COASTAL SALINITY INDEX (CSI) - A NEW TOOL FOR COASTAL MANAGERS

The Coastal Salinity Index (CSI) can be found at
https://www2.usgs.gov/water/southatlantic/projects/coastalsalinity/home.php

Coastal drought is unique in its effects on the salinity dynamics of creeks, rivers, and estuaries. Commonly-used drought indices characterize hydrological, agricultural, and meteorological conditions; however they do not incorporate salinity, a key stressor associated with coastal drought. Salinity is a critical response variable that integrates hydrologic and coastal dynamics including sea level, tides, winds, precipitation, streamflow, and tropical storms.

## What is the Coastal Salinity Index?

The CSI is a drought index tool that uses salinity data to characterize saline (drought) and freshwater (wet) conditions in coastal surface waters.

- The CSI uses an approach similar to the Standardized Precipitation Index (SPI) to show the probability of recording a given amount of salinity.
- The CSI can be computed for multiple time intervals from 1 to 24 months to characterize short- and long-term conditions.
- The CSI does not depict hourly to daily salinity fluctuations, but the response to monthly (and longer) precipitation and streamflow conditions.

Who can use the CSI?

The CSI was developed to characterize coastal drought, monitor changing salinity conditions, and improve understanding of the effects of changing salinities on fresh and saltwater ecosystems, fish habitat, and freshwater availability for municipal and industrial use. Key audiences include:

- **Resource managers.** Those who monitor drought conditions in order to make decisions and manage resources, such as water, fisheries, wildlife, refuges, preserves, and forests.
- **The drought monitoring community.** Those who monitor drought conditions, make determinations regarding drought status, and disseminate drought information, for example, drought coordinators and response committees, State climatologists, and National Weather Service offices.
- **Researchers.** Those who are interested in studying drought and improving understanding of the drivers and effects of drought in coastal areas.
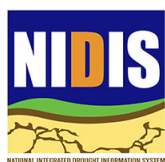
What does this new tool provide?

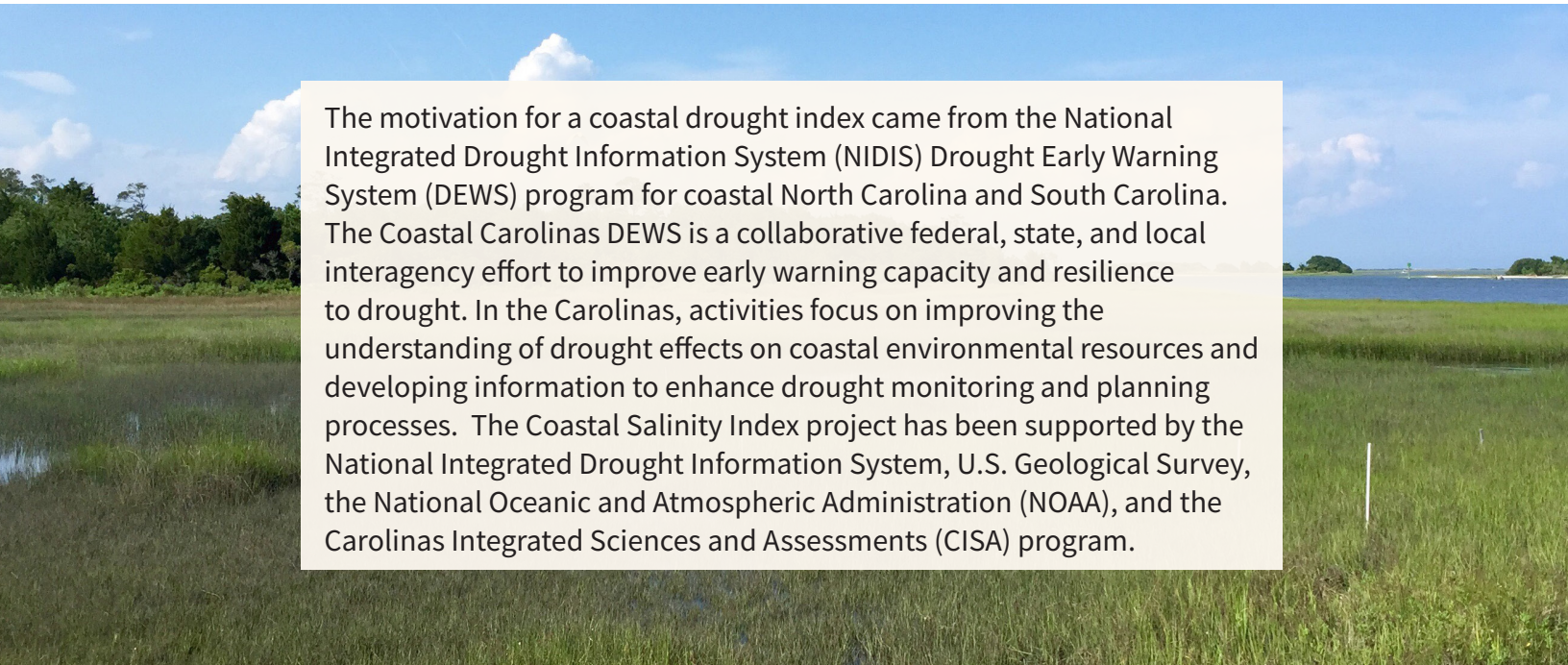This free, online tool has many functions including:

- Data and graphs for weekly trends for salinity and water temperature conditions, as an indicator of recent hydrological conditions.

- Data and graphs for monthly salinity averages.

- Downloadable software package (R-package), to encourage the use of CSI in current and future research efforts (https://github.com/USGS-EDEN/CSI).

- Access to real-time CSIs for the Carolinas (https://www2.usgs.gov/water/southatlantic/projects/coastalsalinity/home.php) and south Florida (https://sofia.usgs.gov/eden/coastal.php).

- Access to historic CSIs through the USGS ScienceBase Catalog (https://www.sciencebase.gov/catalog/item/5852c109e4b0e2663625ed92)

- A CSI User Guide (https://www2.usgs.gov/water/southatlantic/projects/coastalsalinity/files/CSI_User_Guide.pdf).

What are the future plans for the CSI?

- **Increase number and spatial coverage of monitoring sites.** Include more real-time gauge stations along the Eastern seaboard and the Gulf of Mexico, with potential expansion to the Pacific coast.

- **Advance key research questions.** Better understand how salinity information can be incorporated into short and long-term planning in areas such as fisheries (e.g., oysters, crabs), conservation (e.g., wetlands) and water (e.g., municipal utilities) management.

- **Expand use of CSI applications in coastal decision making.** Develop more case studies of how the CSI can be utilized or improved.

- **Move towards predictive capacity.** The CSI currently serves as an indicator of historical change and current conditions. Can the CSI evolve into a forecast tool as well?

Questions or Suggestions?

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The motivation for a coastal drought index came from the National Integrated Drought Information System (NIDIS) Drought Early Warning System (DEWS) program for coastal North Carolina and South Carolina. The Coastal Carolinas DEWS is a collaborative federal, state, and local interagency effort to improve early warning capacity and resilience to drought. In the Carolinas, activities focus on improving the understanding of drought effects on coastal environmental resources and developing information to enhance drought monitoring and planning processes. The Coastal Salinity Index project has been supported by the National Integrated Drought Information System, U.S. Geological Survey, the National Oceanic and Atmospheric Administration (NOAA), and the Carolinas Integrated Sciences and Assessments (CISA) program.