

ResilientCoasts

DRAFT PLAN

APPENDIX I

Coastal Resilience District Delineation Technical Documentation



May 2025

Technical Documentation for Coastal Resilience Districts

1 | Introduction

The ResilientCoasts Plan (2025) establishes 15 “Coastal Resilience Districts” across the Massachusetts coastline. The purpose of delineating these districts is to highlight regional differences in coastal areas, help facilitate coordination on coastal resilience efforts at the district-scale, identify opportunities for integrated management, and appropriately scale projects and strategies for greater impact and efficiency.

The data and methods for delineating these districts are described below.

2 | Identifying Coastal Resilience Districts

Three primary data sources were used to identify the geographic traits and differences of each Coastal Resilience District (CRD):

- Coastal wetland resources¹,
- Major watershed basins² and sub-basins³, and
- Modeled future coastal flood risk.

Additional data and information on the concentrations of people and development (based on U.S. Census Bureau 2020 Decennial Census), the location of flood pathways (based on analysis of Woods Hole Group using Massachusetts Coast Flood Risk Model), and the extent of ongoing regional collaborations were considered after the initial delineation of CRDs. Using this information, further refinements were made after seeking input from a variety of stakeholders and the public.

Landward, Seaward and Inter-District Boundaries

The initial delineation of CRDs was divided into three components: landward boundary, seaward boundary, and inter-district boundaries. Each component was built upon the previous, resulting in a single data layer representing 15 distinct CRDs.

Landward Boundary

Identification of the landward boundary of the CRDs relied on three primary data sources:

- Massachusetts Coast Flood Risk Model (MC-FRM) 2070 Coastal Flood Exceedance Probabilities⁴

¹ Massachusetts Department of Environmental Protection, 2017, MassDEP Wetlands (2005), Massachusetts Bureau of Geographic Information (MassGIS), accessed October 2024, at URL <https://arcgisserver.digital.mass.gov/arcgisserver/rest/services/AGOL>.

² Massachusetts Bureau of Geographic Information (MassGIS), 2003, Major Drainage Basins, accessed July 2024, at URL <https://www.mass.gov/info-details/massgis-data-major-drainage-basins>.

³ Massachusetts Bureau of Geographic Information (MassGIS), 2007, Major Drainage Basins, accessed July 31, 2024, at URL <https://www.mass.gov/info-details/massgis-data-drainage-sub-basins>.

⁴ Commonwealth of Massachusetts, 2022, Massachusetts Coast Flood Risk Model (MC-FRM) 2070 Coastal Flood Exceedance Probabilities, Massachusetts Office of Coastal Zone Management, URL <https://mass-eoea.maps.arcgis.com/home/item.html?id=8510107ced124fc1a328b2d3229918c4>.

- Massachusetts Coastal Bank Erosion Hazard Mapping Top of Current Coastal Bank (2013-2014)⁵
- U.S. Geological Survey's (USGS) 1:24,000 Surficial Geology⁶

The landward boundary of CRDs is primarily defined as the MC-FRM 2070 extent of the 0.1% annual coastal flood exceedance probability (ACFEP). The coastwide composite of the MC-FRM 2070 probability data was used to generate an extent for the 0.1% ACFEP.

An exception to the MC-FRM-derived landward boundary is where elevated coastal banks occur. Mapped coastal banks (CZM Top of Current Coastal Bank [2013-2014]) were buffered based on the type of surficial geologic material present. The USGS 1:24,000 Surficial Geology data layer (accessed from the Massachusetts Bureau of Geographic information, or MassGIS) was used to differentiate coastal banks with consolidated material (e.g., bedrock) from coastal banks with unconsolidated material (e.g., soil and sand). Consolidated banks were buffered 100 feet, and unconsolidated banks were buffered 400 feet to account for future vulnerabilities due to weathering and erosion. The coastal bank buffers were combined with the MC-FRM extent to create a geospatial data layer that delineates the CRD landward boundary. The coastal bank buffers define the landward extent of CRDs only where they reach inland of the MC-FRM-derived boundary.

Seaward Boundary

Identification of the seaward boundary of the CRDs relied on two primary data sources:

- Massachusetts Ocean Management Planning Area⁷
- National Oceanic and Atmospheric Administration's (NOAA) Continuously Updated Shoreline Product (CUSP)⁸

The seaward boundary of CRDs is primarily defined as the nearshore extent of the Massachusetts Ocean Management Planning Area (OMPA). The OMPA generally begins 0.3 nautical miles offshore and excludes Boston Harbor. There are three exceptions to the OMPA defining the seaward boundary of CRDs. First, since Boston Harbor is excluded from the OMPA, NOAA's Continuously Updated Shoreline Product (CUSP) was buffered 0.3 nautical miles within Boston Harbor. Second, islands greater than three acres that occur seaward of the nearshore extent of the OMPA (i.e., they occur within the OMPA) were included in the CRDs. Islands in Salem Sound that occur more than 0.3 nautical miles offshore, along with the Outer Boston Harbor Islands and Nomans Land Island (southwest of Martha's Vineyard) were buffered 0.3 nautical miles if they met the size threshold. The shoreline data source for buffering was NOAA's CUSP. Finally, the Taunton Watershed CRD, which includes portions of the Taunton River Watershed and the Narragansett Bay Watershed, is not included in the OMPA. The

⁵ Massachusetts Office of Coastal Zone Management, 2019, Top of Current Coastal Bank (2013-2014), accessed September 2024, at URL <https://mass-eoea.maps.arcgis.com/home/item.html?id=f68e85214d8744dea1e229d058e4924b>.

⁶ Stone, J.R., Stone, B.D., DiGiacomo-Cohen, M.L., and Mabee, S.B., comps., 2018, Surficial materials of Massachusetts—A 1:24,000-scale geologic map database: U.S. Geological Survey Scientific Investigations Map 3402, 189 sheets, scale 1:24,000; index map, scale 1:250,000; 58-p. pamphlet; and geodatabase files, accessed September 2024, at URL <https://www.mass.gov/info-details/massgis-data-usgs-124000-surficial-geology>.

⁷ Massachusetts Office of Coastal Zone Management, 2021, Massachusetts Ocean Management Planning Area, accessed September 2024, at URL <https://mass-eoea.maps.arcgis.com/home/item.html?id=4f96ff1592964e2287f1e8182707801d>.

⁸ National Geodetic Survey, 2024, NOAA NGS Continually Updated Shoreline Product (CUSP), accessed September 30, 2024, at URL <https://catalog.data.gov/dataset/noaa-ngs-continually-updated-shoreline-product-cusp1>.

seaward boundary in this CRD is an extension of the Massachusetts border with Rhode Island across Mount Hope Bay.

Inter-district Boundaries

As discussed in more detail below, the inter-district boundaries are primarily defined by drainage sub-basins as previously mapped by the USGS Water Resources Division and the Massachusetts Water Resources Commission, with modifications by EEA agencies. Coastal sub-basins were aggregated into 15 distinct CRDs, primarily based on geographic region and dominant landforms, including coastal wetland resources.

The drainage sub-basin delineations do not extend into coastal waters, therefore the inter-district boundaries defined by the drainage sub-basins were manually extended to the CRD seaward edge. Additional modifications were made to the aggregated drainage sub-basins, as necessary (e.g., to account for shared flood pathways as identified by Woods Hole Group using MC-FRM).

Integrating the Landward, Seaward, and Inter-district Boundaries

The intermediary data that define the landward, seaward, and inter-district boundaries were combined into a single data layer. Any areas that were excluded from the CRDs (e.g., high-elevation areas outside of the MC-FRM 2070 floodplain), but were completely surrounded by one or more CRD(s) were either: (1) added to the CRDs if they were less than three acres, or (2) classified as an “Evacuation and Isolation Risk Areas” if they were at least three acres. “Evacuation and Isolation Risk Areas” remain outside of the CRDs. The final data layer consists of 15 features representing each delineated CRD.

3 | Description of Boundaries

The following 15 CRDs were delineated for the ResilientCoasts Plan (2025):

1. **Lower Merrimack CRD:** boundary includes areas of the Merrimack River Watershed, from upstream of the Whittier Bridge (I-95) in Newburyport and Amesbury, through West Newbury, Merrimac, Groveland, Haverhill, North Andover, Methuen, and Lawrence. Contains land across 9 municipalities.
2. **Great Marsh CRD:** boundary extends from Massachusetts state line in Salisbury, south through Newburyport, Newbury, Rowley, Ipswich, Essex, and the Annisquam River watershed in Gloucester. Contains land across 8 municipalities.
3. **Mid-North Shore CRD:** boundary extends from Gloucester’s northern shore, through Rockport, Manchester-by-the-Sea, Beverly, Danvers, Peabody, Salem, and Marblehead, and ends at Blaney Rock in Swampscott. Contains land across 9 municipalities.
4. **Saugus Watershed CRD:** boundary extends from King’s Beach in Swampscott and Lynn, through Nahant, Saugus, Malden, Revere, and Winthrop, ending at Constitution Beach in Boston. Contains land across 9 municipalities.

5. **Mystic-Charles Watersheds CRD:** boundary extends from Constitution Beach in Boston, through the Mystic and Charles River watershed communities of Revere, Chelsea, Everett, Malden, Medford, Winchester, Arlington, Belmont, Cambridge, Somerville, Watertown, Newton, Brookline, and Boston, ending just south of the Dorchester Bay Basin in Boston. Contains land across 14 municipalities.
6. **Boston Harbor Islands CRD:** boundary includes islands in Boston Harbor and Hingham Bay, within the communities of Boston, Hull, Quincy, Weymouth, and Hingham.
7. **Neponset-Weir Watersheds CRD:** boundary extends from Commercial Point in Boston, through the Neponset and Fore River communities of Milton, Quincy, Braintree, and Weymouth, and the Weir River communities of Hingham, Hull, and Cohasset, ending at Black Rock Beach in Cohasset. Contains land across 8 municipalities.
8. **Mid-South Shore CRD:** boundary extends from Black Rock Beach in Cohasset, through the North River communities of Scituate, Norwell, Hanover, Pembroke, and Marshfield, and on through Duxbury, Kingston, and Long Beach in Plymouth. Contains land across 9 municipalities.
9. **Manomet-Sagamore CRD:** boundary includes Plymouth, south of Long Beach, and the northern portion of Sagamore Beach in Bourne. Contains land across 2 municipalities.
10. **North Cape Cod CRD:** boundary extends from Sagamore Beach near the Bourne-Sandwich town line, then east and north along Cape Cod Bay, through Sandwich, Barnstable, Yarmouth, Dennis, Brewster, Orleans, Eastham, Wellfleet, Truro, and ending in Provincetown. Contains land across 11 municipalities.
11. **Outer Cape Cod CRD:** boundary extends along the Atlantic Ocean-facing shore of Cape Cod, from east of the Provincetown Municipal Airport, south through Truro, Wellfleet, Eastham, and Orleans, and around the southeast coast of Chatham, ending between Forest Beach and Red River Beach. Contains land across 8 municipalities.
12. **South Cape Cod CRD:** boundary extends along the south-facing shore of Cape Cod, from between Forest Beach and Red River Beach in Chatham, west through Harwich, Dennis, Yarmouth, Barnstable, and Mashpee, and ending at Surf Drive and Oyster Pond in Falmouth. Contains land across 7 municipalities.
13. **Islands CRD:** boundary includes the island communities of Nantucket, Gosnold, and Edgartown, Oak Bluffs, Tisbury, West Tisbury, Chilmark, Aquinnah on Martha's Vineyard. Contains land across 8 municipalities.
14. **Buzzards Bay CRD:** boundary extends from Woods Hole Village in Falmouth, along the south coast of Bourne, across the Cape Cod Canal to the southern tip of Plymouth, down through Wareham, Marion, Rochester, Mattapoisett, Fairhaven, Acushnet, New Bedford, Dartmouth, and ending in Westport at the Massachusetts state line. Contains land across 12

municipalities.

15. **Taunton Watershed CRD:** boundary extends from the Massachusetts state line in Fall River, Swansea, and Seekonk, upstream through communities on the Taunton, Palmer, and Runnis Rivers, including Somerset, Freetown, Dighton, Berkley, Taunton, Raynham, and Rehoboth. Contains land across 10 municipalities.

Table 1. Municipalities by CRD

| Coastal Resilience District | Municipalities |
|------------------------------------|--|
| Lower Merrimack | *Amesbury, Groveland, Haverhill, Lawrence, Merrimac, Methuen, Newburyport, North Andover, West Newbury |
| Great Marsh | Amesbury (limited), Essex, *Gloucester, Ipswich, Newbury, Newburyport, Rowley, Salisbury |
| Mid-North Shore | Beverly, Danvers, Gloucester, Manchester-by-the-Sea, Marblehead, Peabody, Rockport, Salem, *Swampscott |
| Saugus Watershed | *Boston, *Everett (limited), Lynn, Malden, Nahant, *Revere, Saugus, Swampscott, Winthrop |
| Mystic-Charles Watersheds | Arlington, Belmont, Boston, Brookline, Cambridge, Chelsea, Everett, Malden, Medford, Newton, Revere, Somerville, Watertown, Winchester |
| Neponset-Weir Watersheds | Boston, Braintree, *Cohasset, Hingham, Hull, Milton, Quincy, Weymouth |
| Mid-South Shore | Cohasset, Duxbury, Hanover, Kingston, Marshfield, Norwell, Pembroke, *Plymouth, Scituate |
| Manomet-Sagamore | *Bourne, Plymouth |
| North Cape Cod | *Barnstable, Bourne, *Brewster, *Dennis, *Eastham, *Orleans, *Provincetown, Sandwich, *Truro, *Yarmouth, *Wellfleet |
| Outer Cape Cod | Brewster (limited), *Chatham, Eastham, *Harwich (limited), Orleans, Provincetown, Truro, Wellfleet |
| South Cape Cod | Barnstable, Chatham, Dennis, *Falmouth, Harwich, Mashpee, Yarmouth |
| Islands | Aquinnah, Chilmark, Edgartown, Gosnold, Nantucket, Oak Bluffs, Tisbury, West Tisbury |
| Buzzards Bay | Acushnet, Bourne, Dartmouth, Fair Haven, Falmouth, Marion, Mattapoisett, New Bedford, Plymouth (limited), Rochester, Wareham, Westport |
| Taunton Watershed | Berkley, Dighton, Fall River, Freetown, Raynham, Rehoboth, Seekonk, Somerset, Swansea, Taunton |

*Municipality included in more than one district



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