



# CLIMATE CHANGE AND YOUR HEALTH: A GUIDE FOR RHODE ISLANDERS



RHODE ISLAND  
DEPARTMENT OF HEALTH

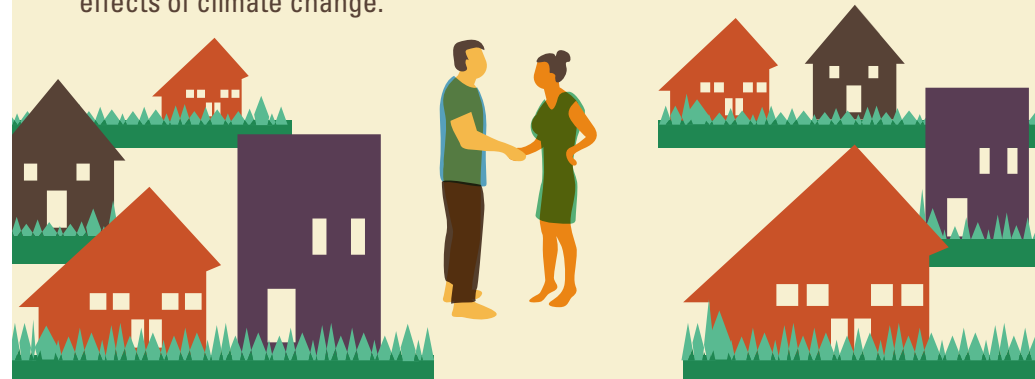


# THE RHODE ISLAND DEPARTMENT OF HEALTH CLIMATE CHANGE PROGRAM

Our mission is to prepare for the human health effects related to climate change to create a healthy, sustainable, and resilient future for all Rhode Islanders.

## WHO WE ARE

The Rhode Island Department of Health (RIDOH) Climate Change Program is part of a national cohort of state and local health programs funded through the Centers for Disease Control and Prevention's (CDC) Building Resilience Against Climate Effects (BRACE) framework, which allows health officials to develop strategies and programs to help communities prepare for the health effects of climate change.



## WHAT WE DO



Develop a unified climate and health adaptation strategy for Rhode Island based on the best available science and the national BRACE program standards.



Convene experts and collect resources to better understand potential climate changes in Rhode Island and to predict and monitor health effects.



Develop programs to mitigate the public health impacts of climate change.



Identify the populations most vulnerable to climate change.

## HOW WE WORK

### EDUCATE

the public to raise awareness about the connection between climate change and health.

### WORK

with community partners/ agencies to develop a unified and equitable adaptation plan.

### ADVOCATE

for policy and behavioral changes that reduce/ prevent emissions of greenhouse gases.

### FOCUS

on holistic solutions, community cohesiveness, and equity.

### COORDINATE

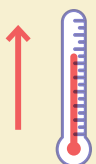
with local, state, and regional partners to leverage efforts to reduce negative health outcomes.

### OFFER

a variety of programs to mitigate public health impacts among vulnerable populations.



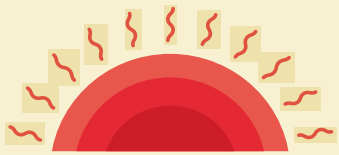
# KEY CLIMATE CHALLENGES FOR RHODE ISLAND



Rhode Island's average temperature has increased about three degrees since 1900. The rest of the continental United States has had an average temperature increase of about 1.5 degrees.



Rhode Island has seen a 76% increase in the number of heavy downpours since 1950 and has had the nation's largest increase of extreme precipitation events since the 1950s.



Spring is arriving earlier and bringing more precipitation, and summers are hotter and drier.



Heavy rainstorms are more frequent. Severe storms cause more floods that damage homes, businesses, and utilities.



Warmer weather could increase the risk of insect-borne diseases.



Ticks that transmit Lyme disease and other diseases are active when temperatures are higher than 45 degrees.

From 1930 to 2000, sea level at the Newport tide gauge increased an average of one inch per decade for a total of nearly 10 inches. Since 2000, the sea level rise has increased one inch every five to six years.

# CLIMATE CHANGE IMPACTS ON HEALTH



Asthma, allergies, and other respiratory illness from increasing allergens/air pollution



More mosquito-borne and tick-borne illnesses related to changes in ecology



Injuries and fatalities due to severe/extreme weather and flooding



Increased levels of water-borne diseases and harmful algal blooms



Impacts on food supply and access to clean water due to extreme weather and droughts



Increased levels of anxiety, post-traumatic stress disorder (PTSD), and other long-term mental health effects

Rising temperatures could increase heat-related illness and death

For more information on the Rhode Island Department of Health Climate Change Program, visit <http://www.health.ri.gov/climatechange>

# EXTREME HEAT

In recent years, there have been higher-than-average temperatures, warmer summers, and more extreme-heat days. These changing conditions can cause more illnesses and deaths, especially for people who have cardiac or breathing problems. During an extreme-heat event, nighttime temperatures may be too warm to allow the body to cool down. It is important to be aware of both the temperature and the heat index. The heat index combines heat and humidity to measure how hot it feels to your body.

## DATA AND PROJECTIONS



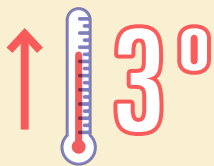
**CURRENT:**  
**90° FOR**  
**10 DAYS**

During an average Rhode Island summer, the heat index reaches 90°F for 10 days.



**PROJECTED:**  
**ABOVE 90° FOR**  
**13-44 DAYS**

Between 2020-2099, Rhode Island may experience 13-44 more days each summer that are above 90°F.



Rhode Island's average temperature has increased by more than 3°F in the past century.



Many Rhode Islanders do not have air conditioning, including at-risk groups.

## WHAT YOU CAN DO



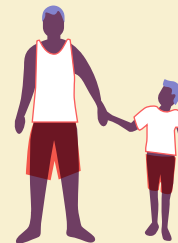
### STAY UPDATED

Check local news for extreme heat alerts and safety tips. Check on friends, family, and neighbors.



### STAY HYDRATED

Drink plenty of fluids. (Avoid alcohol and caffeine.)



### DRESS LIGHTLY

Wear light-colored, light-weight clothing. Use hats with brims and sunscreen with an SPF of 30 or higher.



### SEEK SHADE

Stay out of the direct sun. Seek shady or air-conditioned areas such as libraries or malls.



### SCHEDULE

Schedule outdoor events early in the morning when it's cooler.



### PACE YOURSELF

Pace yourself when you exercise.

## WHAT YOU CAN DO



### VEHICLE DANGER

Never leave a child, a disabled or elderly person, or a pet in an unattended car. A closed vehicle can heat up to dangerous levels in only 10 minutes.



### CONSERVE ENERGY

Use solar energy to power air conditioning units. Incorporate shade trees into landscaping and use energy efficiency measures at home. Conserving energy can help decrease temperatures and the impacts of climate change.



### CHECK RHODE ISLAND EMERGENCY MANAGEMENT AGENCY WEBSITE

([riema.ri.gov](http://riema.ri.gov)), social media, and media reports for updates of cooling center locations.

## HEAT-RELATED ILLNESSES

### HEAT SPASM

Muscle cramps that occur during or after exercise or work in a hot environment.

### HEAT EXHAUSTION

The body's response (thirst, cool and moist skin, weak/fast pulse, shallow/fast breathing) to an excessive loss of water and salt, usually through excessive sweating.

### HEAT STROKE

A life-threatening condition characterized by high body temperature, rapid pulse, difficulty breathing, and confusion.

Extreme heat events, or heat waves, are the leading cause of extreme weather-related deaths in the United States.



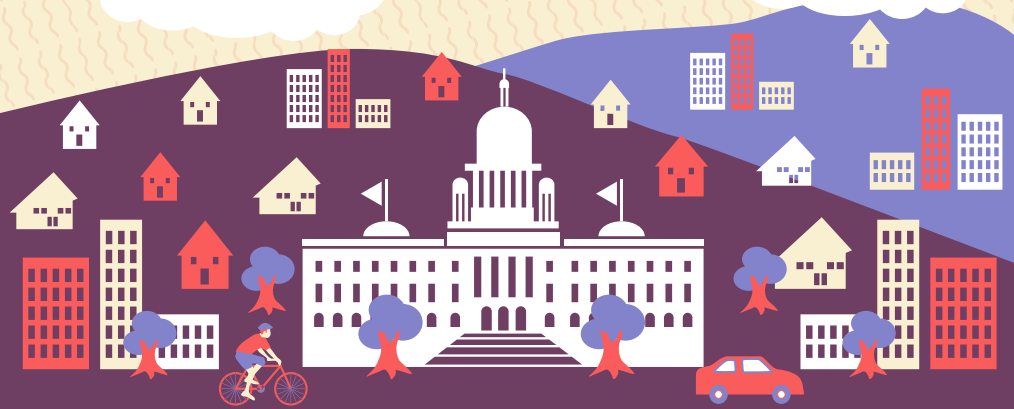
## AT-RISK POPULATIONS

- ☀️ Infants and young children
- ☀️ Low-income residents
- ☀️ Anyone with chronic, long-term medical conditions
- ☀️ Elderly
- ☀️ Disabled
- ☀️ Overweight/obese
- ☀️ Outdoor workers
- ☀️ Pregnant women
- ☀️ Those who use certain medications/illegal drugs
- ☀️ Athletes
- ☀️ Socially isolated





# NORTHEAST REGIONAL HEAT COLLABORATIVE



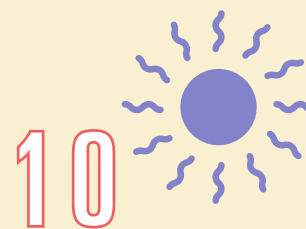
The Northeast Regional Heat Collaborative (NERHC) was started by the Rhode Island Department of Health (RIDOH) Climate Change Program. The Collaborative seeks to reduce the number of heat-related illnesses and deaths in New England through data analysis, new partnerships, improved public health messaging, and policy changes. The group is focused on coordinating responses to protect vulnerable populations and warn the public about those risks. The Collaborative works to improve health messaging across the region and facilitate collaboration on various climate change issues.



## PARTNERS



## DATA AND KEY FINDINGS



### CURRENT DAYS ABOVE 90°F

During an average Rhode Island summer, the heat index reaches 90 degrees on 10 days.



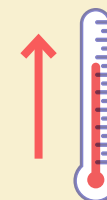
### PROJECTED DAYS ABOVE 90°F

Between 2020 and 2099, Rhode Island may experience 13-44 more days each year above 90°F.



### INCREASED HOSPITALIZATIONS AND DEATHS

Emergency department visits and deaths from all causes in Rhode Island, Maine, and New Hampshire increased by 7.5% and 5.1% respectively on days when the heat index reached 95°F, as compared to days with a maximum heat index of 75°F.



### HEAT INDEX

Heat index is a combined measure of heat and humidity that quantifies how the weather feels.

## POLICY CHANGES



### HEAT ADVISORY

Based on the findings of their studies, NERHC worked with the National Weather Service to lower the threshold for issuing a heat advisory in New England. The new threshold to issue a heat advisory is when the heat index is forecast to reach 95°F for any amount of time on two or more consecutive days or 100°F for any amount of time on a single day.



### HEAT WARNING

The National Weather Service threshold for issuing a heat warning in the region that includes New England remains at a heat index of 105°F and above.

## NEXT STEPS



The Collaborative will continue to work with regional, state, local, and academic partners to collectively improve communication systems and focus on protecting vulnerable populations from high-heat dangers.



# STORMS AND FLOODING

With more than 400 miles of coastline and several rivers that have risen above flood stage in the past, Rhode Island may experience increases in waterborne diseases, mold growth, bacterial contamination, psychological trauma, and long-term effects on local economies. Sea level rise will magnify these impacts.

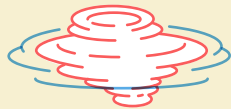
## DATA AND PROJECTIONS



Rhode Island can expect greater impacts to people, homes, businesses, and utilities during and after storms.



Rhode Islanders have homes or businesses in designated flood zones.



The intensity and frequency of North Atlantic hurricanes has increased since the early 1980s.



In potential residential exposure to hurricane storm-surge damage (estimated \$7.2 billion).



Rhode Island sea level is rising faster than the global average, projected up to 6.6 feet by 2100.



Rhode Islanders are at risk of coastal flooding impacts. By 2050, 8,000 more could be at risk.

Lessons from Superstorm Sandy: "... **Redesign your business model. Rethink. Think about the future. Think about the fact that Mother Nature is knocking on your front door, and this is not going to be the last time.**" – Lisa Konicki, President, Ocean Community Chamber of Commerce (Westerly)

## WHAT YOU CAN DO



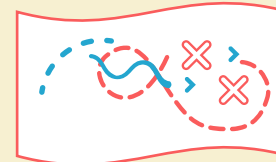
### GET INSURANCE

If your home or business is located in a flood zone, buy flood insurance. Most standard policies do not cover damage caused by floods.



### MAKE A KIT

Gather supplies, including a flashlight and extra batteries, first-aid kit, cash, food and water, essential medicines, and copies of important documents stored in waterproof containers.



### MAKE A PLAN

During an emergency, it is important to know how to reach family members. Pick meeting spots and designate a Rhode Island family emergency contact. Gather and make copies of contact and medical information. Make a plan for your pets. Make sure everyone is familiar with evacuation routes.



### ENROLL NOW

Rhode Island adults and children with disabilities, chronic conditions, and special healthcare needs are urged to enroll in the Rhode Island Special Needs Emergency Registry. Visit [health.ri.gov/emregistry](http://health.ri.gov/emregistry).





## KNOW HOW TO TURN IT OFF

Know how to turn off your gas and electricity at the main switch or valve. This helps prevent fires and explosions.



## DON'T TOUCH

Never touch electrical equipment if you are wet or standing in water. You could be electrocuted.



## STAY TUNED IN

Stay tuned to your phone alerts, TV, or radio for weather updates, emergency instructions, or evacuation orders.



## DON'T DROWN

Avoid walking or driving through flood waters. Turn Around, Don't Drown! Just six inches of moving water can knock you down, and one foot of water can carry your car away.



Rhode Island has seen the highest increase of extreme precipitation in the US since the 1950s.

- Anyone who lives in a designated flood zone
- Anyone who has not purchased flood insurance or has not flood-proofed their home or business
- Low-income renters and homeowners
- Elderly
- People with limited mobility
- People with special healthcare needs
- Socially isolated individuals
- People with limited transportation options





# THE RHODE ISLAND DEPARTMENT OF HEALTH SENIOR RESILIENCY PROJECT

Sponsored by the Rhode Island Department of Health Climate Change Program, the Senior Resiliency Project offered free, on-site emergency planning assistance for elderly housing facilities in Rhode Island. The program was developed in partnership with the Rhode Island Division of Elderly Affairs and is funded through the Rhode Island Office of Housing and Community Development and by the federal Department of Housing and Urban Development Community Development Block Grant Disaster Recovery Grant. The program partnered with consultants from Yale New Haven Health Systems Corporation.

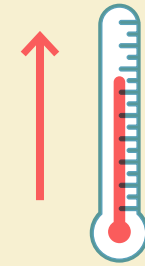
Rhode Island's 65 and older population is expected to double by 2050. One-quarter of Rhode Island's population will be 65 or older by 2030. Nearly half of people older than 65 have a disability.

## MOST VULNERABLE TO CLIMATE CHANGE



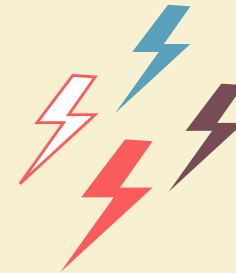
### LIMITATIONS

Mental and physical limitations associated with aging can lower seniors' ability to protect themselves in an emergency.



### RISK OF DEATH

Extreme heat can increase the risk of illness and death, particularly among those with congestive heart failure, diabetes, and other chronic conditions. People with certain diseases or who are taking certain medications are less able to tolerate extreme temperatures.



### POWER OUTAGES

Elevators, electronic medical equipment, and air conditioning can be disrupted, so anyone who uses life-sustaining medical equipment or has impaired mobility may be impacted by prolonged power outages.



### EMERGENCY

In an emergency, interruptions in medical care can be harmful or even deadly for the most vulnerable patients.

## PROJECT OUTCOMES

### PREPARE

Worked with partners, stakeholders, and consultants to assist qualified long-term care facilities, assisted living residences, and independent senior housing facilities to prepare for extreme weather and disasters.

### AUDIT

Provided free, site-specific energy resiliency audits and assisted in the development of all-hazards plans, including provisions for sheltering-in-place.

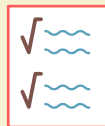
## PROGRAM SUCCESSES

15

Worked with 15 sites that were directly impacted by Hurricane Irene, Super Storm Sandy, or Winter Storm Nemo.



Worked closely with partners to develop energy resiliency plans, shelter-in-place plans, and staff/resident training.



Distributed assessments and sample all-hazard plans. Comprehensive steps were taken by all partners to improve their resiliency and preparedness for future disasters.

## TESTIMONIAL

**“We loved the personalized site assessments that evaluated our specific facility, its equipment, and its preparedness plans ... The identification of our strengths and challenges was so helpful, but even more terrific was the fact that RIDOH offered solutions to help us reduce or eliminate vulnerabilities. The sample plans and checklists helped to keep us prepared and allowed us to self-evaluate areas for improvement.”** - Rhonda Mitchell, Newport Housing Authority

For more information and to download Senior Resiliency Project templates and guides, visit [health.ri.gov/srp](http://health.ri.gov/srp)





# MOSQUITOES

Climate change can cause heavier precipitation, longer warm seasons, and warmer winters. This can make the environment more hospitable to certain types of mosquitoes. Mosquitoes can carry or spread many diseases, including West Nile Virus (WNV), Eastern Equine Encephalitis (EEE), and Zika Virus. The species of mosquitoes that carry WNV and EEE are found in Rhode Island and bite until the first heavy frost (usually the end of October). The species of mosquitoes that carry Zika, chikungunya, dengue fever, malaria, and Yellow Fever are not established in Rhode Island right now. Rhode Islanders traveling to other areas can come in contact with these mosquitoes.

## PROJECTIONS

### Climate change is expected to influence mosquitoes and the viruses they carry.

Changes in precipitation and temperature may alter the primary habitat and range of mosquitoes, and impact survival and spread of viruses transmitted from mosquitoes to humans.

West Nile Virus and Eastern Equine Encephalitis may become more common with climate change.

## WHAT YOU CAN DO



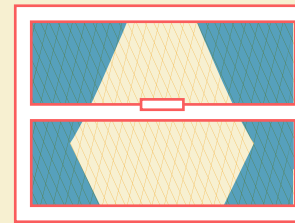
### CLOTHING

When spending time outside during warm weather, wear long-sleeved shirts/pants whenever possible, especially if outside during dawn or dusk.



### DUMP STANDING WATER

Remove any water from unused swimming pools, wading pools, boats, planters, trash and recycling bins, tires, and anything else that collects water, and cover them.



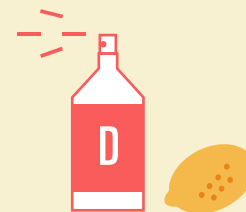
### SCREENS

Put screens on windows and doors. Fix screens that have holes.



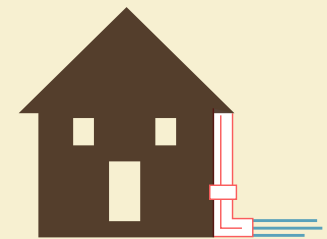
### NETTING

Put insect netting over strollers and playpens.



### BUG SPRAY

Use EPA-approved bug spray with one of the following active ingredients: DEET (20-30% strength), picaridin, IR3535, and oil of lemon eucalyptus or para-menthane-diol. Do not use DEET on infants.



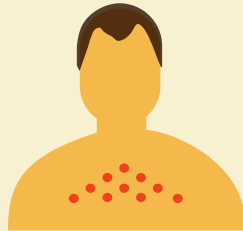
### CLEAN GUTTERS

Remove anything around your house and yard that collects water. Clean gutters and downspouts to ensure proper drainage.



## EASTERN EQUINE ENCEPHALITIS

EEE symptoms include an abrupt onset of chills, fever, generally unhealthy feeling, joint pain, and muscle pain. Signs and symptoms in patients with encephalitis (brain inflammation) are fever, headache, irritability, restlessness, drowsiness, loss of appetite, vomiting, diarrhea, bluish discoloration, convulsions, and coma.



## WEST NILE VIRUS

Severe West Nile Virus symptoms can include high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness, and paralysis. Milder symptoms can include fever, headache, body aches, nausea, vomiting, swollen lymph glands, or rash on the chest, stomach, and back.



## ZIKA VIRUS

Common symptoms of Zika include fever, rash, joint pain, headache, muscle pain, and pink eye. Zika can also be spread from pregnant mothers to their unborn children, and can cause birth defects.



Anyone who works or plays outdoors, such as athletes, hikers, gardeners, and landscapers

Elderly

Pregnant women (Zika virus)

Children

Anyone with a weakened immune system

Travelers (Zika virus)





# TICKS

Ticks are found throughout Rhode Island. Tick-borne diseases are transmitted through the bite of an infected tick. You are most likely to be bitten by a tick in the spring, summer, or fall; however, ticks can survive in the winter if temperatures are above freezing. Warmer winters could increase the number of ticks and the risk for spreading tickborne diseases like Lyme disease, babesiosis, anaplasmosis, ehrlichiosis, Rocky Mountain spotted fever, and Powassan.

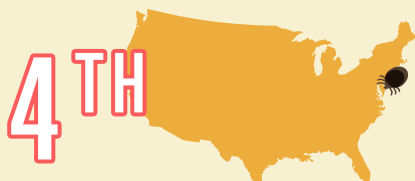
Ticks can be infected with bacteria, viruses, or parasites. If you are bitten by an infected tick, you may become infected. Ticks usually are found in tall grass and leafy areas and often attach themselves to you in your armpits, groin, waistline, or in your hair.

## DATA AND PROJECTIONS

900+

CASES PER YEAR

Lyme disease is extremely common in Rhode Island.



Rhode Island has the fourth-highest rate of Lyme disease in the country.



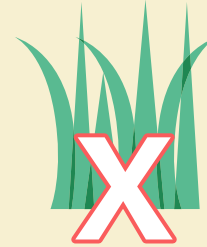
Changing temperature and precipitation patterns could make conditions more hospitable for ticks.



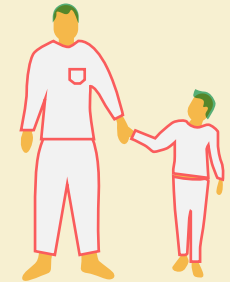
Washington County has the highest rate of Lyme disease in the state; nearly twice the rate of Newport and Bristol counties.

## WHAT YOU CAN DO

### AVOID DIRECT CONTACT WITH TICKS



Avoid wooded and brushy areas with high grass and leaf litter and walk in the center of trails.



Wear long pants and long sleeves whenever possible. Wear light colored clothing so you can see the ticks more easily.



Tuck your pants into your socks so ticks don't crawl under your clothes.



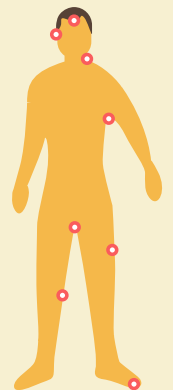
Use products that contain permethrin on shoes and clothing.



When outdoors, use repellents containing 20% DEET, picaridin, IR3535, some oil of lemon eucalyptus or para-menthane-diol. Follow the directions on the package.

#### Where to look:

Along your hairline  
Ears  
Back of your neck  
Armpits  
Groin  
Behind the knees  
Legs  
Between your toes



#### Deer Tick actual size:

Nymph ● Adult Male ● Adult Female ●

## WHAT YOU CAN DO

### CHECK FOR TICKS



Bathe or shower as soon as possible after coming indoors (preferably within 2 hours) to wash off and more easily find ticks that are crawling on you.

Conduct a full-body tick check using a hand-held or full-length mirror to view all parts of your body upon return from tick-infested areas.



Examine gear and pets. Ticks can ride into the home on clothing and pets, then attach to a person later, so carefully examine pets, coats, and day packs.



### REMOVE TICKS FROM YOUR BODY



To remove an attached tick, grasp with tweezers as close as possible to the attachment (skin) site, and pull upward and out with a firm and steady pressure. If tweezers are not available, use fingers shielded with tissue paper or rubber gloves.

## TICK-BORNE ILLNESS AND SYMPTOMS



### COMMON SYMPTOMS

can include tiredness, body/muscle aches, joint pain, fever, rash, stiff neck, and facial paralysis. The type and severity of symptoms vary with the specific disease.

### SYMPTOMS CAN START

as soon as a few days after being bitten or as late as a few months after a tick bite. Some people may have no symptoms at all.

### TICKS CAN CARRY

Lyme disease, anaplasmosis, ehrlichiosis, babesiosis, powassan and Rocky Mountain spotted fever (rare in Rhode Island).

### EARLY DIAGNOSIS

is helpful in successfully treating tick-borne diseases. It is important to contact your healthcare provider if you are experiencing any of these symptoms.

## AT-RISK POPULATIONS



People who spend recreational time outdoors



Outdoor workers



Pet owners



Gardeners



# AIR QUALITY

Climate change impacts the air we breathe, both indoors and outdoors. The changing climate has modified weather patterns, which then influence the levels and location of outdoor air pollutants such as ground-level ozone and fine-particulate matter.

Increasing carbon dioxide (CO<sub>2</sub>) levels and longer, warmer seasons also promote the growth of plants that release pollen. These changes to outdoor air quality also affect indoor air quality because pollutants and allergens get into homes, schools, and other buildings through vents, open windows, or other air-handling systems. Poor air quality, either outdoor or indoor, can negatively affect the human respiratory and cardiovascular systems.

## DATA



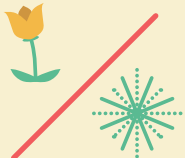
One in 10 Rhode Islanders has asthma.



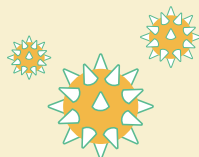
Smoke from more and larger wildfires, even in other parts of the country, impacts local air quality.



American Lung Association air quality rating for Rhode Island.



The onset of spring bloom is occurring earlier, and the first frost is occurring later.



An extended growing season means longer periods of exposure to pollen and mold.



Increased exposure to allergens and air pollutants can cause more severe allergic reactions.

## DATA

40%

MORE LIKELY



Low-income adults in Rhode Island are 40% more likely than other adults to have asthma.



Ground-level ozone can lead to reduced lung function, more hospital visits and admissions for asthma, and premature deaths. Ground-level ozone (a key component of smog) is associated with a variety of health risks.



Changes in temperature and/or precipitation can lead to an increase of acute and chronic respiratory conditions.

## RESPIRATORY ILLNESSES

Ground-level ozone is associated with many health problems, including diminished lung function, emphysema, and COPD, as well as increased hospital admissions and emergency department visits for asthma.

Air pollution is responsible for 200,000 premature deaths each year.

**Rhode Island asthma rates are 33% higher than national averages for adults and 40% higher for children.**

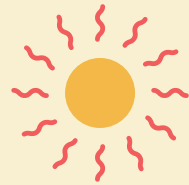


## WHAT YOU CAN DO



### TRANSPORTATION

Bike, walk, use public transportation, or car pool to help reduce air pollution and use less gas.



### RENEWABLE ENERGY

Use renewable energy, like solar and wind, and take advantage of free energy audits.



### AIR QUALITY

Improve your home's indoor air quality by using non-toxic cleaners and having house plants.



### LIMIT ACTIVITY

Limit physical activity on high-pollen-count days.



### AVOID

Avoid using lawnmowers and charcoal grills on days with poor air quality.



### STAY UPDATED

Be aware of Rhode Island's Ozone Alert and see air quality levels at [airnow.gov](http://airnow.gov).

## POLLEN & ALLERGIES

Exposure to allergens and air pollutants at the same time can cause more severe allergic reactions.

People with existing pollen allergies are at an increased risk for acute respiratory effects.

Effects include eye, nose, throat, and lung irritation.



## AT-RISK POPULATIONS

- Anyone who works or plays outdoors, such as athletes, hikers, gardeners, and landscapers.
- Anyone with heart or lung disease
- Elderly
- Children
- Anyone with medical conditions like hypertension (high blood pressure), COPD, or asthma





# FOOD

Climate change has the potential to impact access to safe and affordable food locally, nationally, and internationally. Increasing temperatures, drought, power outages, and ecological changes all threaten the safety and availability of our food and can pose a significant risk to Rhode Islanders' overall health. The food we eat every day can have an impact on climate change. Eating more locally grown and sourced food helps reduce the impact of climate change.

## PROJECTIONS

Ecological and climatological changes are decreasing the nutritional value of some staple crops.

Climate change can affect the length and quality of the growing season.

More frequent droughts, floods, fires, and extreme weather events can have a major impact on crop yields.

Climate change is making it harder to grow food locally and globally.

Climate change poses a risk of increased foodborne diseases.

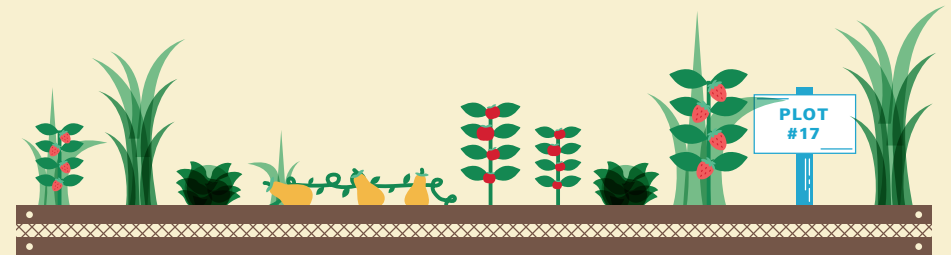
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Impacts of climate change can lead to significant fluctuations in food prices and food security.

## WHAT YOU CAN DO



Grow your own food.

LOCAL

ORGANIC



### ORGANIC & LOCAL

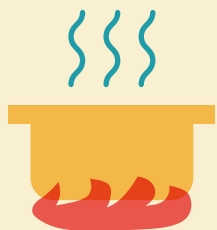
Buy organic foods and/or local foods whenever possible. This helps mitigate climate change and supports our farmers and seafood industry.

### MEAT-FREE MEALS

Try to eat at least one meat-free meal per day. If you're already doing that, gradually increase the number of meat-free meals you eat.

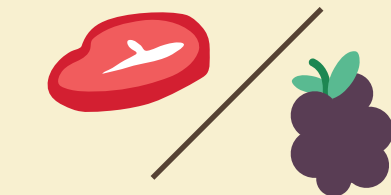


## WHAT YOU CAN DO



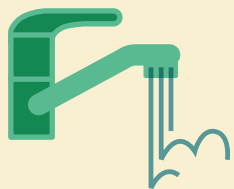
### COOK FOOD PROPERLY

Cook food to proper internal temperatures to avoid illness. Keep hot foods hot and cold foods cold.



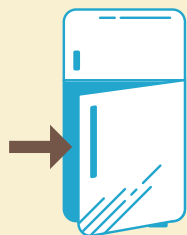
### SEPARATE MEAT

Separate raw meat and poultry away from foods that won't be cooked.



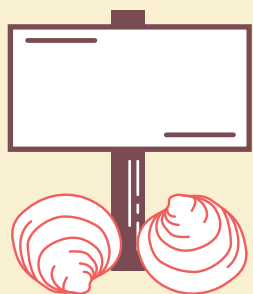
### WASH & SANITIZE

Wash hands, and wash, rinse and sanitize utensils and cutting boards before and after contact with raw meat, poultry, seafood, and eggs.



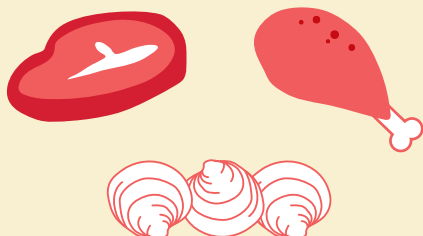
### REFRIGERATE

Refrigerate leftovers within two hours; keep them in the refrigerator at 41°F or below.



### SHELLFISH BAN

Be aware of local shellfishing bans due to bacterial contamination.



### RAW & UNDERCOOKED

Be aware of the risks or avoid eating raw and undercooked foods.

## FOODBORNE ILLNESSES

Foodborne illness may result from consuming food or beverages that are contaminated with bacteria, viruses, parasites, toxins, or chemicals. Foodborne illness can also be caused by eating food that has been stored, handled, prepared, or cooked improperly.



Typical symptoms can include vomiting, diarrhea, and abdominal cramps and can be spread to other people if proper hand hygiene is not practiced.

Vibrio (vibriosis) is a diverse group of marine bacteria found naturally in coastal waters. The highest risk of Vibrio comes from consuming raw or undercooked seafood.



## AT-RISK POPULATIONS

- People who eat undercooked or raw food, especially shellfish
- Anyone who loses power for more than 48 hours
- People with weakened immune systems
- Low income individuals or families
- Children
- Elderly

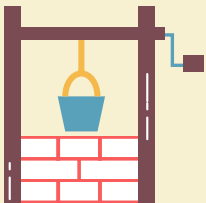


# WATER QUALITY

# WATER

Public health, infrastructure, agriculture, and ecosystems are all impacted by water quality and supply. Waterborne bacteria, viruses, parasites, and algae all pose health risks, including gastrointestinal illnesses, liver and kidney damage, or nerve and breathing problems. As climate change contributes to the warming of Rhode Island's waters, contaminants may become more common, leading to increased cases of illness or death.

## DATA AND PROJECTIONS



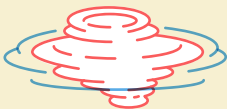
About 12% of Rhode Islanders get their drinking water from private wells.



Climate change may make drought conditions worse.



Droughts are likely to occur at least once each summer.



More extreme storm events will cause more stormwater runoff and increase the concentrations of nutrients that increase the risk of fish kills in Narragansett Bay.



Microalgae seaweeds, blue-green algae, and swimmer's itch, may all become more common.



Fecal bacteria contamination may increase due to stressed wastewater facilities.



### UNSTABLE WATER

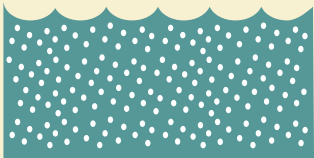
Heavy rainfall increases the amount of runoff and can result in making water resources unusable, unsafe, or in need of water treatment.



### SHELLFISH BAN

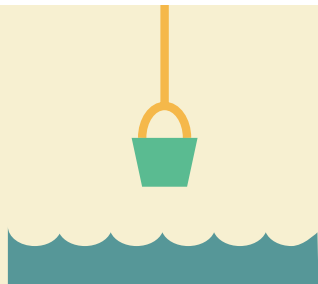
Summertime bans on shellfishing may increase because toxic bacteria grow better in warmer water.

## WATER SUPPLY



### SALINITY

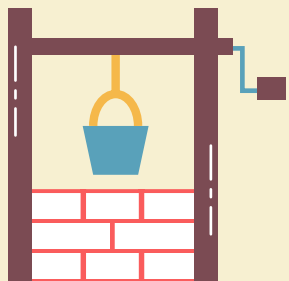
Rising sea level and increased incidence of drought can increase the salinity of both surface water and groundwater.



### WATER SUPPLY

Municipal water systems that get drinking water from groundwater sources are more vulnerable when there is a significant, prolonged loss of water supply.

## WHAT YOU CAN DO



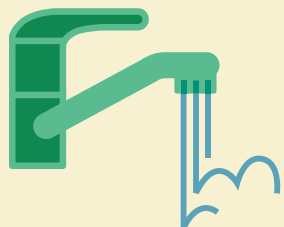
### TEST WELL WATER

Test well water annually.  
Learn more at  
<http://www.health.ri.gov/wells>



### BEACH CLOSURE

Check the Rhode Island  
Department of Health's  
beach closure website at  
[health.ri.gov/beaches](http://health.ri.gov/beaches).



### ASK YOUR LOCAL OFFICIALS

Ask your local officials what  
actions have been taken to  
mitigate the impacts of climate  
change on drinking water.

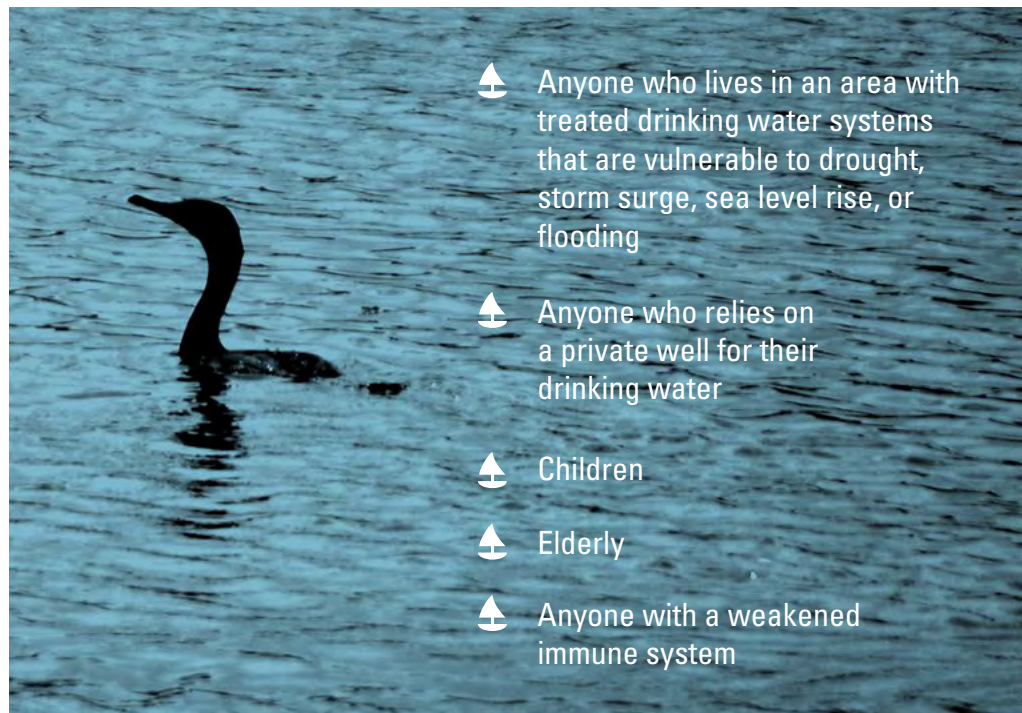


### CONSIDER GREEN INFRASTRUCTURE

Consider improvements  
that can reduce the risk of  
flooding and pollution.

Tiverton deals with drought: "The lack of water does lead to a health issue ... and it's a health and safety concern for the entire community. The sanitary systems don't work if we don't have water." – Robert Lloyd, Tiverton Fire Chief

## AT-RISK POPULATIONS



- ⚠️ Anyone who lives in an area with treated drinking water systems that are vulnerable to drought, storm surge, sea level rise, or flooding
- ⚠️ Anyone who relies on a private well for their drinking water
- ⚠️ Children
- ⚠️ Elderly
- ⚠️ Anyone with a weakened immune system





# GREEN INFRASTRUCTURE

Green infrastructure (GI) refers to nature-based, site-specific stormwater management techniques. These techniques are implemented to reduce the volume of stormwater runoff entering sewer systems, while also restoring the natural hydrologic cycle. As opposed to traditional gray infrastructure, green infrastructure manages stormwater through a variety of small, cost-effective landscape features.



## HOW GREEN INFRASTRUCTURE WORKS



### RAINWATER CAPTURE AND RE-USE

Store runoff to water plants, flush toilets, etc.



### EVAPORATION TRANSPIRATION

Use native vegetation.



### INFILTRATION

Allows water to slowly sink into the soil.

## ENVIRONMENTAL BENEFITS

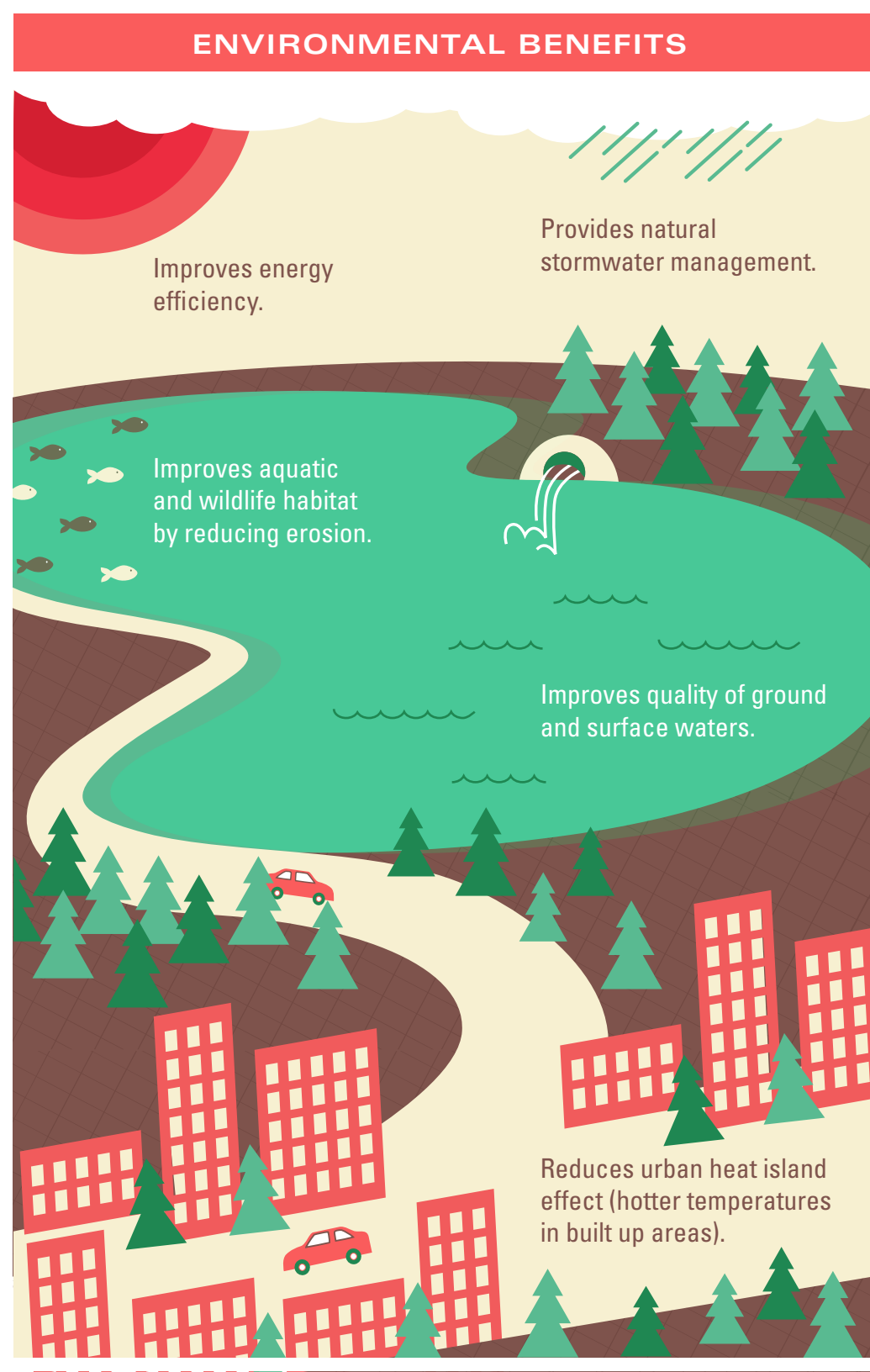
Improves energy efficiency.

Provides natural stormwater management.

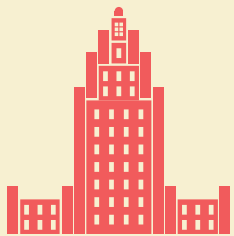
Improves aquatic and wildlife habitat by reducing erosion.

Improves quality of ground and surface waters.

Reduces urban heat island effect (hotter temperatures in built up areas).



## SOCIAL BENEFITS



Improves aesthetics and livability of urban communities.



Improves water and air quality.



Increases recreational opportunities.

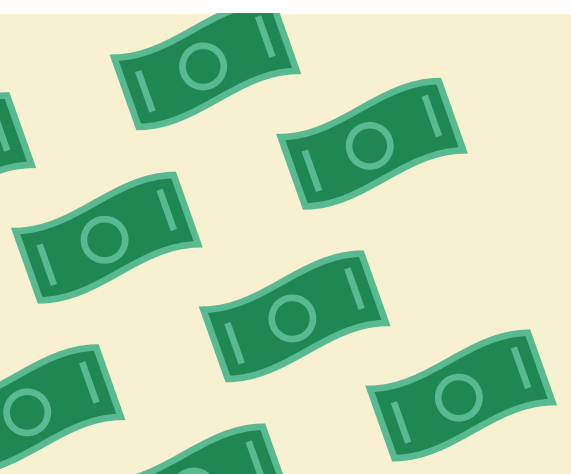


Fosters environmental education opportunities.

## TYPES OF GREEN INFRASTRUCTURE

- ▲ Trees
- ▲ Rain gardens
- ▲ Pocket wetlands (shallow marsh systems designed to control/de-pollute stormwater).
- ▲ Urban agriculture (backyard, rooftop, balcony, community gardening)
- ▲ Vegetated areas
- ▲ Green roofs
- ▲ Infiltration planters (containers with open bottoms to allow stormwater to slowly infiltrate the ground)
- ▲ Infiltration trenches (shallow excavations with rubble or stone to allow for storage of stormwater runoff)
- ▲ Permeable pavement
- ▲ Cisterns/Rain barrels

## ECONOMIC BENEFITS



Increases property values

Reduces existing and potential future costs of gray infrastructure

Reduces energy consumption costs

For more information, visit the Green Infrastructure Coalition at <http://www.greeninfrastructureri.org/>.



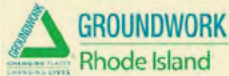


# DEXTER STREET NATURE AT WORK PROJECT

In 2015, the Rhode Island Department of Health's Climate Change Program partnered with Brown University's TRI-Lab (Teaching, Research, Impact), Clean Water Action, and Groundwork Rhode Island to teach a year-long course focused on climate change and environmental justice.

As a part of the course, and with input and feedback from West End residents, students developed climate change adaptation projects. Dexter Street was identified as a location that would benefit from improvements like stormwater management, more green space, and better measures for public safety and walkability. Several neighborhood-based organizations and residents were involved in meetings and with door-to-door surveys. In the spring of 2017, a nature-based project was designed and installed.

## PROJECT PARTNERS



## PROJECT OVERVIEW

Between Potters Avenue and Cranston Street on Dexter Street, 13 trees and 32 decorative shrubs and grasses were planted. This resulted in removing 425 square feet of pavement and created curb cuts to help direct stormwater into the ground instead of into storm drains. New trees and plants offer beauty and shade to neighborhood residents, especially children walking to and from school along Dexter Street. Groundwork Rhode Island will maintain the trees and plants and will work with community partners to continue the maintenance in future years.



## BENEFITS OF THE PROJECT



### PROTECTS

Absorbs water and reduces flooding



### COOLS

Cools natural and built environments



### CLEANS

Uses plants and soils to filter out pollution and absorb CO2



### ECONOMY

Reduces utility bills and creates jobs



### WELLNESS

Enhances social aspects of the community



### HABITAT

Attracts animals, like butterflies, turtles and frogs

## A DEMONSTRATION FOR RHODE ISLAND

The Dexter Street project serves as a model for future green infrastructure projects in Providence and throughout Rhode Island. It represents a grassroots effort with state and non-profit partners working collaboratively to develop nature-based solutions to climate change.

To learn more, visit the Rhode Island Green Infrastructure Coalition's website, <http://greeninfrastructureri.org> or email [info@groundworkri.org](mailto:info@groundworkri.org).



Rhode Island Department of Health  
Climate Change Program  
3 Capitol Hill  
Providence, RI 02908

Health Information Line: 401-222-5960  
[www.health.ri.gov/climatechange](http://www.health.ri.gov/climatechange)

