

# Be Prepared: Water Quality and Climate Change in Florida

By Josiah Neeley and Tony Carvajal



**Maintaining Florida's water supply is a necessity if the state is to continue to grow and thrive in the long term.**

## Introduction

It's no secret that climate change poses acute risks and costs for Florida. With its extended coastline and geographic position, the state has always been vulnerable to damage from hurricanes, flooding and sea level rise. While some of the consequences of climate change have been widely circulated in the media and politics, other serious risks have received comparatively less attention. In particular, the risks that rising sea levels and increased flooding pose to Florida's drinking water supply and to its water infrastructure deserve greater consideration.

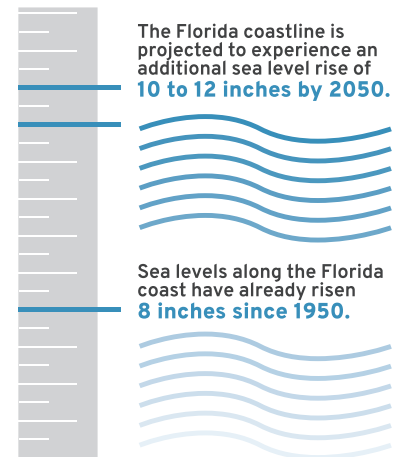
Sea levels along the Florida coast have already risen 8 inches since 1950, with the majority of the increase coming in recent decades.<sup>1</sup> Furthermore, the Florida coastline is projected to experience an additional sea level rise of 10 to 12 inches by 2050.<sup>2</sup>

The future direct effects of this sea level rise are well known. Higher sea levels will impact low-lying coastal areas and make significant portions of the state more prone to flooding.<sup>3</sup> This flood risk will also be exacerbated by changes in weather patterns. Because air can hold more moisture at hotter temperatures, climate change is expected to increase heavy rainfall events in some areas, which is expected to result in more flooding. Paradoxically, though, this extra water can end up reducing the amount of water that is available for human use.

There are two main risks to Florida's water quality from climate change: salt water intrusion into groundwater supplies and the overloading of waste water systems.

But addressing the consequences of climate change also poses another danger: a risk to the public purse. While some costs from warming are unavoidable, Florida should take care that climate change does not become an excuse for bloated government spending programs or that tax dollars are not wasted on inefficient and

### Florida Sea Levels Continue to Rise



needlessly costly responses. The aim of this policy brief is to lay out the likely costs of climate change to Florida's water system and describe some principles that can help guide the state in adapting to these challenges without breaking the bank.

## Sea Level Rise and Salt Water Intrusion

Rising sea levels are expected to be a problem across the globe, but they pose particular challenges for Florida. Most of Florida's bedrock is made up of porous limestone, which allows water to seep through it. In the past, the relative elevation of groundwater aquifers has meant that freshwater from coastal aquifers tends to flow into the ocean. However, as sea levels rise, an increase in hydraulic backpressure could reverse this process, causing saltwater to move inland and potentially contaminate freshwater supplies.<sup>4</sup>

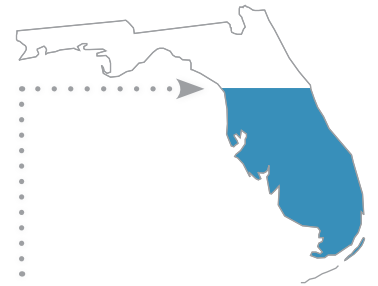
Increasing water salinity has a variety of harmful ecological and environmental effects on everything from water quality to wetland vegetation and agriculture. Given that groundwater provides 64 percent of the Florida's freshwater supply, minimizing saltwater intrusion is a vital task for the state in the coming decades.<sup>5</sup>

There are multiple ways to address the problem of freshwater salination. For example, recharge wells and detention pools could be constructed close to the coastline in certain areas to increase groundwater pressure and avoid inland flooding. Desalination may also be at least technically feasible in some circumstances. The cost of these measures has not been calculated with precision. However, at least one effort to construct a desalination plant in southeast Florida failed due to high costs, constitutional prohibitions against utilities owning the water they treat and challenges related to environmental permitting.

## Wastewater System Risks

As is true of Florida's critical infrastructure in general, much of the state's water infrastructure resides at a low elevation and was not designed to be resilient to the effects of sea level rise and increased flooding. As a result, a significant portion of Florida's water infrastructure will need to be upgraded or relocated as sea levels rise, and neither option will be inexpensive.

Florida's vulnerability to flooding and extreme rainfall is also expected to exacerbate risks to water quality caused by breakdowns in septic tanks and wastewater treatment systems. Florida law requires that septic tanks sit at least 2 feet above groundwater to capture effluent in surrounding soils.<sup>6</sup> But as sea levels rise and more intense rainfall events result in higher baseline groundwater levels, an increasing number of septic tanks will fall below this level and become dysfunctional sources of pollution and contamination, especially in high-density areas.<sup>7</sup> Tidal action and storm surge could cause ground and surface waters to infiltrate these septic tanks and carry the pollution and contamination into bodies of water.



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Similarly, heavy rainfall—especially during the big, super-wet hurricanes that Florida now experiences—can cause “infiltration and inflow” (I&I), which overwhelms wastewater collection and treatment systems. This can force sewage dumps during or even in anticipation of the storms, which exposes the systems’ deficiencies.<sup>8</sup> Storms can also cause prolonged power outages. If wastewater treatment plants and critical infrastructure such as lift stations lack backup power sources, system operators must dump sewage before they are overwhelmed. Indeed, storm surge from climate-fueled hurricanes can directly damage or destroy wastewater infrastructure, rendering areas unable to treat sewage and protect downstream water supplies.

## Principles for Action

As the name suggests, global warming is a global phenomenon with global causes. Florida can nevertheless serve as a leader in decarbonization and resilience by minimizing the costs of climate change and by taking proactive steps to adapt and protect itself from the likely effects of a warmer world.

Conservatives often hesitate to accept the need for protective action to address the effects of climate change because they fear that this will be used as a pretext for massive and wasteful government-spending projects. This is a legitimate fear. At the same time, the failure to act swiftly can increase costs later. It is therefore necessary that Florida’s attempts to increase its climate resilience align with traditional conservative principles of fiscal responsibility and market-based efficiency. We therefore propose the following principles to help guide the state in formulating its policy response.

### Plan Ahead

Florida is a diverse state ecologically and economically, and its water infrastructure has been built and maintained over the decades to different levels of resilience. While we can, in general, assess what risks climate change may pose to Florida water quality, formulating a plan to proactively address those risks requires a more detailed assessment of the potential costs both of inaction and of the various potential remedies.

### Prepare in Advance

It is normal for politicians to put off solutions to future problems, particularly when doing so might involve spending money in the present. But when dealing with substances as dangerous as sewage and as valuable as water, any hesitation would be a mistake for two reasons. First, making upgrades and taking precautions now would be more cost-effective than waiting for systems to break down. Second, waiting to solve a problem until it becomes urgent can lead to poor decision-making, as policymakers would not have time to develop and evaluate alternative proposals, which could result in the hasty selection of a solution that may be ineffective and needlessly costly. As elaborated below, it is important that the state considers alternative responses to help stretch disaster prevention dollars.



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- Minimize Regrets

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## Explore the Alternatives

To protect Floridians' water quality and their pocket books, both the cost of inaction and the cost of various improvement measures must be assessed carefully. Cost-benefit analysis (CBA) is a way of assessing the value of different regulatory and spending program strategies and can be used to compare different strategies with each other to see which is most cost-effective. Climate planning should make use of CBA to prevent unnecessary spending and waste.

## Minimize Regrets

While we can project with a high degree of confidence that certain costs will follow warming in the coming decades, the range of possible costs is wide. This uncertainty can lead to inaction, as policymakers decide that it is not worth addressing a problem when there is a chance it may not materialize. The flip side is that if the effects of warming are more extreme than projected, the costs could be even worse. To minimize the risk that future generations look back with regret about today's policy choices, Florida's response should be geared toward programs that have the highest value compared to the costs and that may be desirable on non-climate as well as on climate-related grounds.

## Conclusion

Maintaining Florida's water supply is a necessity if the state is to continue to grow and thrive in the long term. Ignoring the likely impacts from rising sea levels and a warming climate will not make those risks go away; it will only make them more damaging when they arrive. To avoid breaking the bank, Florida should begin now to plan and implement measures to reduce climate risk to water quality in an efficient and low-cost manner.

### Possible reforms for Florida's wastewater/ stormwater treatment system

- Outlaw the use of water utility revenues for other government programs and projects.
- Require upgrades and replacement for old and at intervals that indicate likely deteriorating infrastructure.
- Require sewer systems to have backup generation available during power outages.

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## ABOUT THE AUTHORS

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## Endnotes

1. "Water Levels, 8724580 Key West, FL," Tides and Currents, NOAA, last accessed Dec. 6, 2022. <https://tidesandcurrents.noaa.gov/waterlevels.html?id=8724580&units=standard&bdate=19500101&edate=20171231&timezone=GMT&datum=MSL&interval=m&action=data>.
2. W.V. Sweet et al., "Global and Regional Sea Level Rise Scenarios for the United States: Updated Mean Projections and Extreme Water Level Probabilities Along U.S. Coastlines," National Oceanic and Atmospheric Administration, last accessed Dec. 7, 2022. p. 111. <https://aambpublicoceanservice.blob.core.windows.net/oceanserviceprod/hazards/sealevelrise/noaa-nos-techrpt01-global-regional-SLR-scenarios-US.pdf>.
3. "Climate Change and Sea Level Rise in Florida: an Update of the Effects of Climate Change on Florida's Ocean & Coastal Resources," Florida Oceans and Coastal Council, December 2010. [https://floridadep.gov/sites/default/files/Climate%20Change%20and%20Sea-Level%20Rise%20in%20Florida\\_1.pdf](https://floridadep.gov/sites/default/files/Climate%20Change%20and%20Sea-Level%20Rise%20in%20Florida_1.pdf).
4. Ibid.
5. Marguerite Koch-Rose et al., "Florida Water Management and Adaptation in the Face of Climate Change," Florida Climate Change Task Force, November, 2011. [http://www.ces.fau.edu/publications/pdfs/water\\_management.pdf](http://www.ces.fau.edu/publications/pdfs/water_management.pdf).
6. Florida Administration Code 64E-6.005 L(2)(b).
7. Andrea Albertin, "Septic systems: What should you do when a flood occurs?," University of Florida, May 4, 2018. <https://nwdistrict.ifas.ufl.edu/nat/2018/05/04/septic-systems-what-should-you-do-when-a-flood-occurs>.
8. "Guide for Estimating Infiltration and Inflow," U.S. Environmental Protection Agency, June 2014. <https://www3.epa.gov/region1/sso/pdfs/Guide4EstimatingInfiltrationInflow.pdf>.