



Coastal Climate Impacts...

What You Can Do.

Q:

frequently
asked questions

Information about climate variability and climate change can enhance many aspects of coastal management.

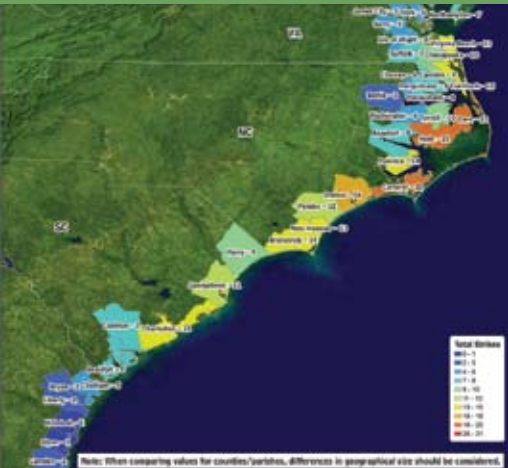
This guide answers some of the common questions community planners, and state and local officials may have about using climate information to make better decisions.

- 1 What is the difference between **weather** and **climate**? What makes **coastal climatology** so special?
- 2 How does climate affect **water resources**?
- 3 Can climate affect the **environmental quality** along the coasts?
- 4 How can we use information about the climate to **reduce damages** from **coastal storms**?
- 5 Does climate affect our **utilities** and **infrastructure**?
- 6 What is the link between climate and **fisheries**?
- 7 What effects can climate have on **recreation and tourism**?
- 8 Where can I get **data and information** about coastal climate?
- 9 What is **Sea Grant** doing to improve my ability to use climate information?

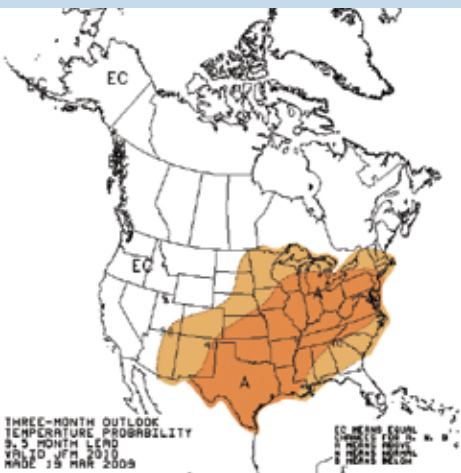


A:

answers to frequently asked questions



Total number of hurricane strikes by counties/parishes, 1900-2007. National Oceanic and Atmospheric Administration (NOAA) National Hurricane Center.



Seasonal temperature outlooks (above) and precipitation outlooks are available to help you plan months in advance. NOAA Climate Prediction Center.

1 What is the difference between **weather** and **climate**? What makes **coastal climatology** so special?

Weather is the short term (daily-to-weekly) atmospheric conditions we experience. Climate is the long-term average weather conditions over time (seasonal-to-millennial periods) that are characteristic of a region like the Carolina coasts. Climatology is the study of climate, and it includes historical climate characteristics, ranges of natural variations in climate, and long-term climate change. Climate also includes the ways the ocean interacts with the land and the air. This means that coastal climate studies consider both atmospheric and marine data, like marine winds, salinity, currents, wave characteristics, and tides.

2 How does climate affect **water resources**?

Increasing population along the coast means an increasing need for sustainable supplies of fresh water. Droughts decrease water availability, and floods contaminate surface water supplies and rivers. Both erosion and temperature changes can alter the distribution of algal blooms. Additionally, observations since the 1920's and 1930's indicate that the sea level in Wilmington, NC, rose at an average rate of about 0.73 feet per century; in Charleston, SC, the rate was closer to one foot per century (NOAA, 2005). Globally, climate scientists expect sea levels to rise at least 0.6 to 2 feet in the next 100 years (IPCC, 2007). As the sea level rises, salt water will inundate estuaries and infiltrate fresh water supplies. You can use National Oceanic and Atmospheric Administration (NOAA) seasonal forecasts and drought outlooks to see if unusually wet or dry periods are likely to occur in the near future. Sea-level rise maps illustrate what impacts higher sea levels might have on local land-use patterns and the economy.

3 Can climate affect the **environmental quality** along the coasts?

Yes. Heavy precipitation and floods increase runoff from agricultural and urban areas, washing fertilizers, sediment, toxic chemicals, and other substances into rivers and streams. During droughts, reduced precipitation can concentrate pollutants in estuaries. You can use flood and drought probabilities calculated from historical climate records and information about climate variability signals, like the El Niño-Southern Oscillation (ENSO), to target critical areas for improving stormwater management, managing erosion, or guiding the use of fertilizers and other chemicals. Finally, dredging projects can have an effect on the shoreline after the material disperses. Ocean data from buoys—including wind, currents, and wave data—can help you negotiate disposal locations for dredged material that minimize negative impacts on your region.

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4 How can we use information about the climate to **reduce damages** from **coastal storms**?

Severe thunderstorms, winter nor'easters, tropical storms, and hurricanes are among the natural hazards we experience along the Carolina coasts. Evacuations are costly, but you can make better decisions about issuing evacuation orders by using information on historical storm tracks and current forecasts. You can improve emergency plans by using historic rainfall and flood data, current rainfall forecasts, and storm-surge models to plan evacuation routes that avoid flooded areas. Additionally, storm-surge models and wave data will help you plan beach nourishment projects that reduce erosion damage from coastal storms.

5 Does climate affect our **utilities and infrastructure**?

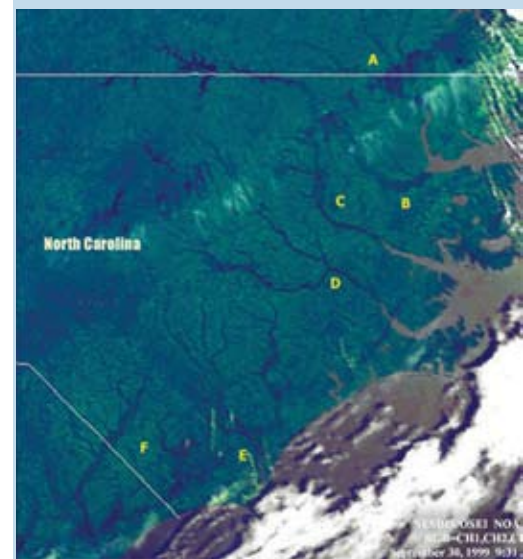
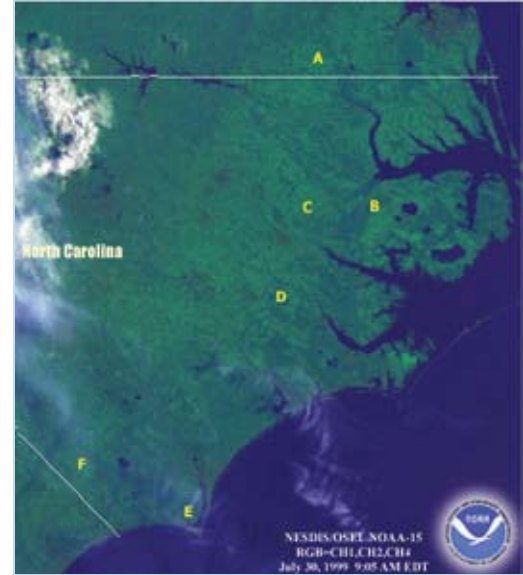
Absolutely! Warmer, drier conditions increase energy demand, so projections of seasonal climate variability and change will help utilities meet demand in both the short- and long-term. To balance utility needs with agricultural and drinking water supply needs, water managers need information on droughts, floods, stream flow, and surface water runoff. Power transmission lines may be exposed to tropical storms and hurricanes, so tropical climatology information can help utilities decrease infrastructure damage. Transportation infrastructure can also benefit from climatic information—for example, changes in temperature and precipitation affect road construction and repair; seasonal forecasts can be used to plan construction schedules that take advantage of beneficial weather conditions.

6 What is the link between climate and **fisheries**?

Different fish species thrive under different marine conditions. Variations in climate on the scale of a few years, like ENSO, can change the ocean temperature and salinity in fishery areas, affecting fish migration and reproduction. In the long term, oceans store both excess heat and carbon dioxide. As humans emit more carbon dioxide, the oceans store more of it, which makes the water more acidic. Marine organisms have a relatively short time to adapt, so these changes can reduce an area's productivity and even cause fisheries to collapse. You may use data on deviations from the normal ocean temperature and chemistry to help fishermen shift to catching alternative species and establish new fishing grounds.

7 What effects can climate have on **recreation and tourism**?

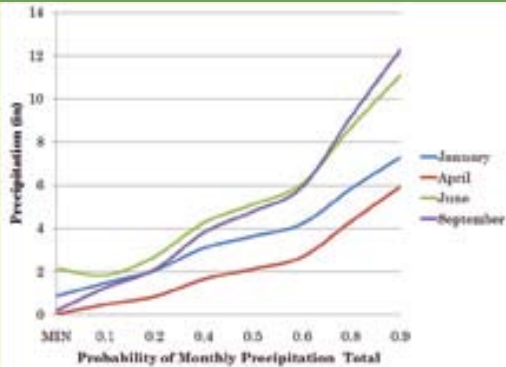
In many of our coastal communities, the recreation and tourism industry is a major source of revenue. Advertising a region's historical seasonal climate may help your region attract more tourists. You can also use historical climate information to plan festivals and recreation activities for favorable locations and times of year. *(Continued on next page.)*



Hurricane Floyd in 1999 is a good example of the impact an extreme event can have on coastal hydrological conditions. By comparing the pre-storm (top) and post-storm (bottom) images, you can see how flooding from the storm washed massive amounts of sediment into coastal estuaries. Climate information can help you plan for such events by allowing you to evaluate alternative management strategies that may help coastal ecosystems recover more effectively. NOAA Office of Hydrologic Development, 2001. www.nws.noaa.gov/oh/hurricane/inland_flooding.html



Answers to frequently asked questions



Probabilities of monthly precipitation totals for January, April, June, and September in Charleston, SC, based on observed data 1971-2000. For example, in April, total monthly precipitation will equal 1.63 inches or less in 4 out of 10 years; in 6 out of 10 years, it will total more than 1.63 inches. (Data: NOAA/NESDIS/NCDC, 2002)

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SOURCES: IPCC, 2007: *Climate Change: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press, Cambridge, UK 1000 pp.

NOAA, 2005: *Sea Levels Online:* <http://tidesandcurrents.noaa.gov/sltrends/sltrends.html>. Accessed 5/23/08.

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Long-term climate change may benefit tourism revenue by extending the traditional summer tourism season. However, negative impacts could include increased damage to beaches and other coastal attractions from more intense coastal storms and sea-level rise, thus increasing the cost of beach renourishment and other erosion control projects.

8 Where can I get data and information about coastal climate?

A variety of climate data and resources exist, and much of it is available for free or at a low cost. Some commonly used resources include:

- **National Oceanic and Atmospheric Administration (NOAA) Climate Prediction Center (CPC)** Seasonal and monthly climate forecasts: www.cpc.noaa.gov/products/forecasts
Drought outlooks: www.cpc.noaa.gov/products/expert_assessment/drought_assessment.shtml
- **NOAA National Hurricane Center (NHC)** Tropical forecasts, climatology: www.nhc.noaa.gov
- **NOAA National Climatic Data Center (NCDC)** Radar images, surface observations, satellite, buoy, and paleoclimatic data. Small fees may apply for selected data: www.ncdc.noaa.gov/oa/ncdc.html
- **NOAA National Ocean Service (NOS)** Data explorer for coastal decision-making, ecological forecasts, aerial photography, real-time currents, and water levels: <http://oceanservice.noaa.gov/dataexplorer>
- **NOAA Coastal Services Center (CSC)** Benthic, shoreline, topographic, land cover/land change data and training through Digital Coast: www.csc.noaa.gov/digitalcoast
Climate hazard vulnerability assessment: www.hd.gov/HDdotGov
- **United States Geological Survey (USGS) National Streamflow Information Program (NSIP)** Real-time and historical stream flow data: <http://water.usgs.gov/nsip/index.html>
- **State Climate Office of North Carolina** N.C. climate data, climatology, and outreach: www.nc-climate.ncsu.edu
- **South Carolina State Climatology Office** S.C. climate data, climatology, and consulting: www.dnr.sc.gov/climate/sco
- **Coastal Heritage** A free quarterly S.C. Sea Grant publication on coastal environmental policy, science, history, and culture: www.scseagrant.org/Sections/?cid=82
- **Coastwatch** A subscription-based N.C. Sea Grant publication on coastal issues and resources: www.ncseagrant.org/home/coastwatch

9 What is Sea Grant doing to improve my ability to use climate information?

Both the North and South Carolina Sea Grant programs have university partners that conduct new research on our region's coastal climatology. This research includes work on improving available climate information products and on methods to assess the impacts of climate variability and change in your area. One current project investigates how industries and coastal resource managers in the Yadkin-Pee Dee drainage basin will adapt to changes in fresh water supply. Additionally, the Sea Grant Climate Extension Specialist (CES) will help you match climate data and information to your decision-making needs and learn how to use this data wisely. Your CES serves both the North and South Carolina coastal regions, and is familiar with emerging local and national research on climate variability and change. We encourage you to contact the CES to discuss ideas you have for new research that could benefit your organization and the resources that Sea Grant can provide for teaching you about climate and incorporating that knowledge into decision-making strategies that may help coastal ecosystems recover more effectively.