

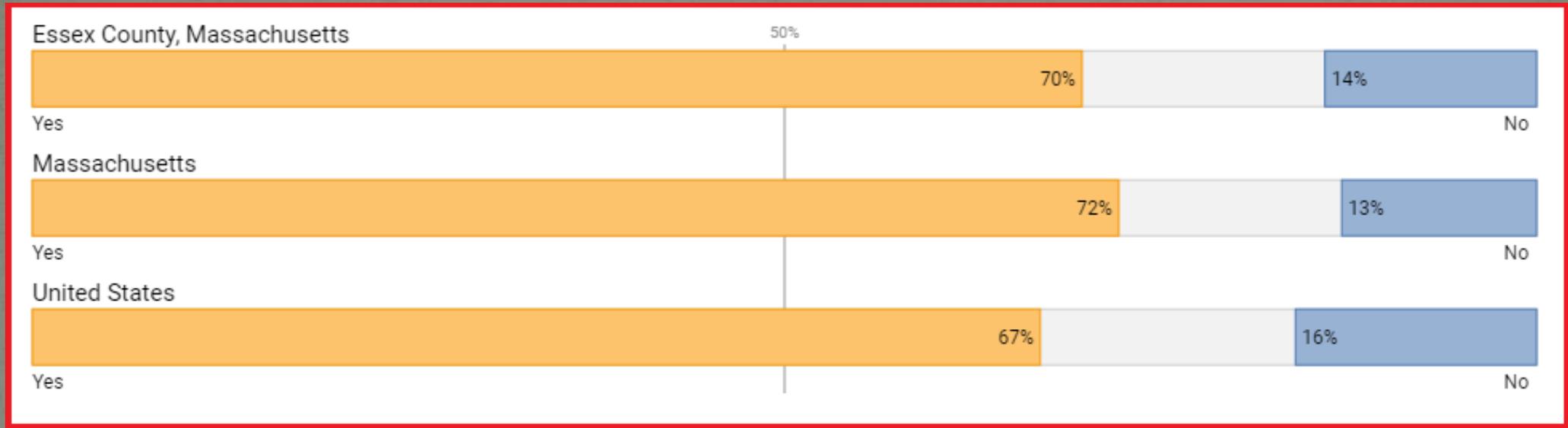
Frog Pot

Goals for my Presentation:

- Have you realize **that Climate Change is Happening**,
 - It's Bad,
 - It's Us,
 - There's Hope
- Illustrate the disconnect between the **public's perception of Climate Change vs. its threat.**
- Illustrate the **current local climate threats & our vulnerability.**
- Illustrate the **progression of Climate Change relative to our attitudes about it.**
 - are we being timely, or catching up?
- Provide **strategies to do something about Climate Change and its threats.**

What do people think?

Is climate change happening?...



Source: Yale Project on Climate Opinion, 2019

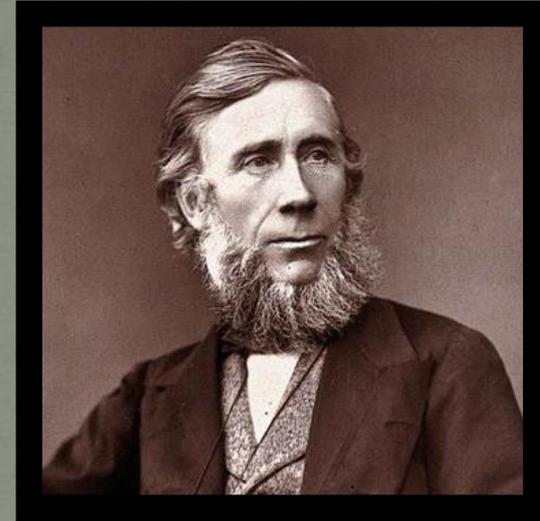
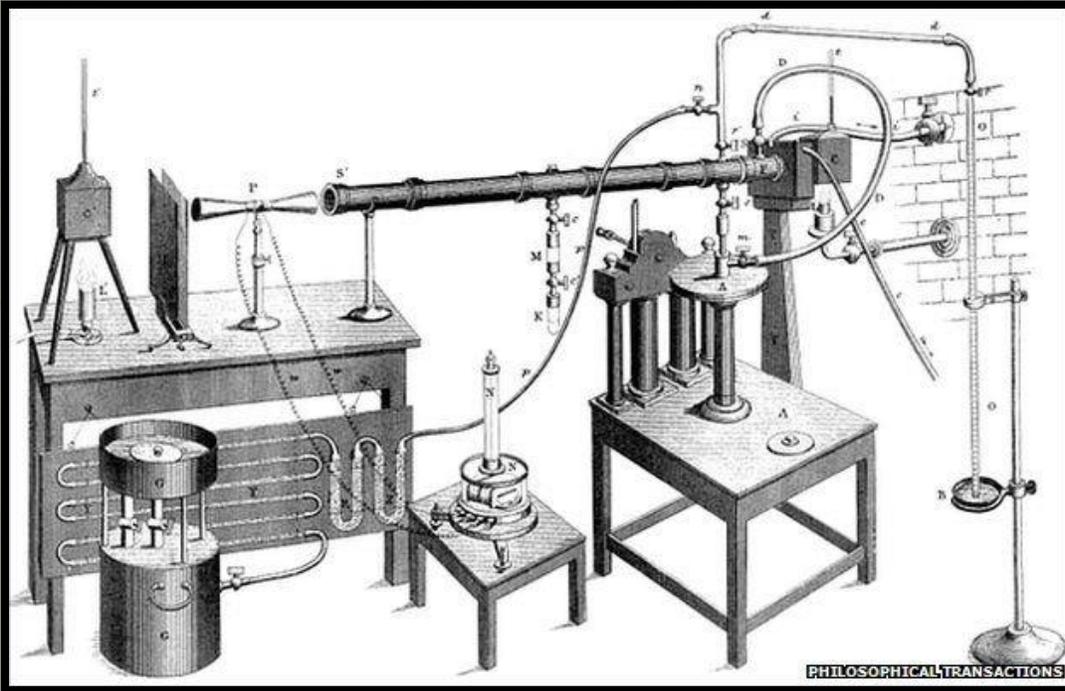
Most perceive that changes are taking place.

**The Science of
Climate Change
Explained in
Simple Terms...**

Search for this program on the web, or find it through the on-demand services of your cable TV provider...

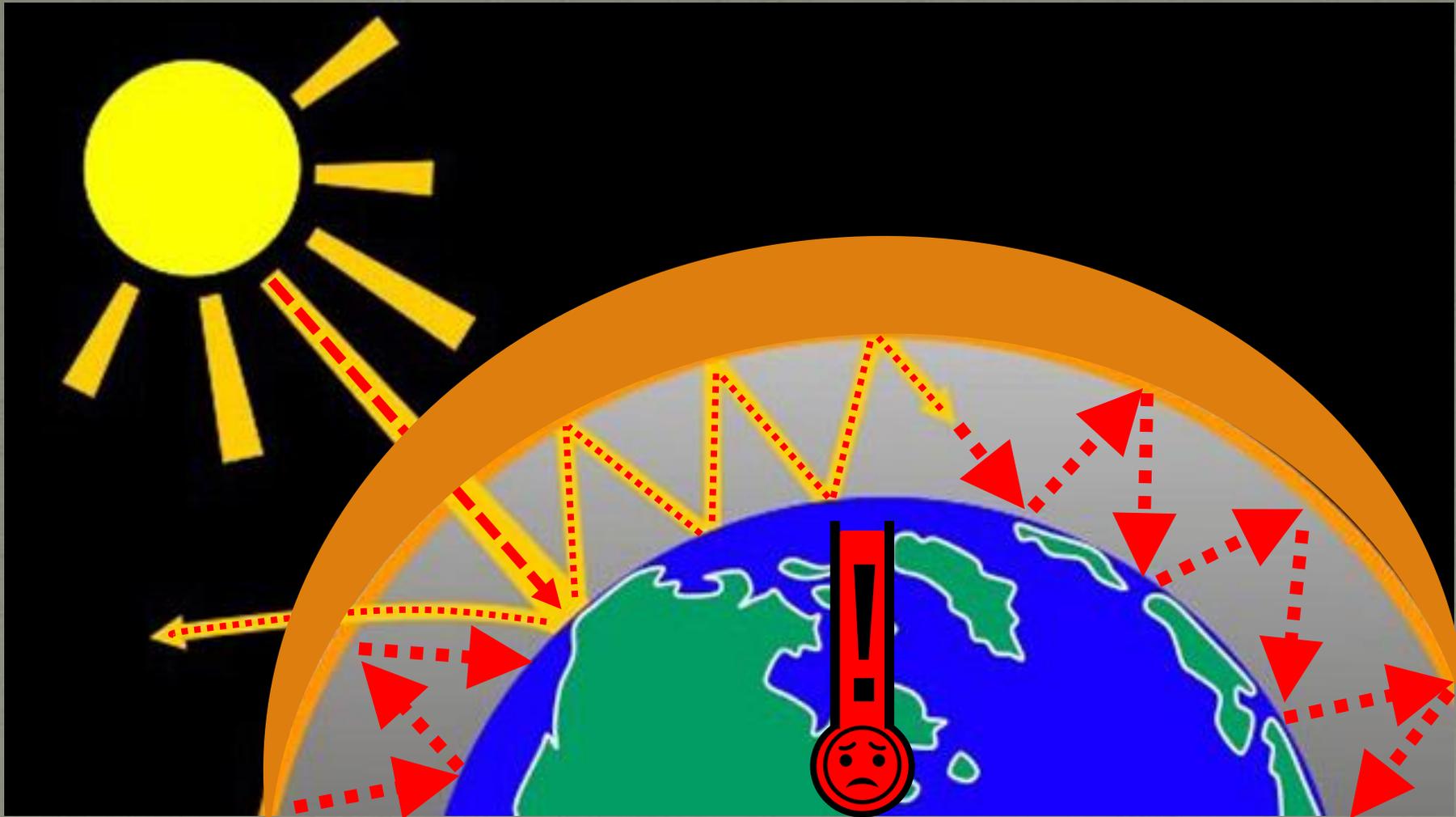


We've known about greenhouse gases & their insulating effects since the **mid 1800s**.



John Tyndall, discovered that certain atmospheric gases trap heat, & theorized that they maintained earth's relatively stable climate...

Greenhouse gases high in the atmosphere have always retained some of the sun's energy & kept our planet habitable... sort of like a comfortable blanket on a bed....



By adding to the greenhouse gas layer, we've effectively increased their "blanketing" effect & warmed our world at a pace not seen over the past 800,000 years...

Svante Arrhenius, Swedish chemist & Nobel laureate... 1896

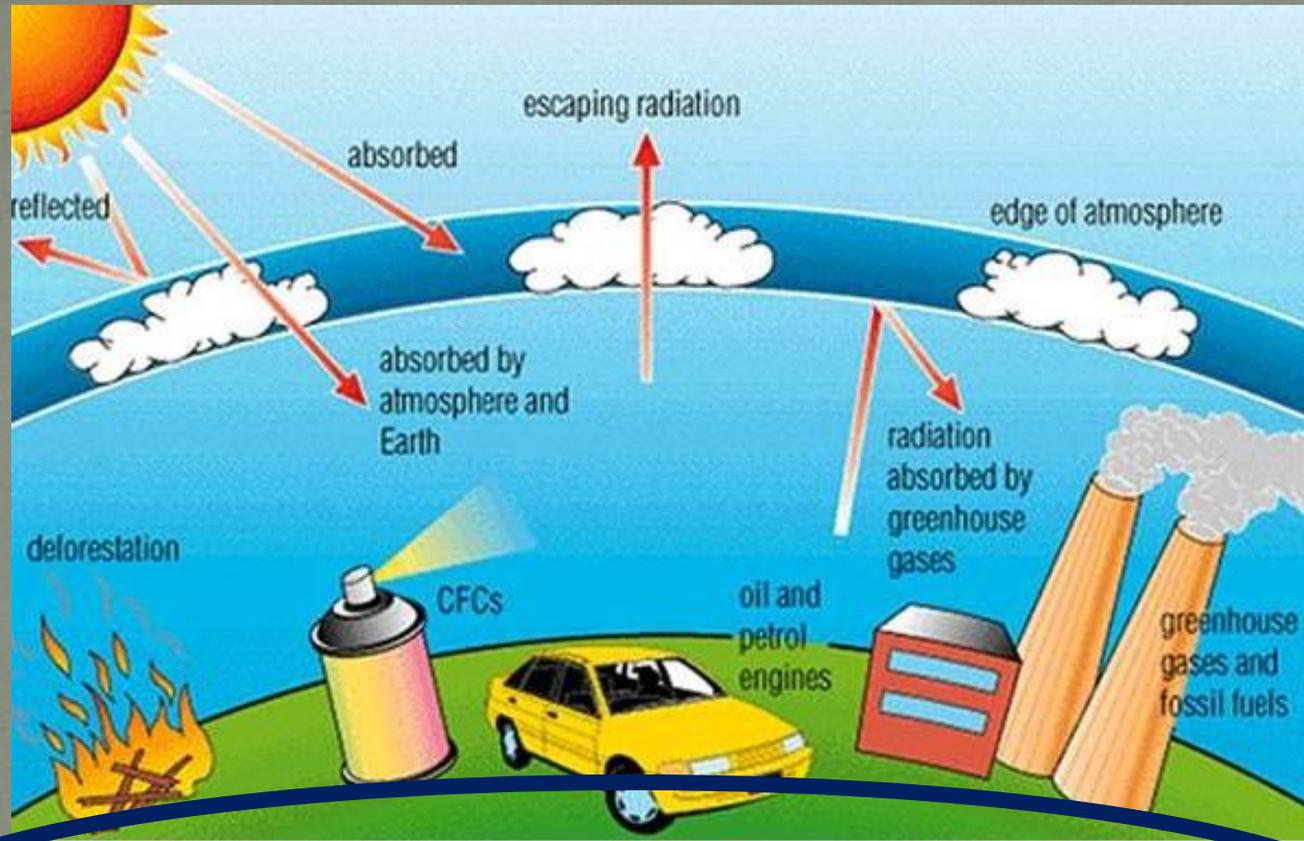
...Deduced that the combustion of coal and petroleum could raise global temperatures.

...Warming would become evident in a few centuries, or sooner with increased consumption of fossil fuels.

...Consumption increased beyond anything the Swedish chemist could have imagined.



How do we produce greenhouse gases?...

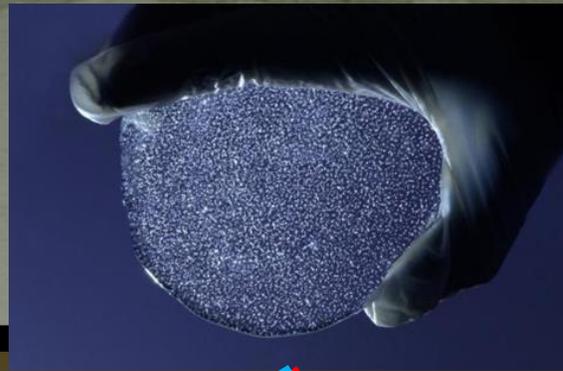


How we live and what we do produce greenhouse gases...

Analysis of ice cores dating back 800,000 years revealed that CO₂ concentrations varied between 180-300ppm - naturally rising & falling in 100ppm cycles lasting 50K-100K years...

This afforded ecosystems the opportunity to adapt to gradual changes in earth's temperature.

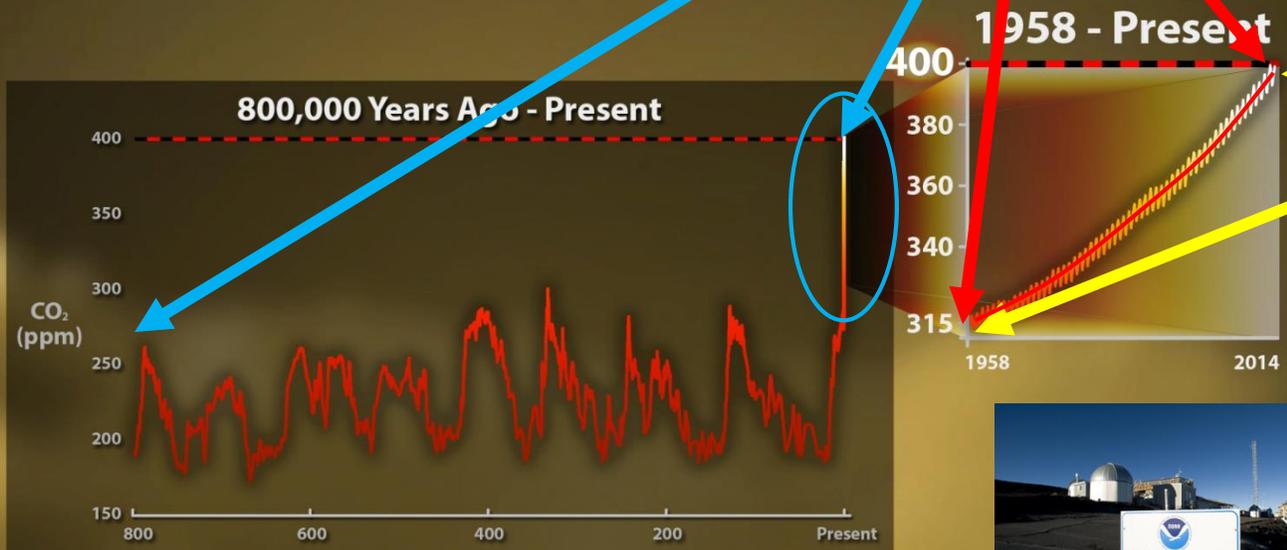
Over the past 107 years, CO₂ has skyrocketed over 100ppm - a rate of change not seen in 800,000 years of earth's history!!!



Analysis of air bubbles trapped in ice cores confirmed Keeling's observations - it was happening!

CO₂ Hits Climate Milestone

First Full Month with Levels Above 400 ppm



Charles David Keeling

... sounded the alarm at the highest levels of government when he observed skyrocketing levels of atmospheric CO₂



Data Source: Scripps Institution of Oceanography, La Jolla, CA

It's important to read this piece of history to understand how special interests squandered an opportunity to stop Climate Change...

1979-1989

Losing Earth: The Decade We Almost Stopped Climate Change

By Nathaniel Rich

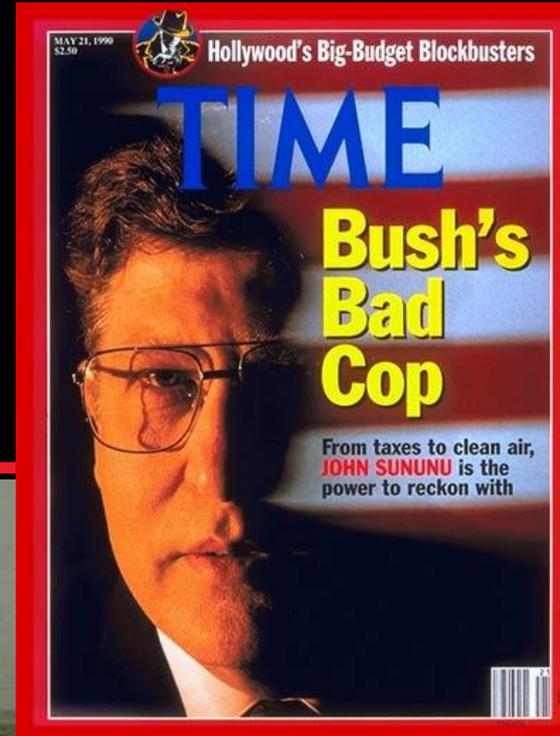
Photographs and Videos by George Steinmetz

AUG. 1, 2018

The New York Times

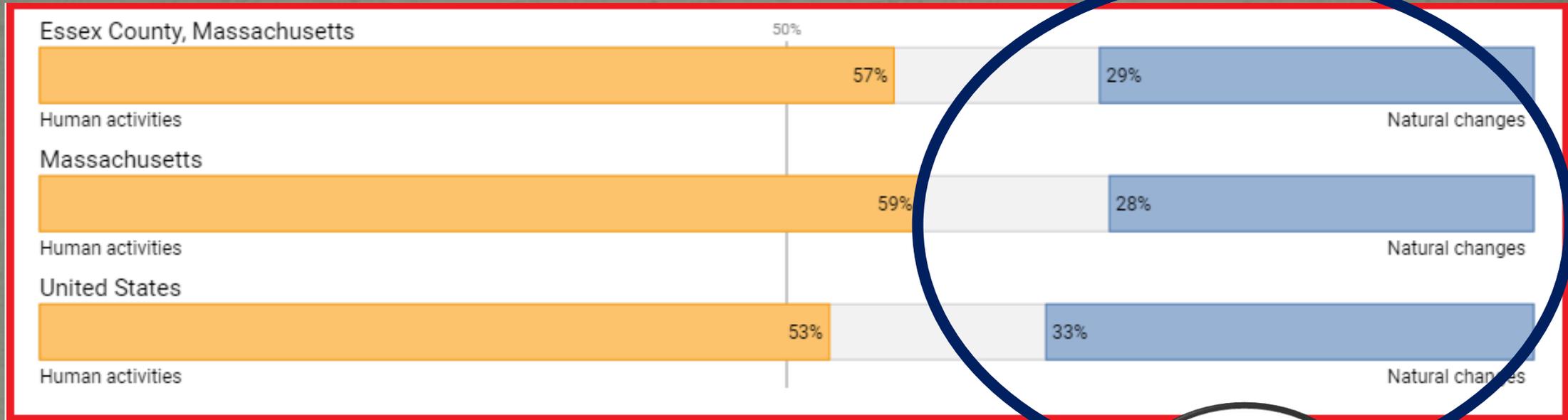
Exxon Knew about Climate Change almost 40 years ago

A new investigation shows the oil company understood the science before it became a public issue and spent millions to promote misinformation



What do people think?

Is climate change mostly caused by human activities...



Source: Yale Project on Climate Opinion, 2019

Most perceive that humans are the driver.

But a significant proportion doesn't think so...



But are we sure?

What's really warming our world?

Explore: blue-marble.de



Is it us, or just a natural cycle?

Atmospheric CO₂ concentration (ppm)

Global average long-term atmospheric concentration of carbon dioxide (CO₂), measured in parts per million (ppm)

Our World
in Data



Let's examine how natural & human factors have contributed to the warming of our world...

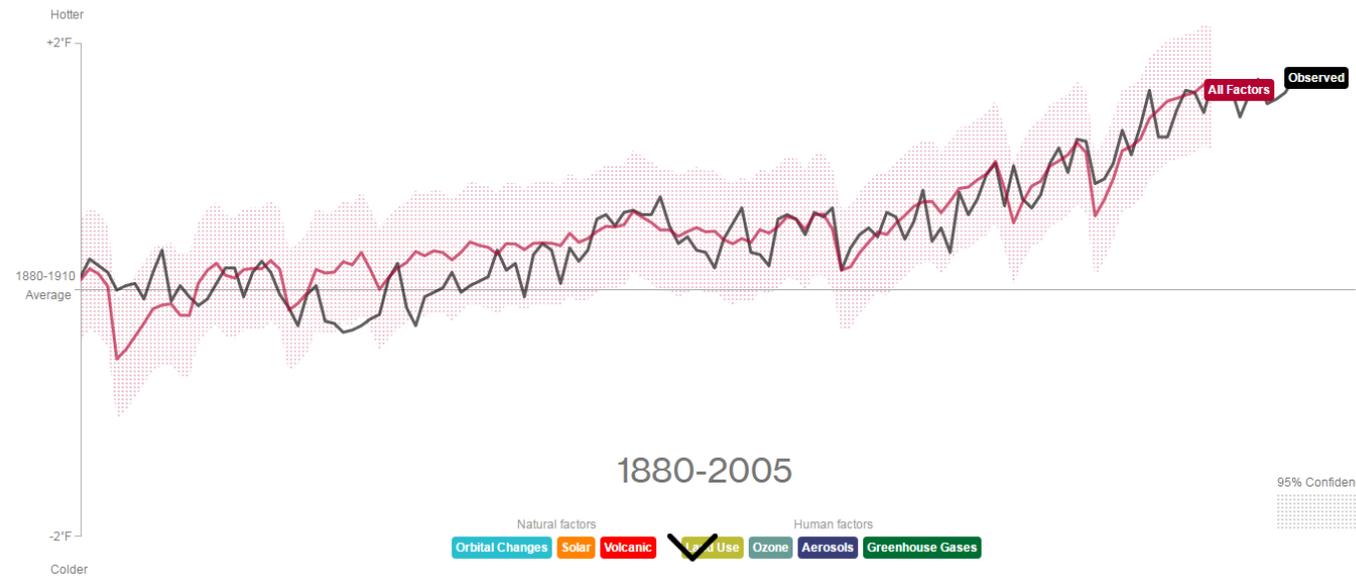
107 Years !!!

1910, 300 ppm

2017, 408 ppm

Compare and Contrast

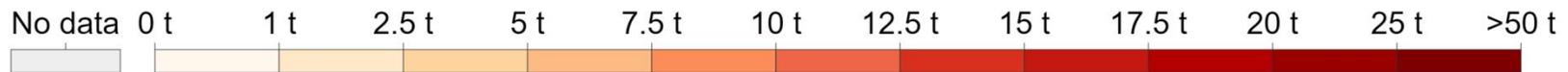
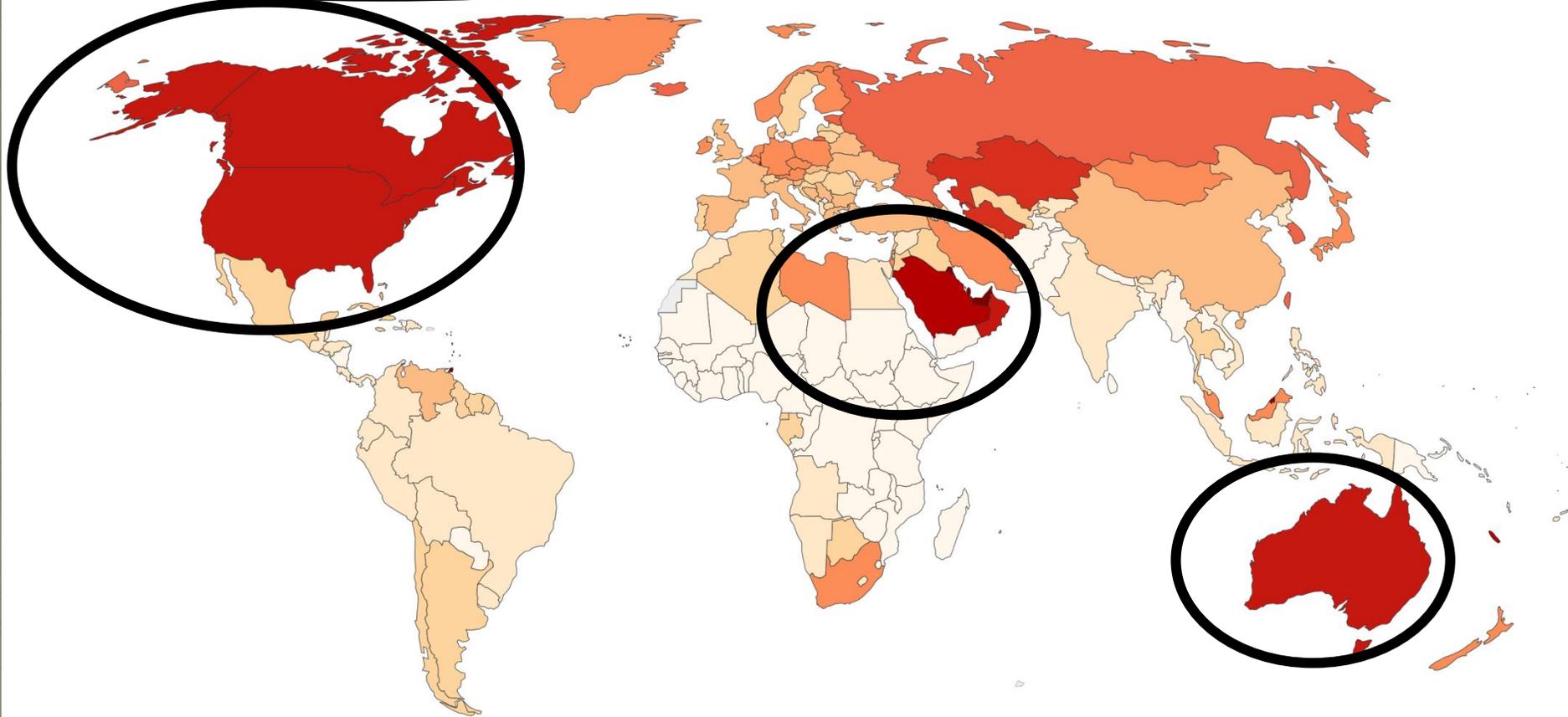
Putting the possible natural and human causes of climate change alongside one another makes the dominant role of greenhouse gases even more plainly visible. The only real question is: What are we going to do about it?

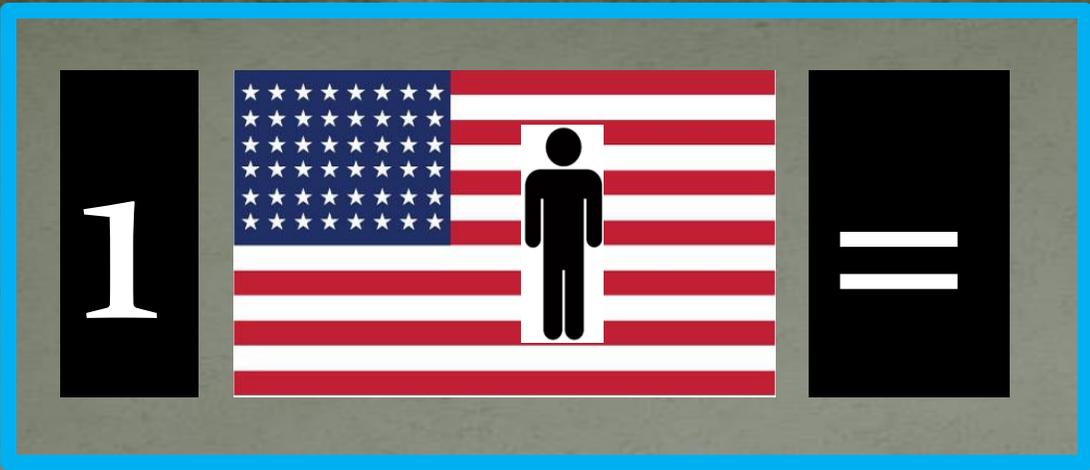


Google: "Bloomberg Climate Change"

CO₂ emissions per capita, 2016

Average carbon dioxide (CO₂) emissions per capita measured in tonnes per year.





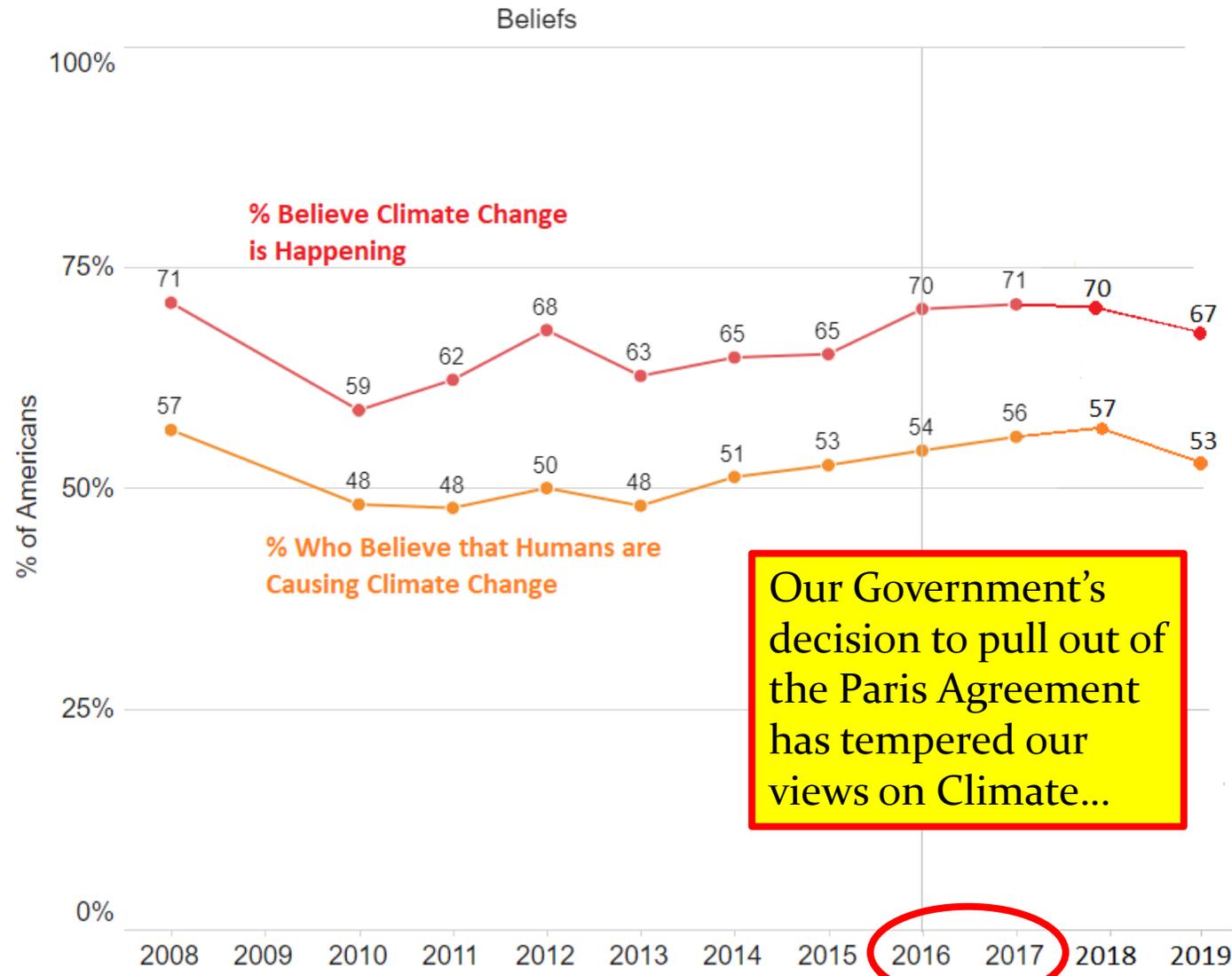
Yikes!!



One U.S. family of 5 has the carbon footprint of 45 Costa Ricans



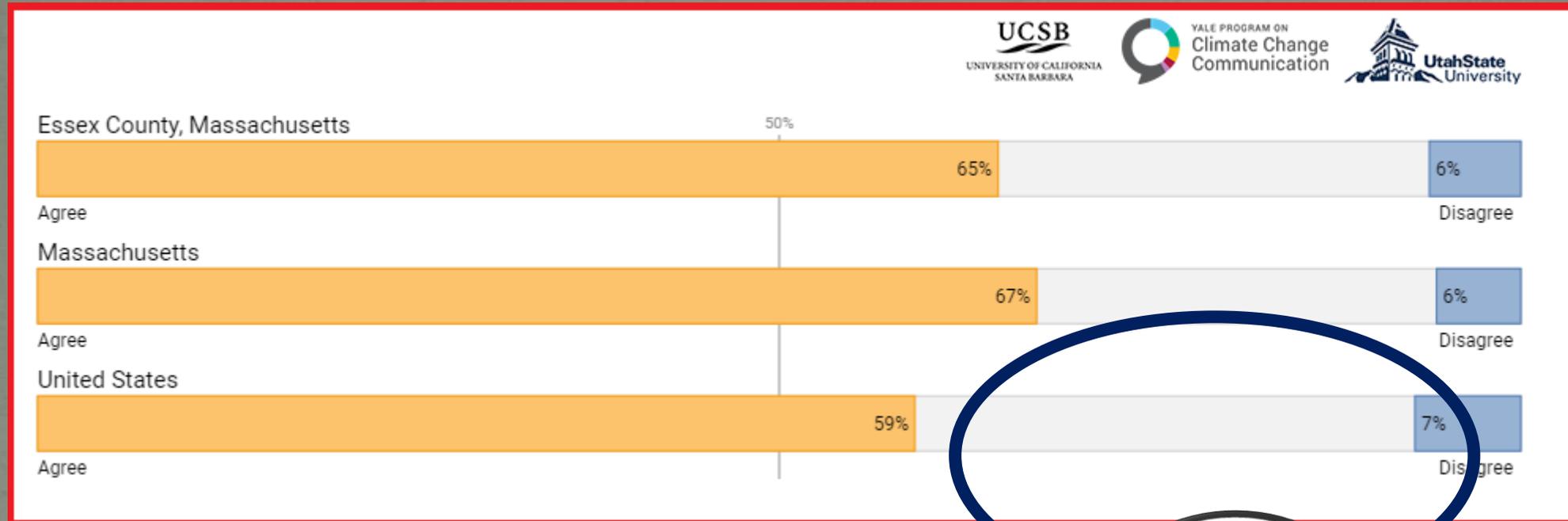
Climate Views Over Time



Our Government's decision to pull out of the Paris Agreement has tempered our views on Climate...

What do people think?

Is climate change affecting the weather?...



Source: Yale Project on Climate Opinion, 2019

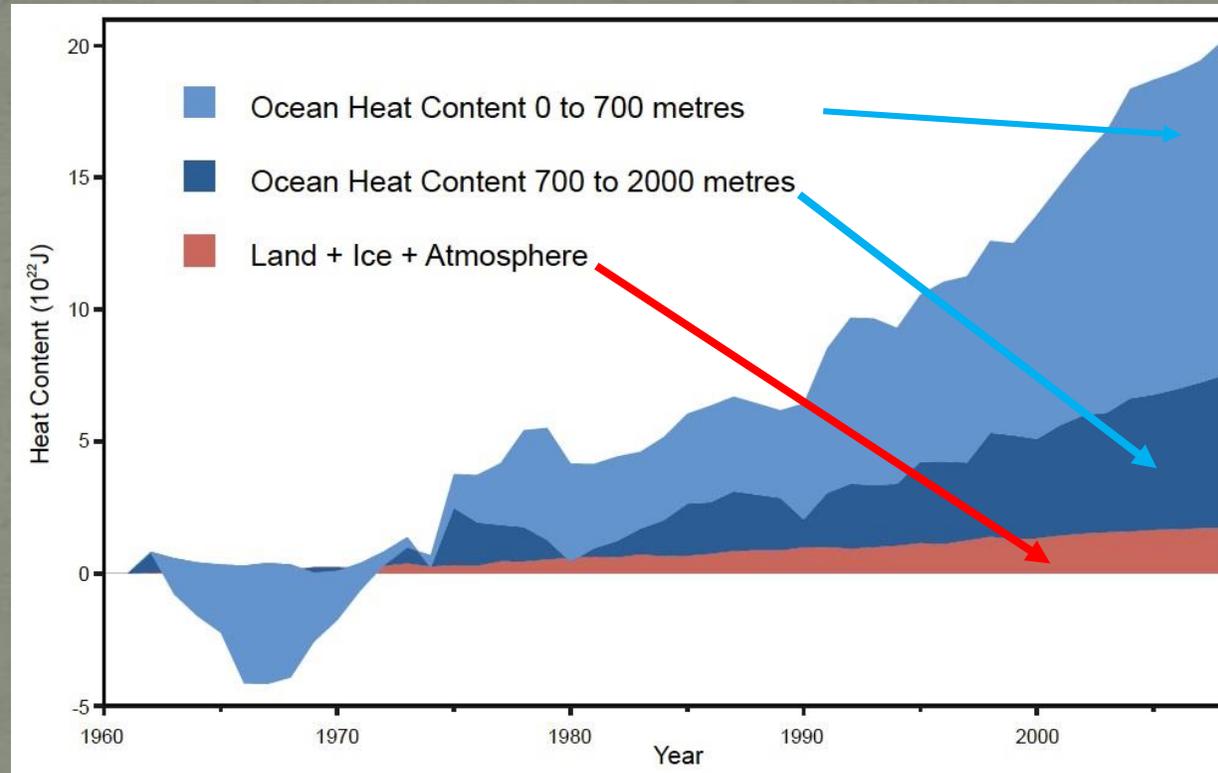


Most perceive it is...

But a significant proportion doesn't...

How's is Climate Change Affecting our Weather?

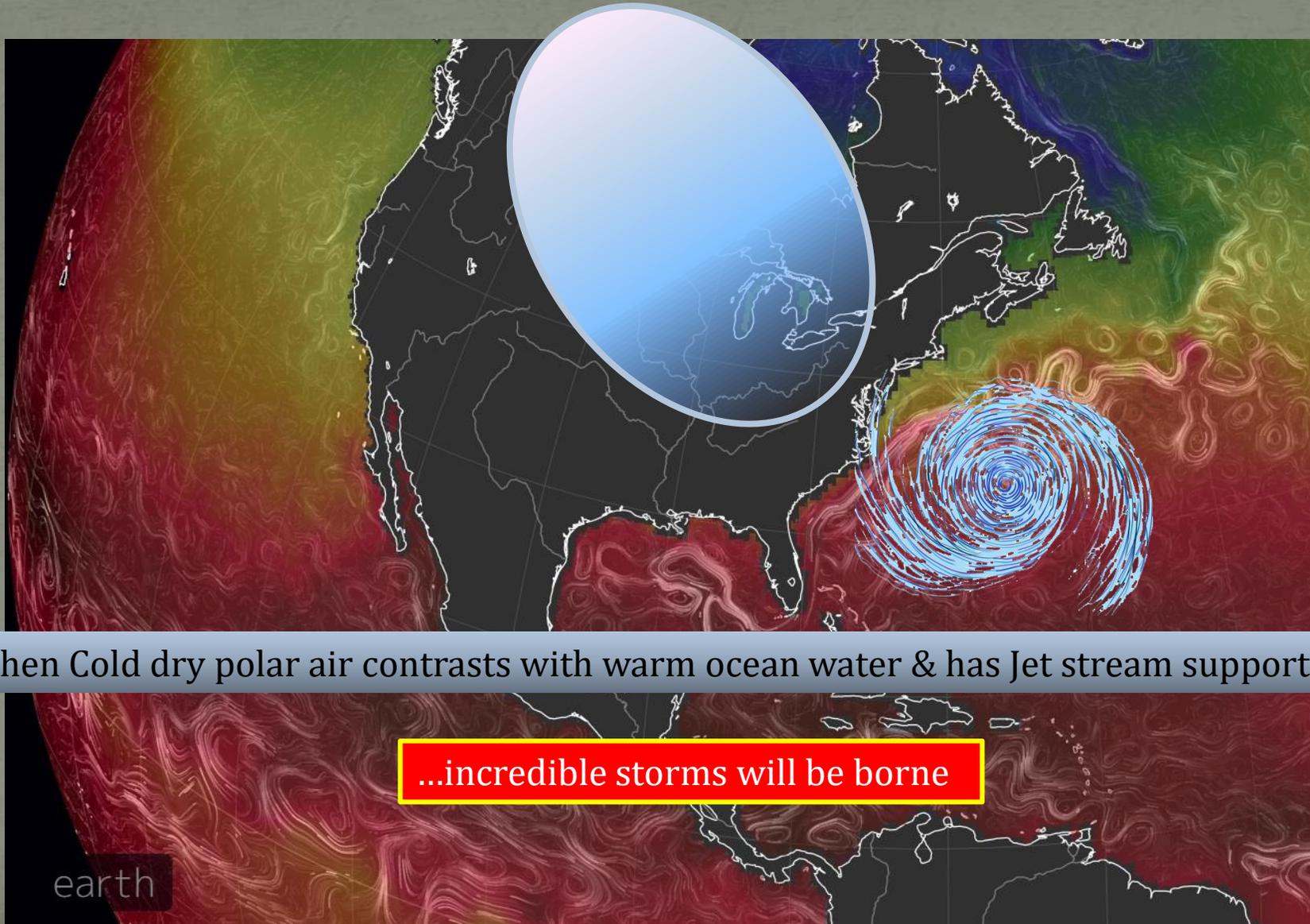
Temperatures would already be 20 deg F hotter if the oceans weren't acting like a giant heat sink and tempering the climate.



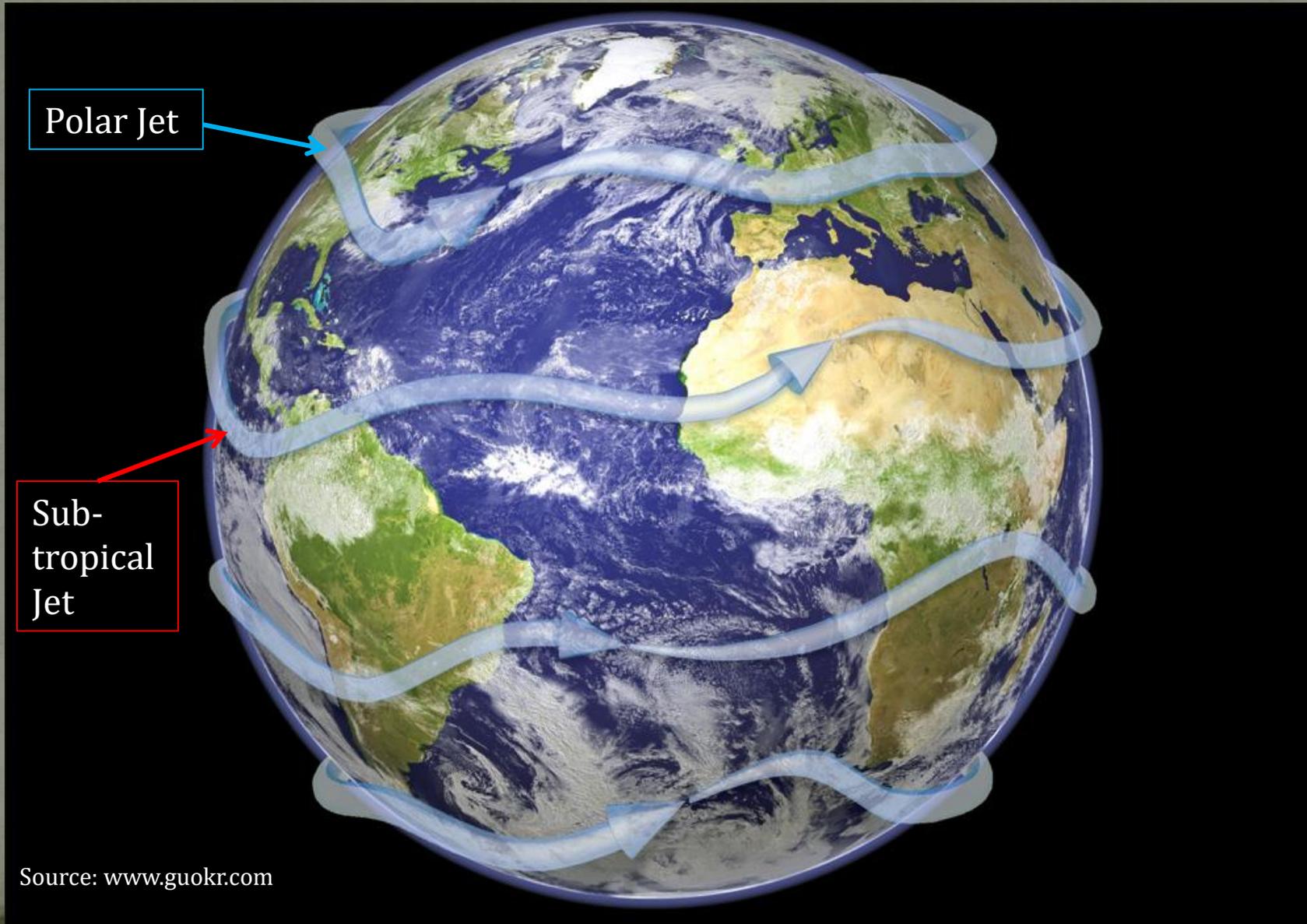
SOURCE: *Comment on Ocean heat content and Earth's radiation imbalance. II. Relation to climate shifts* Dana Nuccitelli, Robert Way, Rob Painting, John Church, and John Cook, March 31, 2012

Land, ice & atmosphere have absorbed less of this energy...

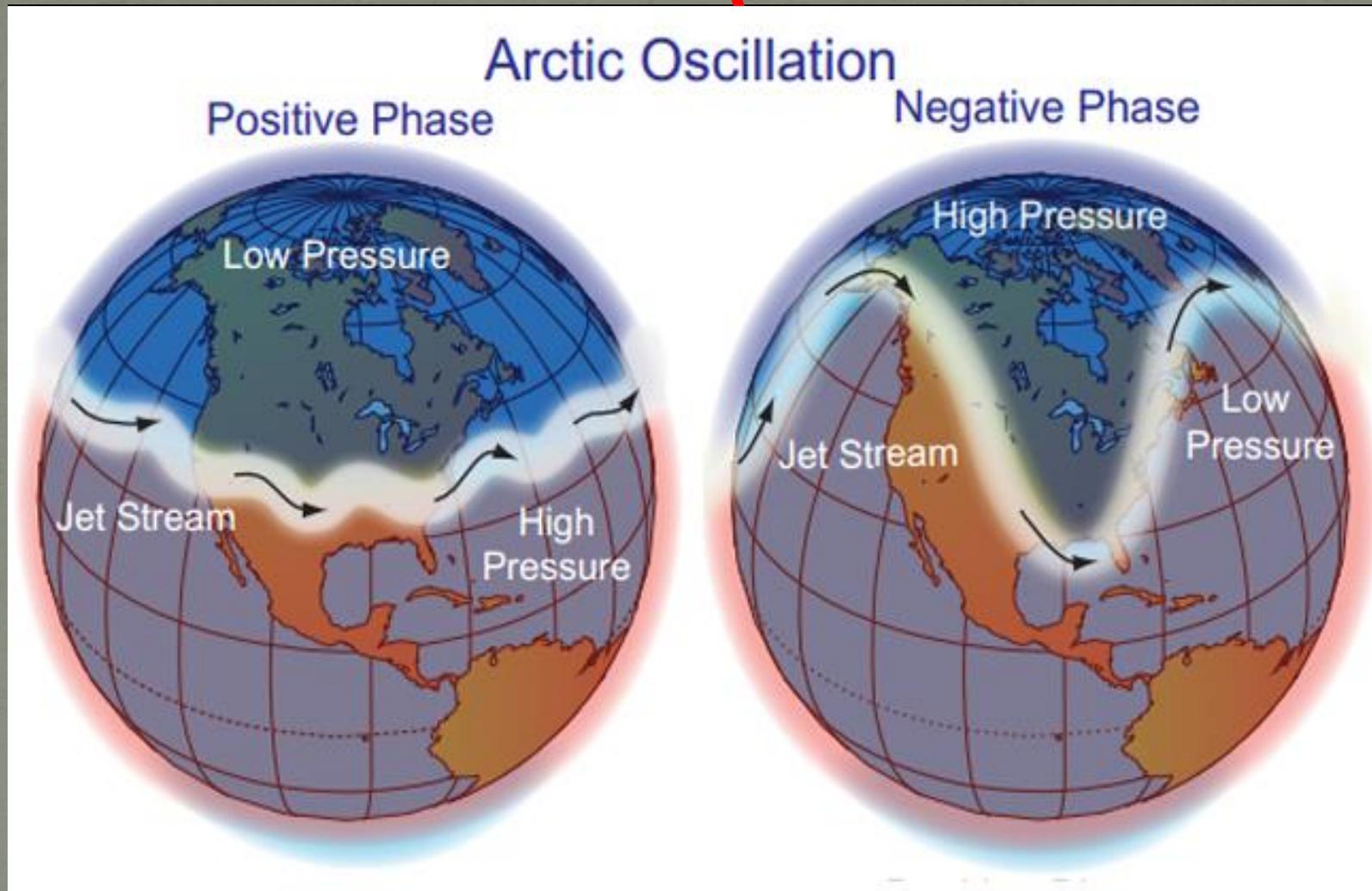
75% of the Earth is covered by Oceans...
All this stored energy is a powder keg waiting for a match.



The Jet Stream is a river of fast moving air high in the atmosphere.
Two Jets affect our storms...



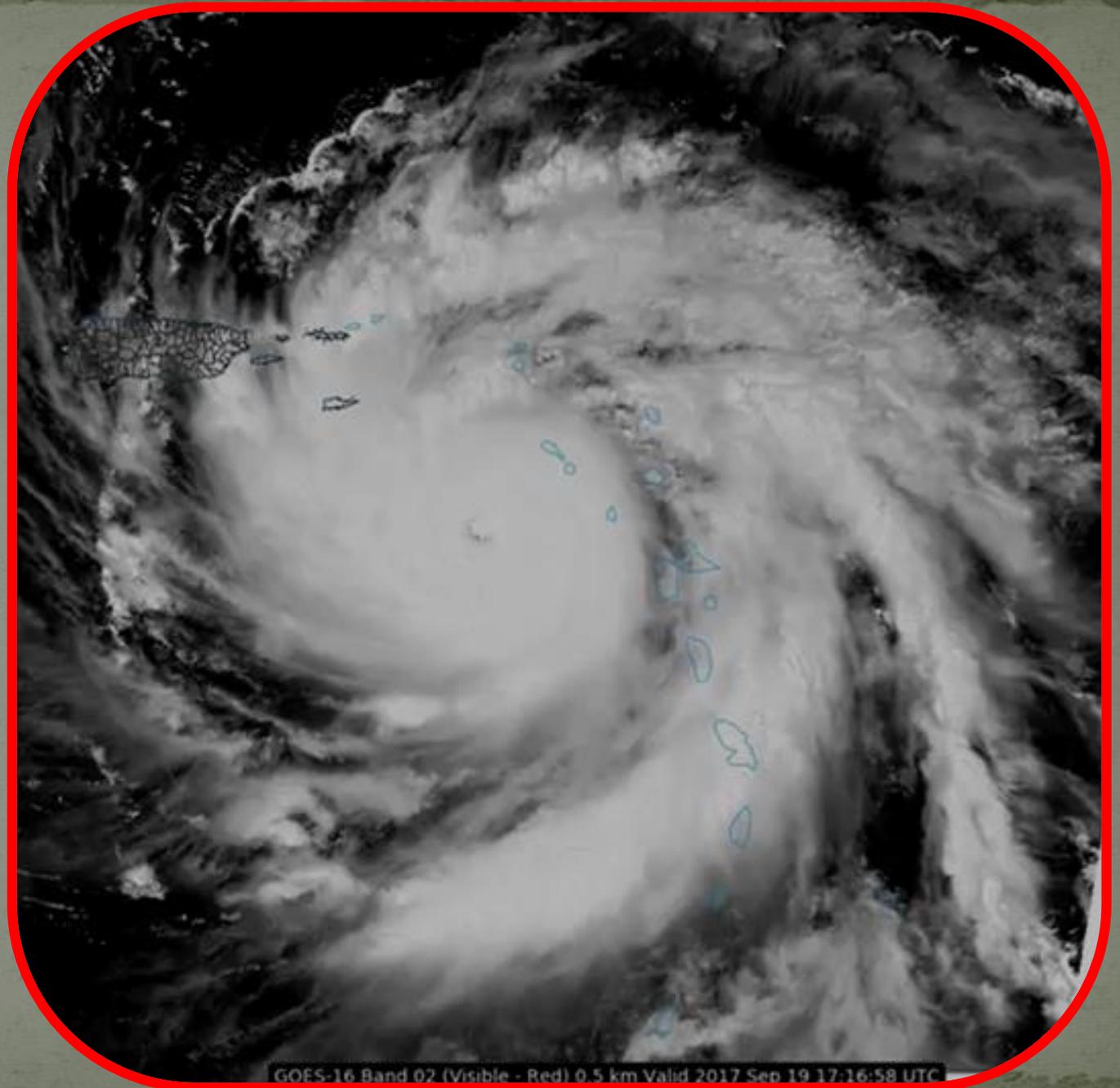
Extra-tropical cyclones like to form in the troughs of wavy polar jets



A warming climate makes the Polar Jet **undulate more often increasing the opportunity for storm formation**....*Jennifer Francis, Climate Scientist, Rutgers University*

Our Coastal Storms include:

*Tropical
Storms &
Hurricanes...*

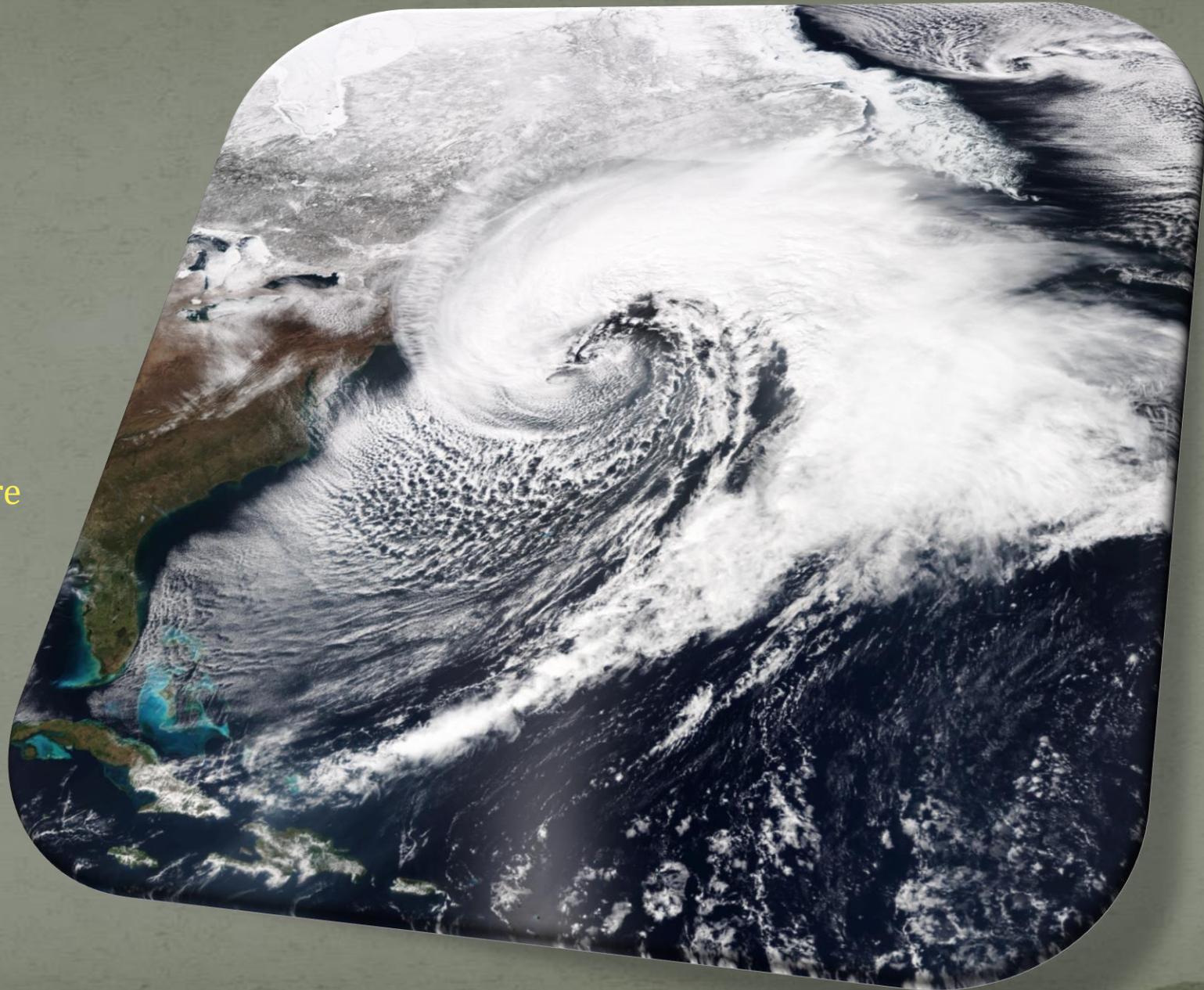


GOES-16 Band 02 (Visible - Red) 0.5 km Valid 2017 Sep 19 17:16:58 UTC

and...

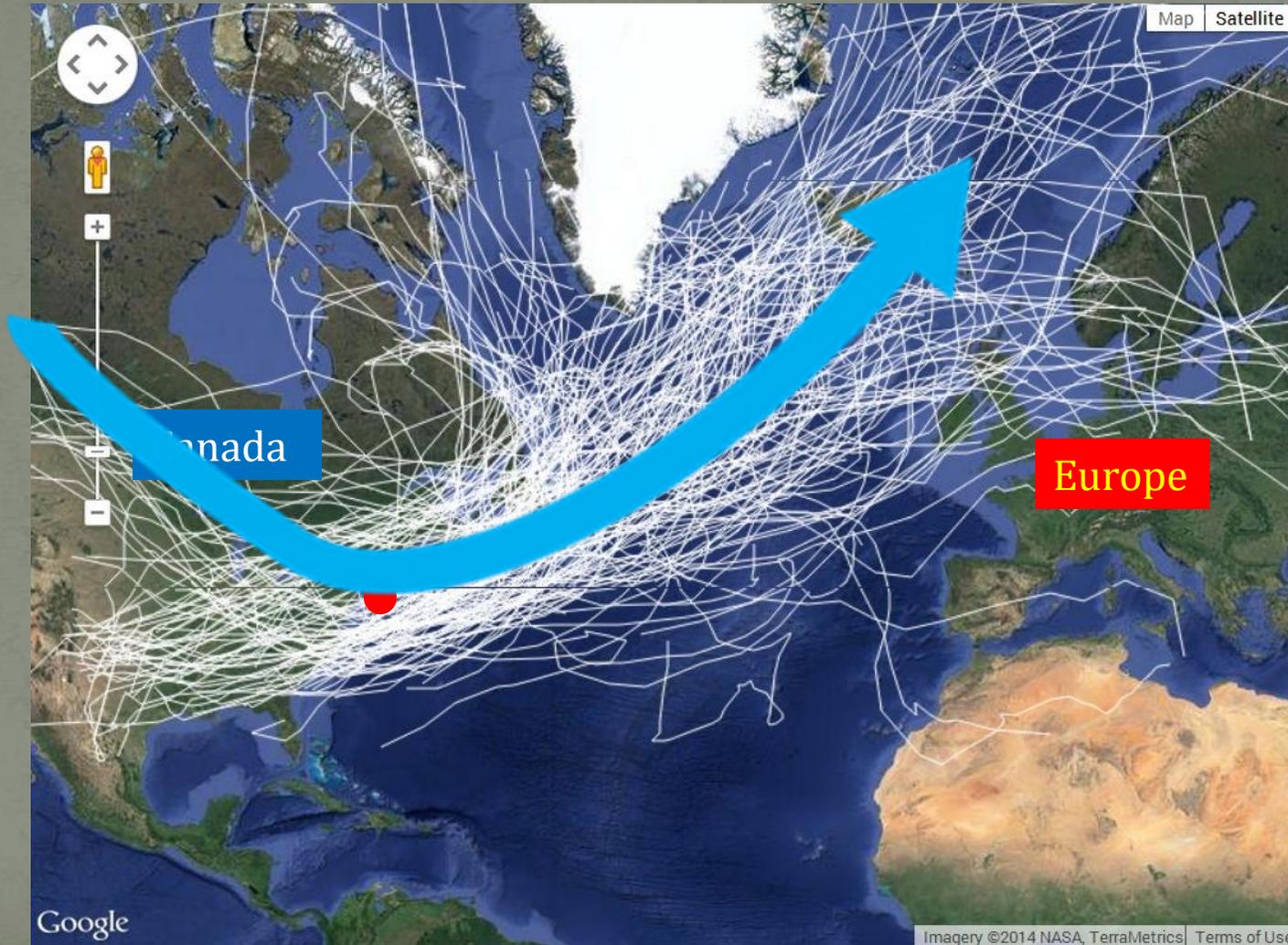
Nor' Easter

Which are Extra-Tropical,
or
Mid Latitude Low pressure
systems



When it comes to powerful mid latitude lows (or cyclones),
we are in the thick of it...

This historical
storm track has
been governed
by the jet
stream...



Climate Change
is expected to
tug the jet's
average
position a bit
further north,
but this change
maintains or
position within
the historical
storm track...

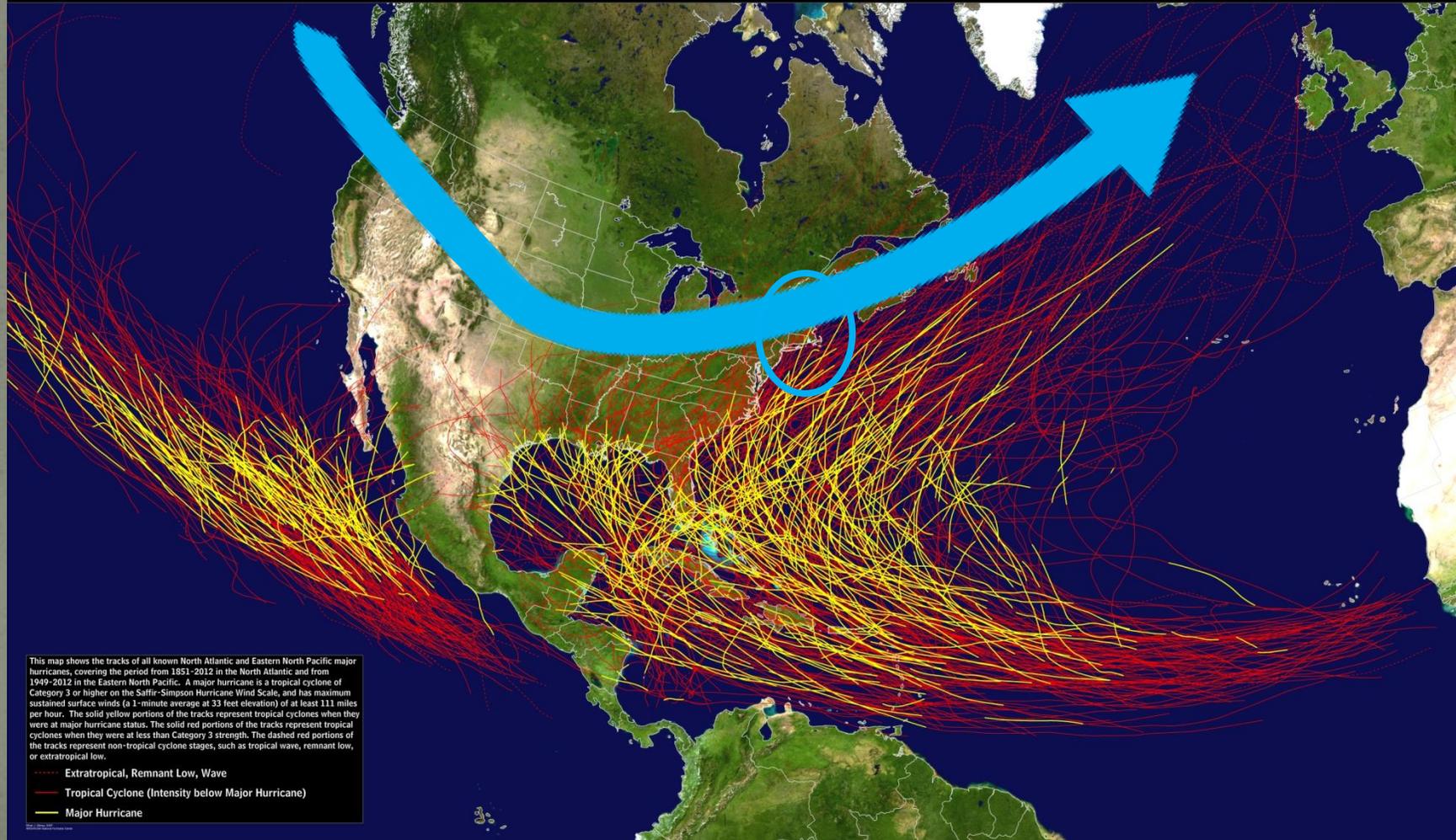
Historically, the Jet's advance southward from its summer retreat in Canada has coincided with the peak of Hurricane season.

The timing nudged tropical activity out to sea before it reached New England

In considering our risk for a storm, we can agree that while hurricanes pose a threat, we haven't see them that often.

Major Hurricane History

Data from 1949 in the Pacific, from 1851 in the Atlantic



This map shows the tracks of all known North Atlantic and Eastern North Pacific major hurricanes, covering the period from 1851-2012 in the North Atlantic and from 1949-2012 in the Eastern North Pacific. A major hurricane is a tropical cyclone of Category 3 or higher on the Saffir-Simpson Hurricane Wind Scale, and has maximum sustained surface winds (a 1-minute average at 33 feet elevation) of at least 111 miles per hour. The solid yellow portions of the tracks represent tropical cyclones when they were at major hurricane status. The solid red portions of the tracks represent tropical cyclones when they were at less than Category 3 strength. The dashed red portions of the tracks represent non-tropical cyclone stages, such as tropical wave, remnant low, or extratropical low.

----- Extratropical, Remnant Low, Wave
—— Tropical Cyclone (Intensity below Major Hurricane)
—— Major Hurricane

As our climate has warmed, the Jet's advance southward has often been delayed, opening the door for tropical systems to travel our way...

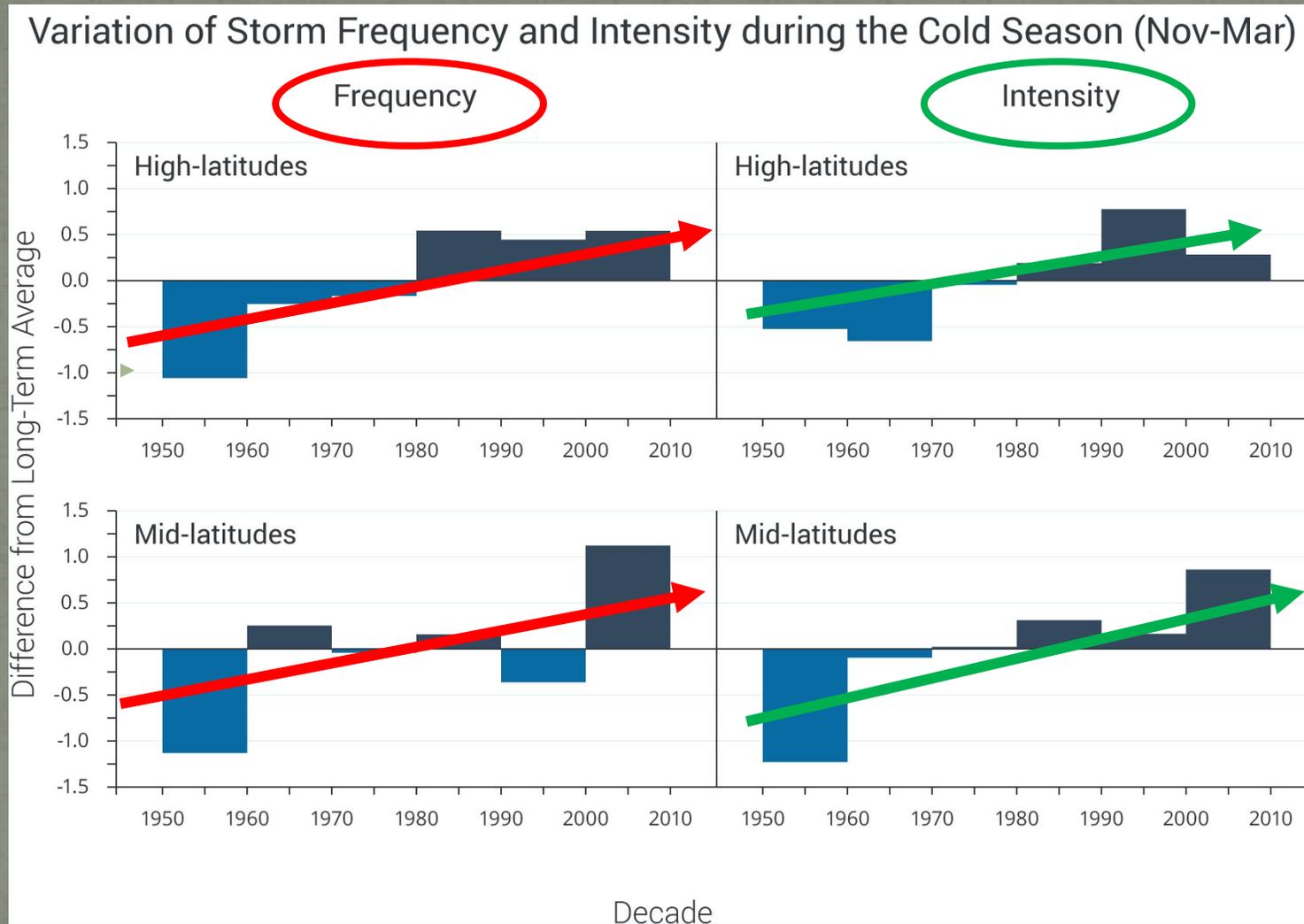
We'll likely see more tropical impacts in the future.

Source: NOAA

So, What's the Bottom Line?

Has Extra Heat in the System & Distortions
to the Jet Stream Resulted in Changes to
Weather?

Winter Storms Have been Becoming More Frequent & More Intense...



Source: National Climate Assessment 2014

All this Heat Energy is Supercharging our Weather...

Climate Change:

... more heat energy and water vapor

... amplifies the contrast between cold & warm air masses,
& our warmer oceans.

... contorts the jet stream that spawn storms & moves weather
systems along

Continued Greenhouse gas emissions will cause

***“all sorts of weather conditions to stick around
longer – be it hot, cold, wet or dry – any of which can
become extreme.”***

... Jennifer Francis, Rutgers University

**Therefore to be resilient, one must consider our community's
vulnerability to the ENTIRE SPECTRUM of weather extreme's**

Let's Consider Some of Our Local Weather Extreme's...

At times it's been very wet...



Sunset Blvd,
Plum Island

Winter of
2015-16

108.6 inches
of snow

... and persistently dry...

(Statewide drought 2015-16)



Ipswich River runs dry, Summer 2016, Photo: IRWA, Suzanne Sullivan

Sometimes It 's Been a Seasonal Pattern – Summer vs. Winter...

Other times it happened within the same month – *Remember October 2017?*
It was both very wet & very dry

How could that be?



October (Average)

Avg. Daily Hi Temp **61** Deg F

On Avg., 0 Days exceed 70 deg. F

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
25	26	27	28	29	30	.36
.18	3	4	5	.18	7	8
9	10	.36	.36	13	14	.73
.18	17	18	19	.19	21	22
23	24	25	26	27	.36	.36
.72	31	NOTES Avg. # Rainy Days: 11 3.98 in water				

October 2017

Observed: Avg. Hi Temp **69 deg F**

28 Days above 61 deg. F. 15 Days 70-80 deg. F

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
25	26	27	28	29	30	1
2	3					.11
.27		.01	12	13	.10	
	17					22
23	.07	1.29	.35	27	28	1.00
.94	31	Rainfall: 4.14 inches over 7 days (vs 11) 75% of the rain (3.23in) fell in just 3 days				

Side by Side Comparison...

October (Average)						
MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
25	26	27	28	29	30	1 .36
2 .18	3	4	5	6 .18	7	8
9	10	.36	.36	13	14	.73
16 .18	17	18	19	.19	21	22
23	24	25	26	27	.36	.36
30 .72	31	NOTES Avg. # Rainy Days: 11 3.98 in water				

Avg. Daily Hi Temp 61 Deg F
On Avg., 0 Days exceed 70 deg. F

EditableCalendar.Com

October 2017						
MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
25	26	27	28	29	30	1
2	3					.11
.27		.01	12	13	.10	
	17					22
23	.07	1.29	.35	27	28	1.00
.94	31	Rainfall: 4.14 inches over 7 days (vs 11) 75% of the rain (3.23in) fell in just 3 days				

Observed: Avg. Hi Temp 69 deg F
28 Days above 61 deg. F 15 Days 70-80 deg. F

EditableCalendar.Com

Compared to average, Oct. 2017 was very warm & dry, but also very wet...Why?

Why did this happen?



We were stuck on the warm side of the jet stream.

It was a pleasant fall season...

What do people think?

Is, or will, climate change harm people in the US?...



Source: Yale Project on Climate Opinion, 2019

Half do not perceive Climate Change as a short- or longer-term threat.

Remember the Jet Stream in October 2017?



What was happening here?

We were stuck on the warm side of the jet stream.

It was a pleasant fall season...

... and all these Americans died...



California November 2018

...and
many
more
people
died...

•Larry Smith, 80, of Paradise

•Don Shores, 70, of Magalia

•Sally Gamboa, 69, of Paradise

•Helen Pace, 84, of Paradise

•Sheila Santos, 64, of Paradise

•TK Huff, 71, of Concow

•Robert Duvall, 76, of Paradise

•David Bradburd, 70, of Paradise

•Elizabeth Gaal, 80, of Paradise

•Dennis Hanko, 56, of Paradise

•John Sedwick, 82, of Magalia

•Joanne Malarkey, 90, of Paradise

•Vernice Regan, 95, of Paradise

•David Young, 69, of Concow

•Marie Wehe, 78, of Concow

•Joan Tracy, 80, of Paradise

•Carl Wiley, 77, of Magalia

•Shirlee Teays, 90, of Paradise

•Jean Forsman, 83, of Magalia

•Joy Porter, 72, of Paradise

•Gary Hunter, 67, of Magalia

•Andrew Downer, 54, of Paradise

•Gordon Dise, 66, of Chico

•Joyce Acheson, 78, of Paradise

•Larry Brown, 72, of Paradise

•Richard Jay Garrett, 58, of Concow

•Donna Ware, 86, of Paradise

•Jennifer Hayes, 53, of Paradise

•John Malarkey, 89, of Paradise

•Russel Stewart, 63, of Paradise

•Teresa Ammams, 82, of Paradise

•Kimber Wehr, 53, of Paradise

•Paula Dodge, 70, of Paradise

•Jesus Fernandez, 48, of Concow

•Rafaela Andrade, 84, of Paradise

•Forrest Rea, 89, of Paradise

•Dennis Clark, 49, Paradise

•Beverly Powers, 64, of Paradise

•Lou Herrera, 86, of Paradise

•James Garner, 63, Magalia

•Carol Arrington, 88, of Paradise

•Joanne Caddy, 75, of Magalia

•Evva Holt, 85, of Paradise

•Julian Binstock, 88, of Paradise

•Sara Magnuson, 75, of Paradise

•Deborah Morningstar, 66, of Paradise

•Victoria Taft, 67, of Paradise

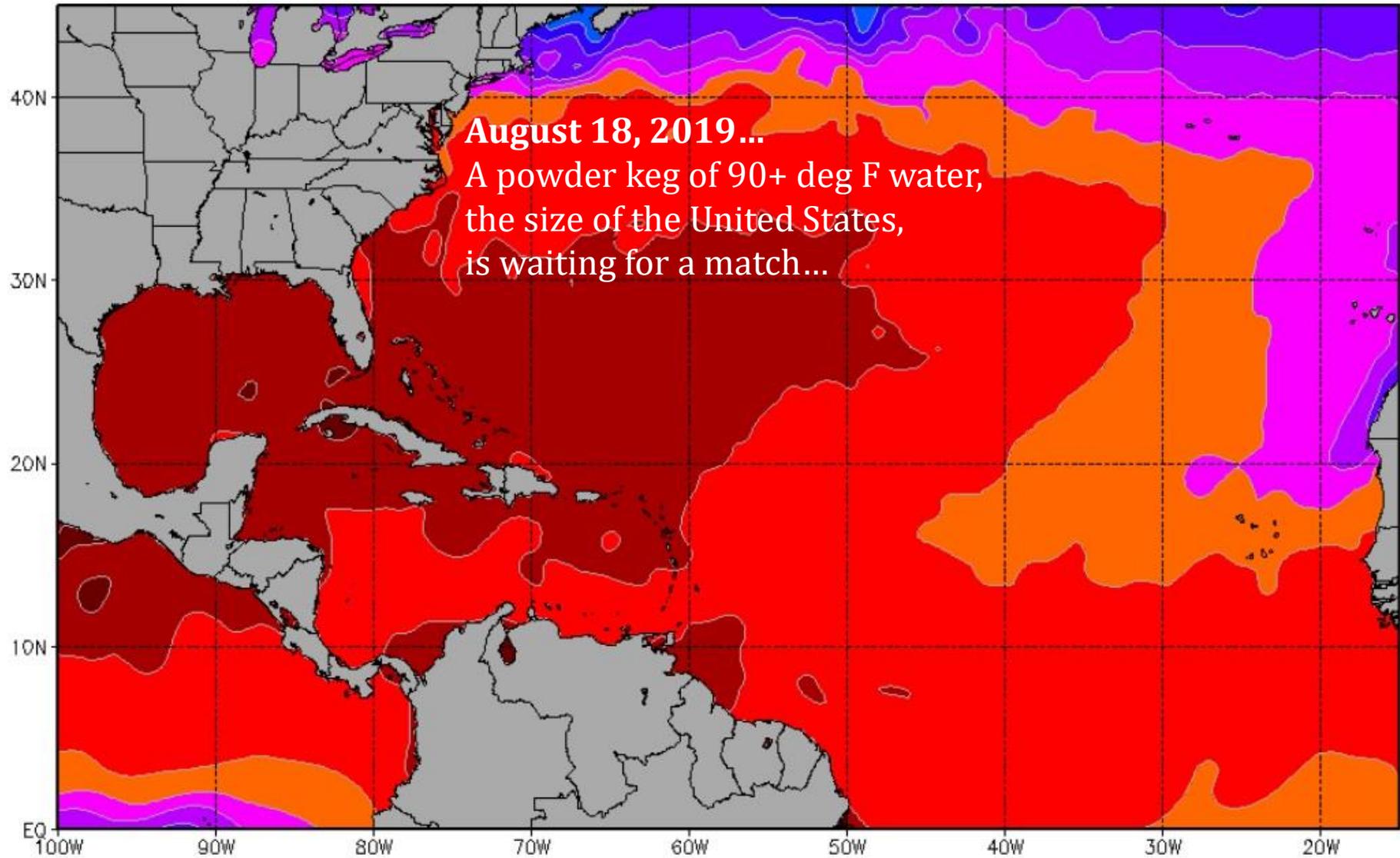
•Richard Brown, 74, of Concow

•Joseph Rabetoy, 39, of Paradise

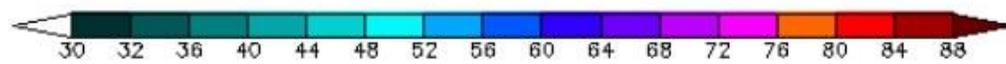
•Randall Dodge, 67, of Paradise

•Ernest Foss, 63, Paradise

UNCLASSIFIED

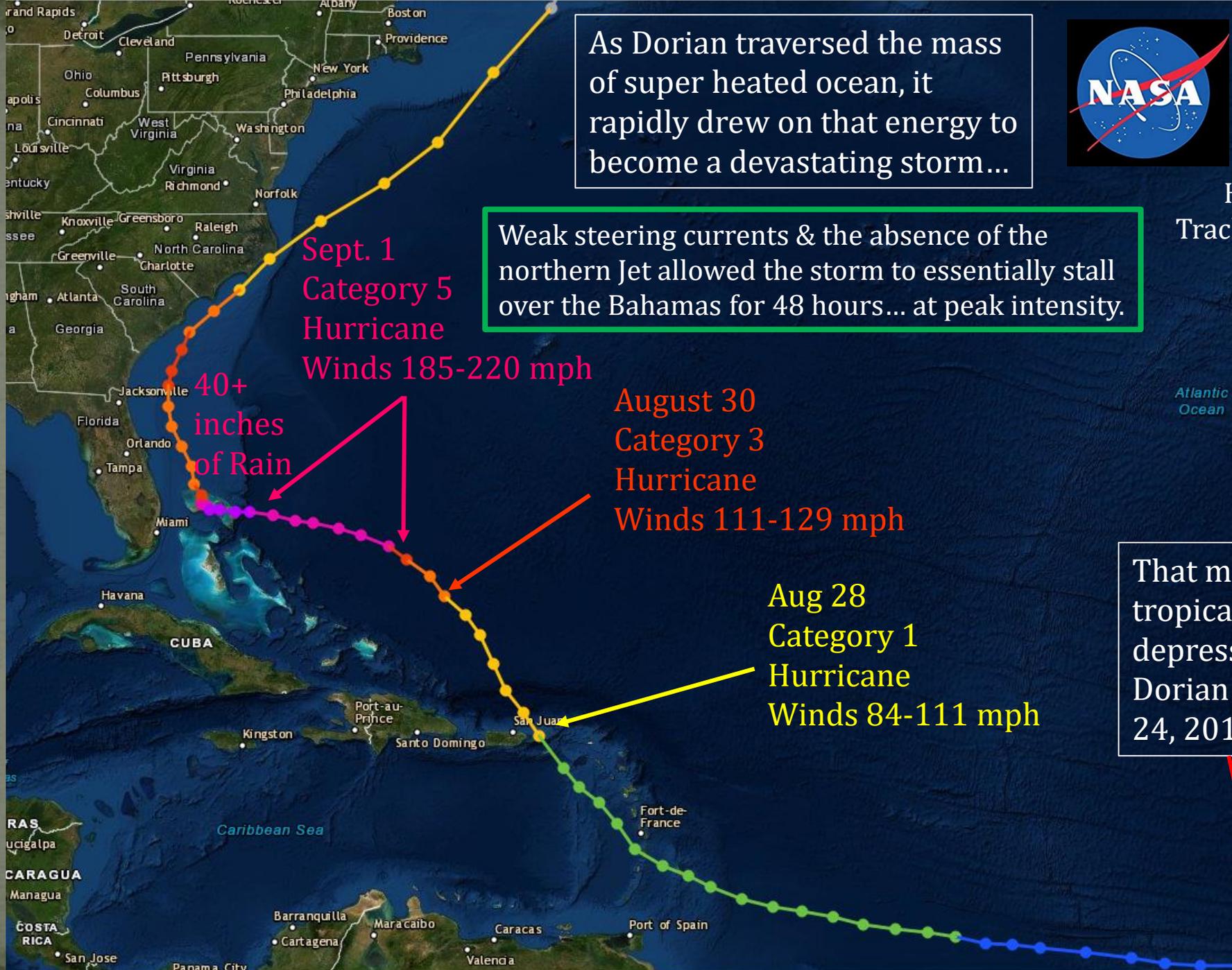


August 18, 2019...
A powder keg of 90+ deg F water,
the size of the United States,
is waiting for a match...



UNCLASSIFIED

VT: Sun 00Z 18 AUG 19
FNMDC NCOA (U): Sea Surface Temp 000 hr fcst degrees [°F]
Run: 2019081800Z Tau: 0



As Dorian traversed the mass of super heated ocean, it rapidly drew on that energy to become a devastating storm...

Weak steering currents & the absence of the northern Jet allowed the storm to essentially stall over the Bahamas for 48 hours... at peak intensity.

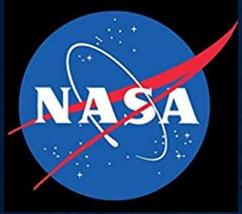
Sept. 1
Category 5
Hurricane
Winds 185-220 mph

40+ inches of Rain

August 30
Category 3
Hurricane
Winds 111-129 mph

Aug 28
Category 1
Hurricane
Winds 84-111 mph

That match was tropical depression Dorian... August 24, 2018

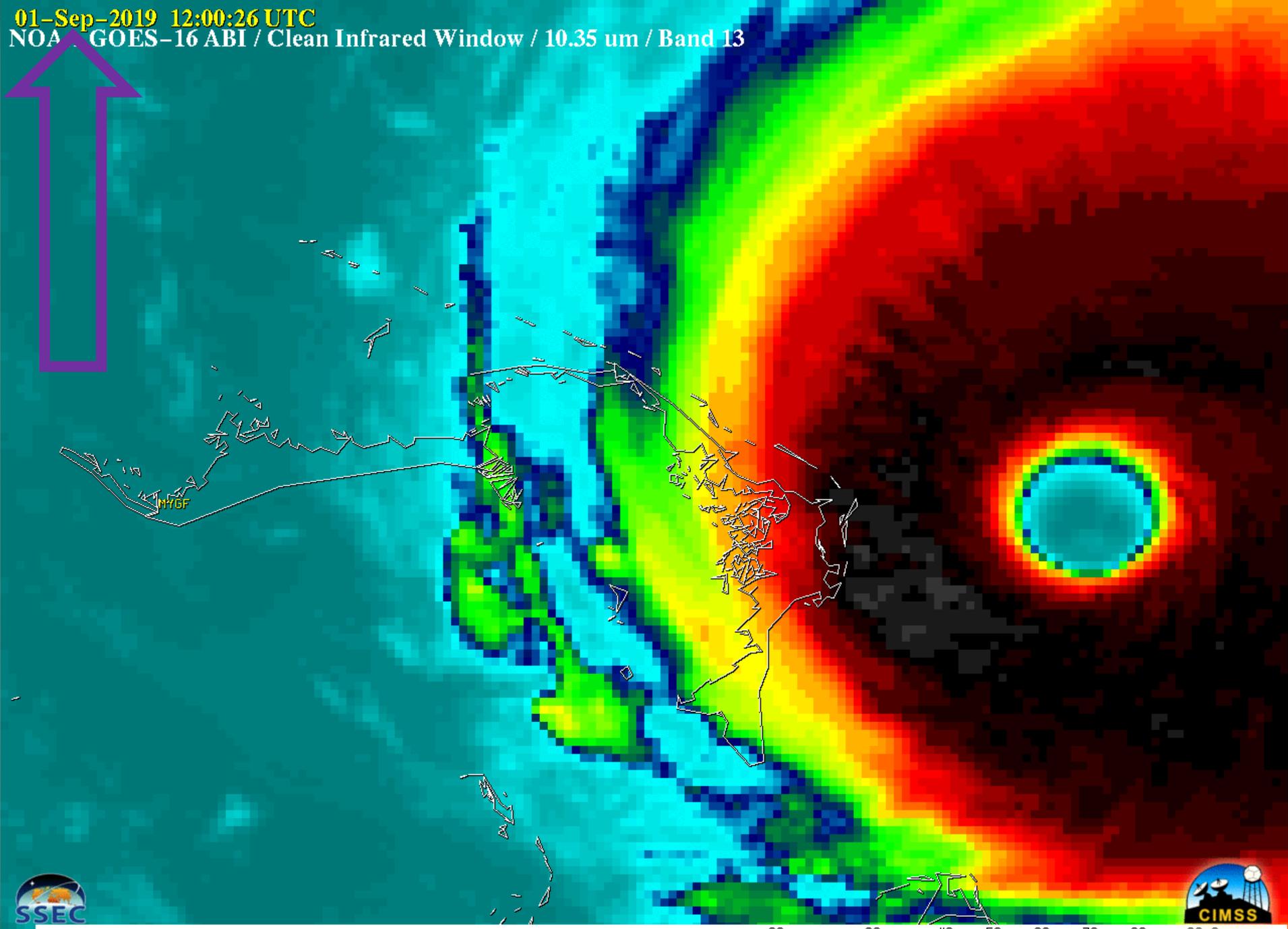
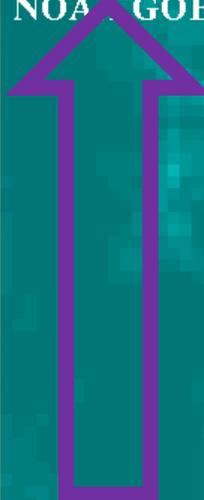


Hurricane Dorian
Track & Intensity History
Aug.-Sept 2019

Category

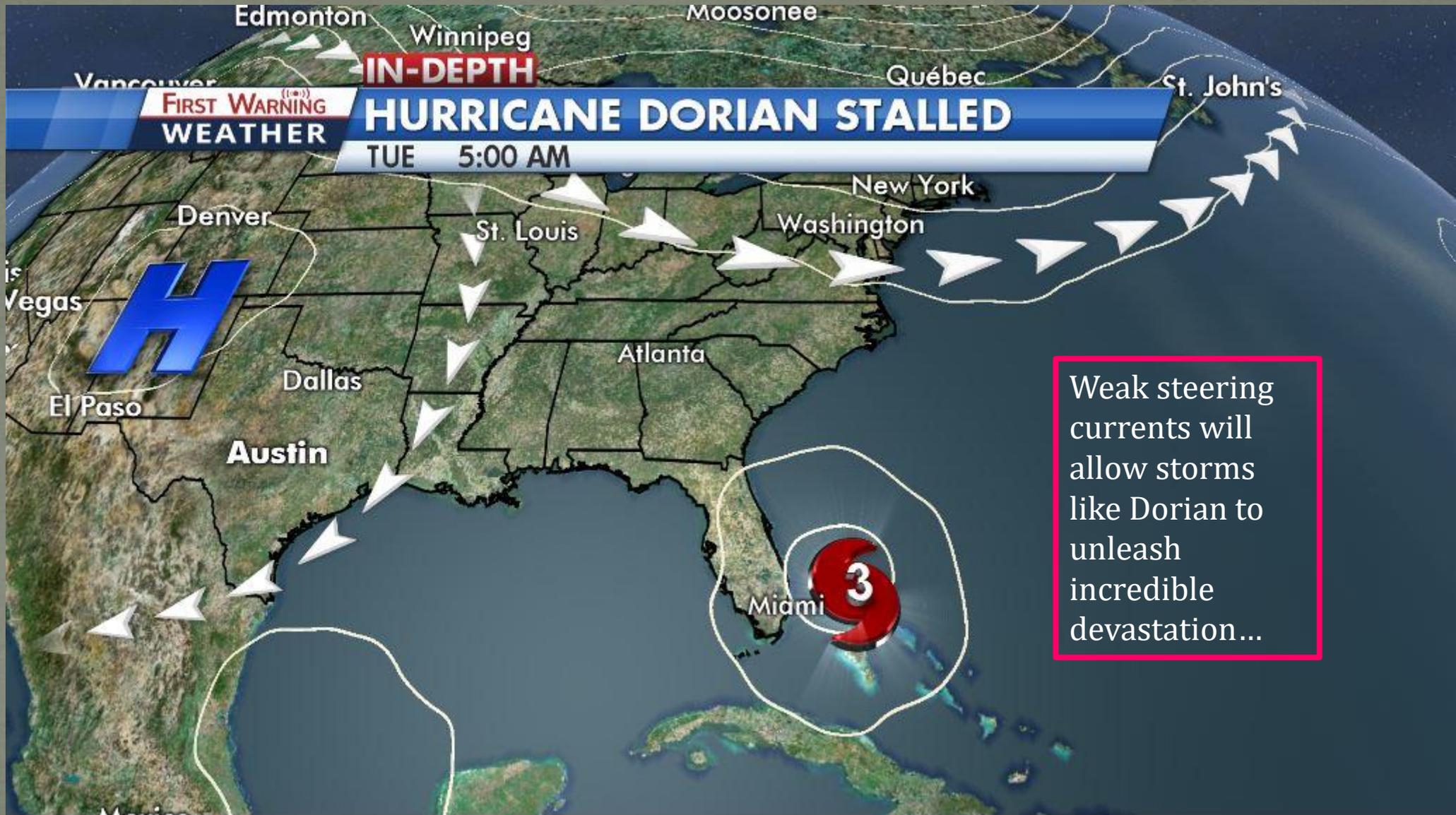
TS	TD	ET	N/A	
H1	H2	H3	H4	H5

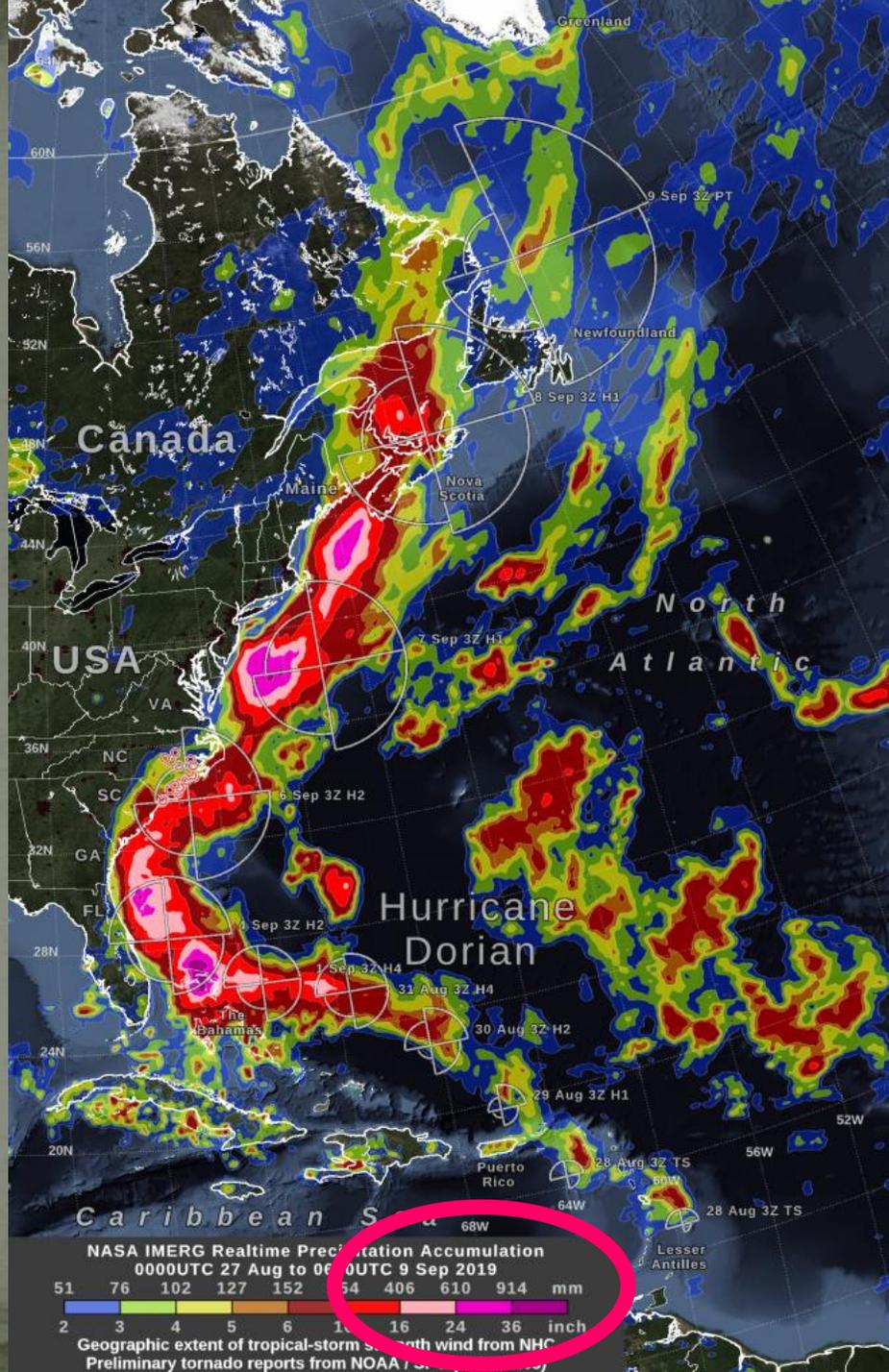
01-Sep-2019 12:00:26 UTC
NOAA GOES-16 ABI / Clean Infrared Window / 10.35 um / Band 13



-20 -30 -40 -50 -60 -70 -80 -90 C







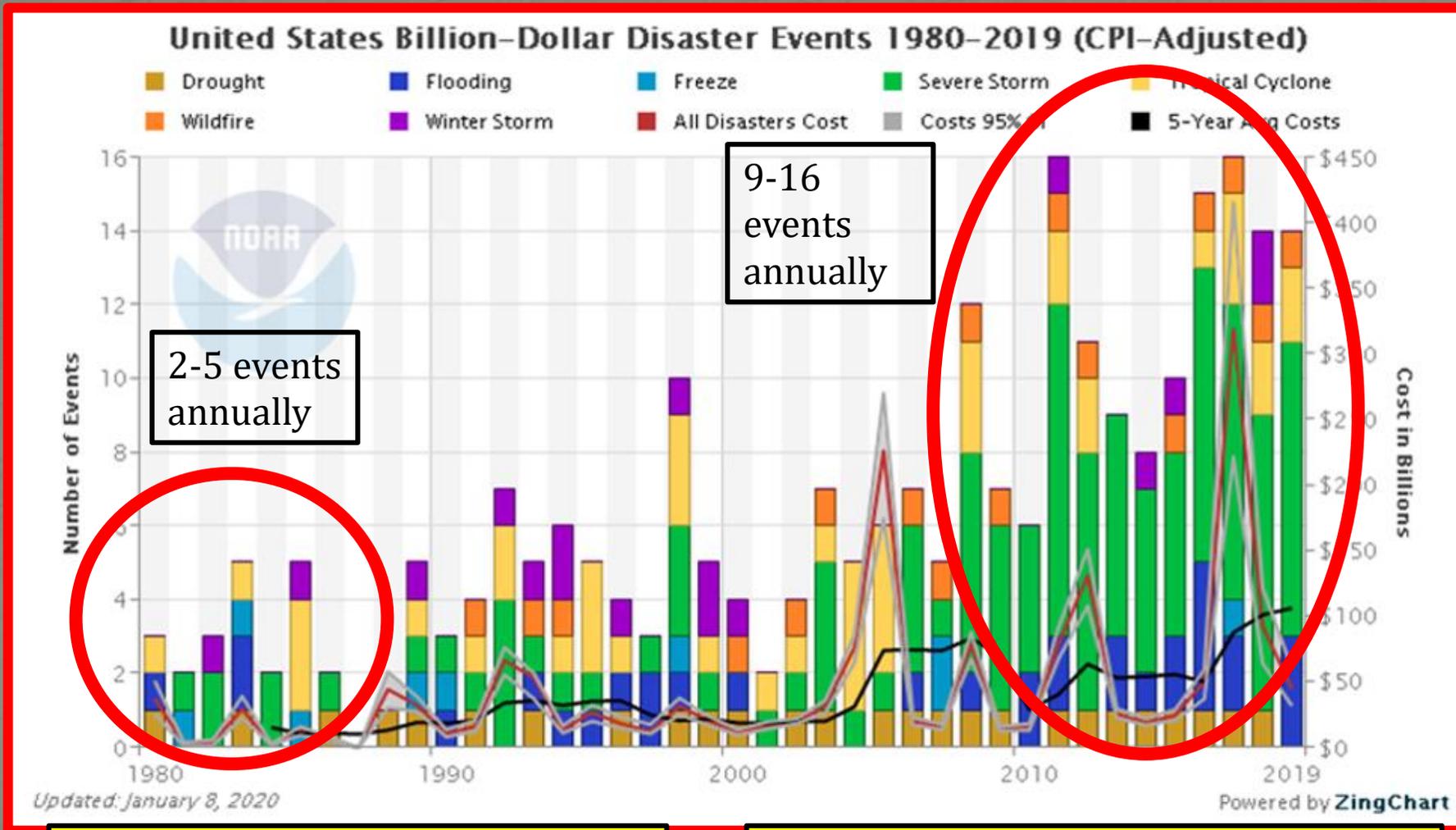
Dorian was a very near miss for the U.S. East Coast...

Had the track been 75-100 miles further west, damages would have been in the Billions of \$...

In a Capitalist Society, Money is a Measuring tool.

Let's Consider How Climate Change is Impacting Our
Wallets

Annual U.S. Weather Related Billion \$ Disasters 1980-2019



\$17.5 Trillion...

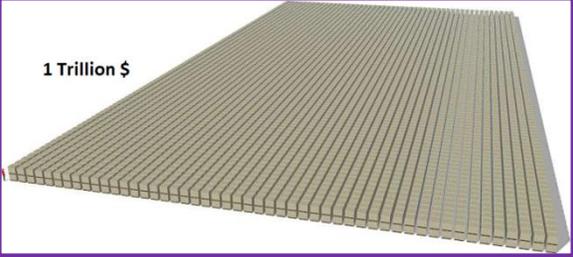
13,249 Lives Lost

Disaster related insurances losses are paid by
everyone...

Costs are shifted to every home, auto, health and other insurance policies to cover
the losses...

\$17.5 Trillion sounds like a big number...
How much is it?

1 Trillion \$



1 Trillion \$



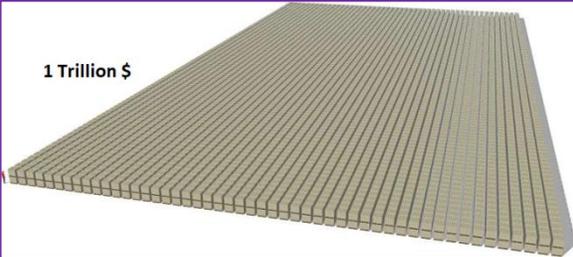
1 Trillion \$



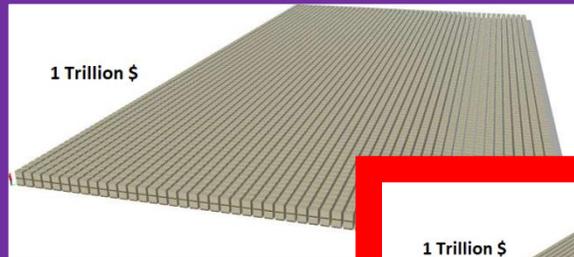
1 Trillion \$



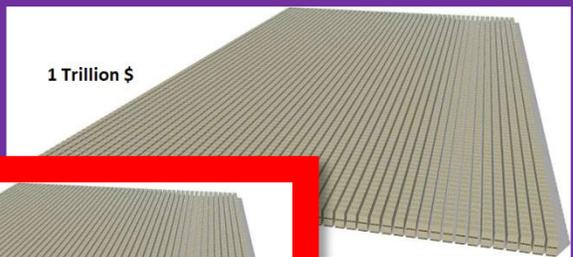
1 Trillion \$



1 Trillion \$



1 Trillion \$



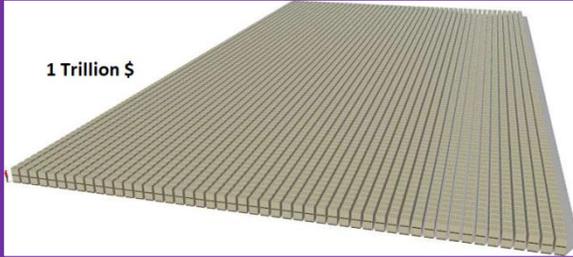
1 Trillion \$



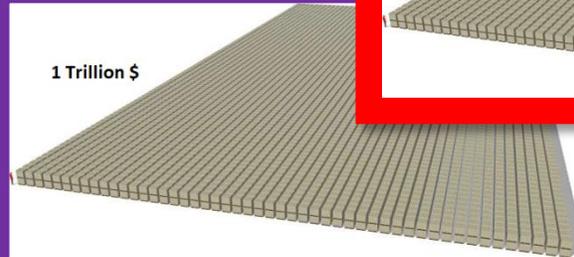
1 Trillion \$



1 Trillion \$



1 Trillion \$



1 Trillion \$



1 Trillion \$



1 Trillion \$



1 Trillion \$



1 Trillion \$



13,249 lives lost sounds like a lot of people ...

What does that look like?

13,249 Lives Lost

Climate Change is Already Harming People in the U.S.,
& Will Likely Continue to Do so...

Zachary Taylor National Cemetery, Louisville, Kentucky, 14,000 Internments



What do people think?

Will, climate change harm me personally?...



Source: Yale Project on Climate Opinion, 2019

Two thirds do not perceive Climate Change as an immediate threat.

That's all happening somewhere else, right – it's not happening near me?

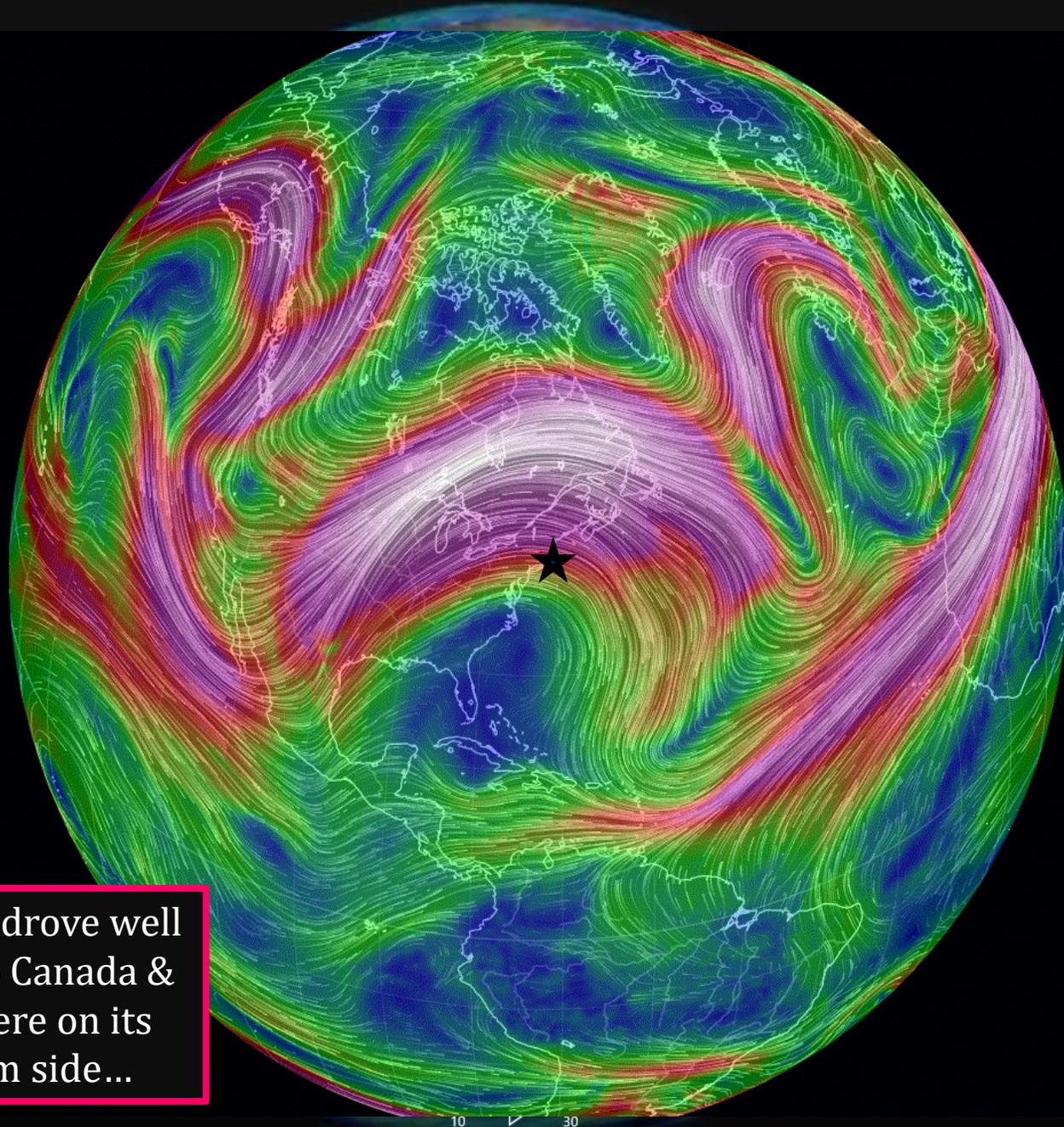
Is Climate Change Harming, or at
least, Affecting Us Locally?

Early to mid
February of
2017...

A Sudden Stratospheric
Warming Event at the
North Pole drove
temperatures from -40
degrees F to above
freezing...

This really
distorted the Jet
Stream...

The Jet drove well
up into Canada &
we were on its
warm side...



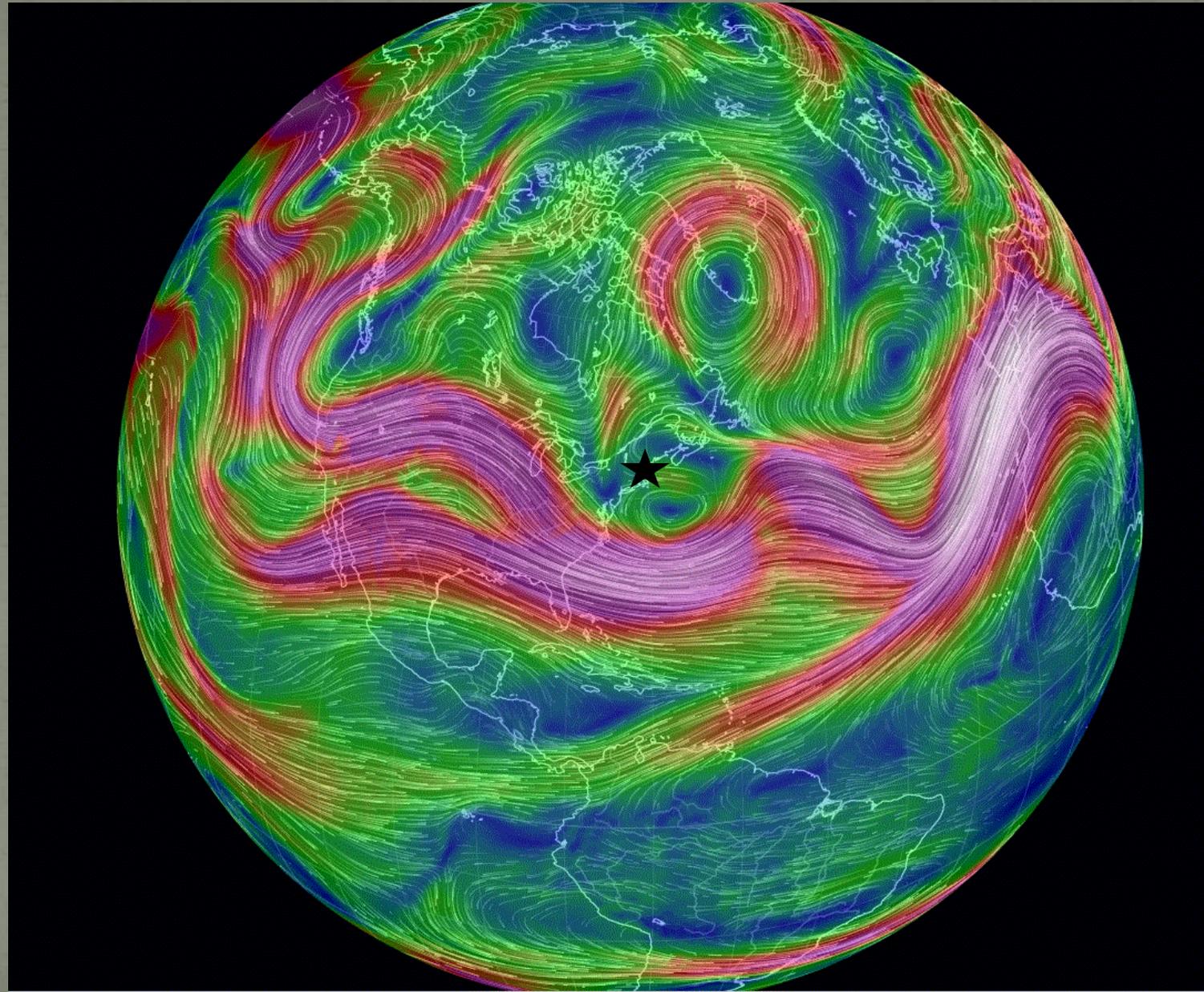
February 20 & 21, 2018

71 degrees & 78 degrees F

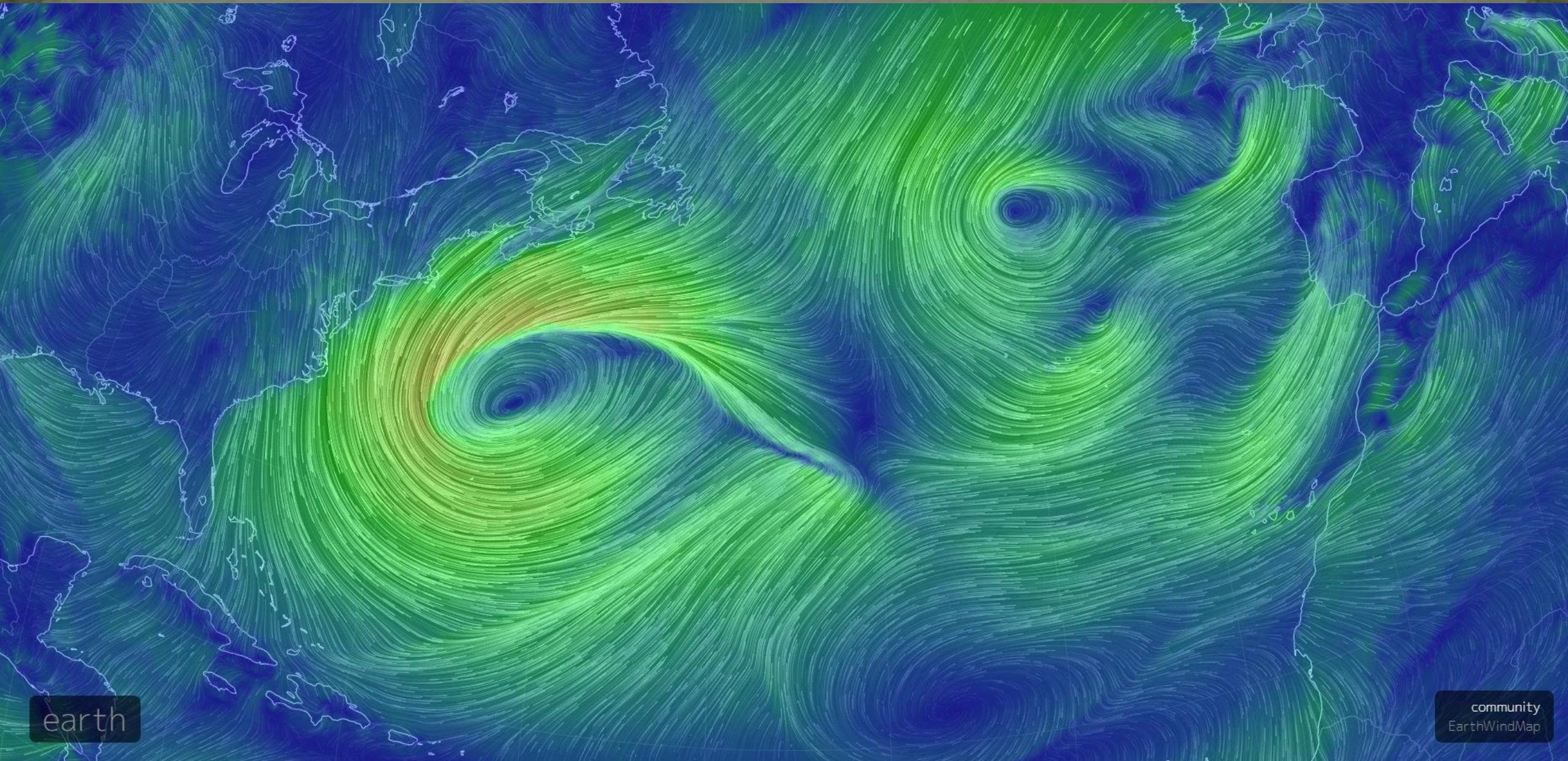
And then...



...a week
later the Jet
moved & Got
stuck...

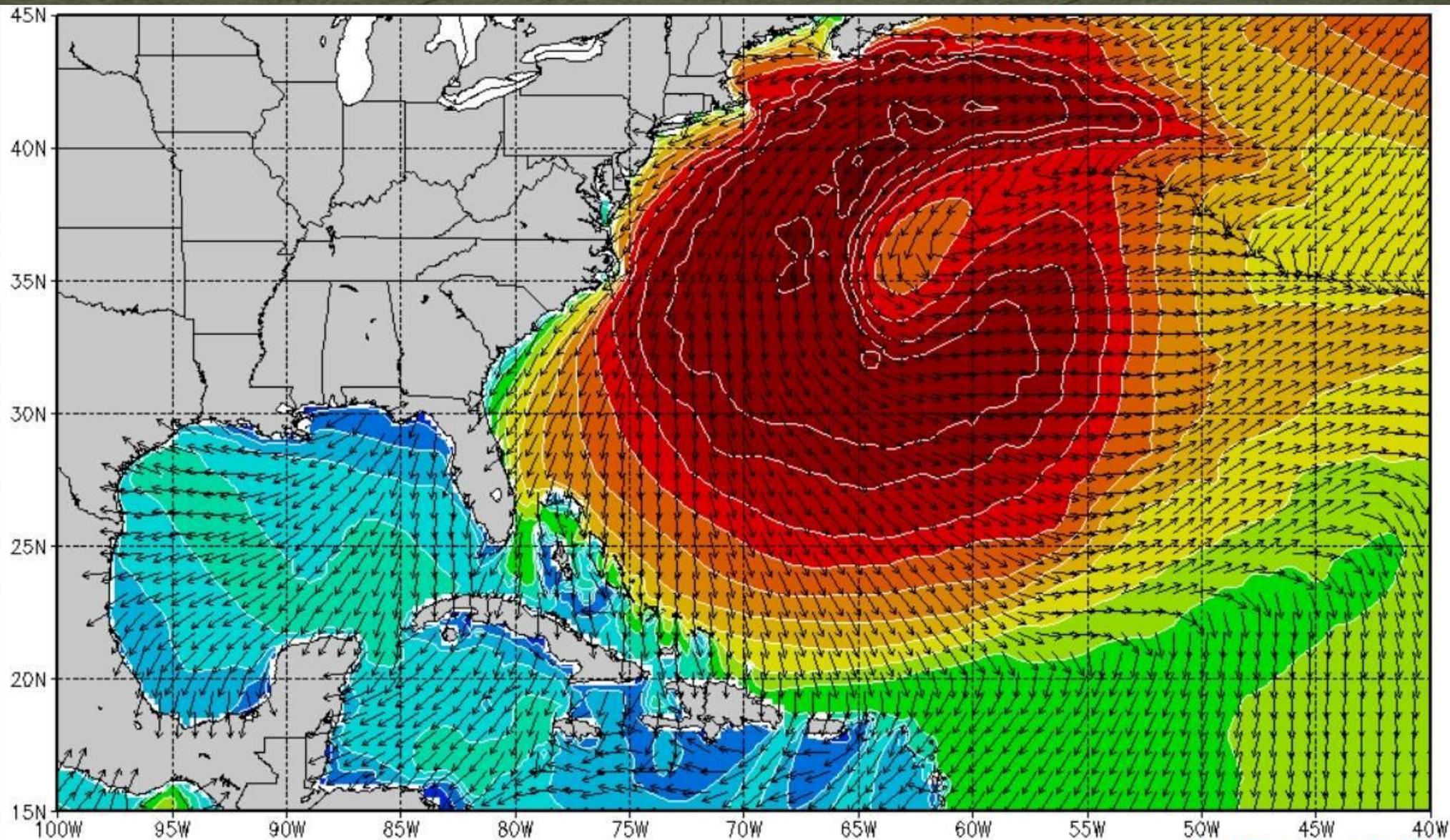




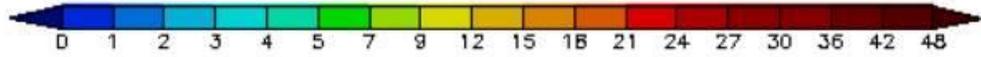


earth

community
EarthWindMap



UNCLASSIFIED



VT: Sun 06Z 04 MAR 18
FNMDC WAVE WATCH (U): Significant Wave Height [ft] and Direction
Run: 2018030312Z Tau: 18

Approved for public access. Distribution is unlimited.







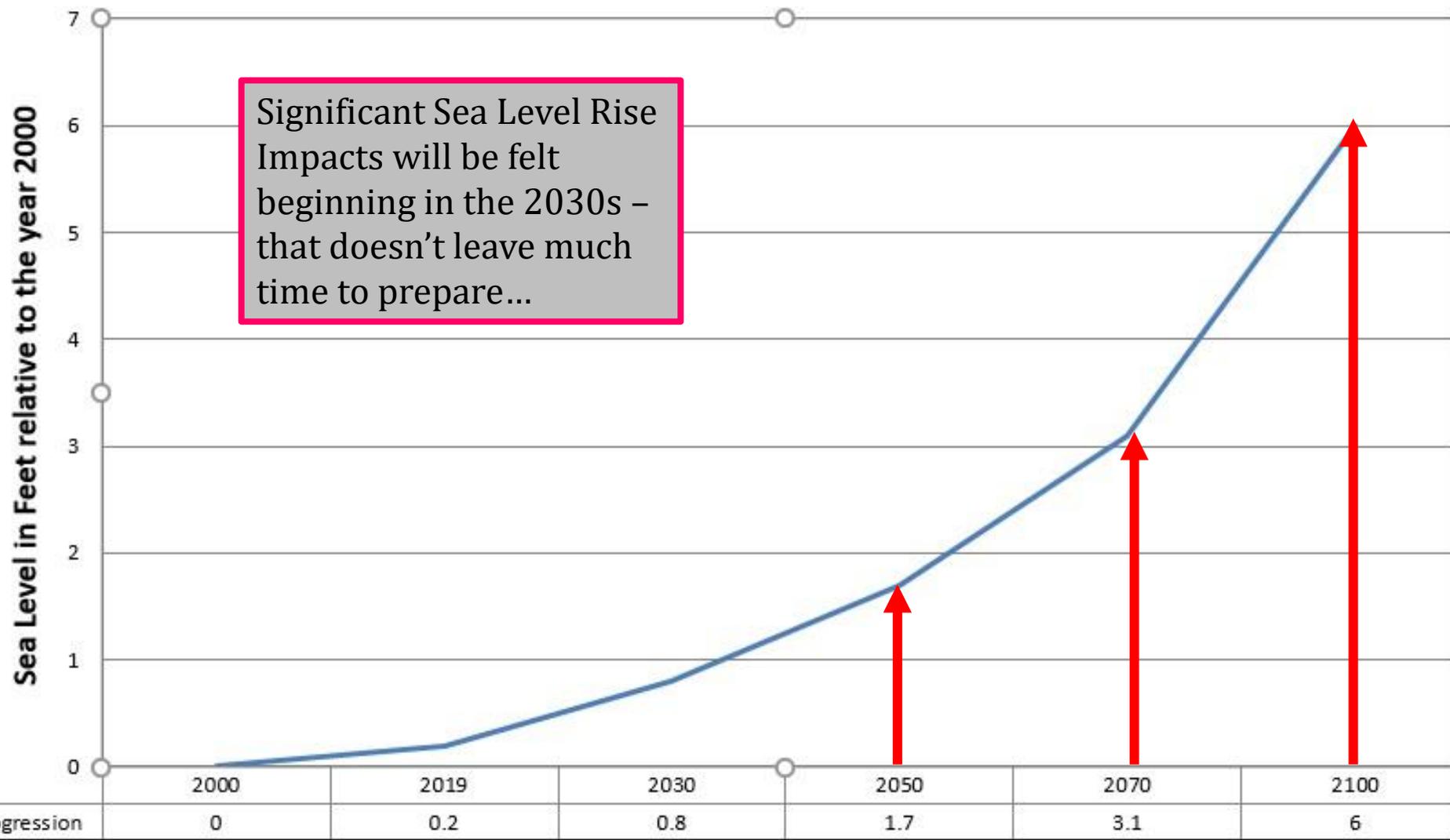
Newburyport Climate Resiliency Plan Identified Hazards

- **Sea Level Rise**
- **Coastal Storms** - Extra Tropical, Tropical, & Hybrid Cyclones
- **Heavy Precipitation Events** (Rain and Frozen – Snow/Ice)
- **Flooding** - Coastal, River and Impervious Surface Run-off
- **Wind**
- **Weather Extremes** - Drought & Heat Waves, Winters & Cold Snaps
- **Insect Disease Vectors** - Tick and Mosquito related illness
- **Combined Sewer Overflows (CSOs)**

Hazards affecting Newburyport will affect West Newbury...

But why are sea level rise, coastal flooding and CSOs a concern – we're high & dry, right?

Newburyport Sea Level Rise Progression Based on NOAA & BRAG Data



Source: *Newburyport Resiliency Plan, Sea Level Rise Subcommittee, 2019*

Again, West Newbury has significant elevation, so what's the problem?

It has to do with our drinking water supply...

Newburyport's Surface Water Reservoir System

The Indian Hill, Upper & Lower Artichoke Reservoirs are linked together via Streams & Spillways

Access to the entire surface water supply is via a single intake located near the lower Artichoke spillway...

Merrimack River

Bartlett Spring Pond Reservoir

Curzon Mill Dam

Artichoke River

West Newbury Water Dept Well Field

Lower Artichoke Spillway

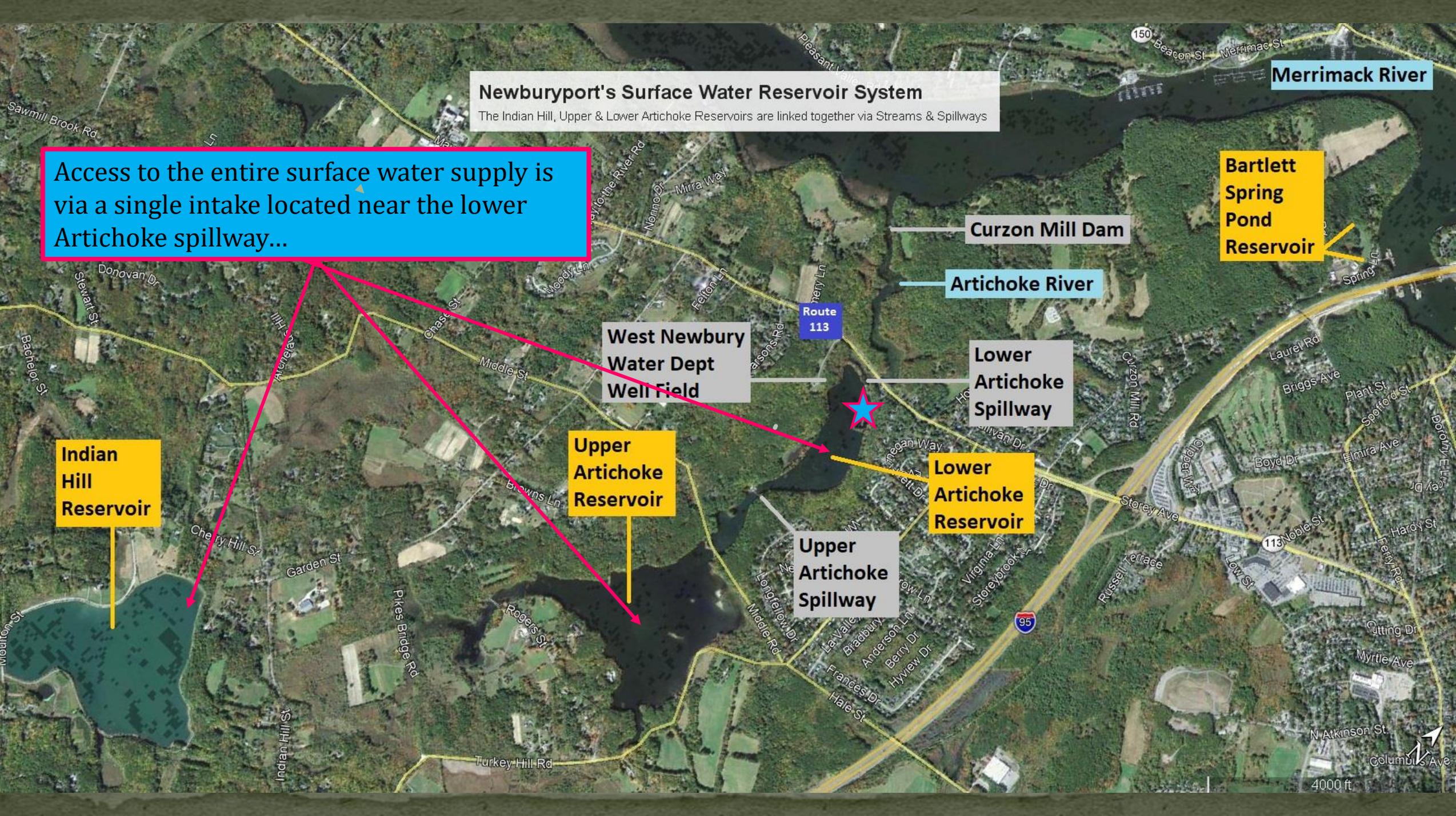
Indian Hill Reservoir

Upper Artichoke Reservoir

Lower Artichoke Reservoir

Upper Artichoke Spillway

4000 ft





Curzon Mill dam is already being topped by the Merrimack River during heavy rain and tidal events...

When this happens, brackish & sometimes CSO contaminated river waters travel all the way to the Lower Artichoke dam & spillway...

**Mean High
Water**



PHOTO: Jon Eric White, City Engineer



The FEMA 100-year event (Storm/Flood)

- Has a 1% chance of happening in any given year.
- A 26% chance of happening over the course of a 30-year mortgage
- A 63% chance of occurring during any 100-year period

The Lower Artichoke Reservoir & access to the Remaining Surface Water supply, as well as West Newbury's well field are vulnerable today, & will be more so in the future...

Mass DEP Recommended
Protection of Critical
Infrastructure Today...

Today's FEMA 100 Year Event

...or the daily tide by 2070-2100

Merrimack River water
level during Mother's Day
Storm of 2006

...or the daily tide by 2050-70

Photo: Mike Morris, NRC

Sept.- Oct. 2019

A dry August resulted in a low reservoir behind the spillway...

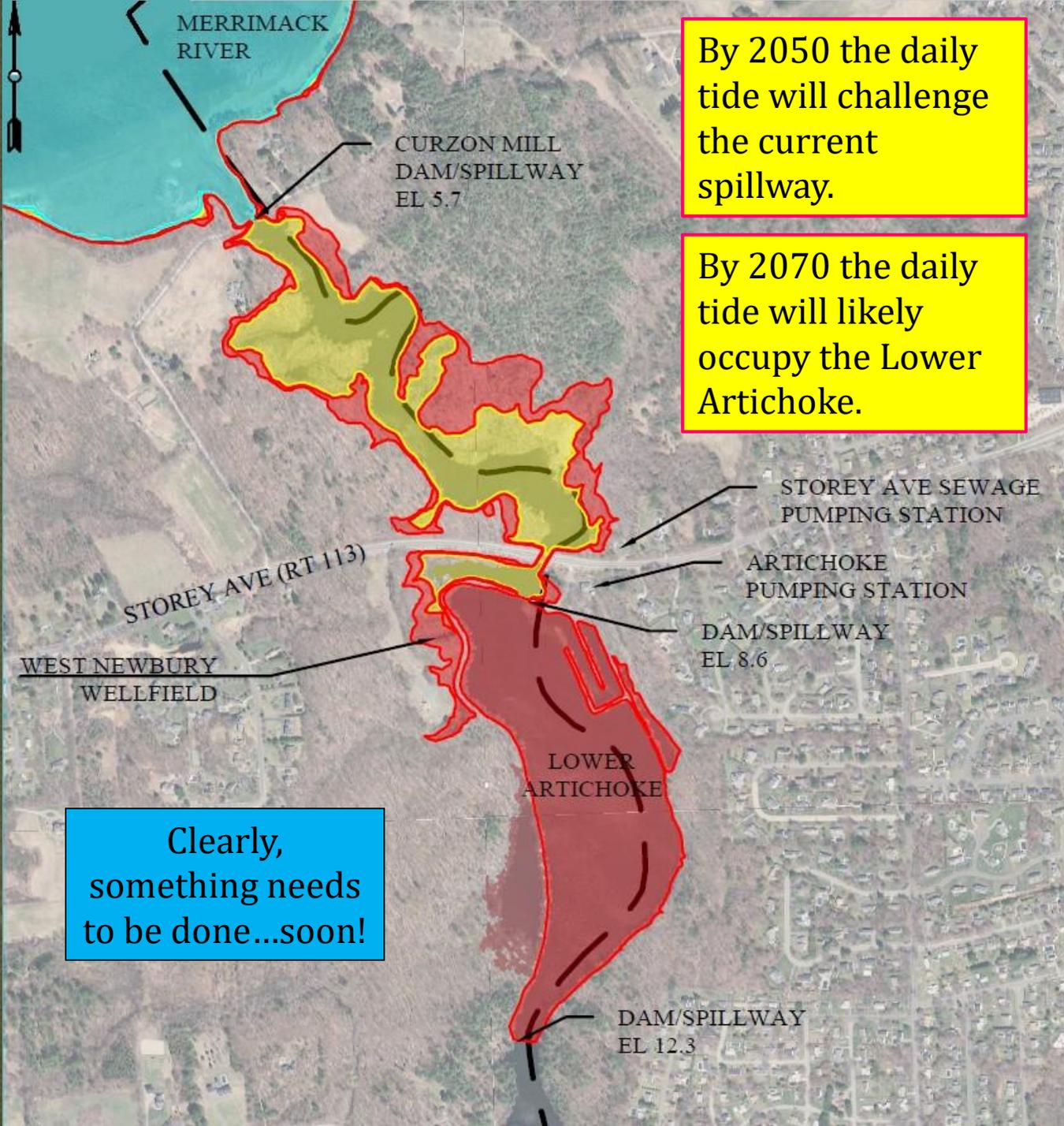
It wouldn't take a 100-year event to flood the reservoir with brackish and/or CSO tainted river water.

It doesn't take a deep flood to create a mess...

...rather just enough to spill over...



PHOTO: Mike Morris, NRC



By 2050 the daily tide will challenge the current spillway.

By 2070 the daily tide will likely occupy the Lower Artichoke.

Clearly, something needs to be done...soon!

LEGEND

MEAN HIGH WATER (MHW)	Current Day
MHW + 2' SEA LEVEL RISE	2050
MHW + 3' SEA LEVEL RISE	2070
MHW + 6' SEA LEVEL RISE	2100
CITY BOUNDARY	---

NOTE:
1. MHW = ELEVATION 4



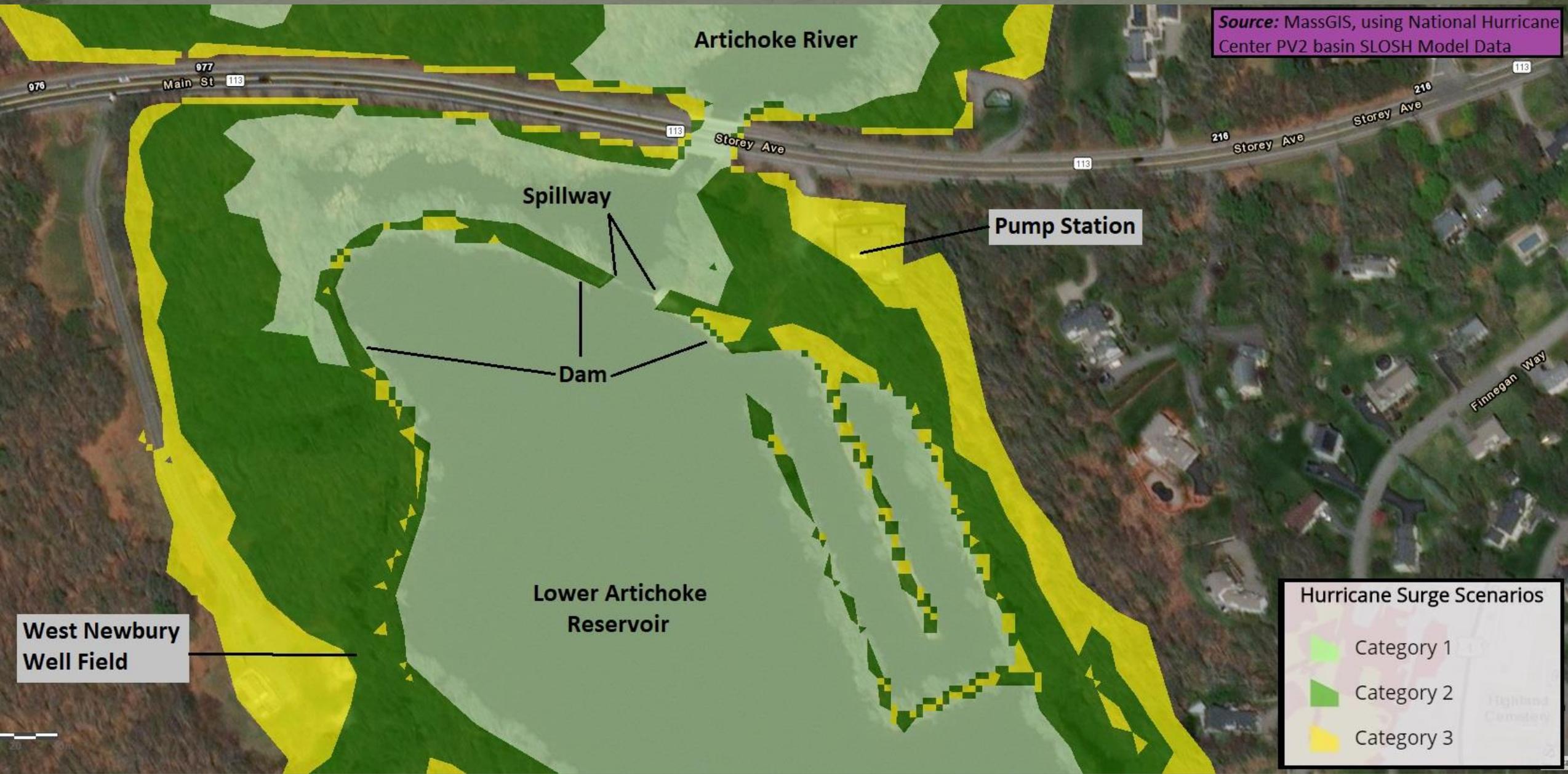
PREPARED BY:
CITY OF NEWBURYPORT
ENGINEERING DIVISION
DATE: OCT 2019

DATA SOURCES:
MassGIS 2013/14 Orthomosaic &
2011 Topographic Data Sets
Datum: NAVD88

Currently, a Category 1 or 2 Hurricane with the right approach could inundate and contaminate the lower Artichoke, cutting off access to the entire surface water supply.



Source: MassGIS, using National Hurricane Center PV2 basin SLOSH Model Data



Artichoke River

977
Main St 113

113

Storey Ave

113

210

Storey Ave

210

Storey Ave

113

Finnegon Way

Spillway

Pump Station

Dam

Lower Artichoke
Reservoir

West Newbury
Well Field

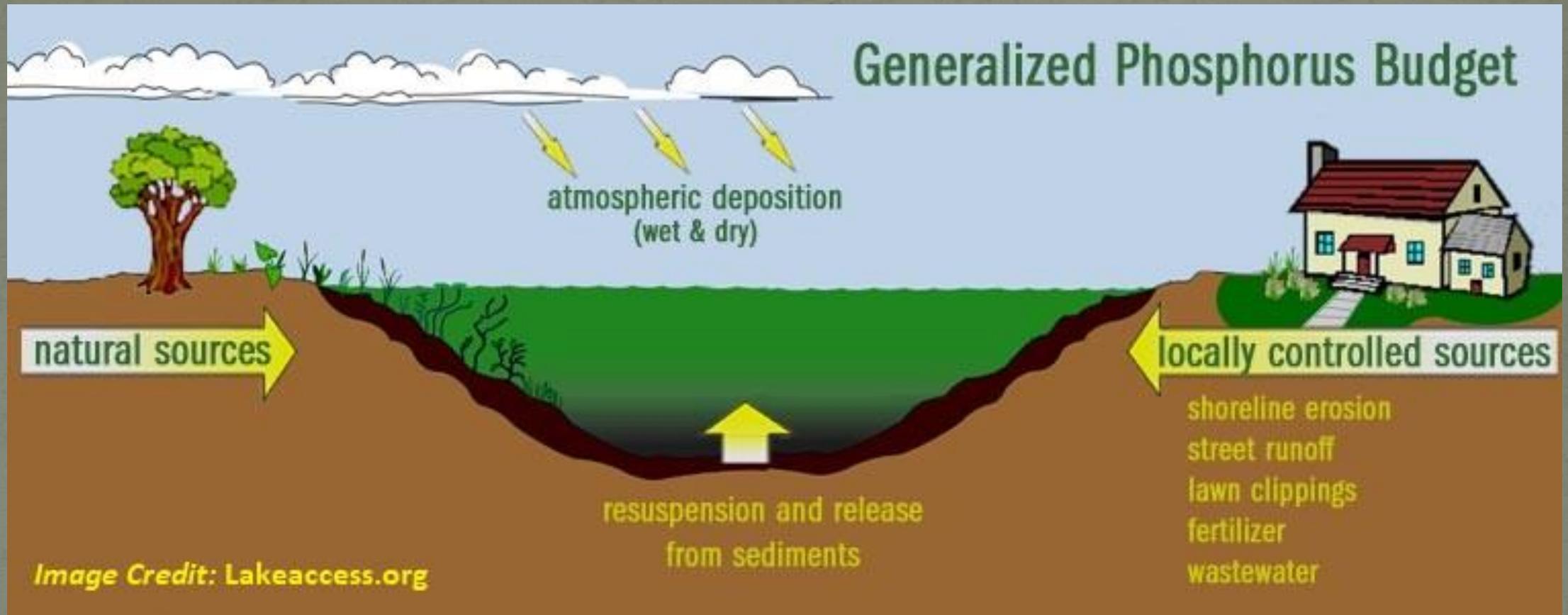
Hurricane Surge Scenarios

- Category 1
- Category 2
- Category 3

Highland
County



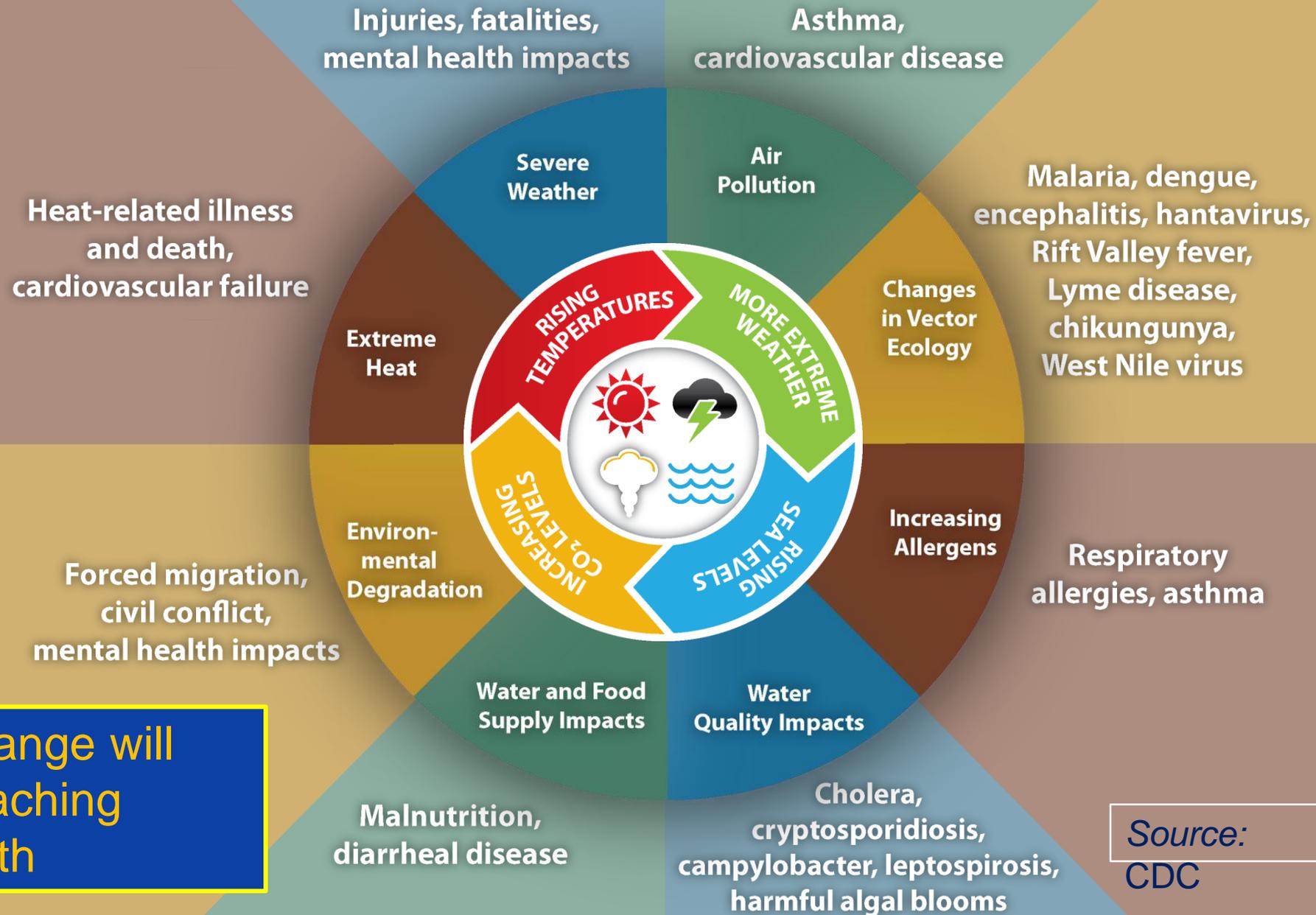
Heavy precipitation atop of a dry ground promotes run-off into our reservoirs



Heavy run-off promotes sedimentation & shallowing of the reservoir reducing its capacity...
Fertilizer & waste-water runoff will promote algal blooms compromising water quality

As most of the lands surrounding the surface water reservoirs are privately owned, this is a concern that will be challenging to manage.

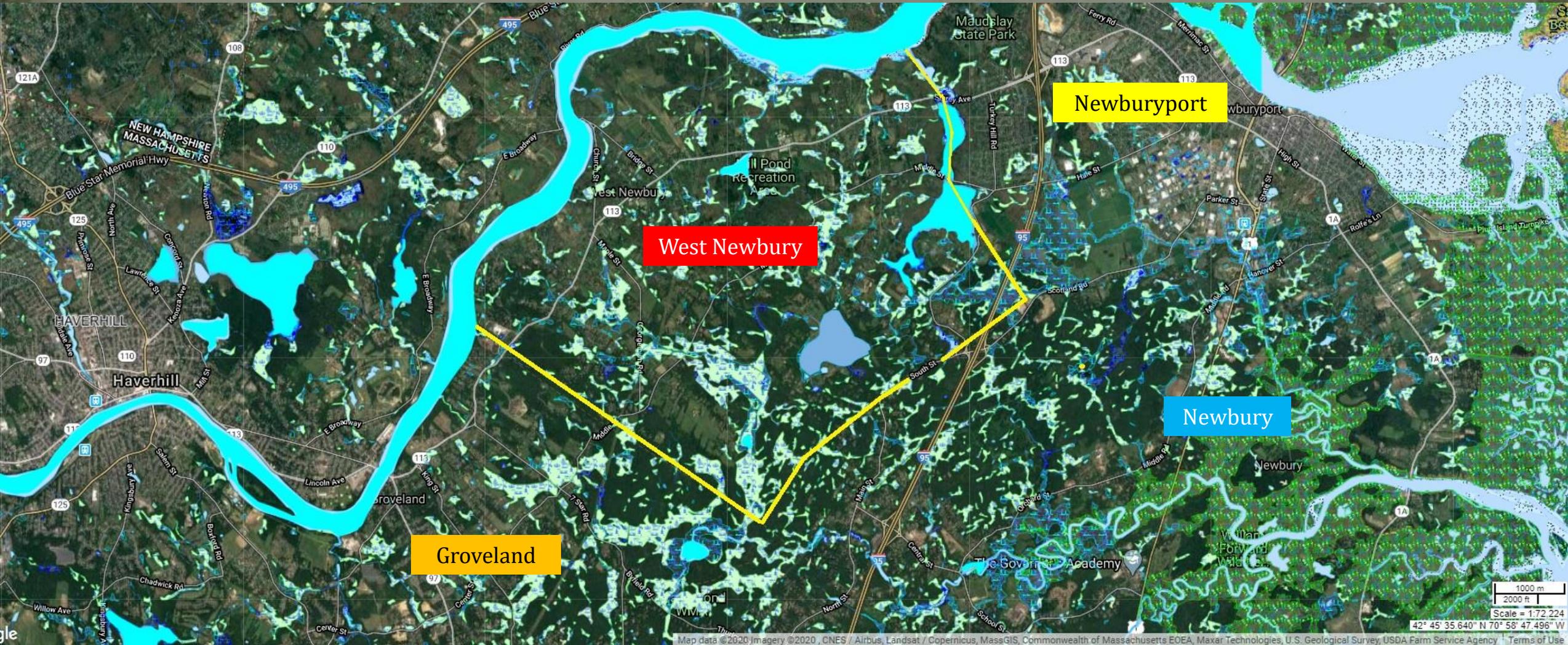
Impact of Climate Change on Human Health



Climate Change will have far reaching Public Health impacts...

Source: CDC

Our Region & Community is very Wet...

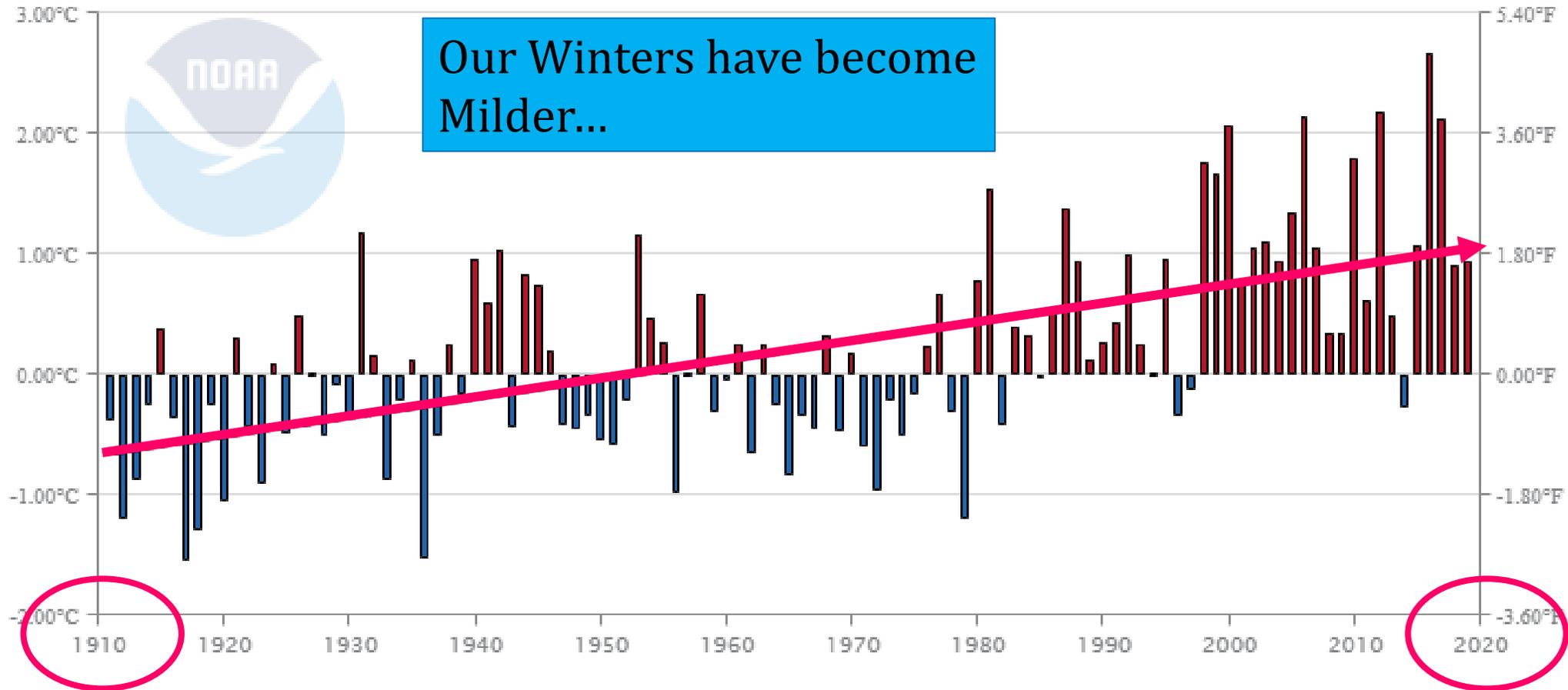


Source: *MassGIS*

North America

November–April Temperature Anomalies

1911–2019 Trend
(+0.16°C/Decade)

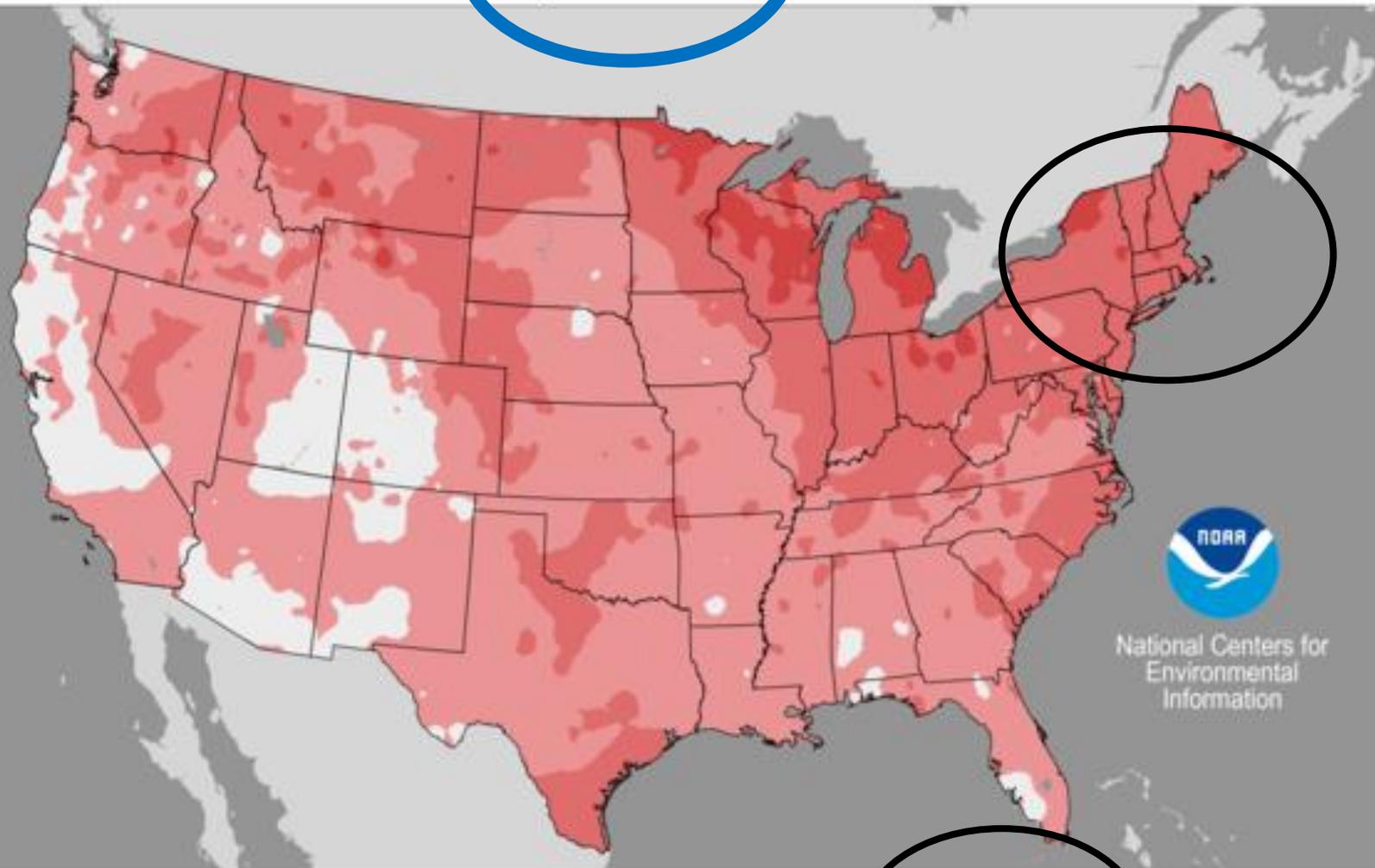


SOURCE: NOAA National Centers for Environmental information, *Climate at a Glance: Global Time Series*, published February 2020, retrieved on February 22, 2020 from <https://www.ncdc.noaa.gov/cag/>

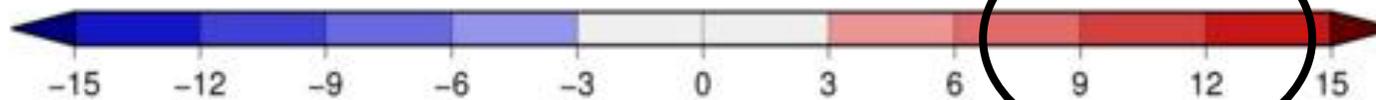
Mean Temperature Departures from Average

January 2020

Average Period: 20th Century



National Centers for
Environmental
Information

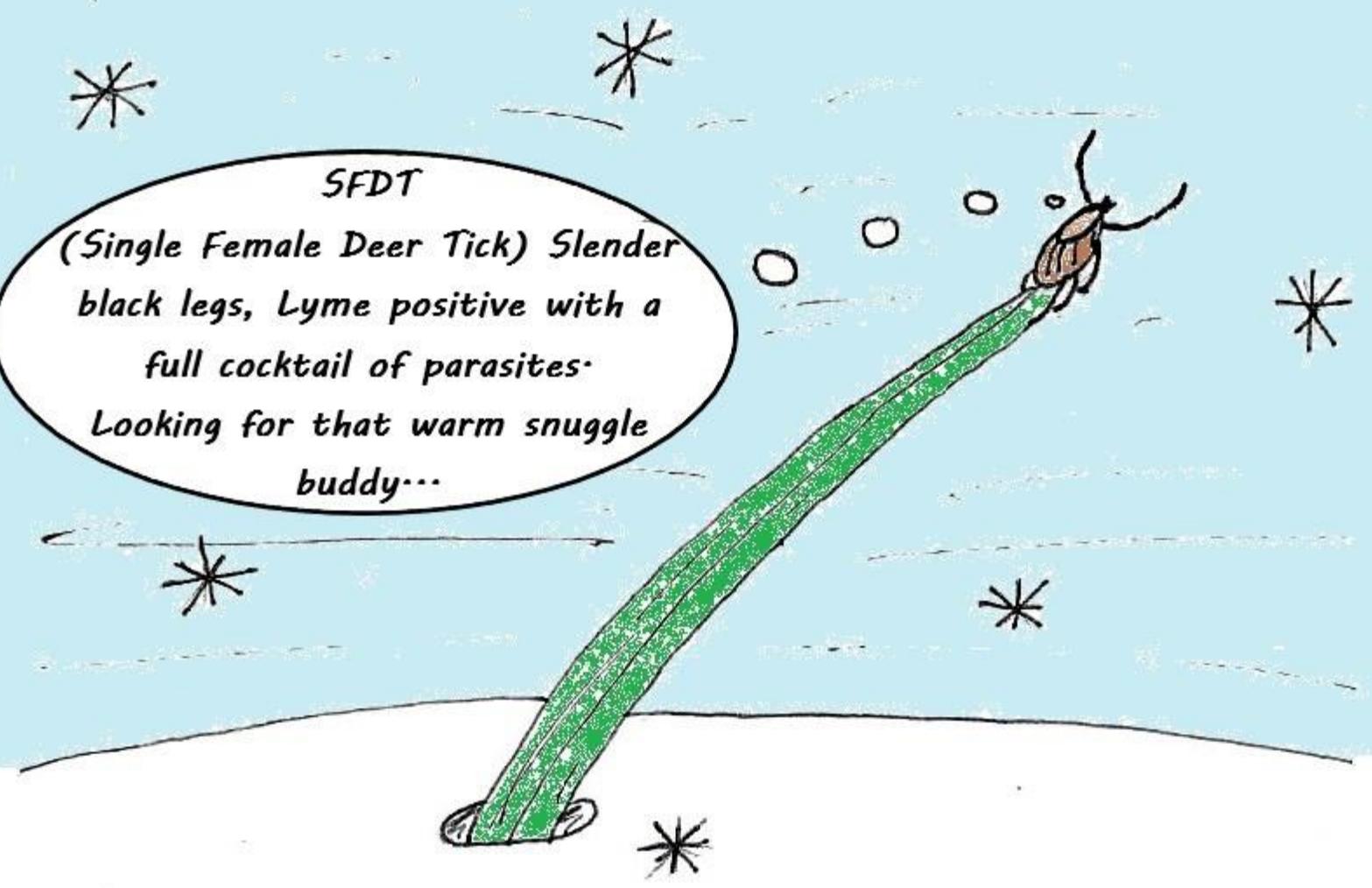


Created: Tue Feb 04 2020

Degrees Fahrenheit

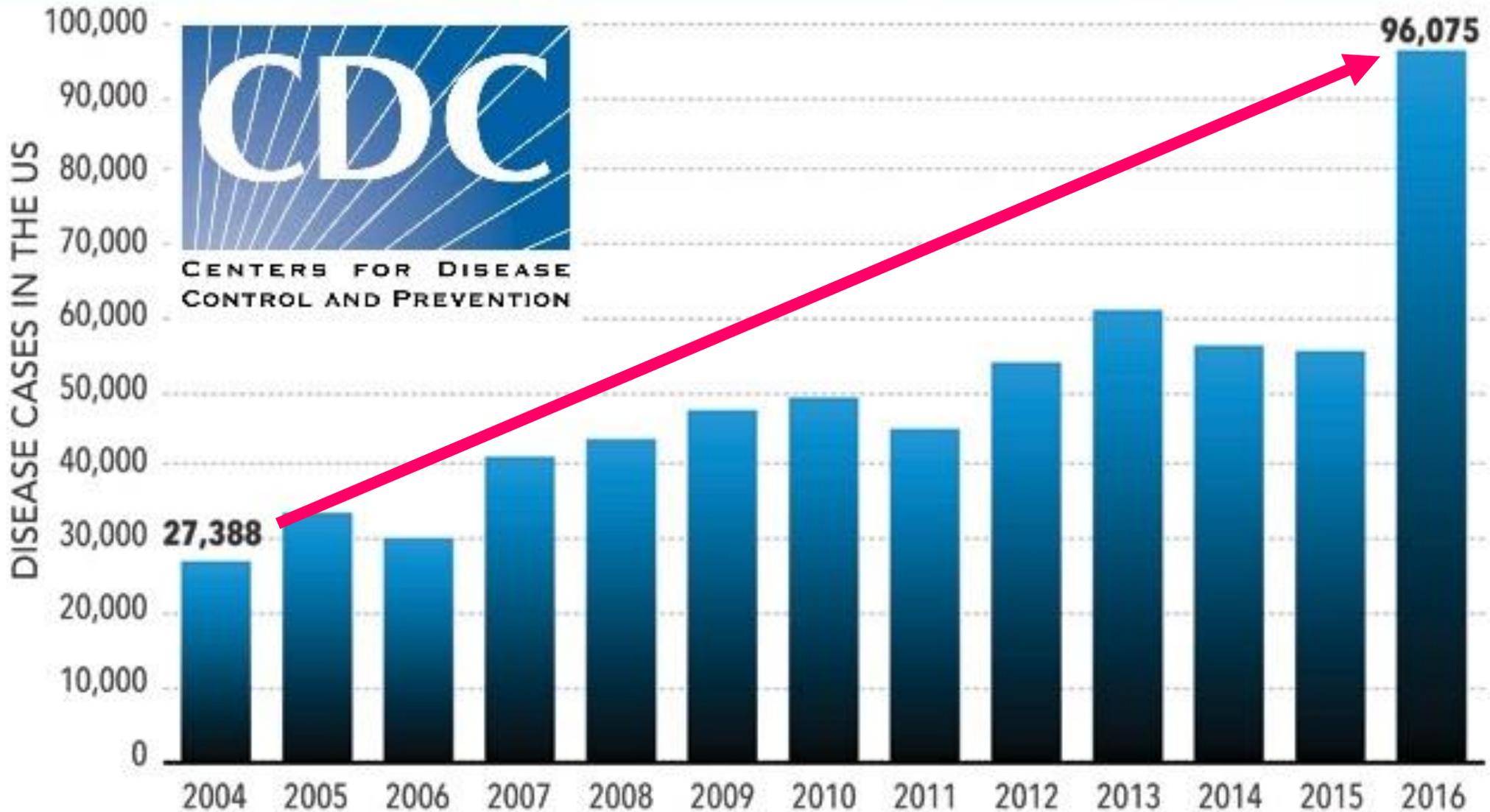
Data Source: 5km Gridded (nClimGrid)

SFDT
(Single Female Deer Tick) Slender
black legs, Lyme positive with a
full cocktail of parasites.
Looking for that warm snuggle
buddy...



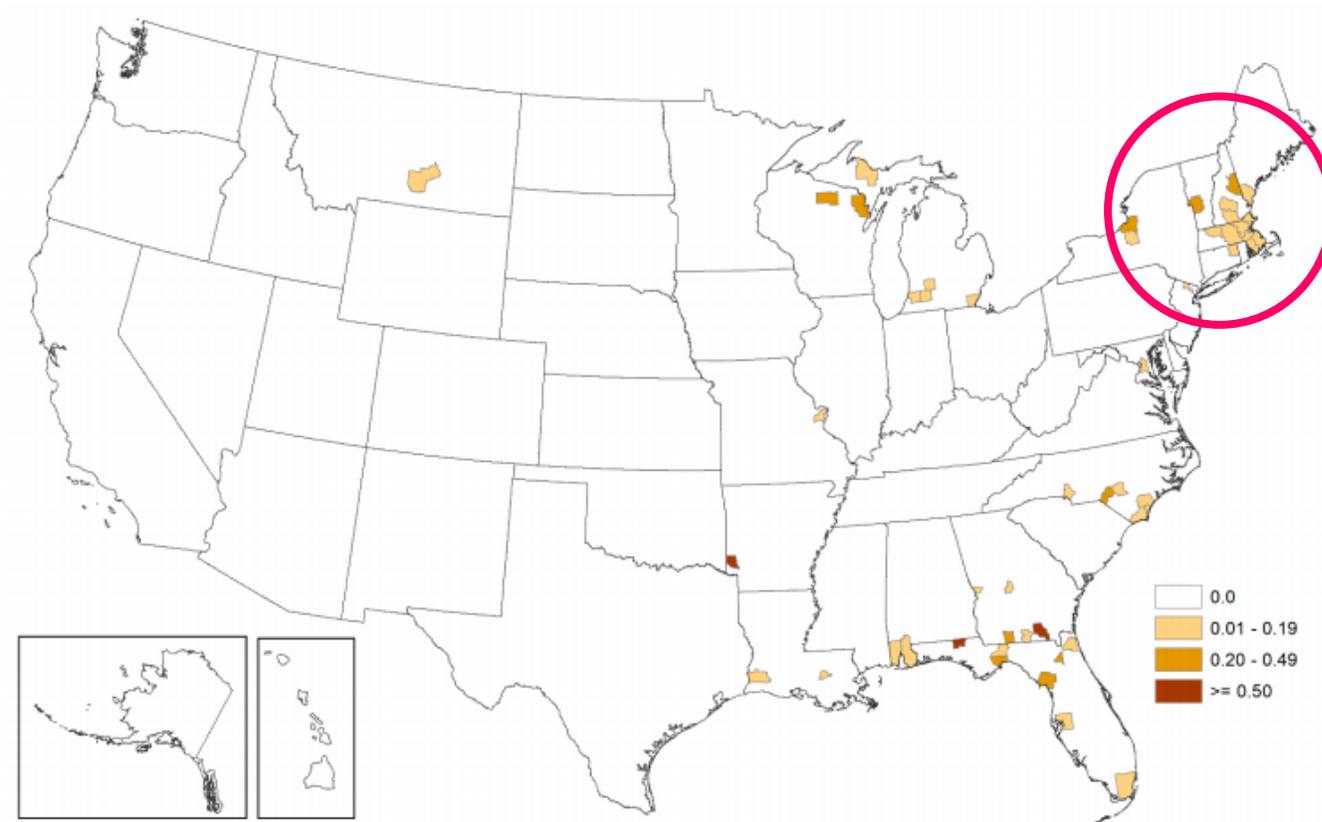
These conditions favor year-round tick activity...

Disease cases from infected mosquitoes, ticks, and fleas have tripled in 13 years.



SOURCE: CDC Vital Signs, May, 2018

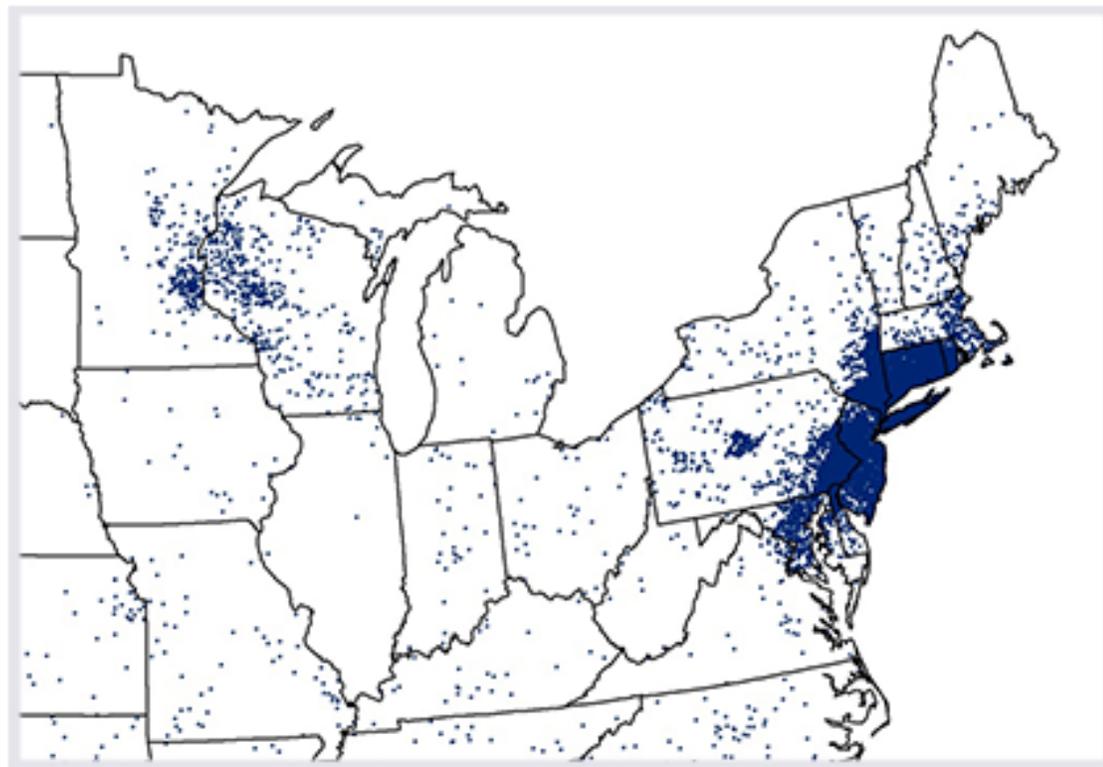
Eastern equine encephalitis virus neuroinvasive disease average annual incidence by county of residence, 2008–2017



Source: ArboNET, Arboviral Diseases Branch, Centers for Disease Control and Prevention

Data Table: This map shows the distribution of Eastern equine encephalitis virus neuroinvasive disease (encephalitis and/or meningitis) average annual incidence by county of residence from 2008 through 2017. Counties are shaded according to incidences ranging from less than 0.20, 0.20 to 0.49, and greater than 0.50 per 100,000 population. Shaded counties are primarily distributed along the Gulf Coast, Eastern seaboard, and the Great Lakes.

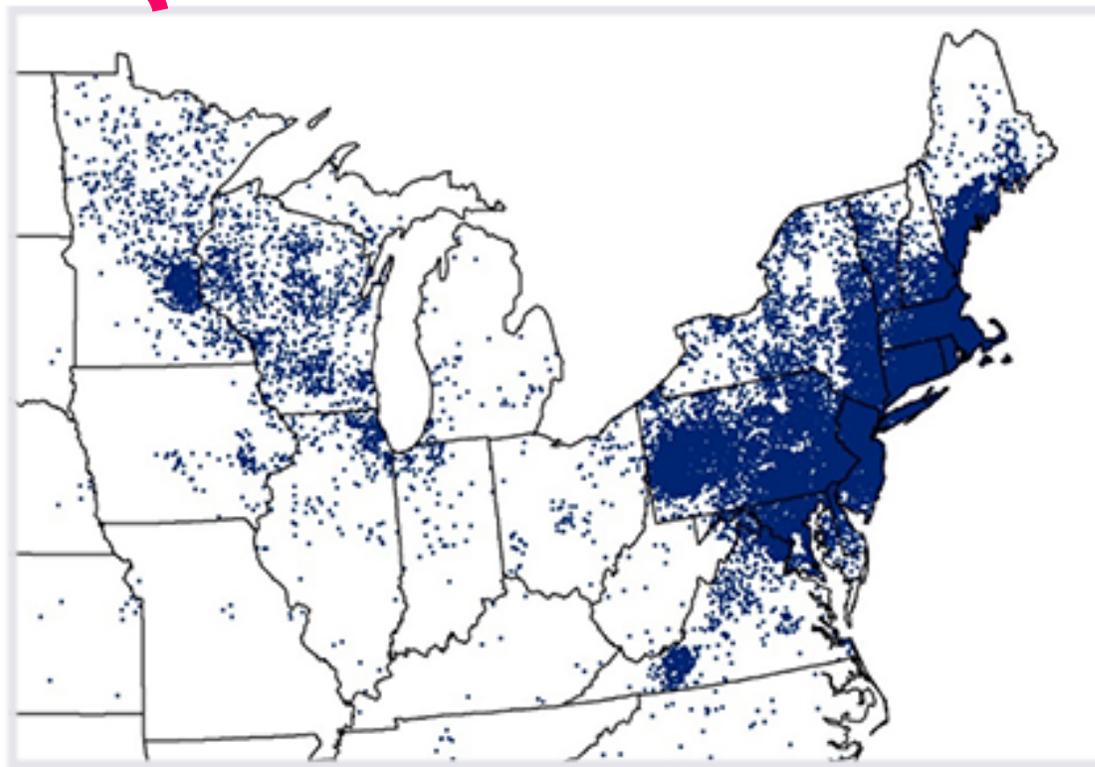
Reported Lyme Disease Cases in 1996 and 2014



1996



2014

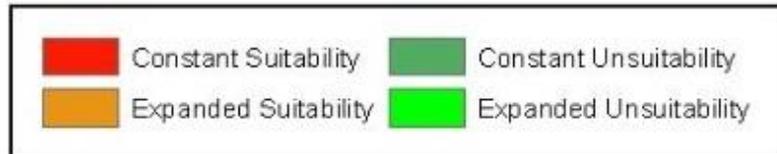
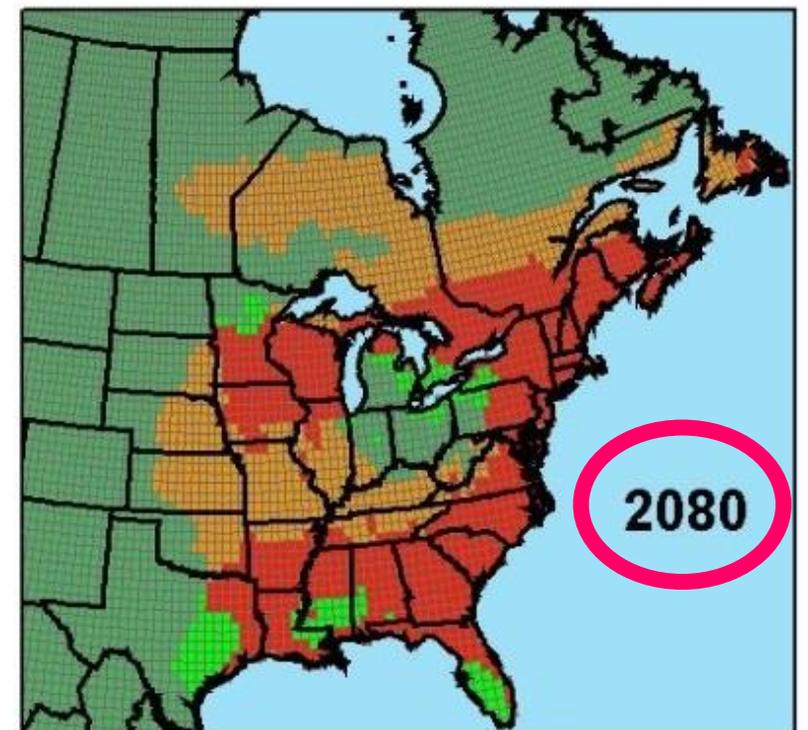
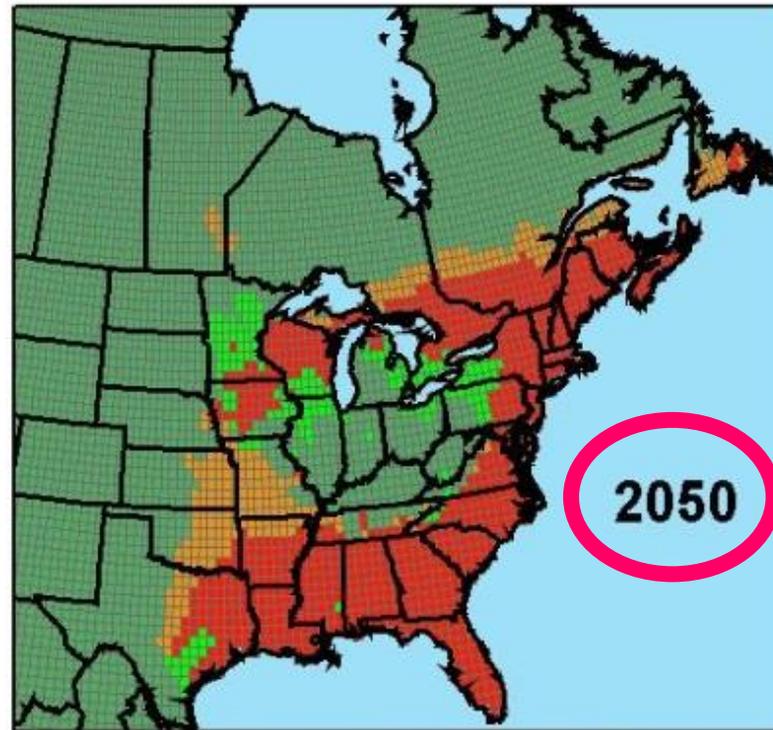


Data source: CDC (Centers for Disease Control and Prevention). 2015. Lyme disease data and statistics. www.cdc.gov/lyme/stats/index.html. Accessed December 2015.

For more information, visit U.S. EPA's "Climate Change Indicators in the United States" at www.epa.gov/climate-indicators.

Tick Habitat Spreads as our Climate Warms...

Projected Distribution of Climate-Based Habitat Suitability for *Ixodes Scapularis* (Lyme Tick)
2020's, the 2050's and the 2080's



Source: *Effect of Climate Change on Lyme Disease Risk in North America*
John S. Brownstein,^{*†} Theodore R. Holford,^{*} and Durland Fish^{*}

Climate Change is Happening.

Climate Change is mostly caused by human activities.

Climate Change is & will continue to harm people in the U.S.

Climate change is harming you.

“Houston, We Have a Problem...”

So where are we relative to Climate Change?

What's the forecast?

Tipping Point...

When does the problem get away from us?

What are our choices relative to experiencing the effects of Climate Change?

These kayakers are safe...

This Kayaker is in more danger, but can still take action

In this position, the Kayaker has little choice



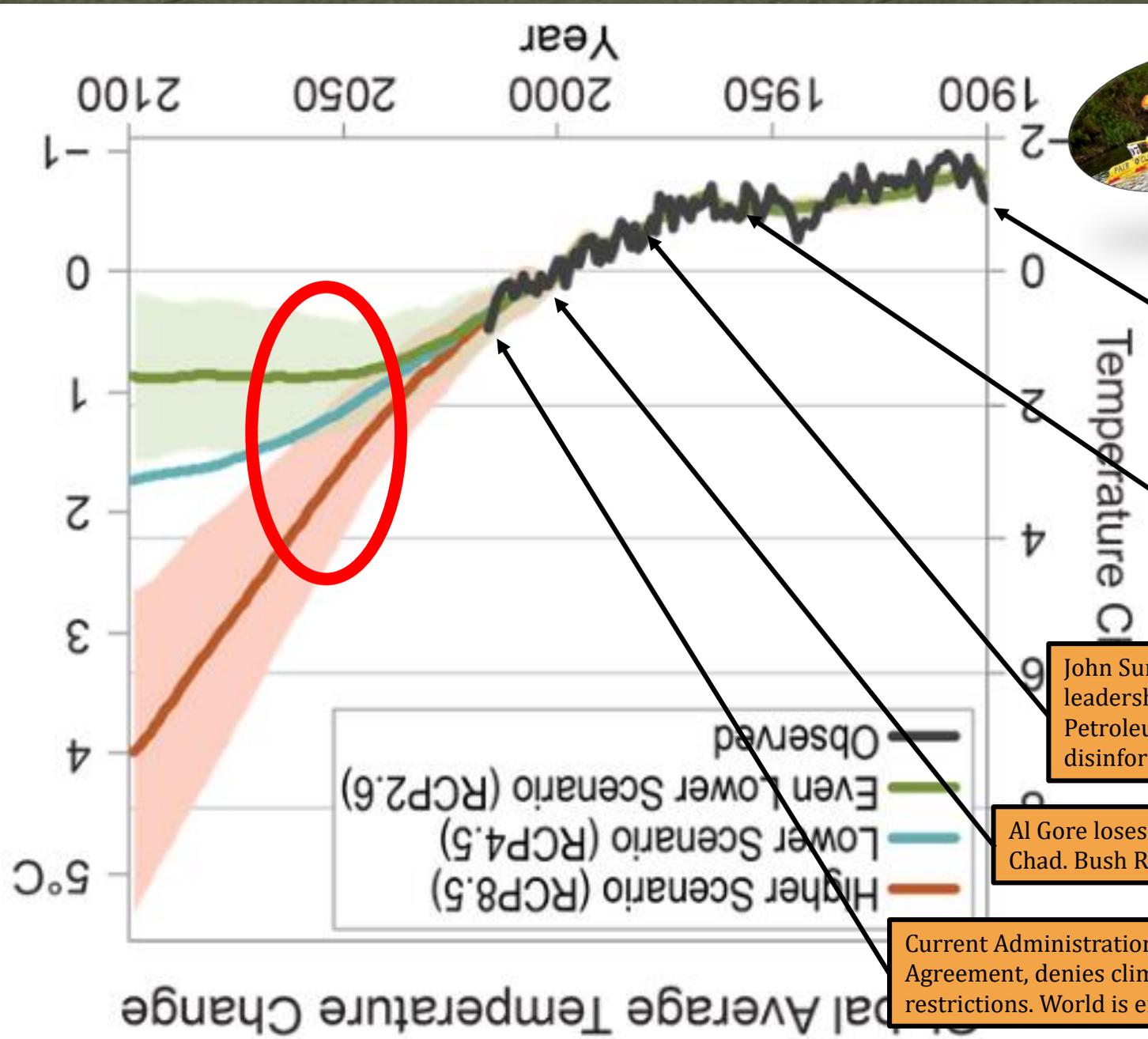
The chart shows global temperature rise & predicted temperatures based on emissions scenarios...

Let's view the chart as a waterfall...

Humanity is depicted as 2 clowns in a raft...

Like the Kayaker in the previous slide, we are set to go over the falls & will experience the effects of Climate Change...

However, we have very little time to effect how "steep our ride will be"...



1890 - Svante Arrhenius & PC Chamberlin predict fossil fuel emissions will warm our world

David Keeling records swiftly rising CO2 levels at Moana Loa and sounds the alarm at the Federal Level.

John Sununu compromises U.S. leadership on Climate Change & Petroleum Industry begins tactical disinformation campaign.

Al Gore loses to George W. Bush by a Hanging Chad. Bush Renounces Kyoto Protocol

Current Administration withdraws from the Paris Agreement, denies climate science, relaxes fossil fuel restrictions. World is emitting at its highest levels ever.

What will be our grade ...

For addressing Climate Change?

A – Already at net zero emissions, no change in climate – **that opportunity was missed in 1979-89**

B – Limit Climate Change to what's already happened. The world is established on a low emissions pathway – **In actuality, we're still emitting on the highest pathway**

C – Drastic measures are taken to limit warming to 2 deg C by 2100.
Net Zero emissions by 2050-60 & removing CO2 from the atmosphere – **a state of Negative CO2 emissions.**

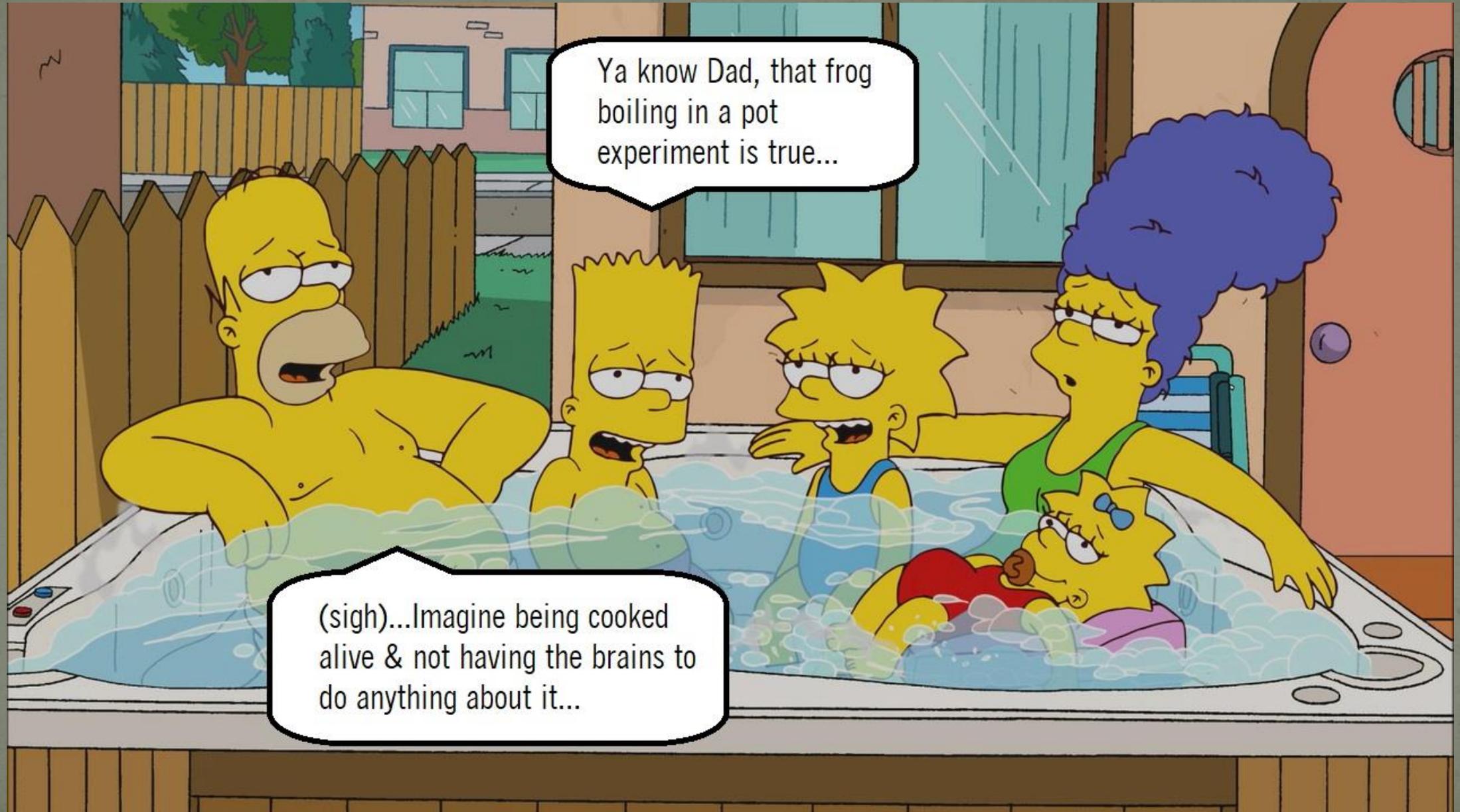
We experience significant sea level rise, weather extremes, ecosystem impacts & extinctions.

- **We have 12-21 years to enact policy & technological changes to make this happen**
- Nationally, there is no leadership, we are at odds with the rest of the world.
- Per capita one of the largest contributors
- **This is a very steep hill to climb ... the US 2020 election is a game changer**

D – Continue slowly with current policies, addressing challenges & disasters as they arise.

3+ degrees of warming is a reality for 2100 - Major ecosystems collapse, large agricultural, economic & societal impacts. – **Our world is not a happy place.**

F – The beginning of the end of the Anthropocene? – **Can we really afford to “flunk” Earth?**



Ya know Dad, that frog boiling in a pot experiment is true...

(sigh)...Imagine being cooked alive & not having the brains to do anything about it...



...But we have the “**brains**” &
technology
to do **SOMETHING – TODAY!**

...each & every one of us!

Take Steps to Make yourself & Your Community
Resilient to Climate Impacts...

Prepare Your Home - The 4 Core Elements of Survival

To survive a natural disaster at home one can safely & sometimes comfortably shelter in place – provided the home is organized around the 4 core elements of survival:
Shelter, Water, Food & Fire



SHELTER: Without it, one can survive only 3 hours in extreme conditions.

- **Is your home vulnerable to:** wind, falling trees, flooding, snow drifts power outages & other utility compromise? Assess & address your home's unique vulnerabilities. Trim trees, shutter windows, flood proof, & diversify your power sources.
- **Stock up on essentials:** first aid kit, medications, hygiene items, spare eyeglasses, appropriate clothing & blankets, signal flares & a whistle.
- **Acquire basic tools** for minor repairs. Trash bags & duct tape can seal broken windows.
- Identify the safest spot in your home & go there when needed.
Above all, be honest & decide if it's safer to stay elsewhere.

FIRE (ENERGY): Fire & energy enhance the previous 3. It warms a shelter, can boil water & cook food, provide light, communications & mobility.

- A backup generator can power critical functions: furnace, stove, refrigerator & electrical sockets.
- A Lithium battery power supply will charge phones, electronics & jump start a car or generator.
- An outdoor gas grill or camping stove will cook food & boil water.
- Spare cans of gas will keep a generator or vehicle running.
- A battery powered AM/FM radio will keep you informed.
- A flashlight will light the way.



WATER: One can live 3 days without water - Assess your needs.

- 1 gallon per person per day (store enough for 3+ days)
- Acquire purification tablets & chlorine bleach to purify water.
- Use rain barrels to collect water, especially for flushing toilets.

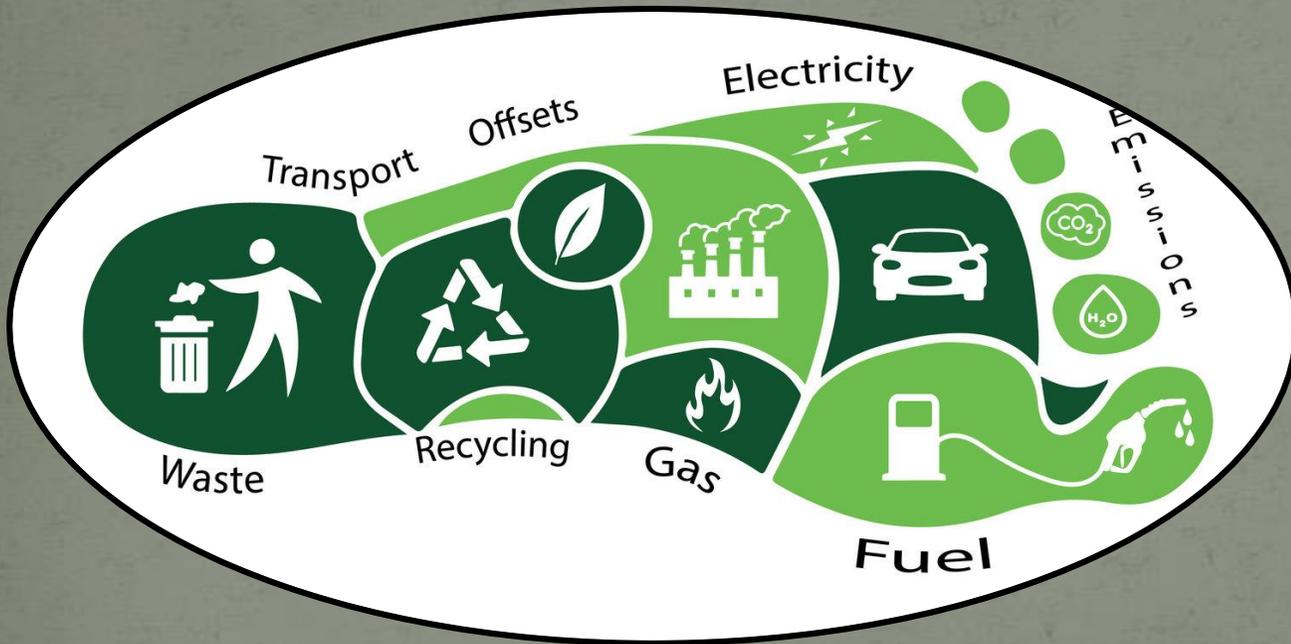


FOOD: With shelter & water, one can survive 3 weeks without food. Food is however essential and makes survival easier:

- Store ready to eat/easy to prepare canned and dry goods.
- Ensure you have a manual can opener and other utensils.

Reduce your personal & community's contribution to
Climate Change...

1) Per capita we are the highest emitters!
Let's get our carbon footprint under control –
Work your contribution towards zero!?!



To Achieve Net Zero Emissions by 2050...

West Newbury needs to quantify & track its **Municipal Carbon Footprint**



Residents need to quantify, report & track their **Residential Carbon Footprint**



The sum total represents the Community Carbon Footprint



Berkley Cool Climate Calculator



One Common Denominator



It's time for a change.

2) Divest from fossil fuels! – invest in emerging technologies



3) Put a price on pollution –
Support a carbon tax that is refunded to households.

4) VOTE Nationally in 2020

YOUR VOICE

There are many important issues –
Vote for What's Important to You!

YOUR VOTE

2020

5) Solving Climate Change is a social problem –
Tell your story, listen to others – inspire & motivate!



We are stewards of this planet and need to fulfill that role.

Our Children behold the tomorrow....



The End

...that we create today.