

Beneficial Rains, Coastal Flooding/Beach Erosion Impact the Rio Grande Valley/Deep South Texas Ranchlands, June 18-20, 2024

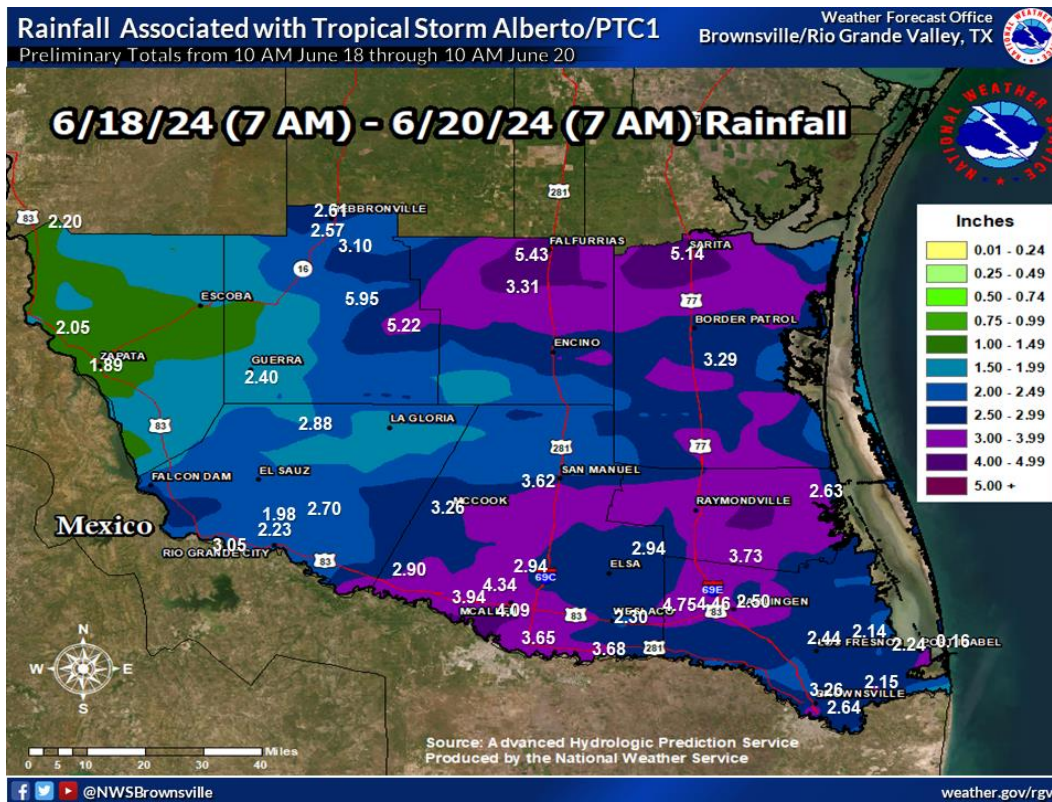
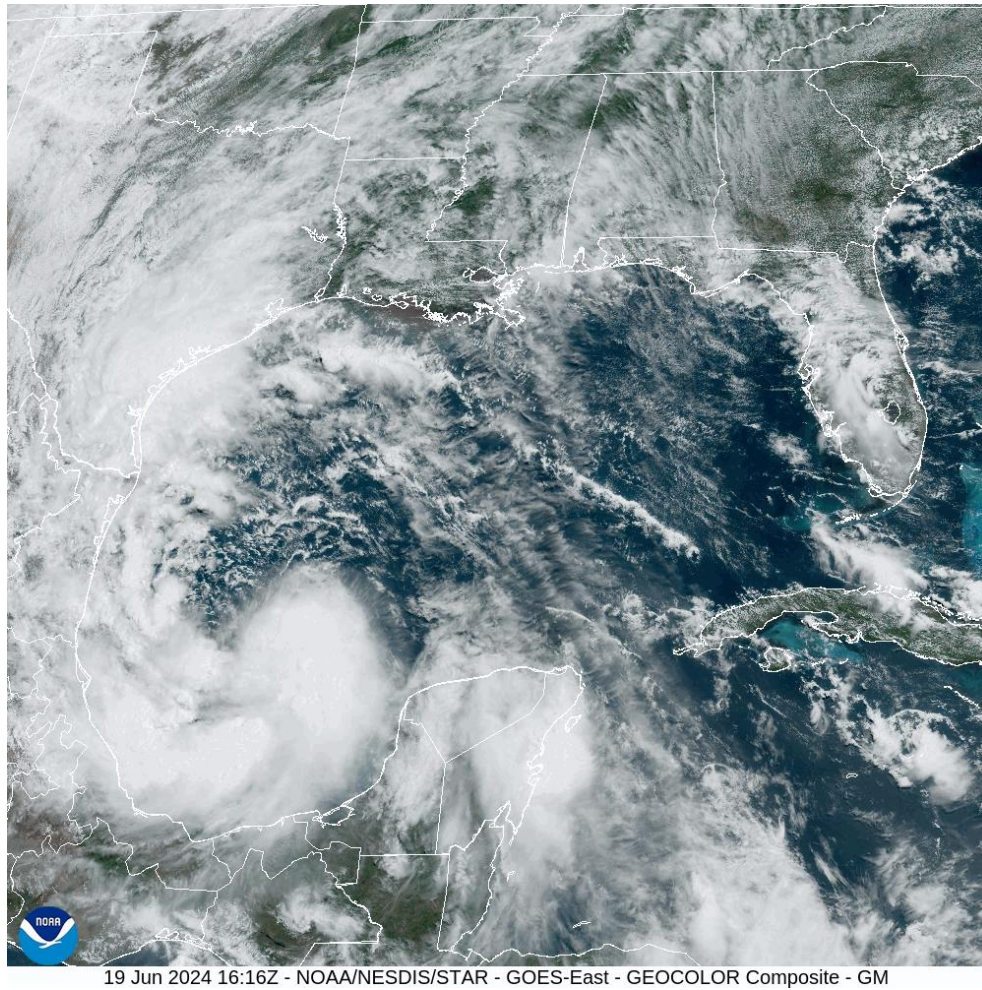


Figure 1. Rainfall associated with moisture from Tropical Storm Alberto/Potential Tropical Cyclone 1, 7 AM June 18 through 7 AM June 20, 2024. Additional isolated to scattered showers fell later on the 20th and 21st after the cyclone made landfall near Tampico, Tamaulipas, Mexico.



Above: Before and after photos taken on the beach, middle of the City of South Padre Island. Left, the widest usable beach of the year, June 14th, 2024, Gulf Access 16 (Neptune).. Right, Roaring waves at high tide June 20th, covering all of the beach at Gulf Access 19 (Aurora). These points are only one half mile from each other.



Above: *Satellite loop showing Alberto getting organized during the afternoon of June 19th, 2024 (swirl east of Tampico, Mexico, southwest Gulf) with broad north-south axis of rain bands that moved onshore well ahead of the landfall of the center, several hundred miles to the south.*

Summary

Following a persistent, record-heat-shattering May through mid-June 2024, the Rio Grande Valley was treated to widespread beneficial rainfall for the first time since mid-February, courtesy of a change in the atmospheric steering pattern which opened the door to a flow of deep tropical moisture from the southwestern Gulf and western Caribbean during the week of June 17th. Rainfall ranged from 1.5 to more than 5 inches across the region (Figure 1, above), and all of it was beneficial – the distance and time between torrential rain bands allowed rain water to soak in rather than rise up. At most, very minor non-impactful brief flooding of poor drainage areas in Hidalgo and Cameron County occurred, but there were no reports of any notable street or property flooding.

The strength and persistence of surface easterly flow well north of the “center” rapidly built seas and swell over the western Gulf, which pounded into the beaches and flooded them with more than 2 feet of water above normally high ground. Nearly three days of these conditions cause significant beach erosion and calving of dunes north of the City of South Padre, with the highest tide levels observed across the Lower Laguna Madre for more than an instant since Tropical Storm Beta in late September, 2020. What had been some of the widest beaches of the season – due to astronomically low tides in late June – became flattened, flooded beaches by the time conditions began to improve – slightly – by late June 21st. Very high surf and life-threatening rip currents developed early on June 18th and would continue into the following weekend. The high tidewater, bottled up in the southern Laguna Madre, rose high on docks and into unprotected areas of Port Isabel and the Laguna side of South Padre Island, as well as onto State Road 4 near Boca Chica Beach. Boat ramps became inaccessible along SR 48 east of the Port of Brownsville. Beach and tide (storm surge) related damage would be calculated after conditions improved.

Evolution

Embedded in the broad southeasterly atmospheric flow (Figure 2) was a break-off wave from a persistent [Central American Gyre \(CAG\)](#), which had developed the prior week. That wave would eject into the Bay of Campeche on the 17th, and slowly organize – and elongate east of the entire Texas coast and south of the Louisiana coast by the 18th. As the wave elongated, associated surface low pressure across the southwest Gulf would combine with strengthening surface high pressure along the southeast U.S. coast – associated with that region’s first “heat dome” – to rapidly build a prolonged, strong fetch of easterly winds and waves across the entire western Gulf (Figure 3).

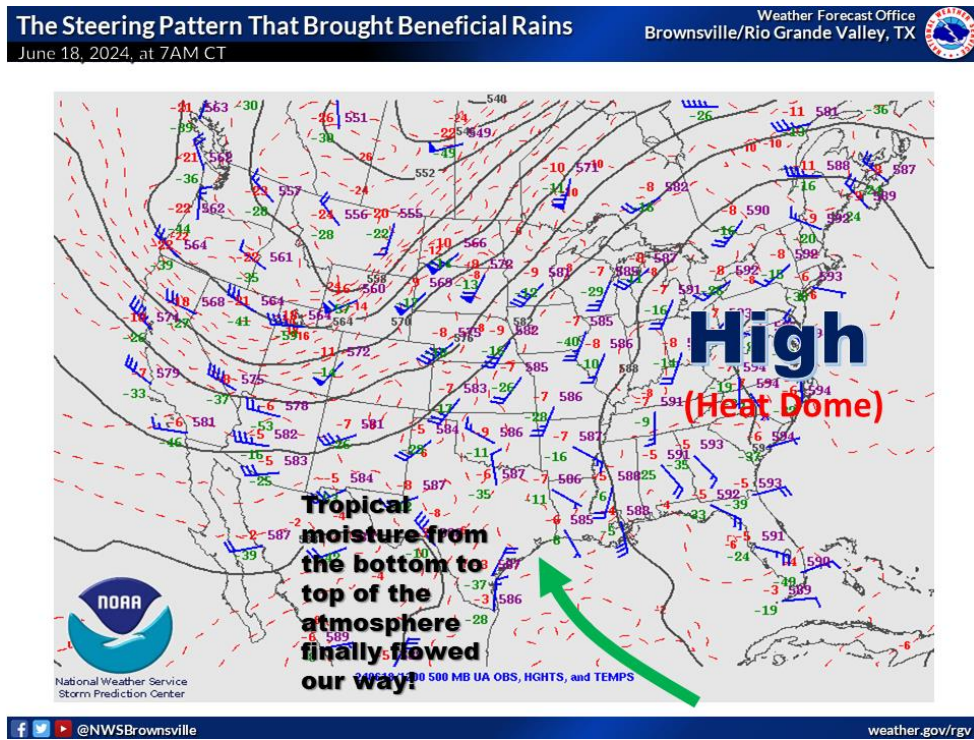


Figure 2. Steering pattern at 500 mb (around 18,000 feet) clearly showing a shift to full-atmospheric flow from the southeast ahead of the wave that would become Tropical storm Alberto on the 19th.

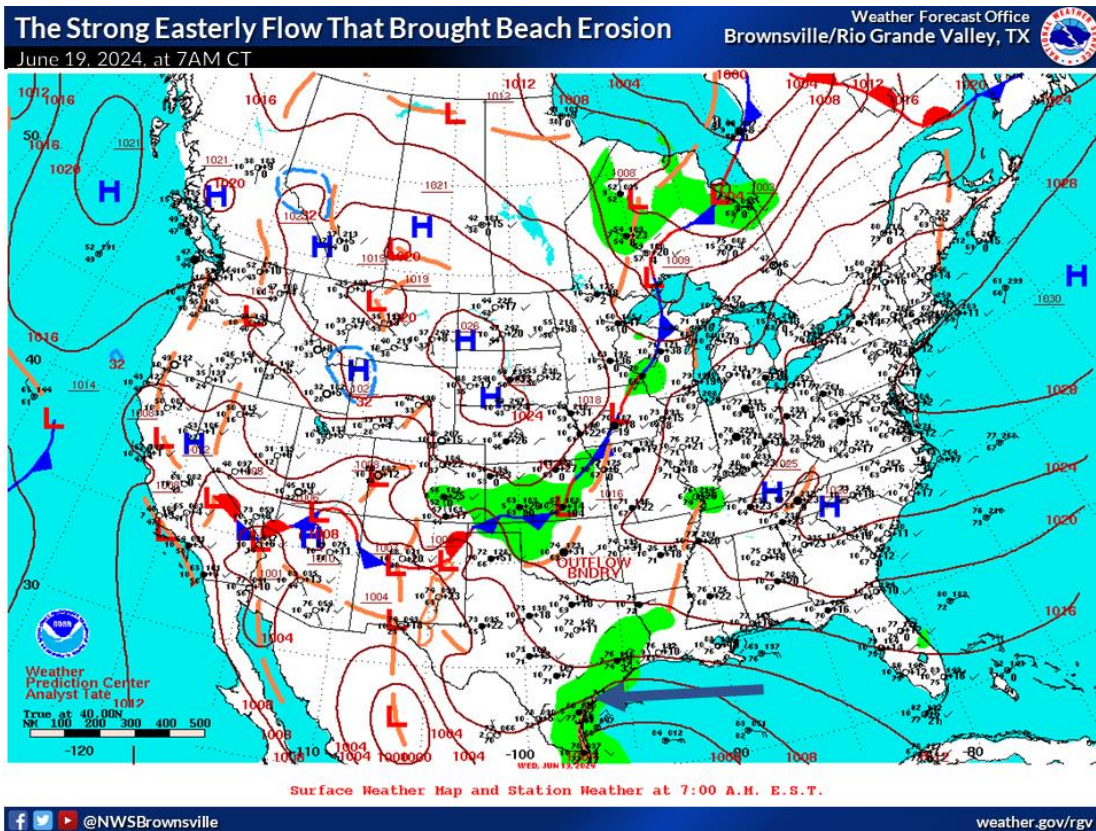


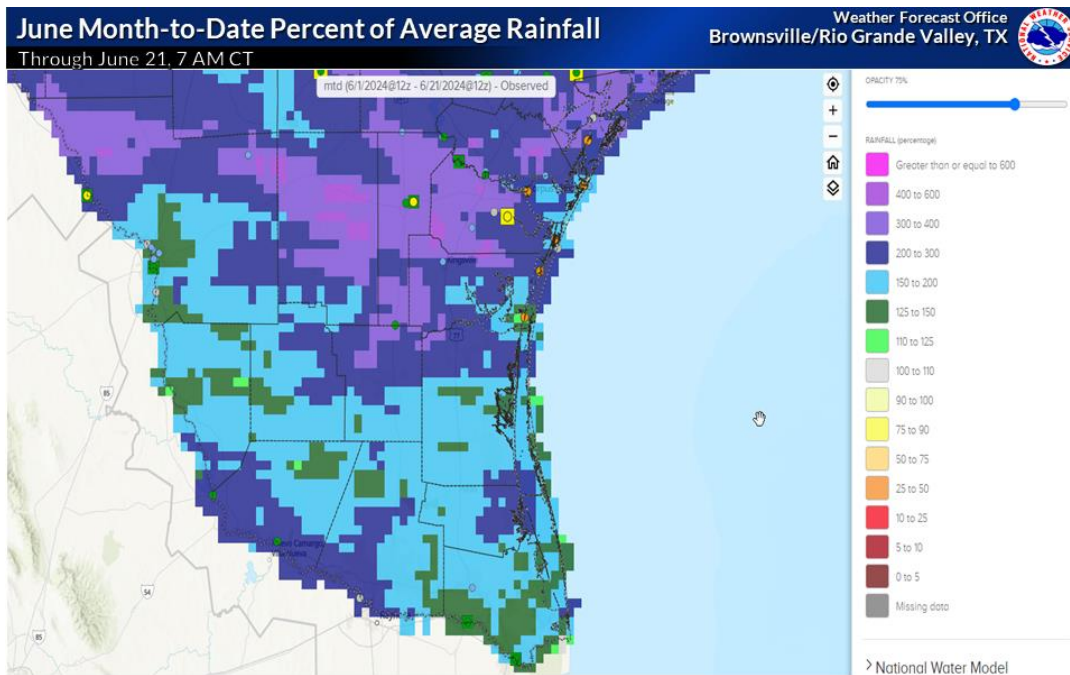
Figure 3. Surface pattern at 7 AM June 19th. Note the strong surface high pressure system (blue H) along the eastern seaboard, with developing low pressure in the southwest Gulf. The relatively “tight” difference between them supported strong easterly flow (blue arrow) across the western Gulf leading to significant high tides and beach erosion.

Those winds frequently gusted to tropical storm force (34 knots, or 39 mph) over the open waters – as far north as 400 miles from the slowly developing core of what became “Potential Tropical Cyclone One” (PTC-1) by the afternoon of Monday, June 17th. Through the day Tuesday, June 18th, the core of the low pressure slowly intensified, but a true closed circulation did not form until mid-morning June 19th, when the cyclone was given the name Alberto, 185 miles east of Tampico, Tamaulipas, Mexico (or nearly 300 miles south-southeast of Brownsville). The system would organize a little bit more as it turned west and accelerated into the coast near Tampico at around 5 AM on June 20th, with a small core of 50 mph winds.

After a slow start to rainfall that began late June 18th and persisted through mid-morning June 19th, the favorable, or “back”, side of the associated northward-extent trough, moved across the Lower Texas coast and steadily progressed across the Rio Grande Valley/Deep S. Texas region through early evening. Brief heavy showers became more steady rain bands for a few hours from late morning to early evening on the 19th, before the situation returned to more infrequent showers and a few thunderstorms from late evening through the overnight of the 19th into the 20th. Some of these cells exhibited rotation, but as of this writing, no verified tornadoes had occurred.

Rain and Wind

As mentioned above, the rain was beneficial for all areas of the Rio Grande Valley and Deep S. Texas ranchlands. Totals quickly surged the month-to-date values (through June 21, Figure 4) to 125 to 300 percent of average; with a weekend of rain on the way, the Valley was likely to end the month in surplus. The primary action day was late morning through late afternoon on the 19th (Figure 5), when the radar “filled in”. Fast movement – up to 30 mph – allowed beneficial rain to cover the area, rather than too much rain too soon.



All of the Rio Grande Valley/Deep S. Texas ranchlands jumped to 125 to 300 percent of June averages through June 21. The Coastal Bend and South Texas Brush Country jumped to 300+ percent of average.

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Figure 4. June 1 through 21 percent of average rainfall for south Texas. Moisture associated with PTC-1/Alberto produced sufficient rain to push values above 100 percent across the entire region.

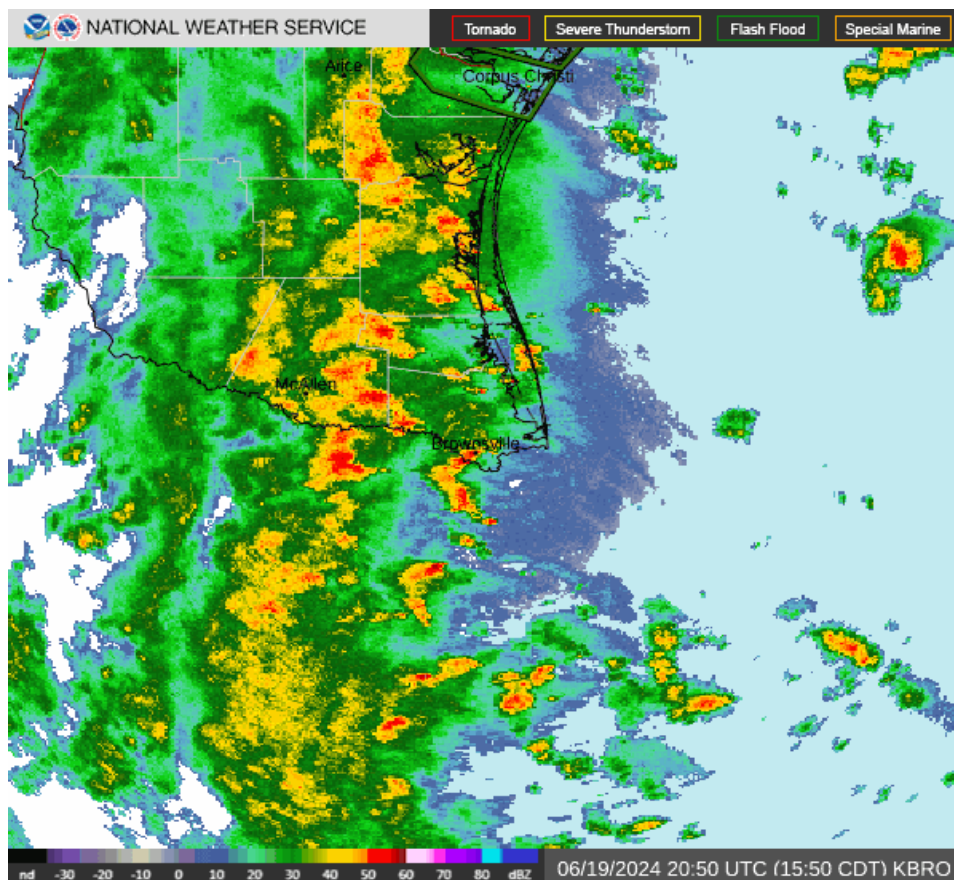


Figure 5. Radar image showing period of heaviest rainfall (mid to late afternoon) across the lower/mid RGV and Brooks and Kenedy County ranches, June 19th, 2024.

As the system passed through on the 19th, the strongest winds occurred only within or near squalls or heavier rain bands, and largely remained below tropical storm force, except for a few locations along Laguna Madre and the beaches. Ironically, the strongest gusts on land actually occurred on June 20th, with strong gusts along the edges and inside showers – aided by afternoon sunshine in some cases. Other peak gusts during the evening of the 19th were likely due to the tightest difference between the pressure systems as well as on the edge of individual cells. No damage or non-routine power outages were reported. The strong wind data are shown below.

Location	Speed	Time/Date	Provider
...Texas...			
...Brooks County...			
Falfurrias	35 MPH	0504 PM 06/20	RAWS
Falfurrias	33 MPH	0455 PM 06/20	AWOS
Encino	24 MPH	0405 PM 06/20	DAVIS
...Cameron County...			
Brownsville	56 MPH	0602 AM 06/20	ASOS
11 N Laguna Vista	45 MPH	1018 PM 06/19	NDBC
Harlingen	45 MPH	1059 PM 06/19	ASOS
Port Isabel	45 MPH	0252 AM 06/20	ASOS
Russell Farms	41 MPH	0625 AM 06/20	MESOWEST
Port Isabel, TX	40 MPH	0318 AM 06/20	NOS-NWLON
Laguna Atascosa	34 MPH	0722 AM 06/20	RAWS
La Feria	34 MPH	0439 PM 06/20	CWOP
Los Fresnos	34 MPH	0507 PM 06/20	CWOP
Los Fresnos	31 MPH	1056 PM 06/19	CWOP
BROWNSVILLE	24 MPH	0116 AM 06/20	CWOP
Harlingen	22 MPH	1145 AM 06/20	DAVIS
...Hidalgo County...			
Mcallen	47 MPH	0314 PM 06/20	ASOS
Texas Agriscience	42 MPH	0110 PM 06/20	MESOWEST
Edinburg Intl	41 MPH	0336 PM 06/20	AWOS
Mission	39 MPH	0335 PM 06/20	CWOP
Weslaco Midvally	38 MPH	0535 PM 06/20	AWOS
Santa Ana Nwr	32 MPH	0545 PM 06/20	RAWS
Mission	31 MPH	1025 PM 06/19	DAVIS
Linn-San Manuel	31 MPH	0346 PM 06/20	RAWS
MCALLEN	31 MPH	0515 PM 06/20	CWOP

Sandpiper Resort	28 MPH	0325 PM	06/20	DAVIS
McAllen	27 MPH	0505 PM	06/20	CWOP
...Jim Hogg County...				
Hebbronville	48 MPH	0555 PM	06/20	AWOS
Hebbronville	46 MPH	0646 PM	06/20	RAWS
...Kenedy County...				
Sarita Station	38 MPH	0950 PM	06/19	MESOWEST
...Starr County...				
6.0 NW La Gloria (TWDB)	39 MPH	0515 PM	06/20	MESOWEST
Falcon Lake	30 MPH	0411 PM	06/20	RAWS
...Zapata County...				
Zapata	32 MPH	0535 PM	06/20	AWOS
...Maritime Stations...				
Rincon Del San Jose, TX	53 MPH	0612 AM	06/20	NOS-NWLON
54 ENE Port Mansfield	45 MPH	0550 AM	06/20	NDBC
SPIW Park	43 MPH	0159 AM	06/20	WXFLOW
South Padre Island C.G. Stat	41 MPH	0242 AM	06/20	NOS-NWLON

Above: Summary of peak winds (gusts) associated with the pressure difference between Alberto and residual low pressure in the southwest Gulf and strong high pressure along the southeast U.S. coast, from late June 19th through June 20th. Many of these winds were reported after Tropical Storm Warnings were lifted.

Storm Surge

The perfect combination of gradient (differential) wind between the aforementioned eastern U.S. surface ridge and broad low pressure that tightened up to include Tropical Storm Alberto brought a rapidly developing strong easterly flow. By the peak of the inflow, offshore seas had built as high as 18 feet, swell period (the time between peak waves) ranged from 10 to 12 seconds. This flow was persistent from early June 18 through early June 21, and maintained high, dangerous surf, very intense currents, and sea water covering the beach for nearly all of the period beginning at high tide Tuesday morning (18th), peaking at high tide both Wednesday and Thursday (20th) morning, and persisting into Friday morning's (21st) high tide. A rare storm surge – the difference between observed tide levels and predicted levels – reached 3 feet at the lower Laguna Madre (bay) locations of South Padre Coast Guard and Port Isabel, and likely did the same at Brazos Santiago, just inshore of the Isla Blanca jetty. The sharp rise in tide departures on June 19th was likely a combination of strong inflow into the ship channel entrance, running into flow from north to south down Laguna Madre – where morning winds on the 19th were from the north/northeast.

The result was the highest persistent water levels since Tropical Storm Beta in late September 2022. However, unlike Beta, the actual tide predictions were much lower – and likely spared even worse damage/erosion. Surge values during Beta were lower, but predicted tide levels were higher (the fall “King” tides were underway

during Beta). Peak **preliminary** surge and high tide values were as follows for available locations. Final values will be available after verification later in summer.

South Padre Island CG Station

- June 19th at 912 PM CT: 3.17 feet above predicted
- June 20th at 342 PM CT: 3.08 feet above predicted

Port Isabel station:

- June 19th at 8 PM CT: 3.24 feet above predicted
- June 20th at 606 PM CT: 3.2 feet above predicted

Brazos Santiago station (just inshore of the Isla Blanca jetty)*:

- June 19th, 654 PM CT: 3.44 feet above predicted**
- June 20th, 336 PM CT: 3.14 feet above predicted.

Preliminary peak water levels, which occurred at high tide, were as follows:

- Port Isabel: **2.87 feet**, 606 AM June 20th
- South Padre Island CG Station: **2.73 feet**, 554 AM June 20th
- Brazos Santiago: **2.50 feet**, 5 AM June 20th

*Site had several periods of missing data.

** Peak departure was a single “spike” that may not be valid after data are verified. Other observations were just above 3 feet (3.11 to 3.19).

If the peak water levels verify, they would be the **fourth highest on record for Port Isabel**, behind only Hurricane Allen (August 9, 1980, 5.57 feet), Hurricane Beulah (September 20, 1967, 4.37 feet), and Hurricane Carla (September 11, 1961, 3.23 feet). Hurricane Alex (June 30, 2010) was next at 2.8 feet.

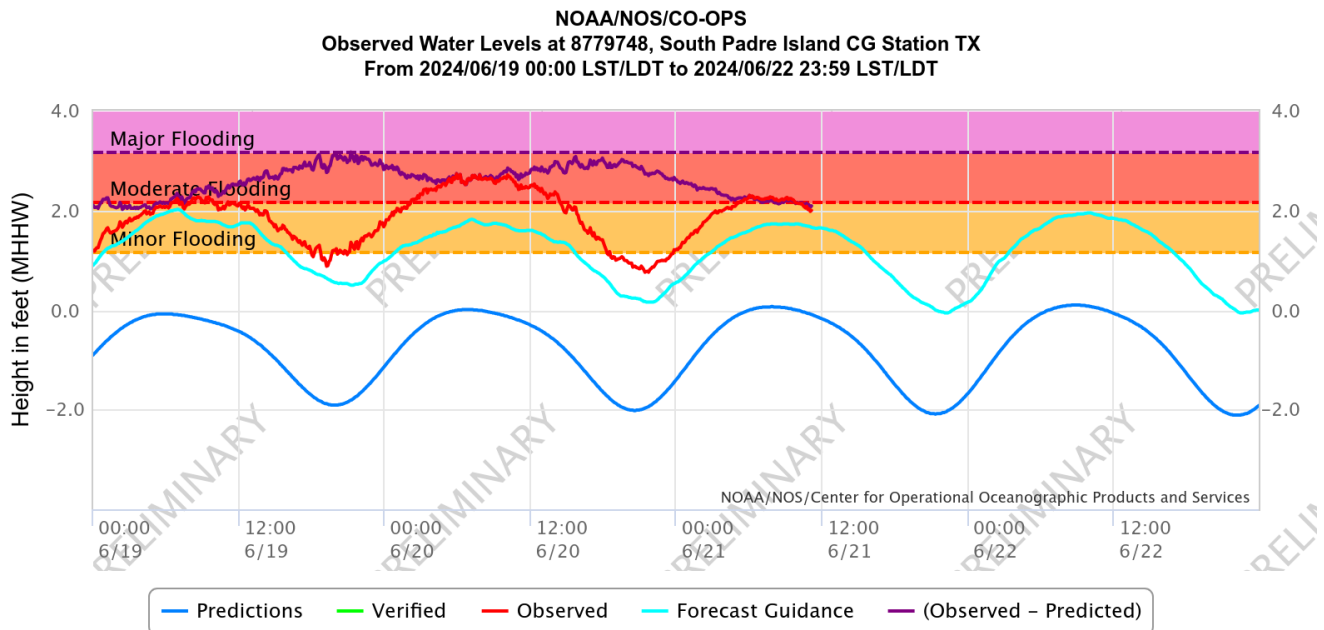


Figure 6. Tide predictions, departures, and actual values for the South Padre Island US Coast Guard Station (bayside) during the peak period of high-water flows associated with PTC-1/Tropical Storm Alberto, June 19-20, 2024.

NOAA/NOS/CO-OPS
Observed Water Levels at 8779770, Port Isabel TX
From 2024/06/19 00:00 LST/LDT to 2024/06/22 23:59 LST/LDT

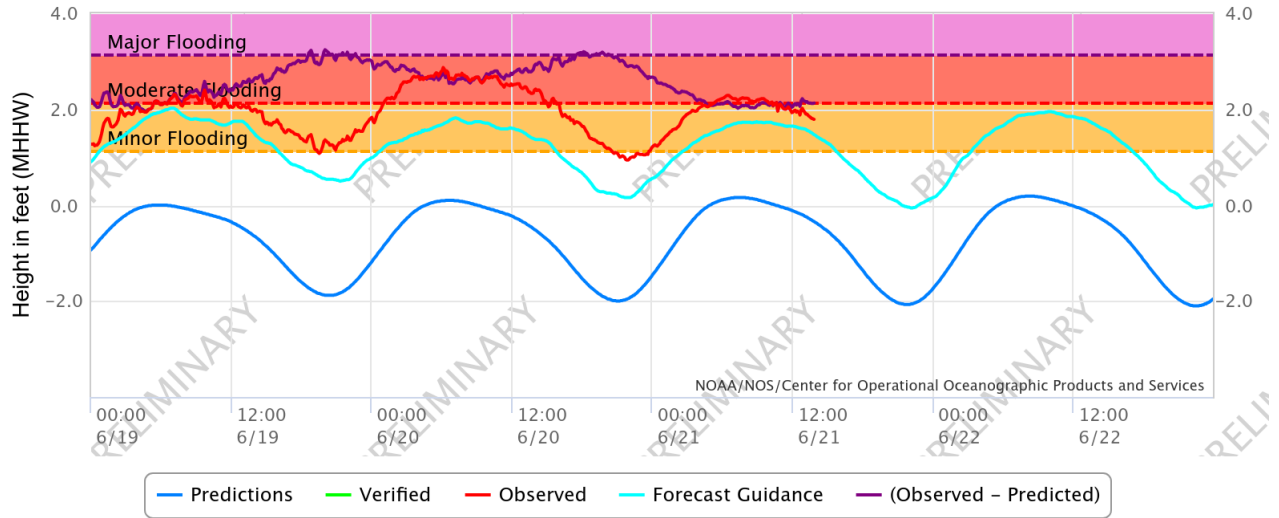
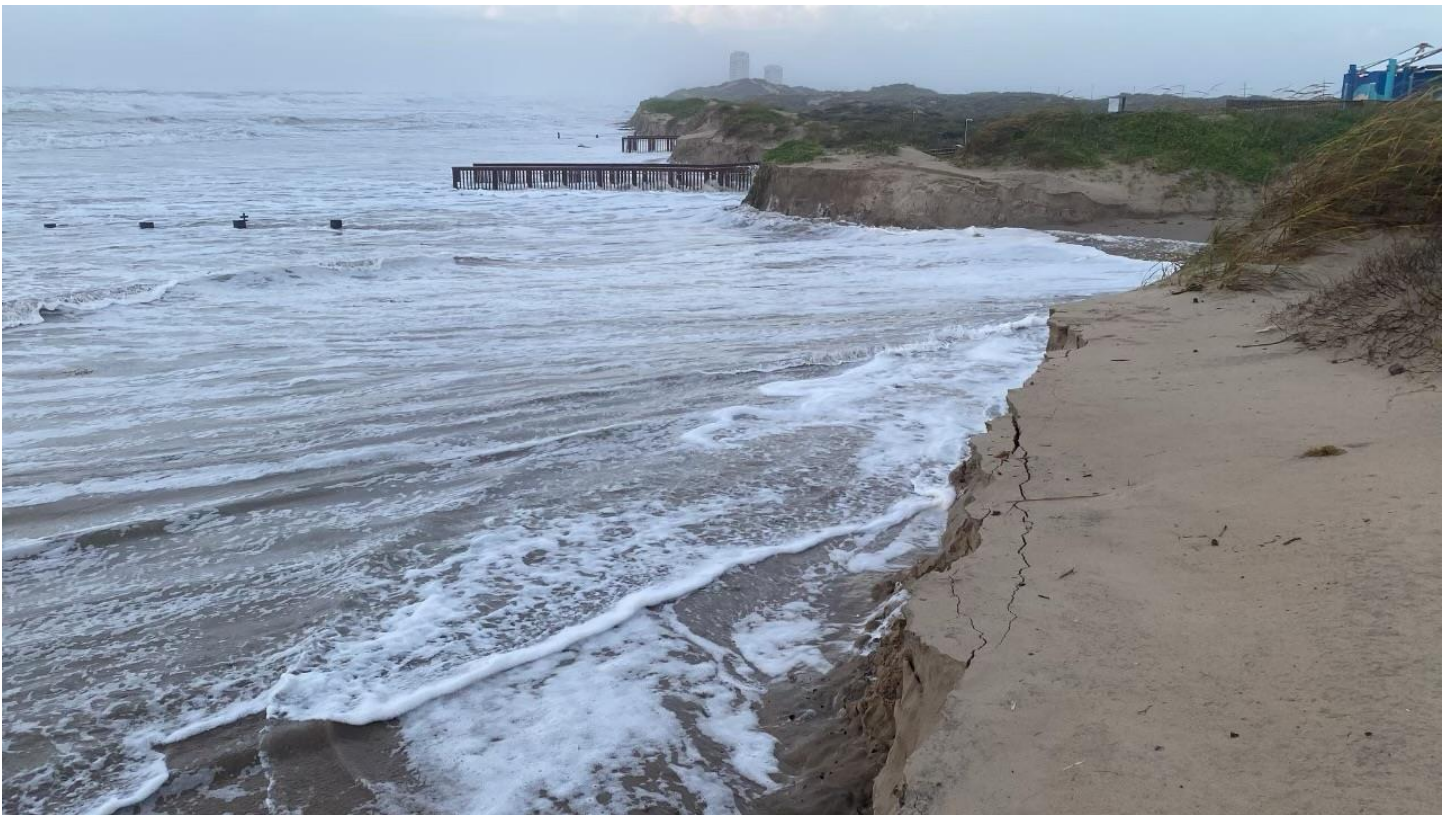
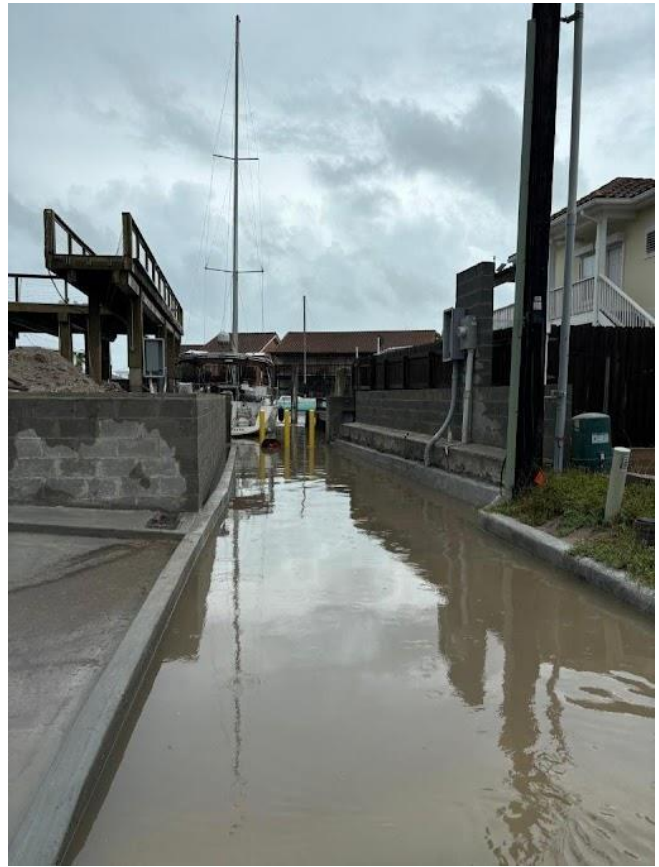


Figure 7. Same as Figure 6 except for the Port Isabel station.



Above: Photo of calving dunes, near Cameron County Public Beach Access #5 on South Padre, around the time of high tide on June 20th. Credit: Joe Vega, Cameron County Parks Dept.



Above: Photo of unusually high water at docks and a canal in Port Isabel. Photo credit: Public report used with permission.

Falcon Reservoir Relief? A Little is Better than None

The rains reached the headwaters of the Lower Rio Grande, with very impressive amounts – initially reported at least 20 to 25 inches of rain which produce massive rapid-flow flash flooding near Monterrey, Nuevo Leon, Mexico – potentially the most since 2010’s Alex. However, lesser rains fall farther north – but still sufficient to produce a brief water rise – or flood “wave” – that moved downstream along the Rio Grande between Del Rio and Laredo. The gage at Columbia Bridge went into action stage on June 20th, and water flow began to reach Falcon reservoir on the 20th and continued into the 21st. Levels rose from 9.25 percent total capacity on June 15th to 9.8 percent as of midday on June 21st, with additional rises expected. Still, these levels are only just “off the mat” from historically low values...and remain only a hair above them for the late June time of year.

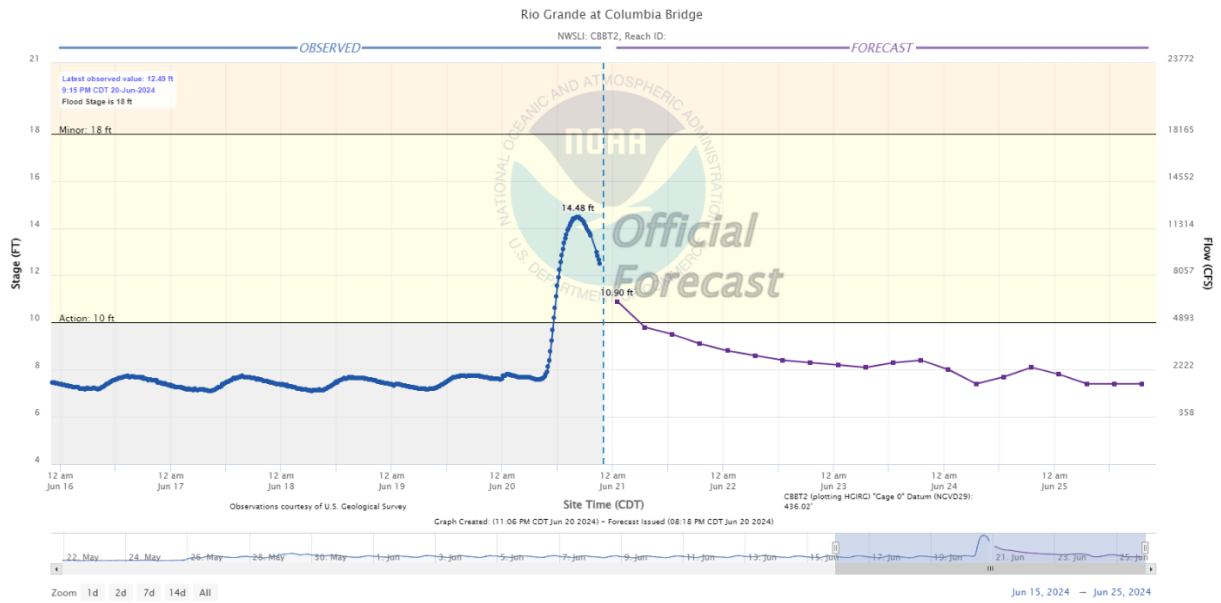


Figure 8. Hydrograph showing flood "wave" that spiked river gage levels at Columbia Bridge, northwest of Laredo, during the afternoon of June 20th, 2024.