

Marsh Restoration and Coastal Resilience Resource Guide

High Level Planning Tools

Guidance Documents

1. [Coastal Marsh Restoration for the Mid Atlantic](#)

Guidance from NOAA and USFWS on planning, designing, permitting, monitoring, and adaptively managing coastal marsh restoration projects in the Mid-Atlantic using an ecosystem-based approach that promotes long-term resilience to sea-level rise and other coastal stressors.

2. [Designing Living Shorelines for Sea Level Rise in Virginia](#)

Technical guide for designing living shorelines in Virginia that are resilient to sea level rise, coastal hazards, and erosion, featuring adaptive design criteria, regulatory guidance, and real-world case studies.

3. [Coastal Resilience Master Plan Phase II](#)

A statewide flood resilience planning framework and risk assessment for coastal Virginia that builds on Phase I by incorporating coastal, rainfall-driven, and riverine flooding into a comprehensive analysis of future flood risks, resilience projects, and adaptation strategies.

4. [VA Beneficial Use of Dredge Material Guidance](#)

Guidance on the beneficial use of dredged material (BUDM) in Virginia, including opportunities, planning considerations, permitting, implementation, monitoring, and recommendations for expanding BUDM practices.

5. [Thin Layer Placement: Best Management Practices](#)

Best management practices for using thin-layer placement (TLP) to restore and enhance Virginia wetlands, including planning, permitting, implementation, and long-term monitoring considerations.

6. [USACE Guidelines for TLP Projects](#)

USACE guidelines for the development and implementation of thin-layer placement (TLP) projects, providing a framework for site assessment, project design, construction, monitoring, and adaptive management in wetland and open-water environments.

7. [Sediment Strategies](#)

The Nature Conservancy Maryland Document discussing habitat restoration using dredge material. The document highlights key considerations and informative case studies to expand the beneficial use of dredge material.

Site Selection Tools

8. [ADAPT VA](#)

Climate adaptation information gateway for Virginia that integrates scientific data, planning tools, and legal and policy guidance, featuring environmental forecasts, sea level rise projections, flood risk and shoreline management tools, and adaptation case studies that support community resilience and informed decision-making.

9. [VA Coastal Resources Tool](#)

Interactive mapping and decision-support tool that provides shoreline condition and tidal marsh inventory data, location-specific shoreline management recommendations, and best management practices to support erosion control and coastal resilience planning across Virginia.

10. [Wetland Condition Assessment Tool \(WetCAT\)](#)

Spatially specific, interactive tool that provides water quality and habitat condition assessments for Virginia nontidal wetlands, along with tidal marsh and shoreline condition information, to support project evaluation, decision-making, wetland condition reporting, and policy development.

11. [ConserveVirginia](#)

Conservation prioritization framework that identifies and maps more than 7 million acres of Virginia's highest-value unprotected lands, representing top priority conservation opportunities in the categories of agriculture and forestry, natural habitat and ecosystem diversity, floodplain and flooding resilience, water quality improvement, cultural and historic preservation, scenic preservation, and protected landscape resilience.

12. [Coastal Geospatial and Education Mapping System \(GEMS\)](#)

Gateway to Virginia's coastal resource data, maps, laws, policies, and conservation planning tools, featuring a growing inventory of natural resource datasets, planning information, and educational resources that support conservation, habitat restoration, informed planning, and community engagement.

13. [Virginia BUDM Matching Tool](#)

GIS-based tool designed for the Elizabeth River Project to advance the beneficial use of dredged material in Virginia by matching planned dredging projects with beneficial use opportunities and providing environmental data layers to inform project planning and implementation.

14. [Virginia Shoreline and Tidal Marsh Inventories](#)

Series of reports documenting the condition of Virginia's tidal shorelines and tidal marshes by locality, combining historic inventories with contemporary GIS, GPS, and remote sensing data.

15. [The Chesapeake Bay Land Use/Land Cover \(LULC\) Database](#)

High-resolution land use and land cover database for the Chesapeake Bay watershed that characterizes landscape conditions and change over time, including land cover classifications, change analyses, change matrices, and summary statistics

Site Specific Tools

Water Levels

16. [NOAA Water Levels](#)

NOAA water level data portal featuring real-time water level observations updated every six minutes at active tide stations, along with historical water level records.

17. [NOAA Datums](#)

NOAA tidal datum portal providing station-specific tidal datum elevations and reference benchmarks for active and historic monitoring stations. (Note: The NTDE is currently being updated from the 1983-2001 version to the 2002-2020 version.)

18. [Virginia Estuarine & Coastal Observing System \(VECOS\)](#)

The Virginia Estuarine and Coastal Observing System provides access to more than 23 years of water quality monitoring data, real-time observations, visualization dashboards, and environmental data applications.

19. [Norfolk Tide Sensors](#)

Water level observations from five tide stations across Norfolk, VA, updated daily and available from September 2020 to the present for tracking local tide conditions.

20. [Vertical Datum Transformation Tool \(VDatum\)](#)

NOAA-developed vertical datum transformation tool that converts geospatial data among tidal, orthometric, and ellipsoidal vertical datums, enabling datasets from different reference systems to be combined and compared. (Note: VDatum currently uses the 1983-2001 National Tidal Datum Epoch (NTDE), current water levels may be higher than modeled.)

Oyster Leases

21. [VMRC Chesapeake Bay Map](#)

Interactive GIS mapping tool displaying Chesapeake Bay shellfish grounds, oyster leases and sanctuaries, harvest and growing areas, submerged aquatic vegetation, marshlands, commercial fishing areas, habitat permit applications, and other marine resource management data to support coastal planning, permitting, and resource management.

Seagrass Beds

22. [VIMS Interactive SAV Map](#)

Interactive map of submerged aquatic vegetation (SAV) beds and aerial imagery, enabling users to view, compare, and track changes in SAV coverage and density across Virginia waters over time.

23. [VMRC Chesapeake Bay Map](#)

Interactive GIS mapping tool displaying Chesapeake Bay shellfish grounds, oyster leases and sanctuaries, harvest and growing areas, submerged aquatic vegetation, marshlands, commercial fishing areas, habitat permit applications, and other marine resource management data to support coastal planning, permitting, and resource management.

Salinity

24. [Virginia Estuarine & Coastal Observing System \(VECOS\)](#)

The Virginia Estuarine and Coastal Observing System provides access to more than 23 years of water quality monitoring data, real-time observations, visualization dashboards, and environmental data applications.

25. [Chesapeake Bay Environmental Forecast System \(CBEFS\)](#)

Chesapeake Bay salinity forecasting tool featuring maps and time-series visualizations of current and forecasted salinity conditions, with comparisons to long-term averages.

Lidar/Elevation

26. [NOAA Digital Coast Data Access Viewer](#)

NOAA geospatial data portal featuring high-resolution aerial imagery, land cover and land use datasets, and topographic, bathymetric, and terrain elevation models for mapping, analysis, and coastal planning.

27. [Virginia LiDAR Inventory Web Mapping Application- VGIN](#)

LiDAR data portal providing access to Virginia's most recent LiDAR point clouds, bare-earth digital elevation models (DEMs), and project metadata, with links to related NOAA and USGS resources and datasets.

28. [NASA Relative Tidal Marsh Elevation](#)

Dataset providing 30-meter resolution maps of tidal marsh elevation relative to tidal range across the contiguous United States, along with tidal amplitude, relative sea-level rise, marsh inundation probability, and elevation uncertainty layers.

Historic Imagery

29. [NOAA Digital Coast Data Access Viewer](#)

NOAA geospatial data portal featuring high-resolution aerial imagery, land cover and land use datasets, and topographic, bathymetric, and terrain elevation models for mapping, analysis, and coastal planning.

30. [Virginia LiDAR Inventory Web Mapping Application- VGIN](#)

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31. [USGS Earth Explorer](#)

USGS geospatial data portal for searching and downloading historical aerial imagery, satellite imagery, and other remotely sensed datasets

32. [Google Earth](#)

Interactive virtual globe and mapping platform providing high-resolution aerial and satellite imagery, 3D terrain visualization, and historical imagery for exploring and comparing landscape changes over time.

33. [Virginia Department of Forestry](#)

Contact your local forester about access to historical imagery.

34. [Historic Aerials](#)

Historical imagery and mapping platform that enables users to view locations through time using orthorectified aerial photography and maps, supporting comparison, change detection, measurement, and geospatial analysis.

35. [ESRI World Imagery Wayback](#)

Historical imagery archive that provides access to previous versions of Esri's World Imagery basemap, enabling users to compare imagery over time, access imagery acquisition dates and metadata, and track updates to the basemap.

Shorelines

36. [NOAA T-Sheets](#)

Historical shoreline survey resource providing access to georeferenced NOAA topographic survey sheets (T-Sheets) and descriptive reports documenting past coastal conditions.

37. [Shoreline Management Model](#)

Geospatial decision-support model that evaluates tidal shoreline conditions and recommends shoreline stabilization strategies, including where living shoreline approaches may be suitable for erosion control.

38. [Shoreline Change Viewer](#)

Interactive mapping tool displaying historical shoreline positions, shoreline change rates, and aerial imagery from 1937 to 2017 for Chesapeake Bay and Virginia's ocean coast, enabling analysis of shoreline change over time.

39. [Site Specific Parameters for Living Shoreline Design](#)

Training resource for assessing site-specific shoreline characteristics, including fetch, bank conditions, vegetation, and tidal factors, to inform living shoreline design.

40. [Homeowner FAQ](#)

Guidance on shoreline management for waterfront property owners featuring information on erosion, shoreline protection options, living shorelines, permitting, and shoreline stewardship.

41. [Living Shoreline Training Certificate for Coastal Landscape Professionals](#)

Professional training and certification program that equips coastal practitioners to assess, design, permit, construct, and maintain living shoreline projects that support shoreline stabilization, habitat restoration, and climate resilience.

Marsh Migration Potential

42. [Marsh Migration Corridor Envelope for Maryland and Virginia](#)

Geospatial dataset identifying potential marsh migration corridors in Maryland and Virginia, highlighting lands where tidal wetlands may expand inland in response to sea-level rise.

43. [Dataset: Marsh Migration Methodology Development for Wetland Restoration Targeting \(Mitchell et al., 2023\)](#)

Dataset and methodology for identifying and prioritizing marsh migration corridors and wetland restoration opportunities under multiple sea-level rise scenarios, integrating shoreline conditions, topography, existing wetlands, and potential migration areas across the Chesapeake Bay.

Vegetation

44. [USGS Unvegetated to Vegetated Ratio of Marsh Units in Chesapeake Bay Salt Marshes](#)

Geospatial dataset quantifying the ratio of unvegetated to vegetated area (UVVR) within Chesapeake Bay salt marsh units, providing an indicator of marsh condition, vulnerability, and resilience.

45. [National Marsh Synthesis Technical Toolkit and Training](#)

Technical toolkit and training program providing standardized methods, R scripts, data templates, and visualization tools for analyzing tidal marsh vegetation monitoring data.

46. [Sentinel Sites](#)

Directory of Chesapeake Bay sentinel sites conducting long-term environmental monitoring and research, serving as reference locations for studying coastal ecosystem change.

Species

47. [DCR Natural Heritage Viewer](#)

Interactive mapping tool providing access to Virginia Natural Heritage data, including rare species occurrences, natural communities, conservation sites, and protected lands.

48. [iNaturalist](#)

Community science platform and biodiversity database providing georeferenced species observations, photographs, identification records, and occurrence maps.

Birds

49. [Center for Conservation Biology Mapping Portal](#)

Interactive mapping portal providing access to Chesapeake Bay bird conservation data, including eagle nests and roosts, osprey nests, colonial waterbird surveys, shorebird roosts, and other avian monitoring datasets.

50. [Atlantic Coast Joint Venture](#)

Data and tools portal featuring mapping applications, conservation datasets, project databases, and partner resources for bird and habitat conservation across the Atlantic Coast Joint Venture region.

51. [eBird](#)

Community science bird monitoring platform providing access to species observations, checklists, occurrence maps, abundance estimates, and seasonal distribution data.

Meteorological

52. [Community Collaborative Rain Hail and Snow Network](#)

Community science weather observation network providing volunteer-collected precipitation, hail, and snowfall data through maps, reports, and monitoring tools.

53. [National Weather Service Historic Data](#)

National Weather Service climate portal providing access to local climate data, historical weather records, and climate outlooks through Weather Forecast Offices across the United States.

54. [Iowa Environmental Mesonet \(IEM\)](#)

Weather monitoring station portal that maps meteorological observation networks across Virginia and provides access to current and historical weather data.

Protocols

55. [National Wetland Condition Assessment 2026 Field Operations Manual](#)

Field operations manual for the EPA National Wetland Condition Assessment, providing standardized methods for evaluating wetland ecological condition through field sampling, vegetation assessment, soils characterization, and water quality monitoring.

56. [Mid-Atlantic Tidal Wetland Rapid Assessment Method](#)

Rapid assessment protocol for evaluating Mid-Atlantic tidal wetland condition, integrating vegetation, hydrology, habitat, and buffer metrics into standardized ecological condition scores.

57. [Assessing tidal marsh resilience to sea-level rise at broad geographic scales with multi-metric indices \(Raposa et al., 2016\)](#)

Multi-metric assessment framework and calculation tool for evaluating tidal marsh resilience to sea-level rise, using ten indicators to assess vulnerability, guide management actions, and support adaptation planning. Also known as MARS

58. [MarshRAM](#)

Rapid assessment method for evaluating salt marsh condition, integrity, vulnerability, ecosystem functions, and migration potential, using standardized field and remote-sensing metrics to support conservation, restoration, and management decisions.