

DEVELOPMENT OF A COASTAL DROUGHT INDEX USING SALINITY DATA

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The location of the freshwater-saltwater interface in surface-water bodies is an important factor in the ecological and socio-economic dynamics of coastal communities. It influences community composition in freshwater and saltwater ecosystems, determines fisheries spawning habitat, and controls freshwater availability for municipal and industrial water intakes. These dynamics may be affected by coastal drought through changes in *Vibrio* bacteria impacts on shellfish harvesting and occurrence of wound infection, fish kills, harmful algal blooms, hypoxia, and beach closures.

Many definitions of drought have been proposed, with most describing a decline in precipitation having negative impacts on water supply and agriculture. Four general types of drought are recognized: hydrological, agricultural, meteorological, and socio-economic. Indices have been developed for these drought types incorporating data such as rainfall, streamflow, soil moisture, groundwater levels, and snow pack. However, these drought indices were developed for upland areas and may not be appropriate indices for characterizing drought in coastal areas. Because of the uniqueness of drought impacts on coastal ecosystems, a need exists to develop a coastal drought index. The availability of many real-time and historical salinity datasets provides an opportunity to develop a salinity-based coastal drought index.

The challenge of characterizing salinity dynamics in response to drought is excluding responses attributable to occasional saltwater intrusion events. We applied various statistical and numerical techniques to evaluate the most appropriate approach to develop salinity drought indices. An approach similar to the Standardized Precipitation Index was modified and applied to salinity data obtained from sites in South Carolina and Georgia, USA. Coastal drought indices characterizing 1-, 3-, 6-, 9-, and 12 month drought conditions were developed. Evaluation of the coastal drought index indicates that the index can be used for different estuary types (for example, brackish, oligohaline, or mesohaline estuaries), for regional comparison between estuaries, and as an index for wet conditions (high freshwater inflow) in addition to drought conditions. The development of the various drought characteristic intervals (1-, 3-, 6-, 9-, and 12 month) allow for the coastal drought index to be correlated with environmental response variables that occur on different time intervals.

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