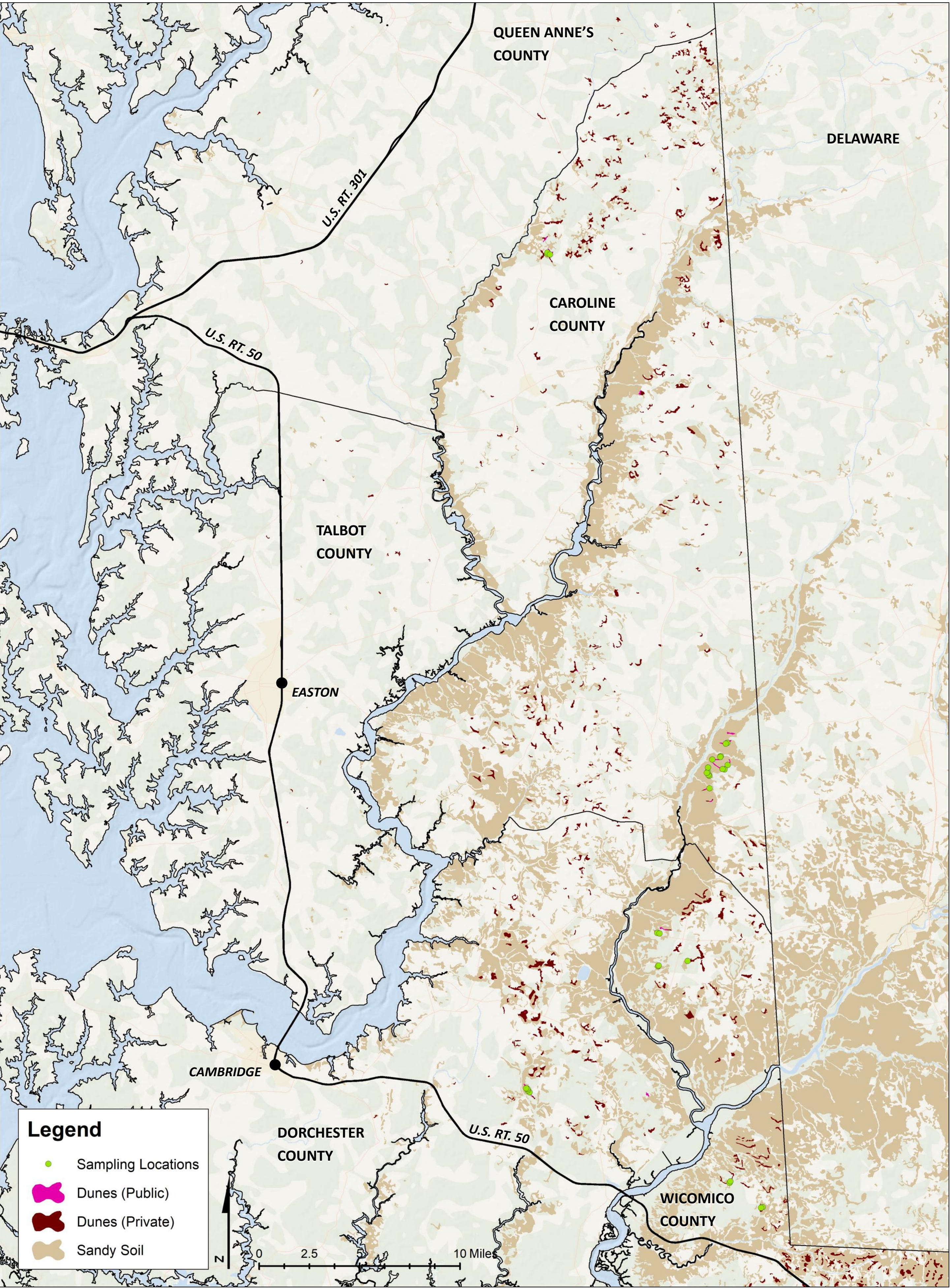


Inland Sand Dune Identification

Landscape-scale GIS Analysis



The Delmarva Peninsula hides a unique geographic feature: inland sand dunes formed over 10,000 years ago. During the late Pleistocene, glacier melt moved sand down from the Great Lakes area, settling in southern Pennsylvania and New Jersey. Strong winds blew sand across the landscape onto the peninsula, which deposited as inland dunes.

Sandy soils are well-drained and nutrient-poor. They support an ecosystem that is disturbance dependent and sunlight-loving. Historically, major storms and wildfires maintained the flora that thrive in sandy conditions. Native peoples frequently used prescribed fire on the landscape before colonization. Pine plantations and fire exclusion on Delmarva caused much of this unique habitat type to transition away from natural conditions. Restoration efforts in certain places have proven to be spectacularly effective, bringing back vibrant oak-pine savannas to the landscape. Great examples can be found in the Pocomoke State Forest, near Furnace Town, and in the Idlywild Wildlife Management Area.

Goals

1. Assess sand dune characteristics across Maryland's Eastern Shore.
2. Identify prominent dunes and field verify sandy soils.
3. Find opportunities to restore sandy sites using timber harvest and / or prescribed fire.

Process

1. Download Web Soil Survey data (online resource from the U.S. Department of Agriculture, Natural Resources Conservation Service).
2. Upload into ArcMap. Filter out and keep soils with $\geq 75\%$ sand content.
3. Create a buffer around tidal waters to help focus on finding *inland* sand dunes.
4. Overlap LiDAR imagery, which shows elevation changes, with the sandy soils layer. Extract sandy areas of locally significant elevation change.
5. Field verify sandy conditions for each soil type. Analyze data collected.

Data Collection

Web Soil Survey data was downloaded for all Eastern Shore of Maryland counties (Kent, Queen Anne's, Caroline, Talbot, Dorchester, Wicomico, Somerset, Worcester) as well as the Delaware counties (New Castle, Kent, Sussex) and Accomack County, Virginia. However, dune identification was only conducted for the Maryland counties.

There were 39 total soil types with $\geq 75\%$ sand content. Only 2 soil types were not able to be sampled. All field data was collected on State land. For the accessible 37 soil types, at least one dune was field verified; some were sampled at up to three dunes. A total of 97 sample points were taken (8 in Kent, 2 in Queen Anne's, 17 in Caroline, 9 in Dorchester, 24 in Wicomico, and 37 in Worcester; these counts loosely reflect the amount of dune area identified in each county). At each point, coordinates, elevation, two photos of the landscape, and a photo of the soil were taken. All points were verified as being sandy; however, the landscape conditions across points varied widely.

12%

Percentage of the Eastern Shore of Maryland (Kent, Queen Anne's, Caroline, Talbot, Dorchester, Wicomico, Somerset, Worcester) that has soil with $\geq 75\%$ sand content. That's **230,000** acres of *super* sandy soil.

6%

Percentage of sandy soil area (14,270 acres) that has locally significant elevation change; i.e. identified as an inland sand dune.

91%

Percentage of identified inland sand dunes located on **private land**. Connecting with landowners and advocating for the creation of early successional habitat is key to wide scale inland dune restoration.

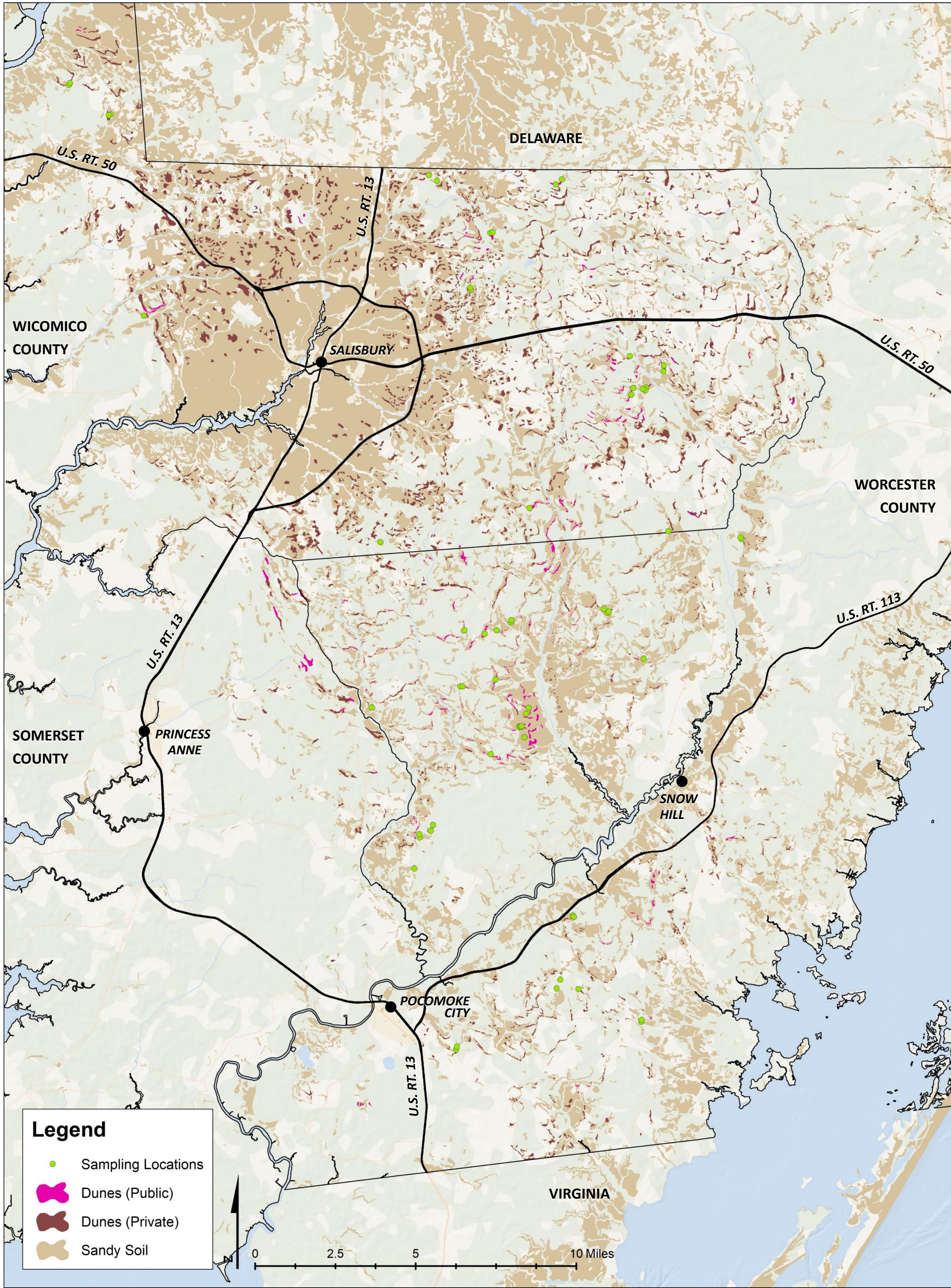


Exhibit 1: Restored Site

The soil type here is Evesboro loamy sand on 5 to 15% slopes, abbreviated EvD. This type is considered excessively drained, containing 82% sand.

A timber harvest at this site (in the Pocomoke State Forest near Furnace Town) removed all of the loblolly pine trees and retained desirable species such as white oak and shortleaf pine as a seed source. Periodic prescribed fires maintain the open, shrubby early successional habitat. The management efforts at this site have fostered the growth of a highly biodiverse ecosystem.



Exhibit 2: Restoration Opportunity

The soil type here is Hammonont loamy sand on 0 to 2% slopes, abbreviated HmA. This type is considered moderately well drained, containing 80% sand. The forest at this site (also in the Pocomoke State Forest) is dense and dark with very little structural diversity. There is no ground vegetation. Some kinds of wildlife may find this appealing; however, the site is surrounded by similar forest. Restoration of this dune area would create a pocket of young habitat, diversifying the local landscape and increasing biodiversity.



Overall Stats

* Highest elevation values per county courtesy of the Maryland Geological Survey, not field verified.

Highest overall elevation on the Shore: 102 (Kent County)

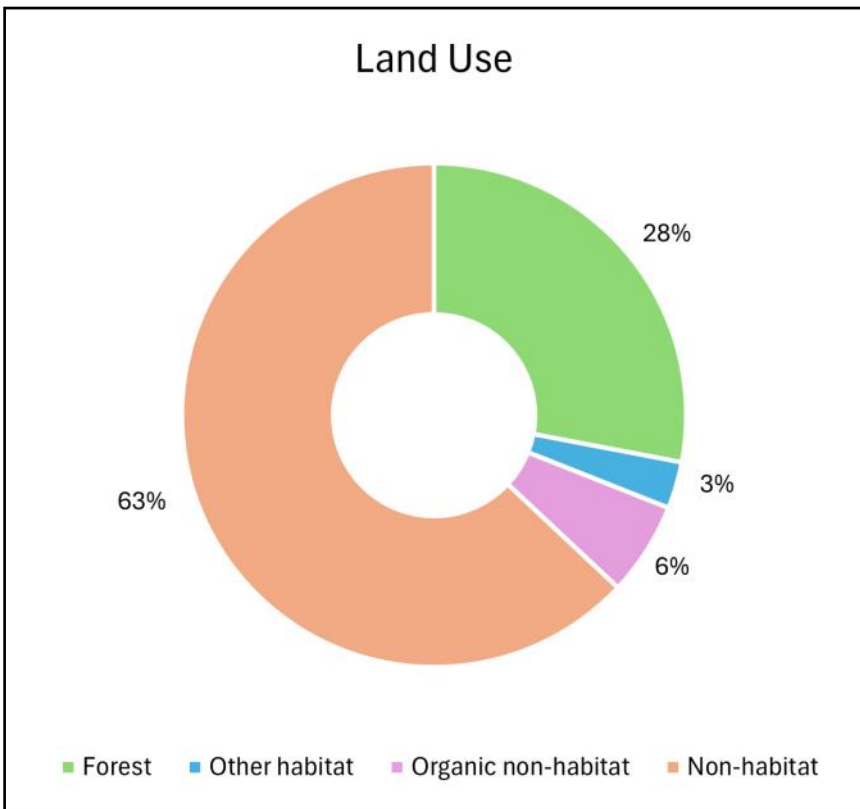
Highest dune elevation sampled: 78.64 (Wicomico County)

Total number of individual dunes: 3,351

County	Highest Overall Elevation*	Highest Dune Sampled
Kent	102	71.75
Queen Anne's	87	58.04
Caroline	79	66.34
Talbot	78	-
Dorchester	57	42.97
Wicomico	73	78.64
Somerset	46	-
Worcester	65	58.10

Category	Land Uses Included
Forest	Forest (includes forested wetlands)
Other habitat	Harvested Forest, Natural Succession, Tree Canopy (Other), Wetlands (non-Organic non-habitat)
Organic non-habitat	Cropland, Pasture/Hay, Tree Canopy over Turf Grass, Turf Grass
Non-habitat	Extractive, Impervious Roads, Impervious Structures, Impervious (Other),

Land use data layers are courtesy of the Chesapeake Bay Program's Conservation Innovation Center (CIC); layers for all the selected counties were completed in 2018.



The majority of sand dunes identified are currently being used for agriculture. A significant portion, however, are forested or otherwise provide habitat.

References & Further Learning

- Colorado State University Extension. (2011). *Estimating Soil Texture: Sandy, Loamy, or Clayey?*. In CMG GardenNotes (Report No. 2014). https://www.carvinstitute.org/sites/default/files/public/downloads/lesson-plans/estimating_soil_texture.pdf
- Denny, C., et. al. (1979). *The Parsonsburg Sand in the Central Delmarva Peninsula, Maryland and Delaware*. Geological Survey Professional Paper 1067-B. United States Geological Survey. <https://pubs.usgs.gov/pp/1067c/report.pdf>
- Denny, C. & Owens, J. (1979). *Sand Dunes on the Central Delmarva Peninsula, Maryland and Delaware*. Geological Survey Professional Paper 1067-C. United States Geological Survey. <https://pubs.usgs.gov/pp/1067c/report.pdf>
- Flagstaff Water Services. (n.d.). *Soil Guide & Definitions*. https://www.flagstaff.az.gov/DocumentCenter/View/57721/LowWaterLandscapeInfo_PDFs_Soil-Guide
- Maryland Geological Survey. (January 2008). *Highest and Lowest Elevations in Maryland's Counties*. http://www.mgs.md.gov/geology/highest_and_lowest_elevations.html
- NOAA National Environmental Satellite, Data, and Information Service. (n.d.). *Learn about Soil Types*. <https://www.nesdis.noaa.gov/learn-about-soil-types>
- USDA Natural Resources Conservation Service. Web Soil Survey. <https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>
- U.S. Geological Survey. The National Map Viewer. <https://apps.nationalmap.gov/>
- Utah State University Forestry Extension. (June 2015). *029— Gardening in Sandy Soils*. <https://extension.usu.edu/forestry/publications/utah-forest-facts/029-gardening-in-sandy-soils#>