# 2021 Brief Weather and Climate Review for the Rio Grande Valley: A Year of Extremes, New Records, and Over $1 Billion in Losses - Again

Above: Fallen citrus a few days following the mid-February 2021 Freeze; iced-over roof and Royal Palm trees in Brownsville at 7 AM February 15, 2021.

One phrase described 2021 for the Lower Valley: "Bouncing from one extreme to another".

When the year finished, most of the Rio Grande Valley experienced one of the warmest and wettest on record. We began with the Mid-February Killing Freeze (February 15-16, extending to February 20). The freeze wiped out sizable numbers of the season's citrus crop, along with other cold-sensitive winter harvest crops. Tropical ornamental plants such as the Royal Palm were decimated in Cameron and parts of Hidalgo County. In all, a doubling of the reported agricultural damage (to include future insured farm losses, as well as ornamental plant losses, left just shy of $1 billion in the Rio Grande Valley; municipal and private damage to burst pipes and other infrastructure likely brought the total losses to $1 billion or more. This was followed by a rapid transition to extreme drought (Level 3) by the end of April. The National Centers for Environmental Prediction has estimated total damage from the February Winter Storm and Cold Wave Across a large portion of the U.S. was nearly $21 billion; a sizable total of the overall damage occurred in Texas.


Above: Left: Firefighters working to control the "Butterfly 2" fire in Brooks County in mid March, 2021. Photo credit: Texas A&M Forest Service. Right: "Butterfly 2" fire viewed from US 281 in Brooks Co.

March and April saw a transition to severe (level 2) through exceptional (level 4) drought, as very little rain fell as temperatures warmed. During the transition to extreme drought, the combination of heavily "cured" grasses and brush (from the February freeze), overall dry and warm conditions, and an embedded "flash dry" event (hot temperatures, gusty winds, humidity below 15 percent) on St. Patrick's Day set the stage for multiple wildfires in Brooks and Kenedy County between March 12 and 20, ultimately burning near 20 thousand acres of ranchland.


Above: Left - Twisted tower blown down by 70 mph winds in Zapata City (May 11). Right: Two feet of water blocking neighborhood roads in north Brownsville (July 9).

The dryness was quickly erased in May, courtesy of repeated thunderstorm events, some which produced damaging wind in addition to flooding on May 11/12 and again on May 19. May through July featured multiple torrential rain events that added up to new record three-month totals at McAllen and Harlingen, besting 2018 (Great June Flood), 2019 (June 24th Flood), 2020

(Hurricane Hanna, late July), and even 2008 (Hurricane Dolly, late July). Local flooding was common during the heaviest rain events, which occurred May 19, June 3, and July 6-9.

Above: Green was good! Heavy to record rainfall between May and mid July left a lush, green landscape across much of the Rio Grande Valley during mid-summer 2021.

The late spring through mid summer wetness reduced July and August heat, with temperatures ending up below the new 1991-2020 "warmer" averages (and close to the prior 1981-2010 averages). Summer's only true heat wave waited until the final days of August and the first week of September, but even then, temperatures were only a couple degrees above the 1991-2020 average. Late-summer heat arrived to close August and begin September, and would be a harbinger for the remainder of the calendar year.

For the months ending in "-er", McAllen ranked second warmest all-time. December 2021 was indicative of the very warm autumn and early winter; the new record heat prior records across the Rio Grande Valley by 2 to more than 4 degrees (Fahrenheit)!

The final four months of warmth, capped by "April in December", pushed average annual temperatures back up the charts for a sixth consecutive year. **McAllen landed at its fifteenth warmest year on record** (dating back 80 years to 1942). Farther east, where temperatures were even warmer than the periods-of-record averages, rankings landed in the top ten. **Brownsville rose the charts to fifth warmest** (out of 144 years of record, back to 1878); **Harlingen, tenth warmest** (out of 109 years of record, back to 1913).

The most telling statistic: Brownsville (officially) saw **8 of the past 11 years (2011-12; 2016-2021) rank *among the top ten warmest all-time*.** Harlingen likely saw the past six years rank among the top ten warmest, but several recent years had missing data. This included sufficient numbers of late spring/summer observations not available in 2018 to calculate the full extent of the warmth. For McAllen, the top eight warmest years have all occurred since 2009 (2009, 2011-12, 2016-20) with 2015 ranking 13th and 2021 ranking 15th (see *Annual Temperature Ranking Tables*). below.

The top echelon temperature rankings occurred despite the Rio Grande Valley (anchor cities) finishing among the top ten **wettest** years on record! More impressively, the rain really didn't get going until the final day of April - when most of the region was in severe to extreme drought. In addition to the May-July rain events mentioned previously, as well as October 1st (lower Valley), other notable rains fell on November 22 and December 19. Brownsville ranked **9th wettest**, Harlingen ranked **5th wettest**, and McAllen ranked **6th wettest** (see *Annual Precipitation Ranking Tables* below)

For the dominant rainfall period that started on April 30, Brownsville ranked 4th (36.64" vs. 55.98" in 1887), Harlingen ranked 2nd wettest (39.11" vs. 39.35" in 1933), and McAllen ranked 1st (31.24", new record vs. 30.09" in 1976). Note that McAllen's value may have been an inch higher, as data from April 30th was missing. These values also were 150 to 200 percent of the 30-year average rainfall across the populated Rio Grande Valley. Farther west, a different story held; despite helpful rainfall during the May-July period, dryness remained across the Rio Grande Plains and Jim Hogg County Brush Country. Rainfall totals there were 50 to 90 percent of average. The lack of significant rainfall, high evaporation rates, and low inflow allowed Falcon International Reservoir to fall near 30 year lows by the end of 2021 and start of 2022.

The combination of weather related damage from the February killing freeze, spring/early summer floods, the October 1 flood in Brownsville, March wildfires and one October wildfire (Starr County), and drought likely pushed *estimated* total dollar damage above $1 billion for the calendar year. This makes two consecutive years of $1 billion or more in weather-related physical infrastructure/property and agricultural damage (and loss) for the Rio Grande Valley and Deep South Texas Ranch/Brush Country.

Above: October 1 Brownsville flood, one day later. Left - Resaca overspilling onto Vermillion Ave. in east Brownsville. Right: 1 to 2 feet of remaining high water along Kingsway Rd. in Brownsville

**Specific Data of Interest**

**Note: Periods of Record:** Brownsville, 1878 (144 calendar years). McAllen, June, 1941 (80 calendar years). Harlingen: February, 1912 (109 calendar years)

***Annual Temperatures***. After a cooler than average start and a near normal late spring/early summer, 2021's temperatures rallied back to close the year.

- **McAllen:** At 76.4 degrees, **ranked 15th warmest.** Number 1: 2016, at 79.5 degrees.
- **Brownsville:** At 76.4 degrees, **ranked 5th warmest**. Number 1: 2012, at 77.3 degrees.
- **Harlingen:** At 76.0 degrees, ranked **10th warmest**. Number 1: 2017 at 77.4 degrees.

***Annual Precipitation.*** Following limited rainfall through the final day of April, the spigot opened up into mid July, with additional heavy rainfall events through fall and early winter. All locations ranked among the top ten wettest on record:

- **McAllen:** At 33.12 inches, **ranked 6th wettest.** Number 1: 1966, at 37.17 inches.
- **Brownsville:** At 39.6 inches, **ranked 9th wettest**. Number 1: 1886, at 60.06 inches.
- **Harlingen:** At 41.26 inches, **ranked 5th wettest**. Number 1: 1976, at 45.3 inches.

***February Freeze.*** Individual daily records for locations across the Valley are shown in these graphics. Here are a couple more:

- **McAllen:** The 10 day rolling period from Feb. 11-20, 2021, ranked **14th coldest all-time** (records back to 1942). The only periods that ranked higher were the late December 1983 freeze, the late December 1989 freeze, and a turn-of-the year freeze from the end of 1946 into early 1947.
- **Brownsville:** With a longer period of record, there were more instances of prolonged cold snaps. **2021 ranked 23rd coldest** (records back to 1878). Other years included 1983 and 1989 (as above), but also 1940 (late January) 1924 (late December), and 1880/81 (late December into early January). Note: 1880 (New Year's Eve) was the largest single-day snow event in Brownsville/Matamoros. The cold snaps of 1895 and 1899 occurred in early to mid February. 1899 is known as the coldest event on record for the state of Texas.
- **Harlingen:** The period from February 12-21 (February 11-20, calendar day-based) ranked **25th coldest on record** (back to 1912). Other years included 1983, 1989, 1946/47 (turn of the year), 1924, 1942, 1997, and 1948.
- **Region:** This was the **coldest February period** on record across the Rio Grande Valley **since 1899**.

***Late Spring-Mid Summer Rainfall***

- **McAllen:** Between May and July 2021, **24.16" of rain shattered the prior record** of 20.83 inches set...in 2020 (one year earlier). The same thing or June and July (16.57" in 2021; 14.51" in 2020)
- **Brownsville:** Between May and July 2021, 16.17" of rain fell, **ranking 3rd wettest all-time** (prior records were set in 1886 and 1887; 19.23" in 1886 is the benchmark). 11.21" fell in June and July, ranking 9th wettest (14.13" in 1887 was wettest).
- **Harlingen:** Between May and July 2021, **22.17" of rain shattered the prior record** of 19.82" set in 2007 (records since 1911). For June and July, 14.1" fell, ranking 3rd wettest (2008 and 2018 ranked ahead, with 16.12" in 2008, the year of Hurricane Dolly).

***October 1 Rainfall:***

- **Brownsville:** The day of the torrents, which began with 1-2" of rainfall in about an hour during the late morning, then concluded with a period of 3-4" per hour for two hours during the peak of a Friday afternoon commute, dropped a daily total of 8.09". That value ranked **7th wettest for any day of the year**. Only April 5, 1991, had more for a non-hurricane-related single day total.
    - The rainfall destroyed the prior single day record for October 1 (8.09 vs. 2.44 in 1958), and ranked second behind October 4, 1996 (9.09"), for a single-day highest amount for the month. 1996 had a tropical cyclone moisture connection (Josephine)

***September-December Temperatures:***

- **McAllen:** 76.7 degrees **ranked second warmest**, behind 78.7 degrees in 2016 (records to 1941)
- **Brownsville:** 77.2 degrees **ranked warmest**, ahead of 76.6 degrees in 2016 (records to 1878)
- **Harlingen:** 76.2 degrees **ranked second warmest**, behind 76.5 degrees in 2016.

***December Temperatures:***

- **McAllen:** 71.5 degrees **broke the prior record** (69.4) by 2.1 degrees (1984)
- **Brownsville:** 73.2 degrees **broke the prior record** (71.2) by 2 degrees (1889)
- **Harlingen:** 72.8 degrees **broke the prior record** (68.5) by 4.3 degrees (1970)!

***New Year, New Record: December 31-January 1 (2022) Temperatures***
New record daytime and morning (low) temperatures were set or neared at all three "anchor" cities of the Rio Grande Valley each day. This led to new 2-day records across the region. A sharp, dry cold front would end the eight-day period of unusual warmth, which pushed surf temperatures at South Padre Island into the upper 70s on New Year's Day.

The numbers follow:

- **McAllen:** 80 degrees **ranked 2.2 degrees above the prior record** (77.8) set in 1951/52.

- **Brownsville:** 80.3 degrees **destroyed the prior record (75.8) by 4.5 degrees**, previously set in 1915.
- **Harlingen:** Using a three-day total (to account for non-calendar day results of the location, whose observations are based on a 7 AM to 7 AM "day"), 75.8 degrees **ranked 2nd warmest**, just behind 76.7 in 1951/52.

### *Annual Temperature Ranking Tables - 2021*

## 2021 Temperature Rankings (red shade)

**Maximum 1-Year Mean Avg Temperature for Brownsville Area, TX (ThreadEx)**

Click column heading to sort ascending, click again to sort descending.

| Rank | Value | Dates | Missing Days |
|---|---|---|---|
| 1 | 77.3 | 2012-01-01 through 2012-12-31 | 0 |
| 2 | 77.2 | 2020-01-01 through 2020-12-31 | 0 |
| 3 | 77.2 | 2017-01-01 through 2017-12-31 | 0 |
| 4 | 76.6 | 2019-01-01 through 2019-12-31 | 0 |
| 5 | 76.4 | 2021-01-01 through 2021-12-31 | 1 |
| 6 | 76.4 | 2016-01-01 through 2016-12-31 | 0 |
| 7 | 76.4 | 2018-01-01 through 2018-12-31 | 0 |
| 8 | 76.1 | 2011-01-01 through 2011-12-31 | 0 |
| 9 | 76.0 | 2006-01-01 through 2006-12-31 | 0 |
| 10 | 75.8 | 2005-01-01 through 2005-12-31 | 0 |

Period of record: 1878-01-01 to 2022-01-04

**Maximum 1-Year Mean Avg Temperature for HARLINGEN, TX**

Click column heading to sort ascending, click again to sort descending.

| Rank | Value | Dates | Missing Days |
|---|---|---|---|
| 1 | 77.4 | 2017-01-01 through 2017-12-31 | 36 |
| 2 | 77.0 | 2016-01-01 through 2016-12-31 | 17 |
| 3 | 76.8 | 2020-01-01 through 2020-12-31 | 24 |
| 4 | 76.6 | 1945-01-01 through 1945-12-31 | 18 |
| 5 | 76.4 | 1946-01-01 through 1946-12-31 | 26 |
| 6 | 76.4 | 2012-01-01 through 2012-12-31 | 14 |
| 7 | 76.3 | 1957-01-01 through 1957-12-31 | 10 |
| 8 | 76.3 | 2019-01-01 through 2019-12-31 | 47 |
| 9 | 76.3 | 1950-01-01 through 1950-12-31 | 1 |
| 10 | 76.0 | 2021-01-01 through 2021-12-31 | 9 |

Period of record: 1912-02-07 to 2022-01-05

**Maximum 1-Year Mean Avg Temperature for McAllen Area, TX (ThreadEx)**

Click column heading to sort ascending, click again to sort descending.

| Rank | Value | Dates | Missing Days |
|---|---|---|---|
| 1 | 79.5 | 2016-01-01 through 2016-12-31 | 0 |
| 2 | 79.5 | 2017-01-01 through 2017-12-31 | 0 |
| 3 | 78.3 | 2012-01-01 through 2012-12-31 | 0 |
| 4 | 78.2 | 2009-01-01 through 2009-12-31 | 0 |
| 5 | 77.8 | 2020-01-01 through 2020-12-31 | 1 |
| 6 | 77.7 | 2018-01-01 through 2018-12-31 | 3 |
| 7 | 77.7 | 2011-01-01 through 2011-12-31 | 2 |
| 8 | 77.6 | 2019-01-01 through 2019-12-31 | 1 |
| 9 | 77.1 | 1999-01-01 through 1999-12-31 | 0 |
| 10 | 76.9 | 1998-01-01 through 1998-12-31 | 3 |
| 11 | 76.9 | 2006-01-01 through 2006-12-31 | 0 |
| 12 | 76.8 | 1990-01-01 through 1990-12-31 | 2 |
| 13 | 76.6 | 2015-01-01 through 2015-12-31 | 0 |
| 14 | 76.5 | 2000-01-01 through 2000-12-31 | 3 |
| 15 | 76.4 | 2021-01-01 through 2021-12-31 | 1 |
| 16 | 76.4 | 2005-01-01 through 2005-12-31 | 0 |
| 17 | 76.3 | 1950-01-01 through 1950-12-31 | 0 |
| 18 | 76.3 | 1994-01-01 through 1994-12-31 | 0 |
| 19 | 76.0 | 1991-01-01 through 1991-12-31 | 1 |
| 20 | 76.0 | 1996-01-01 through 1996-12-31 | 4 |

Period of record: 1941-06-01 to 2022-01-04

Based on 60 or fewer missing observations

### *Annual Precipitation Ranking Tables - 2021*

## 2021 Precipitation Rankings (green shade)

**Maximum 1-Year Total Precipitation for Brownsville Area, TX (ThreadEx)**

Click column heading to sort ascending, click again to sort descending.

| Rank | Value | Dates | Missing Days |
|---|---|---|---|
| 1 | 60.06 | 1886-01-01 through 1886-12-31 | 0 |
| 2 | 59.82 | 1887-01-01 through 1887-12-31 | 0 |
| 3 | 47.51 | 1958-01-01 through 1958-12-31 | 0 |
| 4 | 46.88 | 2015-01-01 through 2015-12-31 | 0 |
| 5 | 41.14 | 1976-01-01 through 1976-12-31 | 0 |
| 6 | 40.98 | 1925-01-01 through 1925-12-31 | 0 |
| 7 | 40.88 | 1884-01-01 through 1884-12-31 | 0 |
| 8 | 40.33 | 1984-01-01 through 1984-12-31 | 0 |
| 9 | 39.60 | 2021-01-01 through 2021-12-31 | 1 |
| 10 | 38.82 | 1912-01-01 through 1912-12-31 | 0 |

Period of record: 1878-01-01 to 2022-01-04

**Maximum 1-Year Total Precipitation for HARLINGEN, TX**

Click column heading to sort ascending, click again to sort descending.

| Rank | Value | Dates | Missing Days |
|---|---|---|---|
| 1 | 45.30 | 1976-01-01 through 1976-12-31 | 0 |
| 2 | 42.50 | 1973-01-01 through 1973-12-31 | 0 |
| 3 | 41.69 | 1933-01-01 through 1933-12-31 | 0 |
| 4 | 41.56 | 1958-01-01 through 1958-12-31 | 0 |
| 5 | 41.26 | 2021-01-01 through 2021-12-31 | 7 |
| 6 | 39.97 | 2008-01-01 through 2008-12-31 | 5 |
| 7 | 39.67 | 1991-01-01 through 1991-12-31 | 26 |
| 8 | 39.22 | 1967-01-01 through 1967-12-31 | 0 |
| 9 | 38.32 | 2018-01-01 through 2018-12-31 | 53 |
| 10 | 37.92 | 1935-01-01 through 1935-12-31 | 0 |

Period of record: 1911-05-01 to 2022-01-05

**Maximum 1-Year Total Precipitation for McAllen Area, TX (ThreadEx)**

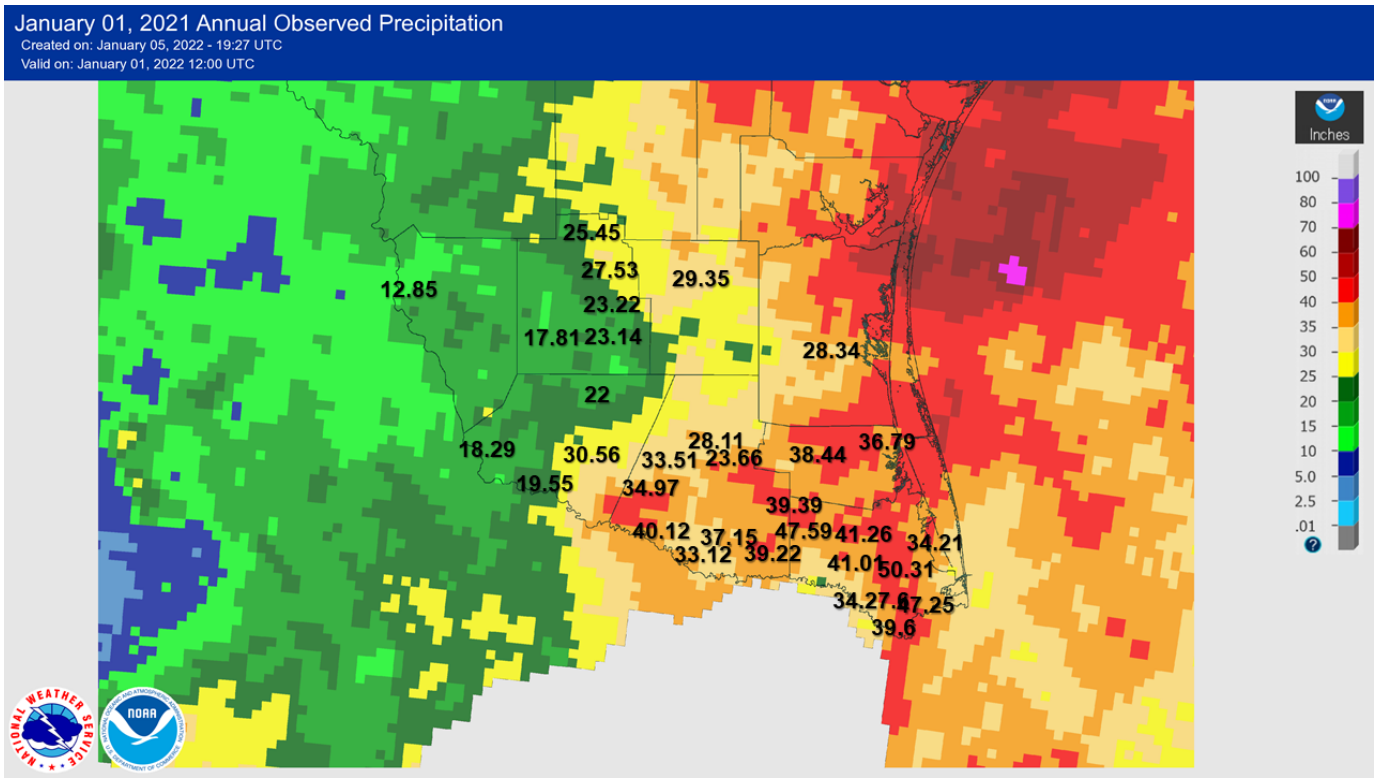
Click column heading to sort ascending, click again to sort descending.

| Rank | Value | Dates | Missing Days |
|---|---|---|---|
| 1 | 37.17 | 1966-01-01 through 1966-12-31 | 0 |
| 2 | 35.73 | 1976-01-01 through 1976-12-31 | 0 |
| 3 | 35.61 | 1958-01-01 through 1958-12-31 | 0 |
| 4 | 35.16 | 1973-01-01 through 1973-12-31 | 0 |
| 5 | 33.57 | 2003-01-01 through 2003-12-31 | 0 |
| 6 | 33.12 | 2021-01-01 through 2021-12-31 | 2 |
| 7 | 32.44 | 1967-01-01 through 1967-12-31 | 10 |
| 8 | 31.66 | 1975-01-01 through 1975-12-31 | 0 |
| 9 | 29.95 | 2015-01-01 through 2015-12-31 | 0 |
| 10 | 29.76 | 1970-01-01 through 1970-12-31 | 0 |

Period of record: 1941-06-01 to 2022-01-04

Based on 60 or fewer missing observations

***Annotated Annual Rainfall Map, 2021. Sources: NWS, CoCoRaHS, Texas Mesonet.***




***Annual Percentage of Average Rainfall Map, 2021.***