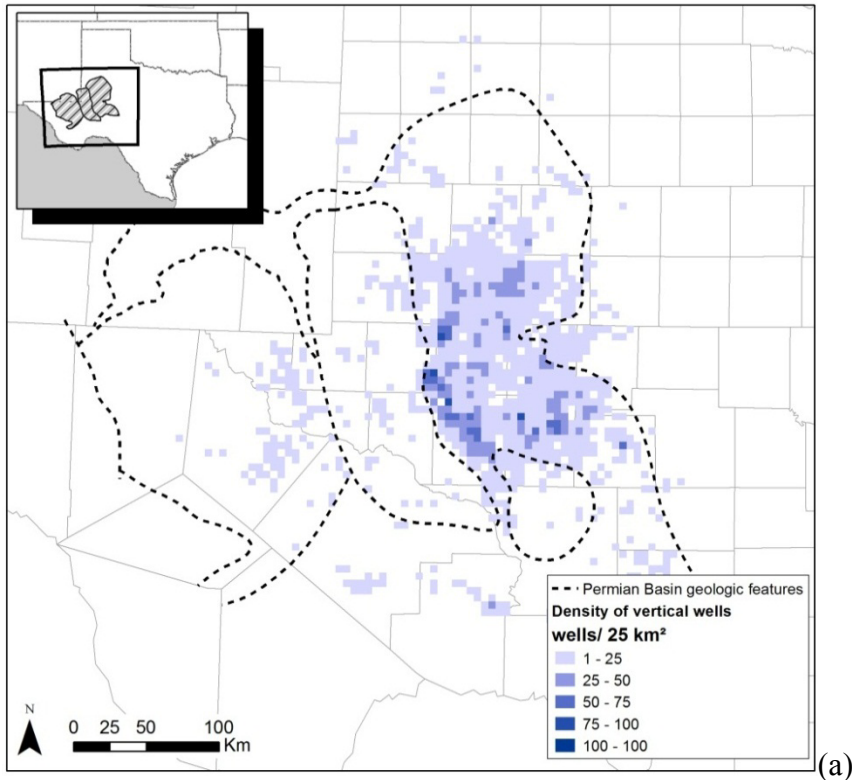


Figure 24. Permian Basin spatial distribution of water intensity for (a) vertical and (b) horizontal wells.

Permian Basin:



Note: 25 km² = 154 × 40 acres, that is, 154 wells/25 km² = 1 well/40 acres

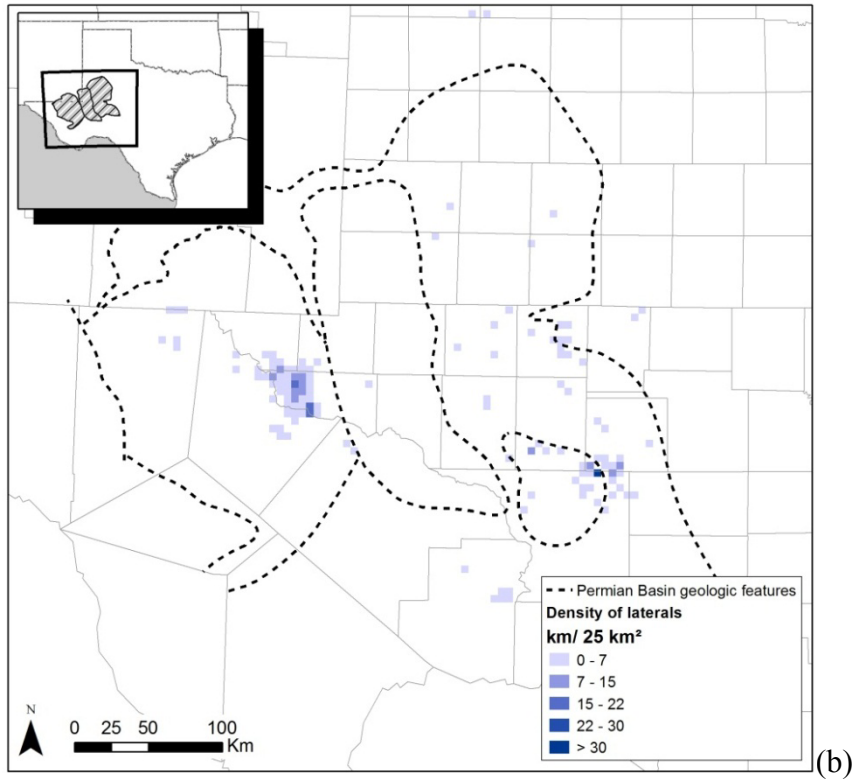


Figure 25. Permian Basin spatial distribution of (a) vertical well density and (b) density of lateral (cumulative length per area) for horizontal wells.

Permian Basin

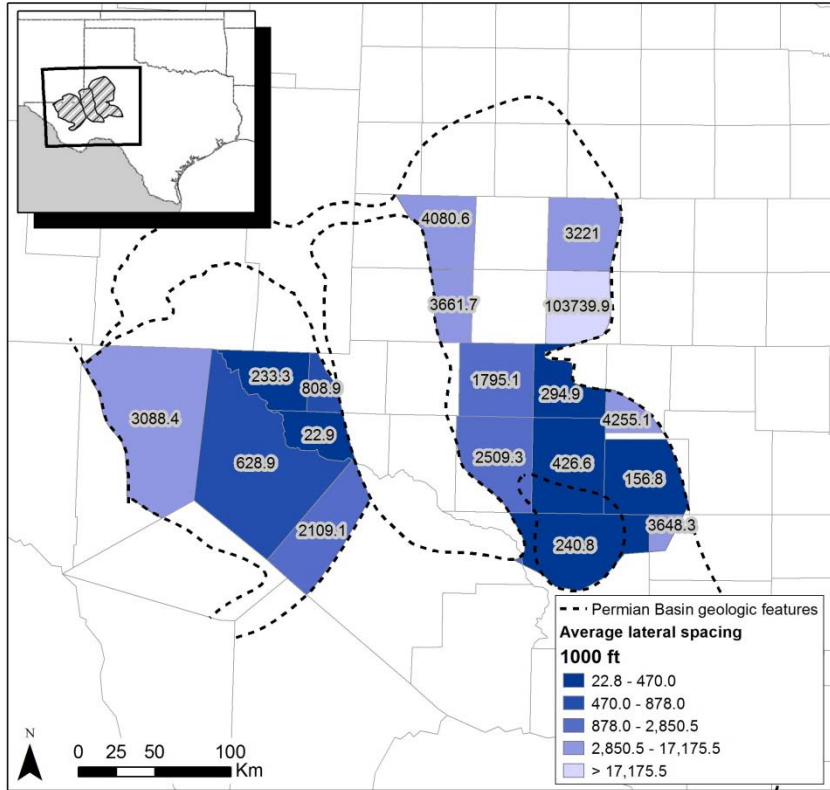
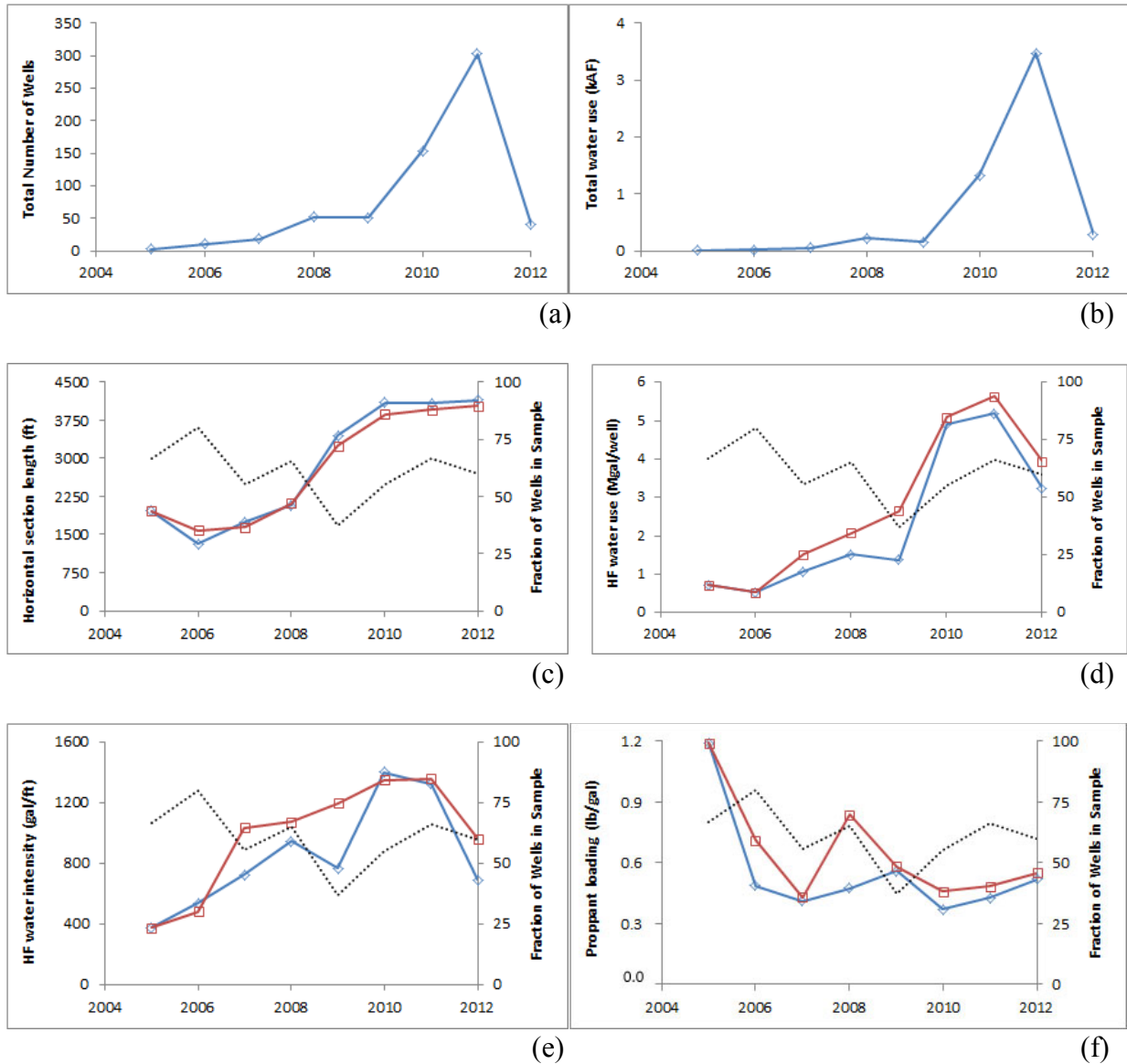


Figure 26. Permian Basin county-level average lateral spacing

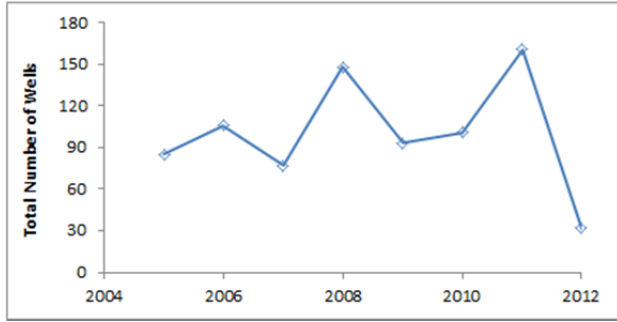
Anadarko Basin: Granite Wash Horizontals:



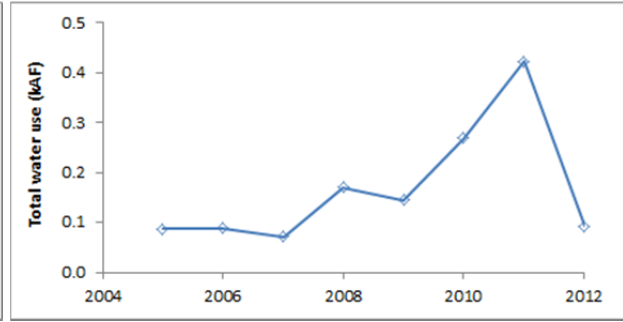
Note: red squares represent average ; blue diamonds represent median; only partial data for 2012

Figure 27. Granite Wash horizontals, various historical parameters and coefficients for reported and estimated water use as a function of time: (a) number of wells; (b) water use; (c) average/median lateral length; (d) average/median water use per well; (e) average/median water use intensity; (f) average/median proppant loading.

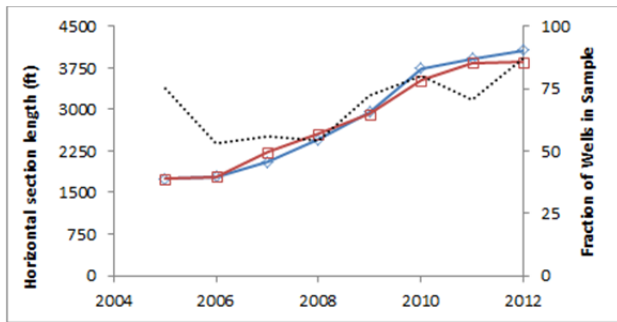
Anadarko Basin: Cleveland Horizontals:



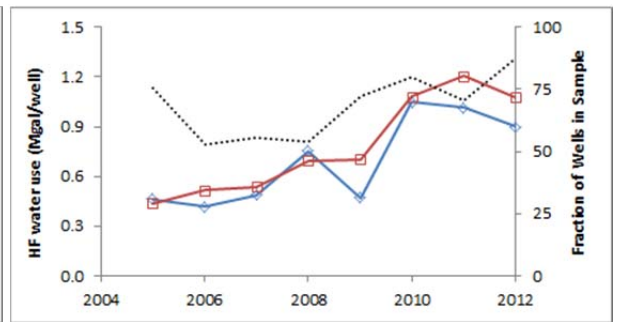
(a)



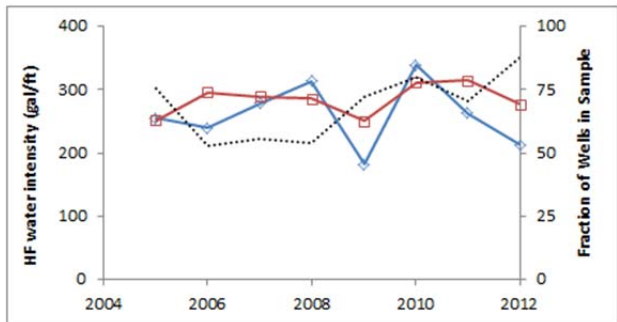
(b)



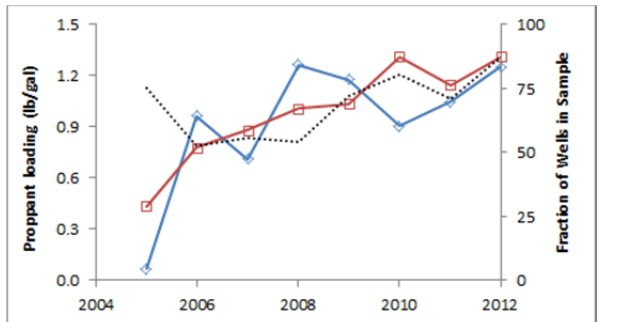
(c)



(d)



(e)

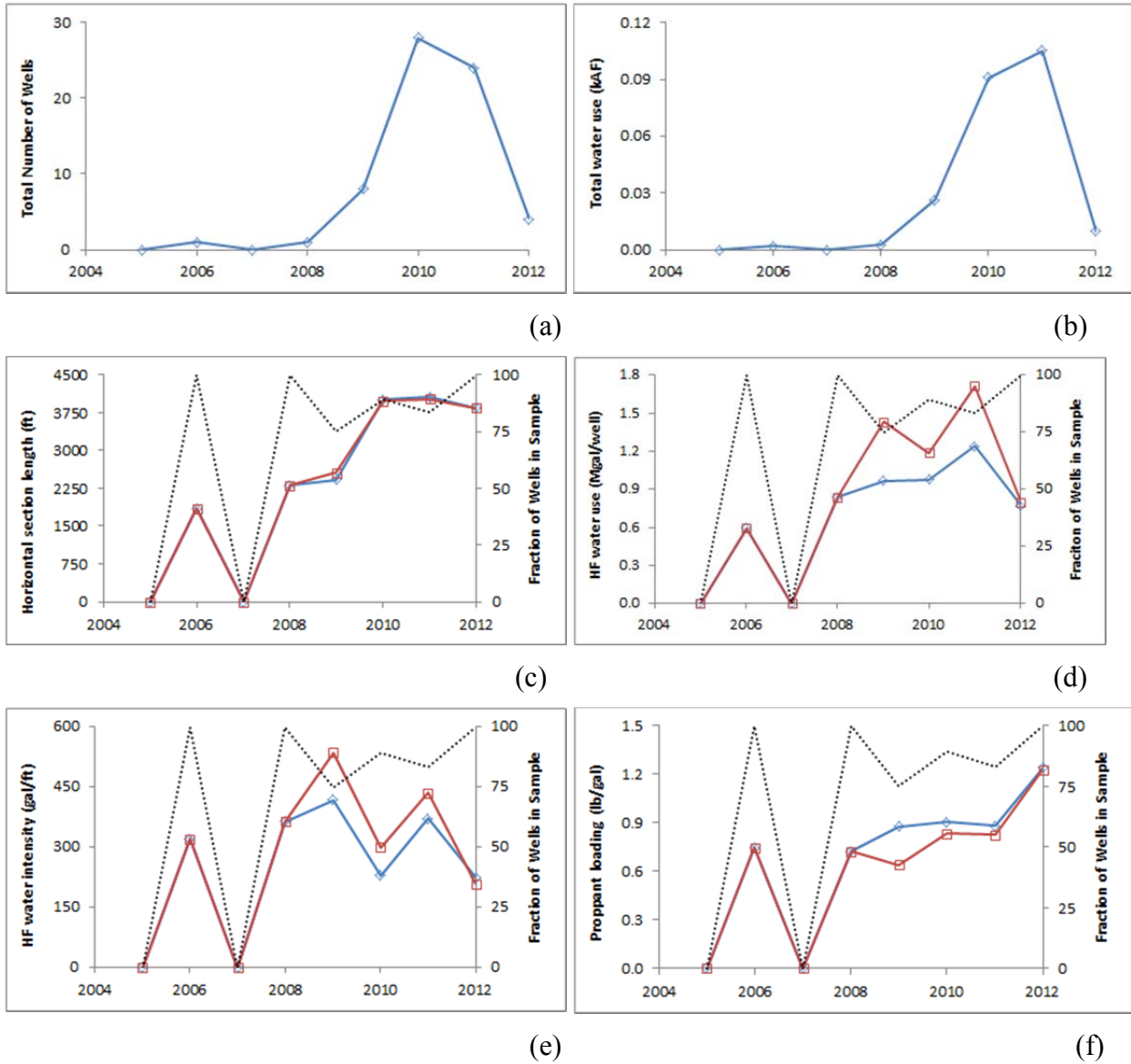


(f)

Note: red squares represent average ; blue diamonds represent median; only partial data for 2012

Figure 28. Cleveland horizontals, various historical parameters and coefficients for reported and estimated water use as a function of time: (a) number of wells; (b) water use; (c) average/median lateral length; (d) average/median water use per well; (e) average/median water use intensity; (f) average/median proppant loading.

Anadarko Basin: Marmaton Horizontals:



Note: red squares represent average ; blue diamonds represent median; only partial data for 2012

Figure 29. Marmaton horizontals, various historical parameters and coefficients for reported and estimated water use as a function of time: (a) number of wells; (b) water use; (c) average/median lateral length; (d) average/median water use per well; (e) average/median water use intensity; (f) average/median proppant loading.

Anadarko Basin: Granite Wash Horizontals:

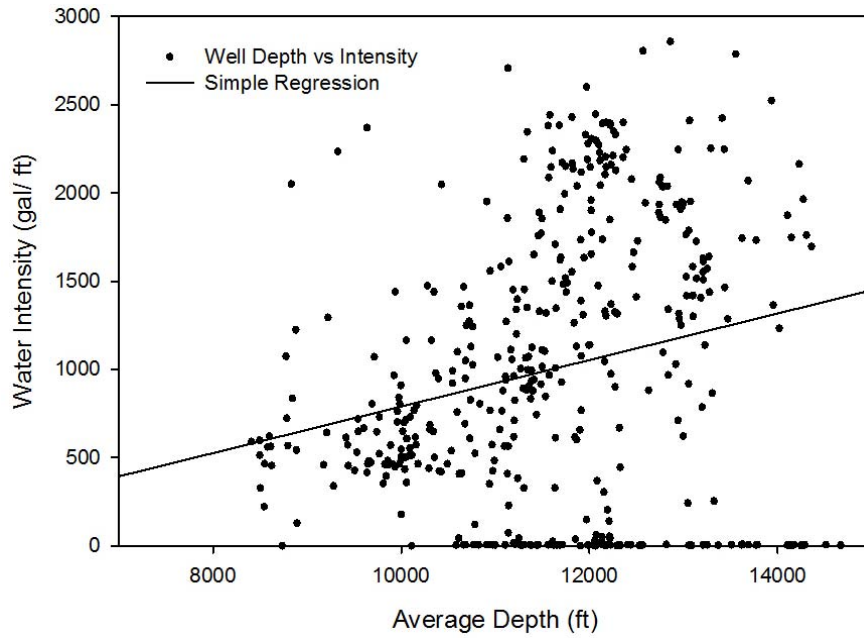


Figure 30. Granite Wash horizontal water use intensity as a function of depth.

Anadarko Basin: Cleveland Horizontals:

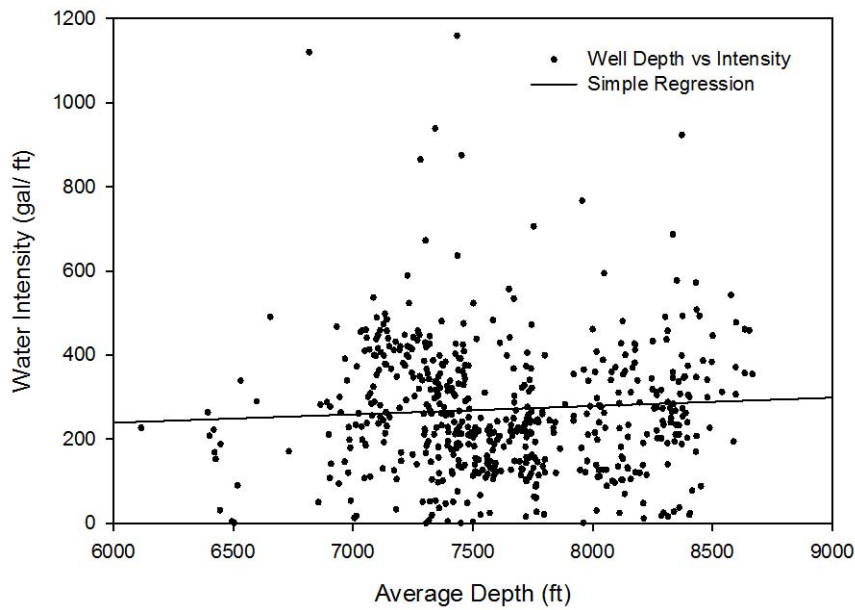
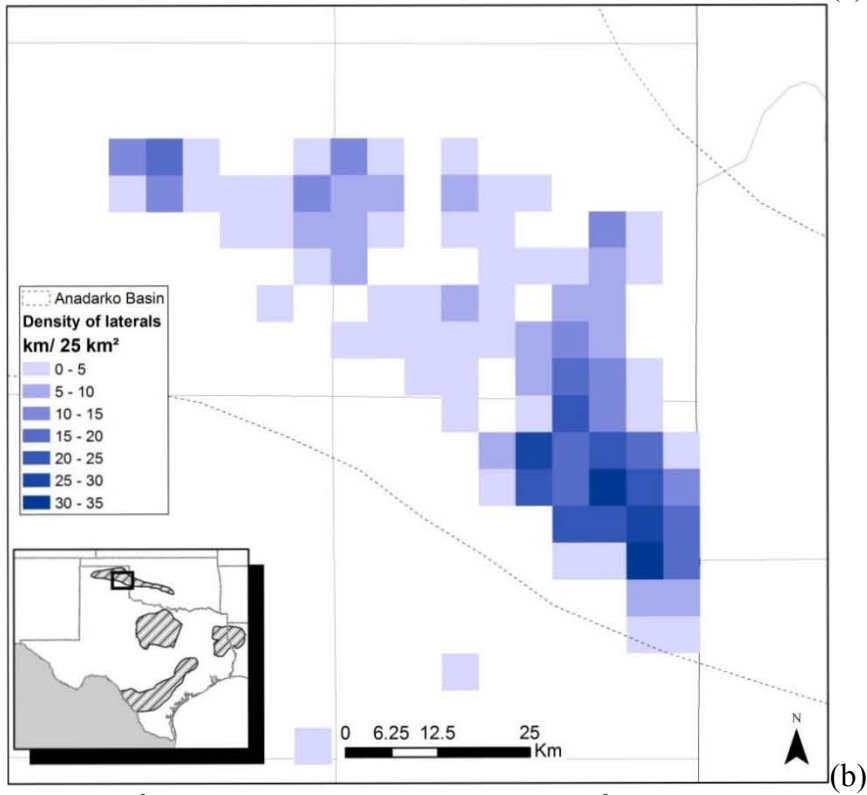
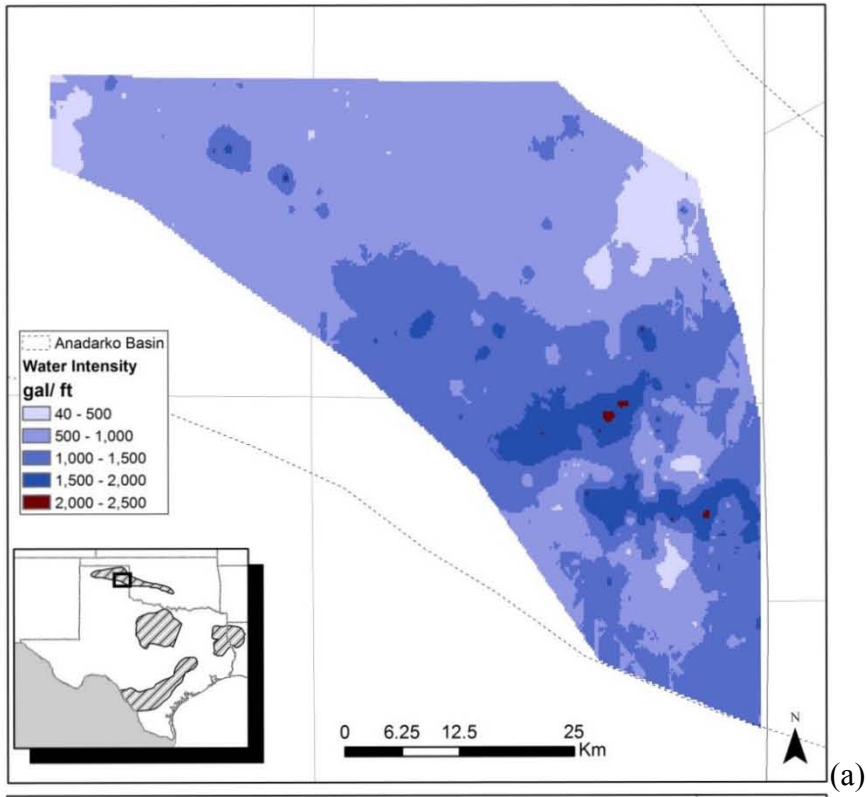


Figure 31. Cleveland horizontal water use intensity as a function of depth.

Anadarko Basin: Granite Wash Horizontals:



Note: $25 \text{ km}^2 = 154 \times 40 \text{ acres}$, that is, $154 \text{ wells}/25 \text{ km}^2 = 1 \text{ well}/40 \text{ acres}$

Figure 32. Granite Wash spatial distribution of (a) water intensity; and (b) density of lateral (cumulative length per area).

Anadarko Basin: Granite Wash Horizontals:

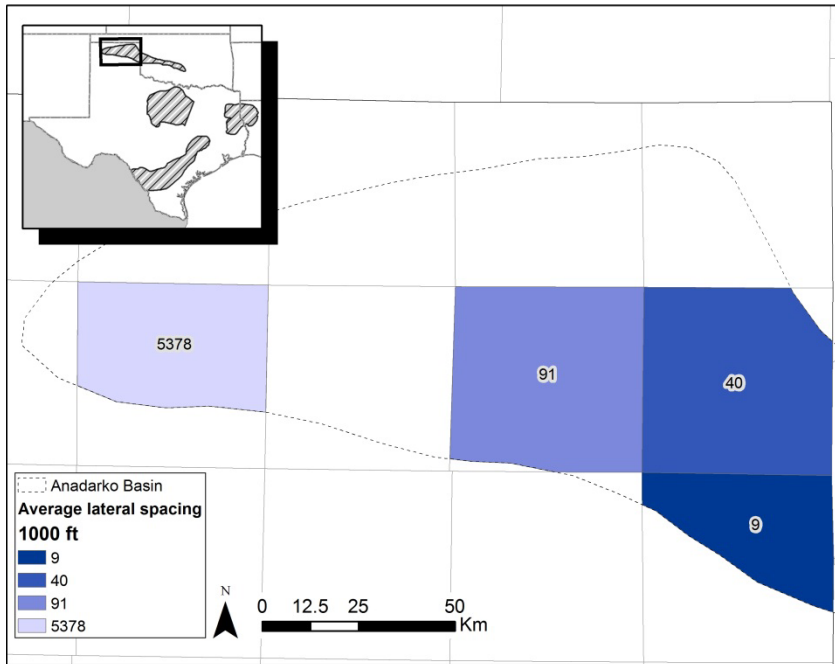
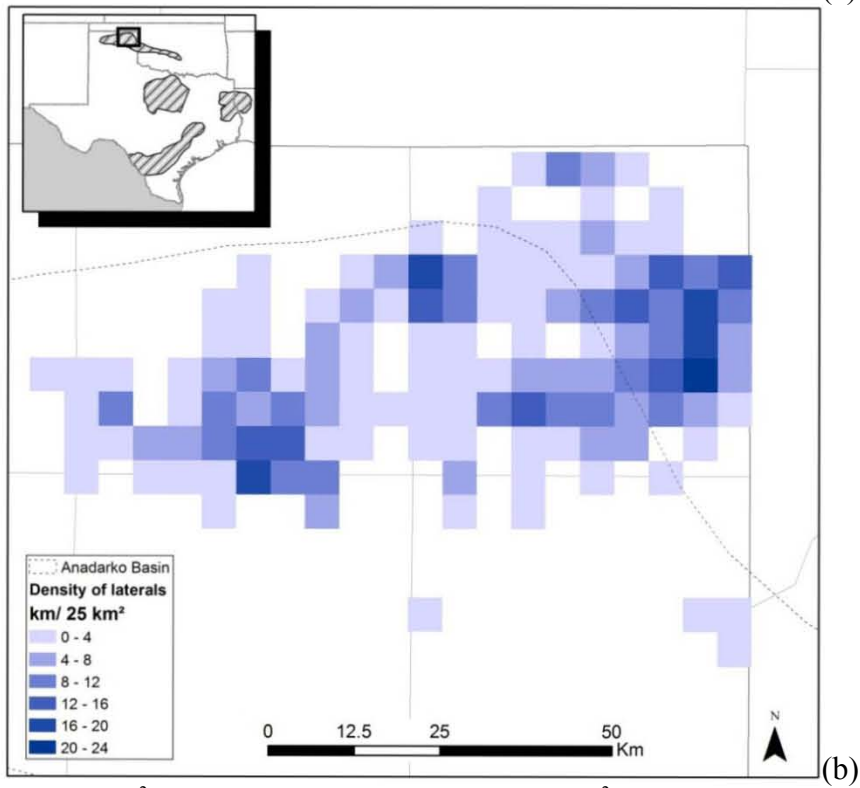
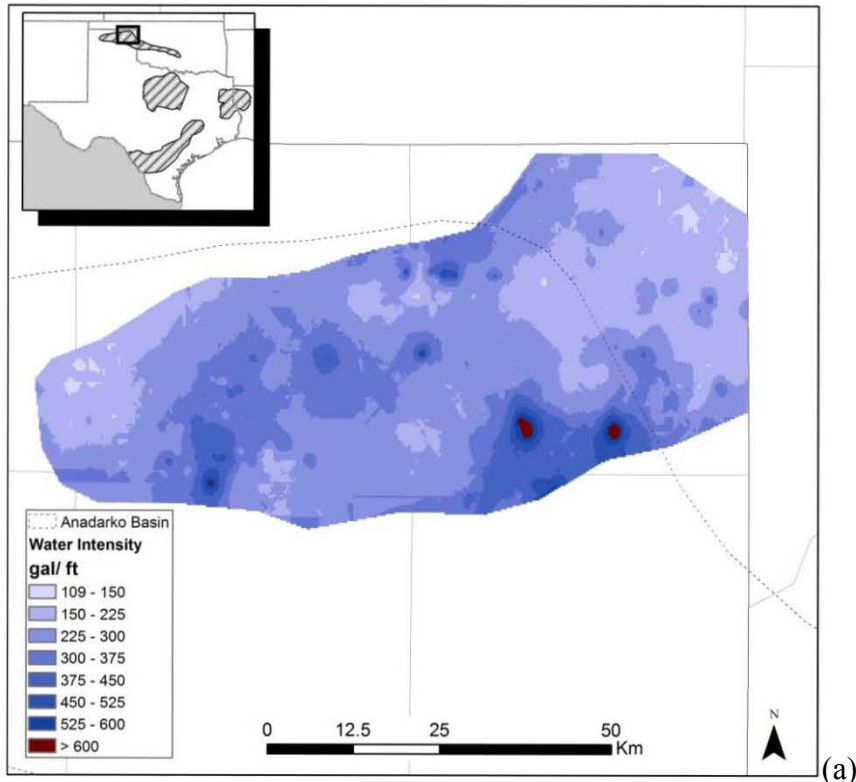


Figure 33. Granite Wash horizontals county-level average lateral spacing

Table 6. Granite Wash county-level average lateral spacing for top producing counties

| County Name | Sum lateral length / county area (km/km ²) | Average Lateral Spacing (1000 ft) |
|-------------|--|-----------------------------------|
| Wheeler | 0.351 | 9.34 |
| Hemphill | 0.082 | 39.74 |
| Roberts | 0.036 | 90.54 |

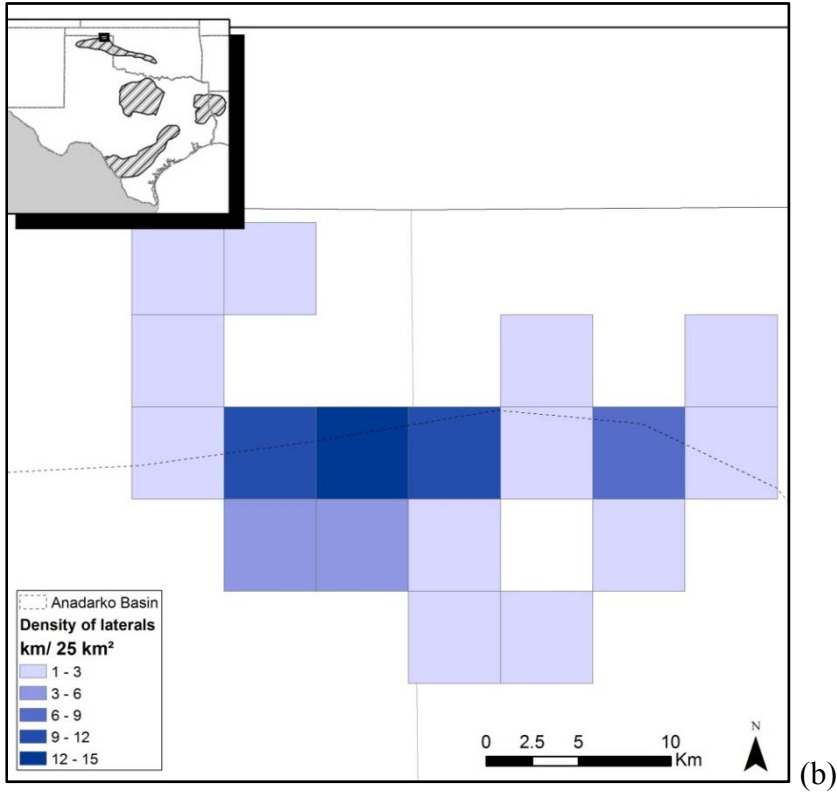
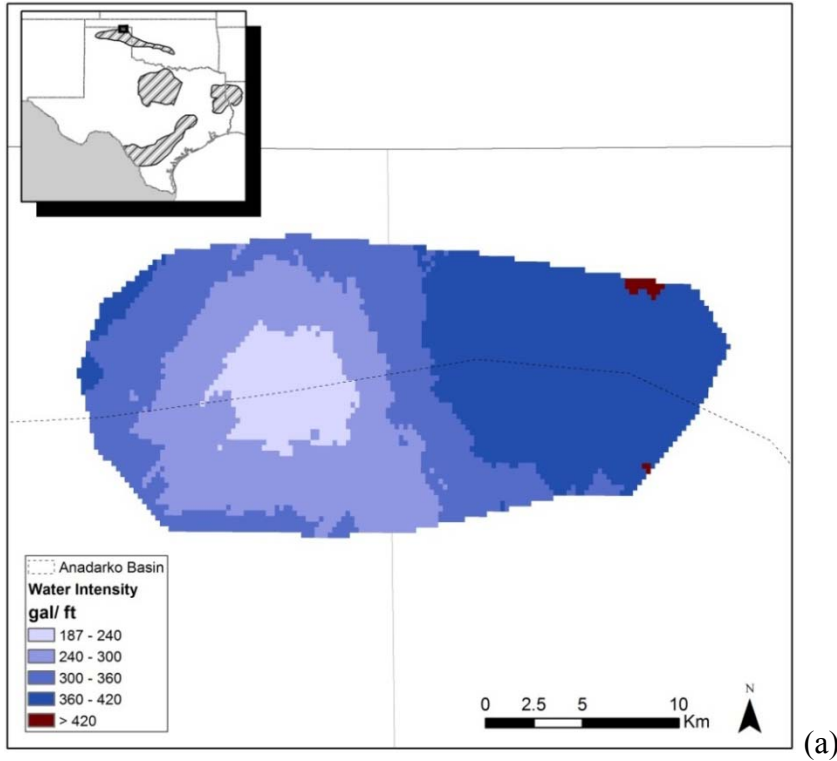
Anadarko Basin: Cleveland Horizontals:



Note: $25 \text{ km}^2 = 154 \times 40 \text{ acres}$, that is, $154 \text{ wells}/25 \text{ km}^2 = 1 \text{ well}/40 \text{ acres}$

Figure 34. Cleveland spatial distribution of (a) water intensity; and (b) density of lateral (cumulative length per area).

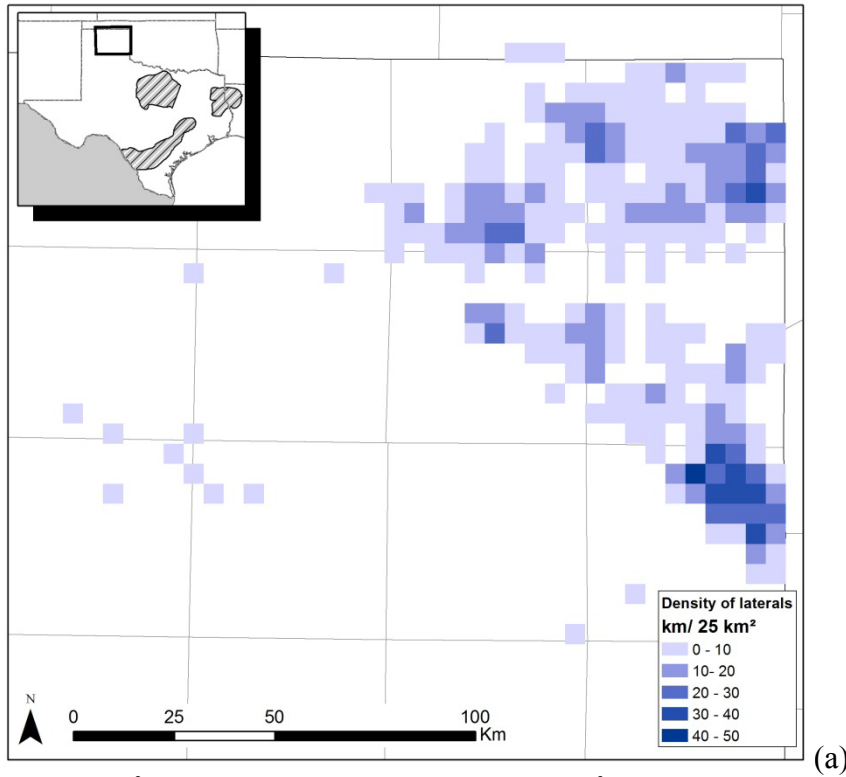
Anadarko Basin: Marmaton Horizontals:



Note: 25 km² = 154 × 40 acres, that is, 154 wells/25 km² = 1 well/40 acres

Figure 35. Marmaton spatial distribution of (a) water intensity; and (b) density of lateral (cumulative length per area).

Anadarko Basin: Horizontals:



Note: $25 \text{ km}^2 = 154 \times 40 \text{ acres}$, that is, $154 \text{ wells}/25 \text{ km}^2 = 1 \text{ well}/40 \text{ acres}$

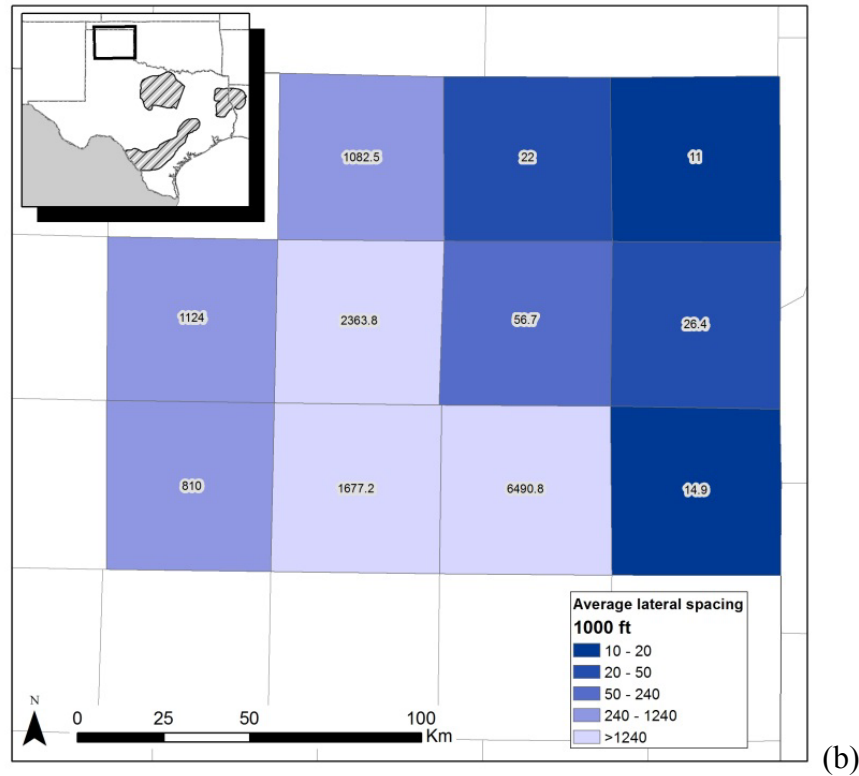


Figure 36. Anadarko spatial distribution of (a) water intensity; and (b) density of lateral (cumulative length per area).

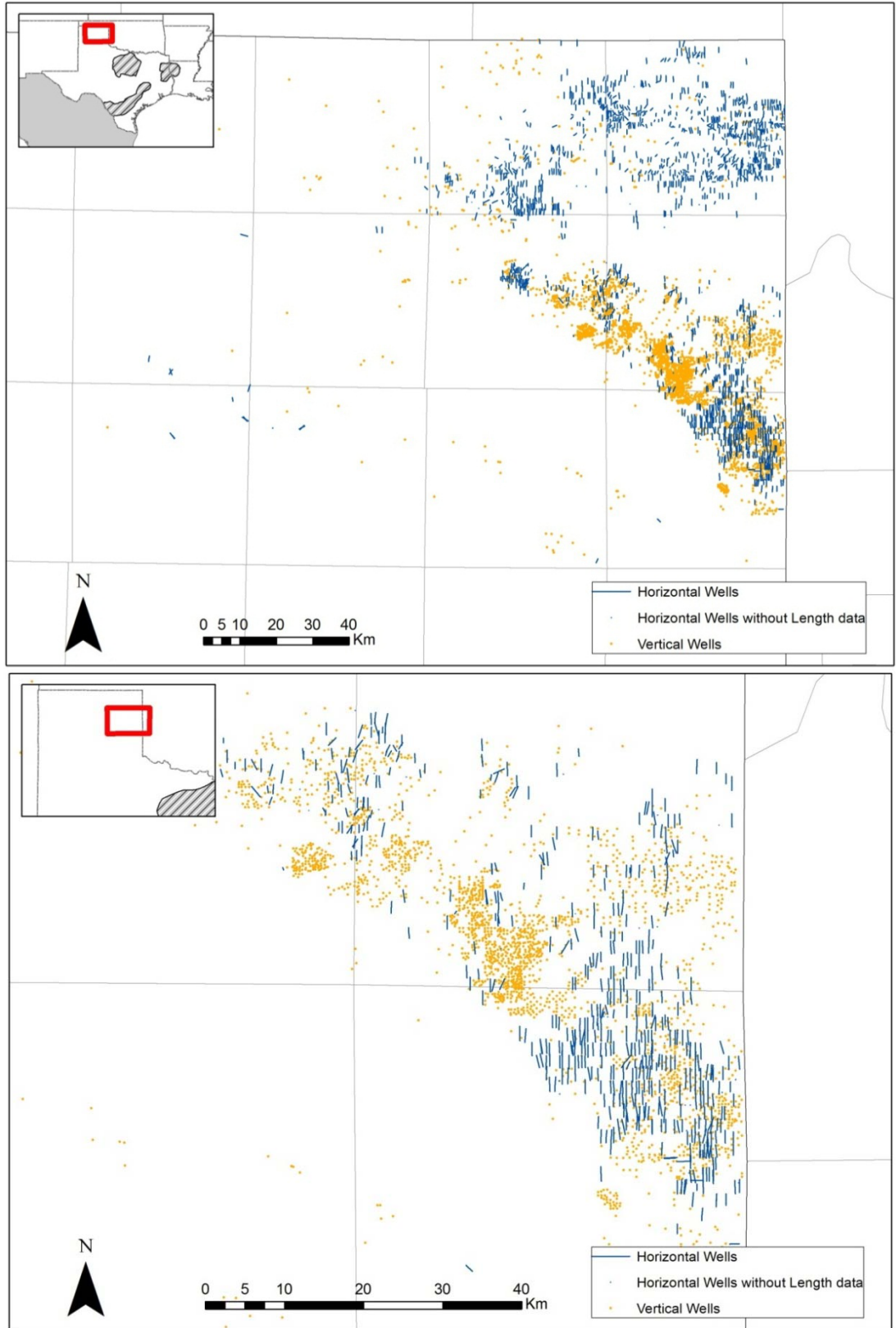
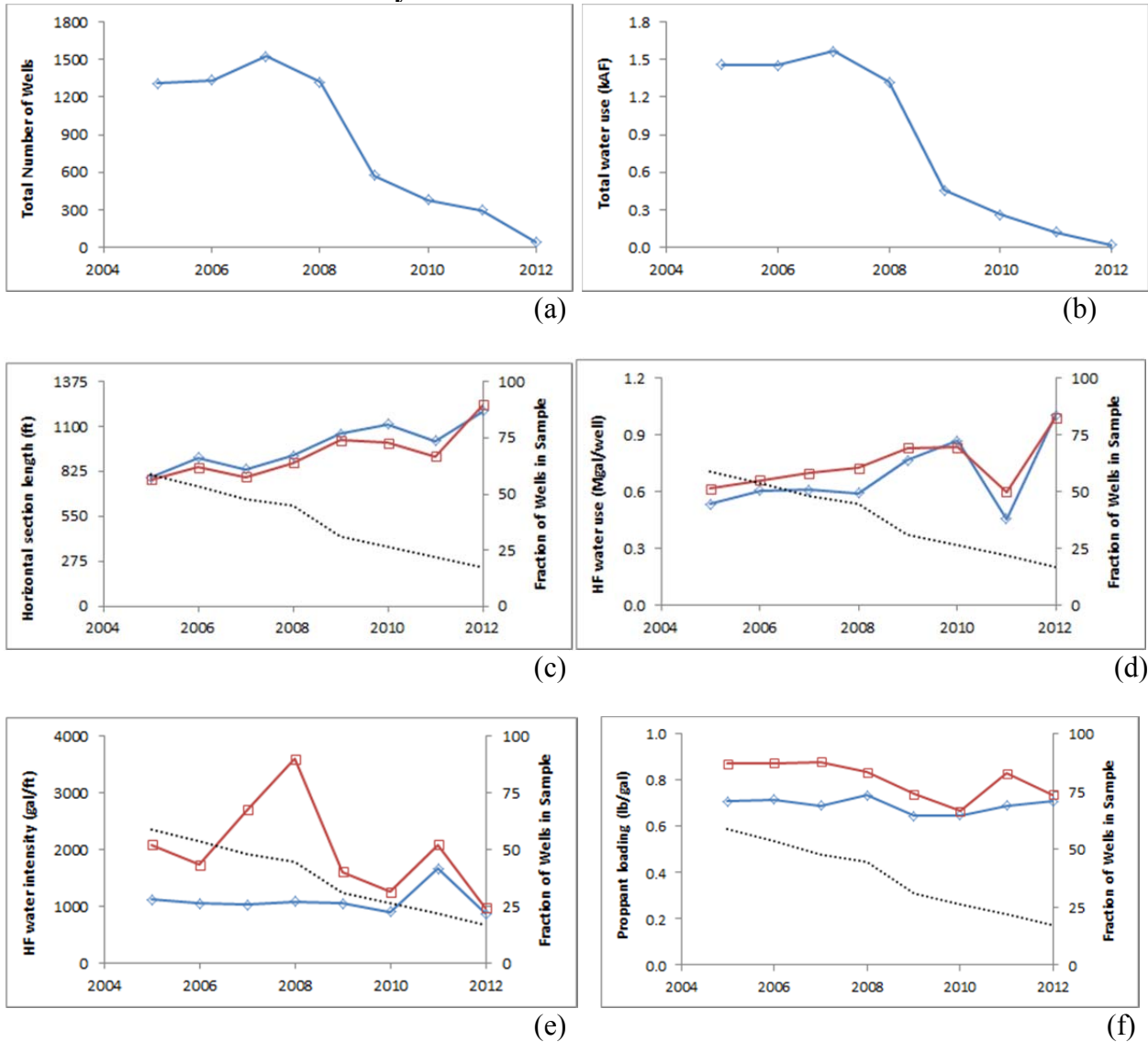


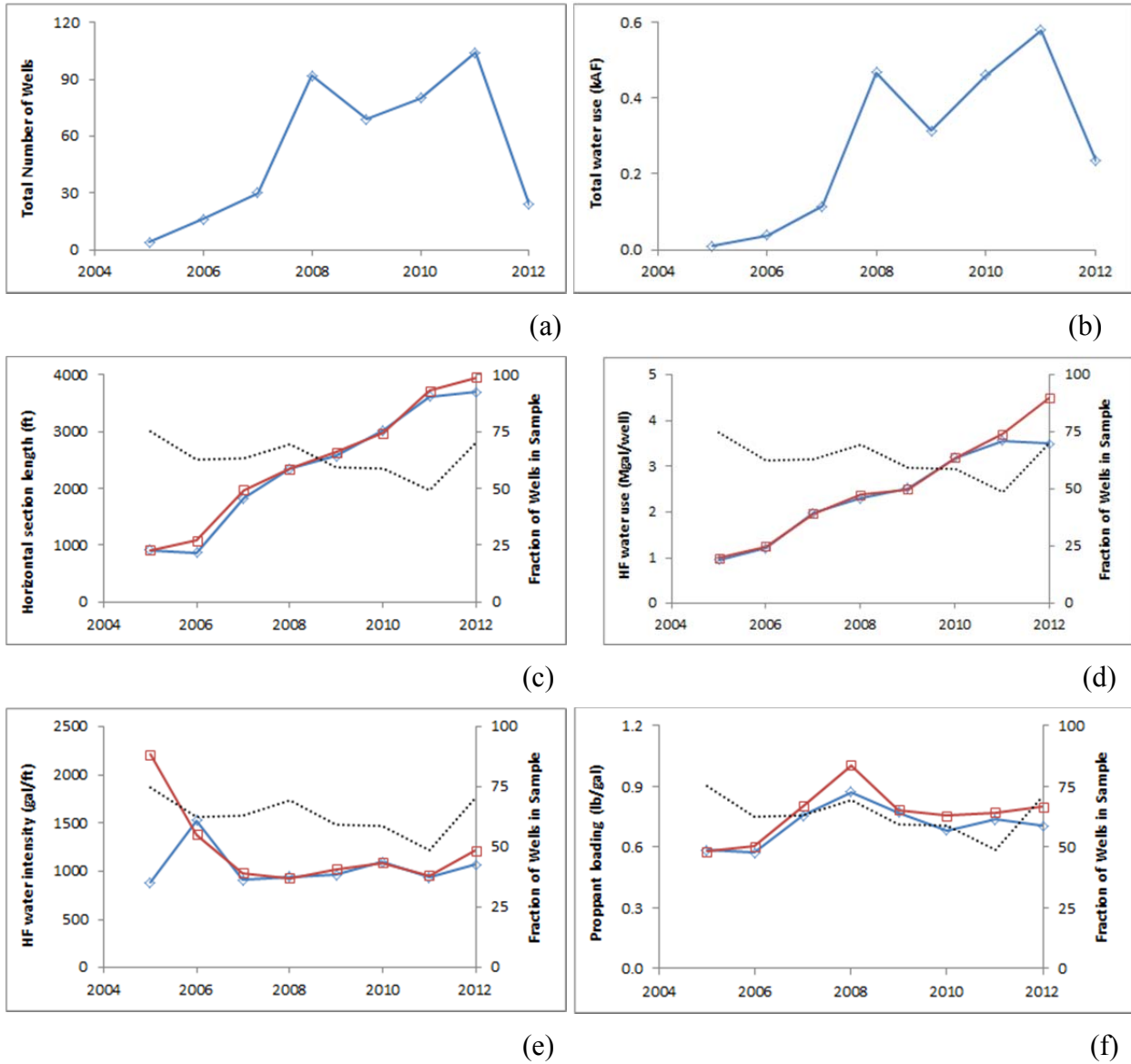
Figure 37. Map view of wells' lateral expression and vertical well location in the Anadarko Basin.

East Texas Basin: Cotton Valley Verticals



Note: red squares represent average ; blue diamonds represent median; only partial data for 2012
 Figure 38. Cotton Valley verticals, various historical parameters and coefficients for reported and estimated water use as a function of time: (a) number of wells; (b) water use; (c) average/median vertical productive section length; (d) average/median water use per well; (e) average/median water use intensity; (f) average/median proppant loading.

East Texas Basin: Cotton Valley Horizontals



Note: red squares represent average ; blue diamonds represent median; only partial data for 2012

Figure 39. Cotton Valley horizontals, various historical parameters and coefficients for reported and estimated water use as a function of time: (a) number of wells; (b) water use; (c) average/median lateral length; (d) average/median water use per well; (e) average/median water use intensity; (f) average/median proppant loading.

East Texas Basin: Cotton Valley

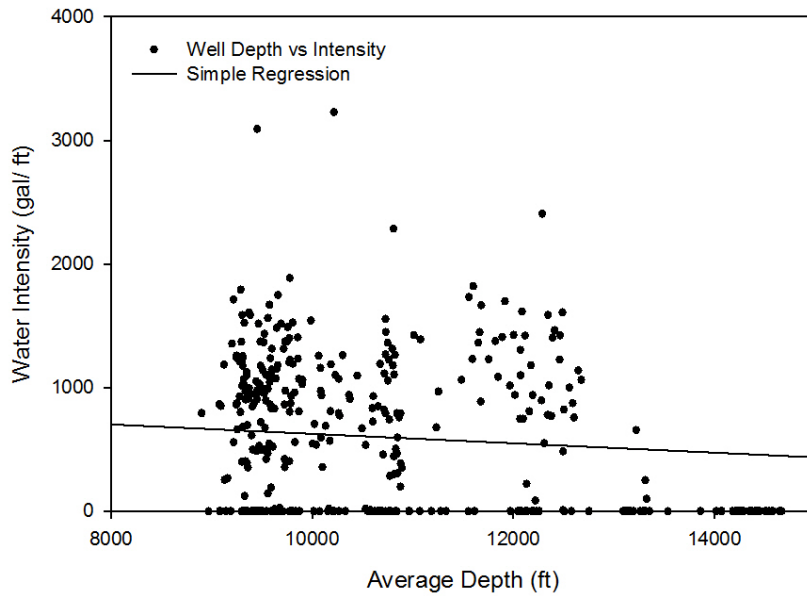
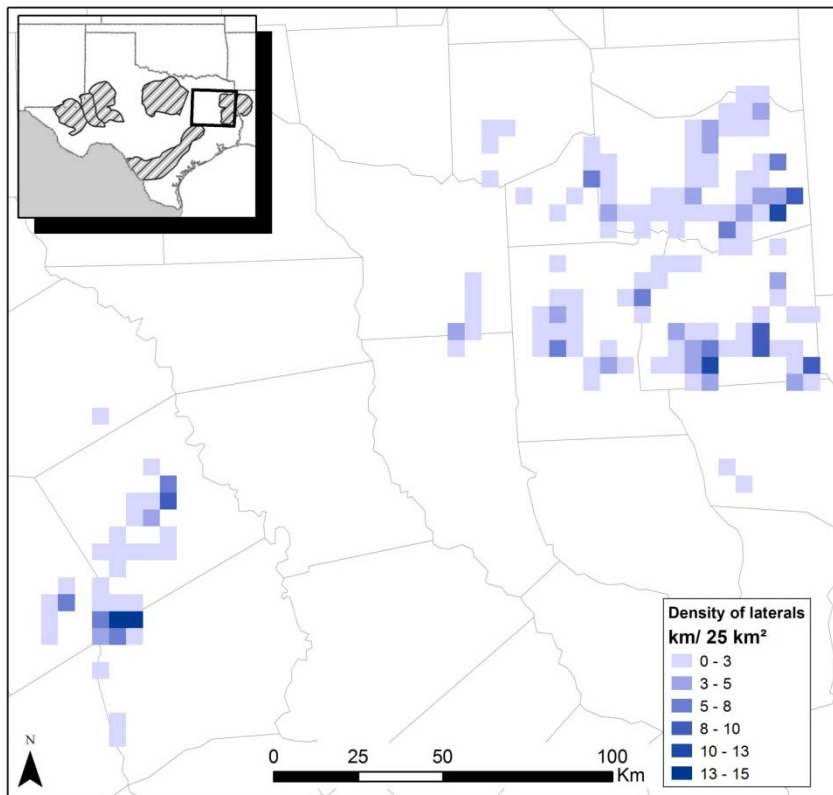


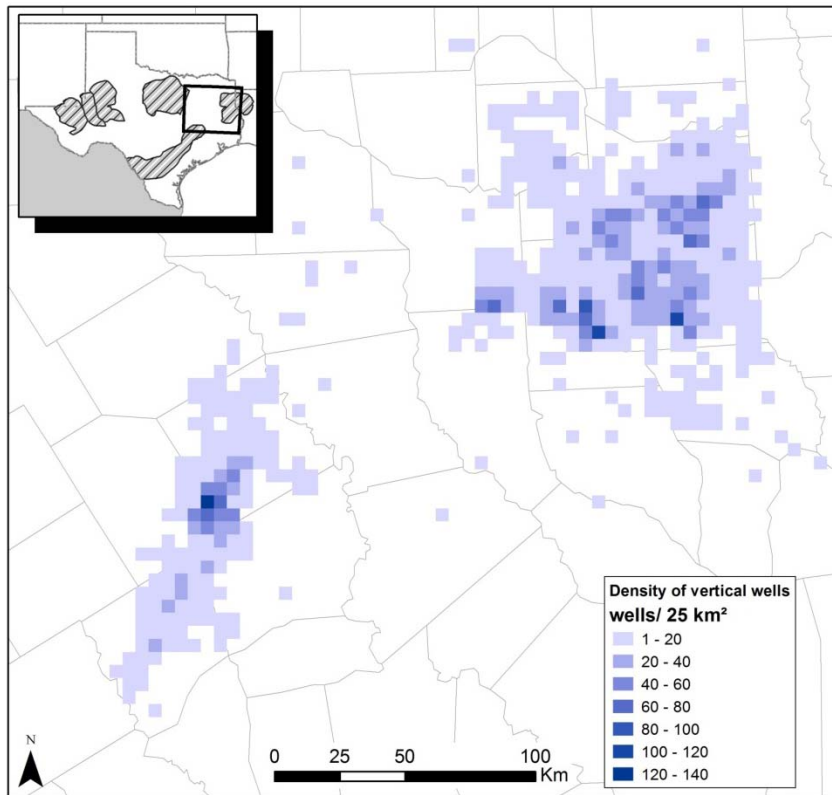
Figure 40. Cotton Valley horizontal water use intensity as a function of depth.



Note: 25 km² = 154 × 40 acres, that is, 154 wells/25 km² = 1 well/40 acres

Figure 41. Cotton Valley spatial distribution of density of lateral (cumulative length per area).

East Texas Basin: Cotton Valley

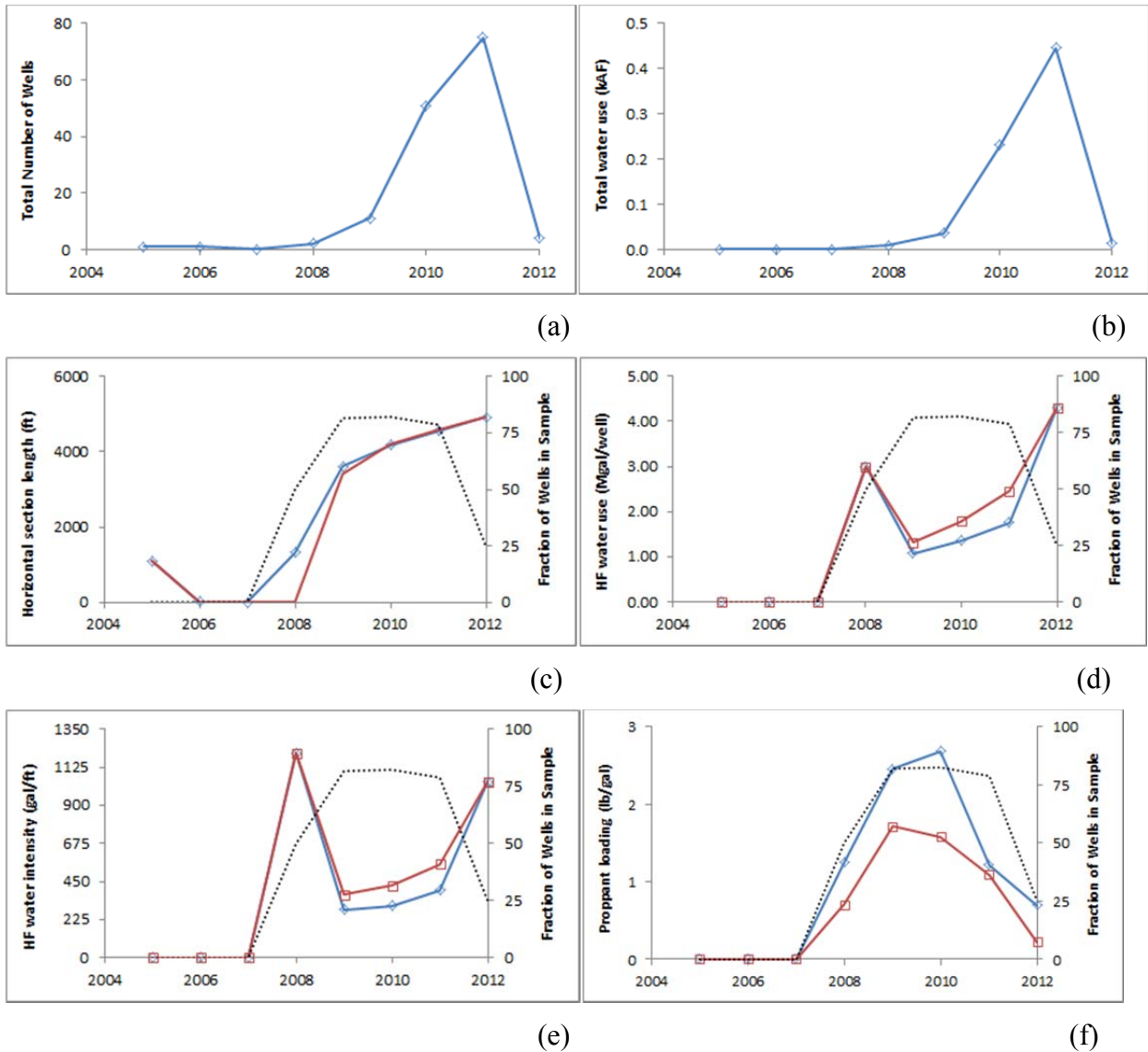


Note: $25 \text{ km}^2 = 154 \times 40$ acres, that is, $154 \text{ wells}/25 \text{ km}^2 = 1 \text{ well}/40 \text{ acres}$

Note: Cotton Valley wells drilled before 2005 are not included (see Nicot et al., 2011 for details).

Figure 42. Cotton Valley spatial distribution of density of vertical wells (years 2005-2011).

Gulf Coast Basin, Olmos - Horizontal



Note: red squares represent average ; blue diamonds represent median; only partial data for 2012

Figure 43. Olmos horizontals, various historical parameters and coefficients for reported and estimated water use as a function of time: (a) number of wells; (b) water use; (c) average/median lateral length; (d) average/median water use per well; (e) average/median water use intensity; (f) average/median proppant loading.

III-2. Current Water Consumption and Sources

III-2-1 Information about Recycling/Reuse and Brackish Water Use

We collected information about recycling/reuse and brackish water use gathered during discussions with operators (Table 7). The amount of fresh water used is quite unequal across the different plays as a function of the local conditions. It can be as low as 20% in Far-West Texas or nearly 100% in East Texas. Collecting a sufficient amount of information concerning recycling/reuse and brackish water use is an improvement over the 2011 report which overall underestimated it. Reuse is limited by the amount of flow back that varies across plays. We could not document volumes of water recycled from wastewater treatment plants, but the TCEQ lists ~30 municipal and industrial facilities located in the Barnett Shale and Eagle Ford Shale plays that provide water to the industry (Figure 44). Groundwater/surface water could be extremely variable within a single play, but water data also reflect local conditions (Table 8): heavy surface water use towards the eastern part of the state and reliance on groundwater (sometimes brackish) elsewhere. The following short paragraphs discuss recycling/reuse and brackish water use and GS/SW split in major plays/regions.

Barnett Shale: For the most part, operators use fresh surface water in this play (estimated at 80% of “new” water). This is a change from the 50%+ groundwater use estimated in 2006 in Bené et al. (2007) and Nicot and Potter (2007). Some operators use brackish water, particularly in the combo play and on the western edges of the play. Some also use outfall from wastewater treatment plants. Overall, little recycling/reuse and brackish water use is currently occurring in this play as compared to other plays further west or south.

Eagle Ford Shale: Operators rely mostly on groundwater (estimated at 90% of “new” water) and there is a significant amount of brackish water being used (currently estimated at 20% but variable among operators). Several aquifers are brackish in the footprint of the play: the Gulf Coast aquifers and the Wilcox aquifers as well as the downdip section of the Carrizo aquifer.

Haynesville Shale and East Texas Basin: Water is generally plentiful in East Texas and no significant recycling/reuse and use for brackish water was documented during this study. We estimated it at 5%, mostly from treatment plants and produced water from Cotton Valley wells. We estimated that about 70% of the “new” water is groundwater.

Permian Basin: A significant percentage (30% or more) of the HF water used in both the Midland and Delaware basins is brackish. Nearly all of the water used is groundwater tapping aquifers such as the Ogallala (which is often brackish towards its southern domain, where the industry has many HF operations), and the Dockum, Trinity Edwards, Capitan, and other aquifers. The industry currently does little recycling/reuse, although several companies use produced water from conventional oil and gas operations. Such produced water has relatively low salinity at several places in the basin.

Anadarko Basin: This basin has hosted much recycling/reuse (estimated at 20%) and use of brackish water (estimated at 30%). Most of the “new” water is groundwater (estimated at 80%).

III-2-2 2011 HF Water Use and Consumption

Combining information collected from the IHS database, industry information, and selected information from the 2011 report results in an estimated water use for HF of ~81,500 AF across the state in 2011 (Table 9). The Barnett Shale and the Eagle Ford shale used a similar amount of

water (~25 kAF), but less fresh water was used in the Eagle Ford. The Permian Basin is catching up (~15 kAF), but it uses relatively less fresh water than the two shale plays. Water use in the Texas section of the Haynesville Shale is becoming subordinate to other plays located in the same area (for example, Cotton Valley). County-level water use (Table 10) shows that many counties across the state have some HF water use (126 counties with >1AF in 2011 and 26 counties with >1kAF). The top 10 HF users consist of Tarrant County in the Barnett core (8.8 kAF), Webb County in the southern Eagle Ford (4.6 kAF), Johnson County in the core of the Barnett Shale (4.2 kAF), Karnes County in the Eagle Ford (3.9 kAF), Wheeler County in the Granite Wash of the Anadarko Basin (3.8 kAF), Dimmit County in the Eagle Ford (3.7 kAF), Denton County in the core of the Barnett Shale (3.2 kAF), Montague County in the combo play of the Barnett Shale (3.2 kAF), La Salle County in the Eagle Ford (2.9 kAF), and Wise County in the core of the Barnett Shale (2.3 kAF). The top ten counties total about half of the HF water use in the state. The top 10 counties stay the same when only water consumption is considered despite some reshuffling because of the variable impact of recycling/reuse and brackish water use.

In the next section we compare our current findings to the findings of the 2011 report (that projected a water use of 62 kAF in 2011, Table 9) and explain the discrepancies.

Table 7. Estimated percentages of recycling/ reused and brackish water use in main HF areas in 2011.

| Play / Region | Type | Current (2011) % |
|------------------|-----------------|---------------------|
| Permian Far West | Recycled/reused | 0% |
| | Brackish | 80% |
| | Fresh | 20% |
| Permian Midland | Recycled/reused | 2% |
| | Brackish | 30% |
| | Fresh | 68% |
| Anadarko Basin | Recycled/reused | 20% |
| | Brackish | 30% |
| | Fresh | 50% |
| Barnett Shale | Recycled/reused | 5% |
| | Brackish | 3% |
| | Fresh | 92% |
| Eagle Ford Shale | Recycled/reused | 0% |
| | Brackish | 20% |
| | Fresh | 80% |
| East Texas Basin | Recycled/reused | 5% |
| | Brackish | 0% |
| | Fresh | 95% |

Table 8. Estimated groundwater / surface water split (does not include recycling / reuse)

| Play / Region | Groundwater | Surface Water |
|------------------|-------------|---------------|
| Barnett Shale | 20% | 80% |
| Eagle Ford Shale | 90% | 10% |
| East Texas Basin | 70% | 30% |
| Anadarko Basin | 80% | 20% |
| Permian Basin | 100% | 0% |

Table 9. HF water use in 2008 and 2011 compared to the 2011 projected water use from 2008.

| Play / Region Unit: kAF | 2011 Actual Water Use | Fraction Non-R/R Non-brackish | 2011 Actual Water Consumption | 2011 Projected Water Use |
|----------------------------|--------------------------|-------------------------------------|----------------------------------|-----------------------------|
| Barnett Shale | 25.75 | 0.92 | 23.69 | 33.08 |
| Eagle Ford Shale | 23.76 | 0.8 | 18.81 | 10.07 |
| East Texas Basin | 7.54 | 0.95 | 7.06 | 8.46 |
| Anadarko Basin | 6.52 | 0.5 | 3.21 | 2.26 |
| Permian Basin | 14.44 | 0.68 / 0.2 | 8.55 | 7.26 |
| Gulf Coast Basin | 3.49 | 0.95 / 0.8 | 3.31 | 1.00 |
| Statewide | 81.51 | 0.79* | 64.63 | 62.13 |

FrackingWaterUse2008&2011_Bob-JPComp_2.xls

*: computed from state consumption and use columns (sum of other rows)

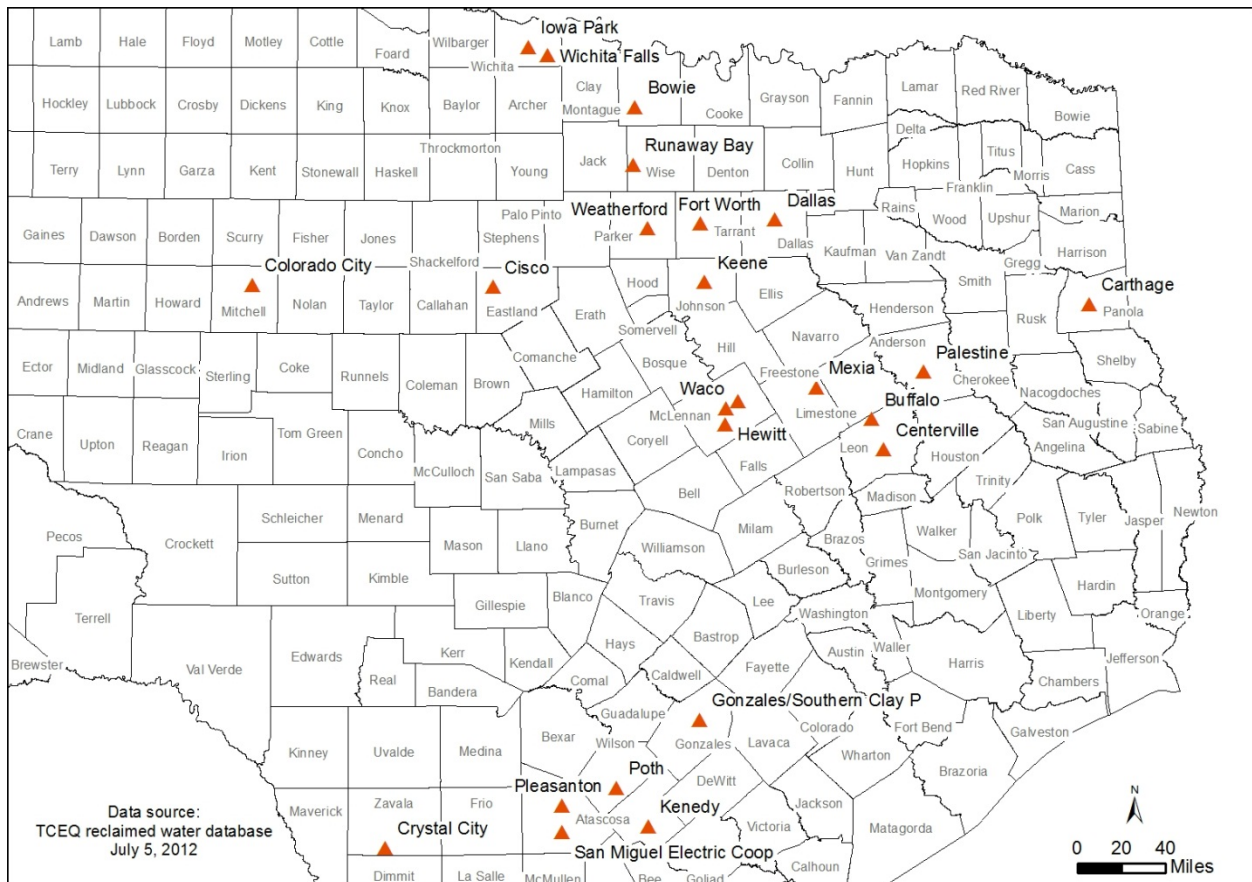
Table 10. County-level estimate of 2011 HF water use and water consumption (kAF).

| County | HF Water Use (kAF) | HF Water Consumption (kAF) | County | HF Water Use (kAF) | HF Water Consumption (kAF) |
|-----------|--------------------|----------------------------|---------------|--------------------|----------------------------|
| Andrews | 1.391 | 0.946 | Limestone | 0.268 | 0.214 |
| Angelina | 0.007 | 0.006 | Lipscomb | 0.382 | 0.191 |
| Archer | 0.017 | 0.016 | Live Oak | 0.972 | 0.777 |
| Atascosa | 1.009 | 0.807 | Loving | 0.189 | 0.038 |
| Bee | 0.066 | 0.053 | McMullen | 1.752 | 1.401 |
| Borden | 0.033 | 0.023 | Madison | 0.204 | 0.163 |
| Brazos | 0.238 | 0.191 | Marion | 0.010 | 0.010 |
| Brooks | 0.008 | 0.006 | Martin | 2.035 | 1.384 |
| Burleson | 0.247 | 0.197 | Maverick | 0.192 | 0.154 |
| Caldwell | 0.075 | 0.060 | Midland | 1.573 | 1.070 |
| Carson | 0.085 | 0.042 | Milam | 0.034 | 0.027 |
| Cherokee | 0.010 | 0.009 | Mitchell | 0.018 | 0.012 |
| Clay | 0.058 | 0.053 | Montague | 3.221 | 2.963 |
| Cochran | 0.031 | 0.021 | Moore | 0.076 | 0.038 |
| Coke | 0.001 | n/a | Nacogdoches | 1.128 | 1.072 |
| Cooke | 1.480 | 1.362 | Newton | 0.098 | 0.093 |
| Crane | 0.159 | 0.108 | Nolan | 0.011 | 0.008 |
| Crockett | 0.475 | 0.323 | Nueces | 0.016 | 0.013 |
| Crosby | 0.012 | 0.008 | Ochiltree | 0.273 | 0.136 |
| Culberson | 0.166 | 0.033 | Orange | 0.006 | n/a |
| Dallas | 0.079 | 0.073 | Palo Pinto | 0.041 | 0.038 |
| Dawson | 0.089 | 0.061 | Panola | 0.966 | 0.917 |
| Denton | 3.249 | 2.989 | Parker | 1.086 | 1.000 |
| DeWitt | 2.151 | 1.721 | Pecos | 0.110 | 0.022 |
| Dimmit | 3.706 | 2.965 | Polk | 0.133 | 0.126 |
| Ector | 0.756 | 0.514 | Potter | 0.044 | 0.022 |
| Ellis | 0.038 | 0.035 | Reagan | 1.240 | 0.843 |
| Erath | 0.012 | 0.011 | Reeves | 0.522 | 0.104 |
| Fayette | 0.132 | 0.106 | Roberts | 0.393 | 0.197 |
| Franklin | 0.014 | 0.014 | Robertson | 0.306 | 0.245 |
| Freestone | 0.424 | 0.339 | Runnels | 0.004 | 0.003 |
| Frio | 0.729 | 0.583 | Rusk | 0.158 | 0.150 |
| Gaines | 0.142 | 0.096 | Sabine | 0.147 | 0.139 |
| Garza | 0.001 | n/a | San Augustine | 1.622 | 1.541 |
| Glasscock | 1.434 | 0.975 | Schleicher | 0.090 | 0.061 |
| Gonzales | 2.224 | 1.779 | Scurry | 0.010 | 0.007 |
| Grayson | 0.021 | 0.020 | Shackelford | 0.002 | 0.002 |
| Gregg | 0.025 | 0.024 | Shelby | 1.419 | 1.348 |
| Grimes | 0.095 | 0.076 | Sherman | 0.002 | 0.001 |
| Guadalupe | 0.018 | 0.014 | Smith | 0.005 | 0.005 |
| Hansford | 0.011 | 0.005 | Somervell | 0.287 | 0.264 |
| Hardeman | 0.017 | 0.012 | Starr | 0.036 | 0.029 |
| Harrison | 0.893 | 0.849 | Sterling | 0.057 | 0.039 |
| Hemphill | 1.462 | 0.731 | Stonewall | 0.001 | n/a |
| Henderson | 0.012 | 0.012 | Sutton | 0.034 | 0.023 |
| Hidalgo | 0.059 | 0.047 | Tarrant | 8.805 | 8.101 |
| Hill | 0.131 | 0.120 | Terrell | 0.010 | 0.007 |
| Hockley | 0.005 | 0.003 | Terry | 0.003 | 0.002 |
| Hood | 0.645 | 0.593 | Titus | 0.003 | 0.003 |

| County | HF Water Use (kAF) | HF Water Consumption (kAF) | County | HF Water Use (kAF) | HF Water Consumption (kAF) |
|------------|--------------------|----------------------------|------------|--------------------|----------------------------|
| Houston | 0.178 | 0.142 | Tyler | 0.076 | 0.072 |
| Howard | 0.552 | 0.376 | Upshur | 0.004 | 0.004 |
| Hutchinson | 0.005 | 0.002 | Upton | 1.761 | 1.198 |
| Irion | 0.875 | 0.595 | Ward | 0.568 | 0.114 |
| Jack | 0.048 | 0.044 | Washington | 0.036 | 0.029 |
| Jasper | 0.087 | 0.083 | Webb | 4.596 | 3.677 |
| Johnson | 4.192 | 3.857 | Wheeler | 3.792 | 1.896 |
| Karnes | 3.869 | 3.095 | Wilson | 0.417 | 0.334 |
| Kenedy | 0.006 | 0.005 | Winkler | 0.062 | 0.012 |
| Kleberg | 0.034 | 0.028 | Wise | 2.314 | 2.129 |
| La Salle | 2.901 | 2.321 | Yoakum | 0.018 | 0.013 |
| Lavaca | 0.118 | 0.094 | Young | 0.008 | 0.007 |
| Lee | 0.131 | 0.105 | Zapata | 0.032 | 0.026 |
| Leon | 0.273 | 0.218 | Zavala | 0.407 | 0.127 |
| | | | SUM | 81.50 kAF | 64.63 kAF |

Note: filtered at 0.001 kAF

FrackingWaterUse2008&2011_Bob-JPCComp_2.xls

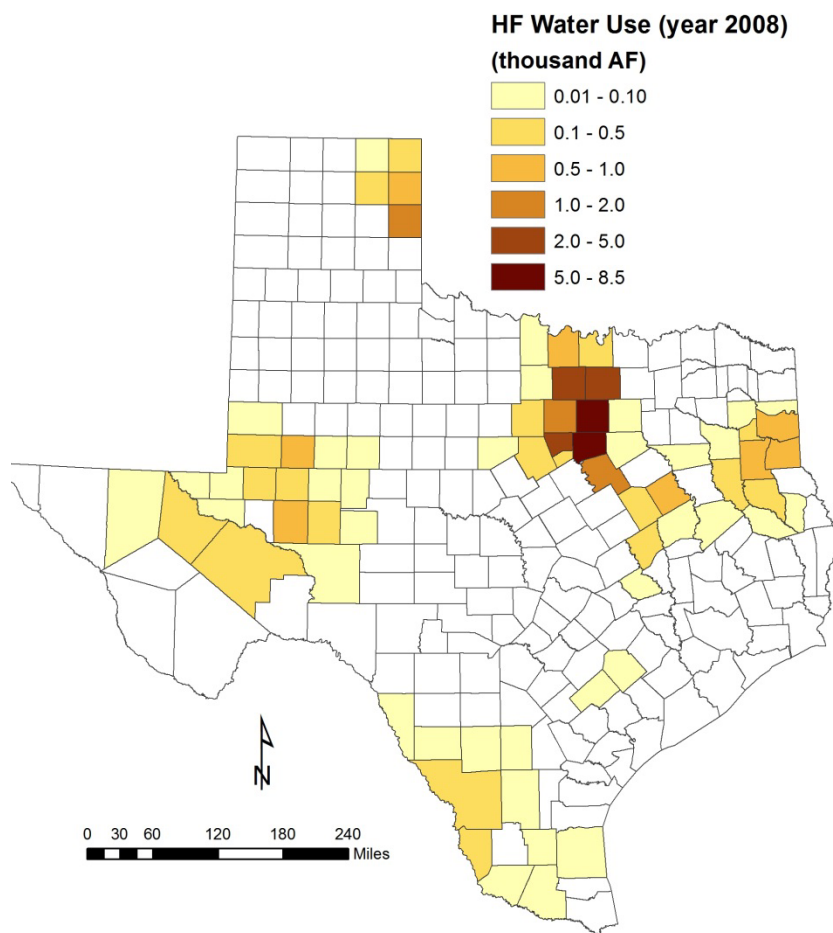


Source: TCEQ, 2012

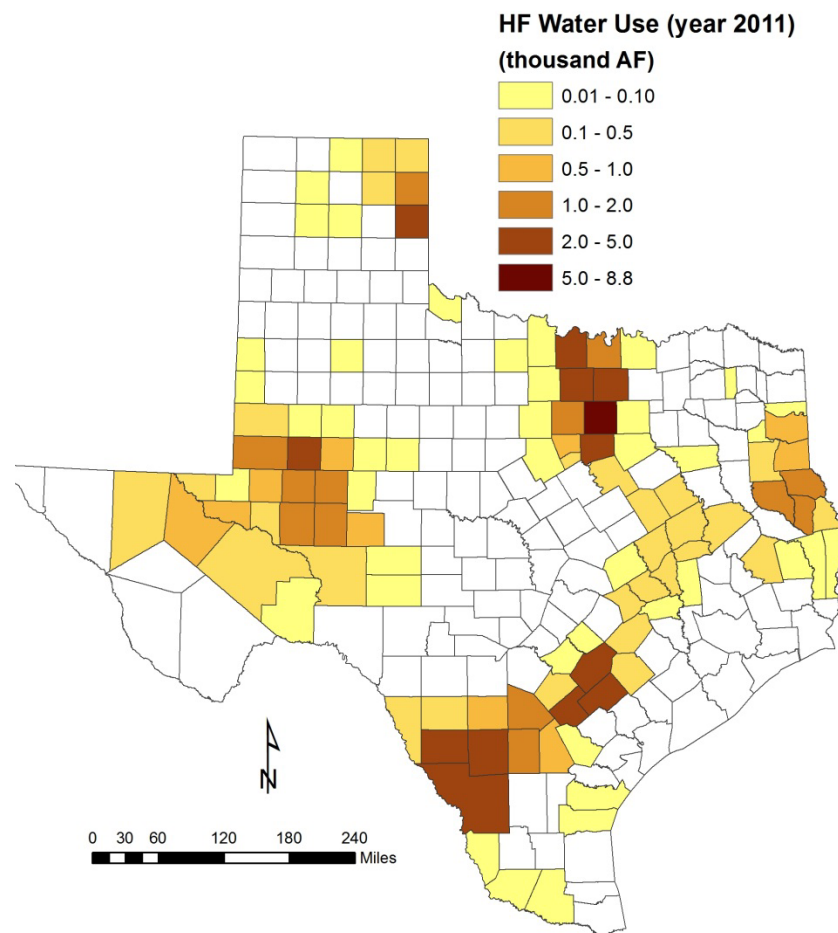
Figure 44. Location of waste water treatment facilities that provide or have provided water to the industry for HF as of July 2012.

III-3. Comparison to Earlier Findings

Projections made in 2009 for 2011 in the 2011 report underestimated water use by about 30% (81.5 kAF compared to 62.1 kAF, Table 9). It is important to understand the underlying causes in order to develop better projections in this document. Comparing actual water use in 2008 and 2011 (Figure 45) shows (1) extension of HF across the state, Barnett Shale stays relatively steady, fracturing in the Haynesville Shale and Anadarko Basin expands, and the Eagle Ford becomes much more prominent as does the Permian Basin. A bar plot illustrates the county-by-county discrepancies between projections and actual numbers (Figure 46). A cross-plot is a different way of presenting the same information (Figure 47), and it is apparent that most counties with larger water use (dots in the upper right-hand side of the side) were correctly accounted (no dots on either the x- or y-axis), even if it was underestimated (dots mostly below the 1:1 line). Major discrepancies occurred because there was no Barnett extension outside of the core area (for example, Bosque, Comanche, Erath, and Palo Pinto counties in Figure 46), and because of more and faster development in the Eagle Ford Shale and Permian Basin. Both these factors are connected to the drop in gas price and increase in oil price in the past 2 or 3 years, parameters notoriously difficult to predict.



~36,000 AF
(Nicot et al., 2011)



~81,500 AF
including ~17,000 AF of recycling/reuse
and use of brackish water

Figure 45. Spatial distribution of HF water use in 2008 and 2011.

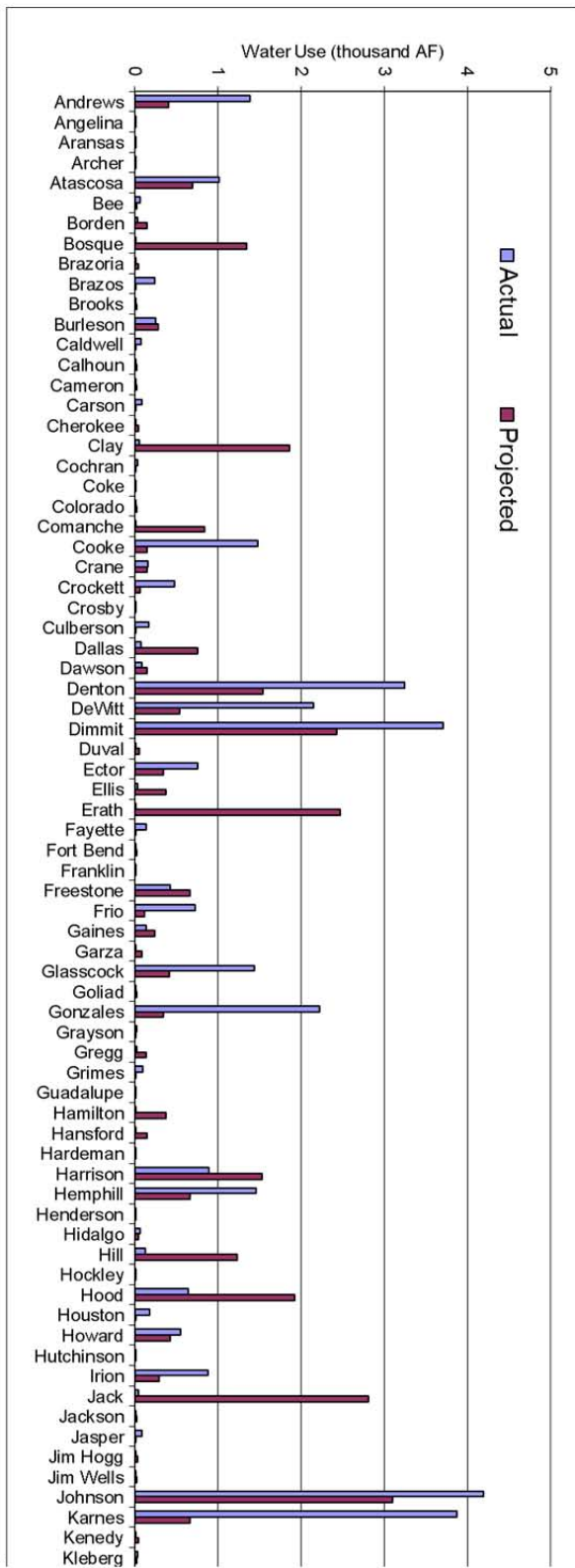
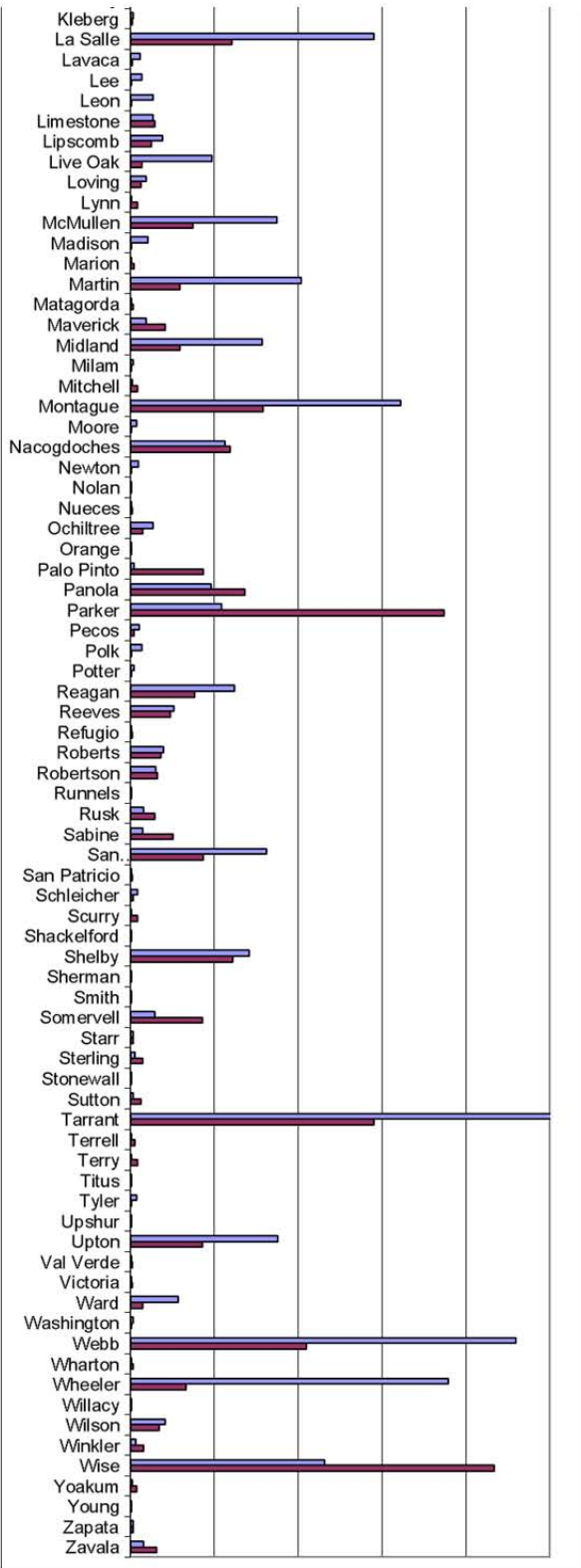
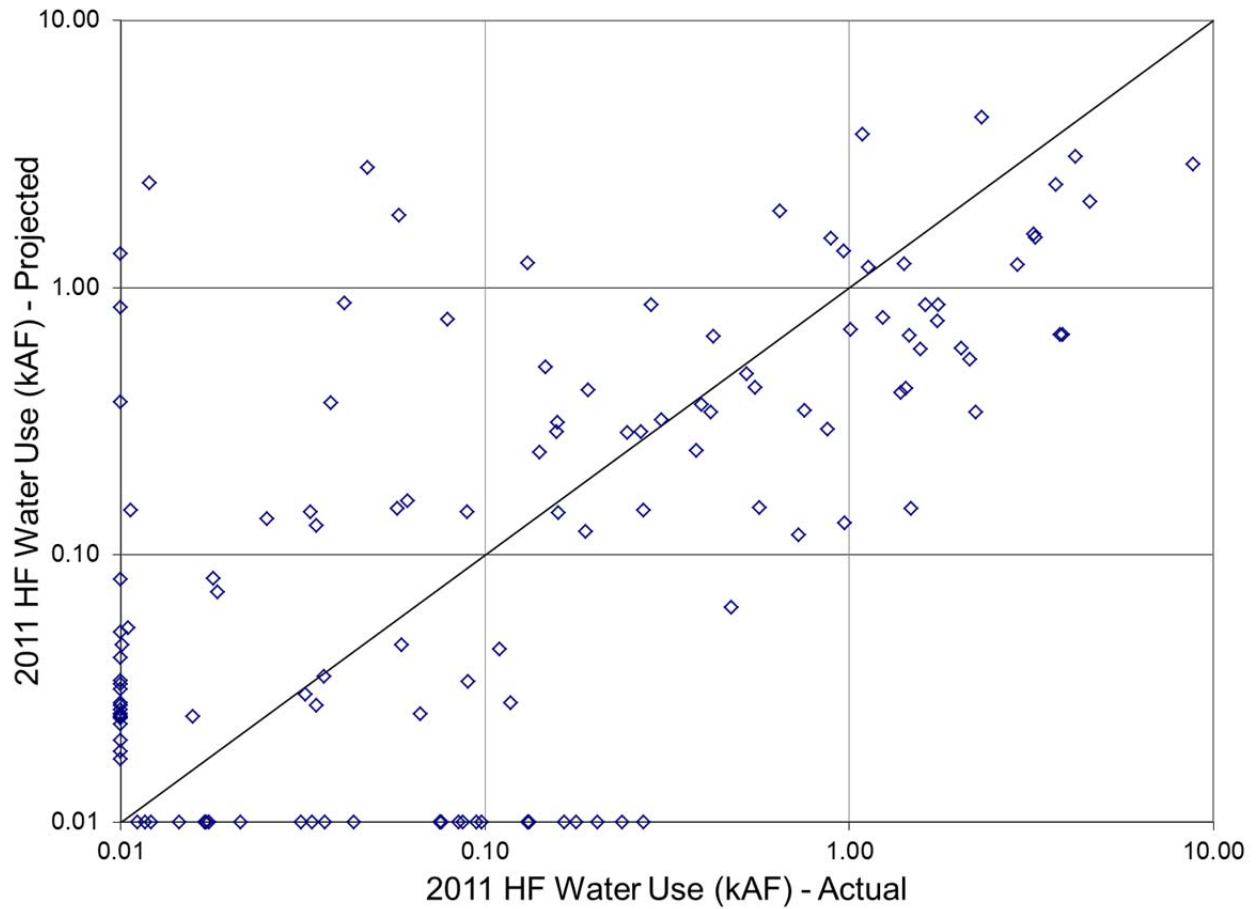


Figure 46. Bar plot comparison of 2011 actual water use to projections from 2009.



Note: Note the log-log scale.

Figure 47. County-level cross-plot comparison of 2011 actual water use to projections from 2008. Values on x- and y- axis represent counties whose actual (y-axis) / projected (x-axis) water use is 0. A total of 168 counties are represented.

III-4. Drilling Water Use

In the course of the study, we also collected information about drilling water use. Results are not sufficiently representative to change results presented in the 2011 report amounting to 8 kAF. The general observation, though, is that drilling requires water of better quality than HF although in smaller amounts (Table 11). The amount of water used depends on the length of the well and on operator preferences but also, more importantly, heavily on local factors. For example, in the Eagle Ford the drilling muds used in drilling through horizontal sections (for example, Fan et al., 2011) are oil-based.

Table 11. Drilling water use information

| Play / Region in 1000's gal/well | Range provided by operators | Comments |
|-------------------------------------|--------------------------------|----------|
| Barnett Shale | 250 | N/A |
| | 210-420 | ~Fresh |
| | 168 | ~Fresh |
| | 500 | ~Fresh |
| Eagle Ford Shale | 125 | N/A |
| | 420 | N/A |
| | 160 | ~Fresh |
| | 126 | ~Fresh |
| | 252-420 | ~Fresh |
| East Texas Basin | 600 | N/A |
| | 840-1,100 | ~Fresh |
| | 420 | ~Fresh |
| Anadarko Basin | 200 | N/A |
| | 420 | ~Fresh |
| Midland Basin (Permian Basin) | 84 | ~Fresh |
| | 100 | N/A |
| | 210 | ~Fresh |
| | 210-420 | ~Fresh |
| Delaware Basin (Permian Basin) | 100 | N/A |
| | 210-420 | Brackish |

Note: fresh is defined as TDS < 3,000 mg/L

IV. Water Use Projections

This section describes projections for HF water use and fresh-water consumption in Texas to year 2060. As described in the 2011 report, all projections entail many uncertainties and those caveats are still valid in this update. In general, the life of the plays was extended beyond 2060, less prospectivity was given to the gas window, and steeper development to the oil window section of plays or tight oil plays. The overall results is that the HF water use will have a broad plateau at ~125 kAF/yr around the 2020-2030 decade and then slowly decrease with time to 2060 and beyond (Figure 48). However, the amount of fresh water consumed (that is, not recycled or reused or brackish water) will stay relatively constant at ~70 kAF despite the increase in water use and then slowly subside with the decrease in HF activities. Fresh-water use will decrease for two reasons: (1) the industry is getting better at reusing flow back (but sometimes limited by the small fraction coming back) and at finding alternate sources of recycling (treatment plants, produced water from conventional wells) and at using brackish water because of the technological advances in additives tolerating more saline water. And (2) the Permian Basin, which may become the focus of HF in Texas in the long run, offers great production potential. In the Permian Basin, fresh water is at a premium and brackish water is already used by the industry.

Total oil and gas water use and consumption (combining HF, waterflooding, and drilling) is presented in Figure 49. Oil and gas water use, consistent with the definition of make-up fresh water used in this document, was computed by summing HF water use (Figure 48), drilling water use –with no change from the 2011 report, and waterflood water use –computed from the 2011 report by adding fresh and brackish water use. Oil and gas water consumption was computed by summing HF water consumption (Figure 48), drilling water use –with no change from the 2011 report and the additional note that water use and consumption are identical. Waterflood water consumption is the same as water use in the 2011 report that represented fresh water use. Projected oil and gas water use and consumption are dominated by HF. By design, in the 2011 report, drilling technology was projected to move the industry away from the use of fresh water. Progress in waterflooding was also projected to decrease fresh water requirements but to increase brackish water use until the whole industry relies only on saline water (not showed). Under these assumptions, oil and gas industry water use is projected to peak with a broad plateau at 180 kAF in the 2020-2030 decade, slowly declining to ~60 kAF by 2060. Fresh water consumption in the oil and gas industry is projected to reach a maximum of ~100 kAF before the end of this decade and then to slowly decrease to a low level of a few tens of thousands AF by the middle of the century.

We did not account for many unknowns that could possibly impact the results as they did in the Eagle Ford Shale when the industry switched from slick-water fracs to gel fracs in the oil window that use less water. The Eagle Ford was the only play in which we observed such a trend, everywhere else the trend (based on 2 to 5 years of data) shows an increase or a steady value in water intensity (Table 12). Data about recycling/reuse and brackish water use were derived from industry information of these uses as of today and in 2020 (Table 13). The most likely values from 2011 and 2020 are essentially estimated directly from the various responses in a given play. Extrapolation to 2060 and translation to high and low scenarios for all years starting in 2012 are speculative and are based on industry trends and on the general knowledge of the authors about fresh and brackish water aquifers and of their yields around the state. The

amount of reuse cannot be larger than the amount of flow back / produced water from recently fractured wells and at the play level reuse is likely less because of the operational issues of transporting water. Some plays, such as the Haynesville and Eagle Ford Shales, are at a disadvantage for this; they produce back less than 20% of the injected water (Table 14). They, and others, could however take advantage of produced water from other formations.

We did not deviate much from the overall water use of the 2011 report because of constraints accounted for the 2011 report and related to drilling rig count, labor force availability/staff shortage, infrastructure development, and other factors. National rig count seems steady at ~2,000 or slightly lower in the past year (~50% of them in Texas), but drillers are improving at operating them, which suggests that the projections presented in this update are consistent with the number of drilling rigs currently available.

Cumulative water use is related to the eventual well density or lateral spacing. Ultimate average spacing between laterals, or vertical well density, is the parameter driving water use along with water intensity. Typical vertical well spacing is 1 well per 40 acres; that ratio can decrease to 1 well per 20 or 10 acres in some instances. Typical lateral spacing can be computed from 1 horizontal well per 160 acres. If lateral length is 5,000 ft, the resulting spacing between laterals is 1,400 ft. If the horizontal well density declines to 1 well per 40 acres, lateral spacing is 350 ft. This update document assumes a lateral spacing of 1000 ft, perhaps smaller in oil windows (Figure 51).

County-level projections for HF water use and water consumption are listed in Table 15. The county coverage is essentially the same as in the 2011 report with the addition of four counties in East Texas (Polk, Tyler, Jasper, and Newton counties, Figure 50). Total oil and gas (combining HF, waterflooding, and drilling) county-level projections are presented in Table 16.

The following paragraphs address HF projection issues specific to each play and region. Each play is represented by two plots. One plot compares projections from the 2011 report to projections from this update. The second plot displays water use and fresh water consumption in the high, low, and most likely scenarios. Only the latter is displayed in the first plot and is retained as the preferred set of projections to be used by the TWDB. As explained in the Methodology Section (Section II), low and high scenarios were derived by varying two factors: (1) the prospectivity factor, which assesses the ultimate amount of HF in a play, varies on a county and play basis from 1 to 0, with 1 meaning the county is within the core area and highly prospective (for example, Tarrant County in the Barnett Shale) and near- zero values suggesting that little of the county will be developed (for example, Shackelford County in the Barnett Shale); and (2) coefficients for recycling/reuse and brackish water use (Table 13). The prospectivity factor was changed according to a sliding linear scale: a value of 1 stays at 1 but a value of 0.2 either goes to zero (low water use scenario) or 0.4 (high water use scenario). The change was made systematically with no tentative exercise to tailor it to each county/play couple. In the case of tight oil/ tight gas plays, a third factor was varied. This factor varies from 0 to 1 and addresses the spatial coverage of the county that could ultimately undergo HF. In the case of resource plays such as shale plays, the factor is constant and close to one because the whole footprint of the play is potentially a target for drilling. The only unknown is the well density which is accounted for through the prospectivity factor. In tight oil/gas plays, it cannot be assumed that the whole footprint of the formation will experience HF because some parts of it can be properly produced through conventional wells. This third factor was used in the East

Texas (Cotton Valley), Anadarko (Granite Wash), Gulf Coast (Austin Chalk), and Permian basins.

Barnett Shale: In this play with the longest history, we considerably decreased the prospectivity factors outside of the core area in the most likely scenario. That is, instead of increasing water use because of the expansion of the productive Barnett Shale footprint, we assumed that most of the HF will stay confined to the core area and stay relatively stable for a few years before slowly decreasing (Figure 52a). The peak from earlier projections has disappeared and water use should stay below 30 kAF and decrease more slowly than projected in the 2011 report. The high water use scenario projection (Figure 52b) displays a small increase in water use (but not in water consumption) in the 2020 decade because the prospectivity factors are closer to those used in the 2011 report.

Eagle Ford Shale: Projections for this play display a decrease in water use compared to those projected values of the 2011 report (Figure 53a) because of the observed decrease in water intensity that we assumed will hold in the future. The projections suggest a slow increase in water for the next 10 years with a broad peak at ~35kAF and a slow decrease beyond 2060. Unlike the Barnett with a clearly delimited core, we assumed that most counties in the Eagle Ford are highly prospective and thus there is not much variation between high and low scenario projections except when recycling/reuse and use of brackish water are included (Figure 53b).

Pearsall Shale: This gas play was briefly hydraulically fractured in the mid-2000's and has not received a lot of attention since then. However, initial production estimates suggest that the play will be produced in the future. We used the same water use parameters in the Pearsall as those in the Eagle Ford Shale because these plays are geographically close. Projections from the 2011 report were only slightly modified displacing the peak water use at ~10 kAF by about 5 years into the future (Figure 54a). As was the case for the Eagle Ford, the high and low scenarios are mostly impacted by the amount of recycling/reuse and brackish water use (Figure 54b).

TX-Haynesville and Bossier Shales: The Haynesville and Bossier Shales have declined in operator interest because of their relatively high operational cost and low gas prices. They are, however, still likely to produce significant amounts of gas in the future, albeit at a lower rate than anticipated in the 2011 report. Projections of this update document show a decreased and broader peak (Figure 55a), with annual water use slated to be no higher than ~12kAF. A minor player, the Haynesville-West play will possibly undergo some development on the western flank of the East Texas Basin and its water use projections stay similar to that of the 2011 report (Figure 56a), with a decrease peak as well. Low and high scenario projections stay relatively close together (Figure 55b), because there is little variability in terms of projected non-fresh water use (almost none).

Other East Texas Formations: This category includes all formations except the Haynesville and Bossier Shales, such as the Cotton Valley, James Lime, Bossier Sands, and others. The same water consumption data used in the Haynesville were used for this group of formations. Relative to the 2011 report projections, the projections derived in this update assumed a broader peak displaced toward the future by ~10 years (Figure 57a). Projected maximum water use is estimated at <5 kAF/yr. The small variance between water use and water consumption is explained by the location of the plays in East Texas where fresh water is relatively abundant and the large differences between the different scenario projections is due to the spread of the third factor, addressing spatial coverage of the formation of interest (Figure 57b).

Gulf Coast Formations: Amount of water use and consumption in the Gulf Coast Basin outside of the shale plays is very uncertain. The Gulf Coast Basin is the area in Texas that has experienced the least HF (Nicot et al., 2011) and explained the large range of projections between the different scenarios (Figure 58b). This category include formations such as the Olmos Sands and the Austin Chalk, and these projections assumed that water use will peak at ~8kAF in the 2020's (Figure 58a). Water consumption is assumed to be much lower because most of the plays are in South Texas, where there are some brackish water resources.

Anadarko Basin: Anadarko Basin consists mostly of the Granite Wash in Hemphill and Wheeler counties and the Marmaton/Cleveland in Ochiltree and Lipscomb counties. Current water use in this basin is much higher than anticipated in the 2011 report projections. We revisited prospectivity factors and the projected water use reaches a broad peak of ~9kAF in the 2020's (Figure 59a) with a smaller projected water consumption because of anticipated recycling/reuse and brackish water use. However, the uncertainty in final coverage put this basin in the same category as the Gulf Coast Basin and East Basin category, resulting in a large spread of potential outcomes (Figure 59b).

Permian Basin: As has the Anadarko Basin, the Permian Basin has grown much faster than anticipated and water use projections call for a plateau at ~40 kAF during the 2020-2040 period (Figure 60a) concomitant with a fairly stable fresh water consumption at 10-15 kAF. The large gap between water use and water consumption, much larger than presented in the 2011 report (Figure 60a), is due to the expectation of availability of significant amounts of brackish water and of their extensive use by the industry (as currently documented by anecdotal evidence). The large range in outcome from the different scenarios is related to the unknowns in spatial coverage of the non-shale plays (Figure 60b). We now turn to the description of the major components making up water use in the Permian Basin. Although the Barnett-Woodford system in the Permian Basin has received limited interest, we assume it will produce gas in the future (Figure 61a). The most likely scenario calls for a peak at ~5 kAF in 2035 but with the possibility of a high scenario with a much higher water use and a low scenario with no development. Development centered on the Wolfcamp is more certain and differences between high and low scenario projections were derived mostly from assumptions on the level of use of non-fresh water (Figure 61b). The other formations in the Permian Basin also display the same uncertainty related to the amount of spatial coverage ("third factor" as described above). The most likely scenario projection is estimated to have a broad peak in the 15-20 kAF range for many years with considerably less water consumption (Figure 61c).

Table 12. Recent trends in well completion and water use in hydraulic-fractured plays.

| Play | Well Type | ~# of Recent Wells/yr | Recent Trend (well/yr) | Water Use / well (Mgal) | Water Use Intensity (gal/ft) | Recent Trend (water use) |
|----------------|-----------|-----------------------|------------------------|-------------------------|------------------------------|--------------------------|
| Barnett | H | 1500 | down / steady | n/a | 1200 | steady |
| Eagle Ford | H | 1000 | strongly up | n/a | 850 | down |
| TX-Haynesville | H | 250 | up | n/a | 1400 | steady |
| Granite Wash | H | 250 | strongly up | n/a | 1200 | steady / up |
| | V | 60 | strongly down | 1500 | 800 | steady |
| Cleveland | H | 100 | steady | n/a | 250 | steady |
| | V | 20 | down | 1.7 | 2000 | steady |
| Marmaton | H | 30 | strongly up | n/a | 250 | steady |
| | V | 10 | steady | 1.0 | 2500 | up |
| Cotton Valley | H | 100 | up | n/a | 1000 | steady |
| | V | 300 | strongly down | 0.8 | 1200 | steady |
| Olmos | H | 50 | up | n/a | 1000 | up |
| | V | 100 | strongly down | 0.15 | 2500 | steady |
| Wolfcamp | H | 150 | strongly up | n/a | 900 | strongly up |
| Wolfberry | V | 2000 | up | 1.0 | 350 | up |
| Canyon | V | 300 | down | 0.4 | 500 | up |
| Clear Fork | V | 800 | up | 0.8 | 350 | up |
| San Andres | H | 50 | strongly down | n/a | 350 | strongly up |
| | V | 800 | steady / up | 0.15 | 500 | steady |

Table 13. Coefficients (%) to compute water consumption to be applied to total water use.

| Play / Region | | High Water Use | Most Likely | Low Water Use |
|------------------------|------------------|----------------|-------------|---------------|
| Far West Permian Basin | Recycling | | | |
| | 2011 | 0 | 0 | 0 |
| | 2020 | 0 | 50 | 40 |
| | 2060 | 0 | 40 | 40 |
| | Brackish | | | |
| | 2011 | 80 | 80 | 80 |
| | 2020 | 80 | 30 | 50 |
| 2060 | 80 | 40 | 50 | |
| Permian Midland Basin | Recycling | | | |
| | 2011 | 2 | 2 | 2 |
| | 2020 | 2 | 25 | 30 |
| | 2060 | 2 | 30 | 40 |
| | Brackish | | | |
| | 2011 | 30 | 30 | 30 |
| | 2020 | 30 | 40 | 40 |
| 2060 | 30 | 40 | 50 | |
| Anadarko Basin | Recycling | | | |
| | 2011 | 20 | 20 | 20 |
| | 2020 | 20 | 30 | 40 |
| | 2060 | 20 | 40 | 40 |
| | Brackish | | | |

| Play / Region | | High Water Use | Most Likely | Low Water Use |
|------------------|------------------|----------------|-------------|---------------|
| | 2011 | 30 | 30 | 30 |
| | 2020 | 30 | 30 | 30 |
| | 2060 | 30 | 30 | 40 |
| Barnett Shale | Recycling | | | |
| | 2011 | 5 | 5 | 5 |
| | 2020 | 5 | 10 | 25 |
| | 2060 | 5 | 20 | 20 |
| | Brackish | | | |
| | 2011 | 3 | 3 | 3 |
| | 2020 | 3 | 15 | 20 |
| 2060 | 3 | 25 | 25 | |
| Eagle Ford Shale | Recycling | | | |
| | 2011 | 0 | 0 | 0 |
| | 2020 | 0 | 10 | 10 |
| | 2060 | 0 | 10 | 10 |
| | Brackish | | | |
| | 2011 | 20 | 20 | 20 |
| | 2020 | 20 | 40 | 50 |
| 2060 | 20 | 50 | 50 | |
| South Texas | Recycling | | | |
| | 2011 | 0 | 0 | 0 |
| | 2020 | 0 | 10 | 10 |
| | 2060 | 0 | 10 | 10 |
| | Brackish | | | |
| | 2011 | 20 | 20 | 20 |
| | 2020 | 20 | 40 | 50 |
| 2060 | 20 | 50 | 50 | |
| East Texas | Recycling | | | |
| | 2011 | 5 | 5 | 5 |
| | 2020 | 5 | 10 | 10 |
| | 2060 | 5 | 10 | 10 |
| | Brackish | | | |
| | 2011 | 0 | 0 | 0 |
| | 2020 | 0 | 0 | 10 |
| 2060 | 0 | 10 | 10 | |

Table 14. Estimated flow back/produced water volume relative to HF injected volume.

| Play / Region | Comment |
|--------------------------------|---|
| Delaware Basin (Permian Basin) | Close to 100% in year 1, 150% well life >200% well life |
| Midland Basin (Permian Basin) | 50%-100% in year 1 |
| Anadarko Basin | ~50% in month 1, 90% at month 6 |
| Barnett Shale | 10-20% month 1, 20-60% well life 70% year1; 150% in 5 years |
| Eagle Ford Shale | 20% over life; 20% over life |
| Haynesville Shale | 20% over life; 15% over life |
| Cotton Valley Fm. | 60% month 1, >100% well life; 40% or 100% over life |

Table 15. County-level estimate of 2012-2060 projections for HF water use and water consumption (AF).

| County | Water Use (AF) | | | | | | | | | | | Water Consumption (AF) | | | | | | | | | | |
|---------------|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------------|-------|-------|-------|-------|-------|-------|-------|------|------|------|
| | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 |
| Anderson | 0 | 31 | 58 | 89 | 119 | 131 | 139 | 124 | 105 | 85 | 66 | 0 | 23 | 41 | 64 | 86 | 97 | 104 | 92 | 76 | 61 | 46 |
| Andrews | 1,391 | 1,617 | 2,140 | 2,053 | 1,965 | 1,878 | 1,654 | 1,431 | 1,207 | 983 | 806 | 946 | 862 | 749 | 690 | 634 | 580 | 501 | 425 | 351 | 279 | 224 |
| Angelina | 7 | 60 | 160 | 260 | 360 | 379 | 345 | 310 | 276 | 241 | 207 | 6 | 56 | 144 | 231 | 315 | 327 | 293 | 260 | 228 | 196 | 165 |
| Aransas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Archer | 17 | 81 | 183 | 284 | 385 | 354 | 321 | 289 | 257 | 225 | 193 | 16 | 68 | 137 | 206 | 270 | 239 | 209 | 181 | 154 | 129 | 106 |
| Armstrong | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Atascosa | 1,009 | 2,902 | 2,638 | 2,589 | 2,594 | 2,598 | 2,602 | 2,314 | 1,953 | 1,591 | 1,230 | 807 | 2,064 | 1,583 | 1,500 | 1,443 | 1,386 | 1,329 | 1,144 | 935 | 736 | 545 |
| Austin | 0 | 0 | 98 | 195 | 293 | 264 | 234 | 205 | 176 | 146 | 117 | 0 | 0 | 59 | 115 | 169 | 148 | 129 | 110 | 92 | 75 | 59 |
| Bailey | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bandera | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bastrop | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Baylor | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bee | 66 | 80 | 101 | 108 | 94 | 81 | 67 | 54 | 40 | 27 | 13 | 53 | 60 | 64 | 67 | 57 | 48 | 39 | 31 | 23 | 15 | 7 |
| Bell | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bexar | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Blanco | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Borden | 33 | 228 | 638 | 892 | 899 | 906 | 764 | 622 | 480 | 338 | 230 | 23 | 122 | 223 | 307 | 303 | 300 | 248 | 198 | 150 | 104 | 69 |
| Bosque | 0 | 192 | 329 | 466 | 603 | 553 | 502 | 452 | 402 | 352 | 301 | 0 | 162 | 247 | 338 | 422 | 373 | 327 | 283 | 241 | 202 | 166 |
| Bowie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brazoria | 0 | 41 | 60 | 79 | 97 | 91 | 79 | 67 | 55 | 43 | 31 | 0 | 31 | 38 | 49 | 59 | 54 | 46 | 38 | 31 | 24 | 17 |
| Brazos | 238 | 322 | 696 | 931 | 1,166 | 1,036 | 905 | 775 | 644 | 514 | 384 | 191 | 243 | 431 | 559 | 681 | 592 | 506 | 423 | 343 | 267 | 193 |
| Brewster | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Briscoe | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brooks | 8 | 37 | 49 | 62 | 62 | 54 | 46 | 38 | 30 | 22 | 14 | 6 | 28 | 31 | 38 | 38 | 32 | 27 | 22 | 17 | 12 | 8 |
| Brown | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Burleson | 247 | 331 | 943 | 1,409 | 1,877 | 1,676 | 1,474 | 1,273 | 1,071 | 867 | 665 | 197 | 250 | 580 | 840 | 1,090 | 952 | 819 | 690 | 567 | 447 | 334 |
| Burnet | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Caldwell | 75 | 90 | 116 | 103 | 90 | 77 | 64 | 52 | 39 | 26 | 13 | 60 | 68 | 73 | 64 | 55 | 46 | 38 | 29 | 22 | 14 | 7 |
| Calhoun | 0 | 25 | 33 | 42 | 42 | 37 | 31 | 26 | 21 | 15 | 10 | 0 | 19 | 21 | 26 | 26 | 22 | 18 | 15 | 11 | 8 | 5 |
| Callahan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cameron | 0 | 37 | 50 | 62 | 62 | 54 | 46 | 38 | 30 | 22 | 14 | 0 | 28 | 31 | 38 | 38 | 32 | 27 | 22 | 17 | 12 | 8 |
| Camp | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carson | 85 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 42 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cass | 0 | 10 | 25 | 41 | 56 | 68 | 60 | 52 | 45 | 37 | 30 | 0 | 9 | 24 | 38 | 52 | 60 | 52 | 45 | 38 | 31 | 24 |
| Castro | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chambers | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cherokee | 10 | 70 | 128 | 186 | 244 | 284 | 253 | 221 | 190 | 158 | 126 | 9 | 66 | 122 | 173 | 223 | 254 | 221 | 189 | 159 | 129 | 101 |
| Childress | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Clay | 58 | 194 | 355 | 516 | 678 | 621 | 565 | 508 | 452 | 395 | 339 | 53 | 164 | 266 | 374 | 474 | 419 | 367 | 318 | 271 | 227 | 186 |
| Cochran | 31 | 94 | 121 | 149 | 176 | 203 | 180 | 158 | 135 | 113 | 90 | 21 | 50 | 42 | 51 | 59 | 67 | 59 | 50 | 42 | 35 | 27 |
| Coke | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coleman | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Collin | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Collingsworth | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Colorado | 0 | 38 | 517 | 996 | 1,462 | 1,314 | 1,166 | 1,018 | 870 | 722 | 574 | 0 | 29 | 312 | 587 | 843 | 741 | 643 | 548 | 458 | 371 | 287 |
| Comal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Comanche | 0 | 125 | 228 | 332 | 436 | 392 | 349 | 305 | 261 | 218 | 174 | 0 | 105 | 171 | 241 | 305 | 265 | 227 | 191 | 157 | 125 | 96 |
| Concho | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cooke | 1,480 | 1,653 | 1,294 | 934 | 575 | 215 | 0 | 0 | 0 | 0 | 0 | 1,362 | 1,396 | 970 | 677 | 402 | 145 | 0 | 0 | 0 | 0 | 0 |
| Coryell | 0 | 289 | 1,012 | 947 | 684 | 421 | 158 | 0 | 0 | 0 | 0 | 0 | 244 | 759 | 686 | 479 | 284 | 103 | 0 | 0 | 0 | 0 |

| County | Water Use (AF) | | | | | | | | | | Water Consumption (AF) | | | | | | | | | | | |
|------------|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|
| | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 |
| Cottle | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Crane | 159 | 339 | 438 | 559 | 681 | 802 | 729 | 656 | 583 | 510 | 438 | 108 | 181 | 153 | 189 | 223 | 257 | 229 | 203 | 177 | 152 | 128 |
| Crockett | 475 | 996 | 1,636 | 1,946 | 1,760 | 1,475 | 1,190 | 905 | 620 | 335 | 149 | 323 | 531 | 573 | 669 | 594 | 489 | 387 | 288 | 194 | 103 | 45 |
| Crosby | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Culberson | 166 | 141 | 188 | 576 | 963 | 1,280 | 1,163 | 1,047 | 931 | 814 | 698 | 33 | 75 | 66 | 149 | 231 | 290 | 262 | 235 | 207 | 180 | 154 |
| Dallam | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dallas | 79 | 654 | 1,018 | 848 | 679 | 509 | 339 | 170 | 0 | 0 | 0 | 73 | 553 | 763 | 615 | 475 | 343 | 220 | 106 | 0 | 0 | 0 |
| Dawson | 89 | 476 | 724 | 918 | 954 | 990 | 844 | 699 | 553 | 408 | 294 | 61 | 254 | 253 | 308 | 308 | 308 | 257 | 208 | 160 | 115 | 80 |
| Deaf Smith | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Delta | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Denton | 3,249 | 3,159 | 2,106 | 1,053 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,989 | 2,667 | 1,579 | 763 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DeWitt | 2,151 | 1,977 | 1,773 | 1,569 | 1,354 | 1,130 | 907 | 684 | 460 | 237 | 14 | 1,721 | 1,407 | 1,065 | 924 | 780 | 638 | 500 | 369 | 243 | 122 | 7 |
| Dickens | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dimmit | 3,706 | 4,777 | 4,765 | 4,857 | 4,871 | 4,834 | 4,232 | 3,489 | 2,746 | 2,002 | 1,259 | 2,965 | 3,407 | 2,828 | 2,774 | 2,669 | 2,534 | 2,145 | 1,710 | 1,294 | 895 | 516 |
| Donley | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Duval | 0 | 70 | 94 | 117 | 118 | 103 | 87 | 72 | 57 | 42 | 27 | 0 | 53 | 59 | 73 | 72 | 61 | 51 | 41 | 32 | 23 | 14 |
| Eastland | 0 | 0 | 424 | 642 | 550 | 458 | 367 | 275 | 184 | 92 | 0 | 0 | 0 | 318 | 465 | 385 | 309 | 238 | 172 | 110 | 53 | 0 |
| Ector | 756 | 983 | 1,340 | 1,434 | 1,529 | 1,484 | 1,309 | 1,134 | 959 | 784 | 644 | 514 | 524 | 469 | 478 | 488 | 451 | 390 | 332 | 274 | 219 | 176 |
| Edwards | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ellis | 38 | 87 | 126 | 166 | 206 | 185 | 164 | 144 | 123 | 103 | 82 | 35 | 74 | 95 | 120 | 144 | 125 | 107 | 90 | 74 | 59 | 45 |
| El Paso | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Erath | 12 | 163 | 253 | 343 | 433 | 397 | 361 | 325 | 289 | 253 | 217 | 11 | 137 | 190 | 249 | 303 | 268 | 235 | 203 | 173 | 145 | 119 |
| Falls | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fannin | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fayette | 132 | 1,081 | 2,329 | 2,093 | 1,822 | 1,526 | 1,229 | 932 | 636 | 340 | 43 | 106 | 773 | 1,402 | 1,236 | 1,054 | 864 | 681 | 505 | 337 | 176 | 23 |
| Fisher | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Floyd | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Foard | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fort Bend | 0 | 35 | 46 | 58 | 58 | 51 | 43 | 36 | 28 | 21 | 14 | 0 | 26 | 29 | 36 | 35 | 30 | 25 | 20 | 16 | 11 | 7 |
| Franklin | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Freestone | 424 | 750 | 975 | 1,229 | 1,424 | 1,404 | 1,241 | 1,076 | 912 | 748 | 584 | 339 | 678 | 846 | 1,042 | 1,196 | 1,164 | 1,012 | 863 | 720 | 582 | 449 |
| Frio | 729 | 1,119 | 1,146 | 1,176 | 1,189 | 1,159 | 1,127 | 1,097 | 947 | 769 | 589 | 583 | 809 | 701 | 708 | 692 | 647 | 602 | 559 | 465 | 364 | 266 |
| Gaines | 142 | 830 | 1,273 | 1,709 | 1,881 | 1,841 | 1,582 | 1,323 | 1,064 | 805 | 599 | 96 | 443 | 445 | 563 | 588 | 542 | 456 | 372 | 290 | 212 | 152 |
| Galveston | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Garza | 1 | 237 | 315 | 394 | 473 | 426 | 379 | 331 | 284 | 237 | 189 | 0 | 126 | 110 | 136 | 160 | 141 | 123 | 106 | 89 | 72 | 57 |
| Gillespie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Glasscock | 1,434 | 1,938 | 2,621 | 2,466 | 2,311 | 1,978 | 1,646 | 1,313 | 980 | 648 | 427 | 975 | 1,033 | 917 | 848 | 780 | 655 | 535 | 419 | 306 | 198 | 128 |
| Goliad | 0 | 34 | 45 | 56 | 56 | 49 | 42 | 35 | 27 | 20 | 13 | 0 | 25 | 28 | 35 | 34 | 29 | 24 | 20 | 15 | 11 | 7 |
| Gonzales | 2,224 | 1,746 | 1,552 | 1,358 | 1,164 | 970 | 776 | 582 | 388 | 194 | 0 | 1,779 | 1,241 | 931 | 798 | 669 | 545 | 427 | 313 | 204 | 99 | 0 |
| Gray | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Grayson | 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gregg | 25 | 134 | 224 | 313 | 402 | 449 | 405 | 362 | 318 | 274 | 230 | 24 | 127 | 208 | 284 | 357 | 391 | 347 | 305 | 263 | 223 | 184 |
| Grimes | 95 | 125 | 287 | 448 | 569 | 506 | 443 | 380 | 317 | 254 | 191 | 76 | 94 | 178 | 270 | 334 | 291 | 249 | 209 | 170 | 133 | 97 |
| Guadalupe | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hale | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hall | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hamilton | 0 | 251 | 304 | 253 | 203 | 152 | 101 | 51 | 0 | 0 | 0 | 0 | 212 | 228 | 184 | 142 | 103 | 66 | 32 | 0 | 0 | 0 |
| Hansford | 11 | 0 | 513 | 1,025 | 879 | 732 | 586 | 439 | 293 | 146 | 0 | 5 | 0 | 205 | 397 | 329 | 265 | 205 | 148 | 95 | 46 | 0 |
| Hardeman | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hardin | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Harris | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Harrison | 893 | 1,578 | 2,223 | 2,012 | 1,851 | 1,689 | 1,527 | 1,365 | 1,203 | 1,041 | 880 | 849 | 1,479 | 2,030 | 1,808 | 1,636 | 1,469 | 1,307 | 1,149 | 996 | 847 | 704 |

| County | Water Use (AF) | | | | | | | | | | | Water Consumption (AF) | | | | | | | | | | |
|------------|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|
| | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 |
| Hartley | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Haskell | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hays | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hemphill | 1,462 | 2,484 | 2,231 | 1,978 | 1,724 | 1,470 | 1,217 | 963 | 710 | 456 | 203 | 731 | 1,132 | 892 | 766 | 646 | 533 | 426 | 325 | 231 | 143 | 61 |
| Henderson | 12 | 46 | 124 | 201 | 278 | 333 | 296 | 259 | 222 | 185 | 148 | 12 | 44 | 117 | 187 | 254 | 297 | 259 | 222 | 186 | 151 | 118 |
| Hidalgo | 59 | 63 | 83 | 104 | 105 | 91 | 78 | 64 | 51 | 37 | 24 | 47 | 47 | 53 | 65 | 64 | 54 | 45 | 37 | 28 | 20 | 13 |
| Hill | 131 | 1,429 | 1,225 | 1,021 | 816 | 612 | 408 | 204 | 0 | 0 | 0 | 120 | 1,207 | 919 | 740 | 571 | 413 | 265 | 128 | 0 | 0 | 0 |
| Hockley | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hood | 645 | 409 | 580 | 751 | 921 | 829 | 737 | 645 | 553 | 461 | 369 | 593 | 346 | 435 | 544 | 645 | 560 | 479 | 403 | 332 | 265 | 203 |
| Hopkins | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Houston | 178 | 237 | 305 | 271 | 237 | 203 | 170 | 135 | 102 | 68 | 34 | 142 | 179 | 193 | 168 | 144 | 121 | 99 | 77 | 57 | 37 | 18 |
| Howard | 552 | 1,471 | 2,360 | 2,822 | 2,642 | 2,250 | 1,859 | 1,468 | 1,076 | 685 | 422 | 376 | 784 | 826 | 970 | 892 | 745 | 604 | 468 | 336 | 210 | 126 |
| Hudspeth | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hunt | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hutchinson | 5 | 0 | 90 | 180 | 154 | 128 | 103 | 77 | 51 | 26 | 0 | 2 | 0 | 36 | 70 | 58 | 47 | 36 | 26 | 17 | 8 | 0 |
| Irion | 875 | 1,478 | 2,429 | 2,889 | 2,613 | 2,190 | 1,766 | 1,343 | 920 | 497 | 221 | 595 | 788 | 850 | 993 | 882 | 725 | 574 | 428 | 287 | 152 | 66 |
| Jack | 48 | 242 | 363 | 485 | 605 | 545 | 485 | 424 | 363 | 303 | 242 | 44 | 204 | 273 | 351 | 424 | 368 | 315 | 265 | 218 | 174 | 133 |
| Jackson | 0 | 34 | 45 | 56 | 56 | 49 | 42 | 35 | 28 | 20 | 13 | 0 | 25 | 29 | 35 | 34 | 29 | 25 | 20 | 15 | 11 | 7 |
| Jasper | 87 | 105 | 135 | 120 | 105 | 90 | 75 | 60 | 45 | 30 | 15 | 83 | 79 | 86 | 75 | 64 | 54 | 44 | 34 | 25 | 16 | 8 |
| Jeff Davis | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Jefferson | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Jim Hogg | 0 | 45 | 60 | 75 | 75 | 65 | 56 | 46 | 37 | 27 | 17 | 0 | 34 | 38 | 46 | 46 | 39 | 32 | 26 | 20 | 15 | 9 |
| Jim Wells | 0 | 34 | 45 | 57 | 57 | 50 | 42 | 35 | 28 | 21 | 13 | 0 | 26 | 29 | 35 | 35 | 30 | 25 | 20 | 15 | 11 | 7 |
| Johnson | 4,192 | 4,038 | 3,365 | 2,692 | 2,019 | 1,346 | 673 | 0 | 0 | 0 | 0 | 3,857 | 3,410 | 2,524 | 1,952 | 1,413 | 909 | 437 | 0 | 0 | 0 | 0 |
| Jones | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Karnes | 3,869 | 2,749 | 2,457 | 2,165 | 1,863 | 1,554 | 1,245 | 937 | 629 | 320 | 11 | 3,095 | 1,956 | 1,475 | 1,273 | 1,073 | 876 | 686 | 505 | 331 | 165 | 6 |
| Kaufman | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Kendall | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Kenedy | 6 | 57 | 76 | 95 | 95 | 83 | 71 | 58 | 46 | 34 | 22 | 5 | 43 | 48 | 59 | 58 | 49 | 41 | 33 | 26 | 19 | 12 |
| Kent | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Kerr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Kimble | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| King | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Kinney | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Kleberg | 34 | 37 | 49 | 62 | 62 | 54 | 46 | 38 | 30 | 22 | 14 | 28 | 28 | 31 | 38 | 38 | 32 | 27 | 22 | 17 | 12 | 8 |
| Knox | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lamar | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lamb | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lampasas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| La Salle | 2,901 | 4,432 | 4,425 | 4,532 | 4,621 | 4,698 | 4,147 | 3,440 | 2,732 | 2,025 | 1,318 | 2,321 | 3,154 | 2,612 | 2,563 | 2,499 | 2,427 | 2,070 | 1,659 | 1,265 | 889 | 530 |
| Lavaca | 118 | 913 | 1,522 | 1,388 | 1,241 | 1,086 | 930 | 775 | 620 | 464 | 309 | 94 | 651 | 915 | 818 | 716 | 613 | 513 | 418 | 326 | 239 | 155 |
| Lee | 131 | 203 | 392 | 508 | 624 | 553 | 484 | 414 | 345 | 274 | 204 | 105 | 152 | 243 | 305 | 365 | 316 | 270 | 226 | 184 | 142 | 103 |
| Leon | 273 | 663 | 1,289 | 1,800 | 2,309 | 2,192 | 1,934 | 1,674 | 1,416 | 1,155 | 898 | 218 | 487 | 831 | 1,166 | 1,487 | 1,415 | 1,225 | 1,041 | 864 | 693 | 529 |
| Liberty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Limestone | 268 | 307 | 347 | 388 | 410 | 376 | 332 | 287 | 242 | 197 | 153 | 214 | 281 | 307 | 333 | 346 | 312 | 270 | 229 | 190 | 153 | 116 |
| Lipscomb | 382 | 560 | 1,026 | 876 | 725 | 574 | 423 | 272 | 121 | 0 | 0 | 191 | 255 | 410 | 339 | 272 | 208 | 148 | 92 | 39 | 0 | 0 |
| Live Oak | 972 | 783 | 729 | 676 | 692 | 720 | 748 | 776 | 689 | 575 | 461 | 777 | 558 | 439 | 399 | 392 | 388 | 384 | 379 | 324 | 261 | 200 |
| Llano | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Loving | 189 | 313 | 418 | 561 | 704 | 690 | 627 | 565 | 502 | 439 | 376 | 38 | 167 | 146 | 187 | 227 | 213 | 191 | 169 | 147 | 127 | 107 |
| Lubbock | 0 | 0 | 0 | 51 | 103 | 154 | 140 | 126 | 112 | 98 | 84 | 0 | 0 | 0 | 10 | 21 | 31 | 28 | 25 | 22 | 20 | 17 |
| Lynn | 0 | 0 | 246 | 336 | 427 | 517 | 460 | 402 | 345 | 287 | 230 | 0 | 0 | 86 | 116 | 144 | 171 | 149 | 128 | 108 | 88 | 69 |
| McCulloch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| County | Water Use (AF) | | | | | | | | | | | Water Consumption (AF) | | | | | | | | | | |
|---------------|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 |
| McLennan | 0 | 53 | 120 | 187 | 253 | 228 | 203 | 177 | 152 | 127 | 101 | 0 | 45 | 90 | 135 | 177 | 154 | 132 | 111 | 91 | 73 | 56 |
| McMullen | 1,752 | 2,545 | 2,762 | 3,067 | 3,329 | 3,562 | 3,306 | 2,930 | 2,553 | 2,177 | 1,801 | 1,401 | 1,815 | 1,627 | 1,729 | 1,797 | 1,840 | 1,658 | 1,430 | 1,211 | 1,001 | 801 |
| Madison | 204 | 261 | 561 | 750 | 940 | 832 | 727 | 622 | 518 | 413 | 308 | 163 | 197 | 348 | 451 | 549 | 475 | 406 | 339 | 275 | 214 | 155 |
| Marion | 10 | 121 | 270 | 420 | 569 | 579 | 522 | 466 | 408 | 351 | 295 | 10 | 114 | 249 | 380 | 506 | 506 | 449 | 393 | 339 | 286 | 236 |
| Martin | 2,035 | 2,446 | 3,071 | 2,824 | 2,577 | 2,267 | 1,892 | 1,516 | 1,141 | 765 | 512 | 1,384 | 1,305 | 1,075 | 963 | 855 | 731 | 597 | 468 | 344 | 224 | 145 |
| Mason | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Matagorda | 0 | 46 | 61 | 77 | 77 | 67 | 57 | 47 | 37 | 28 | 18 | 0 | 35 | 39 | 48 | 47 | 40 | 33 | 27 | 21 | 15 | 9 |
| Maverick | 192 | 1,574 | 1,857 | 2,241 | 2,626 | 3,010 | 2,843 | 2,538 | 2,234 | 1,928 | 1,623 | 154 | 1,119 | 1,074 | 1,226 | 1,368 | 1,501 | 1,376 | 1,195 | 1,022 | 856 | 698 |
| Medina | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Menard | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Midland | 1,573 | 2,640 | 3,265 | 3,034 | 2,803 | 2,465 | 2,045 | 1,625 | 1,205 | 785 | 488 | 1,070 | 1,408 | 1,143 | 1,034 | 928 | 791 | 643 | 499 | 361 | 227 | 136 |
| Milam | 34 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mills | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mitchell | 18 | 238 | 317 | 397 | 476 | 428 | 381 | 333 | 286 | 238 | 190 | 12 | 127 | 111 | 136 | 161 | 142 | 124 | 106 | 89 | 73 | 57 |
| Montague | 3,221 | 3,496 | 2,997 | 2,497 | 1,998 | 1,498 | 999 | 499 | 0 | 0 | 0 | 2,963 | 2,952 | 2,248 | 1,810 | 1,398 | 1,011 | 649 | 312 | 0 | 0 | 0 |
| Montgomery | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Moore | 76 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 38 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Morris | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Motley | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Nacogdoches | 1,128 | 1,424 | 2,066 | 1,937 | 1,809 | 1,659 | 1,503 | 1,347 | 1,191 | 1,036 | 880 | 1,072 | 1,327 | 1,873 | 1,731 | 1,593 | 1,438 | 1,283 | 1,132 | 985 | 842 | 704 |
| Navarro | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Newton | 98 | 125 | 161 | 143 | 125 | 108 | 89 | 71 | 54 | 36 | 18 | 93 | 94 | 102 | 89 | 76 | 64 | 52 | 41 | 30 | 20 | 9 |
| Nolan | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Nueces | 16 | 34 | 45 | 56 | 56 | 49 | 42 | 35 | 28 | 20 | 13 | 13 | 25 | 29 | 35 | 34 | 29 | 25 | 20 | 15 | 11 | 7 |
| Ochiltree | 273 | 408 | 748 | 985 | 815 | 646 | 476 | 306 | 136 | 0 | 0 | 136 | 186 | 299 | 382 | 306 | 234 | 166 | 103 | 44 | 0 | 0 |
| Oldham | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Orange | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Palo Pinto | 41 | 194 | 356 | 518 | 680 | 612 | 544 | 476 | 408 | 340 | 272 | 38 | 164 | 267 | 376 | 476 | 413 | 354 | 298 | 245 | 196 | 150 |
| Panola | 966 | 1,412 | 1,988 | 1,801 | 1,655 | 1,511 | 1,366 | 1,221 | 1,077 | 932 | 787 | 917 | 1,323 | 1,816 | 1,618 | 1,464 | 1,314 | 1,169 | 1,028 | 891 | 758 | 630 |
| Parker | 1,086 | 925 | 1,255 | 1,585 | 1,916 | 1,724 | 1,533 | 1,341 | 1,149 | 958 | 766 | 1,000 | 781 | 941 | 1,149 | 1,341 | 1,164 | 996 | 838 | 690 | 551 | 421 |
| Parmer | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pecos | 110 | 130 | 173 | 387 | 601 | 746 | 674 | 601 | 528 | 456 | 383 | 22 | 69 | 60 | 108 | 156 | 180 | 161 | 142 | 123 | 105 | 87 |
| Polk | 133 | 180 | 232 | 206 | 180 | 155 | 129 | 103 | 77 | 52 | 26 | 126 | 136 | 147 | 128 | 110 | 92 | 75 | 59 | 43 | 28 | 14 |
| Potter | 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Presidio | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rains | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Randall | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reagan | 1,240 | 3,207 | 4,019 | 3,627 | 3,236 | 2,844 | 2,332 | 1,820 | 1,308 | 796 | 444 | 843 | 1,710 | 1,407 | 1,247 | 1,092 | 942 | 758 | 580 | 409 | 244 | 133 |
| Real | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Red River | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reeves | 522 | 866 | 1,155 | 1,744 | 2,333 | 2,509 | 2,304 | 2,098 | 1,893 | 1,687 | 1,481 | 104 | 462 | 404 | 556 | 705 | 713 | 646 | 581 | 518 | 456 | 395 |
| Refugio | 0 | 32 | 42 | 53 | 53 | 46 | 39 | 33 | 26 | 19 | 12 | 0 | 24 | 27 | 33 | 32 | 27 | 23 | 19 | 14 | 10 | 7 |
| Roberts | 393 | 1,628 | 1,419 | 1,210 | 1,002 | 793 | 584 | 376 | 167 | 0 | 0 | 197 | 742 | 568 | 469 | 376 | 287 | 205 | 127 | 54 | 0 | 0 |
| Robertson | 306 | 587 | 741 | 773 | 806 | 734 | 639 | 544 | 449 | 354 | 259 | 245 | 501 | 587 | 619 | 648 | 584 | 500 | 419 | 342 | 268 | 196 |
| Rockwall | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Runnels | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rusk | 158 | 477 | 930 | 1,384 | 1,838 | 1,707 | 1,542 | 1,378 | 1,213 | 1,048 | 884 | 150 | 446 | 850 | 1,245 | 1,627 | 1,487 | 1,322 | 1,161 | 1,005 | 853 | 707 |
| Sabine | 147 | 235 | 470 | 705 | 940 | 861 | 783 | 705 | 627 | 548 | 470 | 139 | 218 | 423 | 625 | 823 | 743 | 666 | 590 | 517 | 445 | 376 |
| San Augustine | 1,622 | 2,092 | 1,953 | 1,814 | 1,674 | 1,534 | 1,395 | 1,256 | 1,116 | 977 | 837 | 1,541 | 1,941 | 1,758 | 1,610 | 1,465 | 1,323 | 1,186 | 1,052 | 921 | 793 | 670 |
| San Jacinto | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| San Patricio | 0 | 28 | 37 | 46 | 46 | 40 | 34 | 28 | 22 | 17 | 11 | 0 | 21 | 23 | 28 | 28 | 24 | 20 | 16 | 13 | 9 | 6 |

| County | Water Use (AF) | | | | | | | | | | Water Consumption (AF) | | | | | | | | | | | |
|------------------|----------------|------------|------------|------------|------------|------------|------------|-----------|-----------|-----------|------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 |
| San Saba | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Schleicher | 90 | 312 | 468 | 568 | 584 | 507 | 430 | 354 | 277 | 200 | 140 | 61 | 166 | 164 | 195 | 197 | 168 | 140 | 113 | 87 | 61 | 42 |
| Scurry | 10 | 0 | 249 | 341 | 432 | 524 | 466 | 408 | 349 | 291 | 233 | 7 | 0 | 87 | 117 | 146 | 174 | 151 | 130 | 109 | 89 | 70 |
| Shackelford | 2 | 0 | 156 | 311 | 467 | 421 | 374 | 327 | 280 | 234 | 187 | 2 | 0 | 117 | 226 | 327 | 284 | 243 | 204 | 168 | 134 | 103 |
| Shelby | 1,419 | 1,658 | 3,073 | 2,929 | 2,785 | 2,621 | 2,377 | 2,133 | 1,889 | 1,645 | 1,400 | 1,348 | 1,539 | 2,771 | 2,607 | 2,446 | 2,270 | 2,027 | 1,790 | 1,561 | 1,337 | 1,120 |
| Sherman | 2 | 0 | 0 | 92 | 184 | 158 | 132 | 105 | 79 | 53 | 26 | 1 | 0 | 0 | 36 | 69 | 57 | 46 | 36 | 26 | 16 | 8 |
| Smith | 5 | 18 | 49 | 80 | 111 | 133 | 118 | 103 | 88 | 74 | 59 | 5 | 17 | 47 | 75 | 101 | 118 | 103 | 88 | 74 | 60 | 47 |
| Somervell | 287 | 184 | 260 | 336 | 413 | 372 | 330 | 289 | 248 | 207 | 165 | 264 | 155 | 195 | 244 | 289 | 251 | 215 | 181 | 149 | 119 | 91 |
| Starr | 36 | 48 | 64 | 79 | 79 | 69 | 59 | 49 | 39 | 29 | 18 | 29 | 36 | 40 | 49 | 48 | 41 | 35 | 28 | 22 | 16 | 10 |
| Stephens | 0 | 52 | 184 | 315 | 447 | 402 | 357 | 312 | 268 | 223 | 179 | 0 | 44 | 138 | 229 | 313 | 271 | 232 | 195 | 161 | 128 | 98 |
| Sterling | 57 | 265 | 707 | 881 | 893 | 905 | 765 | 625 | 484 | 344 | 236 | 39 | 141 | 248 | 303 | 302 | 300 | 249 | 199 | 151 | 105 | 71 |
| Stonewall | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sutton | 34 | 0 | 390 | 534 | 677 | 821 | 730 | 639 | 547 | 456 | 365 | 23 | 0 | 137 | 183 | 229 | 272 | 237 | 204 | 171 | 140 | 109 |
| Swisher | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tarrant | 8,805 | 6,836 | 5,469 | 4,101 | 2,734 | 1,367 | 0 | 0 | 0 | 0 | 0 | 8,101 | 5,773 | 4,102 | 2,974 | 1,914 | 923 | 0 | 0 | 0 | 0 | 0 |
| Taylor | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Terrell | 10 | 0 | 162 | 221 | 281 | 341 | 303 | 265 | 227 | 189 | 151 | 7 | 0 | 57 | 76 | 95 | 113 | 98 | 84 | 71 | 58 | 45 |
| Terry | 3 | 0 | 243 | 332 | 422 | 511 | 454 | 397 | 341 | 284 | 227 | 2 | 0 | 85 | 114 | 142 | 169 | 148 | 127 | 106 | 87 | 68 |
| Throckmorton | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Titus | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tom Green | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Travis | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trinity | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tyler | 76 | 110 | 147 | 184 | 185 | 161 | 137 | 114 | 90 | 66 | 42 | 72 | 83 | 93 | 114 | 113 | 96 | 80 | 65 | 50 | 36 | 23 |
| Upshur | 4 | 57 | 247 | 437 | 627 | 764 | 690 | 617 | 543 | 469 | 396 | 4 | 54 | 226 | 393 | 555 | 665 | 591 | 519 | 449 | 382 | 316 |
| Upton | 1,761 | 2,955 | 3,728 | 3,442 | 3,156 | 2,870 | 2,398 | 1,927 | 1,455 | 983 | 664 | 1,198 | 1,576 | 1,305 | 1,171 | 1,041 | 916 | 749 | 588 | 433 | 283 | 185 |
| Uvalde | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Val Verde | 0 | 0 | 80 | 110 | 139 | 168 | 150 | 131 | 112 | 94 | 75 | 0 | 0 | 28 | 38 | 47 | 56 | 49 | 42 | 35 | 29 | 22 |
| Van Zandt | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Victoria | 0 | 35 | 46 | 58 | 58 | 51 | 43 | 36 | 28 | 21 | 14 | 0 | 26 | 29 | 36 | 35 | 30 | 25 | 20 | 16 | 11 | 7 |
| Walker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Waller | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ward | 568 | 568 | 683 | 888 | 871 | 855 | 764 | 672 | 581 | 489 | 398 | 114 | 568 | 239 | 297 | 278 | 260 | 228 | 197 | 167 | 138 | 110 |
| Washington | 36 | 0 | 497 | 878 | 798 | 718 | 638 | 559 | 479 | 399 | 319 | 29 | 0 | 298 | 516 | 459 | 404 | 351 | 300 | 251 | 204 | 160 |
| Webb | 4,596 | 3,661 | 3,476 | 3,052 | 2,626 | 2,244 | 1,872 | 1,501 | 1,128 | 699 | 255 | 3,677 | 2,627 | 2,109 | 1,814 | 1,529 | 1,274 | 1,033 | 803 | 580 | 344 | 113 |
| Wharton | 0 | 43 | 57 | 71 | 72 | 62 | 53 | 44 | 35 | 26 | 17 | 0 | 32 | 36 | 44 | 43 | 37 | 31 | 25 | 20 | 14 | 9 |
| Wheeler | 3,792 | 3,524 | 3,072 | 2,620 | 2,168 | 1,717 | 1,265 | 813 | 362 | 0 | 0 | 1,896 | 1,605 | 1,229 | 1,015 | 813 | 622 | 443 | 274 | 117 | 0 | 0 |
| Wichita | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wilbarger | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Willacy | 0 | 23 | 31 | 39 | 39 | 34 | 29 | 24 | 19 | 14 | 9 | 0 | 18 | 20 | 24 | 24 | 20 | 17 | 14 | 11 | 8 | 5 |
| Williamson | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wilson | 417 | 1,612 | 1,865 | 1,679 | 1,492 | 1,306 | 1,119 | 932 | 746 | 560 | 373 | 334 | 1,146 | 1,119 | 986 | 858 | 734 | 615 | 501 | 392 | 287 | 187 |
| Winkler | 62 | 464 | 618 | 821 | 1,024 | 979 | 873 | 767 | 661 | 556 | 450 | 12 | 247 | 216 | 275 | 332 | 305 | 267 | 231 | 195 | 160 | 127 |
| Wise | 2,314 | 2,757 | 2,450 | 2,144 | 1,838 | 1,531 | 1,225 | 919 | 613 | 306 | 0 | 2,129 | 2,328 | 1,838 | 1,555 | 1,287 | 1,034 | 796 | 574 | 368 | 176 | 0 |
| Wood | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yoakum | 18 | 238 | 330 | 423 | 384 | 346 | 308 | 269 | 230 | 192 | 154 | 13 | 127 | 116 | 145 | 130 | 115 | 100 | 86 | 72 | 59 | 46 |
| Young | 8 | 0 | 78 | 157 | 235 | 211 | 188 | 164 | 141 | 118 | 94 | 7 | 0 | 59 | 113 | 164 | 143 | 122 | 103 | 85 | 68 | 52 |
| Zapata | 32 | 41 | 55 | 68 | 68 | 60 | 51 | 42 | 33 | 25 | 16 | 26 | 31 | 35 | 42 | 42 | 35 | 30 | 24 | 19 | 13 | 8 |
| Zavala | 407 | 2,065 | 2,427 | 2,280 | 2,167 | 2,035 | 1,904 | 1,773 | 1,502 | 1,197 | 891 | 326 | 1,477 | 1,465 | 1,351 | 1,247 | 1,132 | 1,020 | 912 | 747 | 575 | 410 |
| SUM (kAF) | 81.5 | 110 | 132 | 135 | 134 | 122 | 104 | 87 | 70 | 53 | 39 | 64.8 | 78.2 | 76.9 | 76.0 | 72.8 | 64.2 | 53.2 | 43.4 | 34.4 | 26.3 | 19.1 |

Table 16. County-level estimate of 2012-2060 projections for oil and gas water use and water consumption (AF).

| County | Water Use (AF) | | | | | | | | | | | Water Consumption (AF) | | | | | | | | | | |
|---------------|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|
| | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 |
| Anderson | 39 | 129 | 140 | 157 | 177 | 181 | 185 | 169 | 147 | 126 | 105 | 67 | 87 | 88 | 98 | 109 | 115 | 121 | 109 | 93 | 78 | 63 |
| Andrews | 3,212 | 3,481 | 3,959 | 3,833 | 3,710 | 3,511 | 3,177 | 2,842 | 2,509 | 2,192 | 1,929 | 1,868 | 1,231 | 1,029 | 921 | 819 | 742 | 640 | 544 | 453 | 372 | 311 |
| Angelina | 0 | 116 | 220 | 316 | 412 | 427 | 389 | 351 | 312 | 274 | 237 | 32 | 112 | 203 | 286 | 366 | 374 | 336 | 299 | 263 | 228 | 195 |
| Aransas | 0 | 12 | 10 | 8 | 7 | 5 | 5 | 5 | 5 | 5 | 5 | 10 | 11 | 10 | 8 | 6 | 5 | 5 | 5 | 5 | 5 | 5 |
| Archer | 30 | 351 | 405 | 444 | 483 | 389 | 344 | 311 | 279 | 246 | 213 | 239 | 326 | 337 | 343 | 344 | 252 | 222 | 194 | 167 | 142 | 119 |
| Armstrong | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Atascosa | 1,012 | 2,993 | 2,770 | 2,713 | 2,706 | 2,700 | 2,693 | 2,393 | 2,021 | 1,649 | 1,279 | 867 | 2,155 | 1,711 | 1,618 | 1,551 | 1,484 | 1,415 | 1,219 | 1,000 | 790 | 590 |
| Austin | 0 | 28 | 127 | 224 | 320 | 288 | 257 | 226 | 194 | 163 | 132 | 20 | 29 | 88 | 143 | 195 | 173 | 151 | 130 | 110 | 91 | 73 |
| Bailey | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bandera | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bastrop | 0 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Baylor | 1 | 14 | 14 | 14 | 14 | 14 | 13 | 13 | 13 | 13 | 13 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 13 | 13 |
| Bee | 66 | 111 | 127 | 129 | 112 | 95 | 80 | 67 | 53 | 40 | 26 | 92 | 90 | 89 | 87 | 74 | 62 | 52 | 44 | 36 | 28 | 20 |
| Bell | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bexar | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Blanco | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Borden | 27 | 272 | 679 | 926 | 927 | 929 | 784 | 639 | 494 | 352 | 244 | 72 | 165 | 263 | 339 | 331 | 323 | 267 | 214 | 164 | 117 | 82 |
| Bosque | 0 | 470 | 557 | 627 | 696 | 579 | 516 | 466 | 416 | 365 | 315 | 238 | 439 | 462 | 485 | 502 | 387 | 340 | 296 | 255 | 216 | 180 |
| Bowie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brazoria | 0 | 91 | 102 | 113 | 125 | 114 | 100 | 88 | 76 | 64 | 52 | 42 | 80 | 78 | 82 | 86 | 76 | 67 | 59 | 52 | 45 | 38 |
| Brazos | 238 | 364 | 741 | 975 | 1,207 | 1,072 | 938 | 804 | 670 | 536 | 402 | 266 | 286 | 477 | 602 | 721 | 628 | 538 | 451 | 368 | 287 | 211 |
| Brewster | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Briscoe | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brooks | 27 | 70 | 77 | 84 | 80 | 69 | 60 | 52 | 44 | 36 | 28 | 50 | 60 | 58 | 60 | 55 | 47 | 41 | 36 | 31 | 26 | 22 |
| Brown | 23 | 35 | 34 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 17 | 16 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| Burleson | 247 | 380 | 995 | 1,459 | 1,923 | 1,717 | 1,512 | 1,306 | 1,100 | 892 | 686 | 279 | 299 | 632 | 890 | 1,135 | 993 | 855 | 723 | 595 | 471 | 354 |
| Burnet | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Caldwell | 75 | 98 | 123 | 111 | 98 | 85 | 72 | 59 | 46 | 33 | 20 | 82 | 75 | 81 | 71 | 62 | 54 | 45 | 37 | 29 | 22 | 14 |
| Calhoun | 18 | 48 | 52 | 57 | 55 | 47 | 41 | 35 | 30 | 25 | 19 | 34 | 41 | 39 | 41 | 38 | 32 | 28 | 24 | 21 | 18 | 15 |
| Callahan | 84 | 93 | 88 | 88 | 87 | 83 | 79 | 74 | 70 | 66 | 62 | 29 | 24 | 18 | 17 | 16 | 15 | 15 | 15 | 15 | 15 | 15 |
| Cameron | 27 | 58 | 65 | 72 | 68 | 57 | 47 | 39 | 31 | 23 | 15 | 38 | 47 | 45 | 48 | 43 | 34 | 28 | 23 | 18 | 13 | 9 |
| Camp | 13 | 12 | 12 | 11 | 11 | 11 | 10 | 9 | 9 | 8 | 8 | 2 | 2 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carson | 2 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
| Cass | 1 | 30 | 39 | 48 | 58 | 68 | 60 | 52 | 45 | 37 | 30 | 26 | 28 | 36 | 44 | 52 | 60 | 52 | 45 | 38 | 31 | 24 |
| Castro | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chambers | 0 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 8 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Cherokee | 10 | 129 | 172 | 216 | 263 | 299 | 267 | 236 | 204 | 173 | 141 | 80 | 123 | 163 | 201 | 239 | 269 | 236 | 204 | 173 | 144 | 116 |
| Childress | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Clay | 63 | 508 | 613 | 699 | 786 | 655 | 584 | 527 | 471 | 414 | 357 | 318 | 472 | 506 | 538 | 563 | 435 | 382 | 333 | 286 | 243 | 202 |
| Cochran | 56 | 128 | 154 | 181 | 208 | 234 | 210 | 187 | 163 | 139 | 115 | 46 | 64 | 54 | 63 | 71 | 79 | 70 | 62 | 54 | 46 | 38 |
| Coke | 520 | 511 | 484 | 480 | 477 | 451 | 425 | 397 | 370 | 346 | 322 | 114 | 84 | 46 | 40 | 33 | 32 | 31 | 29 | 28 | 27 | 26 |
| Coleman | 100 | 113 | 108 | 107 | 107 | 102 | 97 | 91 | 86 | 82 | 77 | 37 | 31 | 24 | 23 | 22 | 21 | 21 | 21 | 21 | 21 | 20 |
| Collin | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Collingsworth | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Colorado | 28 | 129 | 608 | 1,078 | 1,534 | 1,376 | 1,221 | 1,067 | 913 | 759 | 605 | 86 | 120 | 402 | 667 | 913 | 802 | 697 | 596 | 499 | 406 | 317 |
| Comal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Comanche | 2 | 388 | 444 | 485 | 525 | 419 | 363 | 319 | 276 | 232 | 188 | 224 | 366 | 374 | 379 | 380 | 278 | 240 | 204 | 170 | 138 | 109 |
| Concho | 515 | 507 | 480 | 477 | 474 | 448 | 422 | 394 | 367 | 343 | 320 | 114 | 84 | 46 | 40 | 34 | 33 | 31 | 30 | 29 | 28 | 27 |
| Cooke | 1,493 | 1,708 | 1,343 | 978 | 612 | 246 | 28 | 27 | 26 | 25 | 24 | 1,391 | 1,434 | 1,001 | 702 | 421 | 158 | 13 | 13 | 13 | 13 | 13 |
| Coryell | 0 | 569 | 1,238 | 1,102 | 767 | 434 | 158 | 0 | 0 | 0 | 0 | 236 | 522 | 972 | 827 | 548 | 284 | 103 | 0 | 0 | 0 | 0 |

| County | Water Use (AF) | | | | | | | | | | | Water Consumption (AF) | | | | | | | | | | |
|------------|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|
| | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 |
| Cottle | 32 | 43 | 41 | 41 | 41 | 39 | 38 | 36 | 34 | 33 | 31 | 18 | 16 | 14 | 14 | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
| Crane | 280 | 508 | 617 | 728 | 840 | 947 | 861 | 776 | 692 | 610 | 531 | 227 | 246 | 225 | 249 | 273 | 299 | 265 | 232 | 201 | 174 | 149 |
| Crockett | 507 | 1,097 | 1,732 | 2,035 | 1,843 | 1,552 | 1,261 | 971 | 682 | 394 | 207 | 553 | 606 | 641 | 730 | 650 | 539 | 434 | 332 | 235 | 143 | 85 |
| Crosby | 1,083 | 1,050 | 994 | 987 | 980 | 926 | 871 | 814 | 757 | 706 | 656 | 224 | 161 | 82 | 69 | 55 | 53 | 50 | 47 | 45 | 43 | 40 |
| Culberson | 279 | 293 | 506 | 873 | 1,240 | 1,535 | 1,393 | 1,250 | 1,110 | 972 | 843 | 151 | 97 | 249 | 308 | 371 | 415 | 368 | 323 | 279 | 240 | 208 |
| Dallam | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dallas | 79 | 726 | 1,076 | 888 | 700 | 512 | 339 | 170 | 0 | 0 | 0 | 134 | 624 | 818 | 651 | 493 | 343 | 220 | 106 | 0 | 0 | 0 |
| Dawson | 268 | 695 | 954 | 1,137 | 1,164 | 1,184 | 1,023 | 862 | 703 | 546 | 423 | 165 | 323 | 328 | 371 | 360 | 353 | 296 | 241 | 189 | 140 | 104 |
| Deaf Smith | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Delta | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Denton | 3,249 | 3,297 | 2,220 | 1,136 | 51 | 19 | 13 | 13 | 13 | 13 | 13 | 3,108 | 2,805 | 1,688 | 840 | 44 | 13 | 13 | 13 | 13 | 13 | 13 |
| DeWitt | 2,177 | 2,061 | 1,858 | 1,646 | 1,421 | 1,188 | 958 | 729 | 500 | 271 | 42 | 1,801 | 1,493 | 1,149 | 999 | 846 | 694 | 550 | 413 | 281 | 155 | 35 |
| Dickens | 0 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 13 |
| Dimmit | 3,708 | 4,874 | 4,919 | 5,001 | 5,001 | 4,952 | 4,337 | 3,580 | 2,824 | 2,068 | 1,315 | 3,068 | 3,506 | 2,980 | 2,913 | 2,795 | 2,648 | 2,246 | 1,797 | 1,368 | 958 | 569 |
| Donley | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Duval | 52 | 133 | 147 | 160 | 153 | 131 | 114 | 99 | 84 | 69 | 54 | 96 | 114 | 110 | 114 | 105 | 89 | 77 | 68 | 58 | 50 | 41 |
| Eastland | 333 | 578 | 937 | 1,091 | 934 | 764 | 644 | 535 | 425 | 318 | 211 | 286 | 303 | 539 | 619 | 472 | 335 | 263 | 196 | 133 | 75 | 21 |
| Ector | 845 | 1,144 | 1,537 | 1,612 | 1,690 | 1,628 | 1,435 | 1,245 | 1,056 | 870 | 725 | 850 | 612 | 588 | 577 | 570 | 520 | 447 | 377 | 310 | 251 | 206 |
| Edwards | 0 | 28 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 28 | 28 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 |
| Ellis | 38 | 112 | 147 | 180 | 213 | 186 | 164 | 144 | 123 | 103 | 82 | 56 | 99 | 114 | 133 | 150 | 125 | 107 | 90 | 74 | 59 | 45 |
| El Paso | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Erath | 12 | 470 | 505 | 521 | 536 | 426 | 376 | 340 | 304 | 268 | 232 | 274 | 443 | 427 | 411 | 391 | 283 | 250 | 218 | 188 | 161 | 134 |
| Falls | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fannin | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fayette | 132 | 1,149 | 2,403 | 2,164 | 1,887 | 1,585 | 1,282 | 979 | 677 | 375 | 72 | 166 | 844 | 1,476 | 1,306 | 1,118 | 922 | 733 | 551 | 377 | 210 | 51 |
| Fisher | 432 | 426 | 403 | 401 | 398 | 376 | 355 | 332 | 309 | 289 | 269 | 97 | 71 | 40 | 35 | 30 | 28 | 27 | 26 | 25 | 24 | 24 |
| Floyd | 148 | 156 | 148 | 147 | 146 | 139 | 131 | 123 | 116 | 109 | 102 | 42 | 34 | 23 | 21 | 19 | 19 | 19 | 18 | 18 | 18 | 17 |
| Foard | 3 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 11 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Fort Bend | 25 | 66 | 72 | 79 | 75 | 65 | 56 | 49 | 41 | 34 | 27 | 47 | 56 | 54 | 56 | 52 | 44 | 38 | 33 | 29 | 24 | 20 |
| Franklin | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 3 | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Freestone | 429 | 929 | 1,117 | 1,331 | 1,494 | 1,458 | 1,291 | 1,121 | 954 | 785 | 618 | 600 | 844 | 975 | 1,133 | 1,254 | 1,213 | 1,056 | 903 | 757 | 615 | 479 |
| Frio | 729 | 1,167 | 1,217 | 1,243 | 1,250 | 1,215 | 1,178 | 1,142 | 986 | 804 | 620 | 666 | 858 | 772 | 774 | 752 | 702 | 652 | 603 | 504 | 398 | 296 |
| Gaines | 124 | 914 | 1,429 | 1,846 | 2,000 | 1,945 | 1,671 | 1,398 | 1,127 | 859 | 651 | 190 | 517 | 590 | 686 | 694 | 635 | 533 | 436 | 344 | 259 | 197 |
| Galveston | 0 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Garza | 53 | 321 | 395 | 469 | 544 | 491 | 438 | 386 | 334 | 284 | 234 | 44 | 166 | 144 | 164 | 184 | 162 | 142 | 122 | 104 | 87 | 71 |
| Gillespie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Glasscock | 1,838 | 2,402 | 3,057 | 2,887 | 2,718 | 2,355 | 1,994 | 1,634 | 1,275 | 921 | 681 | 1,590 | 1,165 | 1,010 | 923 | 839 | 704 | 575 | 452 | 334 | 224 | 153 |
| Goliad | 25 | 64 | 70 | 77 | 73 | 63 | 54 | 47 | 40 | 33 | 26 | 46 | 55 | 53 | 55 | 50 | 42 | 37 | 32 | 28 | 24 | 20 |
| Gonzales | 2,164 | 1,791 | 1,600 | 1,405 | 1,207 | 1,010 | 813 | 616 | 418 | 221 | 24 | 1,764 | 1,288 | 980 | 844 | 712 | 585 | 463 | 346 | 233 | 126 | 23 |
| Gray | 68 | 78 | 75 | 74 | 74 | 70 | 67 | 63 | 60 | 57 | 53 | 26 | 22 | 17 | 16 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Grayson | 6 | 19 | 18 | 18 | 18 | 18 | 18 | 18 | 17 | 17 | 17 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| Gregg | 25 | 191 | 274 | 353 | 433 | 476 | 429 | 383 | 337 | 292 | 246 | 71 | 182 | 256 | 322 | 387 | 418 | 371 | 326 | 282 | 240 | 199 |
| Grimes | 95 | 159 | 323 | 483 | 602 | 537 | 471 | 405 | 340 | 275 | 209 | 120 | 129 | 214 | 305 | 367 | 321 | 276 | 233 | 192 | 153 | 115 |
| Guadalupe | 0 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Hale | 1,289 | 1,235 | 1,168 | 1,160 | 1,152 | 1,087 | 1,022 | 954 | 886 | 826 | 766 | 252 | 177 | 82 | 67 | 51 | 48 | 45 | 42 | 39 | 36 | 33 |
| Hall | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hamilton | 0 | 361 | 393 | 314 | 236 | 157 | 101 | 51 | 0 | 0 | 0 | 93 | 321 | 312 | 239 | 169 | 103 | 66 | 32 | 0 | 0 | 0 |
| Hansford | 13 | 88 | 577 | 1,068 | 904 | 749 | 602 | 456 | 309 | 162 | 16 | 68 | 79 | 261 | 432 | 348 | 278 | 218 | 161 | 108 | 59 | 13 |
| Hardeman | 0 | 9 | 9 | 9 | 9 | 10 | 10 | 10 | 10 | 10 | 10 | 9 | 9 | 9 | 9 | 9 | 10 | 10 | 10 | 10 | 10 | 10 |
| Hardin | 0 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Harris | 0 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 |
| Harrison | 868 | 1,763 | 2,388 | 2,145 | 1,956 | 1,778 | 1,608 | 1,438 | 1,268 | 1,098 | 930 | 1,021 | 1,658 | 2,189 | 1,935 | 1,735 | 1,557 | 1,386 | 1,219 | 1,059 | 903 | 753 |

| County | Water Use (AF) | | | | | | | | | | | Water Consumption (AF) | | | | | | | | | | |
|------------|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|
| | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 |
| Hartley | 7 | 7 | 7 | 7 | 7 | 6 | 6 | 6 | 5 | 5 | 4 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Haskell | 90 | 98 | 93 | 93 | 92 | 88 | 83 | 79 | 74 | 70 | 66 | 30 | 25 | 18 | 17 | 16 | 16 | 15 | 15 | 15 | 15 | 15 |
| Hays | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hemphill | 1,441 | 2,567 | 2,314 | 2,037 | 1,763 | 1,499 | 1,244 | 988 | 732 | 476 | 223 | 1,498 | 1,209 | 971 | 821 | 683 | 562 | 452 | 349 | 252 | 163 | 80 |
| Henderson | 3 | 120 | 176 | 235 | 296 | 346 | 308 | 272 | 235 | 198 | 161 | 91 | 113 | 166 | 218 | 269 | 310 | 272 | 235 | 199 | 164 | 131 |
| Hidalgo | 46 | 119 | 130 | 143 | 136 | 117 | 101 | 88 | 74 | 61 | 48 | 85 | 101 | 98 | 102 | 94 | 79 | 69 | 60 | 52 | 44 | 37 |
| Hill | 131 | 1,572 | 1,343 | 1,106 | 869 | 632 | 422 | 218 | 13 | 14 | 14 | 244 | 1,349 | 1,031 | 819 | 617 | 427 | 279 | 141 | 13 | 14 | 14 |
| Hockley | 6 | 18 | 18 | 18 | 18 | 17 | 17 | 17 | 17 | 16 | 16 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
| Hood | 645 | 529 | 678 | 820 | 961 | 841 | 743 | 651 | 559 | 467 | 375 | 695 | 465 | 528 | 608 | 679 | 566 | 485 | 409 | 338 | 271 | 209 |
| Hopkins | 42 | 41 | 38 | 38 | 38 | 36 | 34 | 31 | 29 | 27 | 25 | 8 | 6 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| Houston | 178 | 254 | 322 | 287 | 254 | 220 | 187 | 152 | 119 | 85 | 51 | 195 | 196 | 210 | 185 | 161 | 138 | 116 | 94 | 74 | 54 | 35 |
| Howard | 619 | 1,611 | 2,491 | 2,939 | 2,747 | 2,343 | 1,940 | 1,538 | 1,138 | 742 | 476 | 643 | 870 | 898 | 1,028 | 938 | 782 | 633 | 490 | 354 | 226 | 142 |
| Hudspeth | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hunt | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hutchinson | 21 | 51 | 156 | 237 | 204 | 173 | 144 | 115 | 86 | 58 | 30 | 32 | 34 | 85 | 110 | 90 | 75 | 62 | 50 | 39 | 28 | 20 |
| Irion | 1,677 | 2,286 | 3,192 | 3,643 | 3,357 | 2,890 | 2,423 | 1,955 | 1,487 | 1,026 | 713 | 1,070 | 937 | 937 | 1,065 | 940 | 778 | 621 | 471 | 327 | 190 | 102 |
| Jack | 17 | 501 | 575 | 635 | 693 | 572 | 499 | 438 | 378 | 317 | 256 | 232 | 459 | 470 | 487 | 497 | 381 | 328 | 278 | 231 | 187 | 146 |
| Jackson | 25 | 64 | 70 | 77 | 73 | 63 | 55 | 47 | 40 | 33 | 26 | 46 | 55 | 53 | 55 | 51 | 43 | 37 | 32 | 28 | 24 | 20 |
| Jasper | 87 | 118 | 148 | 133 | 118 | 103 | 88 | 73 | 58 | 43 | 28 | 100 | 92 | 98 | 88 | 77 | 67 | 57 | 47 | 38 | 30 | 21 |
| Jeff Davis | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Jefferson | 0 | 13 | 13 | 13 | 13 | 14 | 14 | 14 | 14 | 14 | 14 | 13 | 13 | 13 | 13 | 13 | 14 | 14 | 14 | 14 | 14 | 14 |
| Jim Hogg | 33 | 85 | 93 | 102 | 97 | 83 | 72 | 63 | 53 | 44 | 34 | 61 | 73 | 70 | 73 | 67 | 56 | 49 | 43 | 37 | 31 | 26 |
| Jim Wells | 25 | 65 | 71 | 78 | 74 | 64 | 55 | 48 | 40 | 33 | 26 | 46 | 55 | 53 | 55 | 51 | 43 | 37 | 33 | 28 | 24 | 20 |
| Johnson | 4,192 | 4,240 | 3,530 | 2,809 | 2,086 | 1,365 | 683 | 10 | 10 | 10 | 10 | 4,029 | 3,611 | 2,680 | 2,059 | 1,471 | 918 | 447 | 10 | 10 | 10 | 10 |
| Jones | 117 | 125 | 119 | 118 | 117 | 111 | 106 | 99 | 93 | 88 | 82 | 35 | 29 | 20 | 19 | 17 | 17 | 16 | 16 | 16 | 16 | 16 |
| Karnes | 3,882 | 2,820 | 2,528 | 2,229 | 1,919 | 1,603 | 1,288 | 975 | 662 | 349 | 35 | 3,155 | 2,028 | 1,545 | 1,336 | 1,127 | 923 | 728 | 542 | 363 | 192 | 29 |
| Kaufman | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Kendall | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Kenedy | 42 | 108 | 118 | 130 | 123 | 106 | 92 | 80 | 68 | 55 | 43 | 78 | 92 | 89 | 92 | 85 | 72 | 62 | 55 | 47 | 40 | 33 |
| Kent | 29 | 39 | 38 | 38 | 38 | 36 | 35 | 33 | 32 | 31 | 29 | 18 | 16 | 14 | 14 | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
| Kerr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Kimble | 0 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 |
| King | 8,635 | 8,287 | 7,836 | 7,783 | 7,730 | 7,293 | 6,857 | 6,402 | 5,946 | 5,545 | 5,144 | 1,704 | 1,198 | 565 | 461 | 357 | 334 | 311 | 291 | 271 | 253 | 236 |
| Kinney | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Kleberg | 27 | 70 | 77 | 84 | 80 | 69 | 60 | 52 | 44 | 36 | 28 | 51 | 60 | 58 | 60 | 55 | 47 | 41 | 36 | 31 | 26 | 22 |
| Knox | 3 | 15 | 15 | 15 | 15 | 14 | 14 | 14 | 14 | 14 | 14 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Lamar | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lamb | 647 | 620 | 586 | 582 | 579 | 546 | 513 | 479 | 445 | 415 | 385 | 127 | 89 | 41 | 34 | 26 | 24 | 22 | 21 | 19 | 18 | 17 |
| Lampasas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| La Salle | 2,889 | 4,569 | 4,617 | 4,705 | 4,772 | 4,830 | 4,263 | 3,541 | 2,819 | 2,098 | 1,380 | 2,408 | 3,293 | 2,801 | 2,731 | 2,647 | 2,556 | 2,183 | 1,757 | 1,349 | 959 | 590 |
| Lavaca | 145 | 1,003 | 1,613 | 1,470 | 1,313 | 1,148 | 985 | 824 | 662 | 501 | 340 | 179 | 742 | 1,005 | 898 | 786 | 673 | 567 | 465 | 368 | 274 | 184 |
| Lee | 132 | 230 | 421 | 536 | 650 | 577 | 506 | 435 | 363 | 290 | 218 | 151 | 179 | 272 | 333 | 390 | 340 | 292 | 246 | 201 | 158 | 117 |
| Leon | 327 | 847 | 1,482 | 1,983 | 2,481 | 2,349 | 2,077 | 1,802 | 1,530 | 1,256 | 985 | 361 | 629 | 977 | 1,301 | 1,611 | 1,527 | 1,325 | 1,129 | 941 | 758 | 584 |
| Liberty | 0 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 |
| Limestone | 271 | 383 | 402 | 424 | 431 | 391 | 347 | 302 | 257 | 212 | 167 | 356 | 350 | 355 | 363 | 361 | 325 | 283 | 242 | 203 | 166 | 129 |
| Lipscomb | 387 | 656 | 1,098 | 926 | 758 | 597 | 446 | 294 | 142 | 21 | 21 | 434 | 335 | 467 | 375 | 290 | 221 | 161 | 105 | 52 | 13 | 13 |
| Live Oak | 1,002 | 851 | 814 | 751 | 757 | 776 | 798 | 820 | 729 | 610 | 492 | 853 | 627 | 523 | 473 | 455 | 443 | 433 | 422 | 363 | 294 | 230 |
| Llano | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Loving | 542 | 691 | 792 | 925 | 1,058 | 1,020 | 934 | 848 | 762 | 681 | 601 | 300 | 256 | 223 | 251 | 279 | 259 | 229 | 202 | 175 | 152 | 131 |
| Lubbock | 6,211 | 5,963 | 5,663 | 5,673 | 5,684 | 5,419 | 5,089 | 4,745 | 4,401 | 4,097 | 3,794 | 1,228 | 865 | 433 | 365 | 298 | 290 | 268 | 249 | 229 | 212 | 196 |
| Lynn | 981 | 974 | 1,166 | 1,246 | 1,327 | 1,365 | 1,255 | 1,144 | 1,033 | 929 | 826 | 226 | 168 | 179 | 192 | 205 | 227 | 200 | 175 | 150 | 128 | 107 |
| McCulloch | 42 | 40 | 38 | 38 | 38 | 35 | 33 | 31 | 29 | 27 | 25 | 8 | 6 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |

| County | Water Use (AF) | | | | | | | | | | | Water Consumption (AF) | | | | | | | | | | |
|---------------|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 |
| McLennan | 0 | 194 | 234 | 265 | 296 | 235 | 203 | 177 | 152 | 127 | 101 | 119 | 185 | 197 | 206 | 212 | 154 | 132 | 111 | 91 | 73 | 56 |
| McMullen | 1,720 | 2,653 | 2,912 | 3,203 | 3,448 | 3,666 | 3,398 | 3,010 | 2,622 | 2,235 | 1,850 | 1,465 | 1,924 | 1,775 | 1,860 | 1,911 | 1,941 | 1,746 | 1,507 | 1,276 | 1,056 | 848 |
| Madison | 204 | 295 | 597 | 785 | 972 | 861 | 754 | 646 | 538 | 430 | 323 | 227 | 231 | 384 | 485 | 581 | 504 | 432 | 362 | 295 | 231 | 169 |
| Marion | 5 | 208 | 348 | 483 | 619 | 622 | 561 | 501 | 440 | 379 | 319 | 73 | 196 | 322 | 438 | 552 | 546 | 485 | 425 | 368 | 312 | 258 |
| Martin | 2,435 | 2,906 | 3,527 | 3,262 | 2,998 | 2,657 | 2,251 | 1,845 | 1,441 | 1,043 | 771 | 2,190 | 1,435 | 1,191 | 1,059 | 933 | 796 | 651 | 513 | 380 | 257 | 177 |
| Mason | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Matagorda | 34 | 87 | 96 | 105 | 100 | 86 | 75 | 64 | 55 | 45 | 35 | 63 | 75 | 72 | 75 | 69 | 58 | 51 | 44 | 38 | 32 | 27 |
| Maverick | 174 | 1,652 | 1,988 | 2,364 | 2,737 | 3,111 | 2,933 | 2,617 | 2,302 | 1,986 | 1,674 | 188 | 1,196 | 1,201 | 1,342 | 1,474 | 1,597 | 1,461 | 1,269 | 1,085 | 910 | 744 |
| Medina | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Menard | 1,185 | 1,148 | 1,086 | 1,079 | 1,071 | 1,012 | 952 | 889 | 827 | 772 | 717 | 244 | 175 | 88 | 74 | 59 | 56 | 53 | 50 | 48 | 45 | 43 |
| Midland | 1,719 | 2,876 | 3,522 | 3,272 | 3,025 | 2,666 | 2,227 | 1,788 | 1,350 | 918 | 612 | 1,661 | 1,506 | 1,256 | 1,127 | 1,005 | 855 | 695 | 542 | 395 | 257 | 164 |
| Milam | 0 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| Mills | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mitchell | 27 | 284 | 361 | 435 | 511 | 460 | 409 | 358 | 309 | 259 | 211 | 50 | 162 | 142 | 163 | 184 | 162 | 141 | 122 | 103 | 86 | 70 |
| Montague | 3,233 | 3,776 | 3,228 | 2,665 | 2,102 | 1,538 | 1,026 | 525 | 25 | 24 | 24 | 3,186 | 3,216 | 2,452 | 1,950 | 1,474 | 1,025 | 663 | 326 | 14 | 14 | 14 |
| Montgomery | 0 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Moore | 4 | 16 | 16 | 16 | 16 | 16 | 16 | 15 | 15 | 15 | 15 | 13 | 13 | 13 | 12 | 12 | 12 | 13 | 13 | 13 | 13 | 13 |
| Morris | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Motley | 130 | 138 | 132 | 131 | 130 | 123 | 117 | 110 | 103 | 97 | 91 | 39 | 31 | 22 | 20 | 19 | 18 | 18 | 18 | 18 | 17 | 17 |
| Nacogdoches | 1,073 | 1,642 | 2,299 | 2,141 | 1,986 | 1,815 | 1,643 | 1,471 | 1,299 | 1,128 | 958 | 1,220 | 1,550 | 2,101 | 1,930 | 1,764 | 1,591 | 1,420 | 1,251 | 1,089 | 932 | 779 |
| Navarro | 11 | 25 | 24 | 24 | 24 | 24 | 23 | 23 | 22 | 22 | 21 | 17 | 16 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Newton | 98 | 138 | 173 | 156 | 138 | 120 | 102 | 84 | 67 | 49 | 31 | 111 | 107 | 115 | 102 | 89 | 77 | 65 | 54 | 43 | 33 | 23 |
| Nolan | 214 | 218 | 207 | 205 | 204 | 193 | 182 | 171 | 160 | 150 | 140 | 54 | 42 | 26 | 24 | 21 | 21 | 20 | 20 | 19 | 19 | 18 |
| Nueces | 25 | 64 | 70 | 77 | 73 | 63 | 55 | 47 | 40 | 33 | 26 | 46 | 55 | 53 | 55 | 51 | 43 | 37 | 32 | 28 | 24 | 20 |
| Ochiltree | 286 | 508 | 824 | 1,040 | 853 | 674 | 503 | 332 | 161 | 24 | 23 | 329 | 266 | 355 | 418 | 325 | 247 | 180 | 116 | 57 | 13 | 13 |
| Oldham | 15 | 14 | 13 | 13 | 13 | 12 | 12 | 11 | 10 | 9 | 9 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| Orange | 0 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Palo Pinto | 120 | 547 | 656 | 752 | 847 | 709 | 625 | 552 | 480 | 408 | 336 | 281 | 446 | 483 | 524 | 557 | 430 | 370 | 314 | 261 | 212 | 165 |
| Panola | 958 | 1,578 | 2,136 | 1,919 | 1,749 | 1,590 | 1,438 | 1,286 | 1,134 | 983 | 832 | 1,095 | 1,484 | 1,959 | 1,731 | 1,552 | 1,392 | 1,240 | 1,091 | 948 | 808 | 674 |
| Parker | 1,083 | 1,180 | 1,464 | 1,733 | 2,001 | 1,748 | 1,545 | 1,353 | 1,162 | 970 | 779 | 1,215 | 1,035 | 1,139 | 1,284 | 1,414 | 1,176 | 1,009 | 851 | 702 | 563 | 434 |
| Parmer | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pecos | 409 | 543 | 690 | 878 | 1,068 | 1,180 | 1,072 | 966 | 861 | 762 | 672 | 274 | 227 | 313 | 331 | 353 | 359 | 320 | 283 | 249 | 220 | 198 |
| Polk | 133 | 195 | 247 | 221 | 195 | 170 | 144 | 118 | 92 | 67 | 41 | 148 | 151 | 162 | 143 | 125 | 107 | 90 | 74 | 58 | 43 | 29 |
| Potter | 2 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
| Presidio | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rains | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Randall | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reagan | 1,350 | 3,414 | 4,211 | 3,802 | 3,395 | 2,985 | 2,457 | 1,931 | 1,406 | 886 | 529 | 1,361 | 1,825 | 1,501 | 1,323 | 1,153 | 991 | 796 | 610 | 432 | 265 | 155 |
| Real | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Red River | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reeves | 611 | 1,111 | 1,520 | 2,067 | 2,619 | 2,761 | 2,522 | 2,285 | 2,052 | 1,827 | 1,614 | 701 | 632 | 688 | 796 | 908 | 888 | 791 | 700 | 615 | 541 | 477 |
| Refugio | 23 | 60 | 66 | 72 | 69 | 59 | 51 | 44 | 38 | 31 | 24 | 43 | 51 | 49 | 51 | 47 | 40 | 35 | 30 | 26 | 22 | 18 |
| Roberts | 365 | 1,711 | 1,502 | 1,270 | 1,041 | 822 | 611 | 400 | 189 | 20 | 20 | 423 | 819 | 647 | 524 | 412 | 316 | 231 | 151 | 76 | 20 | 20 |
| Robertson | 305 | 691 | 813 | 817 | 826 | 746 | 651 | 556 | 461 | 366 | 271 | 431 | 599 | 654 | 657 | 664 | 595 | 512 | 431 | 354 | 279 | 208 |
| Rockwall | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Runnels | 285 | 287 | 272 | 271 | 269 | 255 | 240 | 225 | 210 | 197 | 184 | 70 | 53 | 32 | 29 | 26 | 25 | 24 | 24 | 23 | 22 | 22 |
| Rusk | 210 | 719 | 1,149 | 1,569 | 1,994 | 1,844 | 1,668 | 1,492 | 1,316 | 1,141 | 967 | 323 | 637 | 1,017 | 1,377 | 1,730 | 1,578 | 1,404 | 1,234 | 1,070 | 912 | 759 |
| Sabine | 147 | 331 | 584 | 809 | 1,035 | 946 | 858 | 770 | 682 | 595 | 508 | 196 | 319 | 536 | 728 | 915 | 826 | 739 | 653 | 571 | 491 | 413 |
| San Augustine | 1,584 | 2,198 | 2,077 | 1,928 | 1,779 | 1,628 | 1,479 | 1,330 | 1,180 | 1,032 | 884 | 1,642 | 2,052 | 1,880 | 1,722 | 1,567 | 1,415 | 1,268 | 1,124 | 983 | 847 | 715 |
| San Jacinto | 0 | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 9 | 9 | 9 | 8 | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 9 | 9 | 9 |
| San Patricio | 20 | 52 | 57 | 63 | 60 | 51 | 44 | 39 | 33 | 27 | 21 | 38 | 45 | 43 | 45 | 41 | 35 | 30 | 26 | 23 | 19 | 16 |

| County | Water Use (AF) | | | | | | | | | | Water Consumption (AF) | | | | | | | | | | | |
|------------------|----------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|-------------|------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 |
| San Saba | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Schleicher | 230 | 473 | 621 | 718 | 732 | 647 | 562 | 477 | 392 | 308 | 241 | 144 | 213 | 199 | 226 | 225 | 194 | 165 | 136 | 109 | 84 | 64 |
| Scurry | 3 | 34 | 280 | 368 | 456 | 544 | 483 | 423 | 363 | 304 | 246 | 37 | 33 | 118 | 143 | 169 | 193 | 168 | 145 | 123 | 102 | 83 |
| Shackelford | 219 | 464 | 562 | 655 | 747 | 628 | 558 | 500 | 442 | 385 | 328 | 264 | 285 | 329 | 373 | 409 | 305 | 263 | 224 | 187 | 153 | 121 |
| Shelby | 1,388 | 1,861 | 3,283 | 3,109 | 2,938 | 2,754 | 2,496 | 2,238 | 1,980 | 1,723 | 1,467 | 1,536 | 1,745 | 2,976 | 2,781 | 2,593 | 2,400 | 2,143 | 1,892 | 1,650 | 1,414 | 1,185 |
| Sherman | 9 | 42 | 35 | 121 | 207 | 178 | 151 | 124 | 98 | 71 | 44 | 28 | 33 | 26 | 55 | 84 | 70 | 59 | 48 | 39 | 29 | 21 |
| Smith | 20 | 91 | 107 | 125 | 145 | 163 | 147 | 131 | 115 | 100 | 84 | 67 | 71 | 85 | 100 | 117 | 132 | 117 | 102 | 88 | 74 | 61 |
| Somervell | 287 | 237 | 304 | 367 | 431 | 377 | 333 | 292 | 250 | 209 | 168 | 309 | 208 | 236 | 272 | 304 | 253 | 217 | 183 | 151 | 121 | 93 |
| Starr | 35 | 90 | 99 | 108 | 103 | 89 | 77 | 67 | 57 | 46 | 36 | 65 | 77 | 75 | 77 | 71 | 60 | 52 | 46 | 39 | 34 | 28 |
| Stephens | 5,158 | 5,248 | 5,064 | 5,103 | 5,141 | 4,775 | 4,458 | 4,141 | 3,825 | 3,541 | 3,257 | 1,226 | 1,004 | 663 | 630 | 591 | 476 | 423 | 374 | 328 | 285 | 244 |
| Sterling | 89 | 343 | 780 | 947 | 953 | 958 | 812 | 667 | 522 | 380 | 270 | 107 | 191 | 290 | 338 | 331 | 325 | 270 | 217 | 166 | 120 | 85 |
| Stonewall | 629 | 615 | 583 | 579 | 575 | 543 | 511 | 478 | 445 | 416 | 387 | 136 | 99 | 53 | 45 | 38 | 36 | 34 | 33 | 31 | 30 | 29 |
| Sutton | 33 | 59 | 446 | 582 | 720 | 858 | 763 | 668 | 573 | 481 | 389 | 81 | 53 | 185 | 225 | 264 | 303 | 264 | 227 | 192 | 160 | 130 |
| Swisher | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tarrant | 8,805 | 7,084 | 5,672 | 4,245 | 2,817 | 1,391 | 12 | 12 | 12 | 12 | 12 | 8,313 | 6,020 | 4,294 | 3,105 | 1,985 | 935 | 12 | 12 | 12 | 12 | 12 |
| Taylor | 71 | 81 | 77 | 77 | 76 | 73 | 69 | 65 | 62 | 58 | 55 | 26 | 22 | 17 | 16 | 15 | 15 | 15 | 15 | 15 | 15 | 14 |
| Terrell | 502 | 540 | 673 | 724 | 776 | 806 | 740 | 672 | 606 | 544 | 483 | 158 | 128 | 145 | 152 | 160 | 173 | 154 | 136 | 120 | 105 | 92 |
| Terry | 90 | 119 | 355 | 439 | 525 | 606 | 543 | 479 | 416 | 354 | 293 | 51 | 45 | 121 | 144 | 168 | 192 | 167 | 144 | 122 | 102 | 83 |
| Throckmorton | 200 | 204 | 194 | 193 | 191 | 181 | 171 | 161 | 150 | 141 | 132 | 52 | 40 | 25 | 23 | 20 | 20 | 19 | 19 | 19 | 18 | 18 |
| Titus | 8 | 8 | 7 | 7 | 7 | 7 | 6 | 6 | 5 | 5 | 5 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tom Green | 53 | 72 | 69 | 69 | 68 | 66 | 63 | 60 | 58 | 55 | 53 | 31 | 28 | 24 | 24 | 23 | 23 | 23 | 23 | 23 | 23 | 23 |
| Travis | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trinity | 0 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Tyler | 78 | 123 | 160 | 197 | 198 | 174 | 150 | 127 | 103 | 79 | 55 | 91 | 96 | 106 | 127 | 125 | 109 | 93 | 78 | 63 | 49 | 36 |
| Upshur | 39 | 199 | 379 | 551 | 726 | 851 | 771 | 690 | 609 | 529 | 450 | 95 | 164 | 325 | 474 | 620 | 723 | 644 | 566 | 491 | 419 | 349 |
| Upton | 1,744 | 3,075 | 3,887 | 3,575 | 3,265 | 2,960 | 2,470 | 1,984 | 1,499 | 1,020 | 699 | 1,863 | 1,694 | 1,458 | 1,296 | 1,144 | 1,001 | 817 | 641 | 473 | 318 | 219 |
| Uvalde | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Val Verde | 0 | 66 | 144 | 169 | 195 | 221 | 199 | 179 | 158 | 139 | 120 | 67 | 66 | 91 | 97 | 102 | 108 | 98 | 89 | 81 | 74 | 68 |
| Van Zandt | 56 | 65 | 62 | 62 | 61 | 59 | 56 | 53 | 50 | 47 | 45 | 22 | 19 | 15 | 15 | 14 | 14 | 14 | 14 | 13 | 13 | 13 |
| Victoria | 25 | 66 | 72 | 79 | 75 | 65 | 56 | 49 | 41 | 34 | 27 | 47 | 56 | 54 | 56 | 52 | 44 | 38 | 33 | 29 | 24 | 20 |
| Walker | 0 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Waller | 0 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| Ward | 582 | 632 | 775 | 968 | 941 | 915 | 815 | 716 | 617 | 521 | 429 | 622 | 620 | 317 | 362 | 333 | 307 | 267 | 229 | 193 | 161 | 132 |
| Washington | 0 | 44 | 545 | 924 | 840 | 757 | 673 | 589 | 506 | 422 | 338 | 30 | 46 | 346 | 561 | 500 | 442 | 385 | 330 | 277 | 227 | 178 |
| Webb | 4,599 | 3,878 | 3,708 | 3,257 | 2,804 | 2,397 | 2,007 | 1,623 | 1,238 | 796 | 341 | 3,948 | 2,844 | 2,337 | 2,014 | 1,701 | 1,422 | 1,166 | 922 | 687 | 439 | 196 |
| Wharton | 31 | 81 | 89 | 97 | 93 | 80 | 69 | 60 | 51 | 42 | 33 | 58 | 69 | 67 | 69 | 64 | 54 | 47 | 41 | 36 | 30 | 25 |
| Wheeler | 3,794 | 3,609 | 3,157 | 2,682 | 2,210 | 1,748 | 1,293 | 839 | 385 | 22 | 21 | 3,850 | 1,683 | 1,308 | 1,071 | 850 | 651 | 469 | 298 | 139 | 20 | 20 |
| Wichita | 59 | 65 | 62 | 62 | 61 | 58 | 55 | 52 | 49 | 46 | 44 | 20 | 17 | 12 | 12 | 11 | 11 | 11 | 11 | 10 | 10 | 10 |
| Wilbarger | 7 | 20 | 20 | 20 | 20 | 20 | 19 | 19 | 19 | 18 | 18 | 15 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| Willacy | 17 | 44 | 49 | 53 | 51 | 44 | 38 | 33 | 28 | 23 | 18 | 32 | 38 | 37 | 38 | 35 | 29 | 26 | 22 | 19 | 17 | 14 |
| Williamson | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wilson | 418 | 1,671 | 1,929 | 1,740 | 1,548 | 1,357 | 1,165 | 973 | 782 | 590 | 399 | 373 | 1,206 | 1,182 | 1,045 | 912 | 783 | 659 | 540 | 426 | 315 | 210 |
| Winkler | 152 | 621 | 787 | 977 | 1,169 | 1,110 | 991 | 873 | 756 | 642 | 531 | 125 | 318 | 295 | 341 | 387 | 351 | 305 | 261 | 220 | 183 | 149 |
| Wise | 2,313 | 3,014 | 2,661 | 2,293 | 1,924 | 1,556 | 1,238 | 932 | 625 | 319 | 13 | 2,348 | 2,584 | 2,037 | 1,691 | 1,360 | 1,046 | 809 | 587 | 380 | 189 | 13 |
| Wood | 17 | 26 | 25 | 25 | 25 | 24 | 23 | 22 | 21 | 21 | 20 | 13 | 12 | 11 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Yoakum | 1,052 | 1,264 | 1,300 | 1,382 | 1,334 | 1,240 | 1,147 | 1,052 | 957 | 870 | 783 | 246 | 299 | 209 | 222 | 191 | 171 | 151 | 132 | 115 | 99 | 84 |
| Young | 15 | 142 | 197 | 244 | 291 | 236 | 206 | 183 | 159 | 135 | 111 | 125 | 136 | 165 | 188 | 208 | 156 | 135 | 116 | 97 | 81 | 65 |
| Zapata | 30 | 78 | 85 | 93 | 89 | 76 | 66 | 57 | 49 | 40 | 31 | 56 | 66 | 64 | 66 | 61 | 51 | 45 | 39 | 34 | 29 | 24 |
| Zavala | 407 | 2,140 | 2,531 | 2,379 | 2,257 | 2,118 | 1,977 | 1,838 | 1,559 | 1,245 | 932 | 409 | 1,555 | 1,570 | 1,448 | 1,336 | 1,212 | 1,092 | 975 | 802 | 622 | 450 |
| SUM (kAF) | 118.4 | 159.3 | 178.4 | 179.6 | 175.1 | 159.9 | 139.0 | 119.1 | 99.6 | 81.4 | 65.4 | 92.7 | 96.4 | 91.8 | 88.0 | 82.0 | 71.3 | 59.7 | 49.4 | 39.8 | 31.3 | 23.8 |

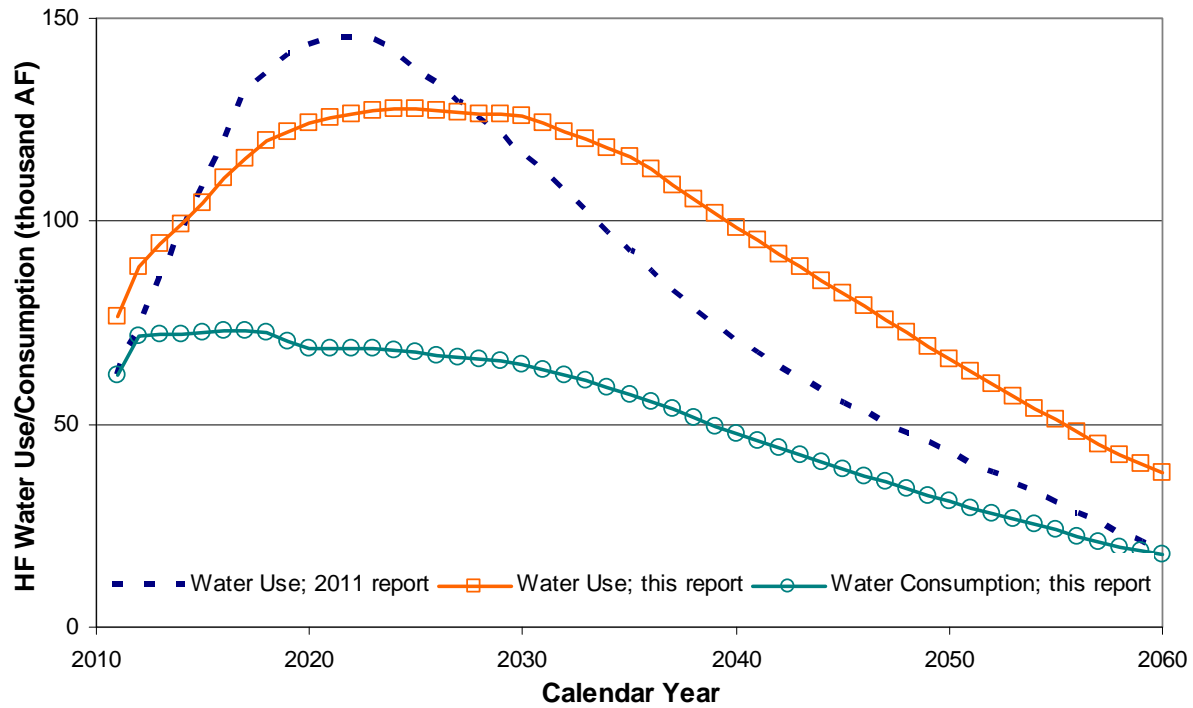


Figure 48. State-level projections to 2060 of HF water use and fresh-water consumption and comparison to earlier water projections.

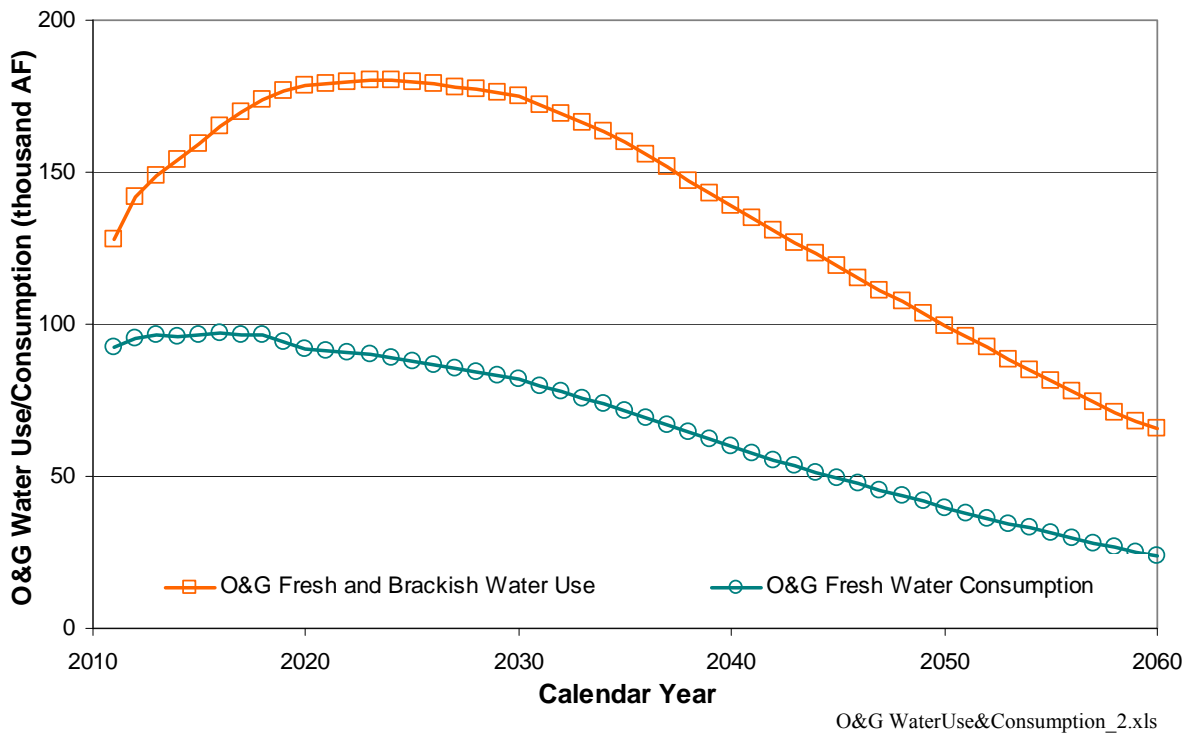


Figure 49. State-level projections to 2060 of oil and gas industry water use and fresh-water consumption.

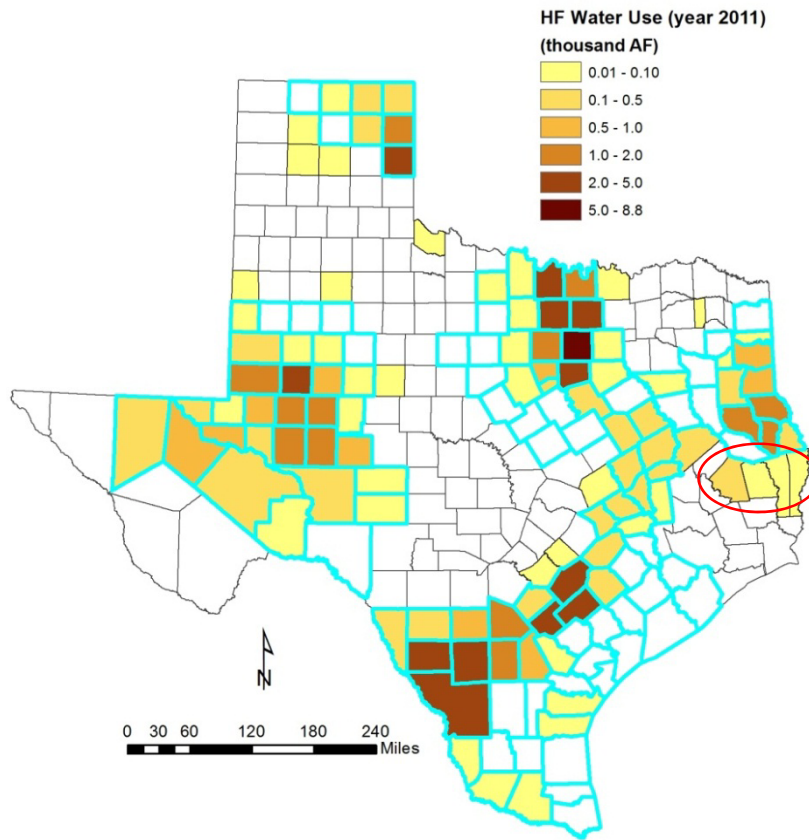
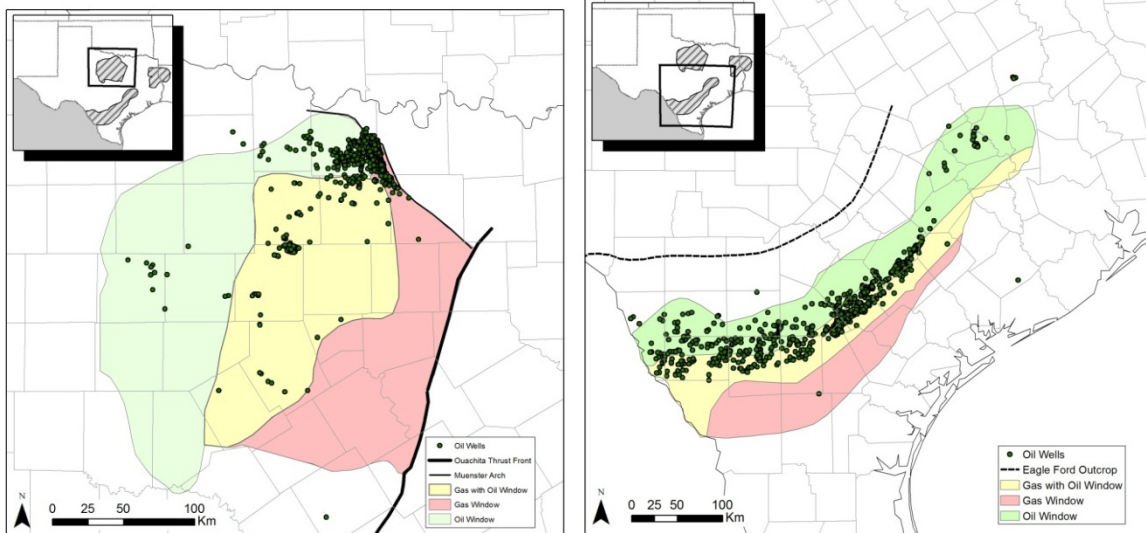


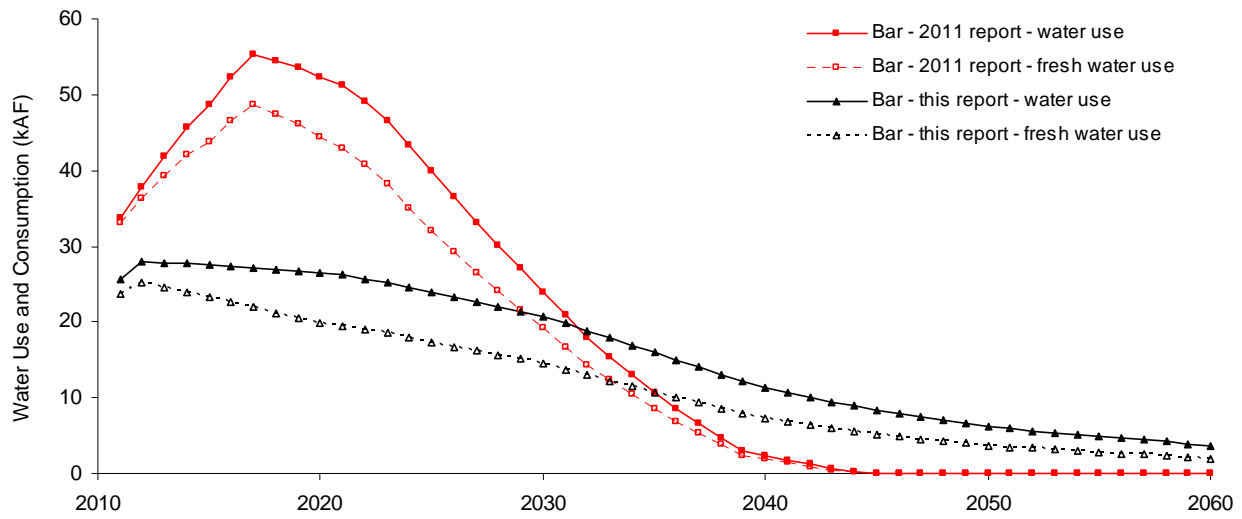
Figure 50. Counties with non-zero projected water use. Same coverage as in the 2011 report (thick blue lines) with the addition of Polk, Tyler, Jasper, and Newton counties in East Texas (red circle).



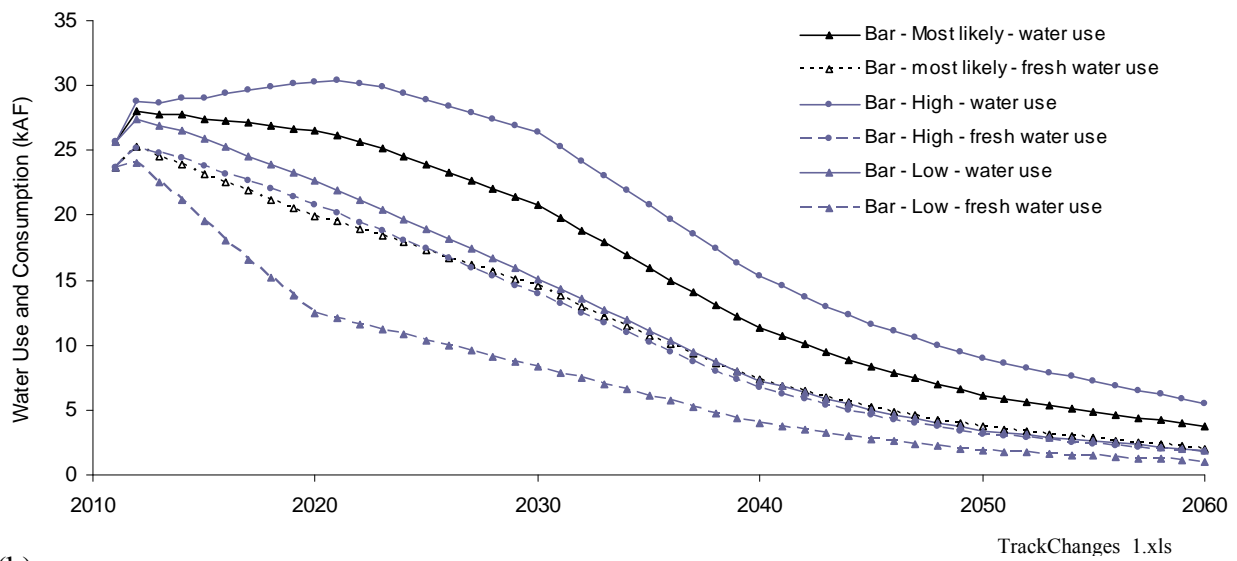
Source: Montgomery et al. (2005)

Source: McMahon and Vaden (2011)

Figure 51. Spatial location of the oil and gas windows in the (a) Barnett Shale and (b) Eagle Ford Shale.

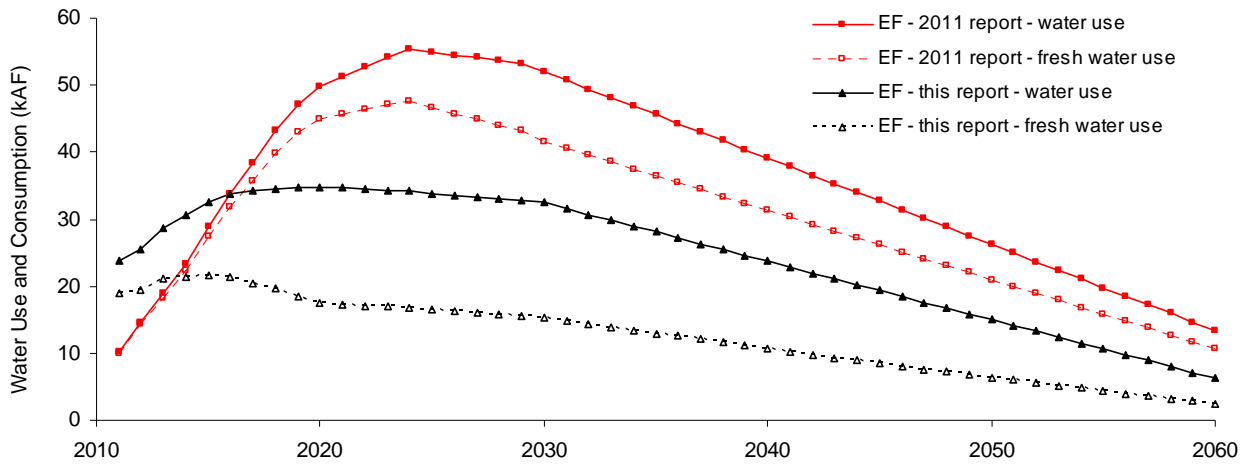


(a)

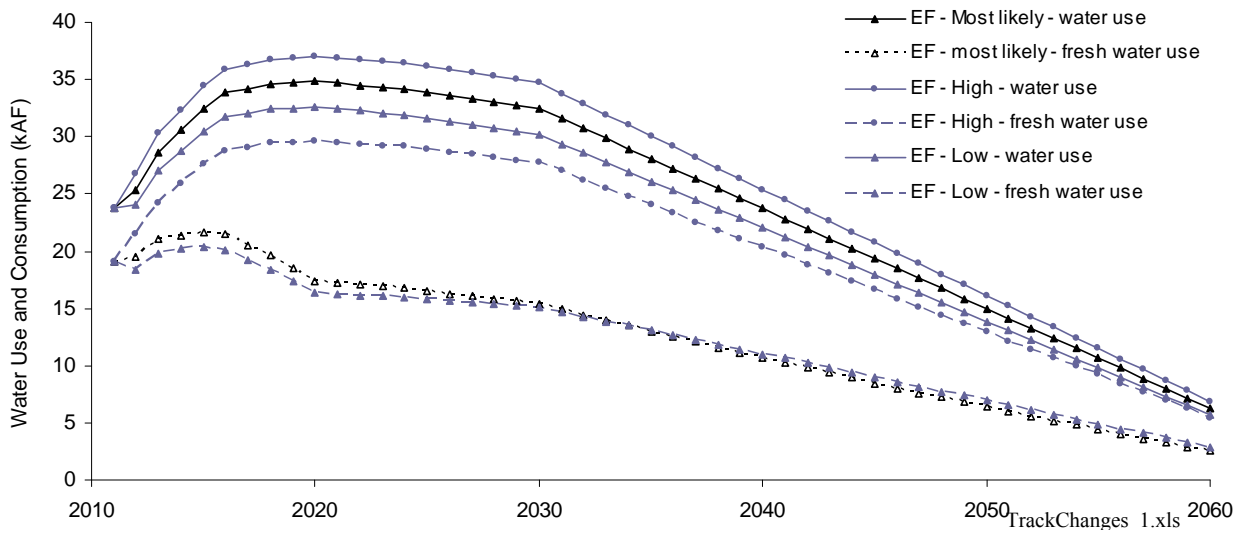


(b)

Figure 52. Barnett Shale water use and consumption projections: (a) comparison with earlier projections; (b) water use and consumption projections under the three scenarios.

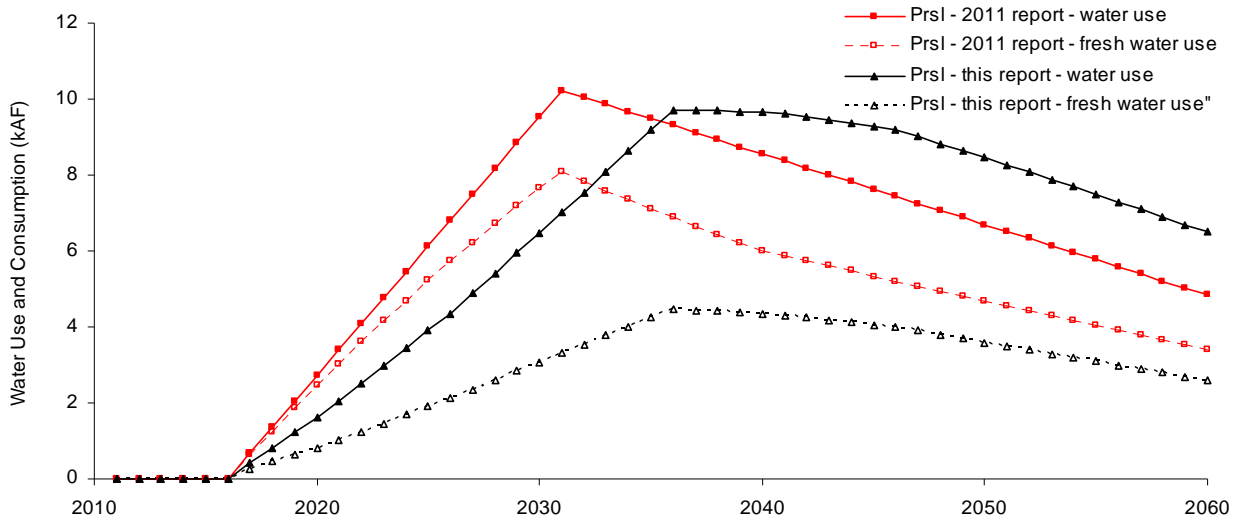


(a)

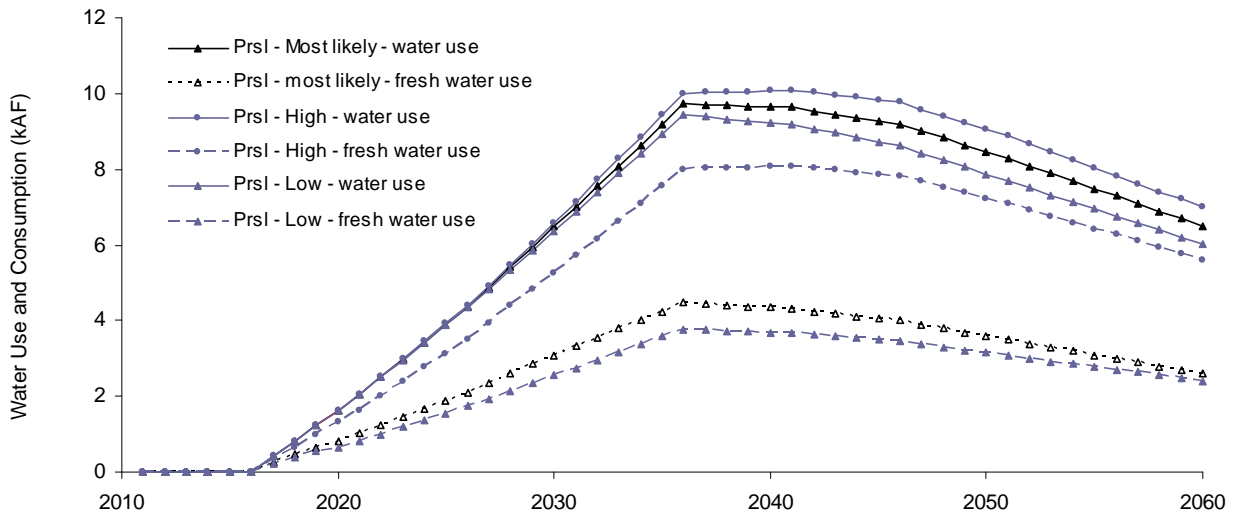


(b)

Figure 53. Eagle Ford Shale water use and consumption projections: (a) comparison with earlier projections; (b) water use and consumption projections under the three scenarios.



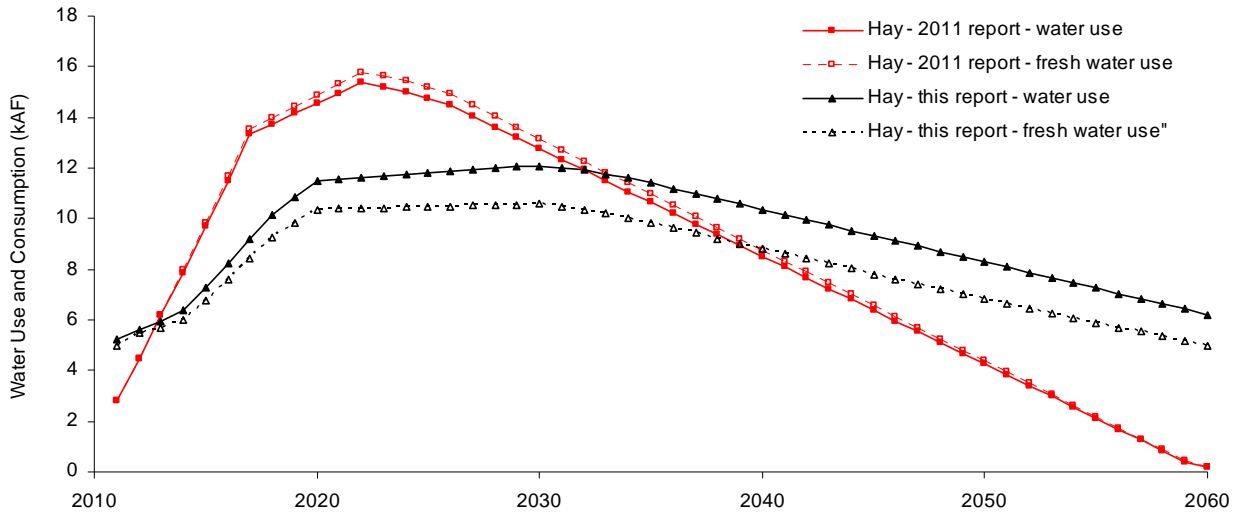
(a)



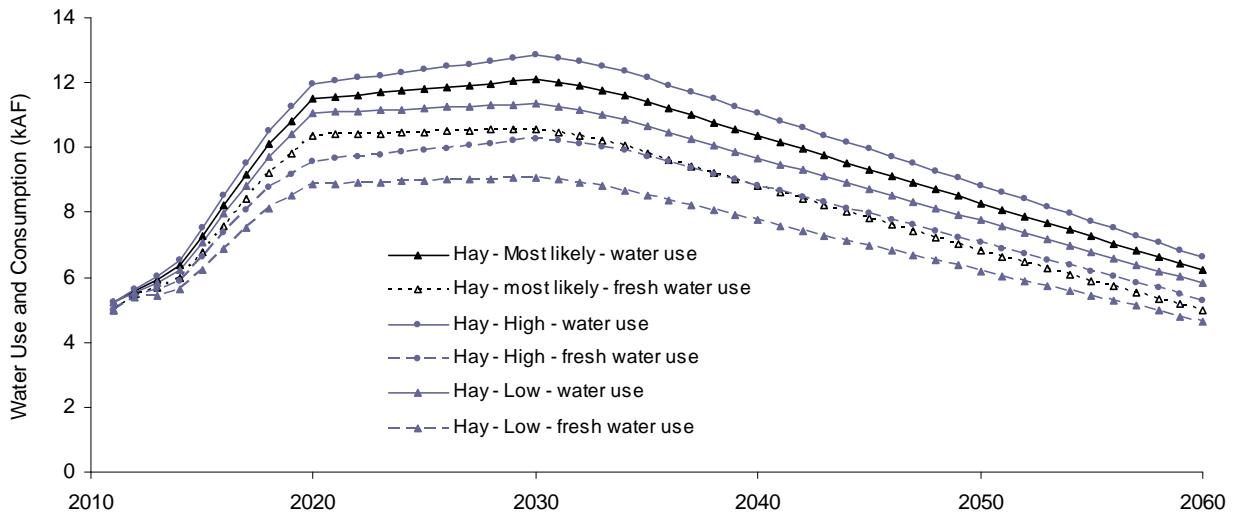
TrackChanges 1.xls

(b)

Figure 54. Pearsall Shale water use and consumption projections: (a) comparison with earlier projections; (b) water use and consumption projections under the three scenarios.



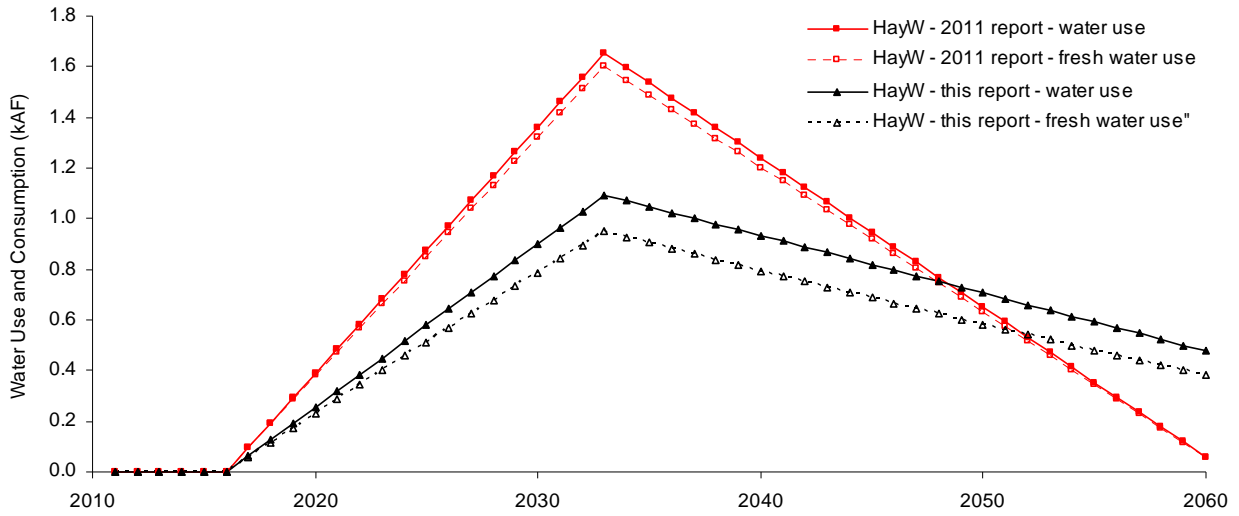
(a)



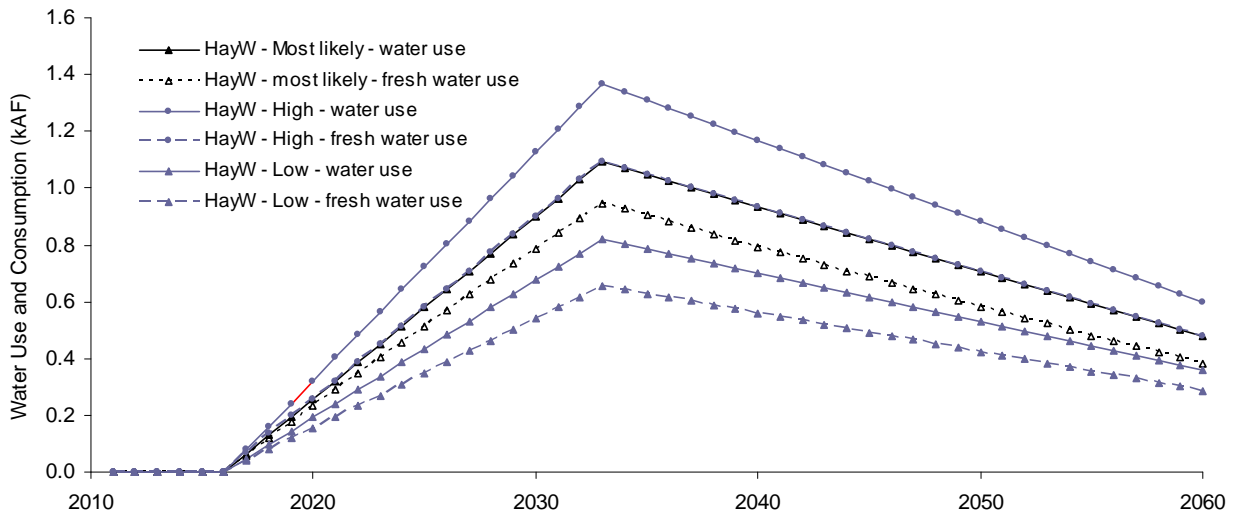
TrackChanges 1.xls

(b)

Figure 55. Haynesville and Bossier Shales water use and consumption projections: (a) comparison with earlier projections; (b) water use and consumption projections under the three scenarios.



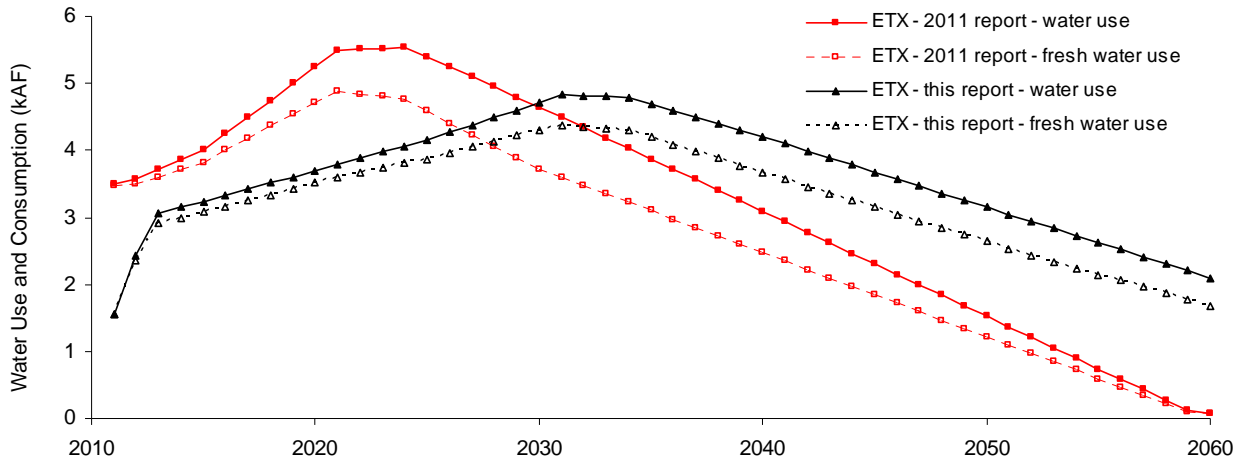
(a)



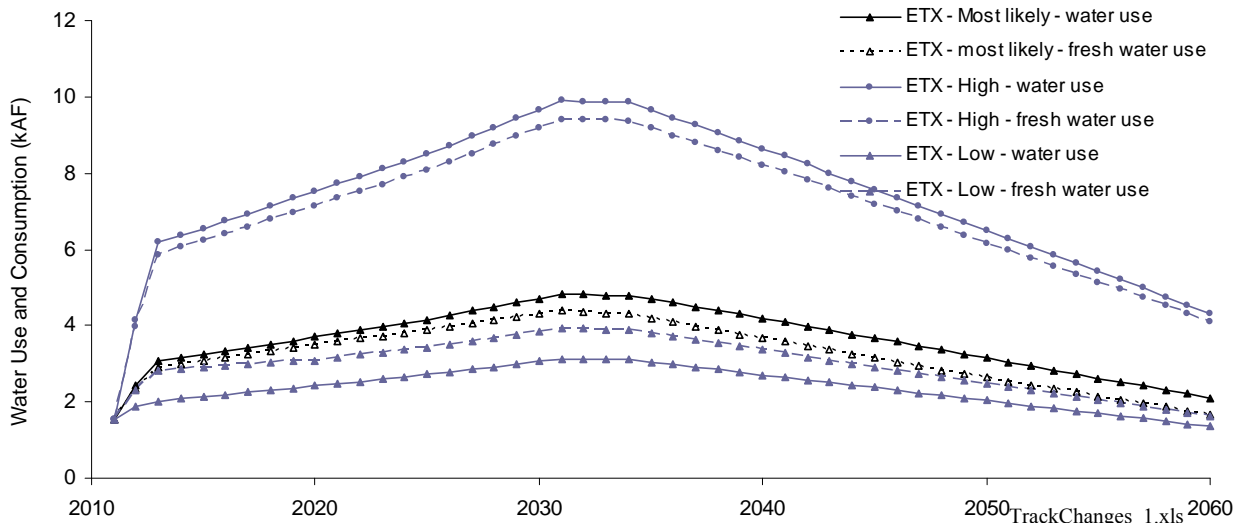
TrackChanges 1.xls

(b)

Figure 56. Haynesville-West Shale water use and consumption projections: (a) comparison with earlier projections; (b) water use and consumption projections under the three scenarios.

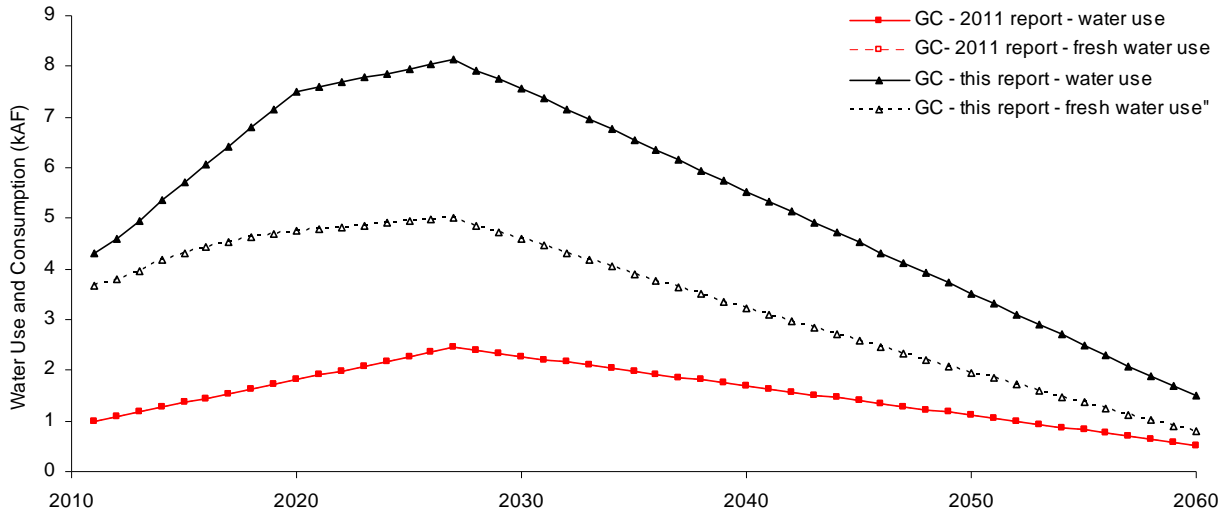


(a)

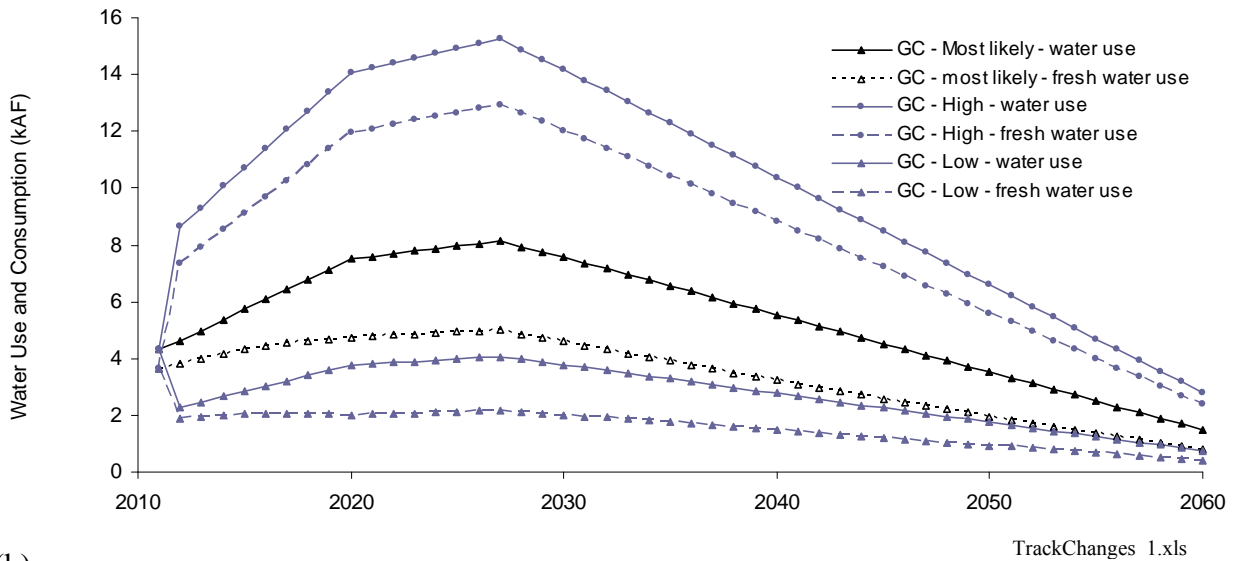


(b)

Figure 57. East Texas (not including Haynesville and Bossier Shales) water use and consumption projections: (a) comparison with earlier projections; (b) water use and consumption projections under the three scenarios.

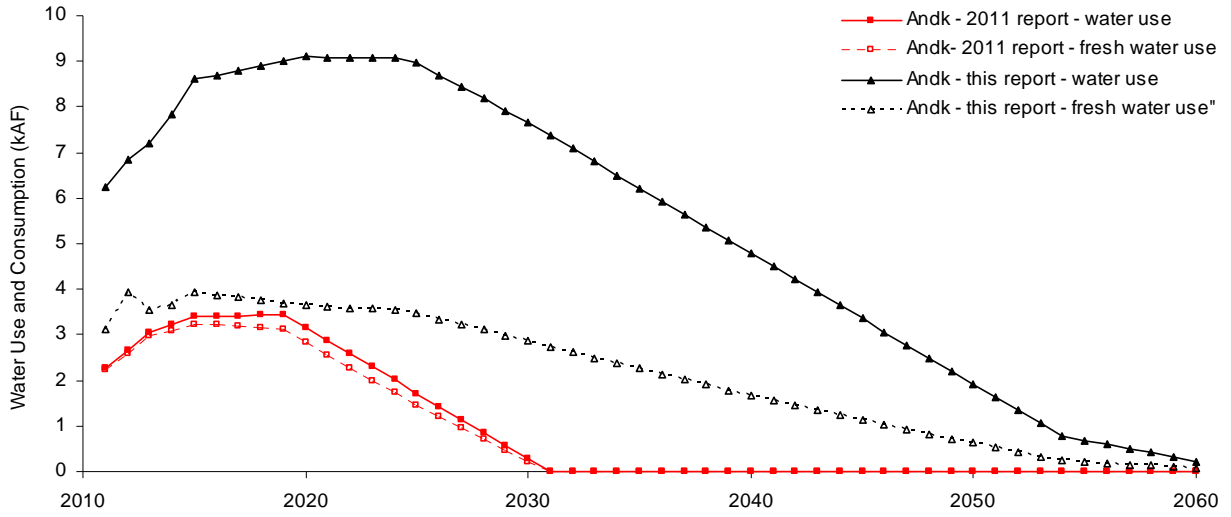


(a)

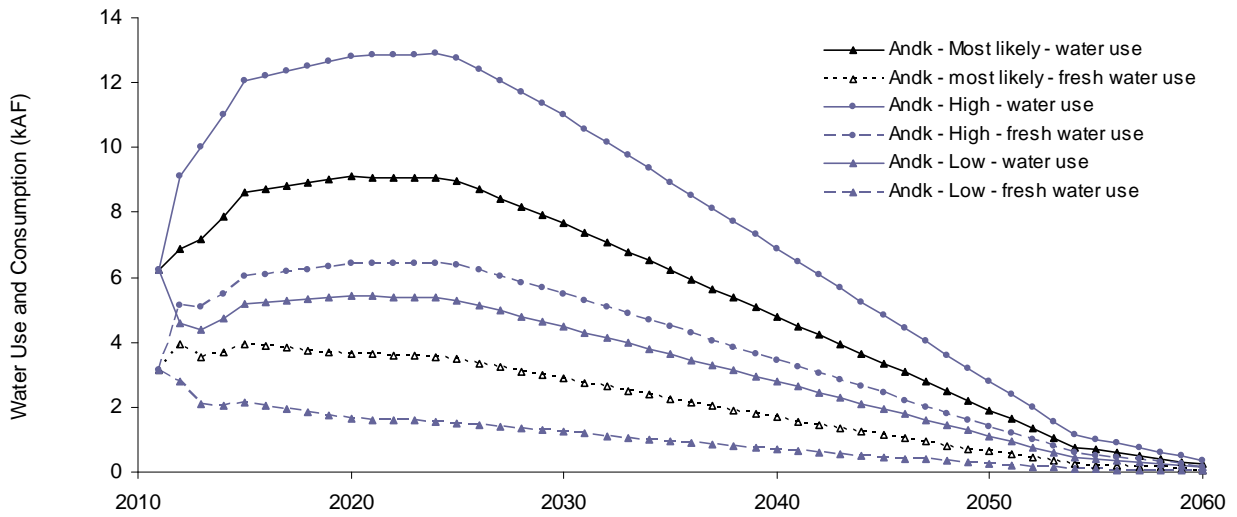


(b)

Figure 58. Gulf Coast (not including shales) water use and consumption projections: (a) comparison with earlier projections; (b) water use and consumption projections under the three scenarios.



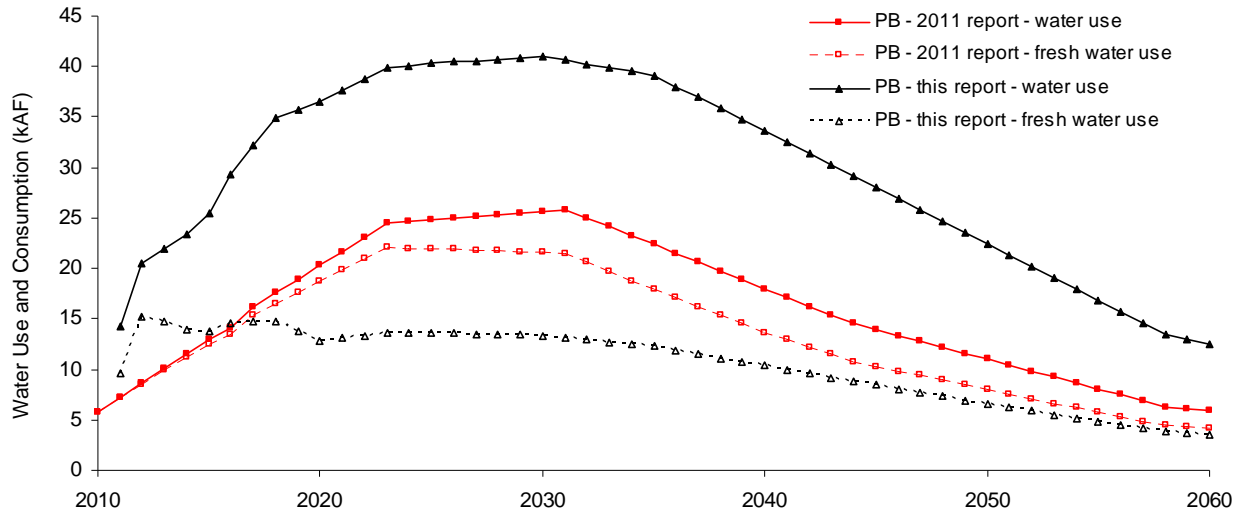
(a)



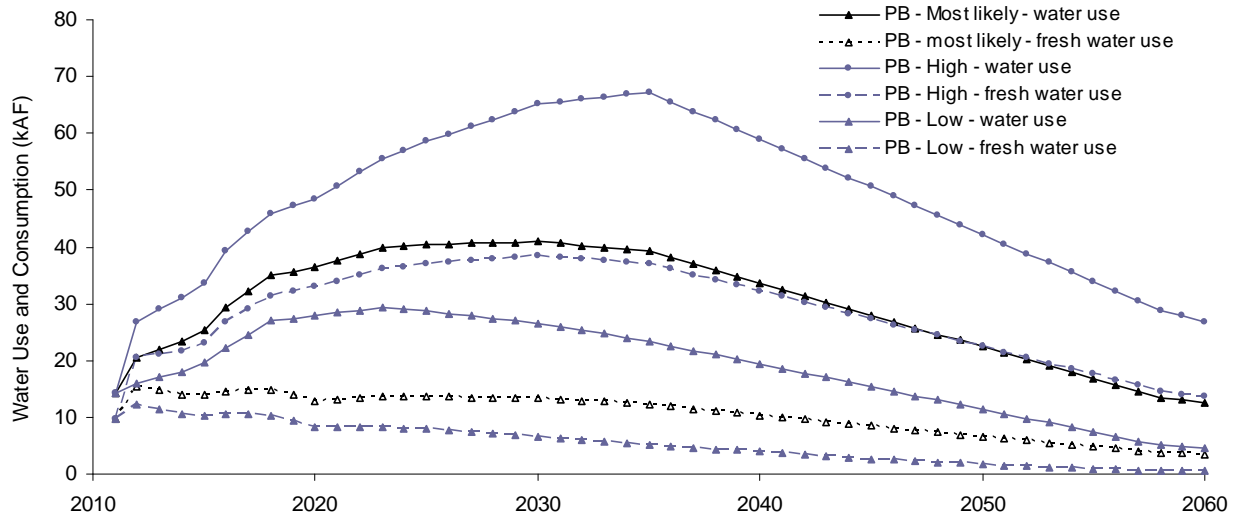
TrackChanges 1.xls

(b)

Figure 59. Anadarko Basin water use and consumption projections: (a) comparison with earlier projections; (b) water use and consumption projections under the three scenarios.



(a)



TrackChanges 1.xls

(b)

Figure 60. Permian Basin water use and consumption projections: (a) comparison with earlier projections; (b) water use and consumption projections under the three scenarios.

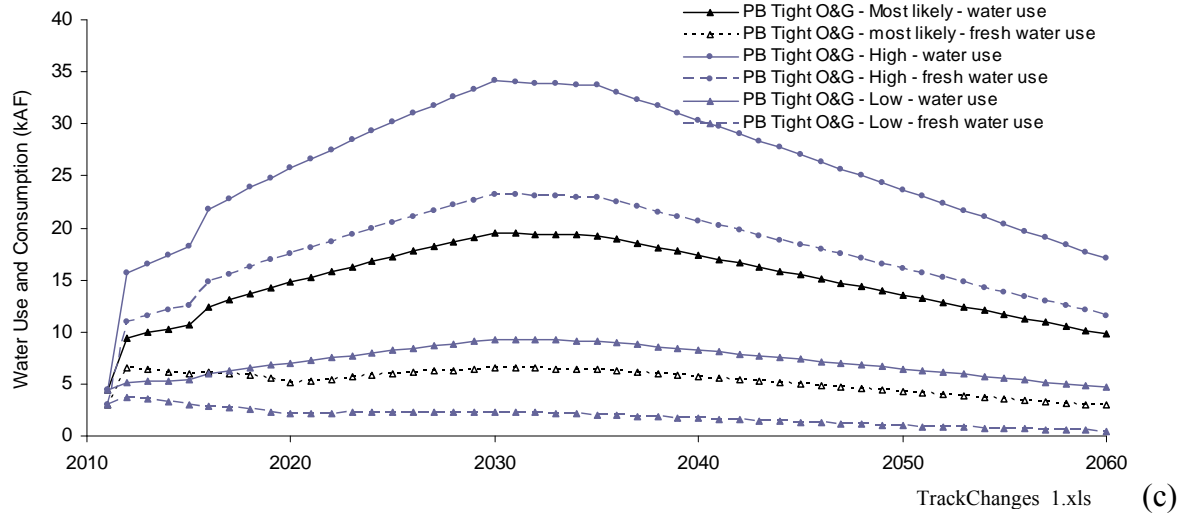
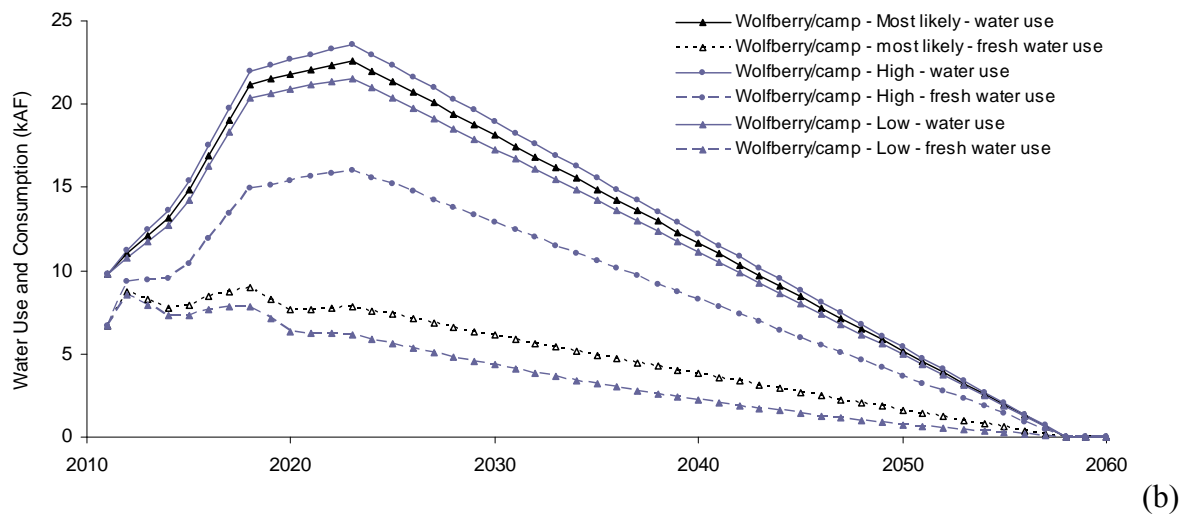
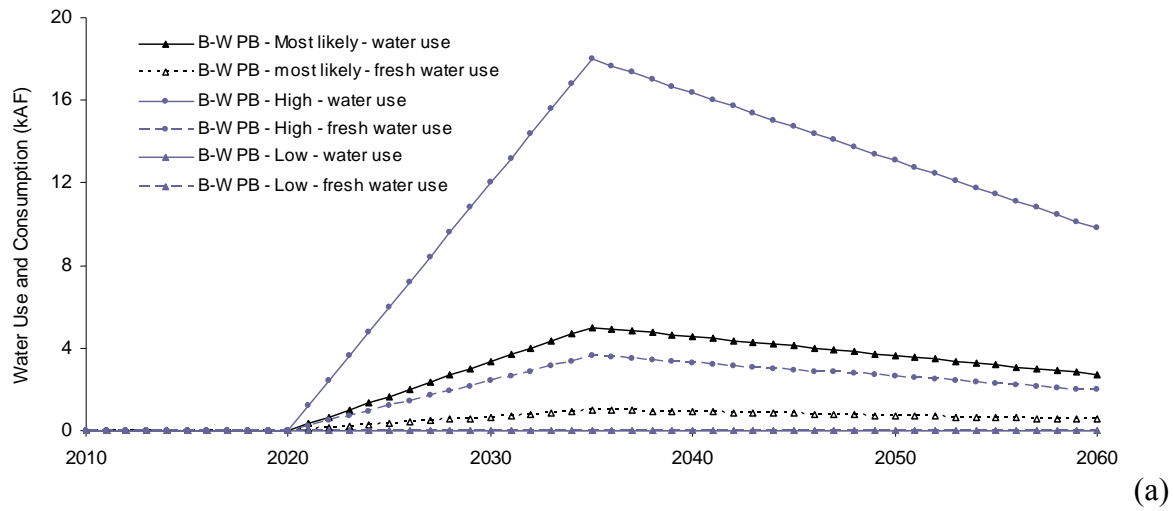
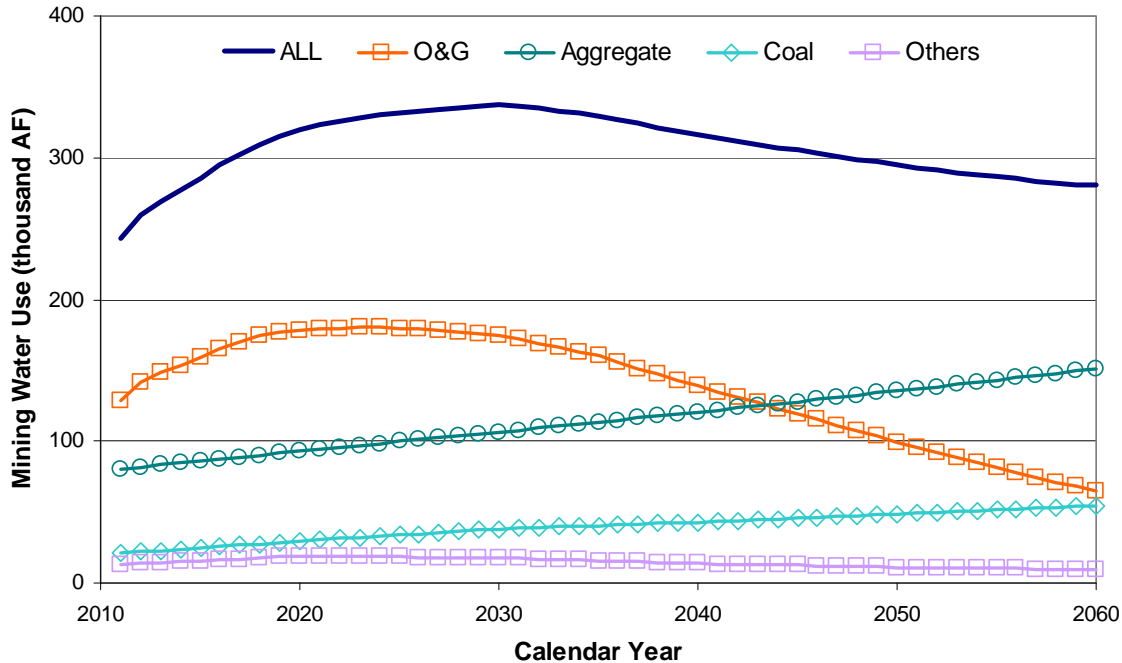


Figure 61. Permian Basin water use and consumption projections under the three scenarios: (a) Barnett and Woodford Shales; (b) Wolfcamp Shale and Wolfberry play; and (c) other Permian Basin formations.

V. Conclusions

This update to the 2011 report (whose conclusions were partly summarized in Nicot and Scanlon, 2012) does not fundamentally change the water use projections put forward originally. Both documents outline a water use that is likely to stay in the vicinity of 100 ± 50 kAF/yr for many years. The new projections lower and broaden the expected peak water use and displace the center of gravity of HF water use toward West Texas, an area of the state that has less fresh water. This mechanically translates into a higher brackish water use which when allied with improvement in reuse technologies results in a much lower fresh water consumption than was projected in the 2011 report. The eventual solution in West Texas, after the initial step of using slightly brackish groundwater, is to use more saline brackish water or the abundant produced water from conventional wells to avoid competition with other users who will also rely more and more on brackish water as their water needs increase. In addition to this expected recycling from other uses, the industry itself is making rapidly maturing technological advances that will improve reuse. Fortunately flow back is abundant in most places where fresh water is not (such as in West Texas). However, as in all predictive work, unexpected events can generate large deviations from the projections (as the shale gas revolution did for domestic oil production). The simple discovery of an additional major play (deeper play?) beyond those described in this document could change the state-level water projections. They, however, are unlikely to deviate much in order of magnitude from those outlined here.

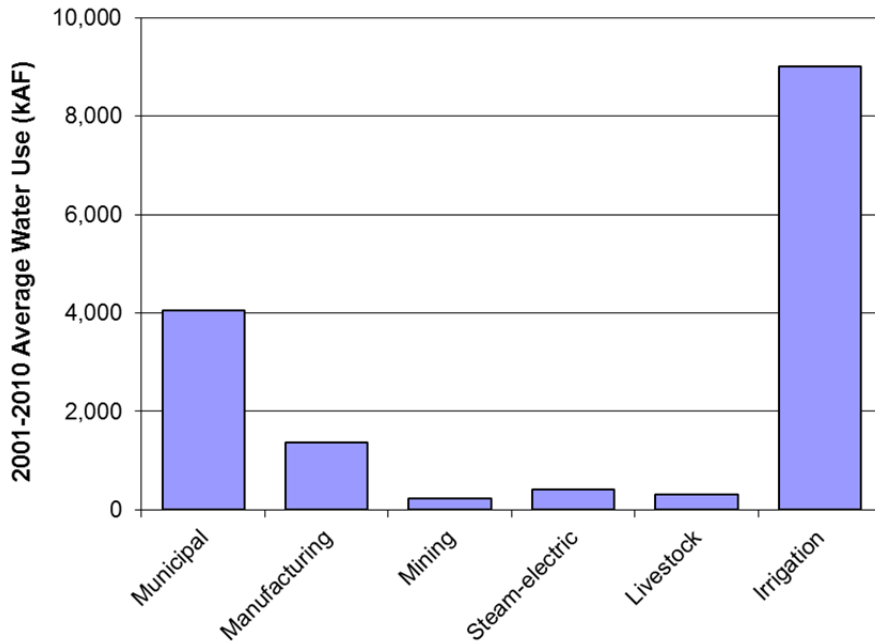
It follows that oil and gas water use projections remain a reasonable fraction of mining water use projections, no more than 54% (Figure 62) and a smaller fraction still of the total amount on water use in Texas every year: <0.1 million AF (81.5 kAF in 2011) compared to 15+ million AF (Figure 63).



MiningWaterUse2010-2060_4_TWDB_just.xls

Note: modified from the 2011 report (Nicot et al., 2011, Fig. 135)

Figure 62. Summary of projected water use by mining industry in Texas (2012-2060).



BarPlots_WaterUse_6.xls

Source: TWDB historical water use surveys,

<http://www.twdb.state.tx.us/waterplanning/waterusesurvey/estimates/>

Note: value displayed for mining water use is the 230 kAF from Nicot et al. (2011) rather than the projected 296 kAF listed in TWDB (2012, p.137) or the 2001-2010 average of 184.4 kAF computed with limited information.

Figure 63. Average state level water use (all categories) in 2001-2010.

VI. References

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- Nicot, J.-P., and Scanlon, B. R., 2012, Water use for shale-gas production in Texas, U.S.: Environmental Science and Technology, v. 46, p. 3580–3586.
- Nicot, J. -P., Hebel, A. K., Ritter, S. M., Walden, S., Baier, R., Galusky, P., Beach, J. A., Kyle, R., Symank, L., and Breton, C., 2011, Current and projected water use in the Texas mining and oil and gas industry: The University of Texas at Austin, Bureau of Economic Geology, Contract Report No. 090480939 prepared for Texas Water Development Board, 357 p. Accessed on 2012: https://www.twdb.state.tx.us/rwpg/rpgm_rpts/0904830939_MiningWaterUse.pdf
- Sinha, S., and Ramakrishnan, H., 2011, A novel screening method for selection of horizontal refracturing candidates in shale gas reservoirs: Society of Petroleum Engineers Paper #144032.
- Texas Water Development Board, 2012, Water for Texas, Vol. II, TWDB Document GP-9-1, January, 392 p.

Appendix 1: Revision to 2011 Report

Although the material below is now obsolete (Table 17), we thought it was important to correct Table 52 of the 2011 report (“Projected water use in the Barnett Shale (Fort Worth Basin”). Although correct values were used in tables of higher order (state level or cumulative across water uses) in the 2011 report, its table 52 was not updated between the draft version and the final version.

Table 17. Update to Table 52 of 2011 report (now obsolete and superseded by this report)

| County | 2010* | 2020 | 2030 | 2040 | 2050 | 2060 |
|-----------------------|---------------------------------------|---------------------------------------|---------------------------------------|------------|------------|------------|
| | AF | | | | | |
| Archer | 0 | 1,618 | 1,292 | 369 | 0 | 0 |
| Bosque | 913 | 2,547 | 1,065 | 0 | 0 | 0 |
| Clay | 634 951 | 3,734 5,596 | 4,663 2,495 | 0 | 0 | 0 |
| Comanche | 429 | 2,524 | 1,125 | 0 | 0 | 0 |
| Cooke | 101 | 282 | 118 | 0 | 0 | 0 |
| Coryell | 0 | 1,793 | 1,140 | 263 | 0 | 0 |
| Dallas | 620 | 769 | 271 | 0 | 0 | 0 |
| Denton | 1,674 | 587 | 0 | 0 | 0 | 0 |
| Eastland | 0 | 1,127 | 1,157 | 386 | 0 | 0 |
| Ellis | 325 | 235 | 63 | 0 | 0 | 0 |
| Erath | 2,017 | 2,500 | 882 | 0 | 0 | 0 |
| Hamilton | 190 | 1,118 | 498 | 0 | 0 | 0 |
| Hill | 1,008 | 1,249 | 441 | 0 | 0 | 0 |
| Hood | 1,720 | 990 | 215 | 0 | 0 | 0 |
| Jack | 4,835 2,386 | 4,706 2,218 | 535 696 | 0 | 0 | 0 |
| Johnson | 3,308 | 1,537 | 241 | 0 | 0 | 0 |
| McLennan | 0 | 1,380 | 680 | 62 | 0 | 0 |
| Montague | 539 809 | 3,474 4,760 | 4,415 2,122 | 0 | 0 | 0 |
| Palo Pinto | 446 | 2,627 | 1,171 | 0 | 0 | 0 |
| Parker | 4,003 | 1,787 | 153 | 0 | 0 | 0 |
| Shackelford | 0 | 1,121 | 1,151 | 384 | 0 | 0 |
| Somervell | 771 | 443 | 96 | 0 | 0 | 0 |
| Stephens | 0 | 1,854 | 1,178 | 272 | 0 | 0 |
| Tarrant | 3,147 | 1,104 | 0 | 0 | 0 | 0 |
| Wise | 4,220 4,642 | 4,064 2,157 | 308 338 | 0 | 0 | 0 |
| Young | 0 | 563 | 578 | 193 | 0 | 0 |
| Total (Th. AF) | 27.9 29.5 | 40.3 44.5 | 47.4 19.2 | 1.9 | 0.0 | 0.0 |

Note: double strikethrough on the incorrect values replaced by the correct but obsolete values.

