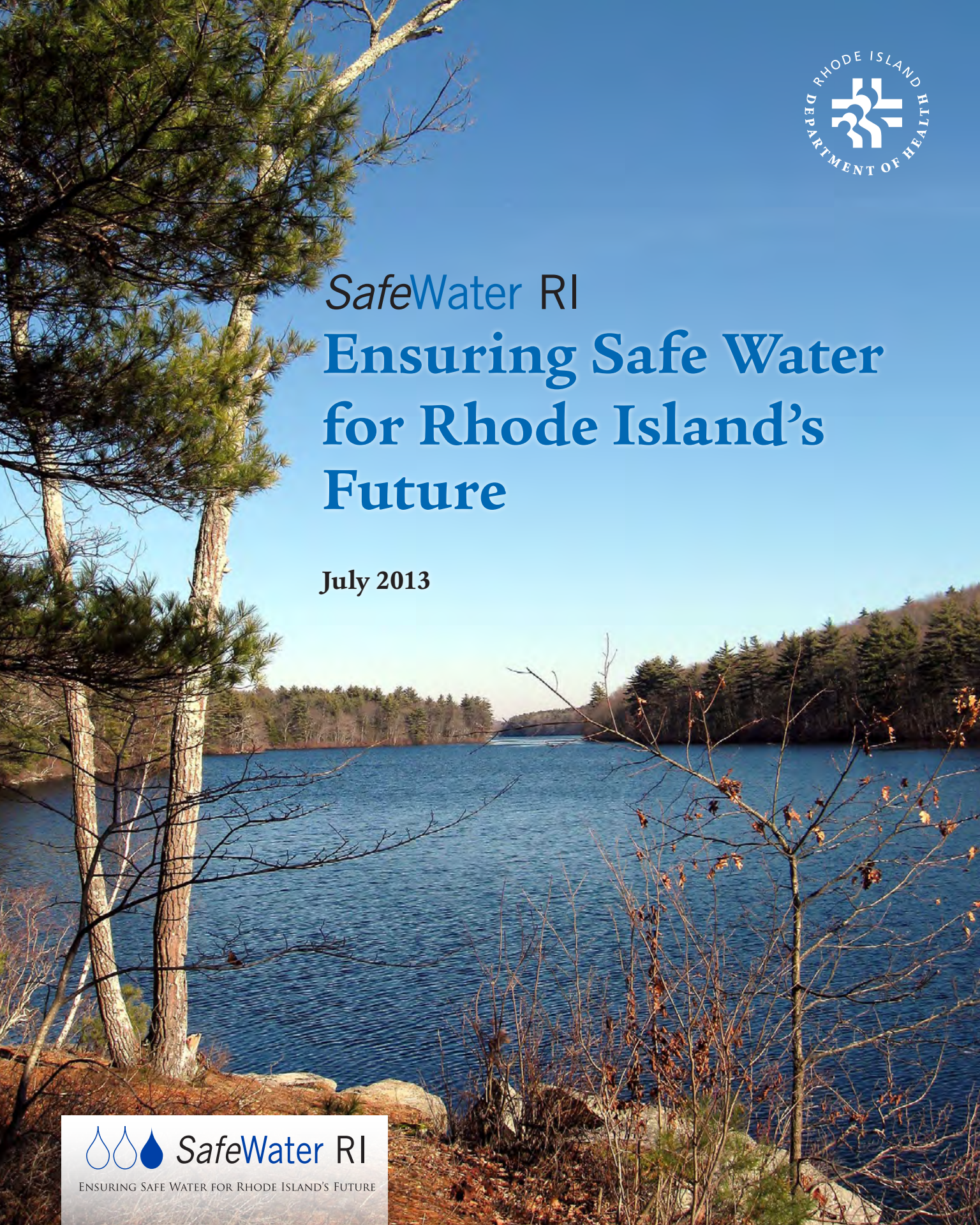

RHODE ISLAND DEPARTMENT OF HEALTH

SafeWater RI

Ensuring Safe Water for Rhode Island's Future

July 2013

SafeWater RI

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Project Background

In January 2012 the Rhode Island Department of Health (HEALTH), Office of Drinking Water Quality, launched *Safe***Water** RI*: Ensuring Safe Water for Rhode Island's Future*.

The project studied the impacts of climate change on drinking water utilities in the state and provided specific information for water utility managers to evaluate and plan for the future.

The objectives of the project were to assess how temperature, rainfall, and other changes might impact Rhode Island, and to develop strategies to address these changing conditions.

The *Safe***Water** RI project included the following phases.

Phase 1 - *Safe***Water** RI conducted a survey of drinking water utilities and met with many utility representatives to compile data and information for the project.

Phase 2 - *Safe***Water** RI assessed the impacts of changing environmental conditions on drinking water utilities.

Phase 3 - *Safe***Water** RI identified appropriate management strategies that could help make those impacts less severe.

Phase 4 - *Safe***Water** RI identified specific recommendations for utilities, as well as state and local governments, to help them develop and implement outreach activities to reach audiences that will be affected by the management strategies identified in Phase 3.

Block Island.

What Are Global Climate Models?

Global climate models are computer simulations that use mathematical equations to predict future weather conditions based on historical weather data.

Climate Change Assessment

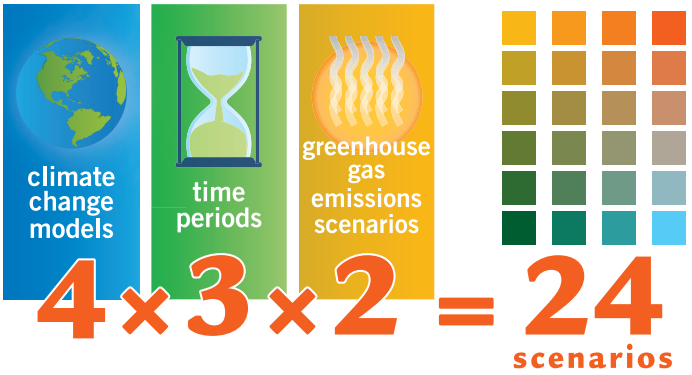
The approach used in this assessment evaluates physical responses to future climate changes in Rhode Island. *Safe***Water** RI used four key indicators of climate change in this analysis: temperature, precipitation, watershed hydrology (how water moves on and below ground), and sea level rise projections.

Future climate change was evaluated across three future time periods, called horizons:

- Time Horizon 1 – 2022
- Time Horizon 2 – 2052
- Time Horizon 3 – 2084

These three time periods were compared to baseline weather conditions from the period of 1978–2007.

For this project, 24 scenarios were evaluated. The 24 scenarios were based on four global climate models, which were applied to the three time horizons under high and low greenhouse gas emissions scenarios (A2 and B1).



Bailey's Beach, Newport, Rhode Island, after Hurricane Sandy, 2012.

Bannister's Wharf, Newport.

Trustom Pond National Wildlife Refuge, before Hurricane Sandy.

Many uncertainties exist related to our current understanding of the climate system and future greenhouse emissions. *Safe***Water** RI used an approach that evaluates a number of scientifically acceptable future conditions to assess the sensitivity of the system. Thus, the goal of the climate change assessment was not to determine the single, most likely future course of the state, but instead to better understand the sensitivity of the Rhode Island coastline and rivers to climate change.

*Safe***Water** RI used two emissions scenarios that were developed by the Intergovernmental Panel on Climate Change (IPCC) and span a range of potential emissions.

- The first scenario, called **A2**, assumes a very diverse world with continuously increasing global population and economic growth. This is a high-emissions, or worst-case, scenario.
- The second scenario, called **B1**, assumes global population growth peaks by roughly 2050 and then declines, leading to a rapid economic shift toward service and information economies, and the introduction of clean and energy efficient technologies. This is a low-emissions, or best-case, scenario.

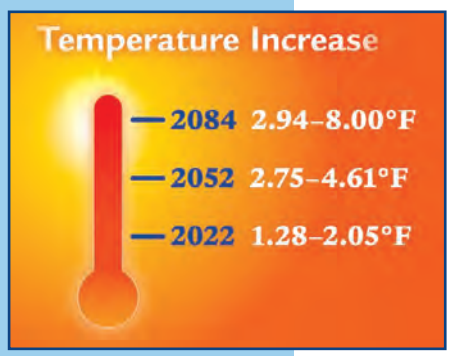
Emissions data from the U.S. Department of Energy (2011) show that global carbon dioxide emissions increased by 6 percent in 2010. This growth rate is higher than the "worst-case" scenario outlined by the IPCC in their Fourth Assessment Report released in 2007.

What Are Emissions Scenarios?

Emissions scenarios describe future releases into the atmosphere of greenhouse gases and other pollutants, and include changes in land use and land cover. Each scenario is based on different assumptions about patterns of economic and population growth, technology development, and other factors. Because levels of future emissions are highly uncertain, these emissions scenarios provide alternative snapshots of how the future might unfold.

Changes in Weather and Water Conditions

The following sections present the changes in weather and water conditions predicted for Rhode Island based on the global climate models used in the assessment.



Temperature

The *Safe***Water** RI project used future temperature predictions for 2022, 2052, and 2084 to estimate the impacts of temperature changes on Rhode Island's water bodies.

The overwhelming consensus across all of the climate models is that average air temperature will increase over the next century. Near the end of this century (by 2084), average annual temperature is expected to have increased by about 2.9–8.0 degrees Fahrenheit.

Precipitation

*Safe***Water** RI used future precipitation predictions (both rain and snow) to estimate future patterns and what impact those patterns will have on Rhode Island's water bodies.

The climate models do not agree as to whether annual average rainfall will increase or decrease in the state over the coming years. However, the models do show that there will be greater variation when precipitation events occur. Rainfall events have a high likelihood of being more extreme; also, the periods between rainfall events could be greater, especially during the summer months. An increase in heavy rain events could lead to episodic flooding along the state's river systems and coastline. On the other hand, longer periods between rain events could lead to severe droughts. Thus, the frequency of both droughts and flood events could be increased.

Flooding in downtown West Warwick, Rhode Island, 2010.

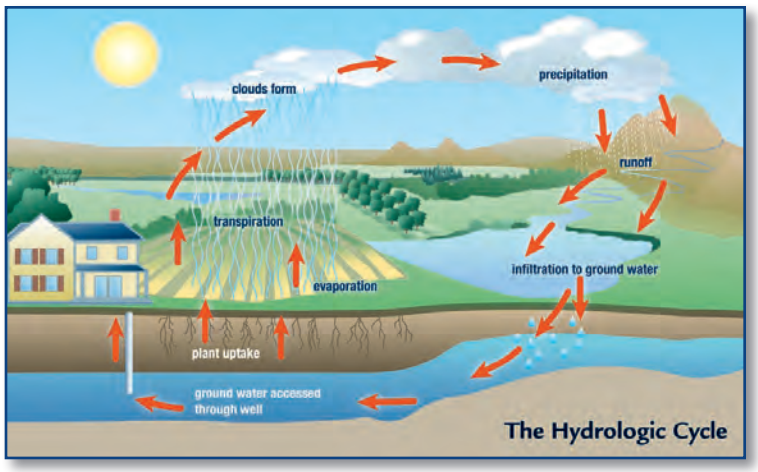
Hydrologic Cycle

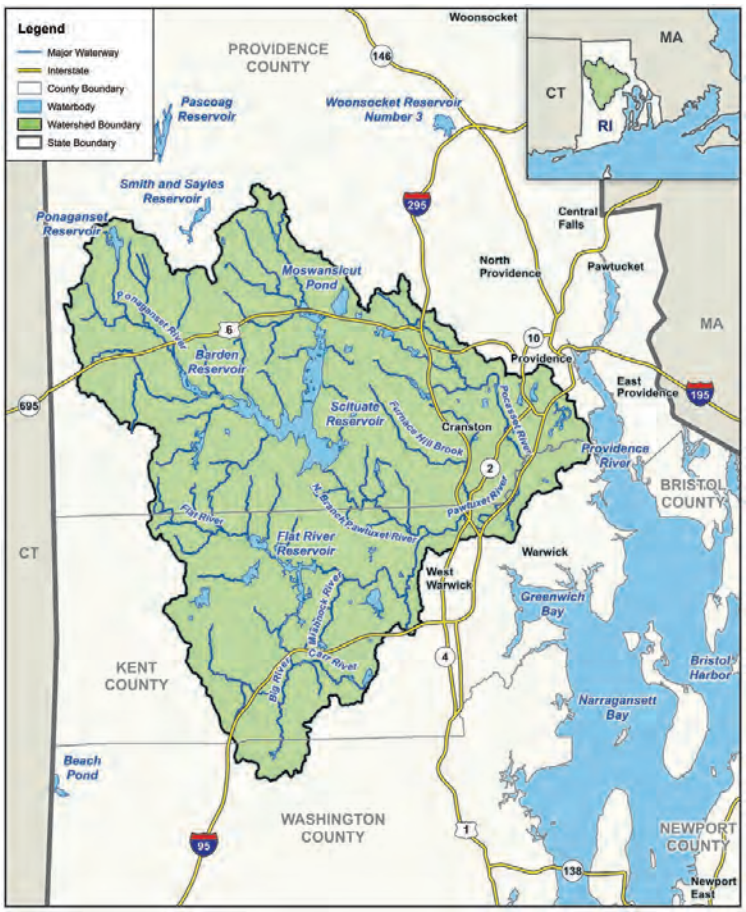
Also known as the water cycle, the hydrologic cycle describes how water moves from the earth's surface (mostly oceans), to the atmosphere, across the land, and into the ground. Because water utilities obtain water from surface waters like rivers and reservoirs, as well as ground water, it is important to understand the impacts that climate change might have on the volume and timing of water moving through the hydrologic cycle.

*Safe***Water** RI used a comprehensive watershed model to predict the impact of increased or decreased precipitation and temperature on the Pawtuxet River watershed, which supplies the majority of water to Rhode Islanders. The Scituate Reservoir, which is in the Pawtuxet River watershed, provides 60 percent of the state's population with drinking water.

Changes in water flow across the Pawtuxet River were examined in great detail and results were extrapolated to the rest of the state's waterways and ecosystems. The model evaluated the full range of high-flow and low-flow responses in Rhode Island's water bodies and along the coastline.

Surface water supplies, such as rivers, streams, and lakes, will likely remain constant over the time periods examined in this analysis. The models predict that while evaporation will increase with rising temperatures, it will be offset by increased precipitation in many of the scenarios *Safe***Water** RI examined.



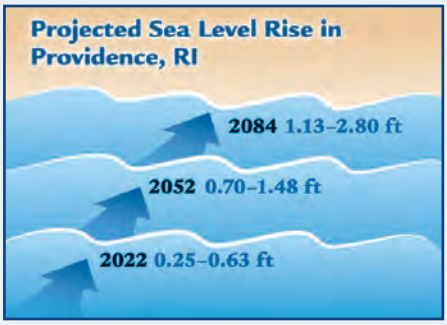


The Scituate Reservoir provides 60 percent of Rhode Island's drinking water, including water for the city of Providence. Understanding how climate change might impact this resource is critical to the work of ensuring adequate future water supplies.

Sea Level Rise

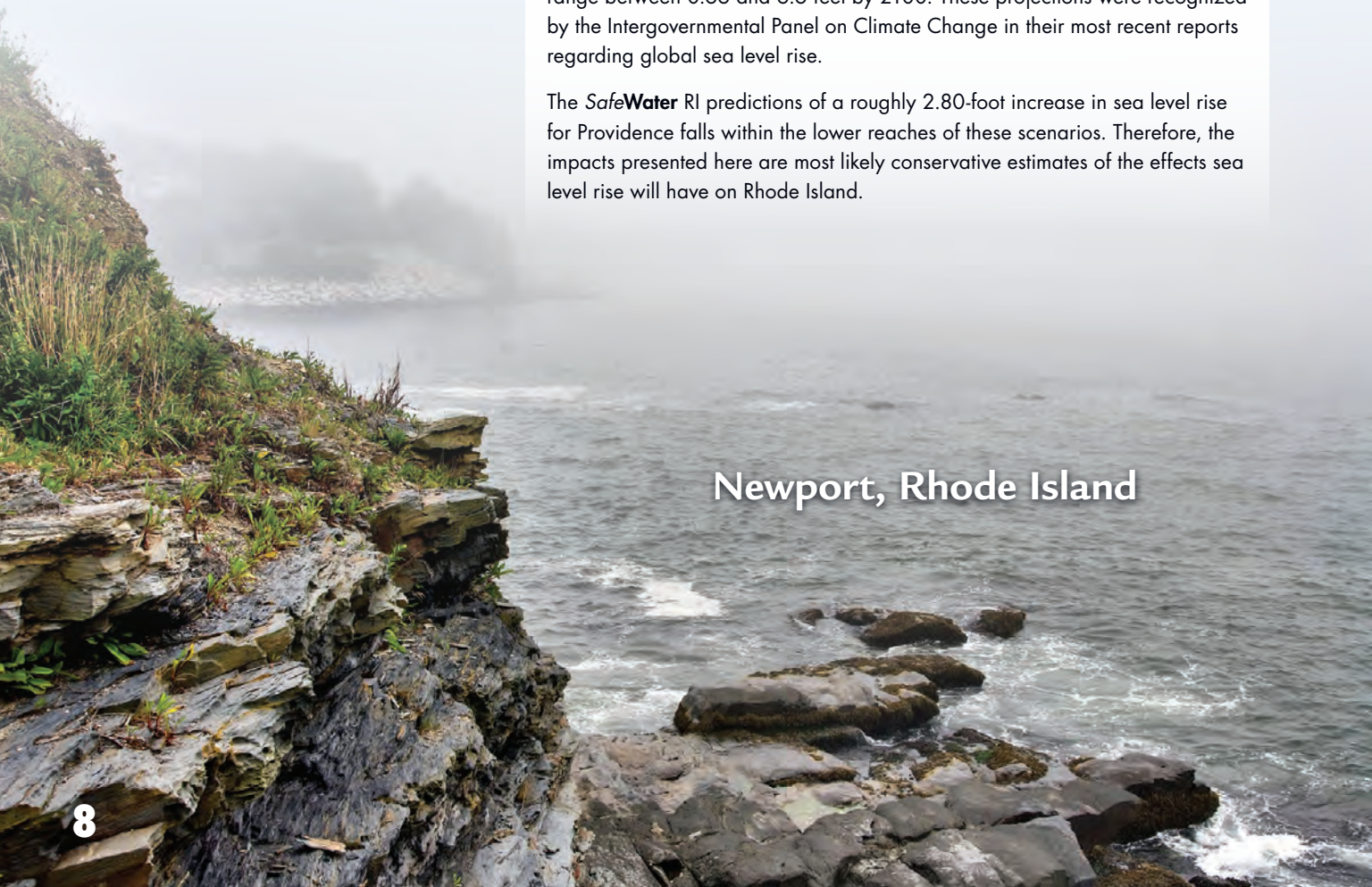
The National Oceanic and Atmospheric Administration (NOAA) has tracked tidal measurements in Newport and Providence since 1930. *Safe***Water** RI used Newport and Providence tidal data to measure sea level rise, which has steadily risen by about 2 millimeters each year since 1930.

*Safe***Water** RI then used a methodology developed by the U.S. Environmental Protection Agency to calculate low and high sea level rise scenarios for the three time periods (2022, 2052, and 2084). The data show an average sea level rise of approximately 2.92 feet in Newport and 2.80 feet in Providence by 2084.



The National Oceanic and Atmospheric Administration released a Technical Report in November 2012 that estimated global average sea level rise would range between 0.66 and 6.6 feet by 2100. These projections were recognized by the Intergovernmental Panel on Climate Change in their most recent reports regarding global sea level rise.

The *Safe***Water** RI predictions of a roughly 2.80-foot increase in sea level rise for Providence falls within the lower reaches of these scenarios. Therefore, the impacts presented here are most likely conservative estimates of the effects sea level rise will have on Rhode Island.

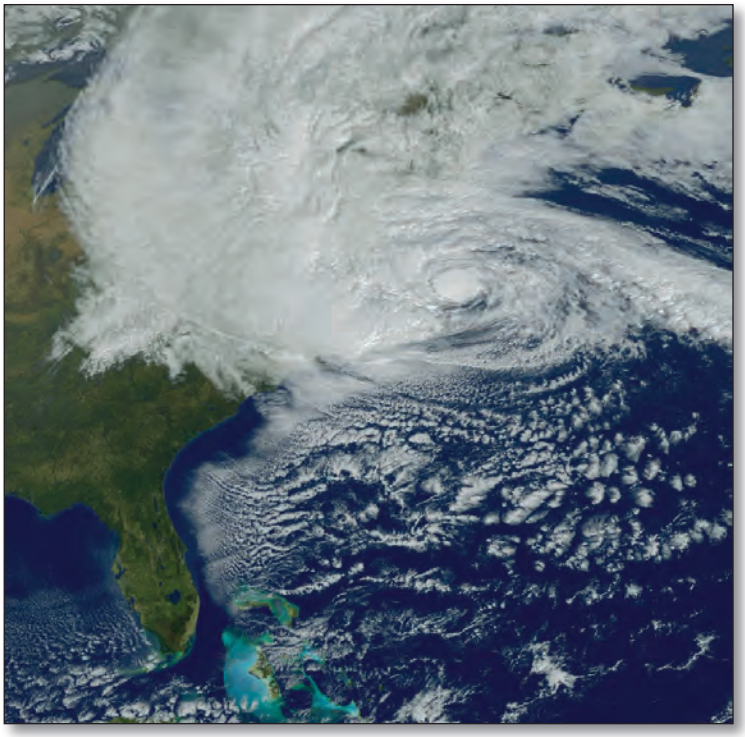


Newport, Rhode Island

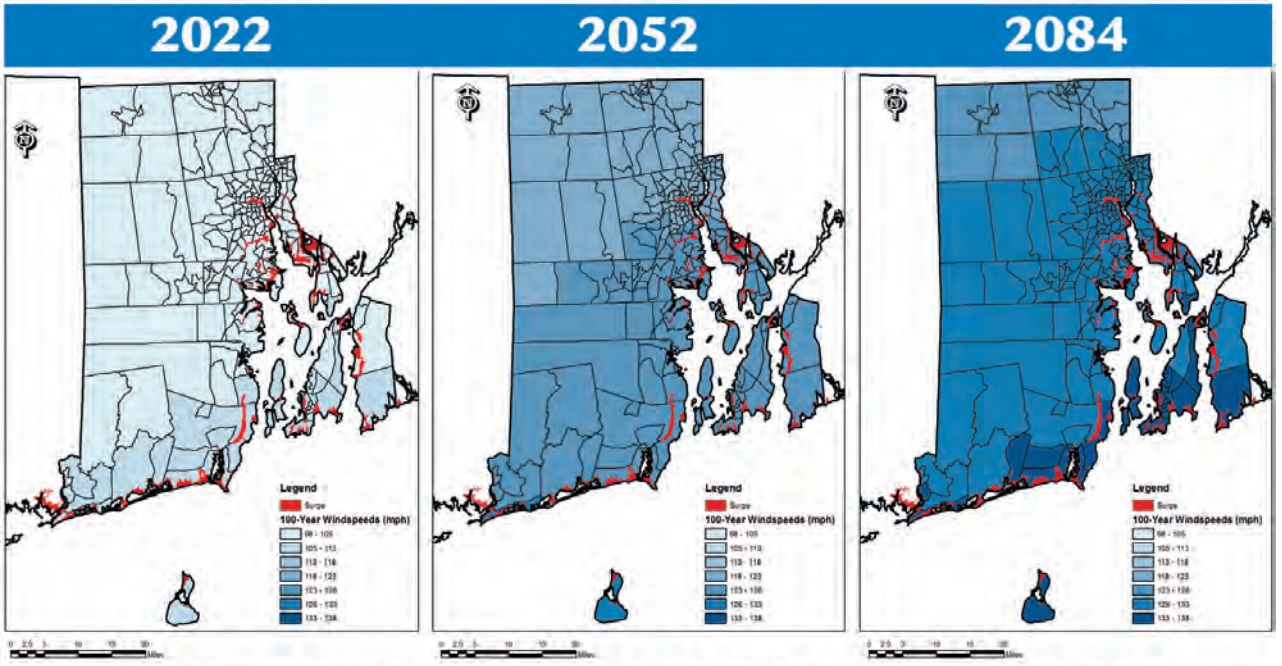
Hurricanes

To assess the impact of increased occurrence and severity of hurricanes in Rhode Island, *Safe***Water** RI used data on sea level rise, coastal erosion, and tidal movements. These three datasets were combined into a hurricane surge model used to assess the effect of hurricane events on Rhode Island's coastline.

The results of the hurricane surge model found that hurricane wind speeds and storm surge will likely increase in response to climate change. The combined impacts of wind speed (blue) and storm surge (red) on the Rhode Island coastline is shown below. The wind speed impacts are associated with a category 2 hurricane in 2022, category 3 in 2052, and category 4 in 2084.



Hurricane Sandy, 2012.



100-Year Hurricane Windspeeds and Storm Surge for Rhode Island (2022)

100-Year Hurricane Windspeeds and Storm Surge for Rhode Island (2052)

100-Year Hurricane Windspeeds and Storm Surge for Rhode Island (2084)

Resulting Impacts of Changing Climate Conditions on Water Utilities

Research conducted for the *Safe***Water** RI project shows that average air temperatures in Rhode Island will increase dramatically over the next century. In addition to warmer temperatures, more extreme rain and snow events are anticipated which will lead to both increased flow volume of local streams and rivers and prolonged or severe droughts. Warmer temperatures will also cause sea levels to rise, which in turn will foster stronger storm surges and could contaminate ground water supplies. These weather changes will result in a variety of conditions that could negatively impact water utilities in the state.

View of the Scituate Reservoir system from the Providence Water Supply Board Fire Tower.

Impacts of Drought on Water Utilities

Temperature models show an increase in precipitation extremes, leading to both extremely wet and extremely dry periods. Any droughts that occur might be more intense, thereby burdening water utilities' limited water supplies.

Water utilities use surface or ground water supplies, or a combination of the two, to meet their customers' needs. Although some modeled results do not appear to predict great risk to surface water supplies from the state's main source of water (the Scituate Reservoir) in the future, there are uncertainties surrounding changing precipitation.

Further stress to water supplies will occur if population grows in the region, thereby raising water demand. Greater demand might result in significant economic and social impacts as demand outgrows supply. For example, a greater number of water utilities withdrawing from the Scituate Reservoir could place unsustainable demands on surface water supplies; as a result, the water utilities might need to invest in acquiring new ground water supplies to keep pace with growing demand for drinking water.

Another stressor on coastal water supply will be saltwater intrusion. As more ground water is used and less is replenished due to decreased seasonal precipitation, saltwater will creep into the coastal ground water contaminating that drinking water resource. This is a large concern for southern Rhode Island, which relies heavily on coastal ground water supplies.

*Safe***Water** RI has attempted to account for all of these concerns when addressing the risks posed by drought to Rhode Island water utilities. The table below shows the results of that assessment in the form of vulnerability rankings. These rankings show the number of utilities that are considered to be at severe risk (ranking 4), moderate to severe risk (ranking 3), low to moderate risk (ranking 2), low risk (ranking 1), or not at risk (ranking 0) from drought.

These rankings were developed by comparing the projected **demand** for water to the projected **supply** of water over a 20-year time period. If a water utility was projected to have greater demand for water than it could supply, they would show a **negative surplus**. This is the case for all utilities ranked at severe risk, whose range of surplus is between -0.42 million gallons per day (MGD) and -0.01 MGD.

Drought Intensity Vulnerability Matrix

Vulnerability Ranking	Range of Projected 20-Year Average Daily **Demand***	Range of Projected 20-Year **Surplus***	Number of utilities per ranking
0	0.23 – 0.85	0.35 – 3.85	4
1	0.65 – 13.40	0.60 – 18.39	7
2	1.12 – 11.32	0.78 – 8.28	4
3	1.45 – 9.60	0.00 – 1.75	6
4	0.50 – 1.36	(0.42) – (0.01)	4

Source: Rhode Island Water 2030, Rhode Island Division of Planning, June 2012.

*MGD

Ranking Key	0	1	2	3	4
	No risk	Low risk	Low to moderate risk	Moderate to high risk	High risk

Impacts of Sea Level Rise, Coastal Flooding, Riverine Flooding, and Hurricanes on Water Utilities

In addition to drought, *Safe***Water** RI also assessed the potential impacts of four other hazards—sea level rise, coastal flooding, riverine flooding, and hurricanes.

Sea level rise

Tide measurements tracked in Rhode Island since 1930 show that sea level has steadily risen. As seawater reaches farther inland, it can cause destructive erosion and submerge low-lying drinking water assets. Large storms can exacerbate the problem, bringing hefty storm surges that can devastate utility infrastructure. *Safe***Water** RI modeling estimates that total costs of replacement for utilities will be approximately $22.3 million through 2022.

Climate models predict that by 2084 sea level will rise by nearly 3 feet in Rhode Island. In addition to streets, homes, and businesses that could be flooded around Warwick (shown here), much of Warwick Water Division's infrastructure, such as distribution pipelines, could also be washed away. (Areas in light blue show expected sea level in 2084. Dark blue represents sea level today.)

Breach at Trustom Pond National Wildlife Refuge following Hurricane Sandy. The breach is now allowing salt water to infiltrate this fresh water ecosystem, which could potentially harm native plant and animal species.

Coastal flooding

As climate change brings sea level rise and more intense storms, the extent of coastal flooding will likely increase. Three water treatment plants owned by Newport Water Division, Jamestown Water Division, and Bristol County Water Authority are already at risk from coastal flooding and this risk will only increase in the coming years. The model results used by *Safe***Water** RI also indicate that several other infrastructure assets are already at risk due to coastal flooding. Total losses associated with damaged infrastructure projected through 2022 will be approximately $14 million.

Riverine flooding

Higher rainfall and snowmelt amounts will increase the total annual flow volume for streams and rivers, which is likely to increase the risk of riverine flooding. Some of the state's water utility infrastructure elements, such as wells, booster stations, and interconnections, are already at risk from flooding; that risk is expected to increase significantly in the future.

The Rhode Island Economic Development Corporation is projected to have the highest loss because several of their wells are predicted to be inundated by roughly 16 feet of water within the 2022 time period. *Safe***Water** RI modeling shows that flooding impacts could even occur as early as 2022, which is well within the infrastructure's lifespan. The total infrastructure losses across all utilities due to riverine flooding could reach approximately $1.5 million by 2022.

Hurricanes

The *Safe***Water** RI model results show that every water utility will be affected from a powerful hurricane because of wind speed alone. Twelve utilities would be affected by the storm surge resulting from damaging winds. The total facility losses due to hurricane storm surge and wind are projected to be $15 million through 2022. However, the greatest losses will occur at three water treatment plants, all of which will be substantially damaged by a powerful hurricane. These plants, owned by Newport Water Division, Jamestown Water Division, and Bristol County Water Authority, are the same three predicted to be impacted by coastal flooding.

Power lines knocked down by winds from Tropical Storm Irene in 2011, Narragansett.

The table below summarizes the total water utility losses from each hazard at the end of the *Safe***Water** RI project time horizon, 2084. These losses pertain to damaged infrastructure only and do not incorporate secondary monetary losses from decreased service capabilities. It is clear that the greatest losses will be a result of sea level rise, projected to total almost $90 million by 2084.

Hurricane Sandy damage at Sachuest Point National Wildlife Refuge.

Total Infrastructure Losses Per Hazard By 2084

Hazard	Number of Impacted Utilities	Number and Types of Impacted Infrastructure (5-Foot Scenario* or 2084)	Approximated Total Losses (5-Foot Scenario* or 2084)
Sea level rise	20	• 507,830 feet of pipeline (5-foot scenario) • 4 booster pump stations • 3 interconnections	$87,500,000
Coastal flooding	11	• 8 booster pump stations • 10 interconnections • 3 treatment plants • 1 pretreatment facility • 3 wells	$22,700,000
Riverine flooding	13	• 9 booster pump stations • 6 interconnections • 1 reservoir • 7 wells	$4,100,000
Hurricane	13	• 10 booster pump stations • 10 interconnections • 1 pretreatment facility • 3 treatment plants • 3 wells	$34,500,000

* The 5-foot scenario represents the highest level result, or worst-case scenario, that was modeled for sea level rise.

Overall Utility Vulnerabilities

All Rhode Island water utilities will be impacted by climate change to some degree. After the assessment of impacts on each water utility, the utilities were ranked by their vulnerability to each of the five hazards—drought, sea level rise, coastal flooding, riverine flooding, and hurricane storm surge and wind speeds. The table below displays the results of this ranking.

Each color in the table corresponds to a ***vulnerability score***. The scores range from 0, indicating that there is no risk, to 4, indicating severe risk to the utility. Each score has a corresponding color that indicates the severity of the risk—darker colors indicate greater risk, lighter colors indicate less or no risk. See the legend below for further explanation.

Water Utility	Drought	Sea Level Rise	Coastal Flooding	Riverine Flooding	Hurricane
Block Island Water Works	-	3	1	0	1
Bristol County Water Authority	1	4	4	0	4
Cumberland Water Department	1	0	0	4	0
East Providence Public Works	2	4	2	0	2
East Smithfield Water District	4	0	0	2	0
Greenville Water District	4	0	0	1	0
Harrisville Fire District Water Department	1	0	0	3	0
Jamestown Water Division	0	4	4	0	4
Johnston Water Control Facility	3	0	0	2	0
Kent County Water Authority	0	3	2	4	1
Kingston Water District	0	0	1	3	1
Lincoln Water Commission	3	0	0	4	0
Narragansett Water Department - North	0	3	2	2	4
Narragansett Water Department - South	0	4	4	0	2
Newport Water Division	2	4	4	0	4
North Kingstown Water Department	1	3	4	4	4
North Smithfield Water Department	-	0	0	2	0
North Tiverton Fire District	4	2	2	3	2
Pascoag Utility District	0	0	0	2	0
Pawtucket Water Supply Board	2	4	2	3	2
Portsmouth Water District and Fire District	3	3	4	0	4
Providence Water Supply Board	-	4	2	4	4
Rhode Island Economic Development Corporation	-	4	2	4	2
Richmond Water Supply System	-	0	0	1	0
Smithfield Water Supply Board	3	0	0	1	0
South Kingstown Water District–Middlebridge	1	4	4	2	4
South Kingstown Water District	1	4	4	3	4
Stone Bridge Fire District and Water Department	2	4	4	0	4
Tiverton Water District	-	0	2	0	1
University of Rhode Island	4	0	0	1	1
United Water Rhode Island	-	4	4	0	4
Warwick Water Division	3	4	4	4	4
Westerly Water Department	1	4	3	2	4
Woonsocket Public Works Department	3	0	0	3	0

Ranking Key	-	0	1	2	3	4
	Not available	No risk	Low risk	Low to moderate risk	Moderate to high risk	High risk

Utilities at Greatest Risk

Highly Vulnerable (At severe risk for four hazards—sea level rise, coastal flooding, riverine flooding, and hurricanes; moderate to severe risk for drought)

- Warwick Water Division

Critically Vulnerable (At severe risk for three hazards)

- Bristol County Water Authority
- Jamestown Water Division
- Newport Water Division
- North Kingstown Water Department
- Providence Water Supply Board
- South Kingstown Water District–Middlebridge
- South Kingstown Water District
- Stone Bridge Fire District and Water Department
- United Water Rhode Island

Moswaniscut Reservoir

Adaptation Strategies

The *Safe***Water** RI project highlights the various risks climate change poses to drinking water utilities. *Safe***Water** RI has identified, evaluated, and prioritized effective responses to these challenges and intends to support their implementation over the coming months and years. The resulting *Safe***Water** RI Adaptation Strategies will help reduce the vulnerability of Rhode Island's drinking water infrastructure.

With feedback and input from many water utility representatives around the state, the Rhode Island Department of Health (HEALTH) developed a suite of potential adaptation strategies for achieving each goal. Each strategy was screened using a number of criteria—social, technical, administrative, political, legal, economic, and environmental. This screening evaluation helped to determine each strategy's feasibility.

Goal 1 – Prevent infrastructure losses to water utilities from hazards

This adaptation goal recognizes that water utilities, particularly those whose infrastructure could be impacted from hazards in the near-term, should develop utility-specific adaptation strategies to prevent or minimize infrastructure losses.

Two strategies could help prevent losses to drinking water utilities:

- **Evaluate at-risk infrastructure** – Utilities should determine if their at-risk infrastructure can be retrofitted, relocated, or if it must be abandoned.

- **Encourage Use of *Safe*Water RI Tools** – Utilities could use the *Safe***Water** RI geographic information system data and tools to further their understanding of the impact of climate change on their infrastructure.

Providence River, with Providence Harbor to the east.

Goal 2 – Ensure adequate potable water supplies

Although drought is not currently affecting most water utilities, the modeling for this study indicates that drought and precipitation variability might negatively impact water availability in the future. *Safe***Water** RI identified the following strategies that will help Rhode Island ensure adequate potable water supplies for its citizens:

- **Implement Local Proposed Alternative Water Supply Sources** – Water utilities could evaluate the local proposed alternative water supply sources proposed for their utility as a way to build resilience into their systems in the case of drought or other emergency situations.

- **Implement Regional Solutions** – The impacted water utilities and other relevant government agencies, such as HEALTH, Rhode Island Water Resources Board, and Rhode Island Department of Environmental Management, could coordinate to implement regional solutions to increase available water supply sources.

Water Conservation Kits in Warwick

Encouraging water conservation is one of the ways drinking water utilities can help ensure adequate water supplies for the future. The city of Warwick recently distributed water conservation kits to those households that participate in voluntary lead and copper testing in appreciation of their assistance. The conservation kits included the following items:

- Kitchen aerator
- Toilet tank displacement bag
- Shower head with aerated stream
- Shower timer
- Leak detecting dye tablets
- Home water audit book

Rhode Island State House, Providence.

- **Evaluate Opportunities for Water Reuse** – Drinking water utilities could collaborate with local wastewater utilities to identify whether, and what type of, water reuse options would be available to supplement water supply.

- **Develop Emergency Water Agreements** – Water utilities that are at risk for drought and do not already have emergency water agreements in place could explore the opportunity to develop such agreements.

- **Enhanced Operations and Systems Management for Water Efficiencies** – Drinking water utilities could enhance operations and system management to improve water efficiency, thereby reducing operating costs (e.g., pumping and treatment) and the need to develop new water supplies.

- **Develop Outreach and Education Strategies for Demand Side Management** – Utilities and local governments could develop and implement an outreach and education plan promoting water conservation activities, such as rebates for water efficient products and practices and training opportunities for irrigation techniques that conserve water.

Emergency Water Agreement Between the Kingston Water District and University of Rhode Island

Water utilities that are expected to have water shortages can develop emergency water agreements to ensure that they can obtain water from utilities that have surplus water. Such an agreement already exists between the University of Rhode Island (URI) and the Kingston Water District. These two entities have wells in the same aquifer and the Kingston Water District maintains three interconnections with URI. Historically, the Kingston Water District has supplied URI with water during times of need.

Water Rates at the Kingston Water District

The Kingston Water District is an example of a utility that has restructured their water rates to reflect different classes of costs. The district has adopted a tiered water rate for its residential customers, which includes a fixed charge for distribution, capital, and infrastructure charges. The distribution charge is based on the customer's water meter reading, which indicates water usage. By basing the distribution charge on usage, the water utility is applying an increased charge to those customers using the most water. The capital and infrastructure charges are uniform fees, and are not dependent on the size of the user's meter with the underlying premise that all customers benefit from capital improvements and infrastructure replacements.

Goal 3 – Use integrated management and planning to increase adaptive capacity

Ensuring that water utilities have the ability to adapt to climate change is critical to the well-being of Rhode Island citizens. To effectively manage the risks posed by sea level rise, flooding, and hurricanes, utilities must use an integrated management framework to comprehensively plan for impacts and increase their ability to adjust to new environmental conditions.

The following strategies could assist Rhode Island drinking water utilities in using integrated management and planning to increase their capacity to adapt to climate change:

- **Integrate Climate Change into Water Utility Planning** – Water utilities could evaluate their priority vulnerabilities, their at-risk infrastructure, and the anticipated time horizon of projected impacts and incorporate adaptation strategies into Water Supply System Management Plans (WSSMPs) and Infrastructure Replacement Plans (IRPs).

- **Coordinate WSSMPs with Community and Municipal Plans** – Water utilities should coordinate with the community and municipal personnel responsible for developing WSSMPs to share the projected impacts of climate change on their utilities and identify at-risk infrastructure, as well as adaptation strategies that are planned or under way.

- **Evaluate Regionalization to Improve Capacity** – Small or stressed water utilities could evaluate opportunities for regionalization, or cooperation among multiple water systems, to increase their capacity.

- **Develop a Sustainable Financial Strategy** – Water utilities could develop a comprehensive financial strategy that ensures revenues cover costs over the long term, including consideration of pricing and rate structures, thereby ensuring sustainability of operations and service.

- **Develop Education and Outreach Strategies for Projected Climate Change Impacts** – Water utilities could develop education and outreach strategies on the projected climate change impacts on the state and the water utility to be directed towards staff and board members as well as customers and other stakeholders such as environmental organizations.

Recommended Next Steps

The last and final phase of the *Safe***Water** RI project is centered on outreach and education. These activities are critical to achieving the *Safe***Water** RI project objectives.

Outreach

Communicating climate change impacts and adaptation strategies to stakeholders can be a daunting task for utility managers. However, HEALTH is dedicated to helping utilities in provide Rhode Island residents, and other key stakeholders, with relevant information regarding the future changes in their environment. HEALTH will begin an education program, both within and outside of the organization, to communicate the potential impacts of climate change to Rhode Island communities. Additionally, through *Safe***Water** RI, HEALTH is providing utilities with outreach materials such as fact sheets and presentations that they can use in getting the word out about how climate change could impact utilities and their customers.

Collaboration

State and local governments have a rich array of strategies and policies at their disposal to meet the climate change challenge in partnership with other states, businesses, civic institutions, and the public. HEALTH will seek out relationships with other state agencies and private organizations to foster understanding and cooperation across sectors.

Additionally, drinking water utilities are encouraged to collaborate with wastewater utilities to identify whether water reuse programs can supplement water supply. This will reduce the pressure on drinking water systems by allowing wastewater systems to provide reused water for agricultural and landscape irrigation, industrial processes, toilet flushing, and replenishing ground water supplies.

Support

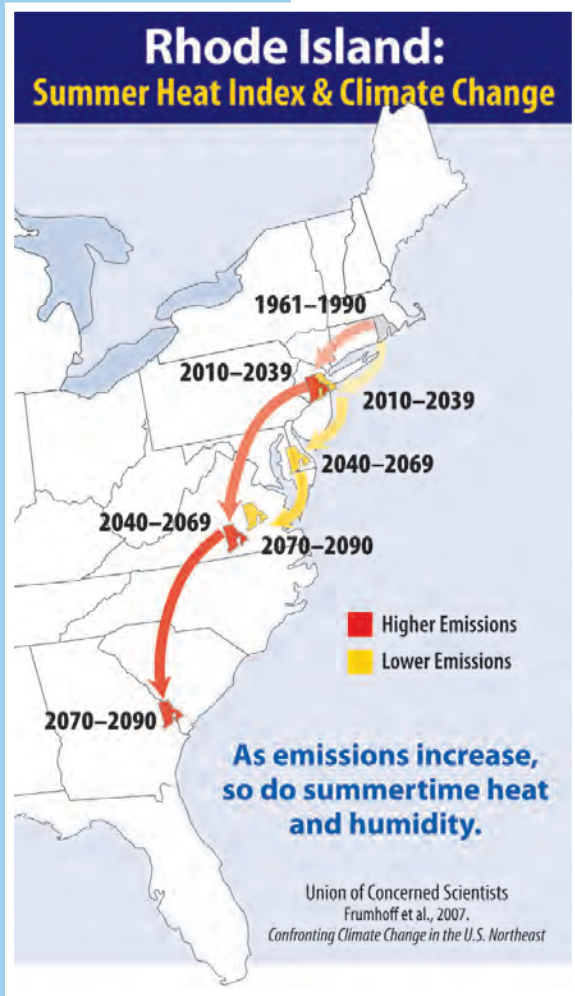
To meet several of the strategies identified in Phase 3, HEALTH intends to work with drinking water utilities as they begin to account for climate change in their current and future planning efforts.

HEALTH hopes to build a strong foundation of knowledge and tools to help public and private decision-makers across Rhode Island prepare for a changing climate. To this end, HEALTH and its partners are providing technical training opportunities on climate change modeling tools to state and water utility employees.

Education and Outreach to Local Schools in North Kingstown

The town of North Kingstown works with local third grade classes to support critical components of their curriculum and to educate students on water issues. The program, "A Day in the Life of a Glass of Water," helps students understand the process of delivering safe drinking water, the importance of water to the environment, and how to conserve water. Climate change issues could be easily integrated into this existing education program or others like it.

HEALTH is also supporting these efforts by reviewing infrastructure plans and comprehensive community plans for climate-change readiness. Another statewide effort underway is the Greenhouse Gas Action Plan which outlines state programs and policies that aim to reduce annual greenhouse gas emissions (www.dem.ri.gov/programs/bpoladm/stratpp/greenhos.htm). In addition, the Rhode Island Climate Change Consortium (www.dem.ri.gov/climate), a multi-stakeholder partnership, developed a set of 52 methods for reducing greenhouse gases.



Using similar climate modeling as *Safe*Water RI, the Union of Concerned Scientists predicts that even assuming the best-case scenario of lower emissions of greenhouse gasses, Rhode Island summers will feel like Virginia summers by 2070.

How Can You Help?

For every year of delay in beginning emissions reductions, global concentrations of greenhouse gases rise higher and the goal of avoiding dangerous climate change becomes more difficult and more costly to achieve. Therefore, action must be taken now to reduce Rhode Island's use of fossil fuels and integrate adaptation strategies into our state and city planning efforts.

Every time we drive a car, flip on a light switch, or turn on the heat, we release greenhouse gases. Rhode Island residents can help lessen the impact of climate change by taking the following actions today, many of which can also save you money:

- Use energy efficient fluorescent lights, weatherproof your house, plant native trees for shade, clean vents and radiators, and install low-flow showerheads.
- Choose Energy Star appliances which use less energy (www.energystar.gov)
- Choose a fuel-efficient car
- Walk, bike, carpool, or take a bus to reduce emissions
- Buy products that are made locally to reduce emissions generated for shipping

For more tips on how you can help, visit www.dem.ri.gov/climate.

The Numbers

2.9°–8.0°F Increase in average annual temperature expected by 2084.

85% Percent of the public water supply in Rhode Island supplied by surface water reservoirs.

20 Number of water utilities that could be adversely impacted by sea level rise in all time periods.

$87.5 million Total projected losses across all water utilities expected from sea level rise damages through 2084.

$9 million

Total projected infrastructure losses at Jamestown Water Division's treatment plant through 2084 as a result of coastal flooding—the highest flood-related loss among all utilities.

3 Number of water treatment plants **currently** at risk from coastal flooding—this risk will only increase in the coming years.

Conimicut Lighthouse

SafeWater RI

Ensuring Safe Water for Rhode Island's Future

Contact Us

The *Safe***Water** RI project reports are available at:
www.health.ri.gov/programs/drinkingwaterquality

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