

Bibliography on the Occurrence and Intrusion of Saltwater in Aquifers along the Atlantic Coast of the United States

Open-File Report 02-235

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By PAUL M. BARLOW and EMILY C. WILD

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FIGURE

1. Map showing selected areas along the Atlantic coast where saltwater has intruded into freshwater aquifers 2

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By Paul M. Barlow *and* Emily C. Wild

Abstract

Freshwater aquifers along the Atlantic coast of the United States are vulnerable to the intrusion of saltwater from saline waters that bound the aquifers along their seaward margins. Incidences of saltwater intrusion have been documented along the Atlantic coast for more than 100 years. This report provides a bibliography of published literature relating to the occurrence and intrusion of saltwater along the Atlantic coast of the United States, including all of the coastal States from Maine to Florida (including the coast of Florida along the Gulf of Mexico). The bibliography contains 549 references that date from 1896 to 2001. The bibliography contains references to books, journal articles, and government and other technical reports and maps that could be readily obtained through a scientific library. Conference papers and abstracts, unpublished manuscripts, publications in press, newspaper articles, consulting reports, and reports prepared by local or regional water companies or water districts are omitted from the bibliography.

INTRODUCTION

Freshwater aquifers along the Atlantic coast are among the most productive in the United States, supplying drinking water to an estimated 30 million people from Maine to Florida in 1995. These freshwater

aquifers are bounded at their seaward margins by saltwater. Under natural conditions, the seaward flow of freshwater prevents saltwater from encroaching coastal aquifers. Ground-water withdrawals, however, lower coastal water levels and can cause saltwater to be drawn landward and upward toward the points of withdrawal, a process called saltwater intrusion. Saltwater intrusion reduces ground-water storage and can lead to the abandonment of supply wells when concentrations of dissolved ions, such as chloride, in water withdrawn at the wells exceed drinking-water standards. Incidences of saltwater intrusion have been documented throughout the Atlantic coastal zone (fig. 1), in some cases dating back more than 100 years. The degree of saltwater intrusion along the coast varies widely, however, and is affected by the hydrogeologic setting, history of ground-water development, and sources of saline water within a particular area.

As part of its Ground-Water Resources Program, the U.S. Geological Survey (USGS) has undertaken an assessment of saltwater intrusion along the Atlantic coast of the United States. The assessment required a review of the extensive body of literature that has been published on the occurrence and intrusion of saltwater along the Atlantic coast. A product of this review was a bibliography of published literature on the subject. Although the focus of the literature review was saltwater intrusion, knowledge of the occurrence of saltwater in aquifers along the Atlantic coastal zone also is important for the monitoring and management of potential saltwater-intrusion problems.

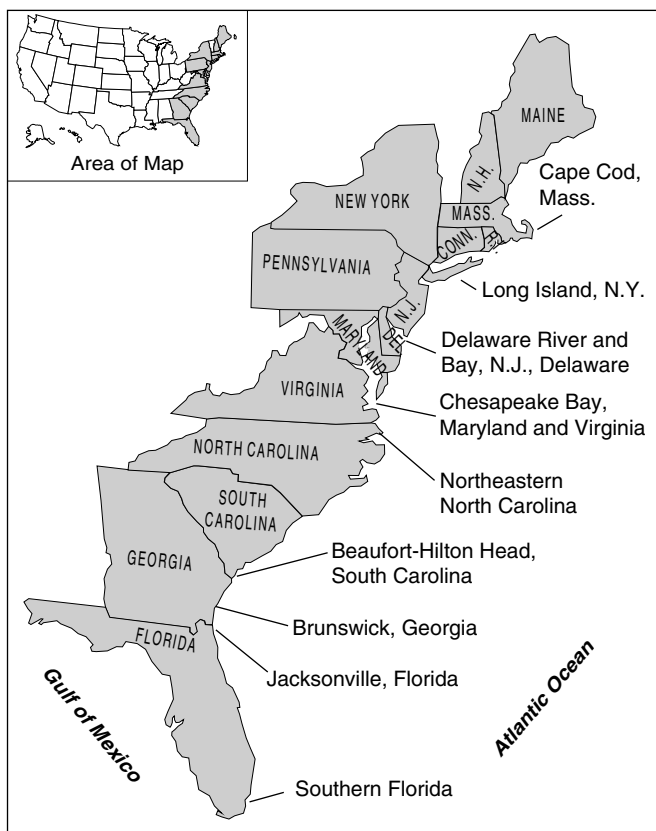


Figure 1. Selected areas along the Atlantic coast where saltwater has intruded into freshwater aquifers.

Purpose and Scope

The purpose of this report is to provide a bibliography of published literature relating to the occurrence and intrusion of saltwater along the Atlantic coast of the United States, including all of the coastal States from Maine to Florida. For completeness, the entire State of Florida is included in the bibliography, even though the western and northwestern coasts of the State lie along the Gulf of Mexico. References in this bibliography date from 1896 to 2001. The bibliography contains references to books, journal articles, and government and other technical reports and maps that could be readily obtained through a scientific library. Conference papers and abstracts, unpublished manuscripts, publications in press, newspaper articles, consulting reports, and reports prepared by local or regional water companies or water districts are omitted from the bibliography.

Approach

The bibliography was compiled from a number of sources. Initially, publications were obtained from reports previously prepared on the subject of saltwater intrusion by Krieger and others (1957), Cooper and others (1964), Feth (1965), Task Committee on Saltwater Intrusion (1969), Todd (1974), Newport (1977), Miller and others (1974, 1977), Reilly and Goodman (1985), Atkinson and others (1986), and Bear and others (1999). A bibliographic listing of reports prepared as part of the USGS Regional Aquifer-System Analysis (RASA) program by Sun and others (1997) also was reviewed. Computerized bibliographic searches then were done for each State by use of the earth-science database GeoRef (produced by the American Geological Institute), which is available from the Cambridge Scientific Abstracts (CSA) Internet Database Service through the USGS Library. These searches consisted of the keyword "salt-water intrusion" in combination with the particular State name. In addition, reports related to the occurrence and intrusion of saltwater listed in bibliographies on several of the USGS web pages for individual States were reviewed. The USGS web pages were accessed at <http://sn.water.usgs.gov/>, where sn is the two-letter State-name abbreviation (such as ma for Massachusetts). Bibliographies listed on a few State Geological Survey web pages also were reviewed; these bibliographies are cited in the respective State listings, with the exception of O'Neil and Lutz (2001) for Pennsylvania. Reference lists for individual reports were reviewed for additional sources of published information; those sources then were reviewed for inclusion in the bibliography. Finally, the draft bibliographic listings for individual States were reviewed by staff of the USGS and three State agencies for completeness and accuracy.

Criteria for selecting documents were relevance to the occurrence and intrusion of saltwater along the Atlantic coastal zone of the United States and availability of documents. Many of the annual data reports produced by the USGS for each State include water-quality data; those reports, however, are not listed in this bibliography. Information about USGS annual data reports for a particular State can be obtained from the USGS web page for that State.

Acknowledgments

The authors thank the U.S. Geological Survey staff who reviewed the bibliographic listings for individual States and contributed bibliographic references. We also thank the following people who reviewed the bibliographic listings for their respective State: Corinne Fitting, Connecticut Department of Environmental Protection; Scott Andres, Delaware Geological Survey; and David Drummond, Maryland Geological Survey. Staff of the U.S. Geological Survey in Reston, Virginia, were particularly helpful in providing the authors many reports for review.

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The bibliography is arranged alphabetically by State and then alphabetically by principal author; where more than one publication by the same author (or authors) is listed, the references are in chronological order. A "Regional Studies" section is provided before the State listings that includes references to reports that discuss the occurrence and intrusion of saltwater within three or more States. Reports that contain information for two States are listed for each of those States. Bibliographies are provided for Connecticut, Delaware, Florida, Georgia, Maine, Maryland, Massachusetts, New Jersey, New York, North Carolina, Rhode Island, South Carolina, and Virginia. No references were found to meet the selection criteria for New Hampshire or Pennsylvania.

Regional Studies

State abbreviations given in the brackets that follow each citation refer to the States covered in that particular citation, arranged from north to south; for example, "[NC-GA]" indicates that the report covers North Carolina, South Carolina, and Georgia.

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