

# Sea-Level Rise in South Florida: Impacts to Drinking Water and Human Health

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## INTRODUCTION

The availability of high quality drinking water is vital to maintaining individual health and quality of life. Climate change scenarios such as Sea-Level Rise (SLR), increasing temperatures, and changing weather patterns threaten the quality and availability of South Florida’s drinking water sources. SLR causes salt water intrusion to freshwater aquifers, flooding, septic tank leakage, and soil saturation. These consequences of rising sea levels pose potential threats to human health. This research highlights SLR impacts to drinking water in South Florida, addressing the ways in which human health can potentially be affected.

## METHODS

A literature review was conducted and included peer reviewed journal articles (2010-present) that focused on SLR effects to drinking water and human health in South Florida. Literature included relevant fields of Epidemiology, Hydrology, Environmental Studies, and Geosciences.

Personal communication was made with a local South Florida hydrologist and soil scientist. The interviewee addressed some of the ways South Florida’s drinking water supply is threatened due to SLR.

## DISCUSSION

Saltwater intrusion to groundwater wells in the southern Biscayne Aquifer (see figure 1) will compromise drinking water for millions of residents (1). As sea levels rise, the increase in groundwater levels will cause soil saturation to place stress on drainage canals and infrastructure, especially when periods of intense rainfall occur. This stress can lead to cracks in sewer and drinking water lines (4). SLR in combination with king tide events will cause flooding and septic tank seepage, resulting in mobilization of fecal coliform bacteria and other contaminants.

Extant literature recognizes a multitude of climate change related health risks, however, there is less research that emphasizes the potential effects to human health in relation to drinking water and SLR. Figure 2 displays that four main impacts to drinking water as a result of SLR and the health risks associated with each factor. The main concerns to human health are the exposure to pathogenic viruses and microorganisms (4, 5, 6, 10) and mental health and stress related disorders (6).

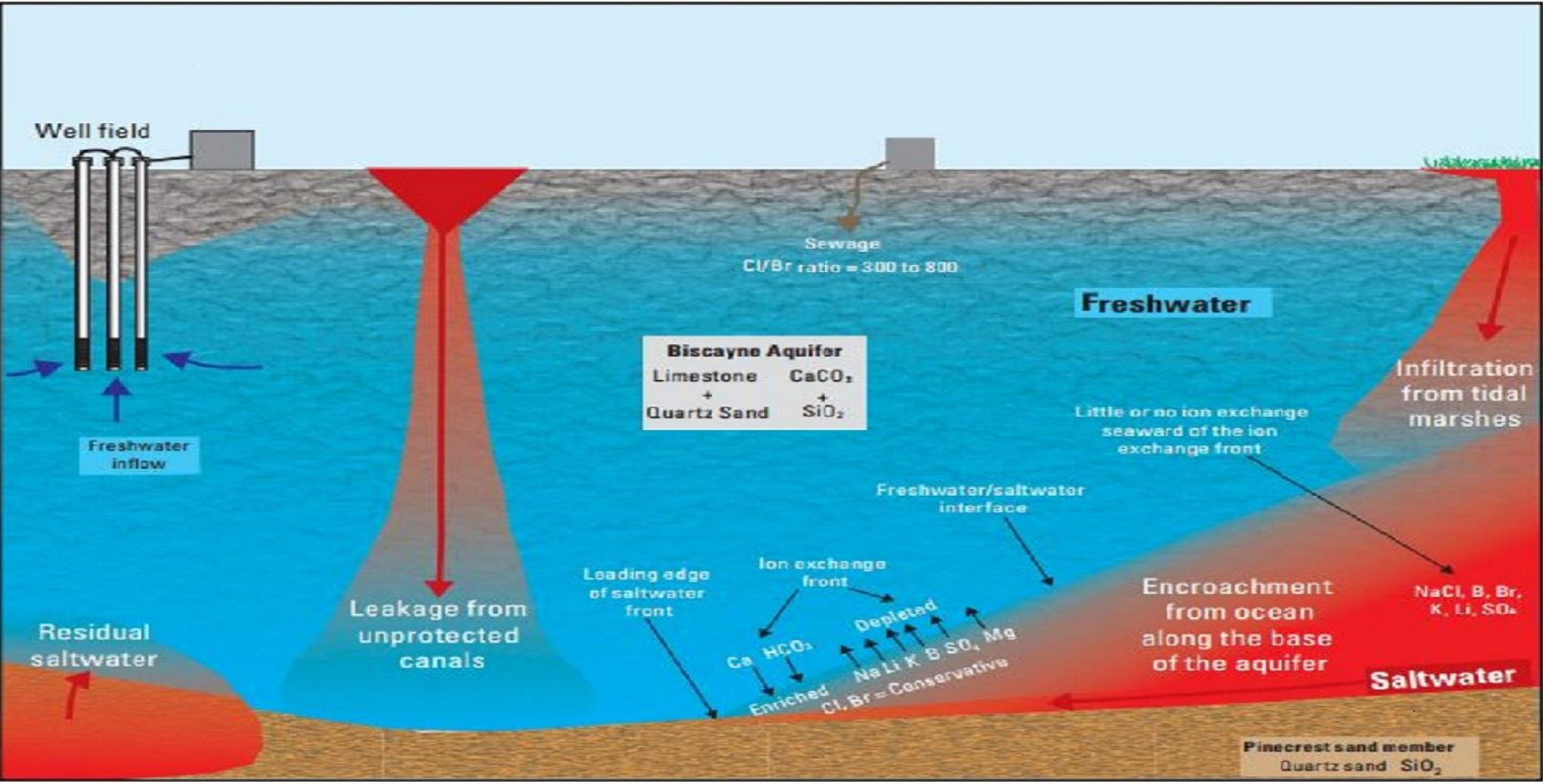


Figure 1. Salt water intrusion to the Biscayne Aquifer. Image source: Prinos et al. (2014).

| Sea-Level Rise Impacts | Drinking Water Effects   | Potential Health Impacts   |
|------------------------|--|--|
| Salt water intrusion   | Disruption to water supply availability (2, 6), increased fees for customers (4), and higher groundwater levels and reduced aquifer storage (3).                   | Mental health and stress related disorders (5, 6).   |
| Flooding               | Nutrient mobilization from agricultural runoff, nitrogen and phosphorus introduction to water sources, algal blooms, overburden to water treatment facilities (6). | Possible exposure to pathogenic viruses and microorganisms (5, 6). Heart effects from increased toxicants in water (6).  |
| Septic tank leakage    | Algal blooms, nutrient mobilization, nitrate and fecal coliform contamination to groundwater (7).  | Possible exposure to cyanotoxins (5), like microcystin, which is carcinogenic to humans (10).  |
| Soil Saturation        | Infrastructure pressure which can result in damaged pipes (4).   | Possible exposure to waterborne pathogens (bacteria, viruses, and <i>Giardia</i> parasites such as <i>Cryptosporidium</i> ) (5) introduced via broken pipes (4). |

Figure 3. SLR Impacts related to human health

## CONCLUSION

South Florida’s karst topography and low-lying elevation make the area particularly vulnerable to SLR. The reviewed literature highlights the ways South Florida’s drinking water supply will be compromised and as a result, human health will become more susceptible to the exposure of waterborne diseases. Additionally, water shortages that may arise due to saltwater intrusion will place intensified economic stress on local communities, contributing to mental health disorders.

SLR will compromise the availability and quality of drinking water to millions of South Florida residents. More research is needed to address potential effects on human health and how preparations can be made to deal with potential health threats.

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**Acknowledgement:** A special thank you to Dr. Keren Bolter for her guidance throughout this research and her valuable input regarding sea-level rise.