

## **Pinellas County Beaches during Tropical Storm Debby, June 25, 2012 and June 26, 2012**

### **Initial Field Observations during the Storm by Ping Wang**

June 25<sup>th</sup> and 26<sup>th</sup> are the second and third days of impact by the energetic conditions associated with Tropical Storm Debby along the Pinellas County beaches. High waves and elevated water level of 2 to 3 feet above predicted levels were causing severe beach erosion. Generally, wider pre-storm beach fared better than the narrow pre-storm beach. Dune and beach scarping was observed along most sections of the beaches, except along sections with very wide (~ over 150 ft wide) beach. It is not clear why scarps were not developed along most of the wide beaches.

This report updates the June 25<sup>th</sup> report and includes the observations on June 26<sup>th</sup>, the third day of energetic wave conditions with elevated water levels. Compared to the conditions on June 25<sup>th</sup>, the overall storm energies subsided modestly on June 26<sup>th</sup>, although the wave height and water level were still much greater than typical conditions. The goal of this continued field observation is to investigate 1) if the active beach and dune erosion has largely stopped as the storm started to subside, very slowly, or 2) if the active erosion continued for this prolonged storm. Similar sites as visited on June 25<sup>th</sup> were visited again on June 26<sup>th</sup>.

In the following, the field observation is described from south to north. Same figure number is used, with June 25<sup>th</sup> photo labeled as Figure XXX\_a and June 26<sup>th</sup> photo labeled as Figure XXX\_b. A red font is used for the description of June 26<sup>th</sup> observations.

Overall, no significantly more erosion occurred along Sand Key north of the headland. However, continued beach and dune erosion occurred at the Sand Key headland. Slightly more erosion occurred south of the headland. A section of Redington Beach (R106-R108) suffered substantially more erosion on June 26<sup>th</sup>. On Treasure Island, Sunshine Beach sustained slightly more dune erosion, while Sunset Beach experienced significantly more erosion on June 26<sup>th</sup>. Sunset Beach likely suffered the most severe dune erosion along the studied beaches. Upham Beach remained rather stable on June 26<sup>th</sup>, as compared to June 25<sup>th</sup>. Considerably more dune erosion occurred along the southern section of the Pass-A-Grille Beach.

### **Long Key:**

**Pass-A-Grille Beach: (R163-R165):** The pre-storm beach was quite narrow. Severe beach erosion occurred on June 25<sup>th</sup> resulting in a continuous dune scarp (Figure 1a). Storm waves are crashing on the seawall in front of the snack bar (Figure 2a). **Considerably more dune erosion occurred along this stretch of the beach on June 26<sup>th</sup>, 2012 as high waves continued to impact the scarp directly.**



Figure 1a. Pass-A-Grille Beach looking north to the snack bar, June 25<sup>th</sup>, 2012.



Figure 1b. Pass-A-Grille Beach looking north to the snack bar, June 26<sup>th</sup>, 2012.



Figure 2a. Pass-A-Grille Beach, seawall in front of the snack bar, June 25<sup>th</sup>, 2012.



Figure 2b. Pass-A-Grille Beach, seawall in front of the snack bar, June 26<sup>th</sup>, 2012. Water in front of the seawall became deeper.

**Middle Section of Long Key (R162-LK6):** The middle section of Long Key still has a flat back beach and a berm (Figure 3). This section of the beach was quite wide pre-storm. Except a section between R159-R155, no significant beach or dune scarp was observed (Figure 4). This section of the beach appeared to be similar on June 26<sup>th</sup>.



Figure 3: Long Key, looking north from ~R162.



Figure 4. Minor dune scarping , looking north from ~R158.

**Upham Beach:** The southern section of Upham Beach (LK3-LK5A) still has a wide beach with no beach scarping (Figure 5). However, judging from the seawall just north of LK3, the beach is likely eroded back 20-30 ft (Figure 6). The northern section of Upham Beach (LK2A to the Blind Pass south jetty) does not have any dry beach left (Figure 6). The storm waves were crashing onto the seawall. This section of the beach appeared to be similar on June 26<sup>th</sup>, as compared to June 25<sup>th</sup>.



Figure 5. LK3, looking south. No beach scarps.



Figure 6. LK3, looking north. Severe beach erosion and overwash into the fence.

## Treasure Island

**Sunset Beach (R137-R142):** Severe beach erosion along this stretch of the beach. R142 and R141 section is severely eroded but with no dune scarp. **This section of the beach appeared to be similar on June 26<sup>th</sup>.** There was a pre-storm dune scarp there. The scarp was nearly completely eroded. R140-R138 has a continuous dune scarp (Figure 7a). Based on the location of the USF survey benchmarks, the dune line retreated 10-15 ft by June 25<sup>th</sup>, 2012. At R139, the seawall became exposed (Figure 8a). Between R139 and R138, the low dune field became quite narrow (Figure 9). **The scarp along R140-R138 has become much worse on June 26<sup>th</sup>, as compared to June 25<sup>th</sup> (Figure 7b). The seawall at R139 was completely exposed with severe erosion in front of the seawall. The dune scarp between R139-R138 also retreated. Overall, on June 26<sup>th</sup>, the dune scarp along this section of the beach retreated another 5 to 10 ft.**



Figure 7a. R140.5 looking north. Continuous dune scarp, June 25<sup>th</sup>, 2012.



Figure 7b. R140.5 looking north. Continuous dune scarp, June 26<sup>th</sup>, 2012. About 5 ft more landward retreat was observed.



Figure 8a. Seawall became exposed at R139, June 25<sup>th</sup>, 2012.



Figure 8b. Seawall became completely exposed at R139, with a nearly 3-ft scour in front of the seawall, June 26<sup>th</sup>, 2012.



Figure 9a. Between R138 and R139. Severe dune erosion. The stairs in the photo was from the dune overwalk near the top of the photo, June 25<sup>th</sup>, 2012.



Figure 9a. Between R138 and R139. Severe dune erosion. Note the PVC pipes have become completely exposed due to the ~5-ft additional scarp retreat, June 26<sup>th</sup>, 2012..

**Middle Section of Treasure Island (R136-R129):** The middle section of Treasure Island was very wide pre-storm. This section still has a wide beach with a berm and no significant beach and dune scarps (Figure 10). The beach appeared to be similar on June 26<sup>th</sup>. It is difficult to compare visually.



Figure 10. R129 looking south. Wide beach with no beach or dune scarp, June 25<sup>th</sup>, 2012.

**Sunshine Beach (R128-R127):** This section of the beach was nourished in August 2010. The beach was modestly wide before the storm. Severe beach erosion occurred with dune scarping. The northern-most dune walk is impacted by wave runoff (Figure 11a). Slightly more dune erosion and scour under the dune overwalk occurred on June 26<sup>th</sup>, 2012 (Figure 11b).



Figure 11a. The northernmost dune overwalk on Treasure Island, looking south, June 25<sup>th</sup>, 2012.



Figure 11a. The northernmost dune overwalk on Treasure Island, looking south, June 26<sup>th</sup>, 2012.

## Sand Key

**South Sand Key (R124-R119):** This section of the beach was not nourished recently and has been quite stable over the last 8 years. Severe beach erosion and dune scarping occurred along most of this section of the beach except at locations with relatively wide beach (Figure 12). **This section of the beach appeared to be similar on June 26<sup>th</sup>.**



Figure 12. R123 looking north. The dune scarp is not continuous but quite close to being continuous. Exceptions are places with wide beach or no dune (e.g., at R120).

**The Madeira Beach Groin Field (R118-R110):** The groin field was completely submerged and hardly visible. Severe beach erosion and nearly continuous dune scarp occurred (except at locations without dunes) (Figures 13 and 14). **This section of the beach appeared to be similar on June 26<sup>th</sup>.**



Figure 13. R118 looking south, nearly continuous dune scarping. June 25<sup>th</sup>, 2012.



Figure 14. R114 looking north. Nearly continuous dune scarping, except at places without dunes.

**End of Sand Key 2006 Nourishment (R109-R106):** This section has very narrow pre-storm beach and very small to no dunes. All the small dunes were nearly completely eroded. The waves were crashing on the seawall on June 25<sup>th</sup>, 2012 (Figure 15a). Considerably more erosion occurred on June 26<sup>th</sup>, 2012 (Figure 15b). The very small amount of sand in front of the seawall has become completely eroded, with over 1 ft additional scour in front of the seawall. At places, rip-raps in front of the seawall became exposed.



Figure 15a. R107 looking north. Several beach signs were washed down, June 25<sup>th</sup>, 2012.



Figure 15b. R107 looking north. Additional erosion occurred along the seawall, June 26<sup>th</sup>.

**North Redington Beach (R105-R100):** This section of the beach was quite wide before the storm, especially at the breakwater. The beach was still quite wide even with the elevated water level (Figures 16 and 17). Only limited beach and dune scarping was observed. The breakwater is mostly submerged. No apparent erosion was observed landward of the breakwater (Figure 18). This section of the beach appeared to be similar on June 26<sup>th</sup>.



Figure 16. Redington Beach Pier looking south.



Figure 17. Redington Beach pier looking north.



Figure 18. Redington Beach breakwater. The beach seemed to be flat and wide landward of the breakwater.

**North Redington Beach (R97-R93):** The section is severely eroded with nearly continuous dune scarp where dunes are present. Some of the dune scarps are very high, up to 6 ft (Figures 19 and 20). Most of this section does not have any back beach. The pre-storm berm was completely eroded. It is difficult to determine if the dune scarp has retreated further landward on June 26<sup>th</sup> due to the lack of fixed reference.



Figure 19. R94 looking south. Active dune scarping. Note the “freshly” fell off sand (lower left), June 25<sup>th</sup>, 2012.



Figure 20. R94 looking north. Nearly continuous beach and dune scarp, June 25<sup>th</sup>, 2012.

**South of Headland (R91-R87):** Similar to the above section, nearly continuous dune scarp. Beach scarp occurred when there is no dune on June 25<sup>th</sup> (Figures 21a, 22, and 23). The surface sediment in local areas has become much coarser with large shell debris on June 26<sup>th</sup> (Figure 21b). At this location, slightly additional dune scarping seems to have happened. The isolated dune feature in Figure 22 has been eroded.



Figure 21a. R88 looking north. Note the “freshly” fell over dune vegetation, June 25<sup>th</sup>, 2012.



Figure 21b. R88 looking north. Much coarser surface sediments, June 26<sup>th</sup>, 2012.



Figure 22. R88 looking south. An isolated dune that is about to be eroded away. A second line of small dunes was establishing along this section of the beach before the storm. That line of dune/vegetation was all eroded, June 25<sup>th</sup>, 2012. This feature was eroded by June 26<sup>th</sup>, 2012.



Figure 23. Beach scarp at R89. This section of the beach (~400 ft) does not have any dunes), June 25<sup>th</sup>, 2012.

**Headland (R86-R83):** This section of the beach was modestly wide (~60-100 ft) before the storm. Severe erosion and continuous dune scarping occurred (Figure 24a, 25a, 26a, and 27a). This is one of the most severely eroded sections with the highest dune scarp at R84. The protruding headland may have sustained higher waves, but this could not be confirmed from the field observations. Continued beach erosion and dune scarping occurred on June 26<sup>th</sup>, 2012 along the headland (Figure 24b, 25b, 26b, and 27b). Additional 3-6 ft dune scarp retreat occurred on June 26<sup>th</sup>.



Figure 24a. R85A looking south. June 25<sup>th</sup>, 2012.



Figure 24b. R85A looking south. June 26<sup>th</sup>, 2012.



Figure 25a. R85A looking north. Continuous dune scarp, June 25<sup>th</sup>, 2012..



Figure 25b. R85A looking north. Note the sail boat has fallen off due to the additional dune scarping, June 26<sup>th</sup>, 2012.



Figure 26a. R84 looking south. About 8 ft dune scarp. Note the sand was still falling of the scarp as the storm waves crashing on the dune scarp, June 25<sup>th</sup>, 2012.



Figure 26b. R84 looking south. Additional erosion occurred, June 26<sup>th</sup>, 2012.



Figure 27a. Fence in front of the hotel at R84. There was a beach and a dune in front of the fence before storm, June 25<sup>th</sup>, 2012.



Figure 27b. Fence in front of the hotel at R84. Slightly more beach erosion occurred and the surface sediment has become coarser, June 26<sup>th</sup>, 2012.

**Indian Rocks Beach (R81-R74):** This section of the beach was modestly wide (~50-100 ft) before the storm. Continuous beach scarp or dune scarp occurred (Figure 28, 29 and 30). **This section of the beach appeared to be similar on June 26<sup>th</sup>.**



Figure 28. R82 looking north, June 25<sup>th</sup>, 2012.



Figure 29. R74 looking south. Active dune scarping. Note that a “fresh” block was falling off the scarp, June 25<sup>th</sup>, 2012.



Figure 30. Turtle eggs exposed at R74 dune scarp, June 25<sup>th</sup>, 2012.

**2006 Nourishment area Transition R74-R71:** This section of the beach was quite narrow (less than 80 ft) before the storm. Severe beach erosion and nearly continuous beach and dune scarping occurred, except at localized places (Figures 31 and 32). **This section of the beach appeared to be similar on June 26<sup>th</sup>.**



Figure 31. R72.5 looking north. Continuous beach and dune scarp, June 25<sup>th</sup>, 2012.



Figure 32. ~R71.5 looking north. Continuous beach and dune scarp, June 25<sup>th</sup>, 2012.

**Belleair Shores (R70-R66):** This section did not receive beach nourishment during 2006 and before. The beach was very narrow (mostly less than 30 ft) before the storm. The narrow beach was mostly eroded, leaving a rather steep swash zone in front of the seawall. The sea oats and small dunes were largely eroded away. The waves were crashing onto the seawall, but not overtopping the seawall (Figure 33 and 34). This section of the beach appeared to be similar on June 26<sup>th</sup>. It is not clear why no additional scour occurred in front of the seawall here (Figure 33), while severe additional erosion occurred along exposed seawall at Redington Beach and Sunset Beach.



Figure 33. ~R69.5 looking north. The seawall was not overtopped, June 25<sup>th</sup>, 2012.



Figure 34. R68 looking north. Some dune vegetation survived at this time, June 25<sup>th</sup>, 2012.

**2006 Nourishment End Zone R65.5 – R62:** This section of the beach was narrow (~50 ft) before the storm. Severe beach erosion and continuous dune scarping occurred (Figures 35, 36, and 37). **This section of the beach appeared to be similar on June 26<sup>th</sup>.**



Figure 35. R64 looking south. Note the dune vegetation was being washed away by the high waves, June 25<sup>th</sup>, 2012.



Figure 36. R62 looking south, continuous dune scarping, note the crack in the sand at the bottom of the photo, June 25<sup>th</sup>, 2012.



Figure 37. R62 looking north, June 25<sup>th</sup>, 2012. The 2012 beach nourishment area in the distance.

**2012 Beach Nourishment Area (R61-R57):** The freshly nourished beach appears to be holding up reasonably well. Serious ponding on the back beach occurred on the beach, partly related to the not yet completed construction. No significant amount of gravel was found in the surf zone (landward edge of the surf zone) and on the surface.



Figure 38. R59 looking north with on-going beach nourishment, June 25<sup>th</sup>, 2012.