



FEMA



Primary Frontal Dunes



(Source: AECOM)

As the first line of defense against flooding, primary frontal dunes are typically mapped as a VE Zone.

This designation ensures that dunes are not subject to manmade alterations in a way that could increase potential flood damage.

What is a primary frontal dune?

A primary frontal dune (PFD) is defined by the [National Flood Insurance Program \(NFIP\)](#) as a continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward of and adjacent to the beach. PFDs are subject to erosion and may be vulnerable to overtopping or breaching from high water levels and waves during coastal storms. The NFIP recognizes the importance of dunes in reducing coastal flood hazards and has established special mapping, insurance, and floodplain management criteria designed to help communities protect the dunes.

How does FEMA assess the coastal flood hazards on a PFD?

FEMA works with scientists and engineers from Federal and State agencies, communities, Tribal entities, contractors, and other stakeholders to analyze flood hazards for coastal communities using the latest scientific methodologies. When FEMA-led project teams determine that a PFD is present in a study area, the project team analyzes the dune to show how it will be affected by the [1-percent-annual-chance](#) storm surge and wave hazards. The analysis considers whether the dune is large enough to survive a storm of this magnitude and estimates the extent of erosion expected during the storm. Analyses are also performed to estimate the flooding expected landward of the eroded dune.

The landward toe of a PFD is located at the point where there is a distinct change from a relatively steep slope to a relatively mild slope. The [V, V1-30, or VE Zone](#) is extended inland to the landward PFD toe. This methodology establishes the minimum landward limit of the [Coastal High Hazard Area \(CHHA\)](#).

Glossary of Terms

1-Percent-Annual-Chance Flood: The flood that has a 1-percent chance of being equaled or exceeded in any given year. It is also referred to as the base flood or 100-year flood.

Base Flood Elevation (BFE): The computed elevation to which floodwater is anticipated to rise during the base flood with wave effects included in coastal areas. The BFE is the minimum regulatory requirement for the elevation or floodproofing of structures. The relationship between the BFE and a structure's elevation determines the flood insurance premium.

Flood Insurance Rate Map (FIRM): The official map of a community on which the National Flood Insurance Program (NFIP) has delineated the BFEs, Special Flood Hazard Areas (SFHA) and the flood insurance premium zones applicable to the community.

Special Flood Hazard Area (SFHA): The area shown as inundated by the floodwaters of the base flood on FIRMs where floodplain management regulations must be enforced and mandatory flood insurance purchase requirements apply.

Coastal High Hazard Area (CHHA): An SFHA 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 (i.e. breaking wave heights greater than or equal to 3 feet) from storms or tsunamis.

V, V1-30, and VE Zone: Coastal High Hazard Area with mandatory flood insurance requirements and enhanced development standards, including the requirement that new buildings are elevated above the BFE on piles, piers, or columns and other requirements.

RiskMAP
Increasing Resilience Together

Why did FEMA decide that a dune above the 1-percent-annual-chance flood level be included in an Special Flood Hazard Area?

FEMA conducted an investigation in 1988 to evaluate the extent of storm-induced erosion on dunes. Based on data from historical flood events, FEMA concluded that most PFDs would experience some level of erosion during a [1-percent-annual-chance flood](#). Based on this conclusion, FEMA published regulations to protect PFDs from manmade impacts or physical alterations that could increase potential flood damage. These regulations also support hazard-specific building standards and land use requirements.



Source: USGS

High storm surge and wave runoff during Hurricane Isabel caused widespread dune erosion in Nags Head, NC.

On [Flood Insurance Rate Maps \(FIRMs\)](#), [Special Flood Hazard Areas \(SFHAs\)](#) are typically delineated based on the best available topography. Communities within the SFHA must enforce floodplain management regulations and mandatory flood insurance requirements exist for structures with a mortgage backed by a Federally regulated lender or servicer, including those located on a PFD.

In areas where PFDs are not present, properties located on high ground can typically be considered for removal from the SFHA via the [Letter of Map Amendment \(LOMA\) process](#). However, due to erosion risk, structures located on PFDs are considered to be in the [CHHA](#) and the SFHA designation cannot be removed, even if the structures are built above the [Base Flood Elevation](#).

How can a community revise the PFD delineation shown on an FIRM?

The standard method to change a PFD delineation is through a [Letter of Map Revision \(LOMR\)](#). Community officials, property owners or lessees, or designated authorized persons (*e.g.*, agents, surveyors, engineers) can develop new flood analyses and submit flood map revision requests to FEMA. If new topographic data becomes available that can be used to refine the PFD delineation, the new data can be submitted to FEMA in support of a LOMR request or during FIRM production. To obtain a copy of the required application/certification forms for a LOMR request, visit:

<http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/mt-2-application-forms-and-instructions>.

Protecting Primary Frontal Dunes

If dunes are mapped outside regulatory flood hazard zones, they become subject to potential development practices. Prior to the development of PFD regulations, dune areas saw construction with little or no requirements for structure elevation or special foundation types. This resulted in degradation of the protective quality of the dunes and put structures at risk from flooding. Structures built with slab-on-grade and even basement foundations failed during large coastal storms due to undermining of the foundations. Wave damage often penetrated landward of the dunes due to increased erosion. In response to these issues, states and floodplain administrators requested more protection of the dunes. This resulted in development of the primary frontal dune definitions and regulation.

Additional Resources

For more information, please visit FEMA's Coastal website:
www.FEMA.gov/coastal-flood-risks

For answers to questions about new FIRMs, the status of a request, or other mapping issues:

FEMA Map Information eXchange
1-877-FEMA-MAP
(1-877-336-2627)

FEMA Map Service Center
www.msc.fema.gov

For answers to questions about flood insurance:
The NFIP Call Center
1-888-379-9531

FloodSmart
www.FloodSmart.gov

For general information on FEMA and its programs:
www.FEMA.gov

RiskMAP
Increasing Resilience Together