

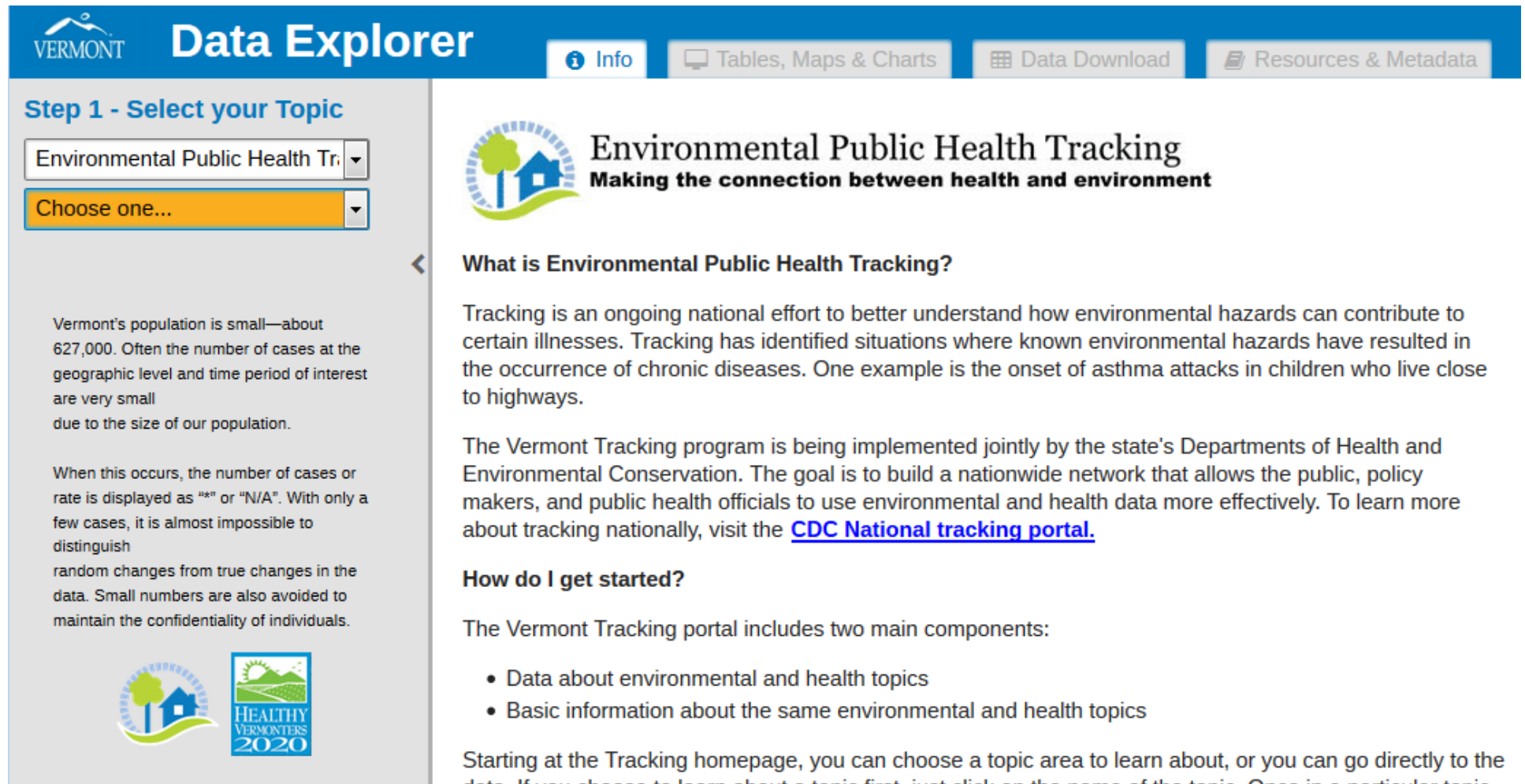


Beating the Heat, Fighting the Bite, and More: Satellite Data Applications for Public Health in VT

How can satellite data be used to protect health?

- Heat-related Illness
- Geological Risk Mapping
- Air Quality and Pollen
- Cyanobacteria (Blue-green Algae)
- Tick and Mosquito-borne Diseases

Environmental Health



The screenshot displays the Vermont Data Explorer interface. At the top, the Vermont logo and 'Data Explorer' title are visible. Navigation tabs include 'Info', 'Tables, Maps & Charts', 'Data Download', and 'Resources & Metadata'. The main content area is titled 'Environmental Public Health Tracking' with the tagline 'Making the connection between health and environment'. A left sidebar contains a 'Step 1 - Select your Topic' section with a dropdown menu set to 'Environmental Public Health Tr...' and a 'Choose one...' button. Below this, explanatory text discusses Vermont's small population and data confidentiality. The main content area features a heading 'What is Environmental Public Health Tracking?' followed by a paragraph explaining the tracking effort. Below that is a section 'How do I get started?' which lists two components: data about environmental and health topics, and basic information about the same topics. At the bottom, it provides instructions on how to navigate the portal.

VERMONT Data Explorer

Info Tables, Maps & Charts Data Download Resources & Metadata


Step 1 - Select your Topic

Environmental Public Health Tr. ▾

Choose one... ▾

Vermont's population is small—about 627,000. Often the number of cases at the geographic level and time period of interest are very small due to the size of our population.

When this occurs, the number of cases or rate is displayed as "**" or "N/A". With only a few cases, it is almost impossible to distinguish random changes from true changes in the data. Small numbers are also avoided to maintain the confidentiality of individuals.

 **Environmental Public Health Tracking**
Making the connection between health and environment

◀ **What is Environmental Public Health Tracking?**

Tracking is an ongoing national effort to better understand how environmental hazards can contribute to certain illnesses. Tracking has identified situations where known environmental hazards have resulted in the occurrence of chronic diseases. One example is the onset of asthma attacks in children who live close to highways.


The Vermont Tracking program is being implemented jointly by the state's Departments of Health and Environmental Conservation. The goal is to build a nationwide network that allows the public, policy makers, and public health officials to use environmental and health data more effectively. To learn more about tracking nationally, visit the [CDC National tracking portal](#).

How do I get started?

The Vermont Tracking portal includes two main components:

- Data about environmental and health topics
- Basic information about the same environmental and health topics

Starting at the Tracking homepage, you can choose a topic area to learn about, or you can go directly to the data. If you choose to learn about a topic first, just click on the name of the topic. Once in a particular topic

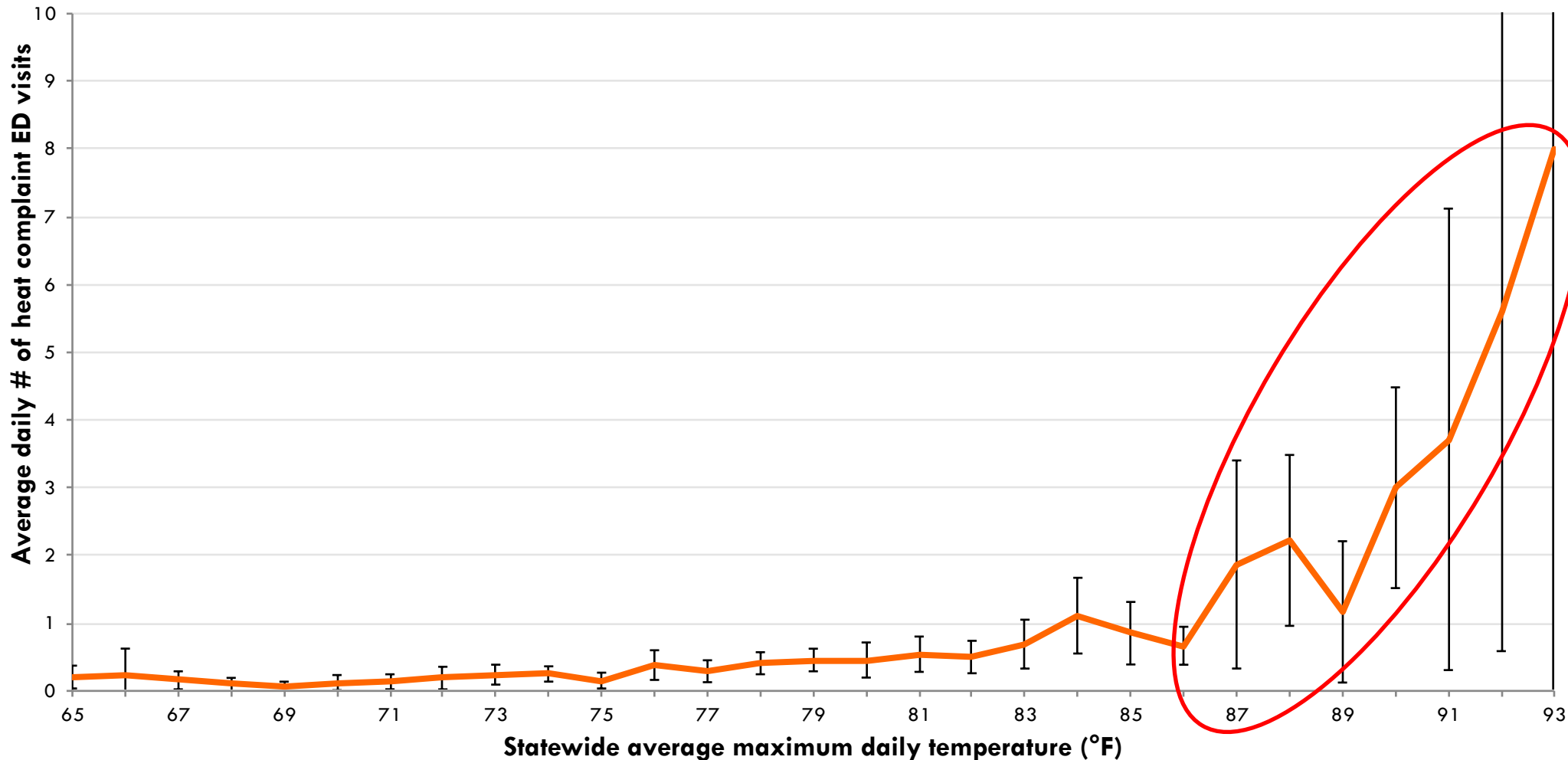


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Heat-related Illness

Hot weather already leads to increased illness & death in Vermont

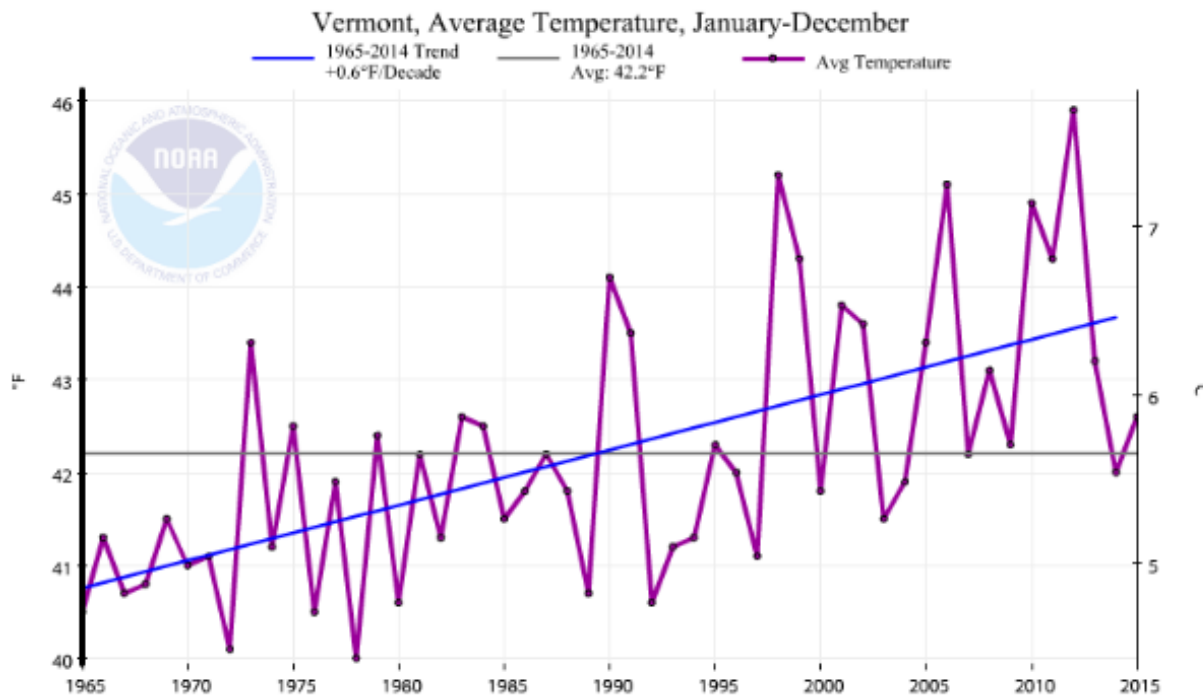
Average daily emergency department visits for heat complaints in Vermont, by maximum daily temperature, 2004 - 2013



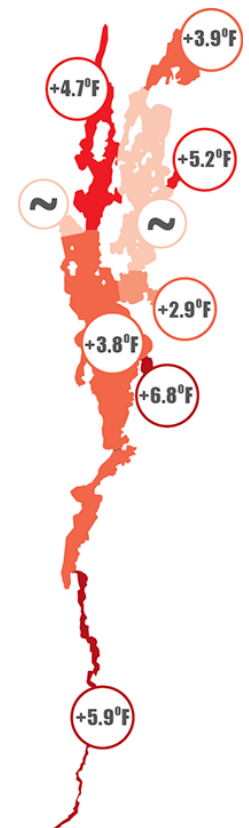
Vermont is already getting warmer...

- On average today, compared to 1964:
 - + 2°F in summer
 - + 4°F in winter } 4th highest rate of annual warming in U.S.

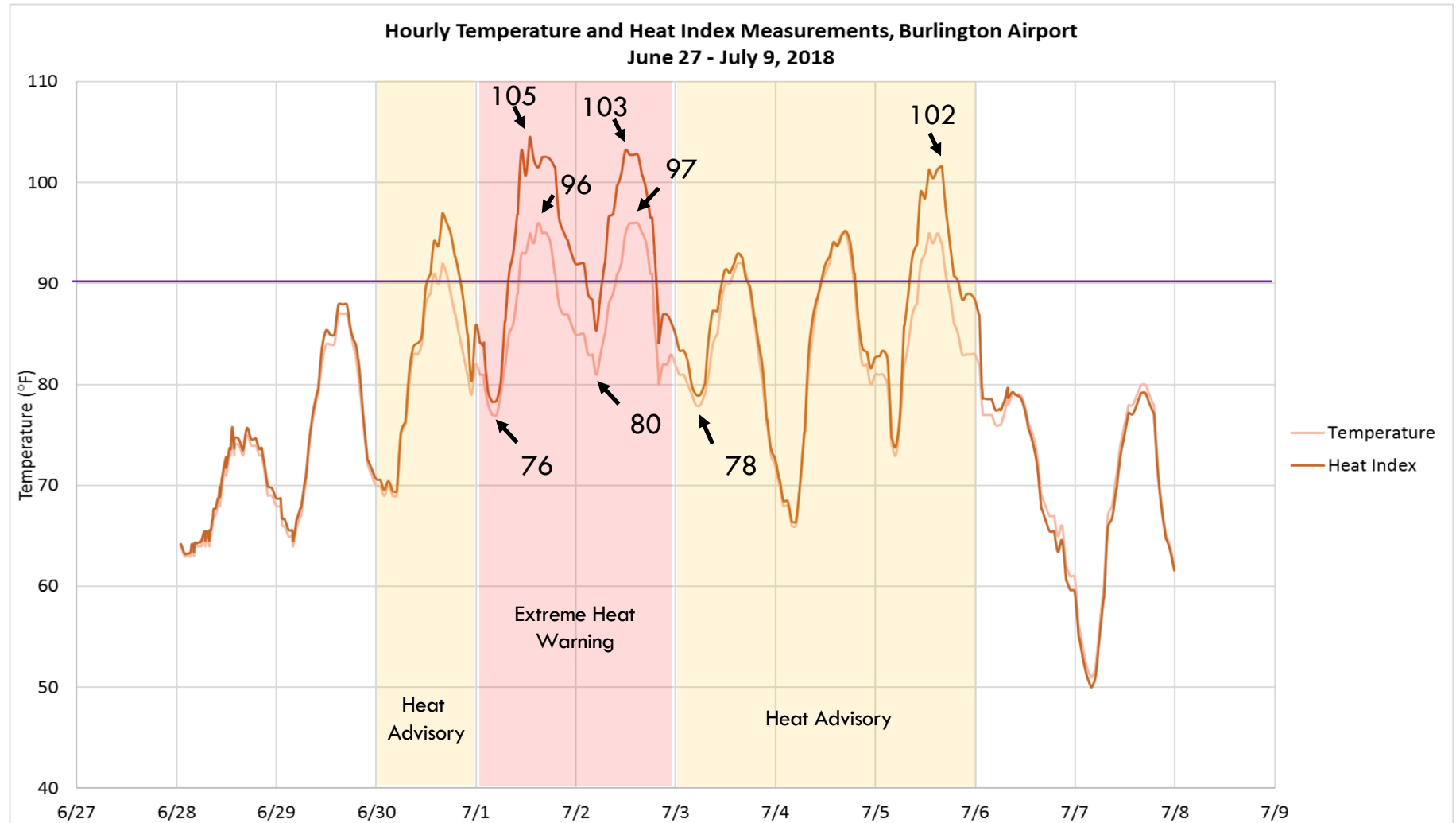
- Spring is arriving 2 weeks earlier, and winter is starting 1 week later (compared to 1960)



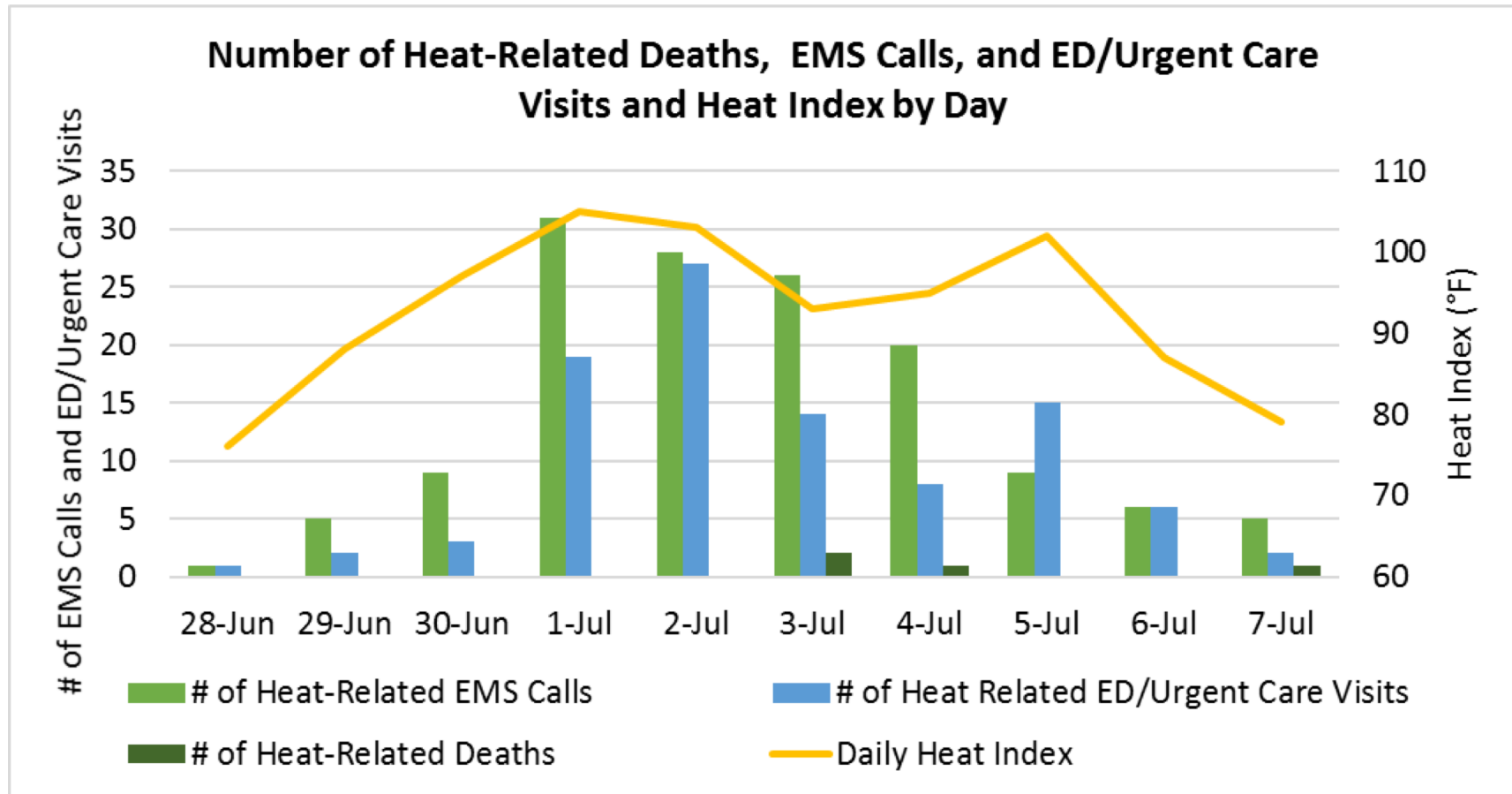
- Change in Lake Champlain temperature, 1964-2009:



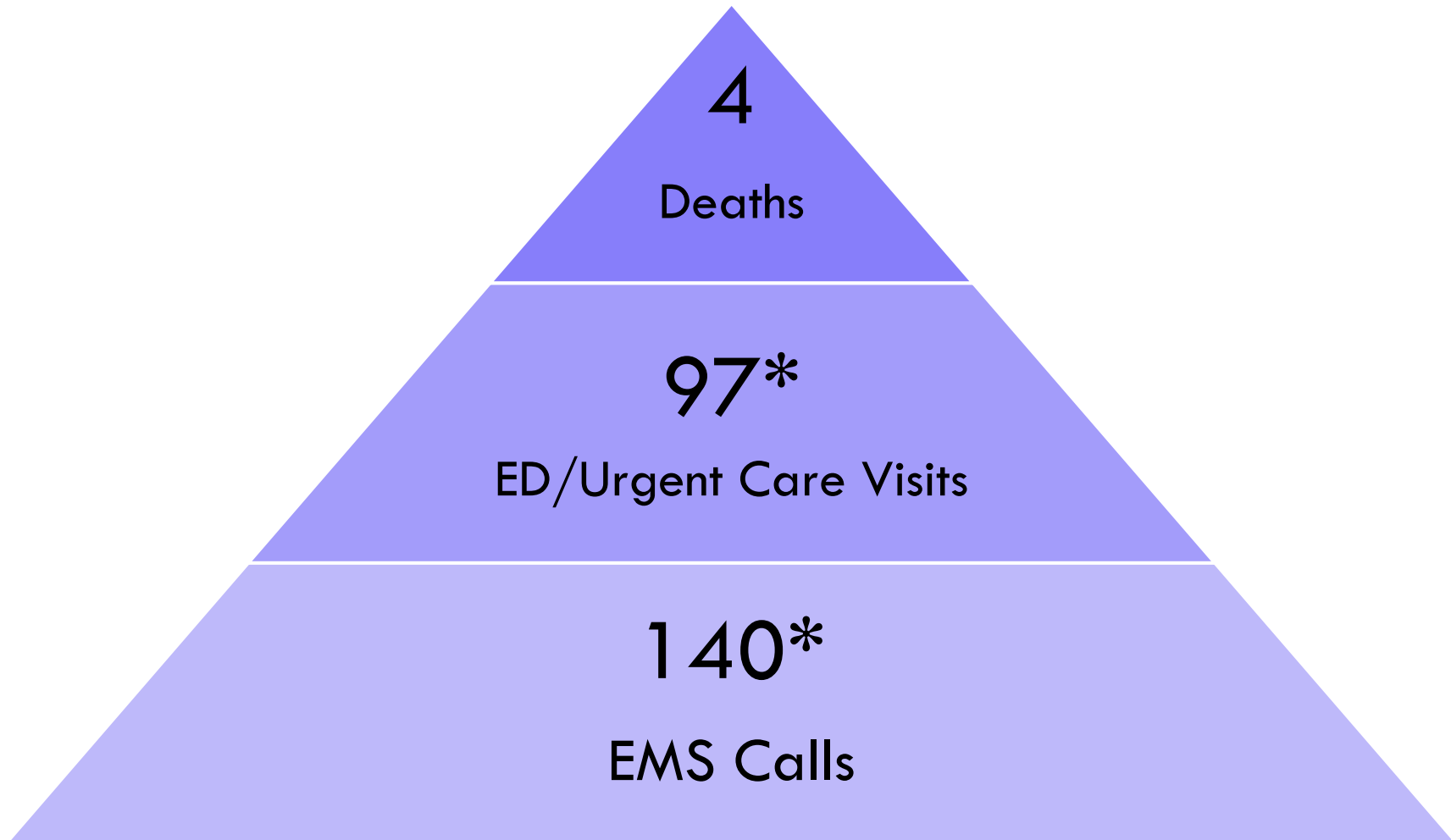
Heat Wave: NWS Burlington Station



Heat-Related Health Impacts, by Day

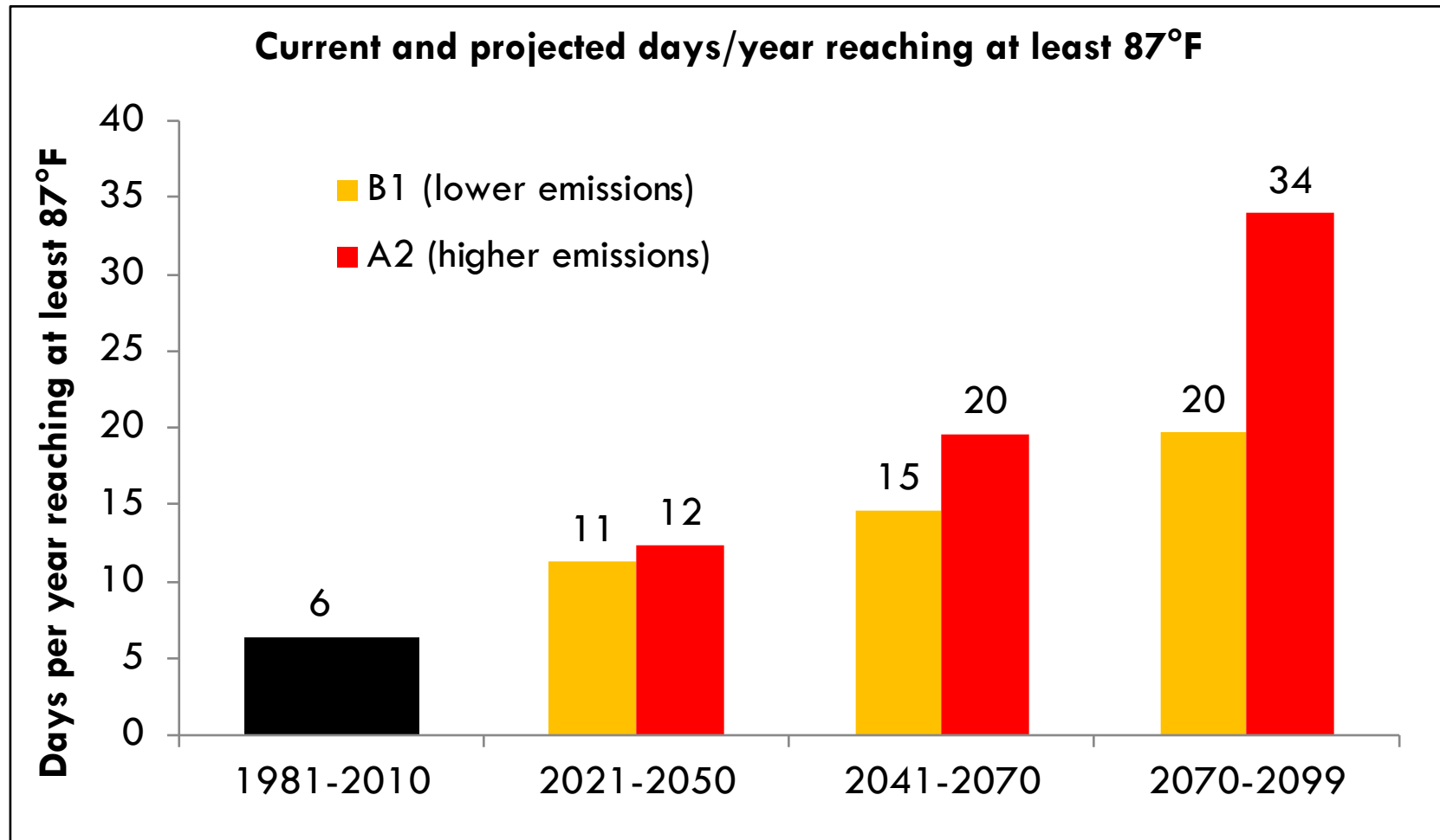


Estimated Heat-Related Health Impacts (6/28/18 to 7/7/18)



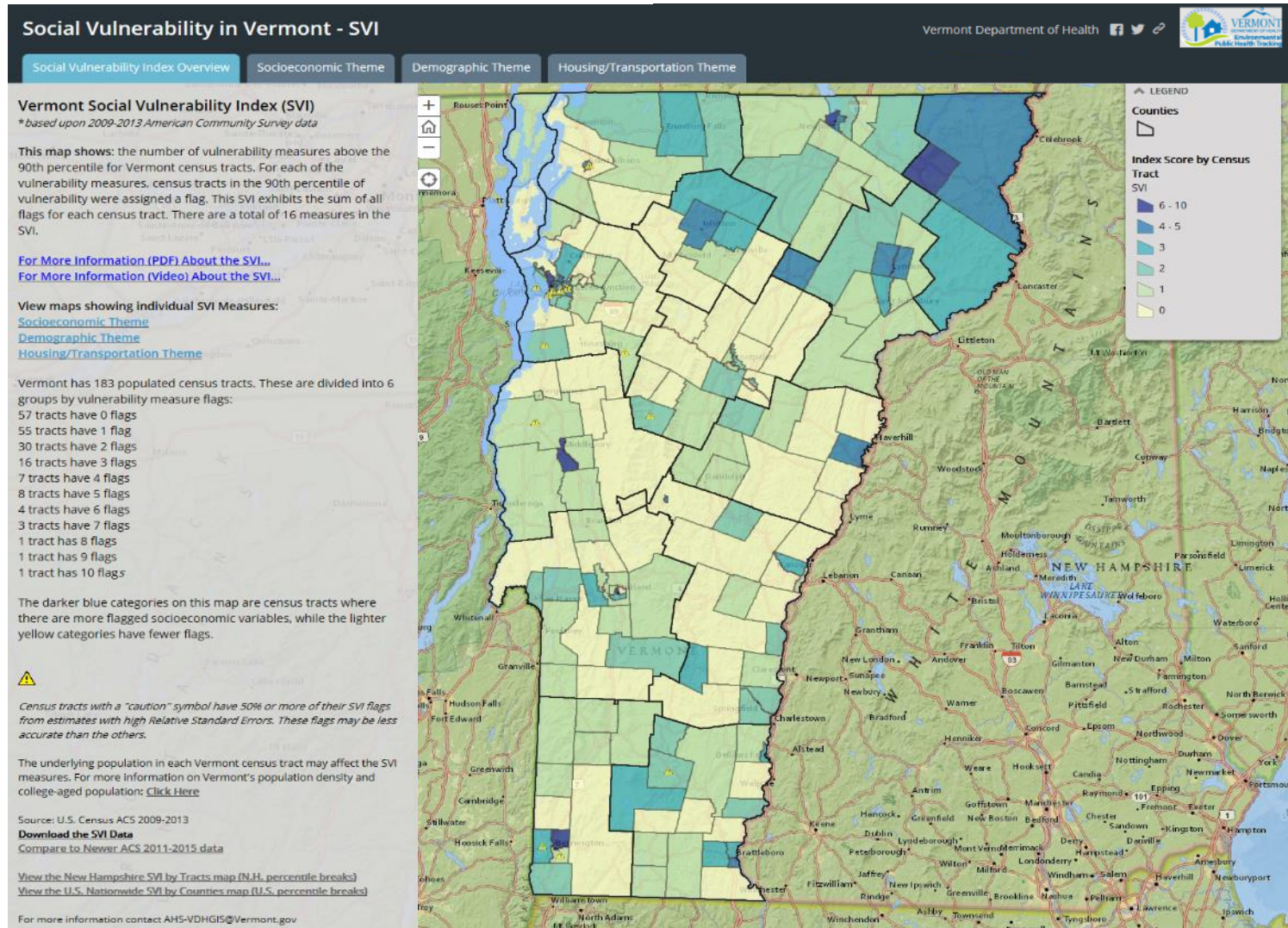
* Estimate based on preliminary surveillance data.

Expect more frequent hot days in the future

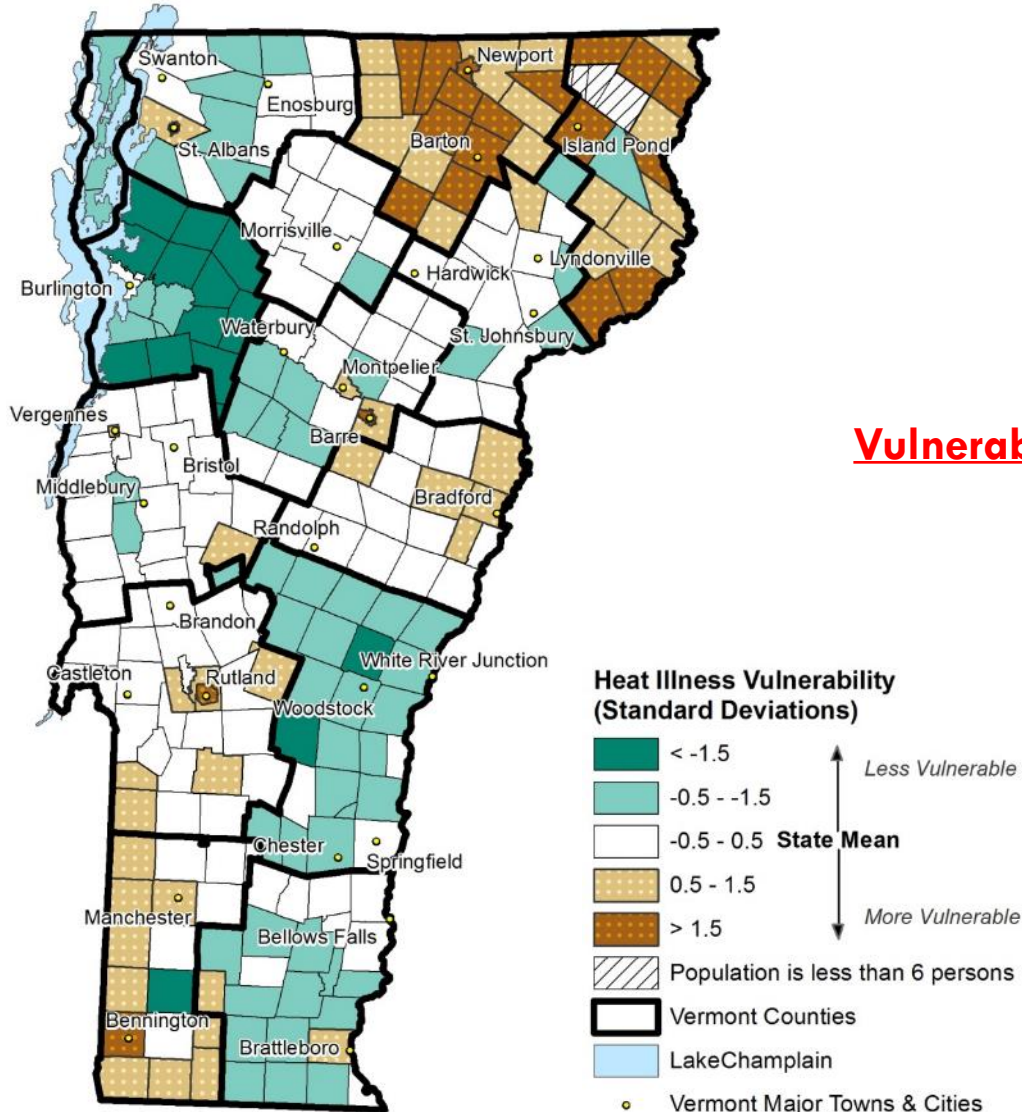


Source: Vermont Department of Health

Vulnerability mapping



Heat Vulnerability Index



Factors:

Exposures

- Environmental characteristics
- Climate acclimation

Vulnerabilities

- Age
- Pre-existing medical conditions

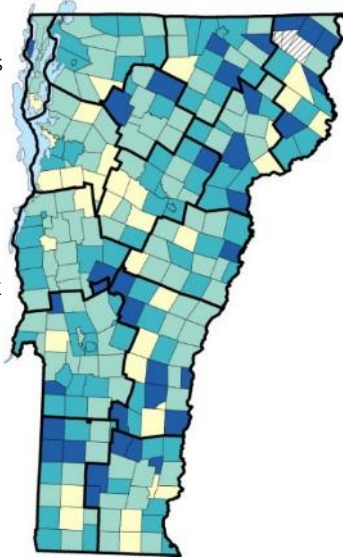
- Socioeconomic status
- Isolation

Barriers to adaptation

- Historic heat illness

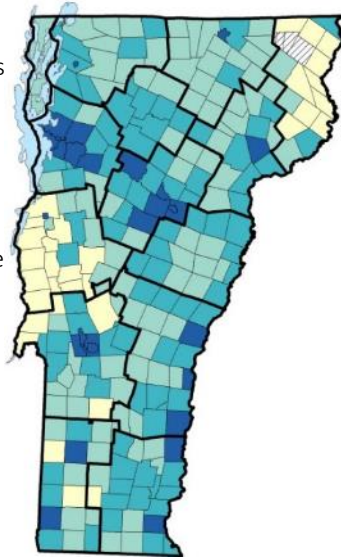
Population

This theme indicates vulnerability based on the population composition of the town. Young children and older adults are age groups at higher risk for heat-related illnesses.



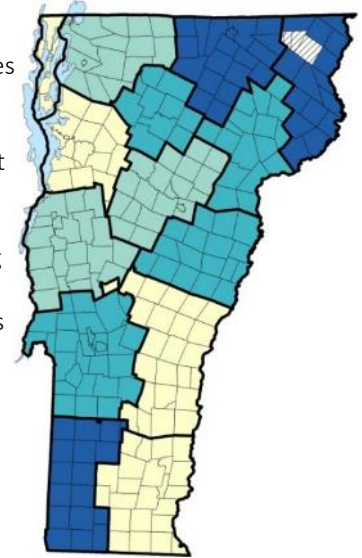
Environmental

This theme indicates vulnerability based on environmental characteristics. Summer heat is exacerbated in locations with dense housing, a high proportion of paved areas and rooftops, and few trees.



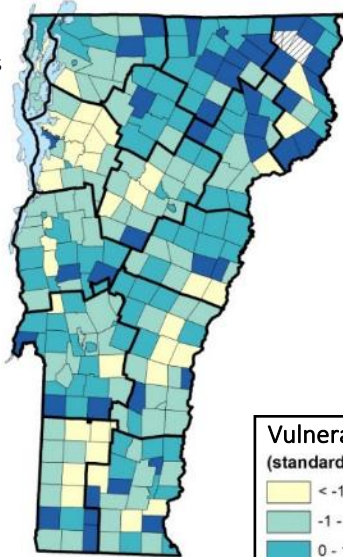
Acclimatization

This theme indicates vulnerability based on how acclimated residents are to hot summer temperatures. Those experiencing fewer hot days per year tend to be less adapted to the impacts of summer heat.



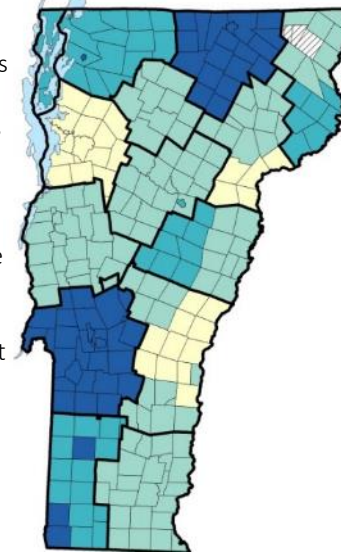
Socioeconomic

This theme indicates vulnerability based on social and economic resources available to town residents. Older adults living alone, those with less education, and those with fewer economic resources are often less able to find relief during summer heat.



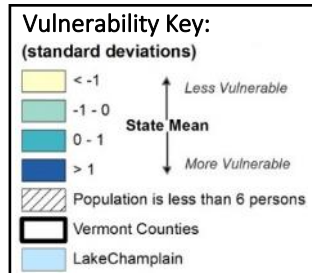
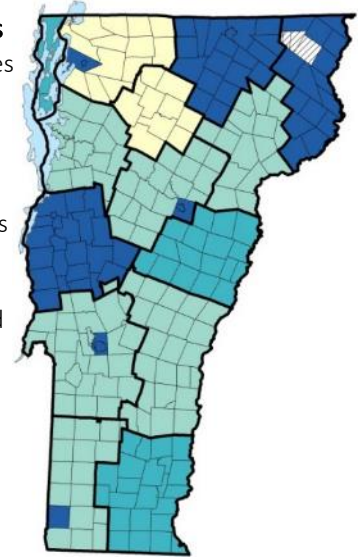
Health

This theme indicates vulnerability based on the health status of town residents. Those with pre-existing medical conditions are more likely to suffer health impacts during summer heat events.

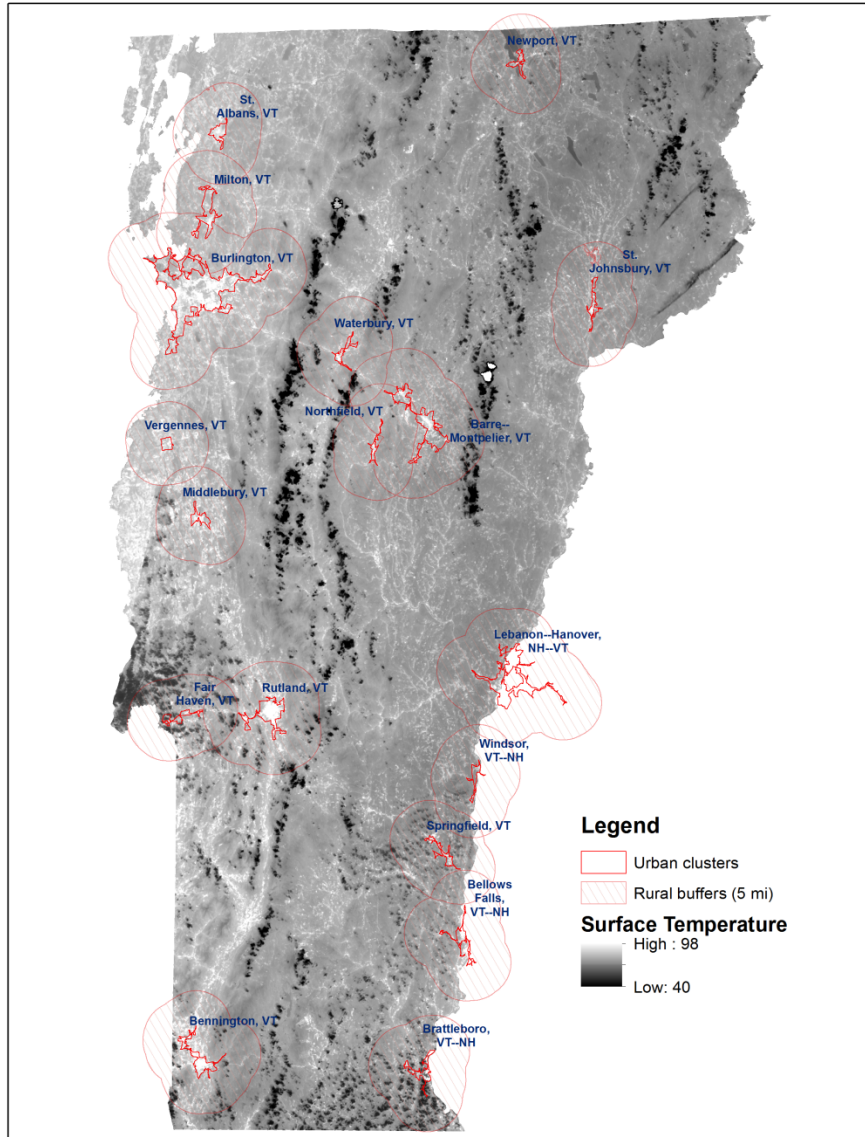


Heat Emergencies

This theme indicates vulnerability based on emergency department visits for heat illness in recent years. Towns that currently experience a high rate of heat-related emergencies are expected to continue experiencing a high rate in the near future.

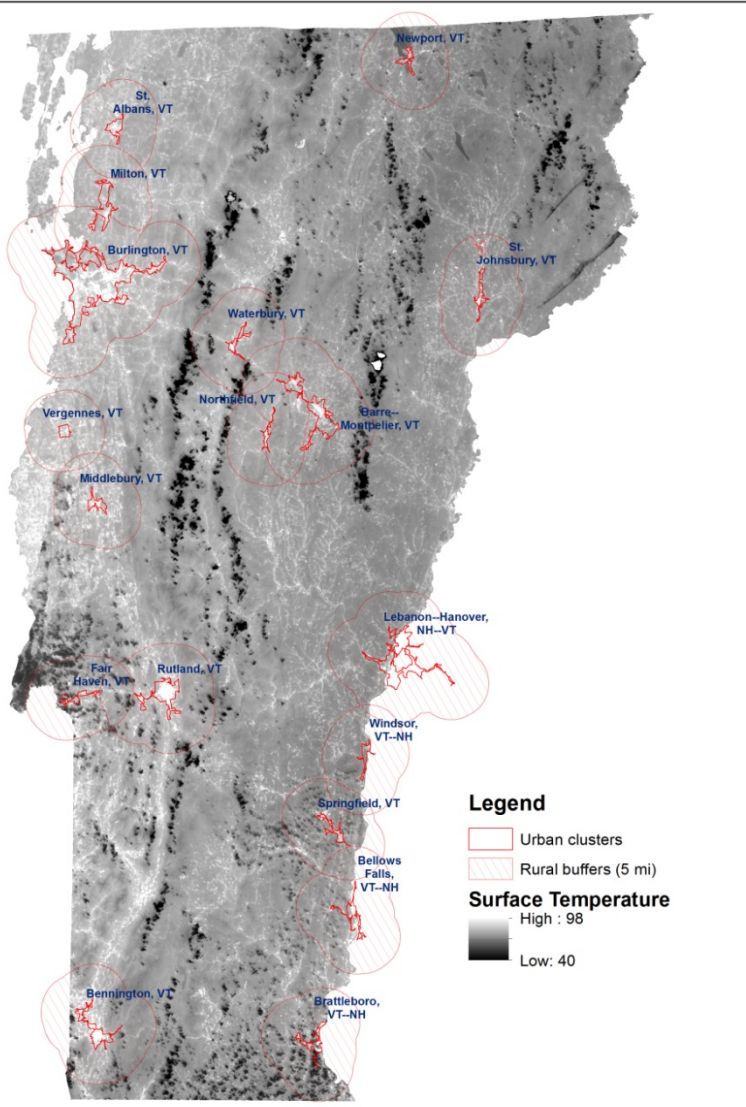


Urban cluster thermal analysis



- Data: Landsat 8
 - 2 mid-summer images
 - 2 similarly warm, non-summer images
 - All were taken mid-day
- Converted thermal band data to surface temperature
- Aggregate temperature to urban clusters and surrounding rural areas

Vermont urban heat island analysis

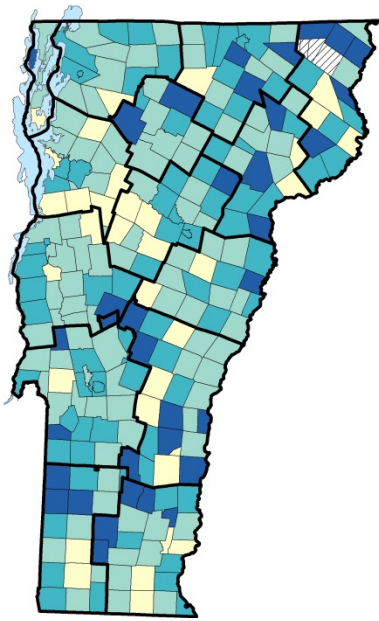


- Strongest associations with temps:
 - Tree cover
 - Impervious surface
 - Housing density

- Comparing urbanized areas to surrounding 5-mile buffers
 - Average temperature difference: **+3.9°F** in urbanized areas
 - Heat-related EMS incident rate difference: **+50%** in urbanized areas

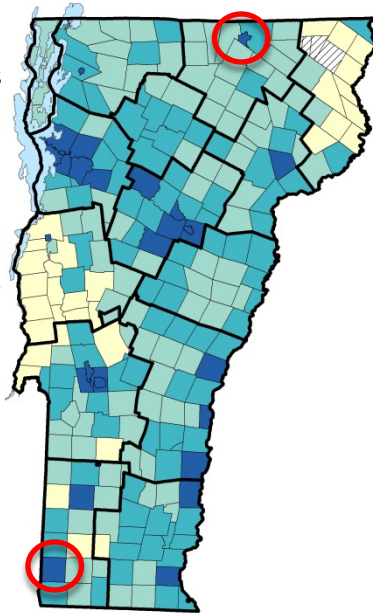
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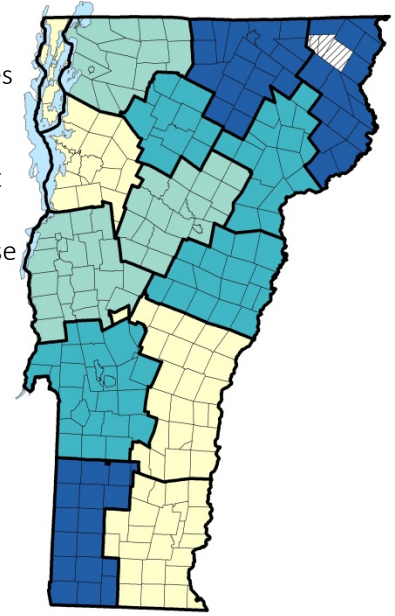
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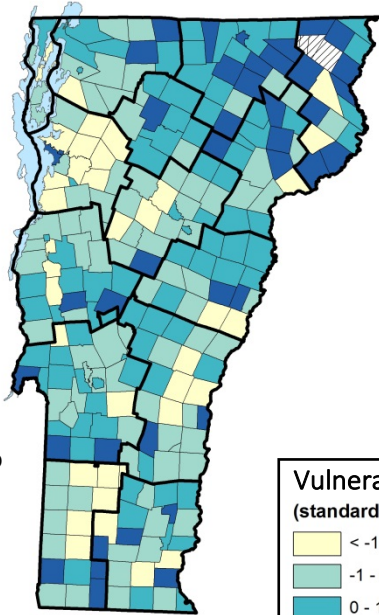
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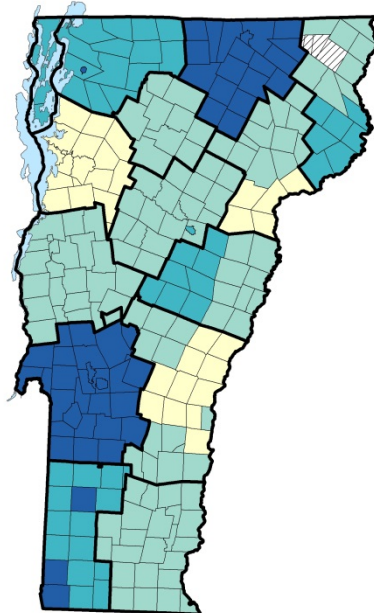
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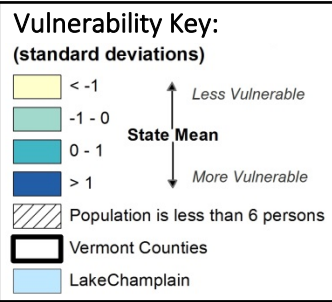
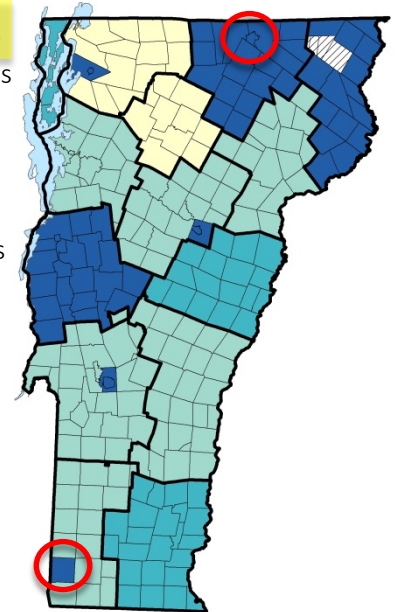
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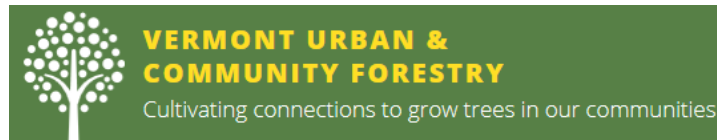


Using trees to save energy and protect health

- 2017: **200 trees** to Bennington & Newport
- 2018: **300 trees** to Barre & Rutland
 - High historic rate of heat illnesses
 - Lacking urban tree canopy
- Expected benefits include:
 - Increased shade & cooling
 - Reduced energy costs
 - Many other health & environmental benefits!



Partners:



Radon Geological Risk Mapping

Radon Risk in Vermont

Fix issues in your story ×

Story not shared ×

Edit

A Vermont Environmental Public Health Tracking App

A series of maps showing long-term residential in-air radon test results from 1994-2016.



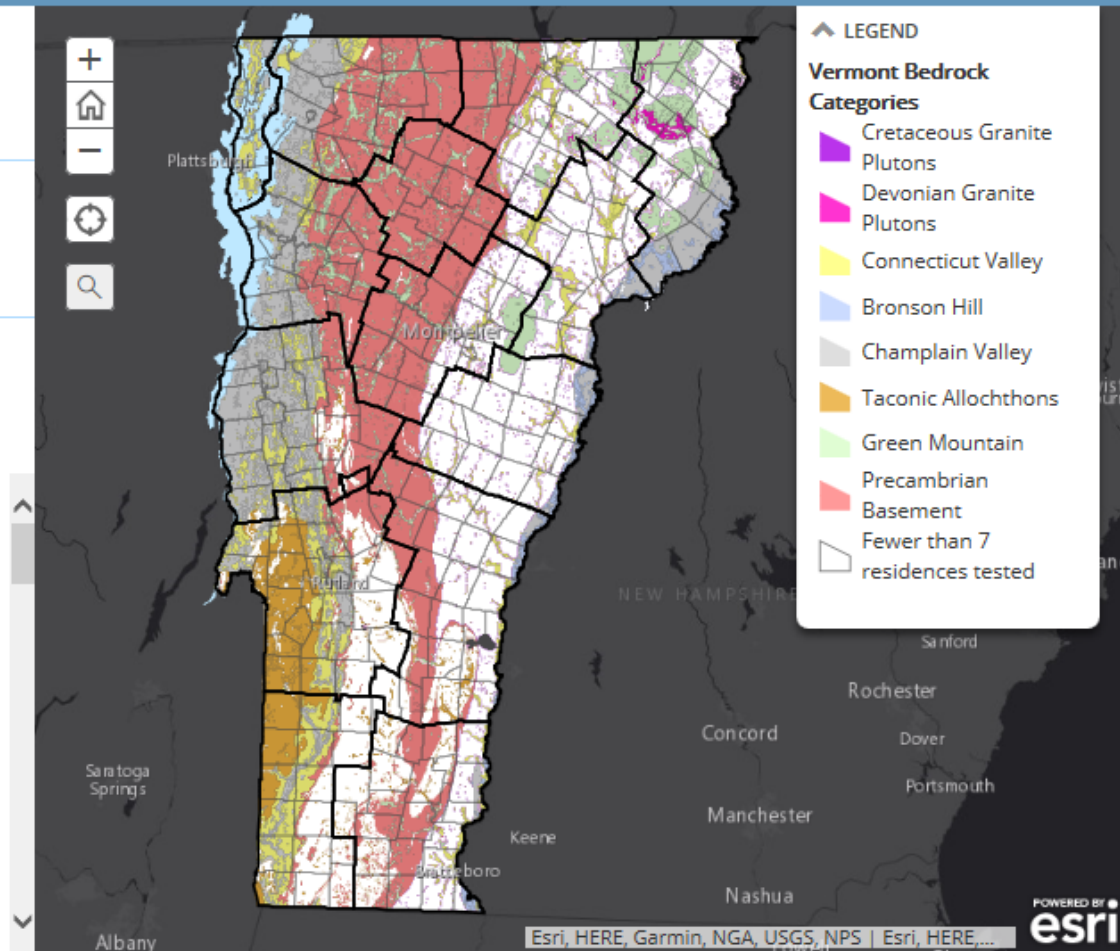
Rates of Radon Testing (by Town)

Elevated Radon Results (by Town)

Radon in Relation to Geology

Radon is a naturally occurring radioactive gas that is estimated to kill 50 Vermonters a year due to lung cancer. Radon can only be detected by testing, and buildings with elevated radon levels are found throughout the state. All Vermont homes should be tested.

Naturally occurring radon gas is released during radioactive decay in the earth's crust. Different combinations of surface and bedrock geology allow different rates of gas to discharge through them. Once the gas rises to the earth's surface, radon can move into the air and seep into buildings through foundation cracks. For more information: [USGS: Geology of Radon](#)



Radon Geological Risk Mapping

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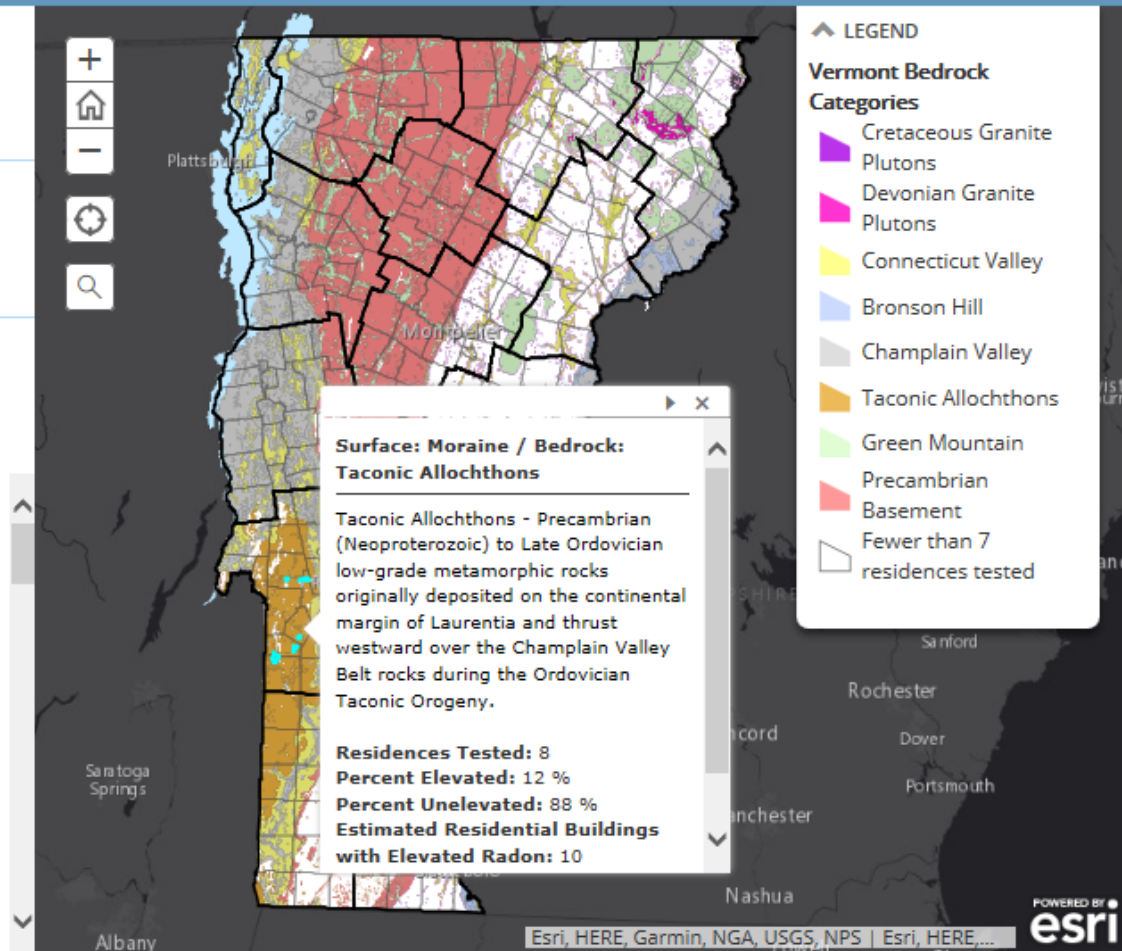
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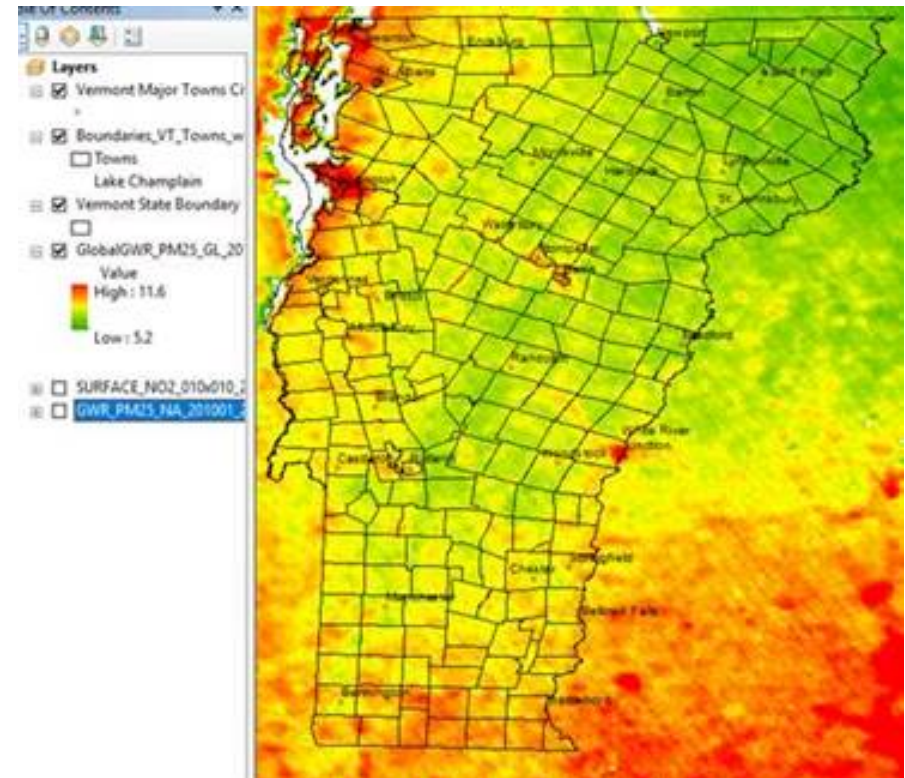
Air Pollution Vulnerability Index (in development with VT DEC)

□ Purpose: support decisions related to:

- Transportation emissions reductions strategies
- Biomass combustion policies and programs

□ Proposed data themes:

- Demographics
- Socioeconomic status
- Health characteristics
- Ambient pollution and emissions
- Population exposure to pollution



Sample data from: Global Annual PM2.5 Grids from MODIS, MISR and SeaWiFS Aerosol Optical Depth (AOD) with GWR, v1 (1998–2016)

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Cyanobacteria Monitoring

Cyanobacteria monitoring & preparedness



Source: [Seven Days](#), Nov 8th, 2017, Lake Carmi Pollution Triggers Call for Stricter Regulation of Dairy Farms



Source: Lake Champlain Committee

Cyanobacteria (Blue Green Algae) Tracker

Conditions change quickly. Keep people and pets away from anything you suspect might be a cyanobacteria bloom.

Select Monitoring Town ▾
Select Lake/Region ▾

Conditions shown on the map are based on the most recent report available.
This map shows the most recent conditions that have been reported from monitored locations. Widespread monitoring typically ends in September. For current conditions at a swimming area, contact the town, [Vermont State Park](#), or private association responsible for maintaining that area.

Learn what blooms look like so you can avoid them.
Watch a video of what cyanobacteria blooms look like [here](#).

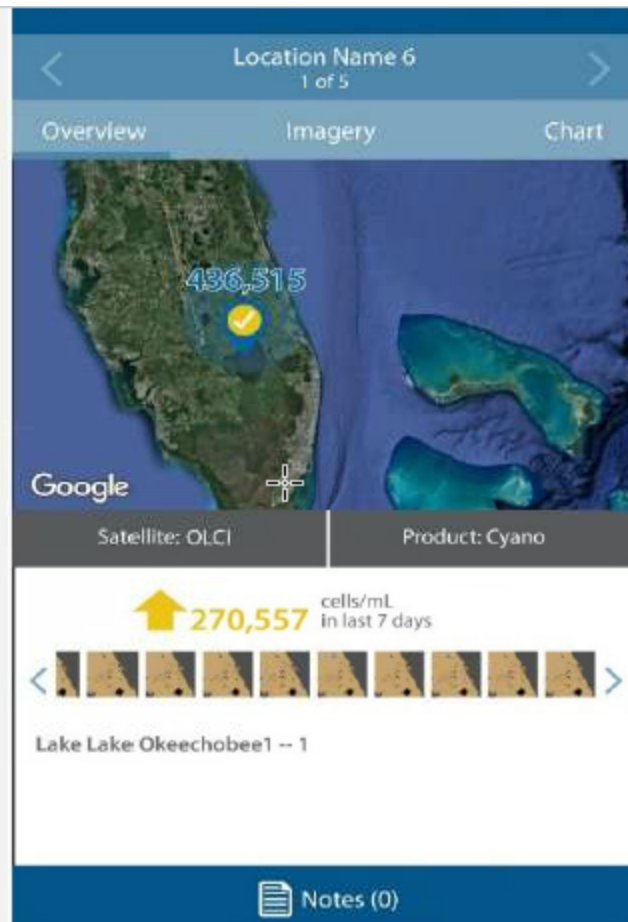
What are Cyanobacteria?
Cyanobacteria, also known as blue-green algae, are a natural component of marine and fresh water ecosystems. Under certain conditions, cyanobacteria multiply quickly, creating blooms. Some blooms produce toxins which can make people and pets sick. [Learn more about cyanobacteria \(blue-green algae\)](#).

Date	Site	Site Name	Town	Status
9/30/2017	49	The Gut	Grand Isle	Generally Safe
9/30/2017	74	Button Bay Boat Launch	Ferrisburg	Generally Safe
9/29/2017	395	RPt DEC Old Beach	Other	Generally Safe
9/29/2017	74	Button Bay Boat Launch	Ferrisburg	Generally Safe
9/29/2017	42	Oakledge Park Blanchard Beach	Burlington	Generally Safe
9/29/2017	43	Oakledge Park South Cove	Burlington	Generally Safe
9/29/2017	72	Burlington, VT - Texaco Beach	Burlington	Generally Safe
9/29/2017	22	North Beach	Burlington	Generally Safe
9/29/2017	54	Leddy Park	Burlington	Generally Safe
9/29/2017	345	Lake Morey	Fairlee	Generally Safe
9/29/2017	40	LTM 40	St. Albans Town	Low Alert
9/29/2017	34	LTM 34	Milton	Generally Safe
9/29/2017	75	Camp Dudley, Westport NY	Westport, NY	Generally Safe
9/28/2017	382	Essex Road	Willsboro, NY	Generally Safe
9/28/2017	54	Leddy Park	Burlington	Generally Safe
9/28/2017	169	Lake Iroquois Southwest	Hinesburg	Generally Safe

Cyanobacteria Monitoring

Cyanobacteria Assessment Network (CyAN)

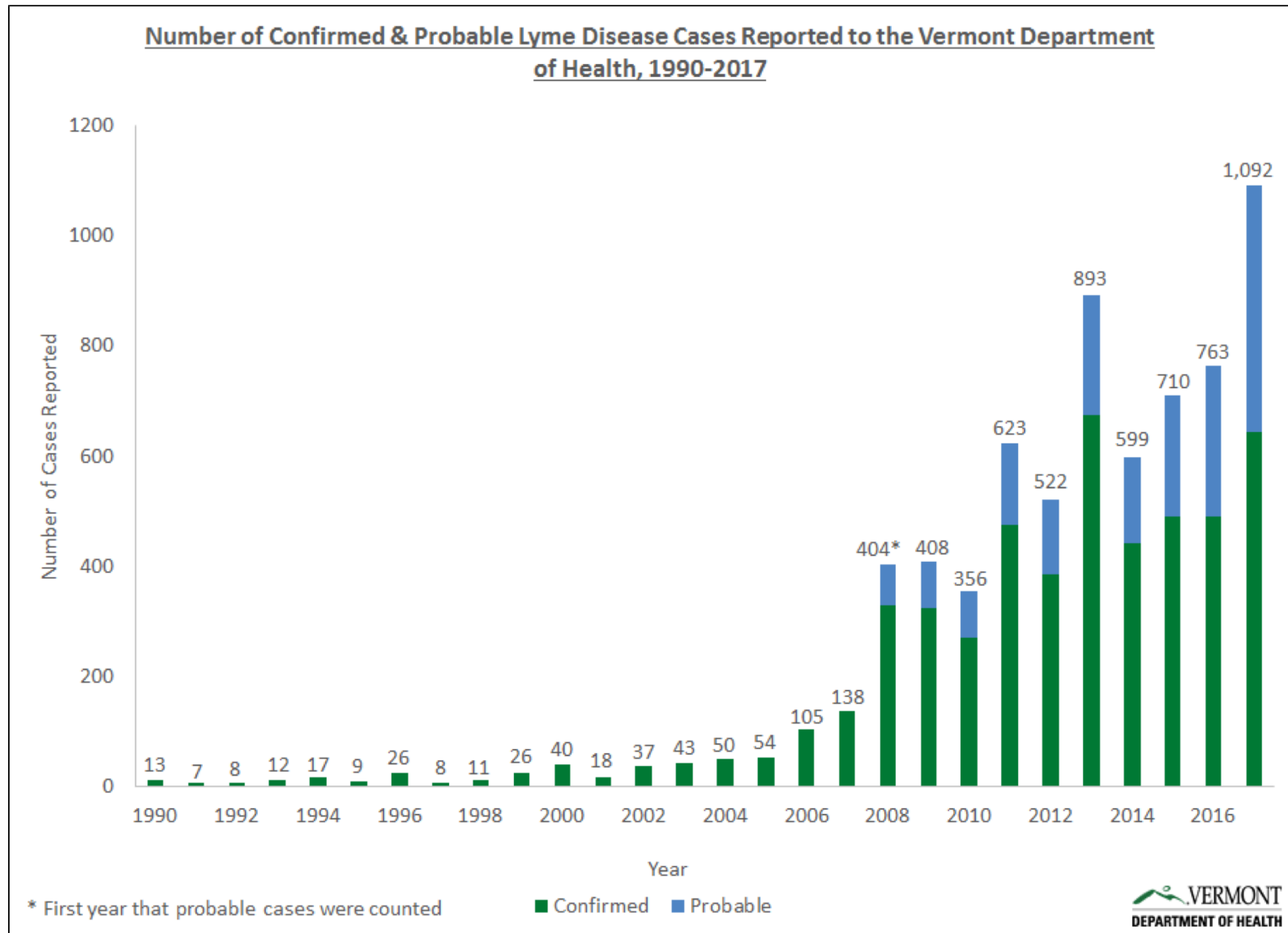
An EPA, NASA, NOAA, and USGS Project



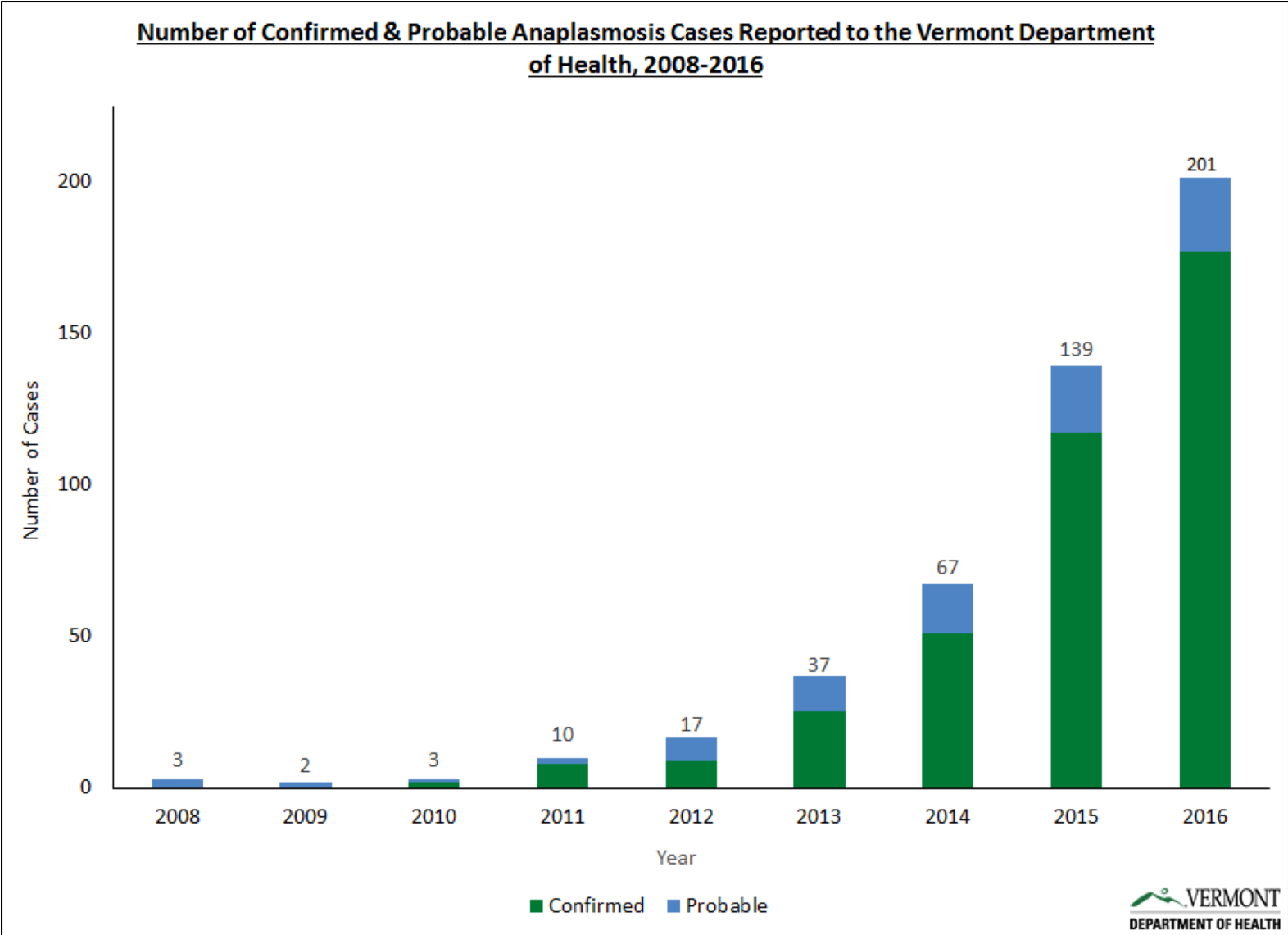
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Vector-borne Disease

Lyme Disease in Vermont



Anaplasmosis



Other possibilities

- Vector host habitat/dynamics
- Emerald Ash Borer – Forecast and mitigate impacts
- Emergency Preparedness: Have RGB data prepped for use during an emergency event
- Land use mapping for nutrient pollution planning for water quality/cyanobacteria (VT DEC)
- Poison Parsnip?


Key Takeaway



- Public health is a data and evidence-driven field
- Our understanding of some infectious and environmental health issues in Vermont can be advanced through application of remotely sensed data.

Acknowledgments

- Centers for Disease Control and Prevention
 - Environmental Public Health Tracking Program
 - Climate and Health Program
- Vermont Department of Health
 - Jared Ulmer, Climate and Health Program Manager
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 - Bridget O'Brien, Radiological and Toxicological Analyst
- NASA GSFC, formerly or currently
 - Jeff Privette
 - Venkat Lakshmi
 - Mike Jasinski
 - Tucker Carlson
 - Brent Holben



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