

Primary Frontal Dunes

Primary frontal dunes are often the first line of defense against flooding in coastal regions. As such, they are mapped as a VE zone. This designation prevents changes to the dune that could increase flood risks.

What is a primary frontal dune?

A primary frontal dune (PFD) is specifically defined by FEMA's National Flood Insurance Program (NFIP). It is a continuous or nearly continuous mound or ridge of sand with relatively steep slopes on both the sea and land sides.

A PFD must be immediately adjacent to the beach. They are subject to erosion and the high water levels and waves of coastal storms may overtop or breach them. Dunes have an important role in reducing coastal flood hazards. The NFIP has set mapping, insurance and floodplain management criteria to help communities protect their dunes.

Protecting Frontal Dunes

If a dune is not shown in a regulated flood hazard zone, local jurisdictions may decide to build on the dune. Before FEMA introduced PFD regulations, many dunes saw this kind of development. There were no requirements for elevating structures or using special foundations. As a result, dunes were less protective. That put structures at risk of flooding. Buildings with slab-on-grade foundations and basements were heavily damaged by large coastal storms. Waves also damaged land and structures further from the dunes, as erosion increased. In response, states and floodplain administrators asked FEMA to protect the dunes as part of coastal floodplain mapping.

How does FEMA assess the coastal flood hazards on primary frontal dunes?

FEMA works with many stakeholders to analyze the flood hazards for coastal communities. These include scientists and engineers from federal and state agencies, communities, tribes and territories and contractors. The FEMA-led project teams use the latest scientific methods.

Teams examine primary frontal dunes to determine how they will be affected by the 1%-annual-chance storm surge and waves. They analyze if dunes can withstand these storms and how much erosion they may cause. Teams also analyze potential landward flooding of an eroded dune.



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The landward heel is the point where the primary frontal dune slope changes distinctly from being relatively steep to relatively mild. This is used to map the minimum extent of the Coastal High Hazard Area (CHHA). The area extends from the ocean to the landward PFD heel. It is mapped as Zone VE.

Glossary

1%-Annual-Chance Flood: The flood that has a 1% chance of occurring in any given year. It is also referred to as the base flood.

Base Flood Elevation (BFE): How high the water is anticipated to rise during the base flood. In coastal areas, wave effects are included. The BFE is the minimum height used for elevating or floodproofing structures.

Flood Insurance Rate Map (FIRM): The official flood map for a community. It shows the BFEs, Special Flood Hazard Areas and other flood hazard zones that apply to the community.

Special Flood Hazard Area (SFHA): An area with a high risk from the base flood. Floodplain management regulations must be enforced in SFHAs, and mandatory flood insurance purchase requirements apply.

Zone VE, also known as the Coastal High Hazard Area (CHHA): An area where waves and fast-moving water can cause extensive damage during the base flood.

Why did FEMA decide to include a dune above the 1%-annual-chance flood level in a Special Flood Hazard Area?



Figure 1: Dune erosion in Nags Head, North Carolina. (Source: USGS)

In 1988, FEMA examined how much dune erosion was caused by storms. Data on historical floods showed that most primary frontal dunes have some erosion during a 1%-annual-chance flood. FEMA then made regulations to protect PFDs from manmade changes that could increase flood damage. These rules also support flood-specific building standards and land use requirements.

Communities that participate in the NFIP must enforce its floodplain management regulations. Also, flood insurance is required in Special Flood Hazard Areas for homes with a federally backed mortgage. Both of these apply to buildings on a PFD. Properties on high ground can typically be considered for removal from the SFHA via the Letter of Map Amendment (LOMA) process. However, due to the erosion risk, structures on PFDs are mapped in a Coastal High Hazard Area. This designation will not be changed, even if the structure is above the Base Flood Elevation.

How can a community change the way a primary frontal dune is shown on a flood map?

The standard way to make this change is a [Letter of Map Revision \(LOMR\)](#). A community can develop new flood analyses and submit a LOMR request to FEMA. It can also submit any newly available data that could refine the PFD designation when FEMA is updating the flood maps.

When requesting a revision, a community should make sure the identified primary frontal dune is as continuous or more continuous than the primary frontal dune that is depicted on the effective flood map. Communities should provide an accurate representation of the dune. This is especially important in areas with multiple ridges throughout a dune field, areas with man-made dunes, and property-specific revisions, including requests that the PFD designation be removed altogether.

The application forms required for a Letter of Map Revision request are available on FEMA's [website](#).

Additional Resources:

- To access flood maps for your community, visit the Map Service Center, or contact the Flood Mapping and Insurance eXchange (FMIX) at 1-877-336-2627 or FEMA-FMIX@fema.dhs.gov.
- To learn more about flood insurance, visit www.FloodSmart.gov.