



Modernizing Coastal Erosion and the Primary Frontal Dune

ASFPM 2019



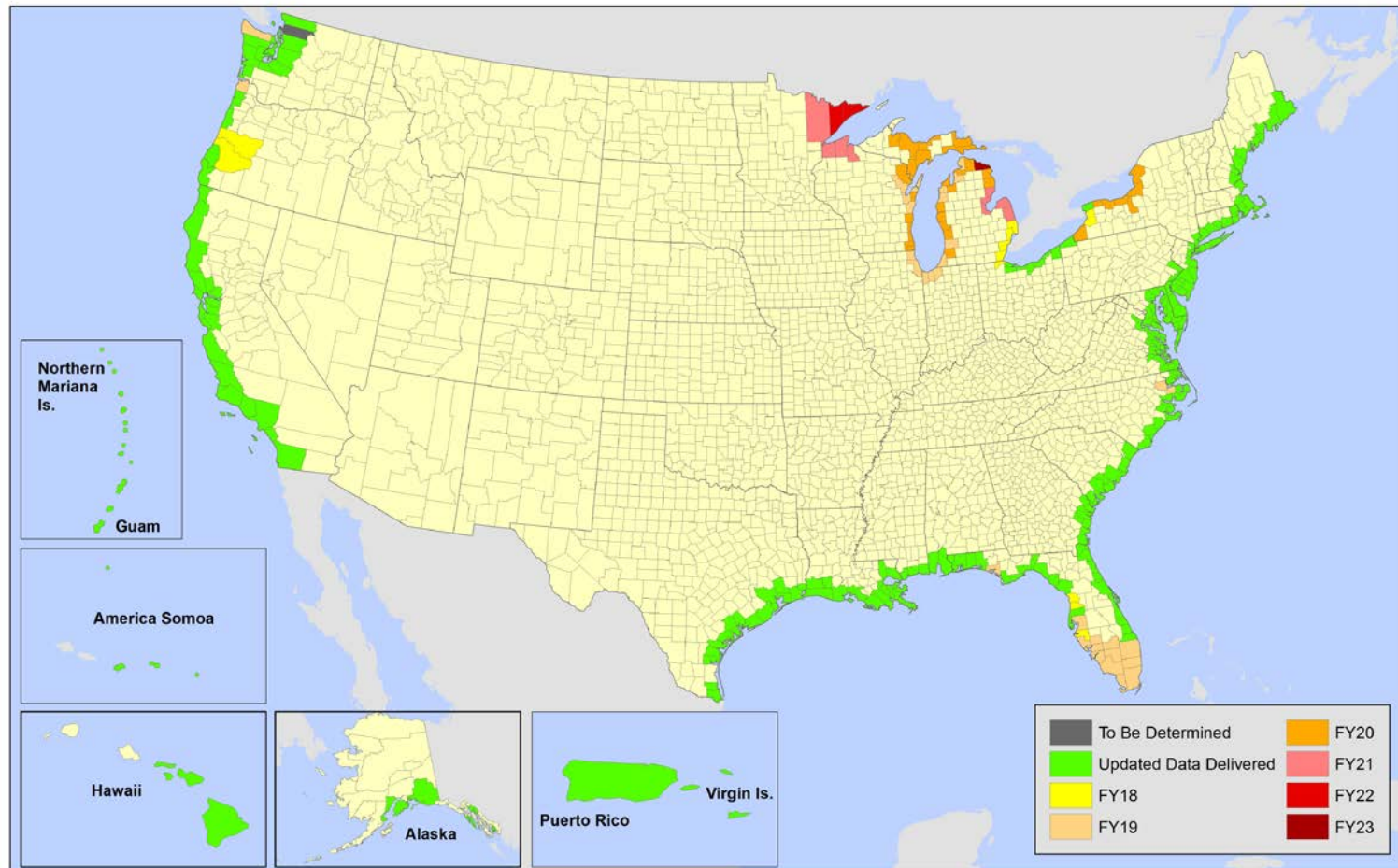
FEMA

Christina Lindemer

Federal Emergency Management Agency

FEMA's Investment in Coastal Mapping

Schedule of Coastal Counties Receiving Updated Mapping Data as of July 2018



FEMA

Updated mapping data consist of both preliminary Flood Insurance Rate Maps (FIRMs) and other non-regulatory products delivered to the county by FEMA. Data are tracked by fiscal year (FY), October through September. Data are updated quarterly and therefore subject to change. For more information, please call 1-877-FEMA MAP (1-877-336-2627), email FEMAMapSpecialist@riskmapcds.com, or visit <https://www.fema.gov/coastal-flood-risks>

RiskMAP
Increasing Resilience Together

Risk MAP Vision and Coastal Mapping

1

Address gaps in data



2

Align increased awareness
with reductions in
vulnerability



3

Support community-level
mitigation planning



4

Improve management of
Risk MAP resources
through tech



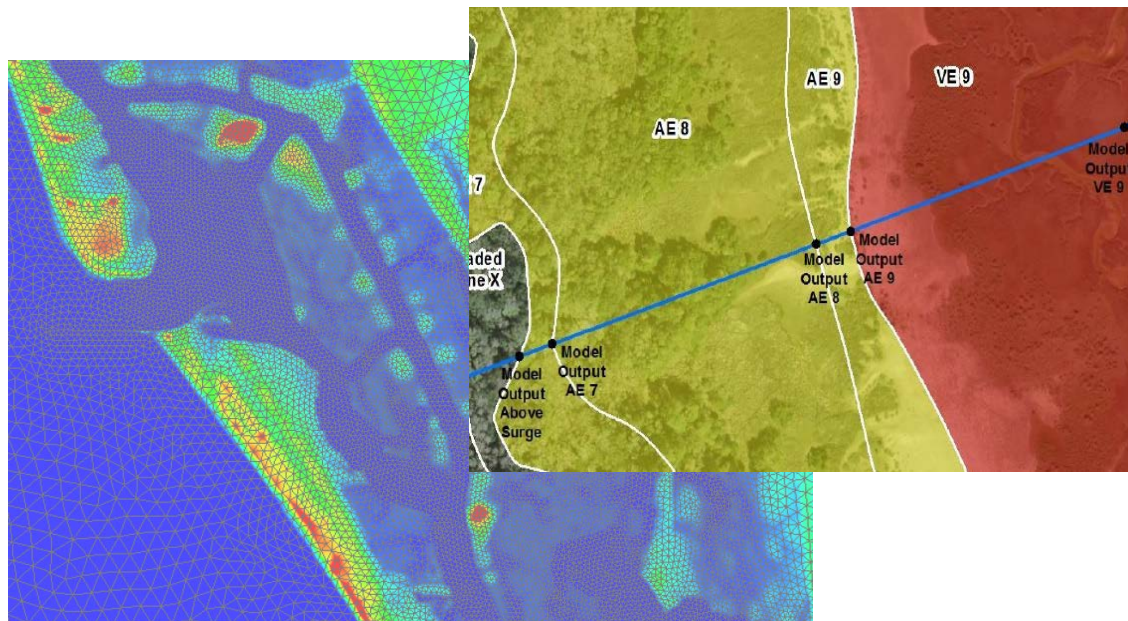
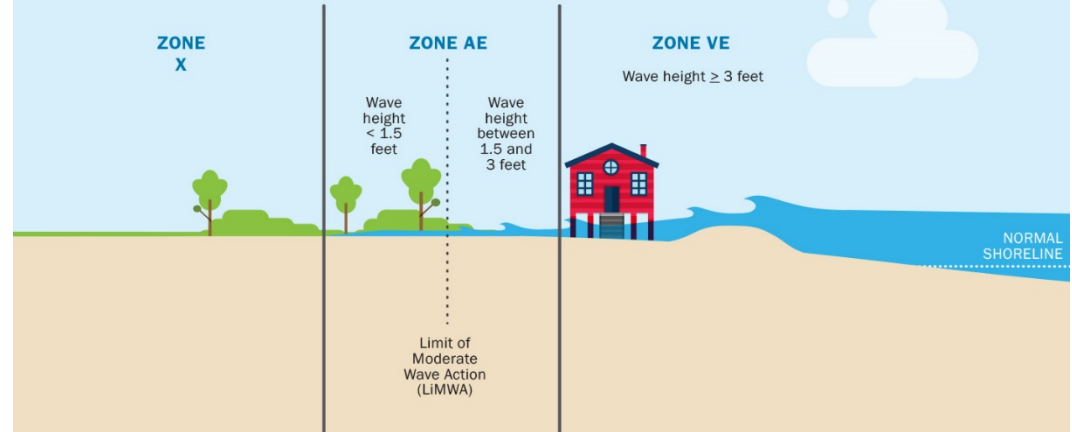
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Improve information sharing
between programs

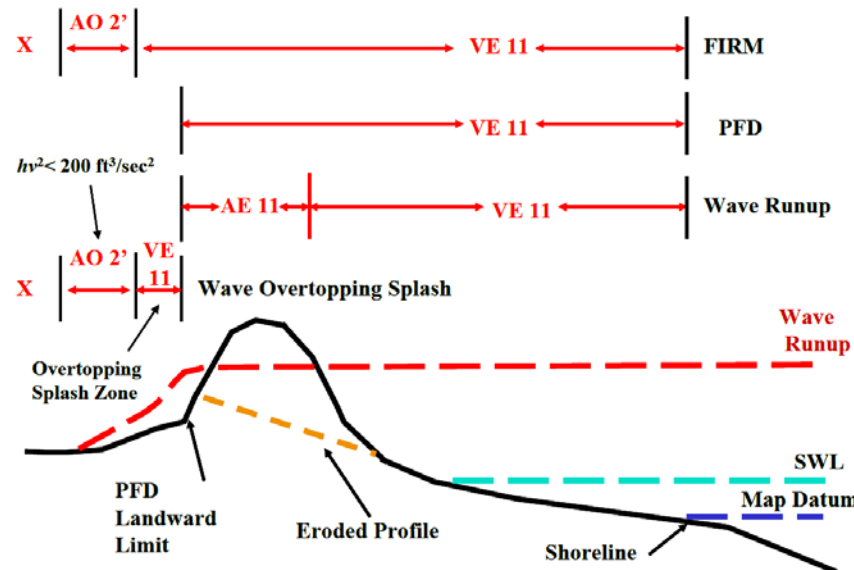
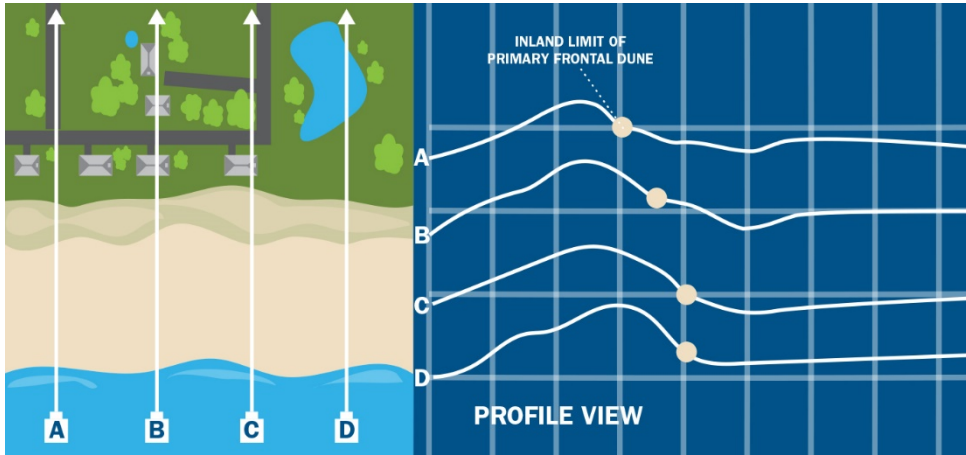


Risk MAP Goals

Coastal Mapping



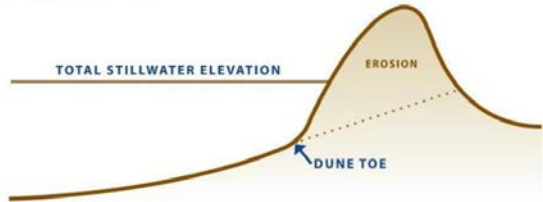
'Non-Hazard Based Risk Identification'



The coastal program uses non-hazard based risk identification where the present methodology did not fully capture the risk (e.g. Primary Frontal Dunes, 30 ft splash zones, geometric erosional profile)

FEMA's Coastal Erosion, the Primary Frontal Dune and the Code of Federal Regulations

DUNE REMOVAL



— Initial Beach Profile
 - - - - - Changed Segment
 (Eroded Profile)

DUNE RETREAT



44 CFR 65.11 Evaluation of sand dunes in mapping coastal flood hazard areas.

- (a) General conditions. For purposes of the NFIP, FEMA will consider storm-induced dune erosion potential in its determination of coastal flood hazards and risk mapping efforts. The criterion to be used in the evaluation of dune erosion will apply to primary frontal dunes as defined in Sec. 59.1, but does not apply to artificially designed and constructed dunes that are not well-established with long-standing vegetative cover, such as the placement of sand materials in a dune-like formation.
- (b) Evaluation criterion. **Primary frontal dunes will not be considered as effective barriers to base flood storm surges and associated wave action where the cross-sectional area of the primary frontal dune, as measured perpendicular to the shoreline and above the 100-year stillwater flood elevation and seaward of the dune crest, is equal to, or less than, 540 square feet.**
- (c) Exceptions. Exceptions to the evaluation criterion may be granted where it can be demonstrated through authoritative historical documentation that the primary frontal dunes at a specific site withstood previous base flood storm surges and associated wave action.

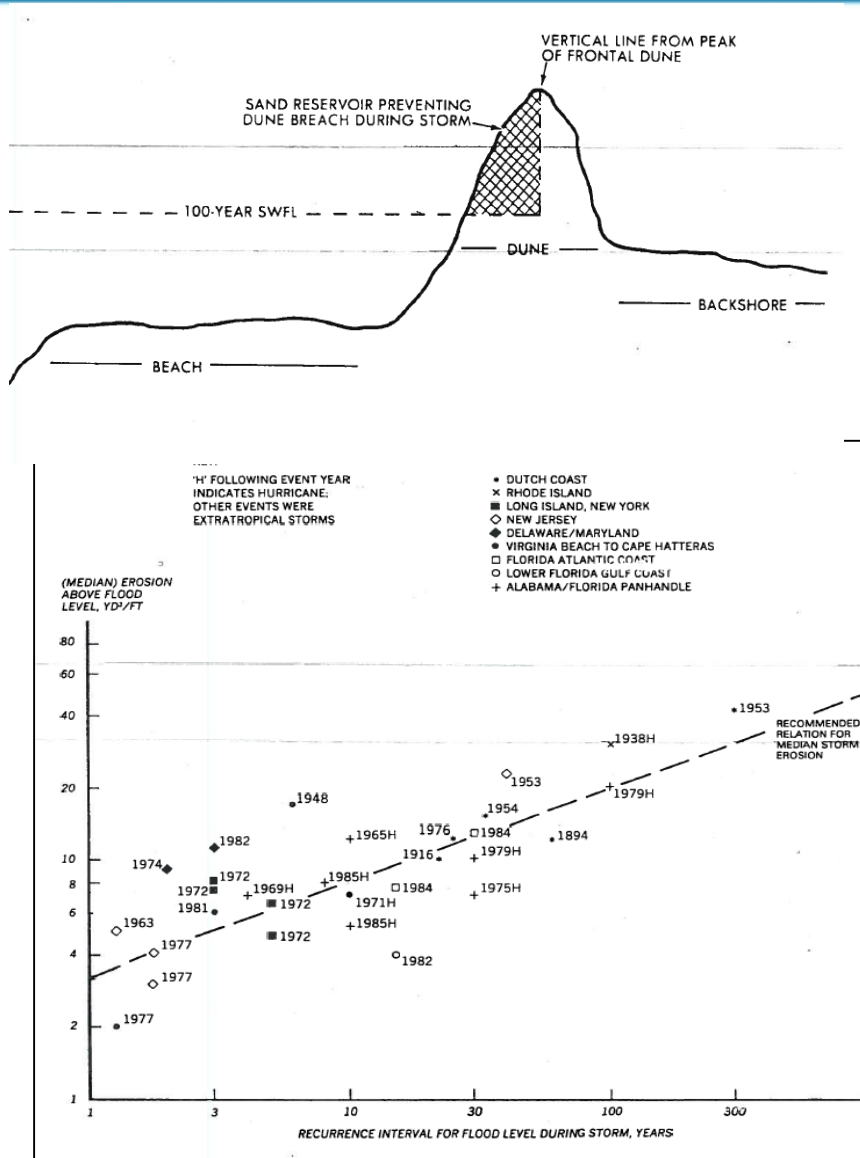
44 CFR 59.1 Definitions

Coastal high hazard area means an area of special flood hazard extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms or seismic sources.

Primary frontal dune (PFD) means a **continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes** immediately landward and adjacent to the beach and subject to erosion and overtopping from high tides and waves during major coastal storms. **The inland limit of the PFD occurs as the point where there is a distinct change from a relatively steep slope to a relatively mild slope.**

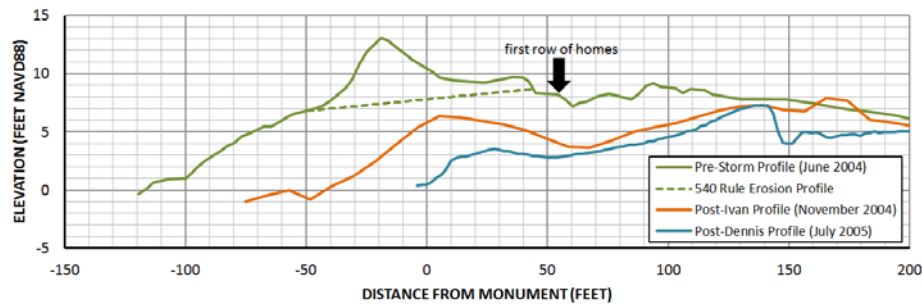


A Brief History of Storm Induced Erosion and the Primary Frontal Dune

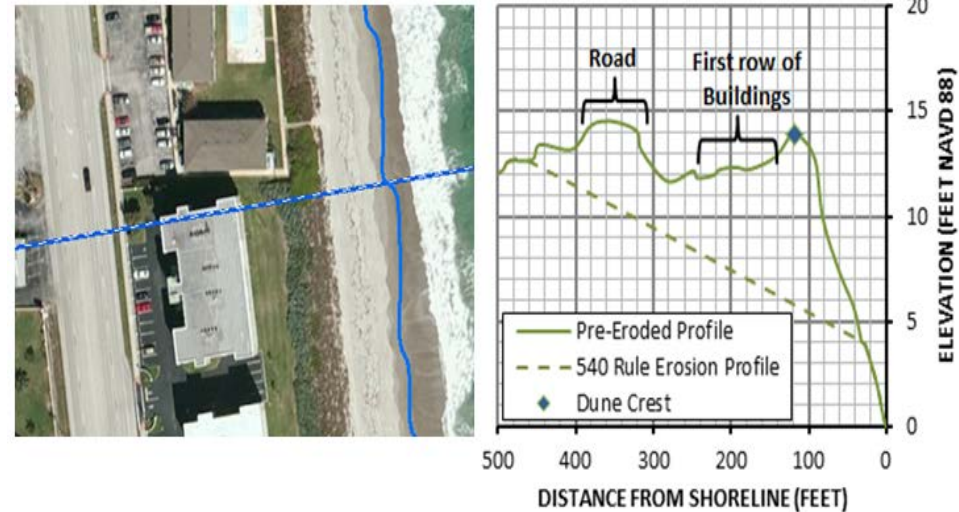
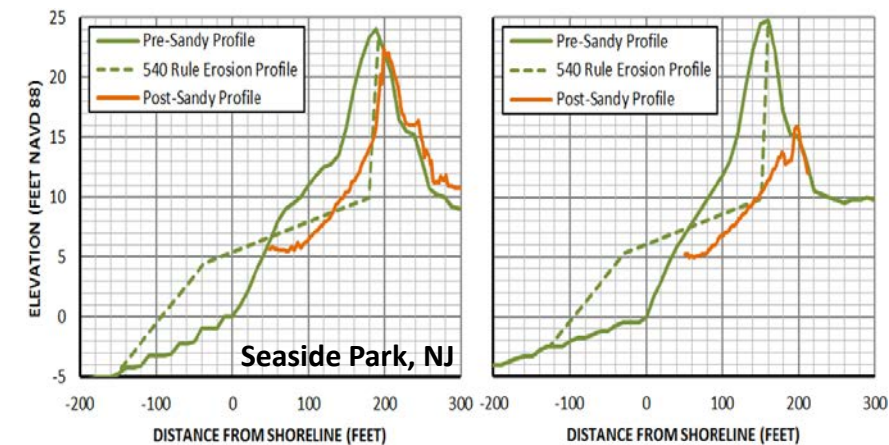


- **1968** – NFIP created
- **1970s – 1980s** - Coastal FIRMs used inconsistent methodology
- **1980s** – several major storms highlighted how FIRMs understated risk, especially erosion
- **1986** - 'Assessment of Current Procedures Used for the Identification for Coastal High Hazard Zones (V-Zones)'
 - PFD should be V-Zone
 - 540 sq ft is found to be the median cross-section of the eroded dune above the 1-percent-annual-chance Stillwater
 - Geometric method recommended
- **1988** – Codified in the CFR
- **2015** – Clarified wave setup should be included

'540 Rule' – Median Matters



Underestimation of Erosion

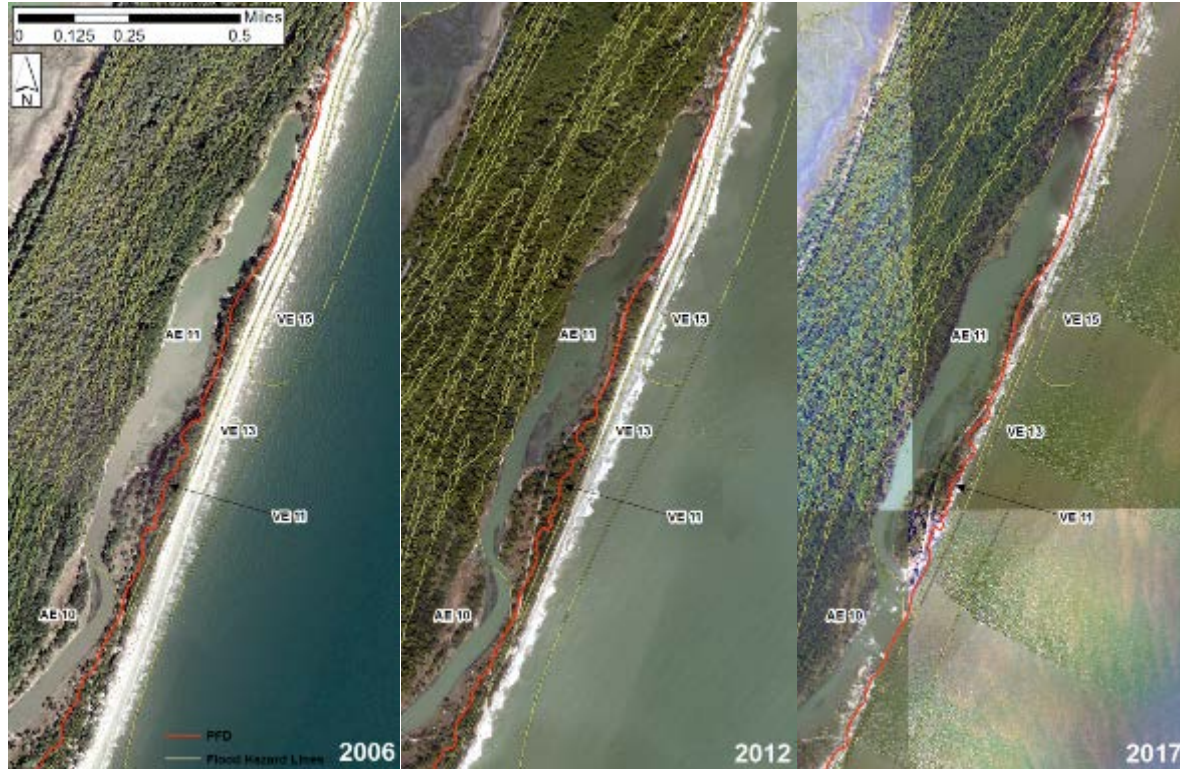


Overestimation of Erosion

Erosion methodology codified in 44 CFR 65.11 is not always technically sound or defensible.

Other Complications...

- Multiple Events in the Same Season
- Storm Duration and Speed
- Lack of Erosion in Surge Modeling
- Long-term Erosion Impacts

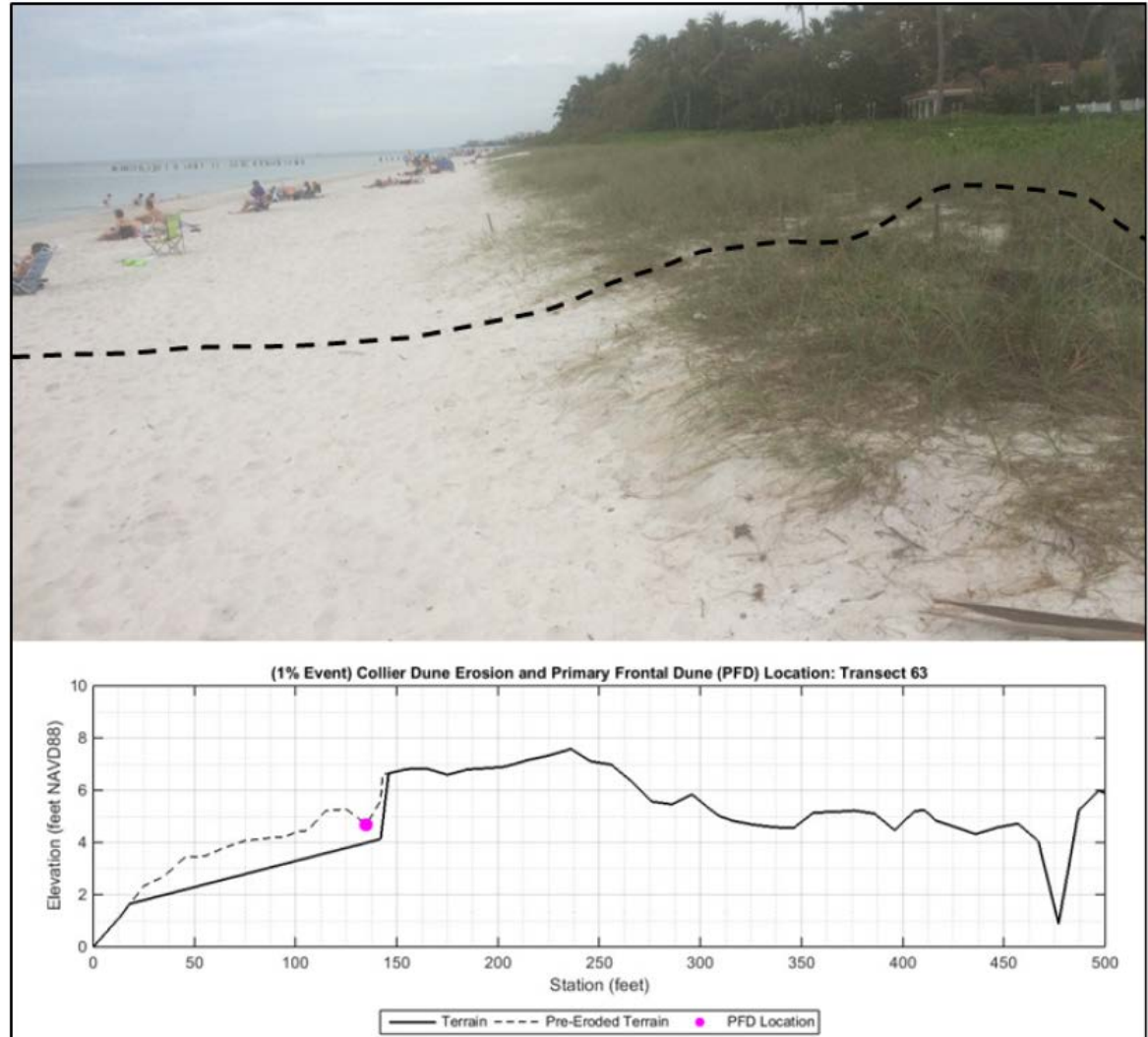


Hunting Island, SC shoreline change (2006 – 2012) relative to preliminary flood mapping and Primary Frontal Dune delineation (red).

Primary Frontal Dune Subjectivity

44 CFR 59.1 Definitions

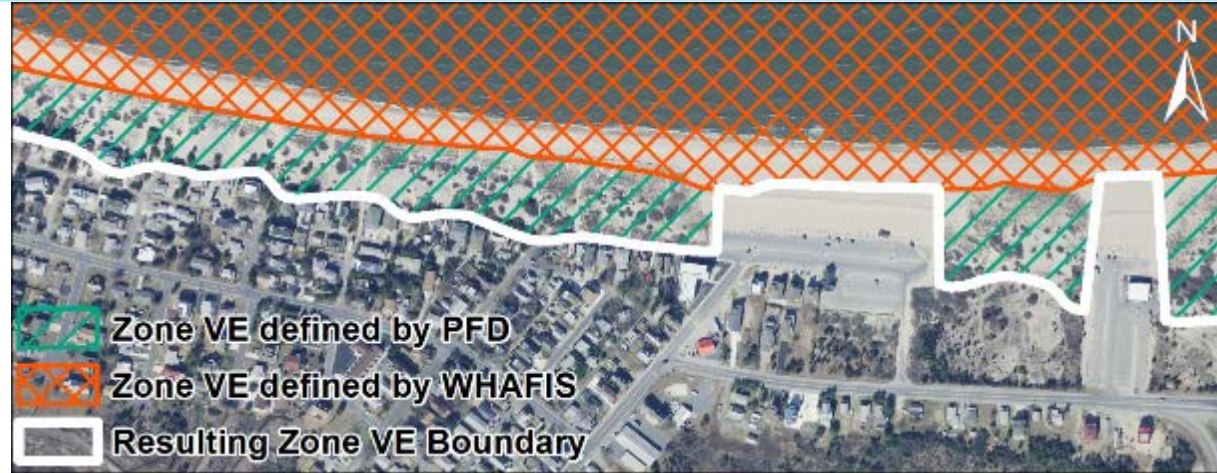
- *Coastal high hazard area* means an area of special flood hazard extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms or seismic sources.
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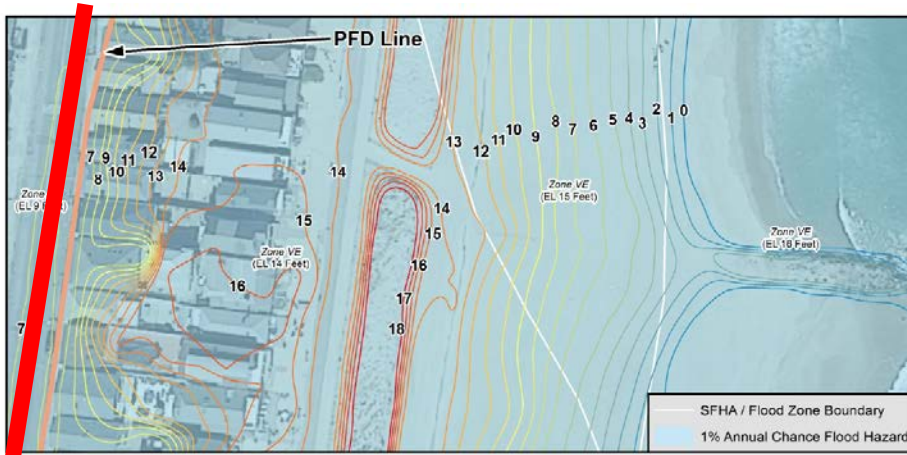
Primary Frontal Dune Issues



Encroachment on the Dune



Dune Gaps and Mapping



Elevations & Overuse of Letters of Map Revisions

44 CFR 59.1 Definitions

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Status Quo... for now

Erosion and Primary Frontal Dune Issue Paper

February 2019

Current:

The Primary Frontal Dune (PFD) zone, as defined in 44 CFR Section 59.1 of the National Flood Insurance Program (NFIP) regulations. The entire PFD is included in the VE Zone. The inland limit of the PFD is the location where the dune profile transitions from relatively steep to relatively mild slopes. (REQUIRED) For more details, see Primary Frontal Dune Guidance.

Recommended Change:

The Primary Frontal Dune (PFD) zone, as defined **as a continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward and adjacent to the beach and subject to erosion and overtopping from high tides and waves during major coastal storms. The inland limit of the primary frontal dune occurs at the point where there is a distinct change from a relatively steep slope to a relatively mild slope.** The entire PFD is included in the VE Zone. The inland limit of the PFD is the location where the dune profile transitions from relatively steep to relatively mild slopes. For more details, see Primary Frontal Dune Guidance.

Transitioning to the Future

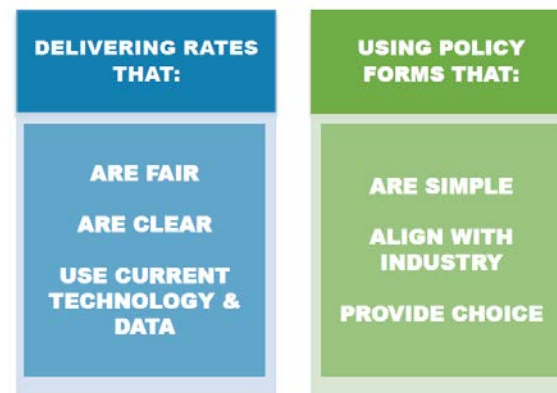
FEMA has set bold strategic goals over the course of the past year and we must evolve to meet the mission



Moonshots



Risk Rating Redesign



So where do we go from here?

1

Address gaps in data



2

Align increased awareness
with reductions in vulnerability



3

Support community-level
mitigation planning



4

Improve management of Risk
MAP resources through tech

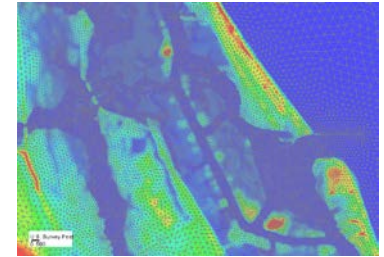


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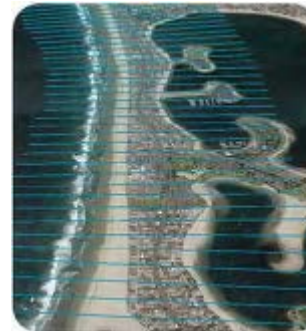
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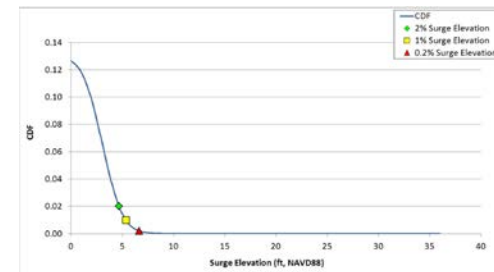
Databases of storms



Meshes, meshes and more meshes



Land use, DEMs, transect layout



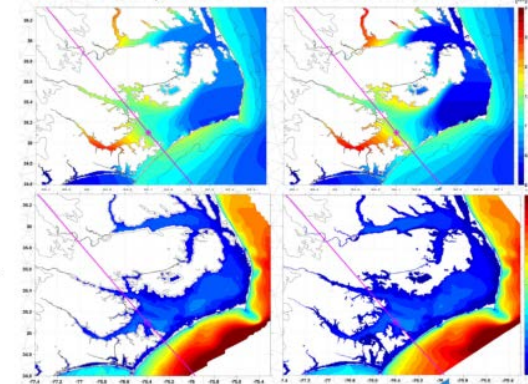
'Statistics'

Surrogate model predictions

High-fidelity model predictions

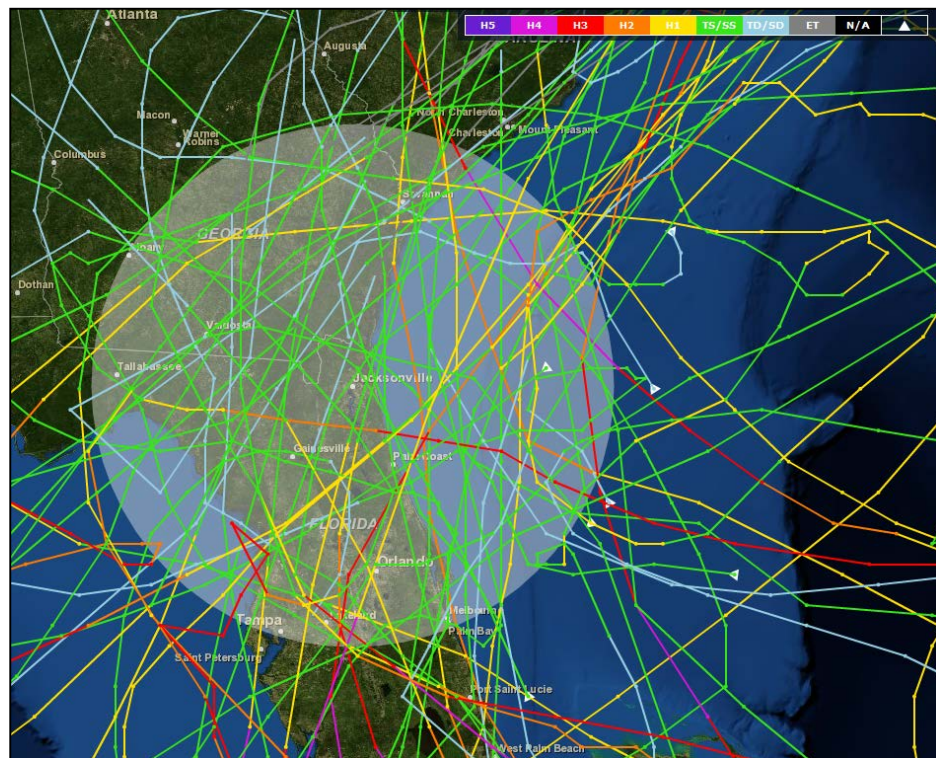
Water levels

Wave Heights



AdcircLite-NC:
Blanton and
Kennedy

Questions or Comments?



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**Special thanks to all
workgroup
members!**

Elena Drei-Horgan, Jeff Gangai, Darryl Hatheway, Chris Mack, Krista Conner, Adam Clinch, Chris Jones, Betsy Hicks, Heather Zhao, Nicole Walker, Nicole Metzger, Erin Benford, Paul Carroll, Sarah Hamm, Khatoon Melick and Stephen Creighton