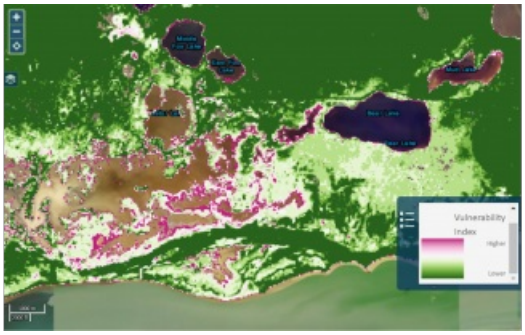
USGS Releases Nationwide Marsh Vulnerability Maps



U.S. Geological Survey scientists have developed and made available a new mapping resource that can identify the most vulnerable marshes across the contiguous U.S. through a combination of remote-sensing and satellite technologies. These maps provide critical information to land managers and help inform marsh conservation and restoration strategies without costly site-specific or labour-intensive assessments.

The USGS has shown that marsh resilience can be evaluated by calculating the ratio of unvegetated area to vegetated area across an entire marsh system, covering marsh plains, channels, ponds and intertidal flats. The method, termed the UnVegetated-Vegetated marsh Ratio or UVVR, uses data collected from 2014 to 2018 through remote-sensing techniques, such as satellite imagery and aerial photography, to gauge how much of an individual marsh is open water and how much marsh plant cover there is. By comparing the ratio of ponds, channels and tidal flats to marsh vegetation, land managers can determine which marshes stand the best chance of persisting in the face of changing conditions.

“The UVVR is a great metric for quickly identifying marshes that may have crossed a stability threshold,” said oceanographer Neil Ganju of the USGS Woods Hole Coastal and Marine Science Center. “When combined with on-the-ground knowledge of an area, it will help managers objectively prioritize restoration.”

Everglades National Park in South Florida is the largest subtropical wetland ecosystem in North America, consisting of about 1.5 million acres of mangrove forests and other coastal wetlands. (Source: USGS)

Counteracting the Effects of Sea-level Rise

Salt marshes are among the most productive and valuable ecosystems in the world. The vegetation in these coastal systems acts as a natural buffer between land and sea, protecting coastline infrastructures under various conditions. Salt marshes also provide essential food, refuge and nursery habitats for commercially and recreationally important species, among other benefits. To continue providing these numerous services, salt marshes need to persist and expand to counteract the effects of sea-level rise and storms that physically erode them.

In the future, the USGS plans to regularly update UVVR assessments using aerial imagery, Landsat and newer satellites to support marsh restoration efforts by the U.S. National Park Service, U.S. Fish and Wildlife Service and coastal state agencies.

The new data products complement detailed mapping by the USFWS’s National Wetland Inventory programme by enabling the comparison of vulnerability between wetland types differentiated by the NWI. The national map of UVVR can also be combined with the Coastal National Elevation Database to generate national estimates of marsh lifespan under varying sea-level rise scenarios.

The UVVR data can be accessed through the USGS Coastal Change Hazards Portal under the Sea-level Rise theme (salt marsh vulnerability) and includes regional and national assessments. The nationwide UVVR data is also available to download in Science Base.

In the Mississippi River Birdfoot Delta, there is intense vegetation loss in marshes farthest away from the river, as indicated by high values of UVVR (shown in pink). In the past, these marshes were naturally replenished by the Mississippi River sediment supply, but human activities have disrupted this natural processâ€”causing these

sediments to instead go straight down the riverâ€™s channel and into the Gulf of Mexico. (Source: USGS)