What Is the Deadliest Animal in the World?

Ask students this question, and you will likely get many responses. Write the answers on the board to categorize responses and lead your students to the correct answer.

Students often list large animals, such as great white sharks, tigers, bears, alligators and hippos. If you tell them that the answer is a smaller animal, they may mention snakes, blue-ringed octopuses or box jellies. If you let them know that the animal is even smaller, they might come up with spiders, ticks or even mosquitoes.

Sometimes the students will mention viruses, bacteria or plants. Although these can also be very deadly, this is a good opportunity to discuss the characteristics of a true animal.

The activity can be a Thought Toss. Students toss an object or toy and give an answer when they catch it (suggestion: a stuffed mosquito). Some classes guess right away that the answer must be "mosquito" since they are tossing one, but others take longer to catch on.

When you are ready for the Big Reveal, whether or not your students got the correct answer, the Gates Foundation *Gates Notes* blog has a good set of resources:
http://www.gatesnotes.com/Health/Most-Lethal-Animal-Mosquito-Week

***Gates Notes* Resources:**

- Graphic of *World's Deadliest Animals: Number of People Killed by Animals per Year* shows that the mosquito is the "deadliest animal." (Note: The graph states that humans kill other humans at a rate of 475,000 per year. It includes citations, but is not clear whether this statistic counts deaths by murder, wars, accidents or other causes.)
- Short video clip about Mosquito Week.
- Three additional short video clips: *What Malaria Feels Like*, *Defeating Dengue* and *Outsmarting Mosquitoes*.

Exit Ticket Ideas:

- Why is the mosquito the deadliest animal in the world?
- Why do you think it is so hard to control mosquitoes? What do you think humans could do to control mosquitoes?
- Do you think we could ever completely eradicate mosquitoes from Earth? Would this be a good idea? Why or why not?

Introduction to Climate Change: It's Not Just Global Warming
Teacher Notes

This activity is designed to follow *Deadliest Animal in the World*. Students can complete this activity in the same class period. The questions can be assigned for homework if time runs out.

Michio Kaku Interview, *CBS News* (video clip)
Watch the 11/2/2012 interview with Professor Michio Kaku on *CBS News* about Hurricane Sandy and climate change. **http://www.cbsnews.com/video/watch/?id=50134386n**

Interview Transcript
A transcript can help students answer questions without showing the video more than once.

Student Questions (activity sheet)
Students can answer guided questions on the activity sheet. Discuss the questions with your class. Focus on the answer to #5. Students should have heard Professor Kaku mention the northward spread of tropical diseases.

Exit Ticket Idea
What is the connection between *Deadliest Animal in the World*, Professor Kaku's discussion, and you?

Background Information

- **Global Warming and the Greenhouse Effect (*Explorer* version)**
  Explorer level material is designed for middle school or introductory level high school life science classrooms.
- **Greenhouse Gases (*Investigator* version)**
  Investigator level material is intended for standard or honors level high school biology as well as AP Biology.

Museum Traveling Exhibit Panels

- **Introduction: Climate Change and Insect-Borne Disease**
- **Climate Change and Patterns of Disease**

CBS News: Hurricane Sandy and Calculating Climate Change
November 2, 2012

http://www.cbsnews.com/video/watch/?id=50134386n

Guest: Michio Kaku, Professor of Physics, City University of New York (a world-renowned theoretical physicist and climate change expert, and author of *Physics of the Future*)

Anchors: Charlie Rose, Gayle King

ROSE: Hurricane Sandy is restarting all over the debate about climate change and its effects on the weather. With us now is Professor Michio Kaku of City University of New York. He is a world-renowned theoretical physicist and a climate change expert. His book *Physics of the Future* was a New York Times Best Seller. Welcome, Professor. Good morning.

KAKU: Glad to be on.

ROSE: So here's the question: Is there a connection between global warming and Hurricane Sandy?

KAKU: There is a connection, but there's no smoking gun. You can't say, "Aha, there is a direct link between Sandy and global warming." However, the energy that the earth receives from the sun—the energy that drives Hurricane Sandy—is going to be increased by global warming. The waters of the Caribbean and the Gulf of Mexico, which is the energy source of hurricanes, is 5 degrees Fahrenheit (5°F) higher than normal in certain areas. And that's the energy source driving global warming and driving hurricanes.

ROSE: So therefore, global warming **is** responsible for the increasing frequency of bad hurricanes but not necessarily for everyone.

KAKU: That's right, on average. OK, also realize that sea levels have risen about a foot in a century, and that means that storm surges could become much more ferocious because of that fact. Now, global warming is a misnomer. It's not really a uniform warming of the earth. It's global swings, in other words, the "weather on steroids." So think of 100-year forest fires, 100-year droughts, 100-year floods, 100-year hurricanes. That could be a new way of life in the future, because there's more energy circulating in the atmosphere.

KING: You say, professor, that this is really so much bigger than a hurricane, than a storm. You think it's much bigger than that.

KAKU: It's bigger because it was caused by the collision of three large air masses. We had a normal hurricane that collided with the jet stream which normally goes maybe to Kansas. It went all the way down to Florida, and so the irregularity of cold air from the Arctic and warm air from the Caribbean area, hotter than normal. The collision of those two morphed into an animal that we have never seen before: this hybrid storm, which then became the "Hurricane from Hell."

KING: It is a trend? Can we use the word trend?

KAKU: It could be a trend. In other words, the take away factor from this interview could be that we could be seeing a new way of life. We might have to get used to the fact that glaciers are receding, that the North polar region is shrinking and thinning, that summers are getting longer, that tropical diseases are spreading north, and that we could have more energized monster storms by the warming of the Caribbean and the Gulf.

ROSE: As you know, Mayor Bloomberg stepped forward and endorsed President Obama because he raised the question that the impact of Hurricane Sandy had put in stark and very clear of what the choices were coming up in this political campaign. Tell me what you think the political questions are about this.

KAKU: Well, whether you are for Romney or Obama, I think it should be on the national agenda. This is an issue that is of national importance. There could be other weird hurricanes waiting to happen, and we don't need another monster hurricane.

ROSE: Can we prepare for them?

KAKU: Well, in the short term we can start to think about sea walls and other factors that the Europeans are already undergoing. The city of Venice, the city of London—many great European cities are already making certain kinds of short-term fixes. Long term, we have to think about renewable energy sources and perhaps driving down the costs.

ROSE: It is my impression—I do have this impression—you correct me or not, that you have changed your mind about global warming?

KAKU: That is right. I used to be a skeptic.

KING: That you were a skeptic—that surprises me.

KAKU: I used to say, come on, the earth is so big and we are so small, but then you look at the indicators, the fact that all the glaciers are receding. We have wacky weather. We have 100-year storms that are now the "new norm," and we have to realize the trends are all in one direction. There is no trend in the other direction. All trends are in the direction of the heating of the earth, the energizing of the atmosphere, which provides the energy of hurricanes.

ROSE: And what percentage of respected scientists believe as you do now? What's the percentage of scientific opinion about what you just said?

KAKU: I think it's near unanimous. You really have to hunt very carefully for any kind of skeptic. Most of the skeptics just like myself have changed their opinion and now realize that it's a real tangible effect. We are completing the dots, even though there's no "aha!" moment where you can say this one storm is caused by global warming.

Name ____________________________________ Class ________________________ Date ____________

Student Questions

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6. List one short-term and one long-term solution to global warming:

Short-term:

Long-term:

7. Professor Kaku uses the term “global warming” more often than “climate change.” Do you think that “global warming” is a good description of the current climate situation? Why or why not?

8. Professor Kaku was once skeptical about climate change. Why?

9. What is his opinion now? Why did he change his mind?

10. How many other respected scientists does he say now support the evidence of climate change?

Global Warming and the Greenhouse Effect

Perhaps you have heard of the greenhouse effect. In a greenhouse, sunlight comes in through the glass and warms everything inside. The heat that radiates from the inside surfaces cannot pass back out through the glass very easily. Heat builds inside the greenhouse because of this captured energy from the sun.

Certain gases in Earth's atmosphere—especially water vapor and carbon dioxide—are like the glass in a greenhouse. We call this the greenhouse effect, and we call these gases greenhouse gases, because they trap some of the heat that rises from Earth's surface when it's heated up by sunlight. Our atmosphere is like an invisible but warming blanket. Most greenhouse gases occur naturally, but some are added to our atmosphere by human actions.

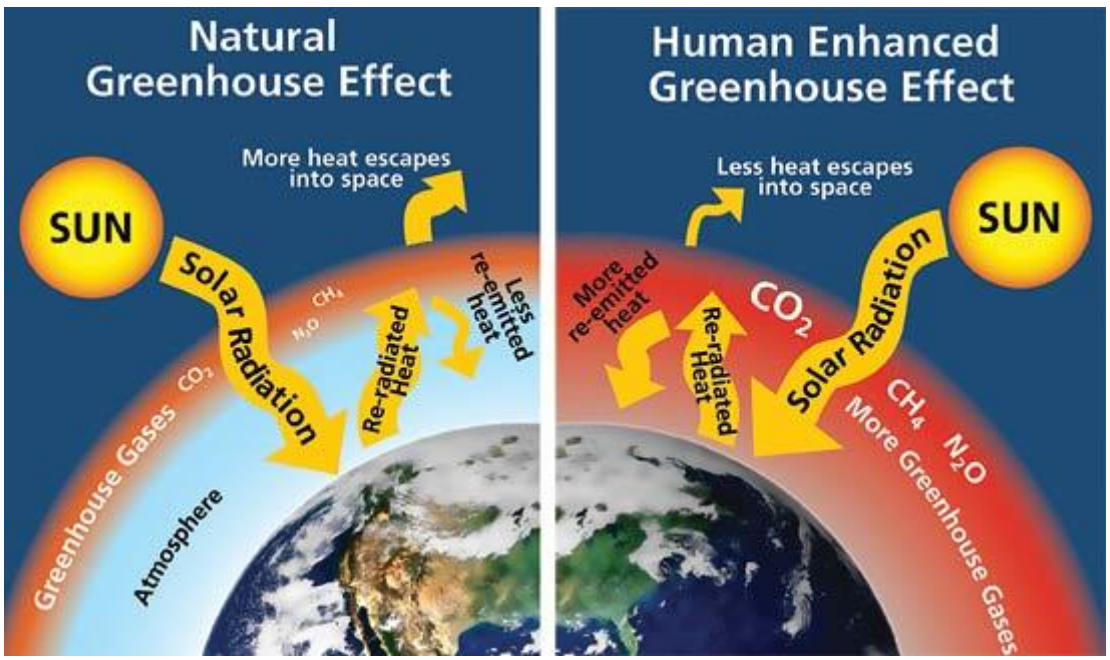


Image by Will Elder, National Park Service

Global warming refers to the rise in average temperatures at Earth's surface and lower atmosphere over the last century. Most scientists believe that greenhouse gases produced by human activity are contributing to global warming. The danger in this warming is that it could alter Earth's climate patterns, increase coastal flooding, and force major changes in the way people live. The more we can learn about global warming, the better prepared we may be to deal with the possible consequences of a changing environment.

Greenhouse Gases

Animals, plants, and most other life forms can live on Earth because we have an atmosphere, a layer of gases that surrounds Earth, held in place by the force of gravity. Most—99.9%—of our "dry atmosphere" (not including water vapor) is composed of just three gases: nitrogen (78.1%), oxygen (O_2, 20.9%) and argon (0.9%). The remaining one-tenth of one percent includes an assortment of other gases. Carbon dioxide (CO_2) is the most plentiful at 0.04%, or 400 ppm (parts per million).

The gases in our atmosphere are colorless and for the most part odorless, but only the larger molecules trap heat. Carbon dioxide and other gases with three or more atoms per molecule (a molecule of CO_2 has one carbon atom and two oxygen atoms) are known as "greenhouse gases."

Our atmosphere lets most of the sun's energy pass through to the surface. Some of this energy is absorbed and the surface of Earth becomes warmer.

This heat would all radiate back into space if we didn't have an atmosphere. But because we do, the greenhouse gases trap some of this re-radiated heat energy like the glass panels of a greenhouse, not letting it escape back into space.

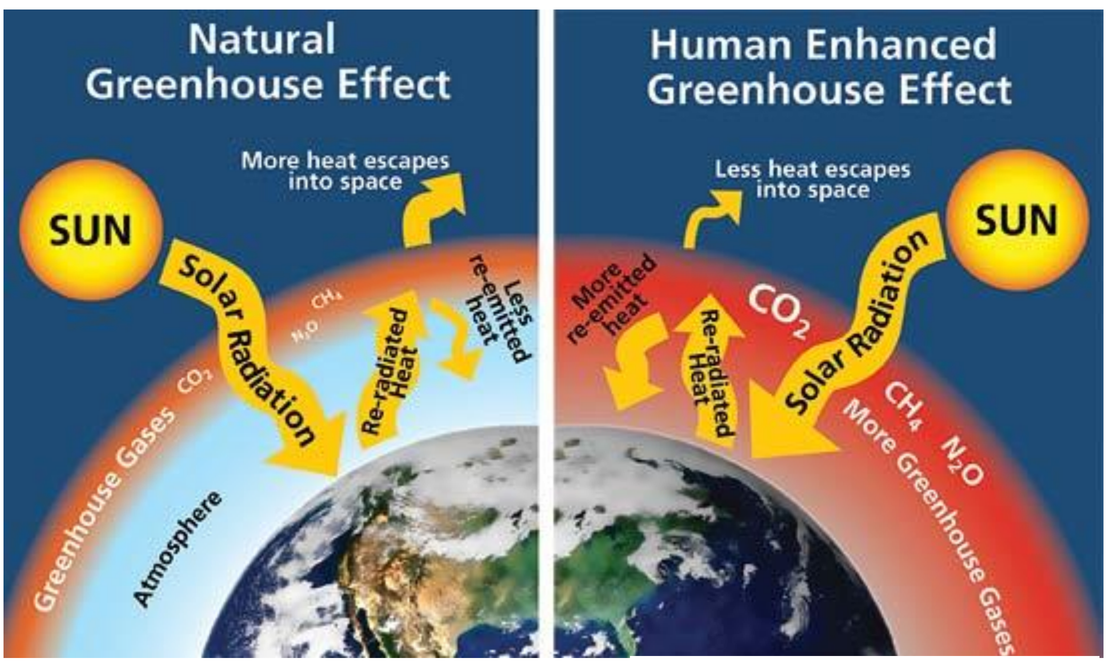


Image by Will Elder, National Park Service

The Issue

Life as we know it today actually depends on these greenhouse gases—without them, temperatures on Earth would be well below freezing all the time! But too much of a good thing can be dangerous. Human activities over the last 150 years, particularly our practice of burning fossil fuels (coal, oil, gasoline, and others) to provide most of the world's energy, have led to rapid increases in the amount of atmospheric CO_2, methane, and nitrous oxide. In that same period we have experienced a significant rise in average global surface temperature.

Most scientists agree that the rapid rise in greenhouse gases has contributed to the rise in temperature. Higher temperatures on Earth mean melting ice and rising sea levels. But temperature is also a major factor in both weather (short-term, mostly local, events like hurricanes and other storms) and climate (long-term conditions that describe a region, like "hot and dry"), and we don't yet know what the consequences of higher temperatures will be.

Some regions that were already hot and dry seem to be getting even drier. It could also be that major storms are happening more often, and hitting harder, in certain parts of the world because of the rise in global temperature. As scientist Jane Lubchenco said in 1998, "Humans have unwittingly embarked upon a grand experiment with our planet. The outcome of this experiment is unknown, but has profound implications for all of life on Earth."

Greenhouse Gases

Carbon dioxide (CO_2) is considered the major driver of increasing temperature, since at 400 ppm there is so much more of it in the atmosphere than any greenhouse gas other than water vapor. Aside from the burning of fossil fuels, CO_2 is generated in huge quantities every day by cellular respiration in plants, animals, and other living things, including soil microorganisms, but a nearly equal amount is used by plants during photosynthesis.

Widespread deforestation leads to more CO_2 in the atmosphere, not only when trees are burned to clear land, but also because fewer trees use CO_2 in photosynthesis, leaving more CO_2 in the atmosphere. Volcanoes are another source of CO_2, but minor compared to what humans produce each year. Finally, the oceans can absorb some of the excess CO_2 that humans produce, but not nearly all of it.

Methane (CH_4) is another greenhouse gas that is a by-product of fossil fuel use (mostly natural gas), but there is currently less than 2 ppm (*much* less than CO_2) in the atmosphere. Believe it or not, in the United States the most significant source of methane is cow burps, considered a human-caused gas emission because we breed and raise so many cattle! And even though a molecule of methane is at least 30 times better at trapping heat than a CO_2 molecule, CO_2 is a more important greenhouse gas because there is so much more of it in the atmosphere.

Nitrous oxide (N_2O) is the other greenhouse gas you are most likely to hear about. Humans add it to the atmosphere when we manage and fertilize our agricultural soil in certain ways *and* when we burn fossil fuels. Nitrous oxide is even better than methane at trapping heat, but with only about 0.3 ppm in the atmosphere it contributes less to the greenhouse effect than CO_2.

Water vapor (H_2O) is another contributor. The atmosphere contains about 10 times more water vapor than CO_2 when the whole atmosphere is considered. Up to 100 times more occurs in certain areas near Earth's surface, like over tropical oceans. The water molecule is also much better than CO_2 at trapping heat. Therefore, you could say truthfully that water vapor is the dominant greenhouse gas. However, human activities don't have much to do directly with the amount of water vapor in the atmosphere, and scientists generally agree that water vapor is not driving the rise in global temperature.

Although it may not drive the rise in global temperature, water vapor is still intimately involved. As CO_2 drives the temperature up, the amount of water vapor in the air also increases, because warmer air can absorb more water. This leads to even higher temperatures.

Climate Change and Insect-Borne Diseases

As average global temperatures rise, insects are migrating into areas that were once too cold for them to live. As they move, they can carry pathogens and diseases into new geographical areas. Climate change is only one reason that diseases transmitted by insects can shift. Other contributing factors include local weather patterns, global trade, human travel, and changes in land use.

Acknowledgments:

This exhibition was made possible through the generous support of a Science Education Partnership Award (SEPA R25OD011112) from the National Institutes of Health.

The Centers for Disease Control and Prevention (CDC) and the National Oceanic and Atmospheric Administration (NOAA) have provided much of the information. Theodore G. Andreadis at the Connecticut Agricultural Experiment Station has contributed research materials and expertise.

For information about the accompanying Science, Technology, Engineering and Mathematics (STEM) life science curriculum for grades 7–12, please visit this website:
www.peabody.yale.edu/pfvector-resources

SEPA SCIENCE EDUCATION PARTNERSHIP AWARD
Supported by the National Institutes of Health

Yale PEABODY MUSEUM OF NATURAL HISTORY

Climate Change and Patterns of Disease

Global climate has changed dramatically over the past 150 years. The primary cause: human-associated activity, particularly the burning of fossil fuels. This raises carbon dioxide (CO_2) levels in the atmosphere and leads to higher average global temperatures and extreme weather events. Increasingly, climate change is affecting how diseases spread, especially those transmitted by insects.

Other factors that affect the spread of insect-borne diseases include seasonal weather patterns, global trade and travel, and socioeconomic conditions.

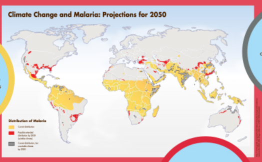
Climate Change—It's Not Just Global Warming

As average global temperatures rise, mosquitoes can spread into new areas that were previously too cold.

Extreme rain events can increase populations of mosquitoes in areas where they already live.

Although drought reduces mosquito populations, water storage in uncovered containers provides new habitats.

Yellow areas represent current distribution of the malarial parasite *Plasmodium falciparum* and the *Anopheles* mosquito that transmits it.



Dark Gray areas are projected to have fewer cases of malaria as higher temperature and drought reduce mosquito habitats.

Currently, malaria is widespread in parts of Central and South America, Africa, and Southeast Asia. The map projects changes in the distribution of malaria by the year 2050, based on climate change models.

Red represents new areas predicted to have a climate suitable for the spread malaria. **Yellow** areas will remain suitable.

Deadliest Animal in the World

Mosquitoes account for nearly 750,000 deaths per year from infectious diseases such as malaria, yellow fever, and dengue.

Anopheles mosquitoes can transmit the malarial parasite *Plasmodium falciparum.*

The Toll of Malaria

Malaria alone kills more than 600,000 people every year and causes devastating illness in another 200 million people.

Children sleeping under a bed net

Better public health infrastructure in the United States and other developed countries will minimize malaria transmission, even if the climate becomes more suitable for the disease. Insect-borne diseases have decreased in developed countries because of advances in sanitation, insect surveillance and control, vaccinations, and disease prevention and treatment.

Consequences of these climate changes will be felt more greatly in tropical areas of the developing world, where insect-borne diseases such as malaria continue to threaten half the world's population. Problems with social and medical infrastructure permit greater risk of disease transmission. Climate change will complicate and intensify these global health issues.

SEPA SCIENCE EDUCATION PARTNERSHIP AWARD
Supported by the National Institutes of Health

Yale PEABODY MUSEUM OF NATURAL HISTORY

Name ________________________________ Class _____________________ Date ___________

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Station 1

Global Temperature and Human Activities

Graphs #1 and #2 – Carbon Dioxide Variations

1. Do you observe a change in CO_2 concentrations in Earth's atmosphere over time? Explain your evidence and specify years.
   - Brainstorm some human activities that might be sources of CO_2 emissions.
   - Brainstorm some natural sources of CO_2 emissions.

Graphs #3 and #4 – Temperature and Carbon Dioxide Variations

2. Since 1958, how have scientists measured current CO_2 levels and temperature of Earth? Describe this method.

3. How do scientists know what the CO_2 levels and temperature of Earth were hundreds of thousands of years ago? Describe this method.

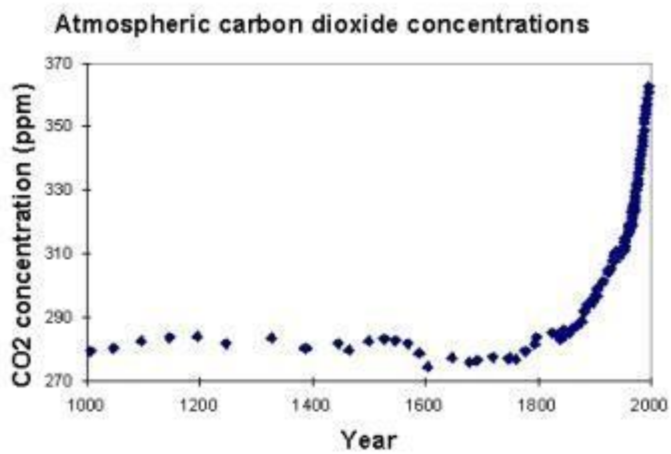
4. Do you observe a correlation between CO_2 levels and global average temperature? Explain your evidence.

Station 1: Graphs #1 and #2

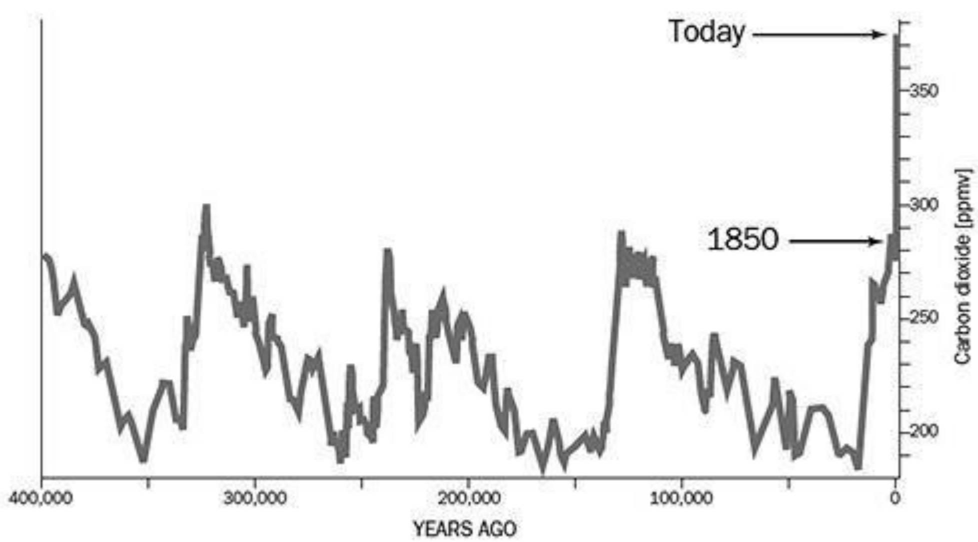
Global Temperature and Human Activities

Carbon Dioxide Variations

ATMOSPHERIC CO_2 LEVELS DURING THE PAST 1,000 YEARS



ATMOSPHERIC CO_2 LEVELS DURING THE PAST 400,000 YEARS



Commonwealth Scientific and Industrial Research Organisation (CSIRO) of Australia

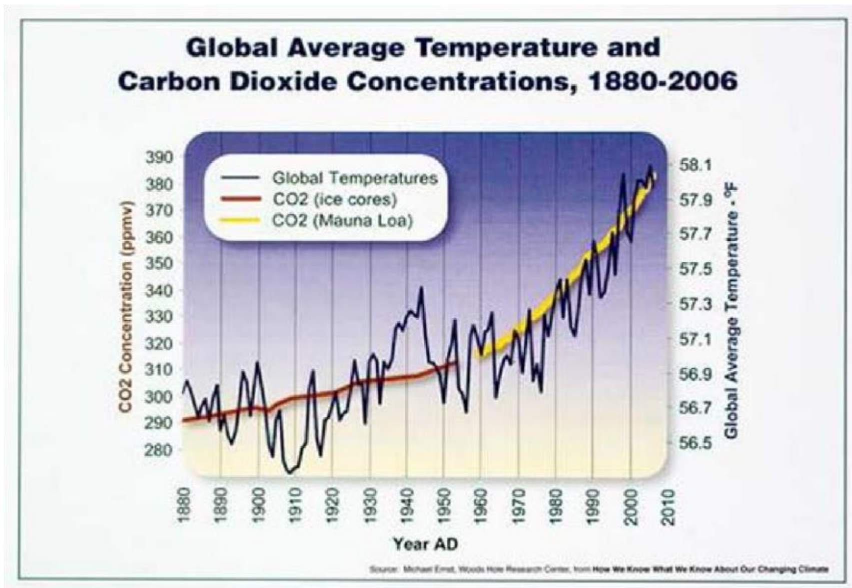
http://ramblingsdc.net/Australia/Greenhouse.html

Station 1: Graphs #3 and #4

Global Temperature and Human Activities

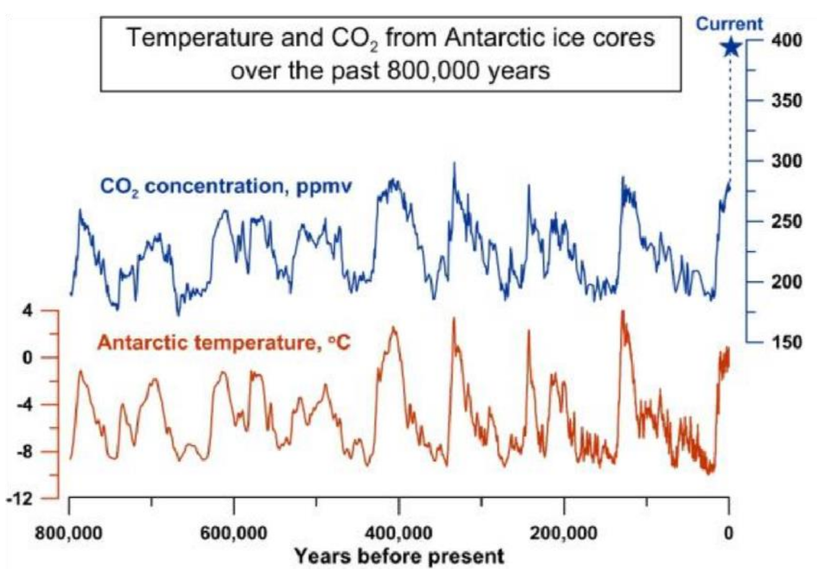
Temperature and Carbon Dioxide Variations

TEMPERATURE AND CO_2 LEVELS, 1880-2006



Graphic Design: Michael Ernst, Woods Hole Research Center
http://whrc.org/publications-data/understanding-climate-change-a-primer/

TEMPERATURE AND CO_2 LEVELS DURING THE PAST 800,000 YEARS



National Academy of Science and The Royal Society (2014). ***Climate Change: Evidence and Choices.***
http://www.nap.edu/openbook.php?record_id=18730

Station 2

Geographic Distribution of Vector-Borne Diseases

Graph #1 – Dengue Fever: Average Annual Number of Cases and Countries Reporting

1. How has dengue fever incidence changed since 1960? Discuss number of cases and number of countries reporting.

Map #1 – Emergence of Dengue Fever

2. Dengue fever incidence and distribution increased in some areas after 1960.
   - What climate factors do these areas have in common?

   - Brainstorm other factors that may have contributed to this change in distribution.

Map #2 – Climate Change and Malaria

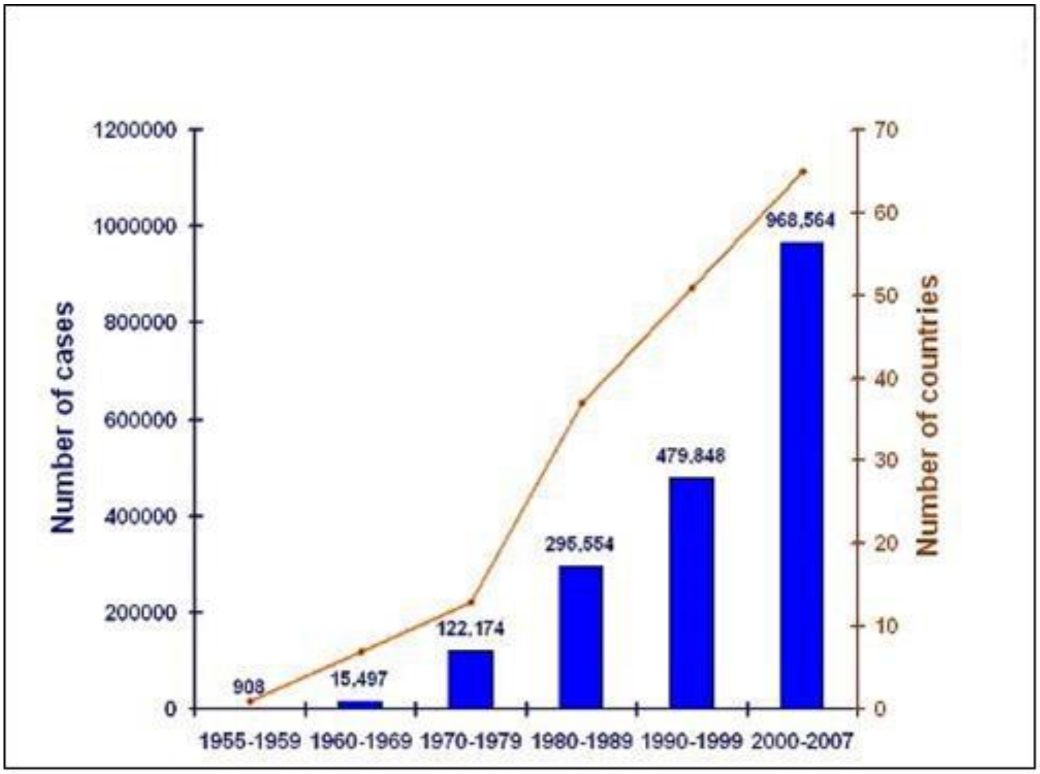
3. Mosquitoes and malaria protozoans thrive in a specific climate.
   - What do the yellow and red areas represent?

   - Brainstorm some climate factors that could contribute to this future change in distribution.

Station 2: Graph #1

Geographic Distribution of Vector-Borne Diseases

Dengue Fever:
Average Annual Number of Cases and Countries Reporting

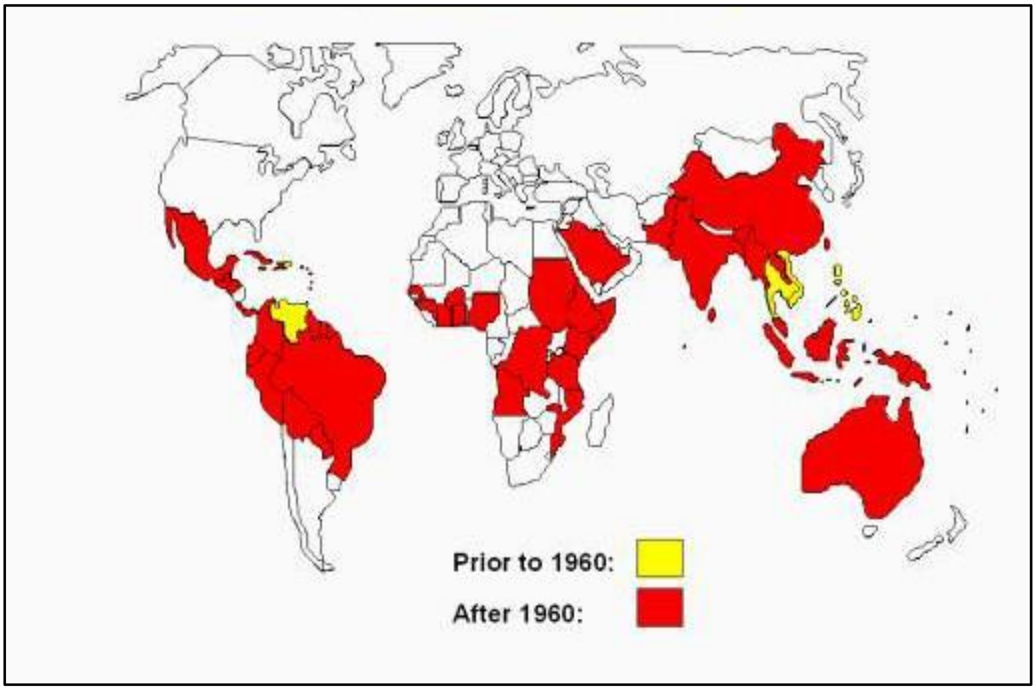


World Health Organization (WHO)
http://www.who.int/csr/disease/dengue/impact/en/index.html

Station 2: Map #1

Geographic Distribution of Vector-Borne Diseases

Emergence of Dengue Fever

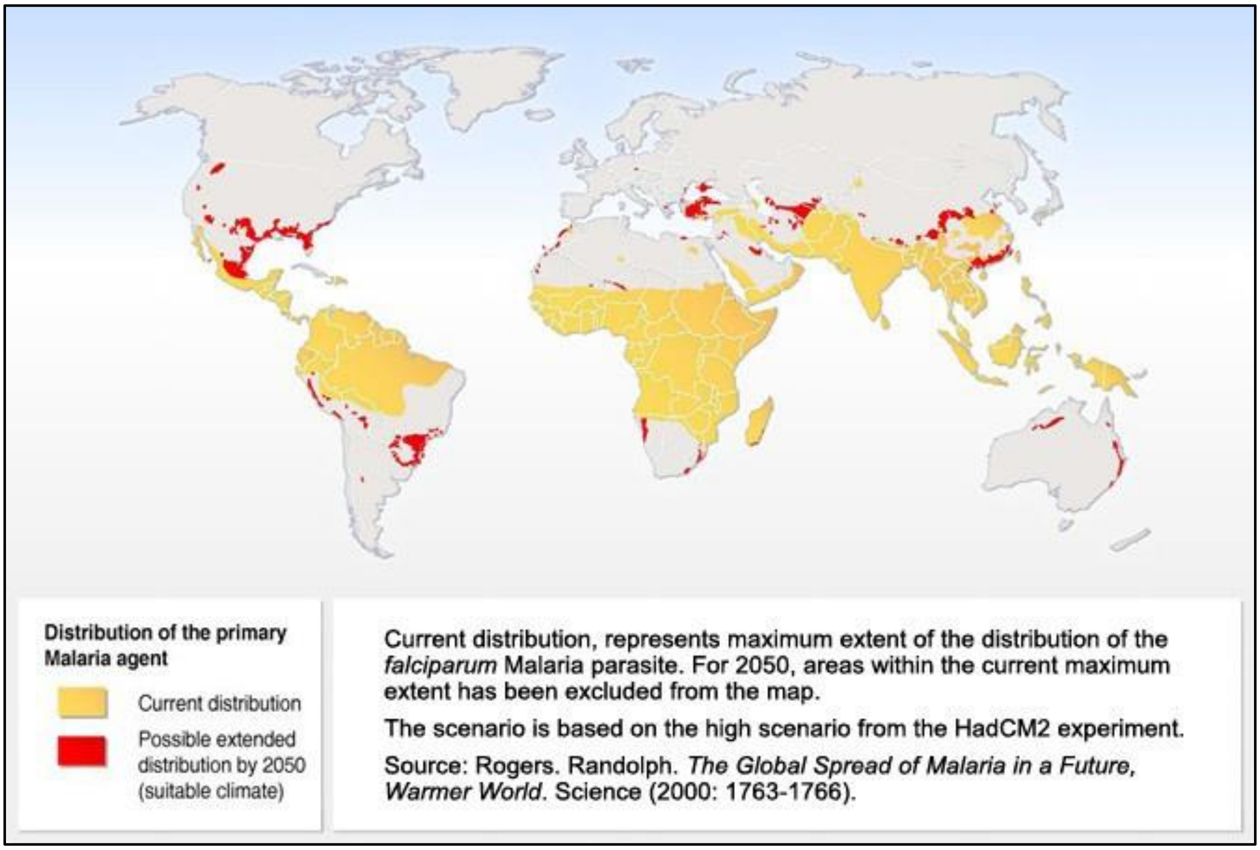


World Health Organization (WHO)
http://www.who.int/csr/disease/dengue/impact/en/index.html

Station 2: Map #2

Geographic Distribution of Vector-Borne Diseases

Climate Change and Malaria



Hugo Ahlenius, UNEP/GRID-Arendal
http://www.grida.no/graphicslib/detail/climate-change-and-malaria-scenario-for-2050_bffe

Station 3

Climate Parameters and West Nile Virus

Map #1 – West Nile Virus Incidence

1. In 2012, two large regions of the U.S. had a high incidence of West Nile virus. Explain how the map shows this incidence for the following geographic areas:
    - Texas, Louisiana and Mississippi
    - North Dakota, South Dakota and Nebraska

Map #2 – Precipitation Maps

2. What do you observe about precipitation during early spring in 2012 for these two regions of the U.S.?

Map #3 – Temperature Maps

3. What do you observe about temperature during summer in 2012 for these two regions of the U.S.?

Conclusion

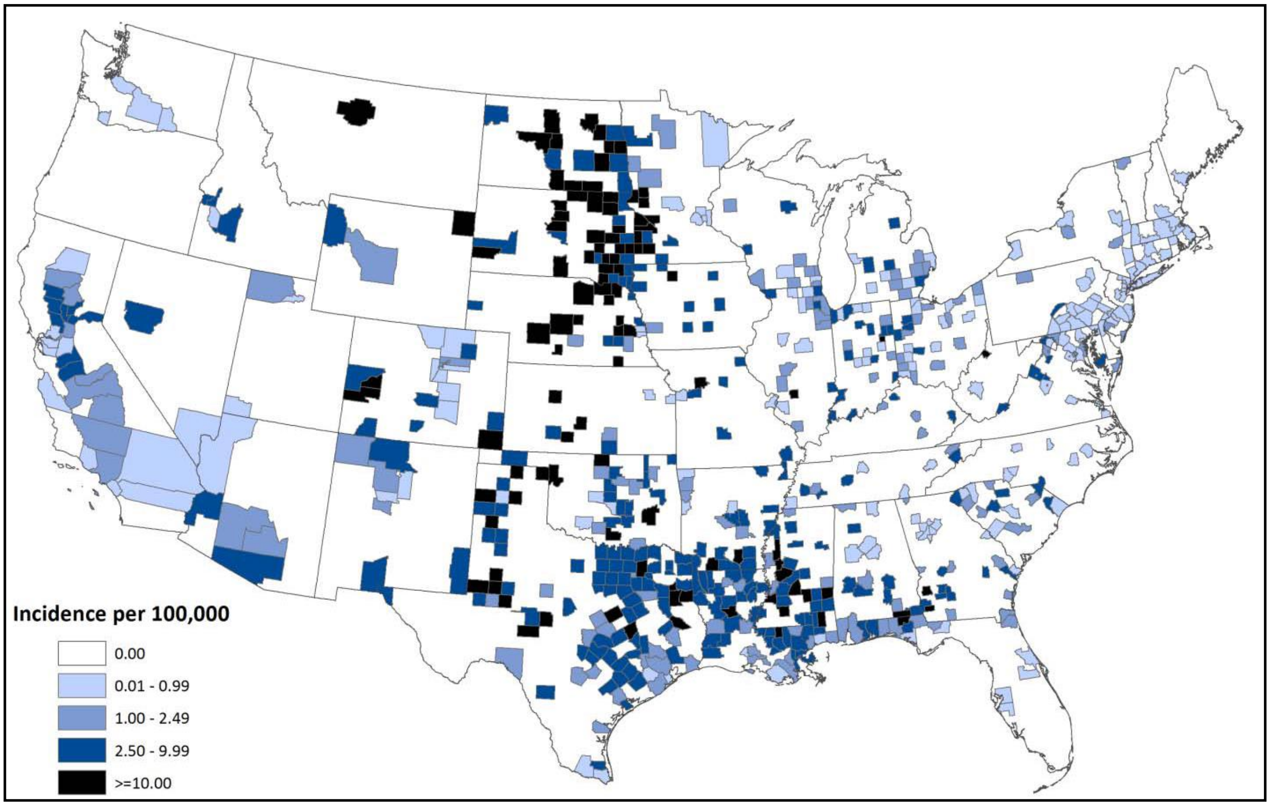
4. Using precipitation and temperature data, create a hypothesis about West Nile virus incidence and climate parameters.

Station 3: Map #1

Climate Parameters and West Nile Virus

West Nile Virus Incidence

Reported to ArboNET, by county, United States, 2012



Centers for Disease Control and Prevention (CDC)

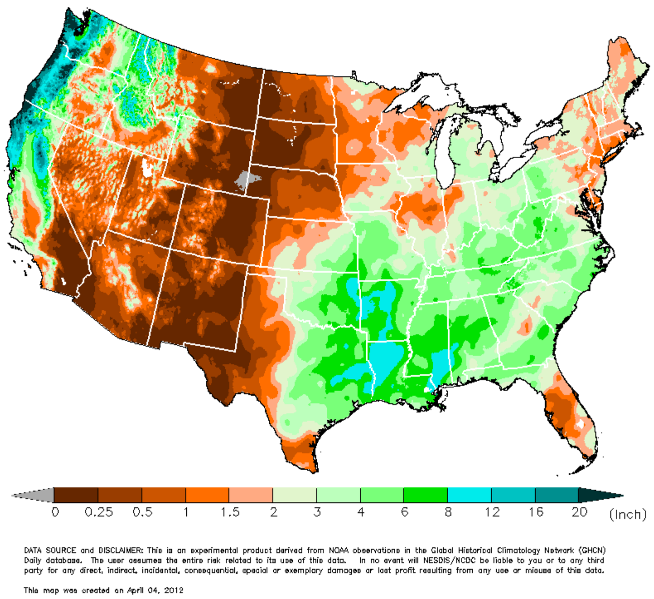
www.cdc.gov

Station 3: Map # 2

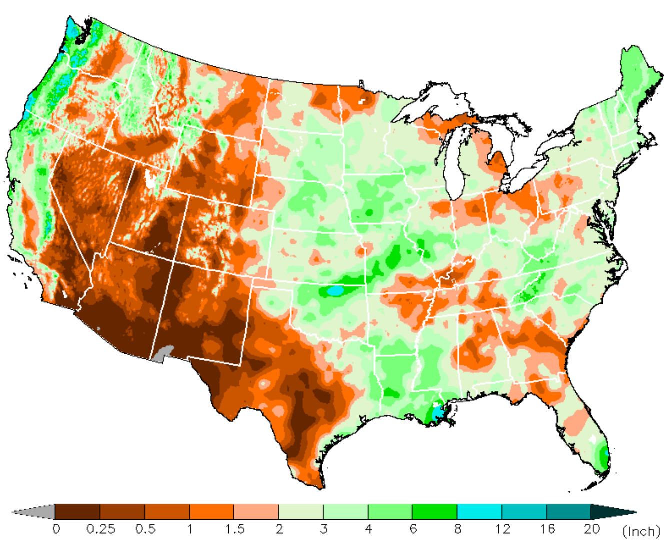
Climate Parameters and West Nile Virus

Precipitation Maps

Precipitation for March, 2012



Precipitation for April, 2012

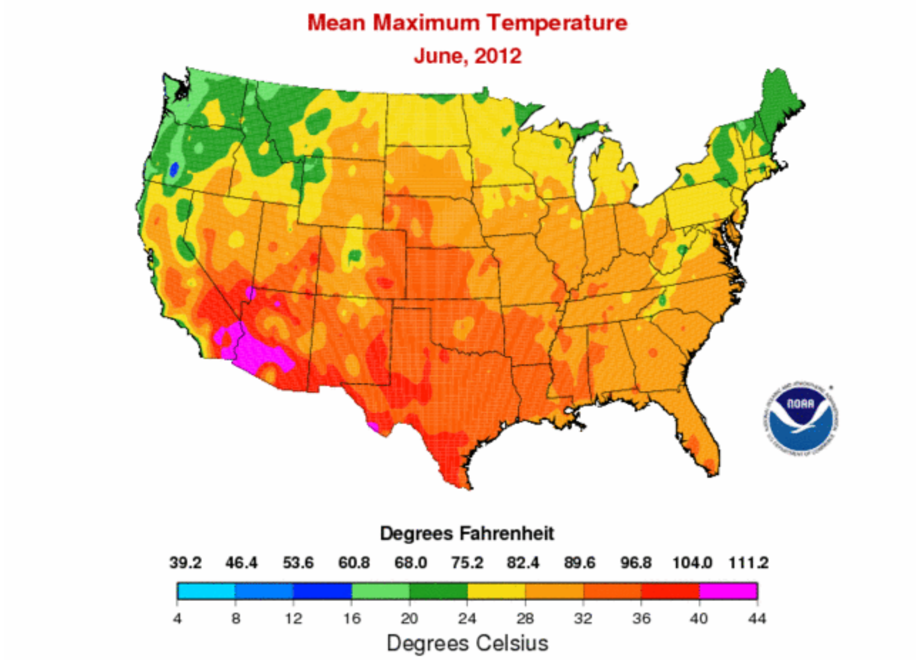


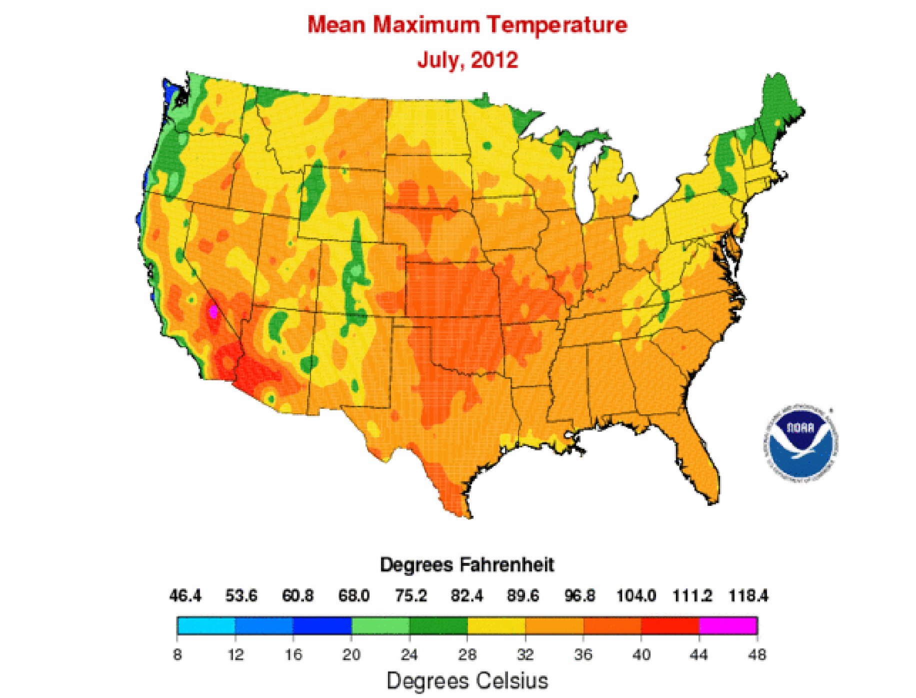
National Climatic Data Center (NCDC)
National Oceanic and Atmospheric Administration (NOAA)
http://www.ncdc.noaa.gov/temp-and-precip/maps.php

Station 3: Map #3

Climate Parameters and West Nile Virus

Temperature Maps





National Climatic Data Center (NCDC)
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http://www.ncdc.noaa.gov/temp-and-precip/maps.php

What Is a Vector-Borne Disease?

Some diseases cannot pass directly from person to person. The **pathogen** that causes the disease must be picked up and transmitted to a new **host**. These are called vector-borne diseases.

A **pathogen** is an organism that causes disease. A **host** is an organism in which a pathogen lives. The host provides food and shelter and is infected with the disease.

Most vector-borne diseases (such as Lyme disease or West Nile virus) live in an animal called the **intermediate host.** The pathogens wait there, growing and multiplying in number until another animal, called a **vector**, picks them up and carries them to us.

Some vector-borne diseases (such as malaria, dengue or chikungunya) can be picked up from one person and transmitted to another person. In both cases, vectors carry the pathogens without getting sick themselves.

Most vectors are **arthropods**—insects and arachnids. A special word—**arbo**viruses—describes **a**rthropod-**bo**rne **v**iruses. When arthropods bite or sting us they directly affect our health. When they act as vectors, they indirectly affect our health.

The best arthropod vectors are bloodsuckers such as mosquitoes (insects) and ticks (arachnids). But not every mosquito or tick carries a pathogen. When mosquitoes and ticks first hatch they are not yet infected. They become pathogen carriers only after they bite an infected host animal.

Several things must be in place before any vector-borne disease can thrive in a human population:

1. enough vectors and intermediate hosts
2. enough of the disease-causing pathogens
3. pathogens that work well with the vectors and the human or animal host
4. the proper conditions (especially temperature and humidity)
5. poor health and low immunity of the human population.

Climate: Macro & Micro

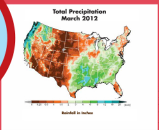
Macroclimate is the general climate of a large region, country or continent.

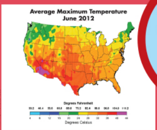
- Broad shifts in climate or extreme weather events can trigger large scale disease outbreaks globally.
- In 2012, a high number of West Nile virus cases were reported in the southern United States. Scientists concluded that heavy spring rainfall followed by an unusually hot, dry summer contributed to the outbreak.

Case Study: West Nile Virus Epidemic
Summer 2012 Dallas, Texas

Spring 2012
High Rainfall

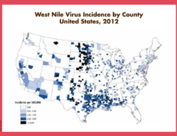
Increased precipitation creates more habitats for mosquito larvae and adult mosquitoes live longer in higher humidity.





Summer 2012
Hot and Dry

High temperatures are linked to faster mosquito development, extended growth season, longer lifespan, and increased disease transmission.



Texas and other southern states with the most West Nile virus cases had excessive rainfall in March 2012 and unusually high temperatures in June 2012. North and South Dakota and Nebraska experienced similar extreme weather in April and July 2012.

Microclimates allow insects to survive in harsh climates by sheltering them in microhabitats with more favorable environmental conditions.

- Natural shelters: snow layers, leaf debris, soil
- Man-made shelters: storm drains, barns, basements

Overwintering As global temperatures rise, some mosquito species are migrating northward. They have a variety of species-specific strategies to survive winter as eggs, larvae or adults. Microclimate shelters allow more mosquitoes to overwinter, so higher numbers emerge in the spring.

EGGS

Eggs of *Aedes* mosquito

Siphoning *Aedes* larvae hatched from eggs that overwintered in a tree hole

The thick-shelled eggs of *Aedes* mosquitoes contain a protein antifreeze that permits them to resist freezing. Tree holes protect eggs over the winter to hatch in the spring.

LARVAE

Culiseta melanura larvae

Culiseta larvae overwinter in underground cavities.

Tree roots can create protected, water-filled cavities that remain above freezing all winter.

ADULTS

Culex female mosquito, slide mounted

Collection of *Culex pipiens* adults from underground bunker walls

Adult *Culex pipiens* mosquitoes overwinter in man-made shelters, such as an abandoned Army bunker in New York City.

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Resources:

https://www.gatesnotes.com/Health/Most-Lethal-Animal-Mosquito-Week

https://www.nap.edu/read/18730/chapter/1

https://www.bloomberg.com/graphics/2015-whats-warming-the-world/