



**ECOSYSTEM SERVICES
RESEARCH PROGRAM**

ECOSYSTEM SERVICES STUDY FOCUSES ON ALBEMARLE-PAMLICO WATERSHED IN CAROLINAS

Issue

The Ecosystem Services Research Program (ESRP) in EPA’s Office of Research and Development (ORD) is identifying and characterizing the services that ecosystems provide to humans and identifying the value that these services represent to human health and well-being.

The Albemarle-Pamlico Watershed Study (APWS) is closely linked with the ESRP- Nitrogen research project whose goal is to connect the effects of reactive nitrogen (Nr) to ecosystem services. Nitrogen affects ecosystem services in both positive and negative ways, enhancing the production of food and fiber, but having adverse effects on other ecosystem services such as provision of drinking water, air quality, forest health, climate regulation, fisheries and aquatic habitat.

The study in the coastal Carolinas region will provide the science

needed to address the problem of Nr pollution in the watershed and the impacts Nr loading has on ecosystem services downstream in the Albemarle-Pamlico Sound. Special emphasis is given to coastal wetlands and, in particular, the role of wetlands in controlling Nr.

There are many sources of Nr to the Albemarle-Pamlico watershed including atmospheric deposition, agricultural runoff and stormwater runoff. As excess Nr is transported downstream by surface and groundwaters, changes occur in estuarine processes and functions including eutrophication, large algal blooms, harmful algal blooms, fish kills and changes in food web dynamics. These changes impact the delivery of ecosystem services or the benefits of nature such as clean water, aesthetics, recreation, food production and flood mitigation.

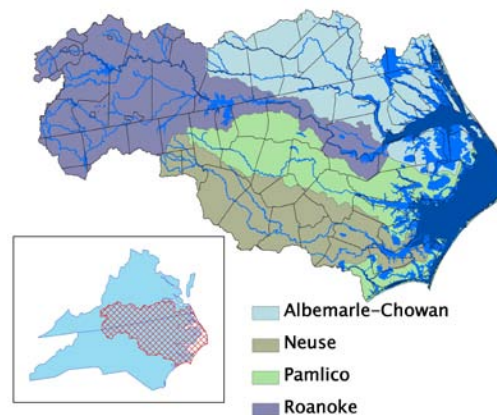


Figure 1. Albemarle-Pamlico Watershed with primary river basins.

The study area includes northeastern North Carolina and Virginia tidewater areas and extends west into the piedmont of North Carolina and highlands of Virginia (Figure 1).

Science Objectives

The principal goal of the study is to provide the information and tools

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needed to understand how watershed regulation of Nr upstream and associated land use decisions influence the nature and quantity of ecosystem services received from estuaries and coastal wetlands.

The objectives are to:

- Identify and characterize coastal ecosystems services, with an emphasis on wetland and estuarine ecosystems.
- Develop a suite of ecological/biophysical tools to map, monitor, or model ecosystem services for use in establishing the relative values represented by coastal ecosystem services.
- Identify the impacts of regional and local management actions and decisions on coastal ecosystems services, with emphasis on reactive nitrogen sources and cycles.
- Develop information and decision tools including the ability to visualize future scenarios of alternative land use and climate-induced sea level rise and make these available to managers and citizens for use in assessing the full cost of land-use decisions.

- Determine the Nr loading rates and concentrations that create tipping points that result in substantial losses of wetland and coastal ecosystem services.

Research questions include:

- What and where are the ecosystem services within the watershed and Albemarle-Pamlico Sound estuary?
- What is the current status and probable future state of these services under current trends and alternative management and sea level rise scenarios?
- What are the atmospheric, aquatic, and terrestrial sources and sinks of Nr within the basins of the Albemarle-Pamlico watershed?
- What are the rates of Nr loading and processes of Nr attenuation within the Neuse and Tar-Pamlico river basins?
- What are the levels of Nr in Albemarle-Pamlico Sound estuary?

- Can we predict the benefits and costs of management decisions on coastal ecosystem services?
- How can we make this information available in a useful and usable form?

Application and Impact

The Albemarle-Pamlico Watershed Study will identify and quantify ecosystem services to support more effective nitrogen management decisions. This will, in turn, promote sustainable coastal communities and good stewardship of the land. This research will provide useful and usable information and tools to determine the real value of ecosystem services and the probable future impacts and costs of decisions under a variety of alternative land-use and sea level change scenarios.

CONTACT:

Darryl Keith, Ph.D., EPA Office of Research and Development, 401-782-3135, keith.darryl@epa.gov

Brenda Rashleigh, Ph D, EPA Office of Research and Development, 706-355-8148, rashleigh.brenda@epa.gov

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