

PREPARING FOR THE HEALTH IMPACTS OF CLIMATE CHANGE

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Beaver Island
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Michigan Climate & Health Adaptation Program

MICHAP

- *Federal/ State /Local Partnership*
- *Integrating Climate Adaptation into Public Health Practice*
- *Promote Adaptation Strategies to Protect Public Health*

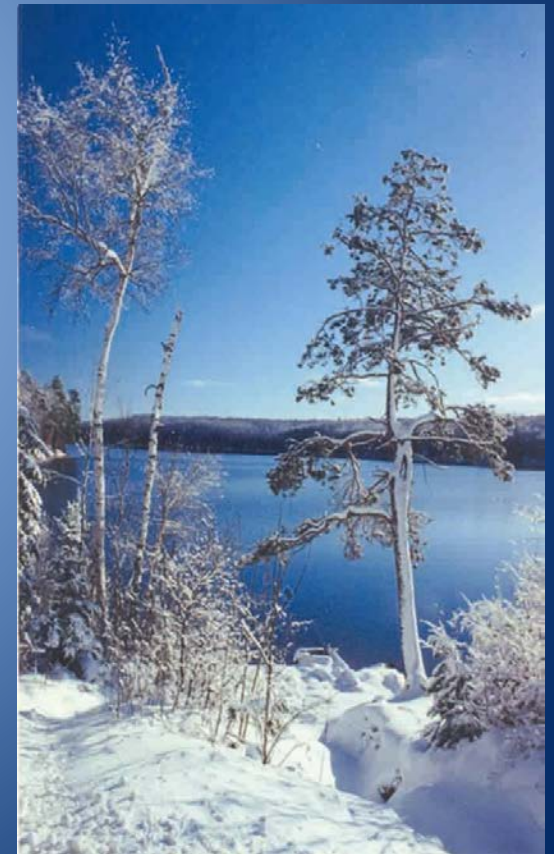


Outline

- Climate Change in Michigan
- How Climate Change Affects Health
- Climate Change Vulnerability in Your Community
- Public Health Response: Mitigation & Adaptation

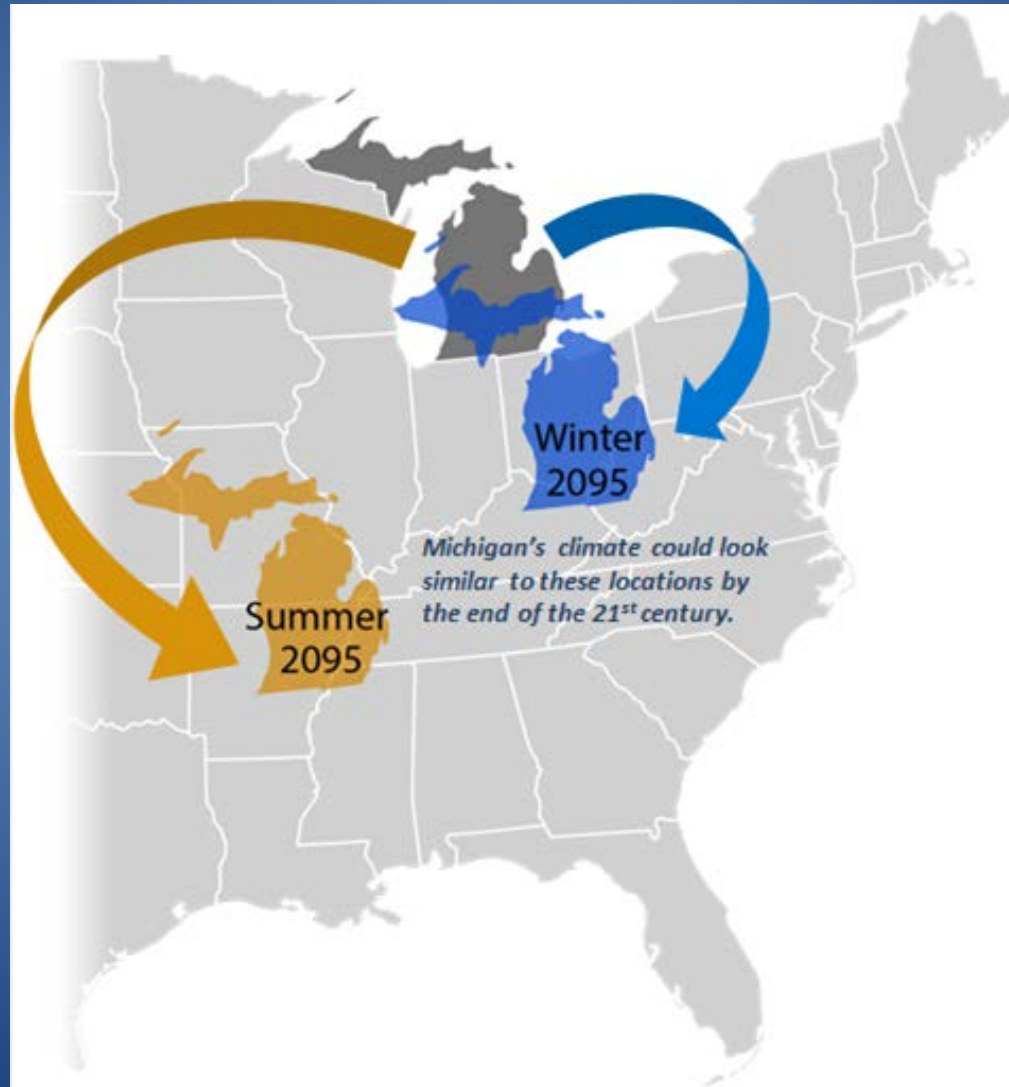
Great Lakes Climate is Changing

- Temperatures are rising, especially in winter. Winters have become milder and shorter.
- Warming winter temperatures increase ice and freezing rain
- Spring is arriving earlier.
- Frequency, intensity of severe storms are increasing.



Source; Edge of the Wilderness Scenic Byways

Climate Change in Context



Courtesy GLISA, 2105, modified from Hayhoe et al.



How Climate Change Affects Health

Climate Change is Bad for People

(adapted from Frumkin et al 2008, Luber et al 2014)

- **Extreme Weather Events**

- Heat waves, storms, floods, droughts, wild fires

- **health impacts:**

- Injuries, heat-related illnesses, death
- Worsening of chronic heart & lung conditions
- Anxiety, depression, mental stress
- Social disruption, housing displacement

- **Environmental Disruption**







- Degraded water & air quality
- Habitat changes

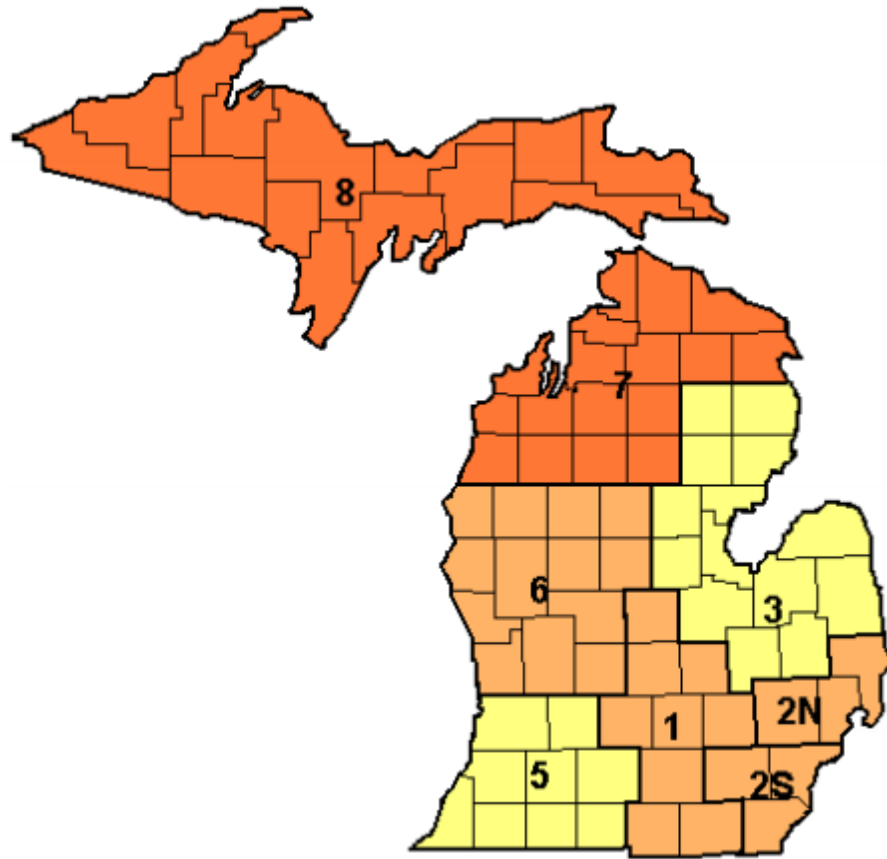
- **health impacts:**

- Vector-borne diseases
- Water- and food-borne diseases
- Asthma and allergic conditions



Priority Climate-Related Health Impacts

| Key Health Outcome | Biophysical Parameter Changes | Predicted Change |
|-----------------------------|--|---|
| Heat Morbidity, Mortality | More frequent, longer Heat Events; Warmer minimum temperatures |  |
| Respiratory Diseases | Air Pollutants increase with high temps; Pollen, Mold levels increase with longer growing season & more moisture |  |
| Injury, CO Poisoning | More frequent Ice Storms, Extreme Rain leading to more Power Outages & Cleanup; changes in other storm types unclear |   |
| Waterborne Diseases, Toxins | Algal blooms, other Flood-related contaminations more frequent |  |
| Vector borne Diseases | Impact on Mosquito & Tick lifecycle unclear |  |

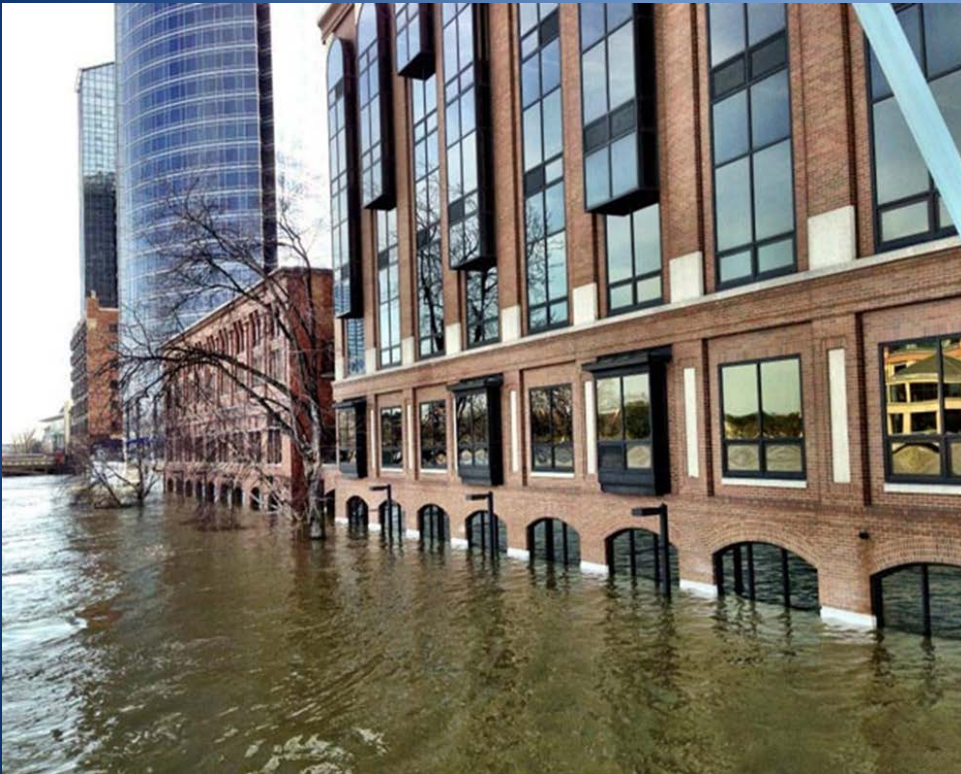


Extreme Heat Events Impacts on Health

Summary of Heat-Related
ED Visits by Region
(April 1 – August 31, 2013)

| Region | Heat-Related ED Visits | All ED Visit | Proportion of Heat-Related ED Visits | Distribution of Heat-Related ED Visits Across Regions |
|----------------|------------------------|--------------|--------------------------------------|---|
| 1 | 524 | 248,482 | 0.211% | 11.54% |
| 2N | 832 | 319,918 | 0.260% | 18.32% |
| 2S | 1124 | 503,790 | 0.047% | 24.75% |
| 3 | 438 | 221,386 | 0.198% | 9.65% |
| 5 | 384 | 205,490 | 0.187% | 8.46% |
| 6 | 847 | 299,551 | 0.283% | 18.65% |
| 7 | 271 | 84,011 | 0.323% | 5.97% |
| 8 | 121 | 39,798 | 0.304% | 2.66% |
| Michigan Total | 4541 | 1,922,426 | 0.236% | 100.0% |

Severe Storms: Floods, Snow/Ice



Downtown Grand Rapids, April 2013

Health Impacts

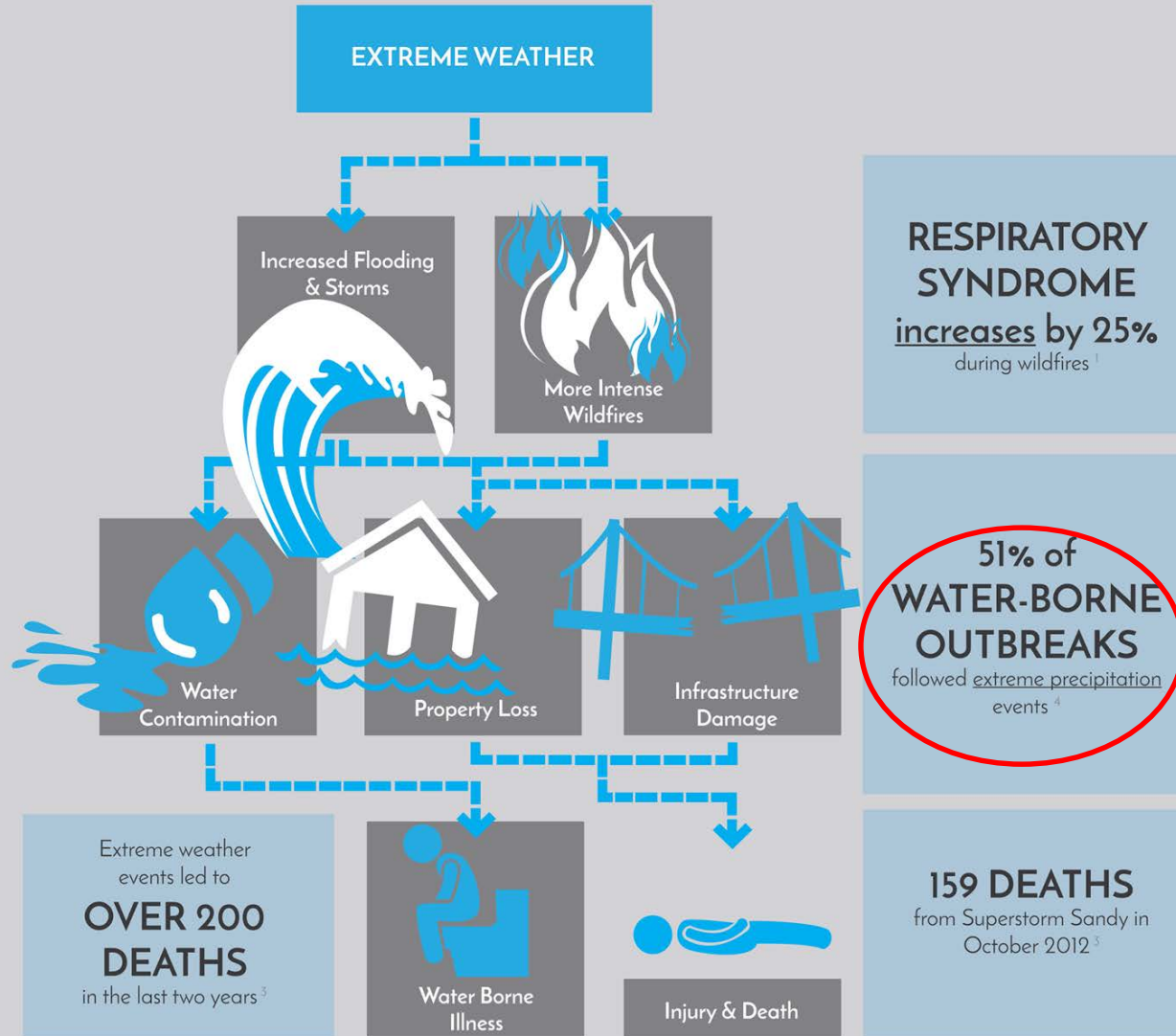
- Physical Injuries (drowning, accidents)
- Allergies (mold)
- Food and Water-borne Illnesses
- Displacement
- Mental Health Issues
- Interruption of Emergency Services
- Carbon Monoxide poisoning

Severe Storms 1996-2016 in Charlevoix & Emmet Counties & St. James Twp.

| | Number of Storms by County | |
|--------------------------------|----------------------------|-------|
| Storm Type | Charlevoix (St. James) | Emmet |
| Winter Storm (ice, snow, cold) | 129 | 112 |
| Thunderstorm w/ Excess Wind | 26 (2) | 25 |
| Hail | 27 (1) | 15 |
| Excess Rain, Flooding | 1 | 1 |
| High/Strong Winds | 10 | 13 |
| Tornado | 1 | 2 |
| Other | 4 | 5 |
| Total | 198 (3) | 173 |
| Average # storms/yr. | 9.4 (0.14) | 8.2 |

Data from the NOAA Storm Events Database: www.ncdc.noaa.gov/stormevents/

HOW CLIMATE CHANGE AFFECTS YOUR HEALTH



Potential Sources of Waterborne Disease Exposure

1. <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5721a2.htm>
2. <https://www.mnd.org/Wildfire/Threats-to-Wildlife/Global-Warming/Global-Warming-is-Causing-Extreme-Weather/Extreme-Weather-and-Climate-Justice.aspx>
3. <http://www.ncei.noaa.gov/data/events>
4. <http://ajph.apublications.org/doi/abs/10.2105/AJPH.91.8.1194>

Local Risk Factors for Waterborne Disease Exposure

| Exposure Source | Estimated no. housing units (2015) ^b | Charlevoix percent (1990) ^a | Michigan percent (1990) ^a |
|--|---|--|--------------------------------------|
| Private well | 9,743 | 56.0 | 57.6 |
| Septic system | 10,909 | 62.7 | 57.3 |
| Septic failures 2013 ^c | 139 | | |
| ‘Too Old’ Septic systems ^d | | 33.0 | |
| Watersheds w. human fecal contamination ^e | | | 100.0 |

- a. Percent calculated using data from the 1990 Census of Housing;
- b. Number calculated using (a) times number of 1995 Charlevoix housing units from Census Quick Facts;
- c. Number reported in **2012 Community Health Assessment**, NW Michigan Health Dept.;
- d. From **2016 Septic Question Project Report**, NW Michigan Health Dept. and Tip of the Mitt Watershed Council.
- e. **PNAS** Aug 18, 2015 vol. 112 (33):10419-10424.

Climate Change → Disrupted Ecosystems

Disruptions → New Opportunities for Diseases To Thrive



Ticks and Lyme Disease

- Lyme Disease first seen in Michigan in 1999
- Human disease incidence increasing
- Tick development, behavior affected by:
 - local temperature
 - precipitation
 - soil type
 - drainage
 - host species
 - land use/ vegetation

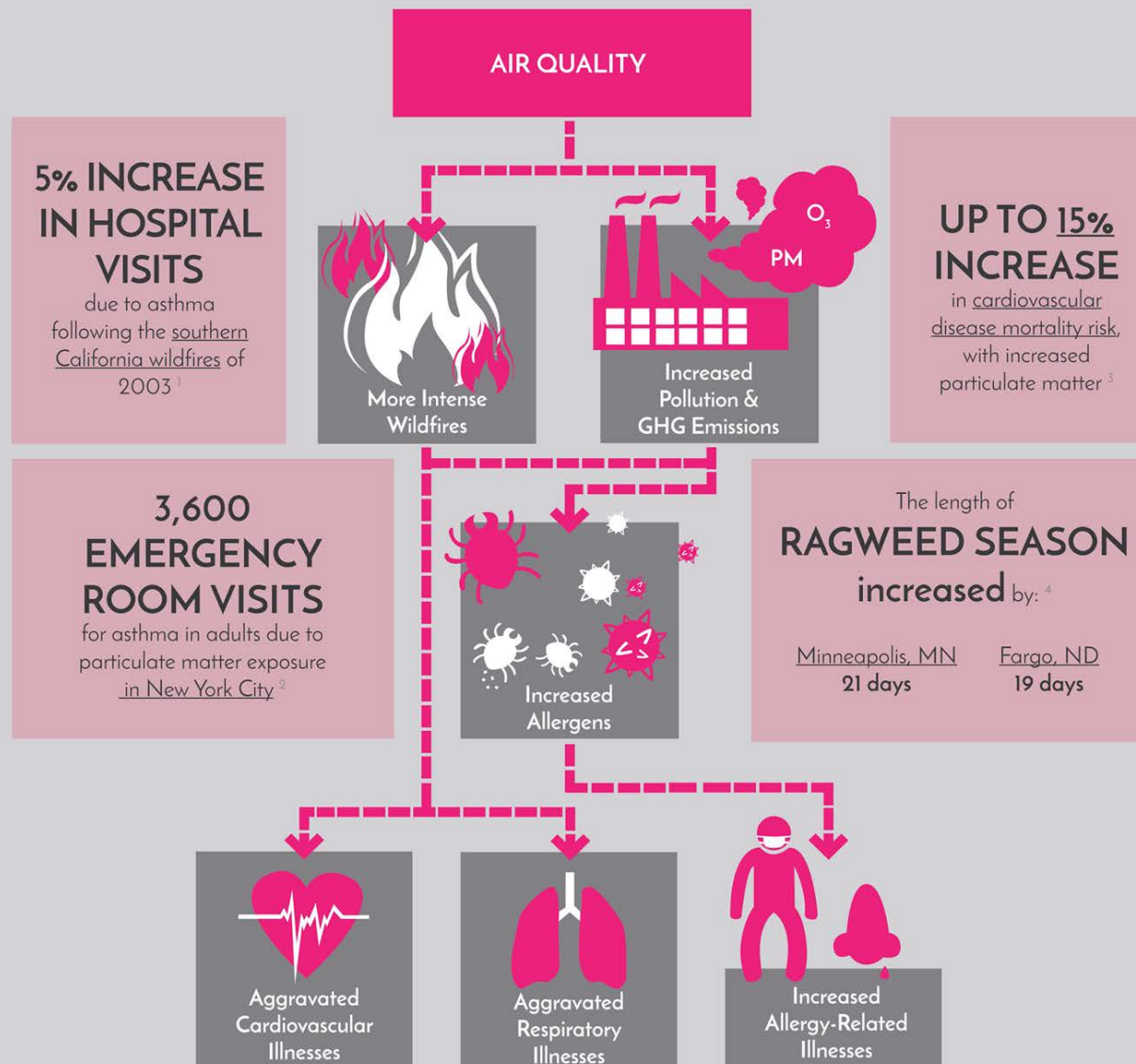


Ixodes scapularis, black legged tick

- Disease risk also related to:
 - outdoor activities
 - landscaping

- Blacklegged tick and Lyme disease endemic range, 2016.**

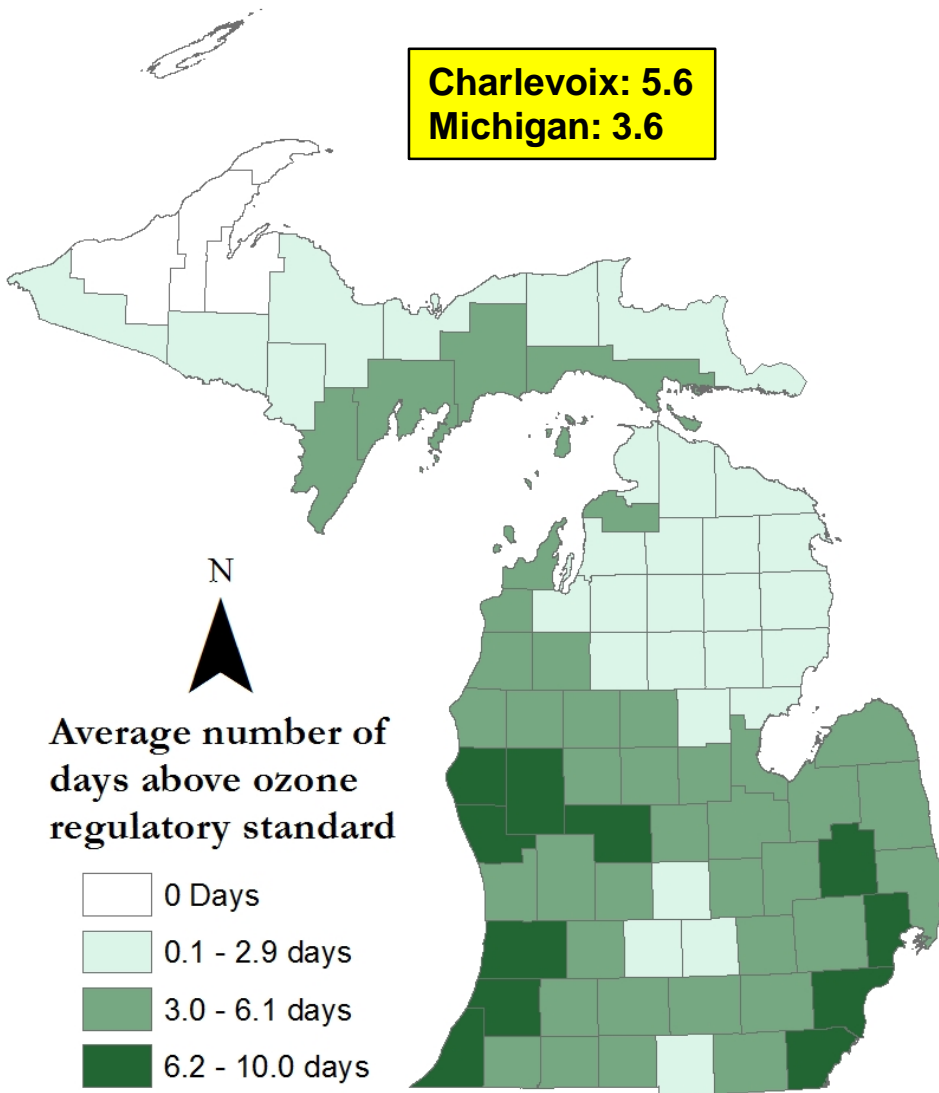
HOW CLIMATE CHANGE AFFECTS YOUR HEALTH



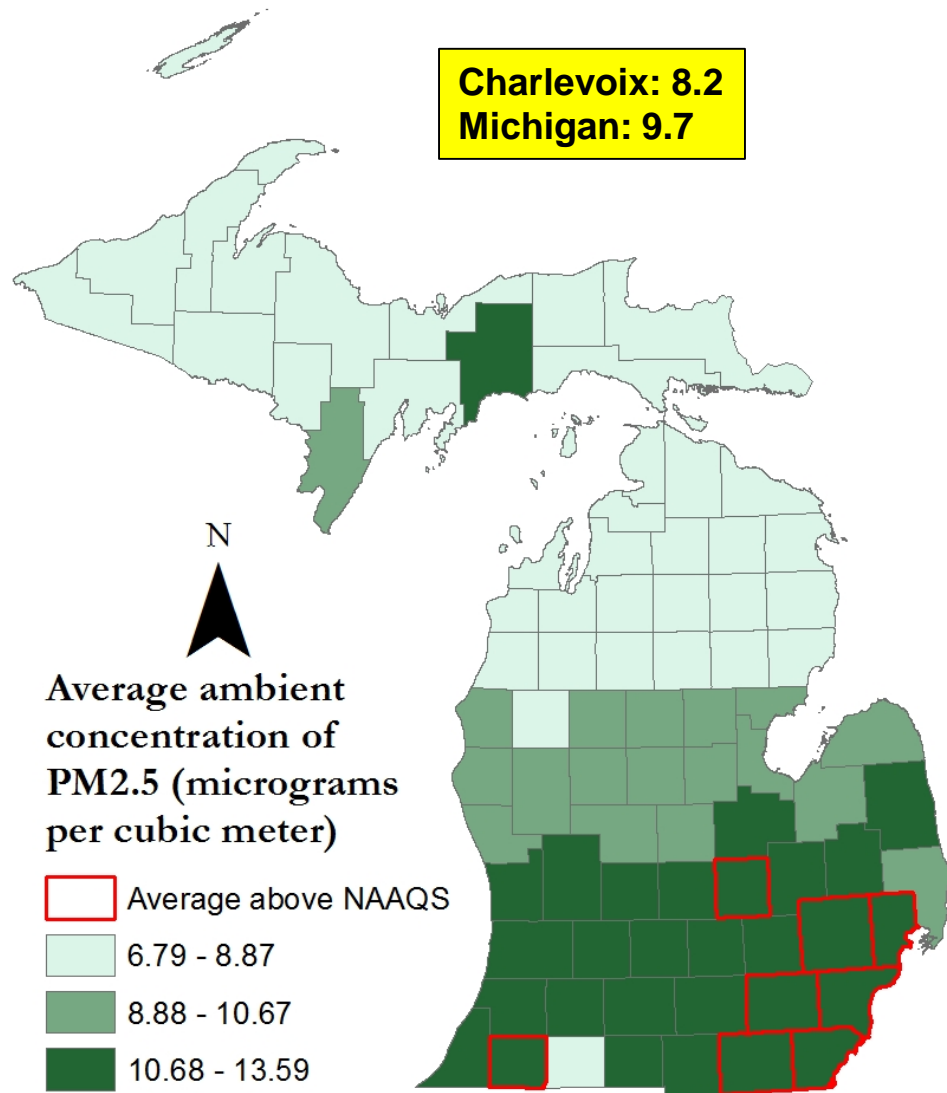
Climate Change Affects Air Pollutants

1. <http://www.ncbi.nlm.nih.gov/pubmed/16076944>
2. <http://www.nyc.gov/html/doh/downloads/pdf/cods/cods-air-quality-impact.pdf>
3. <http://ccs.ohspjournal.org/content/12/1/2131.full>
4. http://www.whitehouse.gov/sites/default/files/docs/the_health_impact_of_climate_change_on_americans_final.pdf

Distribution of Poor Air Quality by County

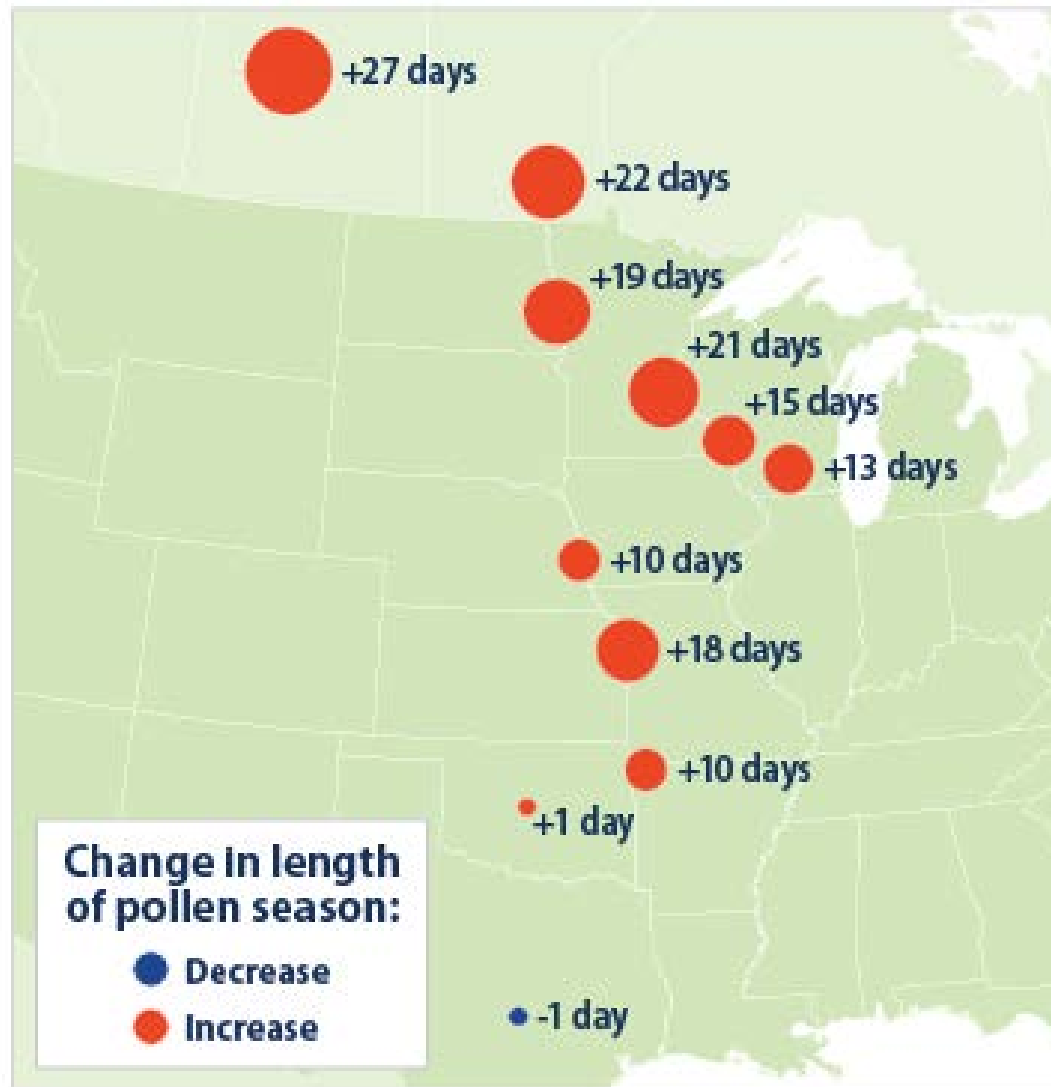


Source: Environmental Health Tracking Network (2005-2011)
 *Includes both counties with monitors and counties which values were mathematically modelled
 *Ozone regulatory standard changed from 80 ppb to 75 ppb in 2008



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 *Includes both counties with monitors and counties which values were mathematically modelled
 National Ambient Air Quality Standard = 12 micrograms PM2.5 per cubic meter

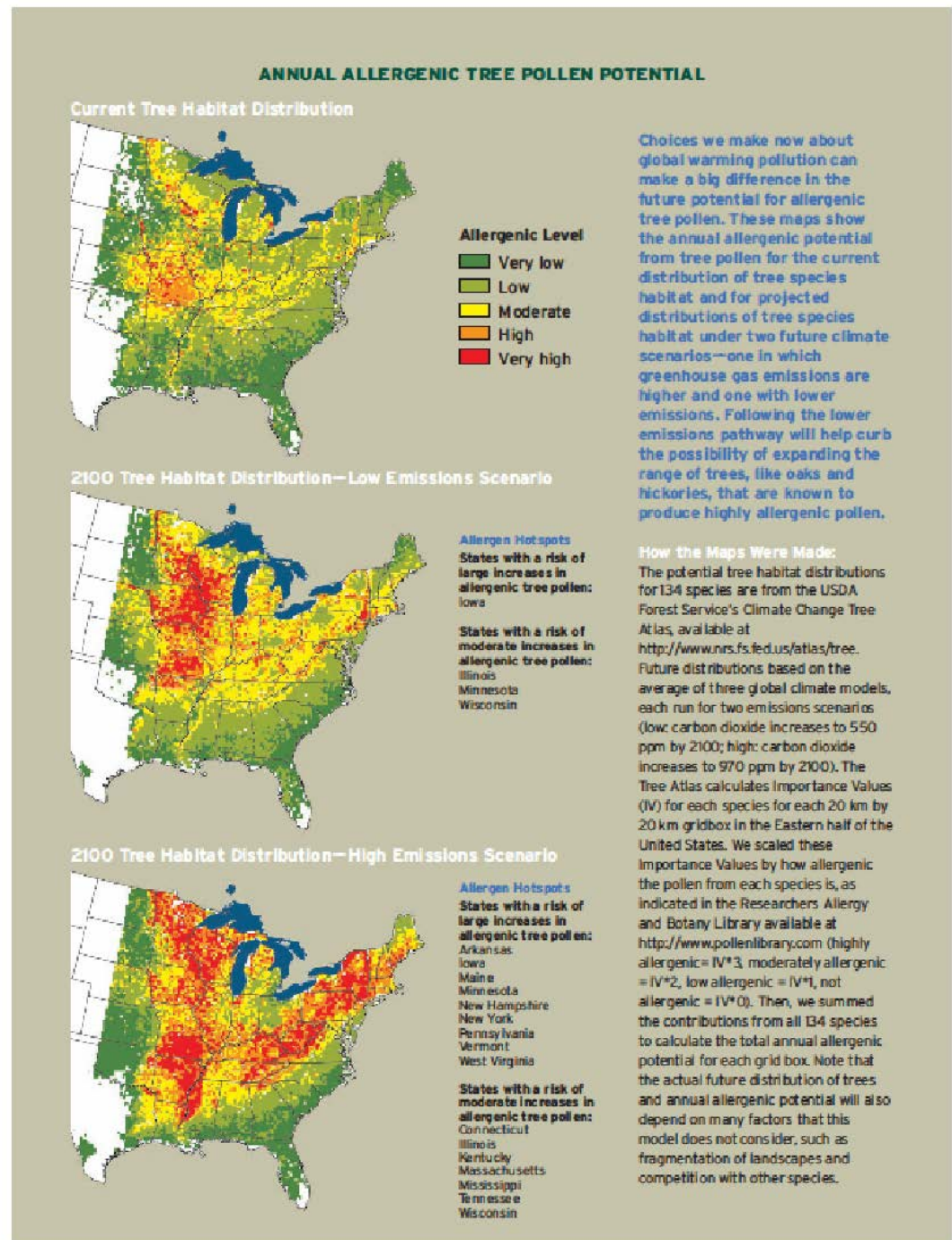
Change in Length of Ragweed Pollen Season, 1995–2013



Data source: Ziska et al., 2014

Example: Increased amounts of Tree Pollen in the air

Extreme Allergies and
Global Warming
NWF 2010





Climate Change Vulnerability

Who is affected by Climate Change?

Everyone is impacted; however, some more likely to be harmed than others.

Vulnerable People are:

- Elderly, or very young children
- Persons with pre-existing conditions
- Persons taking certain medications
- Socially isolated, homeless
- Low income
- Outdoor workers



Vulnerable People (Charlevoix)

| | Charlevoix | | Michigan |
|---------------------------|---------------|----------------|----------------|
| <u>Health Risk Factor</u> | <u>Number</u> | <u>Percent</u> | <u>Percent</u> |
| Age under 5 yrs | 1,233 | 4.7 | 5.8 |
| Age 65 + yrs | 5,799 | 22.1 | 15.8 |
| Non-white | 1,181 | 4.5 | 20.3 |
| In poverty | 3,306 | 12.6 | 16.2 |
| Adult smokers* | | 17 | 21 |
| Adult excessive drinking* | | 28 | 31 |
| Adult Obesity* | | 19 | 20 |

Data from Census Quick Facts 2015 estimates, and

* **2015 Community Health Assessment**, NW Michigan Health Dept. www.nwmich.org

Vulnerable People (Charlevoix)

| Chronic Health Conditions in Charlevoix County | | | | |
|--|--------------------------|---------------|-----------------|---------------|
| I. Self-Reported Conditions from the Behavioral Risk Factor Survey | | | | |
| | <u>Charlevoix County</u> | | <u>Michigan</u> | |
| | <u>rate %</u> | <u>95% CI</u> | <u>rate %</u> | <u>95% CI</u> |
| Disability | 23.6 | 19.9-28.6 | 23.7 | 23.0-24.3 |
| Asthma(Still) | 12.1 | 8.7-16.4 | 10.1 | 9.6-10.6 |
| Asthma(Ever) | 16.3 | 12.1-21.5 | 15.6 | 15.0-16.2 |
| Diabetes | 6.9 | 4.9-9.7 | 9.5 | 9.1-9.9 |
| Heart Attack | 6.7 | 4.5-9.7 | 4.6 | 4.3-4.9 |
| Angina or Coronary Heart Disease | 6.6 | 4.3-9.8 | 4.8 | 4.5-5.1 |
| Stroke | 3.8 | 2.2-6.3 | 2.8 | 2.6-3.0 |
| Any Cardiovascular Disease | 12.6 | 9.5-16.7 | 8.9 | 8.6-9.3 |
| Obesity | 27.3 | 22.2-33.0 | 30.9 | 30.1-31.6 |
| Arthritis | 35.5 | 28.3-43.6 | 31.5 | 30.5-32.5 |

All data from the 2008-2010 Combined Michigan BRFs Regional and Local Health Department Estimates

Vulnerable Places

Higher risk of Exposure

Geographic

Urban/Rural/Farm

Topography/Flood Plain

Storm Frequency/Projections

Infrastructural

Septic Systems

Combined Sewers

Housing

Private Wells

Green space/Trees

Heavy traffic exhaust



How Do We Respond to Protect Human Health?

Public Health Strategies

Mitigation: Reduce, Prevent Carbon Emissions

- Reduce energy consumption
- Use fossil fuel alternatives
- Reduce fossil fuel combustion
- Control emissions

Adaptation: Actions that Moderate Harm

- Monitor conditions, inform the public
- Community, infrastructure planning
- Emergency preparedness



Climate Change Response Has Co-Benefits

- ***Co-Benefits***: actions that benefit the community regardless of future climate changes.
- Examples:
 - Increase energy efficiency/ save money
 - Promote walking, biking / improve fitness
 - Improve greenspaces / more desirable community
 - Build rain gardens / less mosquitoes
- Characteristics of ***Resilient Communities***



For further information:

APHA Climate Change

www.apha.org/topics-and-issues/climate-change

CDC Climate and Health Program

www.cdc.gov/climateandhealth/

National Climate Assessment

<http://nca2014.globalchange.gov/>

<https://health2016.globalchange.gov/>

Contact Us: CameronL@michigan.gov

www.Michigan.gov/climateandhealth