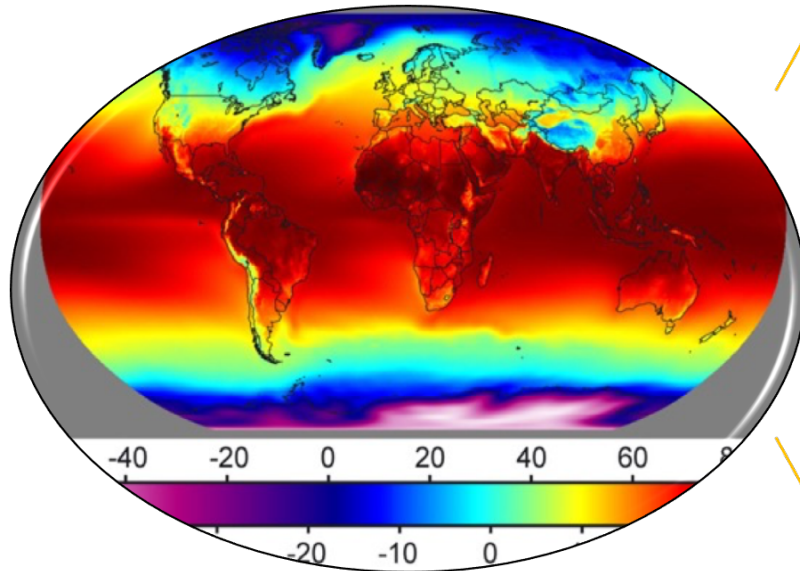


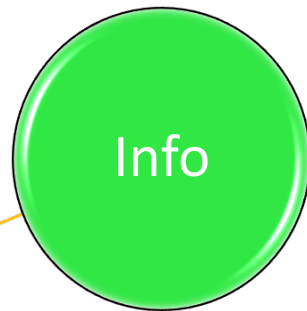
GLOBE Opportunity to Study the Urban Heat Island Effect



When: Wednesday
Time: 8:30 am -12:00 pm
Where: Grand BC



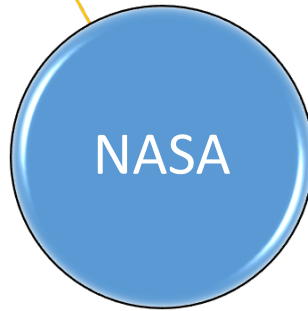
- Students Doing Research



- Meet Lead Scientist & Team
- Science Content



- Surface Temperature Protocol
- Collect & Enter Data



- Data
- Classroom Resources

Participating in the Surface Temperature Field Campaign: Green Walls and "Surf" at the Notre Dame School in the Dominican Republic

Nov 11, 2015



GLOBE Mission EARTH: Fusing GLOBE and NASA Assets to Build Systemic Innovation in STEM Education



PI: **Kevin Czajkowski**, The University of Toledo
Co-I: **Peter Garik**, Boston University
Co-I: **David Padgett**, Tennessee State University
Co-I: **Svetlana Darche**, *WestEd/UC Berkeley*
Co-I: **Jessica Taylor**, NASA Langley Research Center

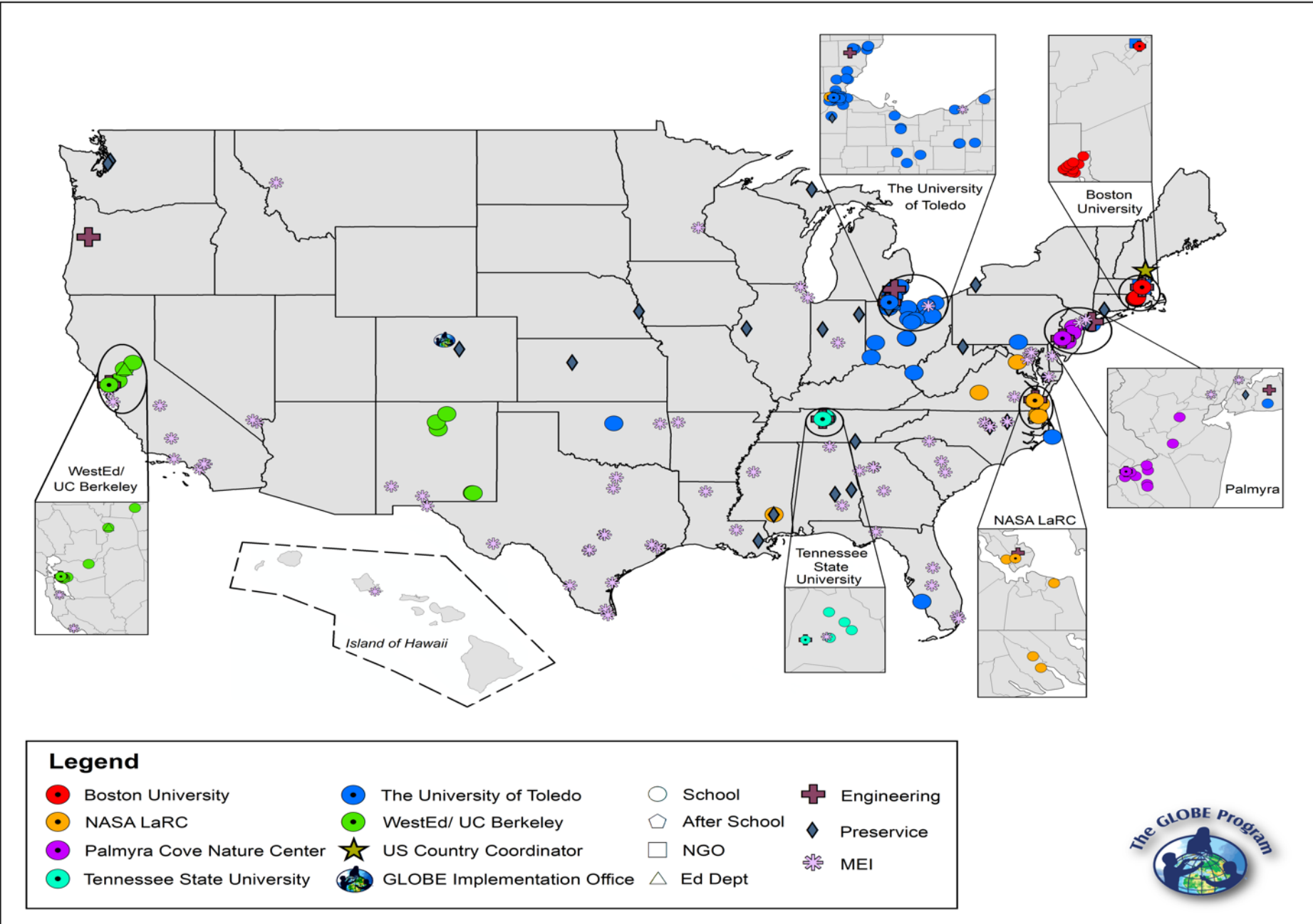
Project Manager: **Janet Struble**
Evaluator: **Nektaria Adaktilou**



GLOBE

Mission EARTH

Reach Map



How does elevation affect surface temperature?

Organization: [Main Street Intermediate School](#)

Student(s): Brynn Prack Brook Elizabeth Heyman Kayli Bergman

Grade Level: Upper Primary (grades 3-5, ages 8-11)

GLOBE Teacher: [Marcy Burns](#)

Contributors:

Report Type(s): International Virtual Science Symposium Report, Mission Earth Report

Protocols: Surface Temperature

Presentation Poster: [View Document](#)

Optional Badges: Be a Collaborator

Date Submitted: 03/29/2019



[View Research Report](#)

Our school has been measuring surface temperature during the month of December each year since 2006. We thought it would be interesting to compare surface temperature data taken at schools at different elevations. We found 8 schools in addition to our school that collected data at the same time. We thought the schools at the higher elevations would have colder surface temperature and the lower elevations would show warmer surface temperatures. We learned from the data that, for the most part, that our hypothesis was correct. However, the data also suggests that other things may also affect the data. More research needs to be done to find out how air temperature, distance from the equator, and landforms might also affect surface temperature data.

How Do Air and Surface Temperature Affect Bulb Growth?

Organization: [Nathan Bishop Middle School](#)

Student(s): Rory Merritt George Groves

Grade Level: Middle School (grades 6-8, ages 11-14)

GLOBE Teacher: [Eileen Nugent](#)

Contributors: Peter Garik, PhD, GLOBE Mission Earth Kathleen Johnson, MS, GLOBE Mission Earth

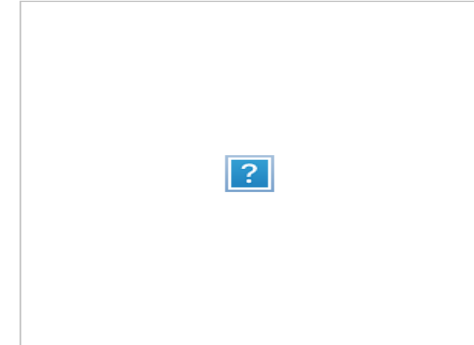
Report Type(s): Standard Research Report, International Virtual Science Symposium Report

Protocols: Air Temperature, Surface Temperature

Presentation Video: [View Video](#)

Optional Badges: Be a Collaborator, Be a Data Scientist

Date Submitted: 04/10/2019



[View Research Report](#)

Background: We are investigating the question “How does the temperature affect the growth of bulbs?” because we find it fascinating and interesting because we like to plant things and record data about them.

Methods: We measured the growth of crocus and grape hyacinth bulbs through January, February, and March and recorded the temperatures and how much the plants grew through the months. We used GLOBE Air and Surface Temperature protocols, infrared thermometers, rulers, and alcohol thermometers.

Results: We got most of our data except for some outside because of snow. And our inside plants grew! But our outside plants didn't.

Conclusions: In conclusion we discovered that as the temperature/weather got colder it was harder for the bulbs to grow so temperature does affect a bulbs growth.

The Urban Heat Island Effect in a Small Town

Organization: [St. Francis Xavier Catholic School](#)

Student(s): Jacob Fleming

Grade Level: Middle School (grades 6-8, ages 11-14)

GLOBE Teacher: [Amy Woods](#)

Contributors:

Report Type(s): International Virtual Science Symposium Report, U.S. Student Research Symposia (SRS)

Protocols: Surface Temperature

Presentation Video: [View Video](#)

Optional Badges: Make An Impact, Be a STEM Professional

Date Submitted: 04/10/2019

[View Research Report](#)

This experiment focused on the question, how will the Urban Heat Island Effect be shown when taking surface temperature measurements in Gettysburg, PA and at St. Francis? The hypothesis states that if surface temperature measurements are taken in an urban environment, then the surface temperature reading will be higher because there is more asphalt, tall buildings, and dark surfaces in cities which will absorb more heat, increasing surface temperature. The independent variable is the location that surface temperature testings are being taken. These locations are in downtown Gettysburg and on the rural campus of St. Francis Xavier School. The dependent variable is the surface temperature taken in Celsius. The controlled variables are the GLOBE Surface Temperature Protocol, the instruments used, and the surfaces the surface temperature is being taken on. This experiment was conducted by taking surface temperature with an infrared thermometer according to GLOBE protocols in Gettysburg downtown and near school. Grass, concrete, and asphalt were tested at both locations. Testings were being taken after school on Mondays and Fridays. The data supported the hypothesis because the in town averages were normally above the school averages. If this project was continued more data would be taken in more places.

Keywords: surface temperature, urban heat island, asphalt, dark surfaces



Effects of Select Weather Factors on Surface Temperature During a Polar Vortex

Organization: [Crestwood High School](#)

Student(s): Ali Akil and Adam Ali

Grade Level: Secondary School (grades 9-12, ages 14-18)

GLOBE Teacher: [Diana Rae Johns](#)

Contributors:

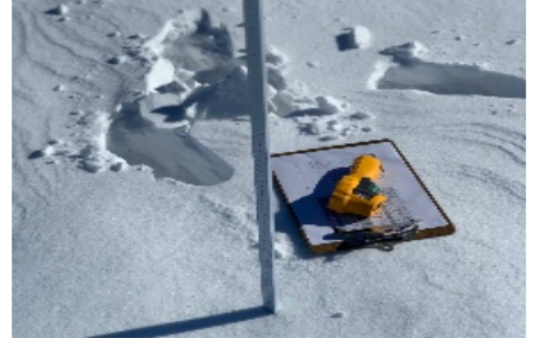
Report Type(s): International Virtual Science Symposium Report

Protocols: Clouds, Surface Temperature, Air Temperature

Presentation Poster: [View Document](#)

Optional Badges: Be a Collaborator, Be a Data Scientist

Date Submitted: 04/10/2019



[View Research Report](#)

Surface temperature is a critical factor that influences local and regional heating because the troposphere we live in warms from the bottom up. Scientists closely monitor the surface temperature in their efforts to document and explain our rising worldwide temperatures. This year's polar vortex in January was a recent weather phenomenon. With our research, we sought to determine if there is a correlation between the air temperatures and surface temperatures during this frosty period and if the polar vortex had an effect on the data we collected at all. For the majority of this school year, we have been collecting surface and air temperature data as well as cloud types and other select atmospheric parameters. We found that wind chill was consistently lower than air and surface temperature and the surface temperature was lower than air temperature on all but 2 days. It was also observed that the cloud cover doesn't correlate with the surface temperature during this period but further research has to be done. When comparing our temperatures with the average Detroit Metropolitan area it was noted that the average of Detroit was consistently higher due to recordings taken at higher altitudes.


Vertical Integration: Students Learning & Growing

One approach to vertical integration of GLOBE and NASA assets has been to encourage students in Career Technical Education (CTE) Academies at GME high schools to conduct and present their scientific research through their CTE coursework each year. For example, students at Skyline High School in Oakland, California have presented GLOBE research work as sophomores, juniors and seniors in the Green Academy.

2017 GLOBE Student Research Symposium at NASA JPL

The Relationship Between Humidity and the Biosphere

Allen Huynh, Ariella Katzman, Aaron Rayray, Sheelah Carey
Skyline High School



Abstract
The goal of our research was to find out if there is a relationship between humidity and the biosphere and types of species in an area, and what that relationship is at a certain place. We wanted to find out whether the amount of water in the atmosphere in a specific place would impact the land cover and species that developed there. We also wanted to know whether areas with similar humidity have a similar biosphere and land cover. Our research was to collect data from various GLOBE sites from four different places with differing climates: Utagarivi, Finland; Tanomah, Saudi Arabia; Eagle River, Wisconsin; and Orokovic, Czech Republic. We were unfortunately not able to gather data from our own school. Places like Finland and Wisconsin, with mostly forest or agricultural lands, would be expected to have a higher humidity because plants need water to grow, and this turned out to be true. In places like Saudi Arabia, the land is covered in desert and the only water is found in spots such as lakes and rivers, so it could be expected to be dry and not very humid at all, which also proved to be true based on the data we gathered. Places like the Czech Republic could be expected to lay somewhere in the middle as it is split between forests, agricultural, dry, and urban areas. Humidity is usually measured using a digital (or analog) hygrometer or a sling psychrometer. We did not take our own measurements because our school was not one of the sites included in our study. Land cover classification is usually determined using MLC codes from the National Land Cover Database from the Multi-Resolution Land Characteristics Consortium (MRLC) website. These codes use colors and numbers to classify types of land cover. We analyzed the data we gathered by comparing the relative humidities to the land cover classification to see if a higher humidity made the land have more trees or vegetation, and the opposite with a lower humidity. This turned out to be true based on the data we collected. It is obvious that there is a nearly direct positive correlation between the humidity in an area and the density of trees and vegetation.

Research Methods
We decided to answer our questions by comparing more specific variables in different areas. The variables we used were relative humidities and land cover classification. We used data from the GLOBE Science Data Visualization System to gather the necessary information to answer our questions. We took data points from four different places with differing climates: Utagarivi, Finland; Tanomah, Saudi Arabia; Eagle River, Wisconsin; and Orokovic, Czech Republic. We were unfortunately not able to gather data from our own school. Places like Finland and Wisconsin, with mostly forest or agricultural lands, would be expected to have a higher humidity because plants need water to grow, and this turned out to be true. In places like Saudi Arabia, the land is covered in desert and the only water is found in spots such as lakes and rivers, so it could be expected to be dry and not very humid at all, which also proved to be true based on the data we gathered. Places like the Czech Republic could be expected to lay somewhere in the middle as it is split between forests, agricultural, dry, and urban areas. Humidity is usually measured using a digital (or analog) hygrometer or a sling psychrometer. We did not take our own measurements because our school was not one of the sites included in our study. Land cover classification is usually determined using MLC codes from the National Land Cover Database from the Multi-Resolution Land Characteristics Consortium (MRLC) website. These codes use colors and numbers to classify types of land cover. We analyzed the data we gathered by comparing the relative humidities to the land cover classification to see if a higher humidity made the land have more trees or vegetation, and the opposite with a lower humidity. This turned out to be true based on the data we collected. It is obvious that there is a nearly direct positive correlation between the humidity in an area and the density of trees and vegetation.

Results

Area	Relative Humidity	Land Cover Classification
Utagarivi, Finland	81%	<ul style="list-style-type: none"> Woodland Mainly Evergreen Dominated by trees (>50%)
Tanomah, Saudi Arabia	27%	<ul style="list-style-type: none"> Desert Open freshwater Low salinity lakes, ponds, and rivers
Eagle River, Wisconsin	76.2%	<ul style="list-style-type: none"> Woodland Mainly Deciduous Evergreen Needle-Leaved Trees
Orokovic, Czech Republic	33%	<ul style="list-style-type: none"> Shrub canopy covers 46% of the ground Composed of mostly

Discussion
This area with a higher humidity had a higher vegetation with more vegetation. The hypothesis was that this was true. With the data we gathered from the GLOBE website, this turned out to indeed be correct. We used data measurements taken from four areas, two with very high humidity, and the other two not so high. The two areas with high humidity were Utagarivi, Finland and Eagle River, Wisconsin. Finland had a relative humidity of 81% while Wisconsin was just under with 76.2%. They both had lots of vegetation including evergreen, deciduous, and pine trees. The areas with lower humidity were Orokovic, Czech Republic, and Tanomah, Saudi Arabia. The Czech Republic had a relative humidity of 33% and Saudi Arabia had 27%. They both had some vegetation but very little of it. They only had shrub canopy and rivers with low salinity that didn't really have any effect on the amount of vegetation. From this data we can see that the areas with higher humidity also had more vegetation than the areas with a very low percent of humidity. In our project there were several difficulties we found that may have been sources of error. First of all, it was very difficult to find sites which had both types of data we wanted, so we had to use two different schools that are close to each other. The other main issue we had was with interpreting the data to make claims. This was especially hard with land cover classification, as the codes were difficult to understand.


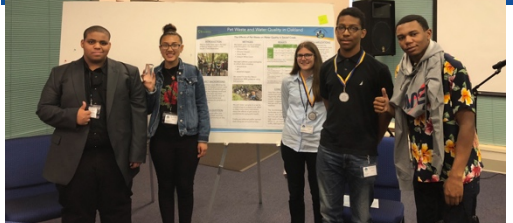
Conclusions
With the data we collected, we can see that a higher humidity has a land cover classification with more plant coverage. The areas with a relative humidity of at least 70% had a biodiversity that included evergreen and deciduous trees. In the areas with the lower relative humidity, they were either covered with shrubs or were a desert which suggests that the areas with the lower relative humidity would have to be less diverse. This matched our predictions on the relation of humidity and plants, but our hypothesis was somewhat different because we found it was difficult.

Research Questions

- How does humidity affect the biosphere and types of species in an area?
- Do areas with similar humidity have a similar biosphere?
- Does a certain biosphere always reflect a similar humidity for different areas?

Introduction
Humidity is sometimes a problem in our biosphere, the world we live in, our species. How, you might ask? Well, humidity affects the food chain. For instance, herbivores, animals that only feed off plants, wouldn't be able to survive in the desert where it's mostly humid and low vegetation. There is some vegetation in the desert but it is not in abundance. These species would be better off in a less humid area where there is more vegetation because most of the water would stay in the ground and not evaporate into the air. The vegetation would also be able to obtain nutrients from the ground. The plants would be able to grow and the herbivores would have a lot to feed on. In an area where it is more humid you find species different from an area that is less humid. Humidity directly affects the biosphere and all living species within. All species in our biosphere would be able to survive by adapting and evolving in the changing humidity in our biosphere.

Example of the data comparison for a single area

2019 GLOBE Student Research Symposium at NatureBridge

Urban Pollution and the Lake Merritt Ecosystem

By Ariella Katzman
Skyline High School - Oakland, CA

Abstract
Urban pollution and its effects on the environment are a major concern. This research aims to investigate the impact of urban pollution on the Lake Merritt ecosystem. The study focuses on water quality, sediment levels, and the presence of pollutants in the water. The research questions are: How does urban pollution affect the Lake Merritt ecosystem? What are the sources of urban pollution? How can we reduce urban pollution? The research methods include water sampling, sediment analysis, and the use of a water quality index (WQI) to assess water quality. The results show that urban pollution has a significant impact on the Lake Merritt ecosystem, with high levels of sediment and pollutants in the water. The research concludes that urban pollution is a major threat to the Lake Merritt ecosystem and that it is important to take action to reduce urban pollution. The research questions are: How does urban pollution affect the Lake Merritt ecosystem? What are the sources of urban pollution? How can we reduce urban pollution? The research methods include water sampling, sediment analysis, and the use of a water quality index (WQI) to assess water quality. The results show that urban pollution has a significant impact on the Lake Merritt ecosystem, with high levels of sediment and pollutants in the water. The research concludes that urban pollution is a major threat to the Lake Merritt ecosystem and that it is important to take action to reduce urban pollution.

Research Questions

- How does urban pollution affect the Lake Merritt ecosystem?
- What are the sources of urban pollution?
- How can we reduce urban pollution?

Research Methods

Results

Conclusions

Conclusion

Urban pollution is a major threat to the Lake Merritt ecosystem and it is important to take action to reduce urban pollution.


Play (k)

2018 Student Research Symposium at NASA AMES

Pet Waste and Water Quality in Oakland

The Effects of Pet Waste on Water Quality in Sausal Creek

INTRODUCTION
Skyline Earth Team spent the year analyzing stream health in the Sausal Creek Watershed.



PROJECT BACKGROUND
One prominent issue affecting the community of Oakland is poor water quality as a result of contamination from things like highway runoff and pet waste. Our team has been investigating the specific issue of pet waste contamination and working to address this problem in our community.

RESEARCH IMPLICATIONS
Our research implies that the community needs to be made more aware of the environmental and health risks posed by poor water quality. In 1976, the U.S. EPA dictated that fecal coliform not exceed 200 CFU/100 mL for recreational waters, however all of our samples exceeded this standard.

CONCLUSIONS
Data from the tests that we performed indicated that pet waste negatively affects water quality. BMT counts, temperature, and dissolved oxygen suggested that areas with less pet and human traffic were healthier. The microbiological lab data reinforced our hypothesis. Dimond Canyon, the site expected to have the most pet traffic, exhibited very high levels of fecal coliform. Joaquin Miller Ct., an isolated site with low traffic, had significantly lower levels.

RESULTS

Parameter	Dimond Canyon	Scout Road	Joaquin Miller Court
Temperature	13.8 C	11.2 C	12.54 C
pH	8	7.33	8.36
Dissolved Oxygen	11.78 ppm	8.45 ppm	9.59 ppm
Fecal Coliform	3	N/A	4

The table above shows data collected for several parameters tested for.

Sample Description	Fecal Coliforms
Dimond Park (Background) (9:55 AM)	2700 CFU/100 mL
200 yards from Dimond Canyon Trail (9:55 AM)	3200 CFU/100 mL
Scout Rd Access Point (10:00 AM)	1100 CFU/100 mL
Joaquin Miller Ct Access Point (10:05 AM)	380 CFU/100 mL

The table above includes fecal coliform enumerations from our 4 test sites.

ACKNOWLEDGEMENTS

Skyline Pathways GREEN ENERGY
cleanwater research
Friends of Sausal Creek



Abstract

The urban heat island(UHI)is the increase in temperature in urban areas. UHI contribute to climate change which cause droughts, rise of ocean levels leading to floods. The hypothesis was the surface temperature of Waite High School (Urban area)is warmer than the surface temperature of Lake High School (rural area). We took surface temperature measurements outside Waite High School using infrared thermometer following GLOBE protocols. We used the globe website to get the data for Lake High School. The surface temperature was warmer at Waite High School than Lake High School. My hypothesis was supported by the data. Our recommendation is to take data measurements in multiple sites all each location.

Problem

Climate change is the warming of temperatures of the Earth. Carbon dioxide causes Global warming. Sea level rises causing flooding which causes damage to environments and habitats. Urban heat Island contributes to climate change because they are a lot warmer areas and are densely populated. We took surface temperature around our school to see if Toledo contributes to climate change.

Hypothesis

The surface temperature of Waite High School is warmer than the surface temperature of Lake High School.

Procedure

We took measurements of the surface temperature at Waite High School which is an urban area by using an infrared thermometer (IRT). We used the globe website to get the surface temperature data from Lake High School which is a rural area. Finally, we compared the two which one was colder or hotter.

Surface Temperatures of Waite High School

By: Ralph Snyder
and
Valente Villegas
Waite High School

Location	Date	Surface Temperature °C	Longitude	Latitude
Lake	10/10/2017	14.1	41.59338	-83.6888
Waite	10/10/2017	25.1	41.64871	-83.51712
Lake	10/11/2017	15.4	41.59332	-83.6888
Waite	10/11/2017	17.1, 4.4	41.64871	-83.51712
Lake	10/27/2017	11.8	41.59349	-83.6884
Waite	10/27/2017	17.6, 18	41.64871	-83.51712
Lake	12/4/2017	1.3	41.59332	-83.6889
Waite	12/4/2017	7	41.64871	-83.51712
Lake	12/10/2017	-11.0	41.59350	-83.6889
Waite	12/10/2017	-10.5, 4.8	41.64871	-83.51712
Lake	3/13/2018	-4.3	41.59011	-83.4763
Waite	3/13/2018	3, -1.4	41.64871	-83.51712
Lake	3/16/2018	8.8, 9.3	41.59011	-83.4763
Waite	3/16/2018	-0.4	41.64871	-83.51712

Results

The surface temperature was higher at Waite High School than at Lake High School. Waite surface temperature was higher in Fall and Winter. Lakes was higher in Spring on only one day 3/16/2018.

Conclusion

My hypothesis was the surface temperature was higher at Waite High School than Lake High School, was supported by the data.

Recommendations

- Instead of recording measurements in one site. Record the surface temperature in multiple sites.
- Measure the grass and cement in urban and rural areas.

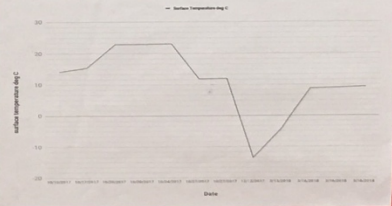
References

- <https://www.globe.gov/>
- Googleearth.com

Surface Temperature at Waite High School



Surface Temperature at Lake High School



Waite High School



Lake High School



Comparing Average Surface Temperatures of Kaohsiung, Taiwan and Wyandotte, Michigan



Ottawa Hills High School

Abstract

We both had some questions about the research questions and we had to change our research question multiple times. Why we made our research question is because we were both interested on both places and to see how hot it would get in Taiwan vs Wyandotte michigan. Because both of our surface temperatures are across the world from each other. We both agreed that we would find the surface temperature for one of these places Jovan would find Kaohsiung Taiwan and Julian would find Wyandotte michigan this was how we planned our project and eventually finished it

Research Question

Asking Questions

Our research question was how does surface temperature in Wyandotte, Michigan compare to the surface temperature of the city Kaohsiung in Taiwan and why? Our surface temperature results can be important for scientific research because scientists are doing studies of antarctica and the glaciers melting so our surface temperatures are very spread out, then we can give the scientist surface temperature information about the world and how this can also tell us about the ocean and how it affects surface temperature. Some people take temperature of the earth but then they do not take in all the other factors that affect the surface temperature such as climate change and the condition of the material such as "dry" and "wet" factors, these are some conditions that affect surface temperature that some scientist do not address. You can change the surface temperature of the material fairly easy. For example you could pour cold water on grass then the surface temperature will be lowered on the area you put water than the rest of the grass.

Introduction

Content Knowledge

For our globe project, Jovan and I are going to compare the surface temperature of two very different places: Wyandotte, Michigan and Kaohsiung, Taiwan. The surface temperatures of Wyandotte, Michigan and Kaohsiung, Taiwan are different because of where each city is located with respect to the equator, the difference in altitude each city is from sea level, and the distance each city is from a body of water. These factors can affect the surface temperature of the Earth and are important to explore to identify why the temperature of Wyandotte, Michigan and Kaohsiung, Taiwan are different. It is important to understand, the difference in temperatures of all across the globe overall, because then, we can learn more about global climate change and find ways to improve and/or prevent it.



Research Methods

Planning Investigations

Describes the planning process

While I was getting my research I think that the globe protocols for the surface temperature of Kaohsiung, Taiwan and Wyandotte, Michigan is very convenient because you can pick the protocol layers and how you want to see the globe in surface temperature. Globe protocols has many modifications and it is easy access to find the information you need. The main resource we used was Globe.gov. Our First step we did was we came up with the locations we were going to do. Then me and my partner Jovan picked Kaohsiung, Taiwan and I choose Wyandotte, Michigan. Then we went to the Globe.gov and clicked globe Database which then went to the surface temperature measurements and other schools gave us data for our project. The average surface temperature of Wyandotte Michigan is 3.0 C the condition was wet and the elevation was 177.60m and the ground material is asphalt. Now for the average surface temp of kaohsiung Taiwan is 40.8 C the number of samples taken was 9 and the surface cover type is short grass 0.5m and elevation is 15.00m, also the time of day of Kaohsiung, Taiwan was taken at 03:16:00 PM and the time of day of Wyandotte, Michigan is 08:08:00 PM.

Carrying Out Investigations

Describes what happened

We first went to the globe website and then went to globe data Vizulize system and went to surface temperature and found our data and that is how we got the data from Michigan and Taiwan. We went to different places on the map in the Visualize system and we found different places on the map. In the Visualize system in globe and it told us that Wyandotte michigan had 8 samples taken and it was moist in the area.

The specifics for For Kaohsiung taiwan it told us that it was dry and there was sunshine. The specifics for Kaohsiung taiwan were Measured At: 2018-11-21 12:34:00 Solar Measured At: 2018-11-21 20:50:00 Solar Noon At: 2018-11-21 03:44:00 Average Surface Temperature: 36.5 °C Surface Condition: dry Number Of Samples Taken: 9 Surface Cover Type: short grass (< 0.5m) Homogeneous Site Short Length M: 2.25 Homogeneous Site Long Length M: 2.25 Site Area M Squared: 5.1 Elevation: 15.00 m.

The data in Wyandotte Michigan the data was Measured 018-11-30 08:06:00 Solar Measured At: 2018-11-30 02:45:00 Solar Noon At: 2018-11-30 17:21:00 Average Surface Temperature: 28.0 °C Surface Condition: Moist Number Of Samples Taken: 1 Elevation: 177.60 m.

The steps for our data collection was going into globe, Visualization system, then clicked surface temperature the Jovan found the data of Kaohsiung Taiwan while I was looking for data on Wyandotte Michigan. Jovan found 8 samples of data in Kaohsiung Taiwan and Julian found 1 data sample for Wyandotte Michigan.

Results

Analyzing Data

Analyzing data: Our research question is how does surface temperature in Wyandotte, Michigan compare to the surface temperature of the city Kaohsiung in Taiwan and why?. One of our realizations were the elevation was very different. This can affect many things such as the air pressure. So like in mountains, the higher you are the lower the air pressure and the colder it is since Wyandotte has a higher elevation it is colder than taiwan already so Wyandotte has a disadvantage in the surface temperature for the hottest surface temperature this shows that elevation does affect surface temperature.

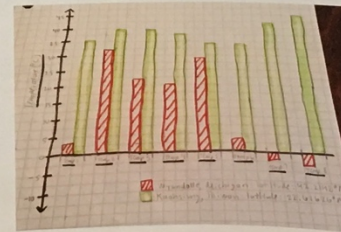
Figure #1



Distance each city is from equator:
Blue: Wyandotte, Michigan
Red: Kaohsiung, Taiwan



Figure #2



8 different temperature points in degrees Celsius of Wyandotte, Michigan and Kaohsiung, Taiwan

Discussion

Interpreting Data

One of the main reasons we got 3.0 C in Wyandotte michigan is because of the climate of when we took the data was wet. This affected the temperature greatly because of all the clouds that sent the rain down they also covered the sun up which means that you are going to lower the surface temperature by a substantial amount. Why the surface temperature for kaohsiung Taiwan was 40.8 C because of the time of day that the temperature was taken because in wyandotte michigan the temperature was taken at 8:08pm but in kaohsiung kaohsiung taiwan it was at 3:16 PM So the sun was higher in the sky in kaohsiung then in wyandotte.

Yes our data does support our hypothesis because The temperature measurements were very different in Kaohsiung Taiwan compared to Wyandotte Michigan. This could help with finding out how temperature is affected by the time or climate that it is taken at. Because then we can find out when the hottest time of the day is for our two locations. Sometimes the measurements that people take can be incorrect or at the wrong time they submitted it so the data could be invalid or incorrect.

Conclusions

Drawing Conclusions & Next Steps

In conclusion, Jovan and I are comparing the surface temperature of two very different places: Michigan and Kaohsiung, Taiwan. From our research we found that Kaohsiung, Taiwan has an average surface temperature of 36.5 °C and Wyandotte, Michigan has an average surface temperature of 28.0°C. One reason why the surface temperatures of these places are different is because of their climates. In Taiwan the climate is dry. This leads to a higher surface temperature because the sunlight directly hits the earth and it is of only 15.00 m. In contrast, Michigan has a wet climate making it colder. Another reason why the temperature in Michigan is colder is because it has an elevation of 177.60 m, whereas Taiwan has an elevation of only 15.00 m. The higher the elevation the lower the pressure because there is less air above you. This lower pressure lets air molecules spread out which decreases the temperature. Lastly, the difference in temperature is because of how far each city is from the equator. The closer a place is to the equator the warmer it is. The measurement of a place from the equator is based on the latitude. Kaohsiung, Taiwan has a latitude of 22.61626° N and Wyandotte, Michigan has a latitude of 42.2142° N. Taiwan has a higher surface temperature because it is closer to the equator than Michigan. Therefore, Kaohsiung, Taiwan has a higher surface temperature than Wyandotte, Michigan because of its type of climate, its distance from water based on its elevation, and its distance from the equator based on its latitude. Understanding the causes in temperature difference between these two cities is important because we can see how global climate change is affecting places all over the globe.

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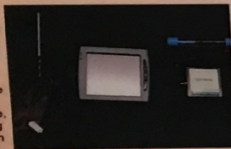
Analysis of Data Collected During the 2017 Solar Eclipse at Eighty Percent Totality

Maysam Aidibi, Leanne Alawieh, Ali Eter, Sara Komaiha, and Hana Salami – Crestwood High School – Dearborn Heights, MI



Abstract

A total solar eclipse occurs when the moon passes directly through the sun and earth. The most recent eclipse in North America took place on August 21st of 2017. On the 20th and 21st of August, a group took surface temperature, air temperature, light intensity, and cloud observation measurements on grass and asphalt sites, in addition to other weather parameters. Students took data in 10 minute intervals from 12:27 P.M. to 4:27 P.M. on both days. This information was then inputted into the GLOBE website and a spreadsheet was made out of the data. After analyzing the data, several differences were found- not only when comparing the two days, but comparing the separate sites. For example, light intensity levels were much lower on the day of the eclipse when compared to the day before. However, light intensity showed little variation when student researchers compared the asphalt and grass sites. Surface temperature and air temperature were also compared on both days/sites. The student researchers also made several unusual observations on the day of the eclipse. Not only did the bindweed- a local flower that grows on site- close during maximum coverage, the students were also able to hear crickets chirping while coverage of the sun increased. Finally, the student researchers found that data from their site, Crestwood High School, was inversely correlated to Lake High School, a site near Toledo with similar maximum coverage. From here, the researchers can evaluate the data to identify factors that may explain these results, such as cloud coverage, humidity, etc. The importance of taking and submitting this data is that these ground-level measurements can be utilized by NASA and GLOBE, two organizations who encourage the measuring of data during events like this.



Research Questions



The location of the research is shown above in a Google maps photo.

- Will select parameters such as surface temperature, light intensity, and air temperature differ on the days leading up to the eclipse versus the day of?
- Will these parameters also differ on grass sites versus asphalt sites?
- What observations will be observed during maximum coverage?
- How will data from one site compare to another with similar totality?

Null Hypotheses

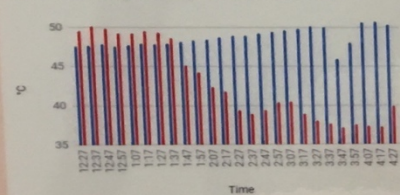
- Surface temperature, light intensity, and air temperature will not differ from the day before the eclipse when compared to the day of.
- Surface temperature, light intensity, and air temperature will not differ when tested on grass and asphalt sites.
- No unusual observations of the surrounding environment will be made on the day of the eclipse.
- Data from Crestwood High School will not differ from data collected at a separate site with similar maximum coverage.



Results

Comparison of Surface Temperature on the 20th and 21st of August

Surface Temp on Asphalt 8/20 vs. 8/21



One of the correlations tested for on asphalt sites was surface temperature. The data demonstrates that as the day progressed on the 20th, the measurements tended to increase. However, on the 21st, as totality approached, surface temperature only decreased, proving the sun is a big factor in determining surface temperature.

Comparison of Light Intensity on Grass vs. Asphalt Sites on the 21st of August

Light Intensity on 8/21 Grass vs. Asphalt



Light intensity was one of the several measurements that was compared between grass and asphalt sites. The graph illustrates that there is very little variation between the two sites. Light intensity stayed consistent, regardless of where it was tested. The data also suggests the influence of the sun on light intensity as when the sun reached 80% coverage, light intensity reached its lowest value.

Implications and Limitations

Due to the rarity of solar eclipses, it is imperative that accurate and persistent measurements are taken on these days. The work done by researchers including students in this project is valuable as it involves ground-level data, which is comparable to the measurements taken by satellite measurements. Eclipses can provide data regarding the lunar orbit, and recently it has been discovered that it may also provide insight on new particle formation. For these reasons, it is necessary that data is collected on solar eclipses. However, there are various potential errors that could have affected the results and therefore made them inaccurate. For example, a difference in cloud coverage could affect the data. Another potential error would be the possibility of a different school taking data. Another potential error would be the possibility of a different school taking data. Another potential error would be the possibility of a different school taking data. Another potential error would be the possibility of a different school taking data.



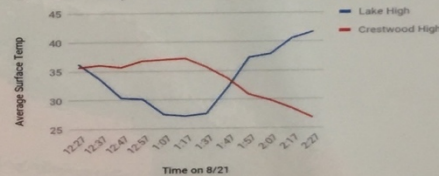
Observation of Local Bindweed on August 21st



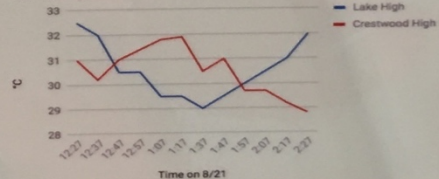
One of the observations recorded was the closing of a local plant- bindweed. The left picture shows the plant two hours before maximum coverage, whereas the right picture shows the effect of the eclipse on the plant, as it had closed up.

Comparison of Data Between CHS and LHS

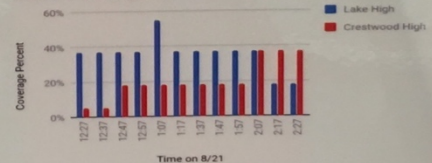
Surface Temp on Grass: LHS vs. CHS



Air Temp on Grass: LHS vs. CHS



Cloud Coverage: LHS vs. CHS



Comparing surface and air temperatures between the two schools proved an inversely correlated relationship. Namely, as Crestwood's surface temperature fell, Lakewood's surface temperature increased, the same pattern was true for air temperature. Students hypothesize that this correlation is attributed to cloud coverage. As seen on the graphs, as cloud coverage decreased at Lake High, air temperature and surface temperature were able to rise, which is thought to be due to a more sunny environment. Likewise, as Crestwood's site became increasingly cloudy, both air and surface temperature decreased.

Method



Conclusions

- Significant differences can be seen when comparing data taken on the day of the eclipse versus the day before, especially when comparing light intensity and surface temperature.
- Air temperature showed a significant difference, but it isn't likely that this is due to the eclipse, and can rather be attributed to cloud coverage. This rejects our null hypothesis that there will be no differences in data taken on the two separate days.
- Data was taken on two separate sites as well. It was found that the separate sites had a significant impact on surface temperature and a slight impact on air temperature. As expected, light intensity didn't seem to be affected by the differing sites. The surface temperature and air temperature reject our null hypothesis that data on two separate sites will not differ when taken on the day of the eclipse.
- There were also several observations made on the day of the eclipse, including the surrounding plants and animals. Due to unusual behaviors of plants such as the bindweed growing on the site and the early hearing of crickets chirping, our null hypothesis that states that there would be no uncommon behaviors observed can be declined.
- Findings from CHS were compared to those of a school in Ohio with similar maximum coverage. The inverse correlation enabled the students to reject the final null hypothesis that the results from both sites would not differ.

Acknowledgements

We'd like to thank the GLOBE program for making our research possible and for giving us a place to store our data. Also, a huge thanks to not only our adviser, but our number one supporter, Mrs. Diana Johns. We would also like to thank Dr. Kevin Czajkowski for giving us the opportunity to interact with several STEM professionals as well as himself. In addition, thanks to Mr. David Bydowski and the AREN project for helping to provide the technology to do this research. Thank you for all your work and encouragement. None of this research would have been possible without the help we received!

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Surface Temperature and Lyme Disease Correlation

Saumya Talla and Aava Paudel

Ottawa Hills Junior High

Abstract

There are many cases of Lyme disease now a days that have been reported in the United States. In addition, many people think rarely about getting this disease. So whenever they go outdoors, they take very little action in trying to prevent it. In our results, we came to a conclusion that surface temperature does not relate to the cases of lyme disease reported. Although ticks that transmit lyme disease are likely to be found in humid environments, especially during the spring and summer. To collect all of our research, we used information from NASA's GLOBE Mission Earth and AREN projects as well as other sources stated in the bibliography. Using the information that was collected, we found out some data that conflicted from our hypothesis. Even though our hypothesis was not supported, we learned many new aspects of our topic that we didn't know before.

Research Question

How does surface temperature affect whether you get Lyme disease or not?

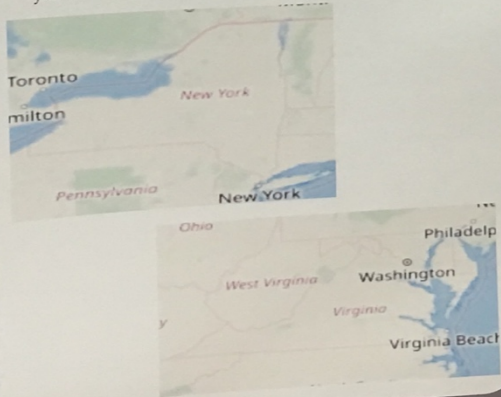
- This is an important question of scientific interest because this disease is common in the northeastern part of the United States, which is the region where Ohio is located in.
- Where did Lyme disease originate from?
- How does climate change affect the rate of Lyme disease?
- Does the number of blacklegged ticks decrease in the winter?

Introduction

There are many cases of people who get Lyme disease due to the lethal exposure of blacklegged ticks or otherwise known as deer ticks. My partner and I have found a great interest in this particular topic that we have chosen. We have decided to conduct research to learn more about our question on whether or not surface temperature affects your chances of getting Lyme disease or not. Blacklegged nymph ticks are very difficult to spot with the naked eye, since they are less than 2 mm in size. Lyme disease is a multisystem bacterial infection caused by the bacterium called *Borrelia burgdorferi*, according to the Children's Hospital of Philadelphia. This infection is transmitted by the bite of a blacklegged tick. They are most active during the the spring and summer months, which is when most people spend their time outdoors. These ticks are most often found in wooded and grassy areas, and could also be transported by symptoms such as fever, fatigue, headache, as well as muscle and joint aches. However, there were very few reported cases of Lyme disease in the United States per year since national surveillance for Lyme disease began in 1982. Furthermore, a mean of about 12,500 cases were reported to the Centers for Disease Control and Prevention from 1993 to 1997. Stated in the multiple website, we found out that ticks need either deer or rodents as their main blood hosts. Moreover, the number of these animals have increased in certain states of the United States including, the northeast, mid-Atlantic states, north central states of Wisconsin and Minnesota, and Northern California. This shows the relevance of research to the community, since Ohio is located in the northeast region. The research in this research is to help educate others on the factors of Lyme disease.

Research Methods

- Our investigation focuses on surface temperature data from Virginia and New York, which are both humid.
- For our data, we compared 2 sets from 2016 and 2017 which was represented in a bar graph.
- Our computers were the only instruments we used to gather research and collect data.
- We used information we collected from the Globe website, from which we figured out the mean surface temperature, while we used various government sites to find our lyme disease count.
- We each performed different roles in data collection. Saumya collected the number of Lyme disease counts reported in each state, while Aava calculated the average surface temperature. We both took a part in organizing and analyzing the data.
- In preparation for our data collection, we added all of the daily surface temperature and divided by the number of data points there were. We then repeated this process four more times. This way we were able to find the average surface temperature for the two states along with the schools we chose, which was 2 years worth of data in each state.



Results

Analyzing Data

- Figure #1 represents the average surface temperature and the number of Lyme disease counts reported in Virginia and New York from 2016 and 2017.
- Figure #2 represents the Lyme disease count and the average surface temperature in Virginia for 2016 and 2017.
- Figure #3 represents the Lyme disease count and the average surface temperature in New York for 2016 and 2017.
- The last two figures are just a representation of each state in which the data was collected from.
- This data does not show a trendline that suggests surface temperature is related to the number of lyme disease reported.
- The data analysis was completed in a Google spreadsheet.

Figure #1

Average Surface Temp and Lyme Disease Count

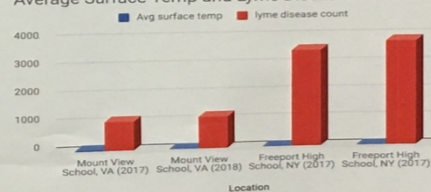


Figure #2

Virginia Lyme Disease Count

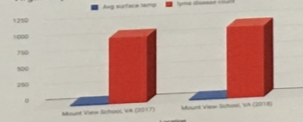
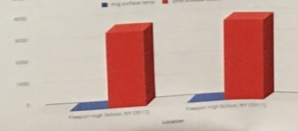


Figure #3

New York Lyme Disease Count



Discussion

Interpreting Data

- The results do not support our hypothesis. This is because the comparison between the average surface temperature to the cases of Lyme disease do not have a correlation, and are not close to being a linear relationship.
- Our results showed that even when the average surface temperature was very low, the Lyme disease count was very high which meant that there was no impact.
- The importance of this analyses regarding to science, is that it can help to provide information to those who tend to spend more time outdoors during the summer when it is more humid, so that they will know how to take safety precautions. This way, we can hopefully contribute to the reduction of Lyme disease.
- This was a limited study as we only did two data collections between two different states. If we were to conduct more trials with this study again, we would collect more data points within each state to be more precise and accurate.
- According to the results from other studies, it appears that temperature does affect the chances of blacklegged ticks spreading this disease, but just not surface temperature.
- Possible sources of error may include only using two data points, not having the same amount of data for surface temperature provided by Globe, and we could have miscalculated the average surface temperature from each state.



Work Photos



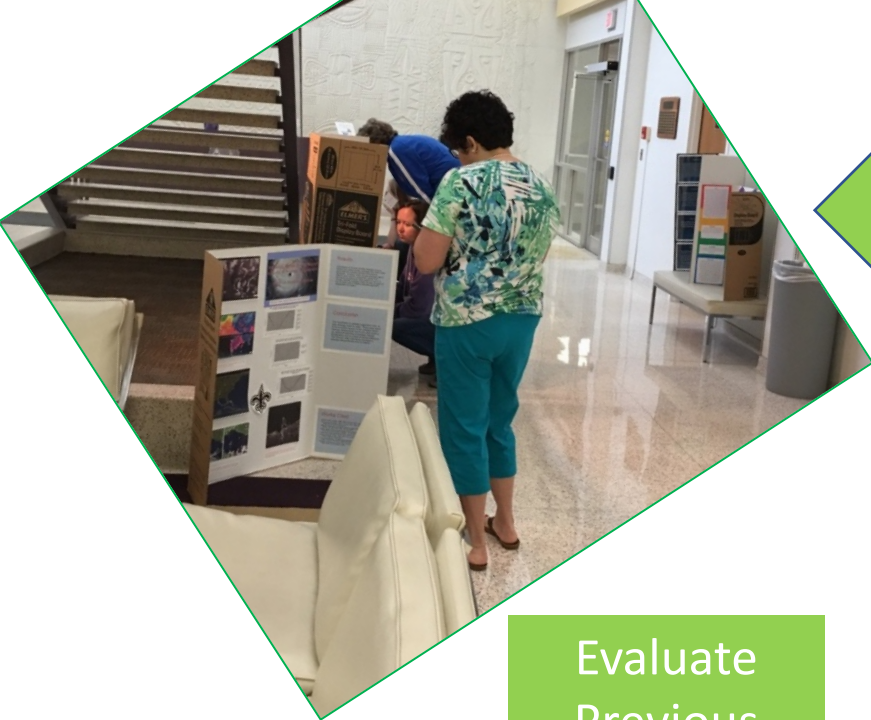
Conclusions

Overall, we did not find a relationship between the surface temperature and the many lyme disease cases reported. The conclusion was reached because our results showed that there was no correlation between these two factors. Some improvements that could be made next time would be to collect data from more than 2 states to make it more exact, and to make sure everything was completed thoroughly. For future research, we should collect more background information on the topic before consenting to a question just to make sure it is doable. Some follow-up research that should be taken, would be to get a clear visual on if your question fits in with the standards before continuing the whole project. There is a really help to boost your understanding of a question you may have or just the project as a whole. This way you can tie up any loose ends you may have.

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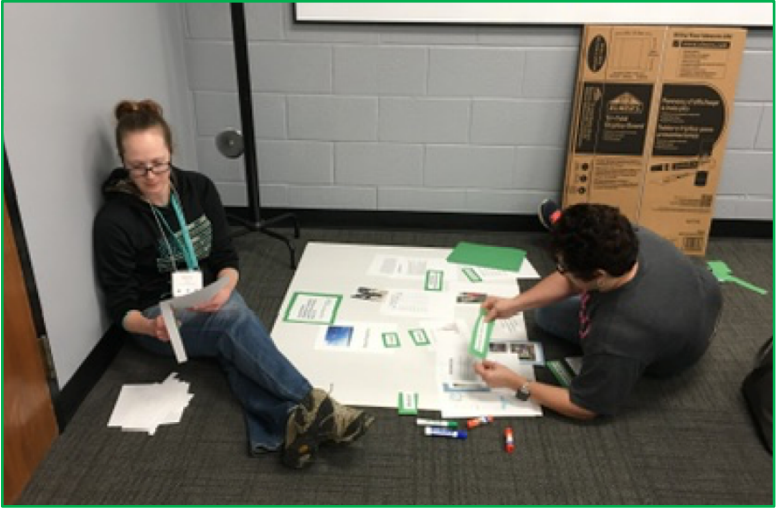
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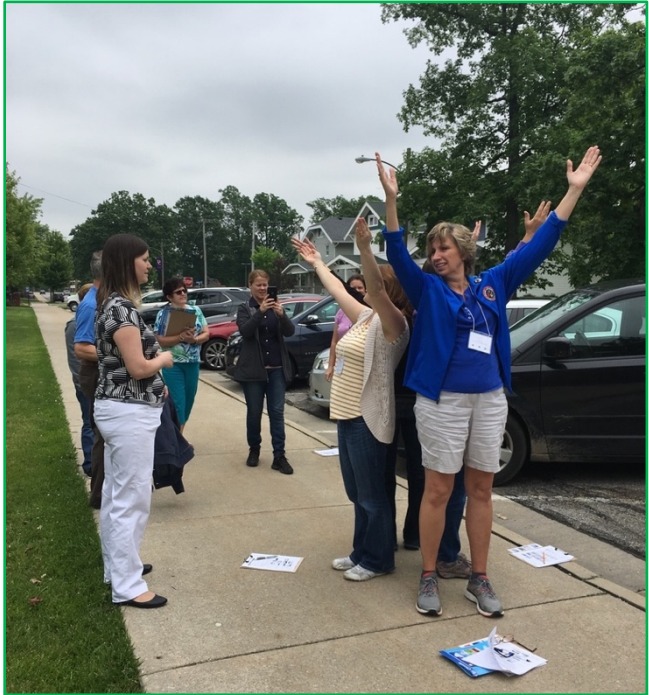


Evaluate Previous Projects

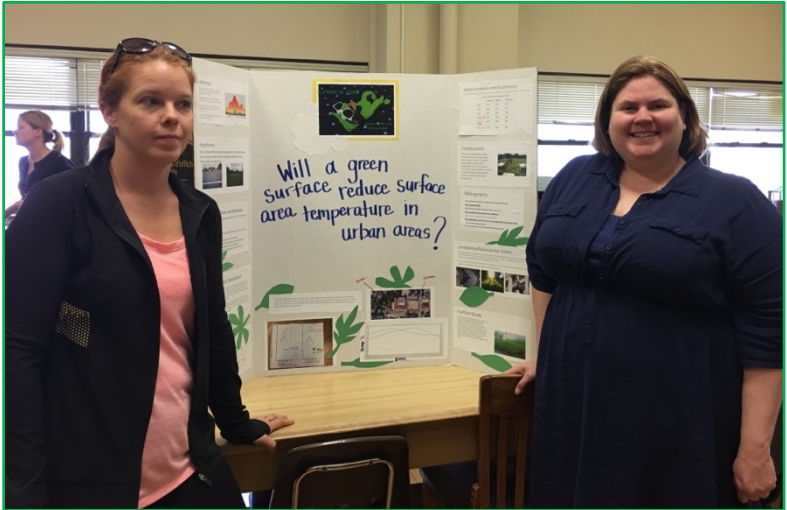
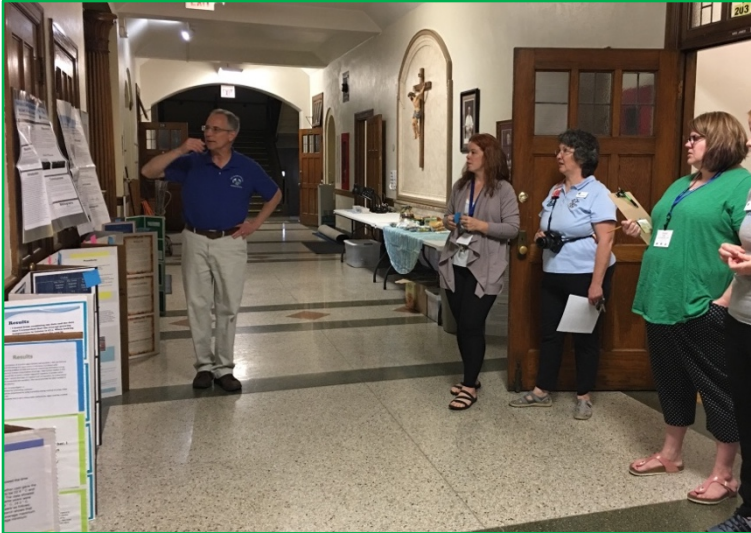
Begin with the End in Mind



Develop Research Question
Complete a Research Project & Present to Peers



Collect GLOBE Data & Submit Data to GLOBE



- Students become GLOBE certified and work with high school students for 3-4 days. Trained in Atmosphere Protocols
- Uses the Climate Study Curriculum
- Early Childhood Education Course - Elementary GLOBE Facebook Live presentations
- Student teachers hone their skills in teaching GLOBE content prior to education careers



MAYMESTER 2019
WEATHER & CLIMATE
 (GEOG 3500)
 (May 6 - May 23)
 MTWR, 12:30-3:45 pm

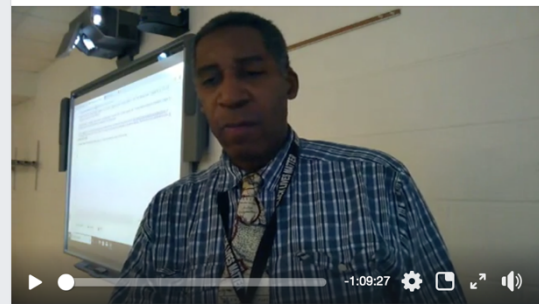


Course includes hands-on NASA AEROKATS experiments
<http://www.lccasproject.net/resources/remote-learning-resources/nasa-aerokats>
 Instructor: David A. Padgett
 Office: 213 Crouch Hall (Graduate Building)
 Phone: 963-5508 or 963-5471
 Email: dapadgett@tnstate.edu Twitter: @TSUGISLAB

COURSE DESCRIPTION
 The properties, behavior, and importance of the atmosphere. Emphasis is given to observation and analysis of clouds and storm systems—cyclones, tornadoes, and hurricanes—the causes and global distribution of climate types, and major atmospheric concerns, including the greenhouse effect, acid rain, the ozone hole, and climatic change.
 The course is supported by online content from the American Meteorological Society Climate Studies Diversity Project (<http://amesedu.ametsoc.org/amesedu/online/info/diversity.html>), the Global Learning and Observations to Benefit the Environment (GLOBE) program (www.globe.gov), and the WeatherBug Achieve program (<http://achieve.weatherbug.com/>)

David A Padgett was live.
 January 24 · 🌐

Land Use Philosophy and Land Use Control - Urban Geography (GEOG 4850)
 - Spring 2019 - January 24 #tennesseestateuniversity

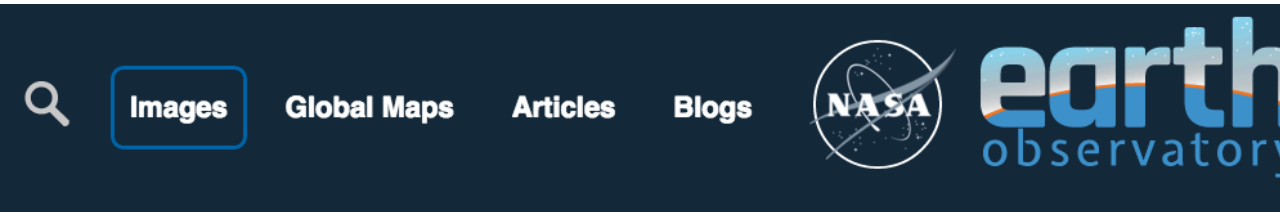


Watch together with friends or with a group Start Watch Party

👤 Nektaria Adaktilou and 6 others 1 Share 65 Views

👍 Like 💬 Comment ➦ Share

Urban Heat Island Impacts



Urban Heat Islands

This page contains archived content and is no longer being updated. At the time of publication, it represented the best available science. However, more recent observations and studies may have rendered some content obsolete. ×



Buffalo

Buffalo - August 3, 2002

Buffalo - August 3, 2002

JPEG

TIFF

KML

- Increased energy consumption
- Elevated emissions of air pollutants and greenhouse gases – ozone
- Compromised human health – increased death rate



Recording surface temperature is important

To help verify surface temperature readings collected by NASA satellites.

A. What is surface temperature?

B. Why collect surface temperature data?

C. How your measurements can help!

D. How to collect your data.

E. How to report data to GLOBE.

F. Understand the data.

G. Quiz yourself!

H. Further resources.

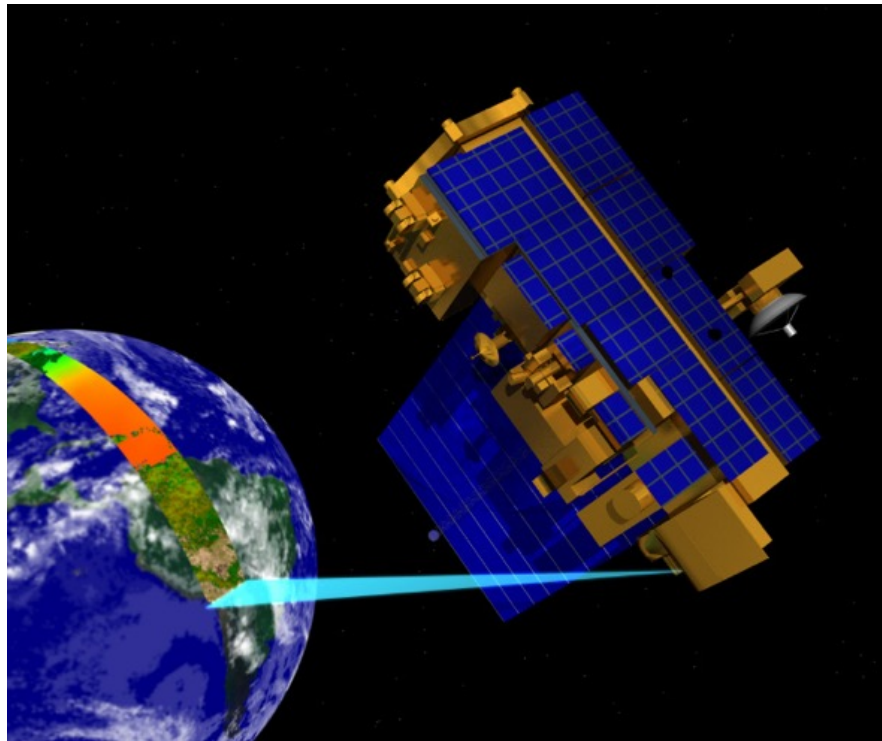


Image: NASA

Find out more about [NASA's MODIS Imagery](#)

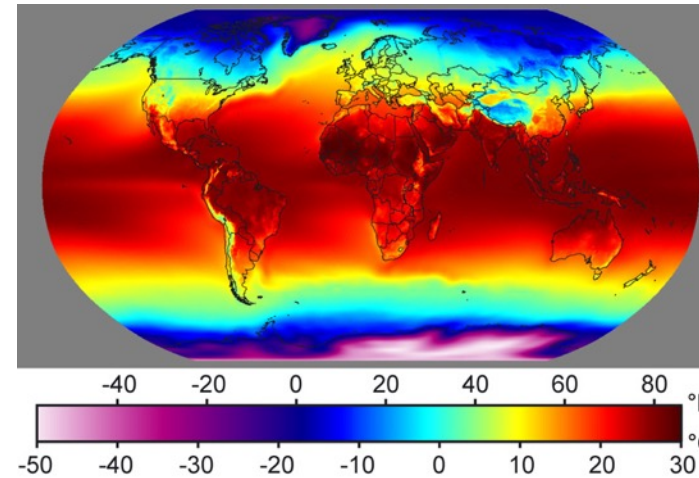


Image: Windows to the Universe

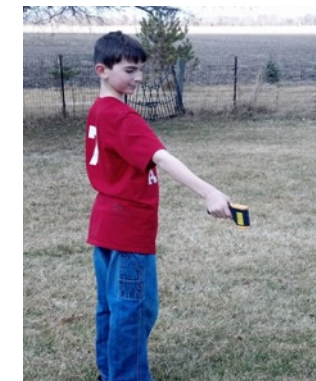


Image: Kevn Czajkowski

GLOBE Urban Heat Island Effect-Surface Temperature Field Campaign



Home > UHIE-Surface Temperature



- UHIE-Surface Temperature**
- Meet the Scientists
- Science of the Surface Temperature Field Campaign
- Past Campaigns
- GLOBE Field Campaigns
- Discussions & Group Documents

Urban Heat Island Effect-Surface Temperature Field Campaign

To get started, use the following links to download the:

1. Surface Temperature Field Campaign Teacher's Participation Guide
2. Surface Temperature Protocol
3. Surface Temperature Data Sheet
4. [Surface Temperature eTraining](#)

Purpose

The purpose of this investigation is to discover how the land cover of the ground affects its surface temperature. But, that is not the only reason to participate in the field campaign. The main research question that needs to be answered is "How does surface cover affect surface temperature?" Students can set up research studies at their own school such as looking at the difference between paved and unpaved areas, such as a grassy area. More schools are taking surface temperature observations, therefore students can investigate how surface temperature changes between schools. They could look at elevation, latitude and longitude, urban versus rural, proximity to water, etc. There are many research questions possible with surface temperature. Students could also look at how cloud cover or humidity affect the surface temperature.

Overview

Urban Heat Island Effect-Surface Temperature Field Campaign is focused on looking at the impact urbanization has on the Earth's surface temperature and how the surface temperature changes the dynamics of the Earth's atmosphere. Studying the energy cycle is fundamental to understanding how the Earth's spheres function within its system. The surface temperature measurements contribute data a) not normally collected by weather agencies, b) for climate studies and c) for ground-truthing satellite data.

Surface Temperature Campaign is not new to the GLOBE Program. The data collection for the Surface Temperature Protocol Campaign as mentioned on the GLOBE website is being done in December when snow occurs. The campaign will encourage individuals to take daily measurements when doing the atmosphere protocols. The Surface Temperature Protocol was originally designed by Dr. Kevin Czajkowski to validate investigate urban heat island effect and to validate satellite thermal measurements from MODIS and LandSat.

What Data to Collect and When

Dr. C needs YOU to collect and submit the following data to GLOBE:

- Cloud Data
- Air Temperature
- Surface Temperature

Take measurements on 5 different days within the following months:

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Surface Temperature Field Campaign			X		X			X				

What to Do and How to Do it

Report data to the GLOBE database



Home > UHIE-Surface Temperature > Meet the Scientists



UHIE-Surface Temperature

- Meet the Scientists
- Science of the Surface Temperature Field Campaign
- Past Campaigns
- GLOBE Field Campaigns
- Discussions & Group Documents

Meet the Scientists

Kevin Czajkowski, Ph.D.



Dr. Czajkowski is the director of the Geographic Information Science and Applied Geographics (GISAG) Lab at the University of Toledo.



Home > UHIE-Surface Temperature > Discussions & Group Documents



- Discussions & Group Documents**
- Discussion Forums
- Documents

Urban Heat Island Effect-Surface Temperature Field Campaign Community

Welcome to the Urban Heat Island Effect-Surface Temperature Field Campaign community where you can share ideas, upload documents and post questions.

If you join this Community as a member, you will receive an email from other members who post to the forum, and your posts will be sent to everyone, so join up and start posting!

Community Members

Filter by Member Search

45 community members

- Mr. A-Amir Naser IV
teacher
Bahrain Trainers
- Akinumiju Akinola
GLOBE Scientist
Obafemi Awolowo University
- Mrs. Alexandra Allen
4-5th Teacher
Reynolds Elementary School
- Ms. Ali Woods
Pioneer Career & Technology Center
- Ms. Antonija Kojundzic
Geography teacher

Members Activities

- Yesterday 7:38 PM
- Julie Malmberg uploaded a new document, PresentationDetroitAnnualMeeting.pptx, in GLOBE.gov.

<https://www.globe.gov/web/surface-temperature-field-campaign>

Urban Heat Island Effect- Surface Temperature Field Campaign



- October, December and March
- Need both urban and rural schools so we can compare.
- 5 different days each month.
- Take observations on a variety of land cover around your school



GLOBE E-Training/Atmosphere/Surface Temperature



<http://www.globe.gov/get-trained>

Home > Get Trained > Protocol eTraining

Protocol eTraining

To enter GLOBE data on this website or through the GLOBE data entry app, GLOBE users must complete the necessary training either by attending a GLOBE workshop or by completing the required online eTraining modules and assessment tests in this section. Please review the [eTraining Requirements](#) to learn which modules are required to become a trained GLOBE teacher or GLOBE Observer. Once your training is complete, you will be ready to start entering your measurements and will be joining a community of thousands teachers around the world!

Existing GLOBE teachers can continue to expand their GLOBE protocol knowledge by completing additional modules and assessment tests. Click on the [Existing GLOBE Teachers](#) link below to learn which tests are required to become certified in a particular GLOBE protocol.

The GLOBE community looks forward to welcoming you. Please [contact us](#) if you have any questions. Your question may also be answered in one of our [Discussion Forums](#), so check there as well.

A [summary document](#) about GLOBE eTraining is available for download.

View the eTraining Requirements for:

- [New GLOBE Teachers](#)
- [GLOBE Observers](#)
- [Trained GLOBE Users](#)

<https://www.globe.gov/get-trained/protocol-ettraining>

<https://www.globe.gov/get-trained/protocol-ettraining/ettraining-modules/16867642/12267>

Home > Get Trained > Protocol eTraining

Atmosphere

Protocol eTraining

- Atmosphere
- Biosphere
- Hydrosphere
- Pedosphere (Soil)
- eTraining Requirements
- eTraining Community Feedback
- Discussion Forums

INTRODUCTION TO ATMOSPHERE

Learn about the GLOBE student investigations that explore the Earth's atmosphere, weather and climate. After completing this module, you will be able to describe the structure and composition of the atmosphere and explain how differential heating of the Earth's surface generates our planet's air circulation patterns. You will be able to identify the atmosphere as one of the interacting components of our Earth system, and become familiar with the Atmosphere Protocols followed by GLOBE students when they collect data for their scientific investigations. Finally, you will explore the steps of setting up a GLOBE Atmosphere study site for and be introduced to GLOBE data reporting and visualization tools.

[Download Module](#) [Assessment Test](#)

CLOUDS

Learn how to select and define a GLOBE atmosphere Clouds protocol study site and get a step by step introduction of the protocol. After completing this module, you'll know how to explain what clouds are and how they form; explain why clouds are an important element of the Earth system; explain why cloud observations are important for understanding our changing Earth system; identify a Clouds study site and take observations of the sky; upload data to the GLOBE database; visualize data using GLOBE's Visualization Site and have ideas for questions you can address using cloud observations.

[Download Module](#) [Assessment Test](#)

Supporting Material:

[Conrtrail Formation Tutorial](#)

In this tutorial, you can explore the physics of conrtrail formation in the atmosphere and develop the ability to recognize the several types of conrtrails that form under varying atmospheric conditions. Practice classifying the type and abundance of conrtrails.

[Cloud Cover Practice](#)

This interactive web-based tool allows you to calibrate your eye by practicing cloud cover estimation using images on the computer.

[Cloud Type Practice](#)

This interactive web-based tool asks a series of questions to help you narrow down the type of cloud you are observing. It can be used both for practice and in the field to identify clouds.

PRECIPITATION - Rain

Learn how to observe rainfall using a GLOBE approved rain gauge as part of a GLOBE Atmosphere Site. In this module, you will learn how rainfall contributes to the hydrologic cycle and impacts local and regional weather and climate. After finishing this module, you will understand how to read a rain gauge properly, when to take the observation and how to record the data on the GLOBE website.

Atmosphere Investigation
Surface Temperature Data Sheet * Required Field

School Name: _____ Study Site: _____
 Observer names: _____
 Date: Year _____ Month _____ Day _____ Universal Time (hour:min): _____

*Surface Temperature
 Site's Overall Surface Condition (Select One) Wet Dry Snow

Sample	Temperature Measurement (°C)	Snow Depth (mm) (If none, selected above)
1	<input type="checkbox"/> zero <input type="checkbox"/> Trace (<10 mm)	<input type="checkbox"/> Measurable (>10mm) mm
2	<input type="checkbox"/> zero <input type="checkbox"/> Trace (<10 mm)	<input type="checkbox"/> Measurable (>10mm) mm
3	<input type="checkbox"/> zero <input type="checkbox"/> Trace (<10 mm)	<input type="checkbox"/> Measurable (>10mm) mm
4	<input type="checkbox"/> zero <input type="checkbox"/> Trace (<10 mm)	<input type="checkbox"/> Measurable (>10mm) mm
5	<input type="checkbox"/> zero <input type="checkbox"/> Trace (<10 mm)	<input type="checkbox"/> Measurable (>10mm) mm
6	<input type="checkbox"/> zero <input type="checkbox"/> Trace (<10 mm)	<input type="checkbox"/> Measurable (>10mm) mm
7	<input type="checkbox"/> zero <input type="checkbox"/> Trace (<10 mm)	<input type="checkbox"/> Measurable (>10mm) mm
8	<input type="checkbox"/> zero <input type="checkbox"/> Trace (<10 mm)	<input type="checkbox"/> Measurable (>10mm) mm
9	<input type="checkbox"/> zero <input type="checkbox"/> Trace (<10 mm)	<input type="checkbox"/> Measurable (>10mm) mm

Comments: _____

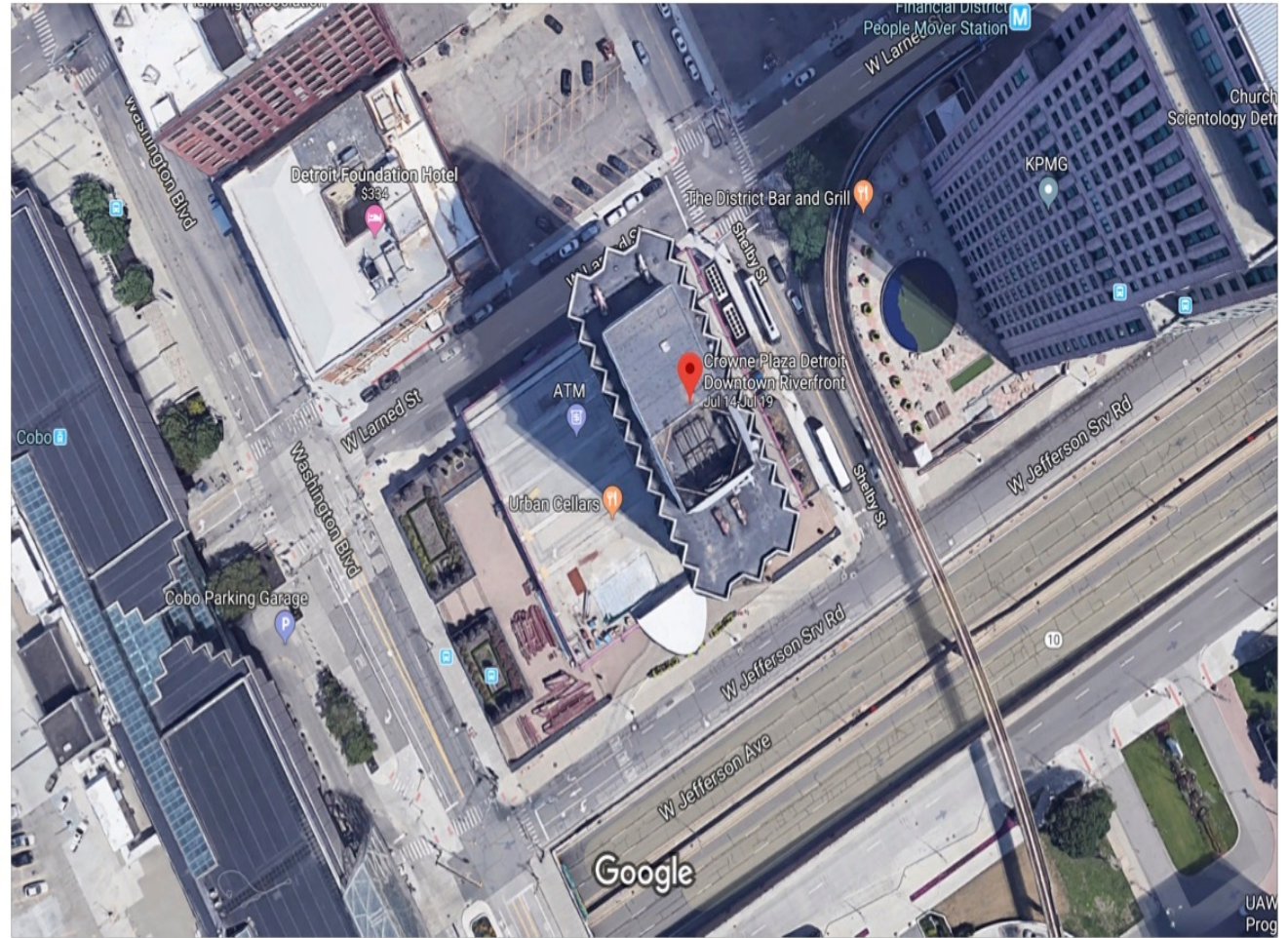
*Sky Conditions (next page): _____

GLEBE 2018 Appendix 19

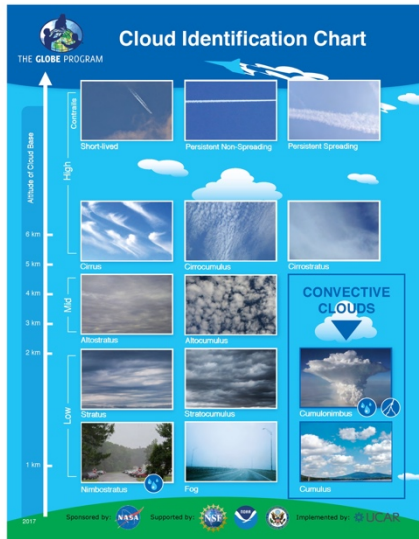


Collect Surface Temperature Data!

Google Maps Crowne Plaza Detroit Downtown Riverfront



Imagery ©2019 Google, Map data ©2019 Google 50 ft



Atmosphere Investigation
Surface Temperature Data Sheet * Required Field

School Name: _____ Study Site: _____
Observer name: _____
Date: Year: _____ Month: _____ Day: _____ Universal Time (hour:min): _____

*Surface Temperature
Site's Overall Surface Condition (Select One): Wet Dry Snow

Sample	Temperature Measurement (°C)	Snow Depth (mm) <small>* If snow selected above</small>
1		<input type="checkbox"/> zero <input type="checkbox"/> Trace (<10 mm) <input type="checkbox"/> Measurable (1-15mm) mm
2		<input type="checkbox"/> zero <input type="checkbox"/> Trace (<10 mm) <input type="checkbox"/> Measurable (1-15mm) mm
3		<input type="checkbox"/> zero <input type="checkbox"/> Trace (<10 mm) <input type="checkbox"/> Measurable (1-15mm) mm
4		<input type="checkbox"/> zero <input type="checkbox"/> Trace (<10 mm) <input type="checkbox"/> Measurable (1-15mm) mm
5		<input type="checkbox"/> zero <input type="checkbox"/> Trace (<10 mm) <input type="checkbox"/> Measurable (1-15mm) mm
6		<input type="checkbox"/> zero <input type="checkbox"/> Trace (<10 mm) <input type="checkbox"/> Measurable (1-15mm) mm
7		<input type="checkbox"/> zero <input type="checkbox"/> Trace (<10 mm) <input type="checkbox"/> Measurable (1-15mm) mm
8		<input type="checkbox"/> zero <input type="checkbox"/> Trace (<10 mm) <input type="checkbox"/> Measurable (1-15mm) mm
9		<input type="checkbox"/> zero <input type="checkbox"/> Trace (<10 mm) <input type="checkbox"/> Measurable (1-15mm) mm

Comments: _____

*Sky Conditions (next page): _____

© 2007 2010 August 10 Atmosphere

What did you find out about today's surface temperature?



<https://www.globe.gov/globe-data/data-entry>



Data Entry

Share

Data Entry

GLOBE Data Entry consists of several options:

Liquid-filled Maximum/Minimum Thermometers - GLOBE no longer recommends the U tube thermometer for recording maximum and minimum air temperatures. The thermometer magnet for resetting the floats becomes demagnetized and/or the floats stick in the tube. GLOBE encourages the use of a digital maximum/minimum thermometer for these air temperature measurements. If you are currently using a U-tube thermometer please consider replacing it with a digital model.



[Data Entry - Desktop Forms](#) - These pages are for entering environmental data - collected at defined sites, according to protocol, and using approved instrumentation - for entry into the official GLOBE science database.



[Data Entry - Mobile App](#) - The app allows users to enter data directly from an iOS or Android device for any GLOBE protocol.



[Training Data Entry](#) - These pages are for practicing data entry, either during workshops or when providing others a view of the data entry process. These data entry pages are based on the newer designed data entry pages. These data are not intended for entry into the official GLOBE science database.



Datasets from NASA Satellites



MODIS Terra Global Land Surface Temperature 2017

Data
Disciplines: LP DAAC

Related Content
Snow along the Caucasus Mountains
Fires in South Sudan
New West Africa Coastal Zone Data Collection at SEDAC
Dust blowing off the coast of Pakistan
Volcanoes of Kamchatka

More Resources
Common Metadata Repository (CMR)
Earthdata Search
Global Imagery Browse Services (GIBS)
LANCE: Land, Atmosphere Near Real-Time Capability for EOS
Worldview

MODIS Terra Global Land Surface Temperature 2017

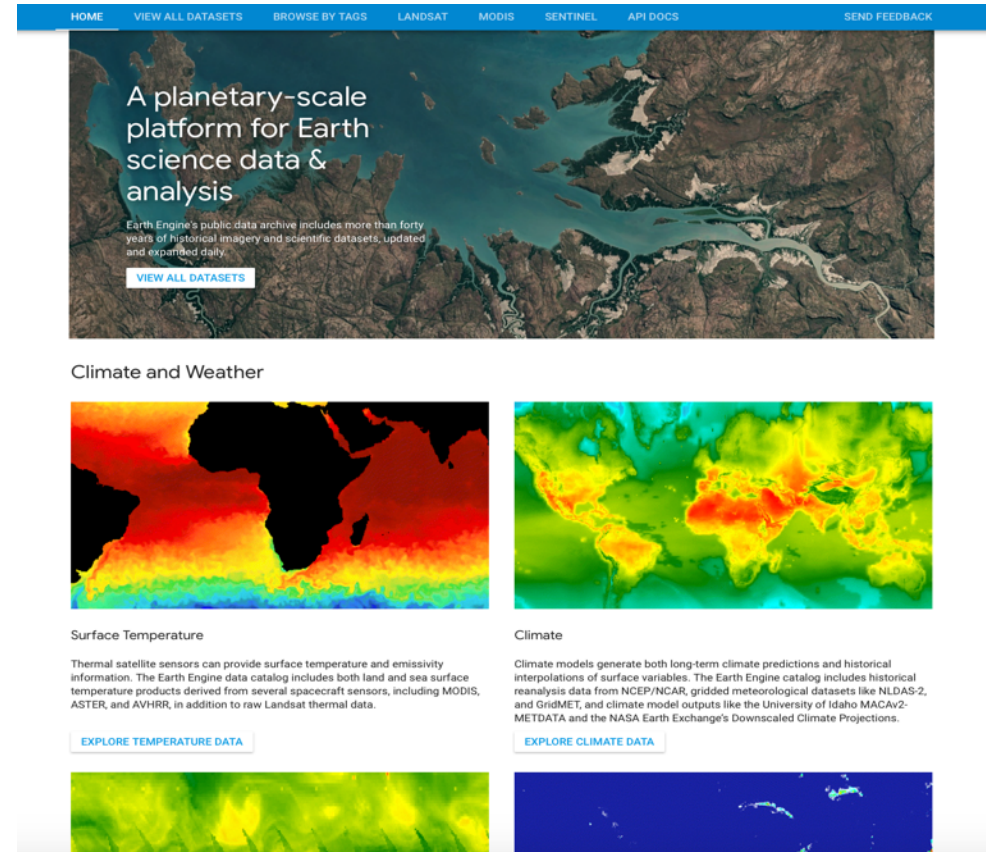
Observe changes in land surface temperature over the course of 2017, with NASA Terra Moderate Resolution Imaging Spectroradiometer (MODIS) images.

This animation shows changes in global land surface temperature over the course of 2017, using NASA Terra Moderate Resolution Imaging Spectroradiometer (MODIS) data. The images were created using the 8-day composite Terra MODIS Land Surface Temperature (LST) data product (MOD11C2). MODIS LST data is managed, archived and distributed by NASA's Land Processes Distributed Active Archive Center (LP DAAC). LP DAAC is one of NASA's Earth Observing System Data and Information System (EOSDIS) DAACs that manage, archive and distribute Earth science data as part of NASA's Earth Science Data Systems Program. It is located at the United States Geological Survey (USGS) Earth Resources Observation and Science (EROS) Center in Sioux Falls, South Dakota.

About the Data
Location: Global
Data Short Name: MOD11C2
DOI: 10.5067/MODIS/MOD11C2.006

Last Updated: Oct 24, 2018 at 10:31 AM EDT

<https://earthdata.nasa.gov/special-feature-modis-global-land-surface-temperature>



HOME VIEW ALL DATASETS BROWSE BY TAGS LANDSAT MODIS SENTINEL API DOCS SEND FEEDBACK

A planetary-scale platform for Earth science data & analysis

Earth Engine's public data archive includes more than forty years of historical imagery and scientific datasets, updated and expanded daily.

VIEW ALL DATASETS

Climate and Weather

Surface Temperature

Thermal satellite sensors can provide surface temperature and emissivity information. The Earth Engine data catalog includes both land and sea surface temperature products derived from several spacecraft sensors, including MODIS, ASTER, and AVHRR, in addition to raw Landsat thermal data.

EXPLORE TEMPERATURE DATA

Climate

Climate models generate both long-term climate predictions and historical interpolations of surface variables. The Earth Engine catalog includes historical reanalysis data from NCEP/NCAR, gridded meteorological datasets like NLDAS-2, and GridMET, and climate model outputs like the University of Idaho MACAv2-METDATA and the NASA Earth Exchange's Downscaled Climate Projections.

EXPLORE CLIMATE DATA

<https://developers.google.com/earth-engine/datasets/>

Help Guide Under the AREN Project:

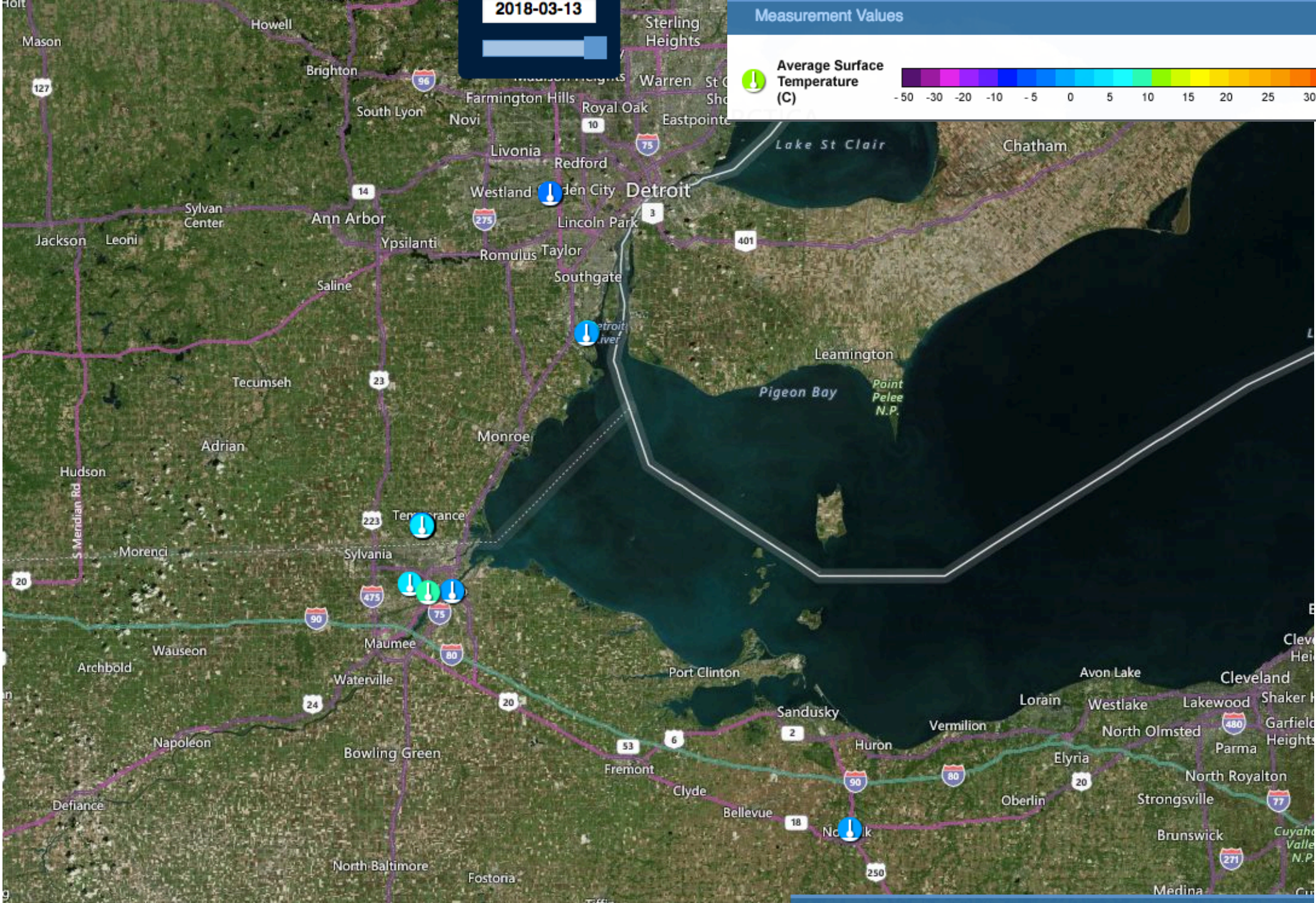
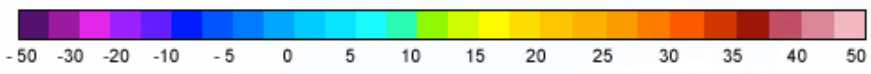
<https://www.globe.gov/documents/23174792/24151782/AREN+GLOBE+Program+Quick+Guide+for+Accessing+Satellite+Data.pdf/7cf42c4a-c7bc-44f1-8e2c-252a26ef0c8b>

2018-03-13

Measurement Values




Average Surface Temperature (C)



Student Research Questions

1. Which surfaces have warmer or cooler surface temperature?
2. How do local weather conditions affect surface temperatures of different materials over time?
3. How do surface temperatures at my school compare with another school in a different environment (ex. Urban vs. Rural)?



***What are your
research
questions?***



NASA's Interest in Urban Heat Island



More NASA Resources

The screenshot shows the NASA Climate Kids website. At the top, there is a search bar and navigation icons for Big Questions, Weather & Climate, Atmosphere, Water, Energy, and Plants & Animals. The main content area is titled "What is an Urban Heat Island?" and includes a "The Short Answer:" section with a text box, a diagram of an urban heat island, and a "Why does this happen?" section with explanatory text. To the right, there are two "More to explore!" sections with links to "What is a renewable energy scientist?" and "Why does NASA study Earth?".

What is an Urban Heat Island?

The Short Answer:

An urban heat island occurs when a city experiences much warmer temperatures than nearby rural areas. The difference in temperature between urban and less-developed rural areas has to do with how well the surfaces in each environment absorb and hold heat.

An urban heat island occurs when a city experiences much warmer temperatures than nearby rural areas.

Urban Heat Island

An illustration of an urban heat island. Image credit: NASA/JPL-Caltech

Why does this happen?

An urban area is a city. A rural area is out in the country. The sun's heat and light reach the city and the country in the same way. The difference in temperature between urban and less-developed rural areas has to do with how well the surfaces in each environment absorb and hold heat.

If you travel to a rural area, you'll probably find that most of the region is covered with plants. Grass, trees and farmland covered with crops, as far as the eye can see.

Plants take up water from the ground through their roots. Then, they store the water in their stems and leaves. The water eventually travels to small holes on the underside of leaves. There, the liquid water turns into water vapor and is released into

More to explore!

What is a renewable energy scientist?

Learn all about [this career!](#)

Why does NASA study Earth?

Because it's the [only planet](#) we can live on!

<https://climatekids.nasa.gov/heat-islands/>

The poster features the "eoKids" logo (earth observatory for kids) and the NASA logo. The background is a photograph of a city skyline at sunset, with a green field in the foreground. The text "Urban Heat Islands" is written in large, bold, red letters, with "Hot Times in the City" below it. The website address "www.nasa.gov" is visible in the bottom left corner.

eoKids
earth observatory for kids

National Aeronautics and Space Administration

NASA

Urban Heat Islands
Hot Times in the City

www.nasa.gov

<https://earthobservatory.nasa.gov/blogs/eokids/eo-kids-urban-heat-islands/>

Data Analysis

- [Creation of Urban Heat Island Story Map](#)
- Data Literacy Cubes
- Practice with Graph Cube





Creation of Urban Heat Islands

Purpose:

This story map allows students to explore the urban heat island effect using land surface temperature and vegetation data. Students will investigate the processes that create differences in surface temperatures, as well as how human activities have led to the creation of urban heat islands.

Phenomenon: Urban Heat Island Effect

Sphere(s):

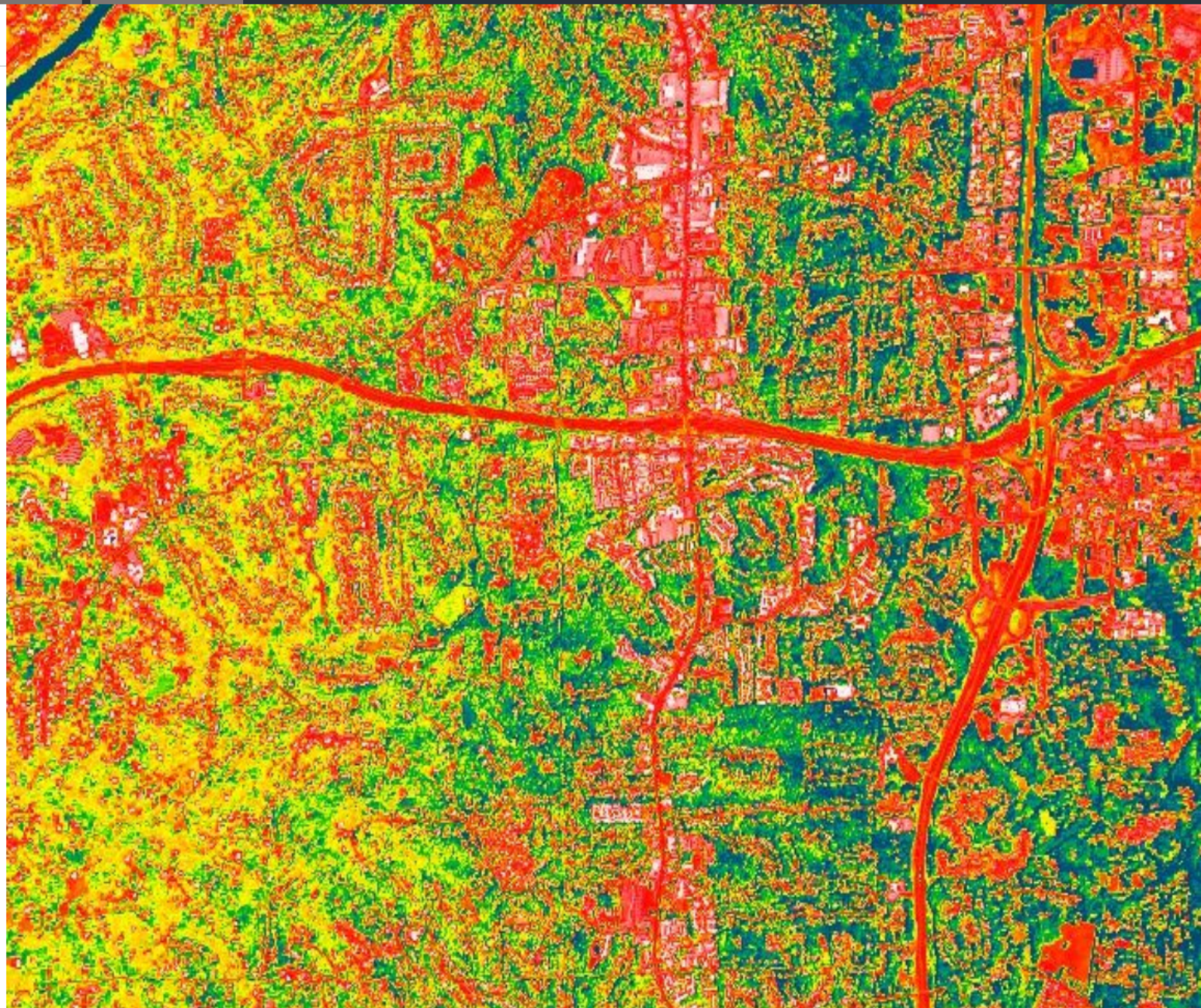
- Geosphere
- Atmosphere
- Biosphere

Grade Level: 6 - 12

Essential Questions:

1. Why do different materials experience differences in surface temperature?
2. What is the role of Urban Heat Islands in Earth's Energy Balance?
3. How has human activity led to the creation of Urban Heat Islands?

Estimated Time for Completing Activity: 90 Minutes





Student Name:

Date:

Period:

Creation of Urban Heat Islands

Link to Story Map:

<https://nasa.maps.arcgis.com/apps/MapSeries/index.html?appid=44b9c8738f0e47e68d9e8ae2c530ed08>

Part I: Engage

1. On the following chart, fill in whether the surfaces shown in the image are typically warmer or cooler than the air temperature on a hot summer day.

Surface	Warmer or Cooler than Air Temperature?
Grass	
Concrete	
Water	
Wood	

2. What is the temperature difference between sunlit concrete and shaded concrete? What does this difference in temperature tell you about how surfaces are heated?
3. Based on what you have seen in this image, which type of area do you think is warmer, urban areas (cities and towns) or rural areas (countrysides)?



Surface Temperature Differences

Analyze the images of people walking barefoot on different surfaces. Think about the times you have walked on these surfaces during a hot, summer day. What was the experience like? Do you ever notice a difference between the temperature of these surfaces and the temperature of the air?

On a bright, hot summer day, if you had to walk barefoot down a dark sidewalk or along pavement lined with green grass, which surface would feel most comfortable to your feet?

Question A.1 : On the following chart, fill in whether the surfaces shown in the image are typically warmer or cooler than the air temperature on a hot summer day.

Surface	Warmer or Cooler than Air Temperature?
Grass	
Concrete	
Water	
Wood	



Creation of Urban Heat Islands



Surface Temperature Differences

Surface Temperature Differences

In the image, different surface temperatures were measured on an Autumn afternoon. Notice that the temperatures of the various surfaces are different from the air temperature, which is 54° Fahrenheit. Also, notice that some temperatures were measured on the same surface both in the sunlight and in the shade.

Question A.2: What is the temperature difference between sunlit concrete and shaded concrete? What does this difference in temperature tell you about how surfaces are heated?

Question A.3: Based on what you have seen in this image, which type of area do you think is warmer, urban areas (cities and towns) or rural areas (countrysides)?

Image: Direct sunlight can heat surfaces well above air temperature
Credit: NASA Earth Observatory photograph by Robert Simmon

GLOBE Surface Temperature Field Campaign

Many schools around the world take part in the [Global Learning and Observations to Benefit the Environment \(GLOBE\) Program](#). GLOBE is an educational program that provides students and the public worldwide with the opportunity to collect scientific data.



Creation of Urban Heat Islands



Surface Temperature Differences

Image: Direct sunlight can heat surfaces well above air temperature

Credit: NASA Earth Observatory photograph by Robert Simmon

GLOBE Surface Temperature Field Campaign

Many schools around the world take part in the [Global Learning and Observations to Benefit the Environment \(GLOBE\) Program](#). GLOBE is an educational program that provides students and the public worldwide with the opportunity to collect scientific data.

One of the measurement campaigns that students can take part in is the [Surface Temperature Field Campaign](#). The purpose of the Surface Temperature Field Campaign is to answer the question, "How does surface cover affect surface temperature?"

Instructions:

Shown on the map are different surface temperature readings provided by schools around the world.

1. Click on a surface temperature data icon anywhere on the map to view the temperature data that were collected at that location.



2. Adjust the time slider to view surface temperature data from different dates



GLOBE Visualization System



Measurements

Data Counts



Select Language



Sign In



Protocol Layers

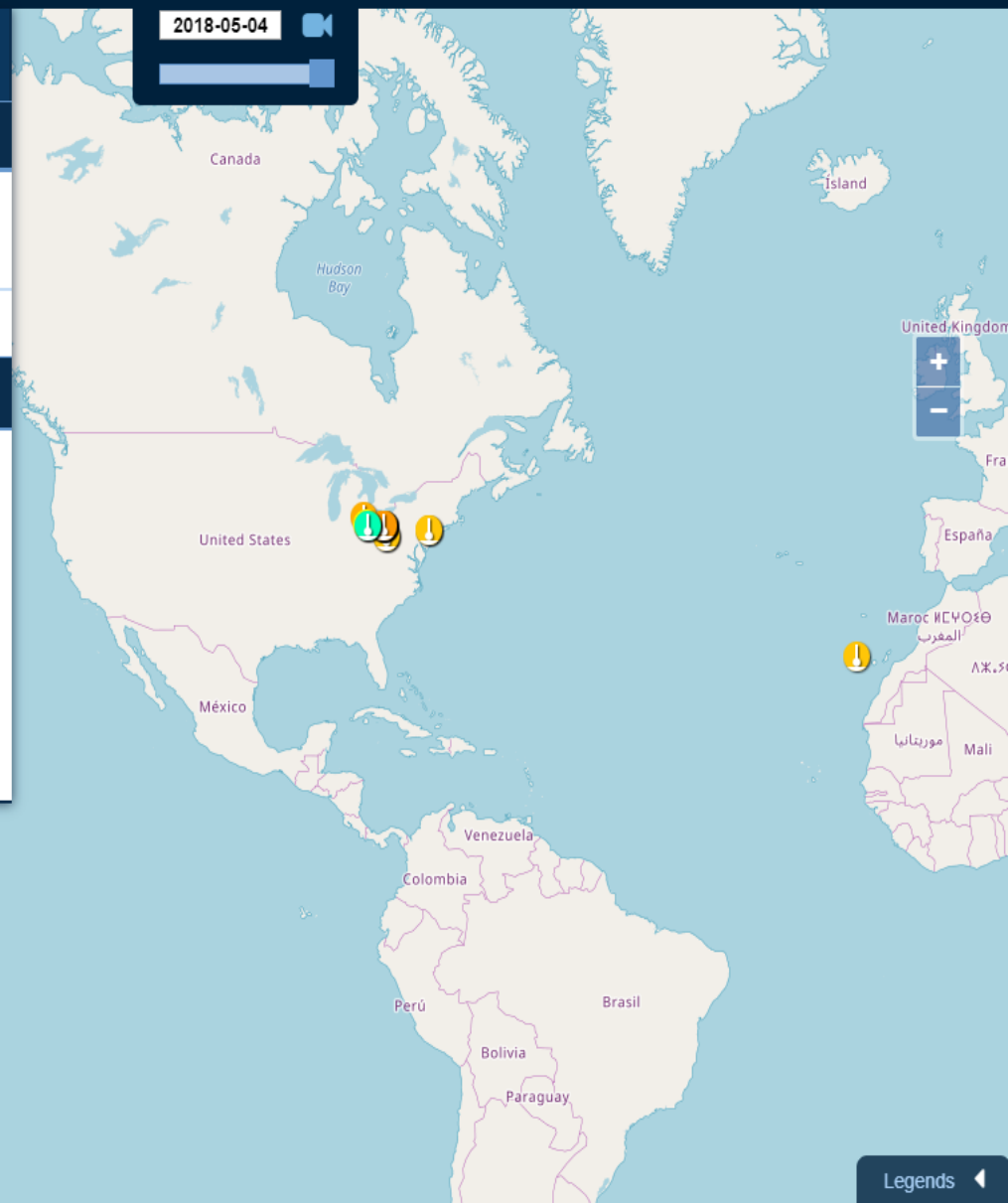
Surface Temperature

Contours

Contour Layer Opacity

Choose sphere to explore protocols

- Atmosphere
- Biosphere
- Hydrosphere
- Pedosphere (Soil)
Soil Temperature and Moisture
- Pedosphere (Soil)
Soil Characterization



Sites on Map: 89

1000 km

© OpenStreetMap contributors.

Legends

Creation of Urban Heat Islands



Surface Temperature Differences

Shumate Middle School's Surface Temperature Data Collection

In 2017, Shumate Middle School collected surface temperature data for the Surface Temperature Field Campaign. They chose two different surfaces to measure the temperature of, a sidewalk and a nearby pond, which are labeled on the image. Located on the next slide you will find a line plot of their surface temperature data for the month of October. Before moving on to the next slide, answer the following question.

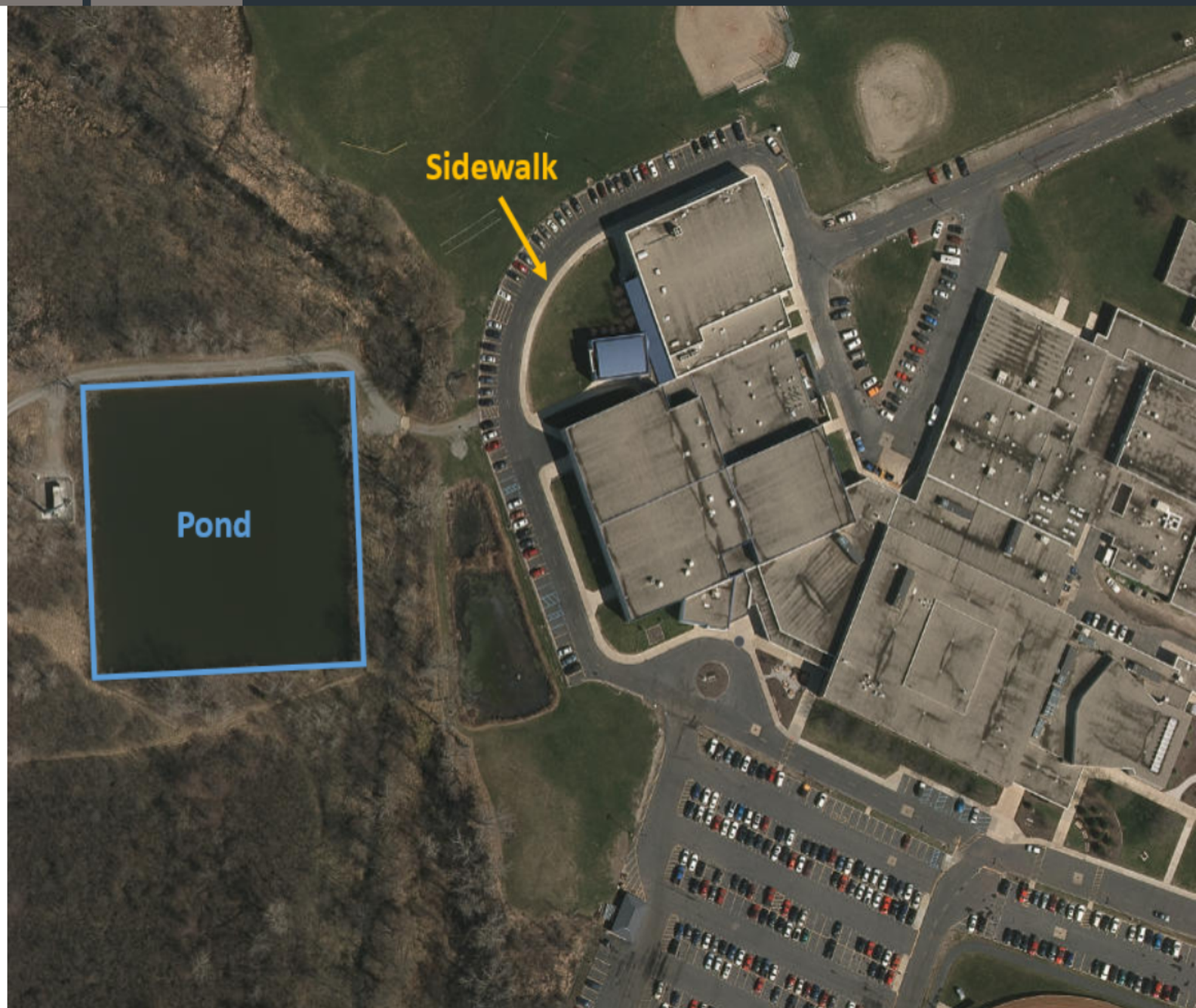
Question A.4: Based on what you already know about the temperatures of different surfaces, which surface do you predict was warmer during the month of October, the pond or the sidewalk?

Shumate Middle School's Surface Temperature Data

This line graph shows two sets of data, one for the sidewalk shown in blue, and another for the pond shown in orange. This way the data for both surfaces can be easily compared.

Was your prediction correct?

Question A.5: Describe what you see on the graph. How do the lines change?





Creation of Urban Heat Islands

Surface Temperature Differences

Shumate Middle School's Surface Temperature Data

This line graph shows two sets of data, one for the sidewalk shown in blue, and another for the pond shown in orange. This way the data for both surfaces can be easily compared.

Was your prediction correct?

Question A.5: Describe what you see on the graph. How do the lines change?

Question A.6: What do these changes in the lines mean?

Question A.7: What patterns do you notice between the sidewalk and pond data?

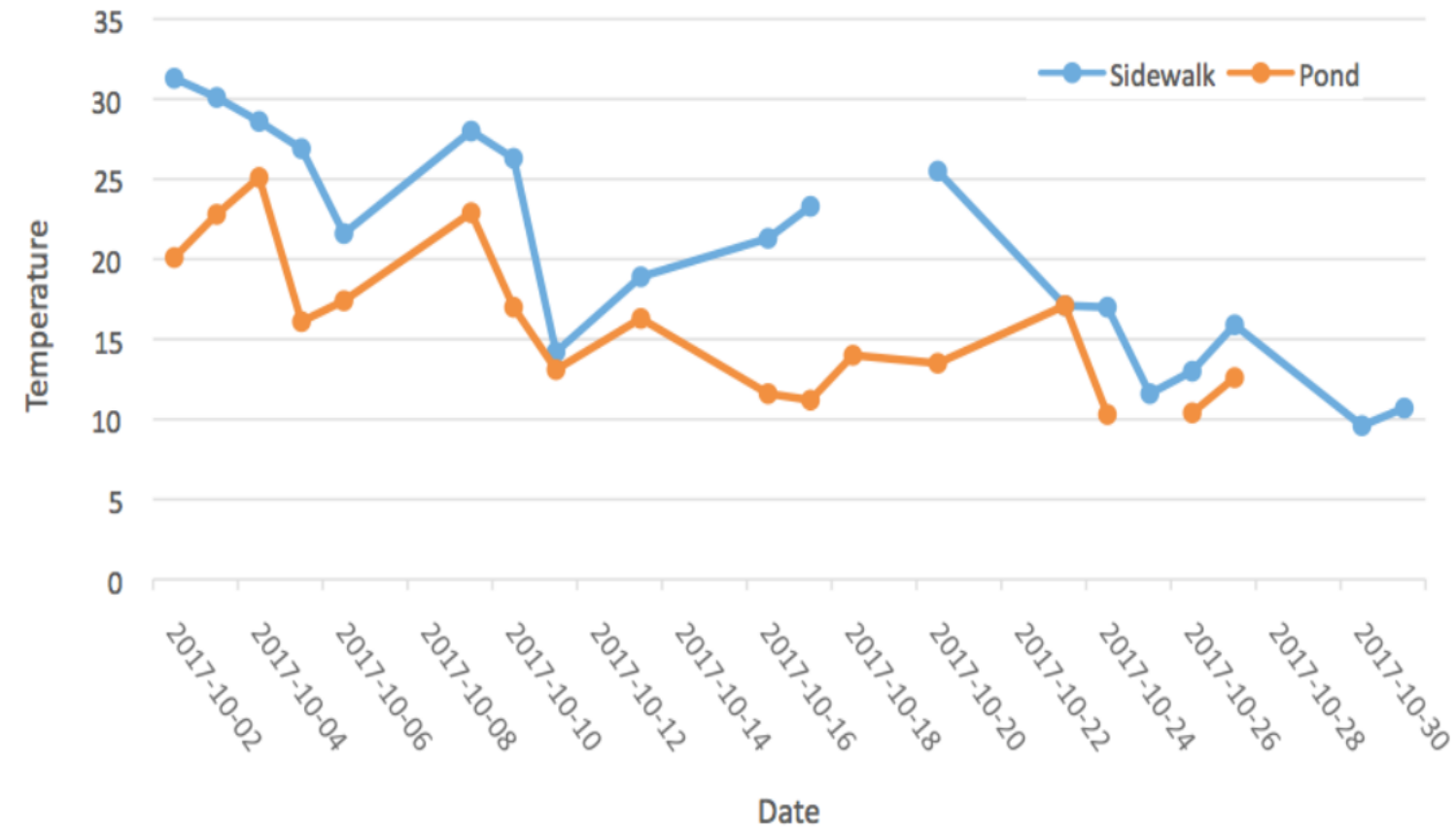
Question A.8: What surprises you about this line graph? Come up with a research question you would like to know the answer to.

Image: Average October Surface Temperature Shumate Middle School
Credit: Kevin Czajkowski, The GLOBE Program

Surface Temperatures in Your Community

Note: Alternatively, this activity can be completed by going outside to the school grounds.

Average October Surface Temperature (°C) Shumate Middle School



Creation of Urban Heat Islands



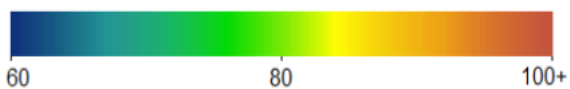
Surface Temperature of Urban Areas

Shown to the right is an image of the surface temperatures in the city of Atlanta, Georgia on May 1st of 2018.

Data: Landsat Provisional Surface Temperature

Credit: Landsat Level 2 Surface Temperature Science Product courtesy of the U.S. Geological Survey

Surface Temperature (degrees Fahrenheit)

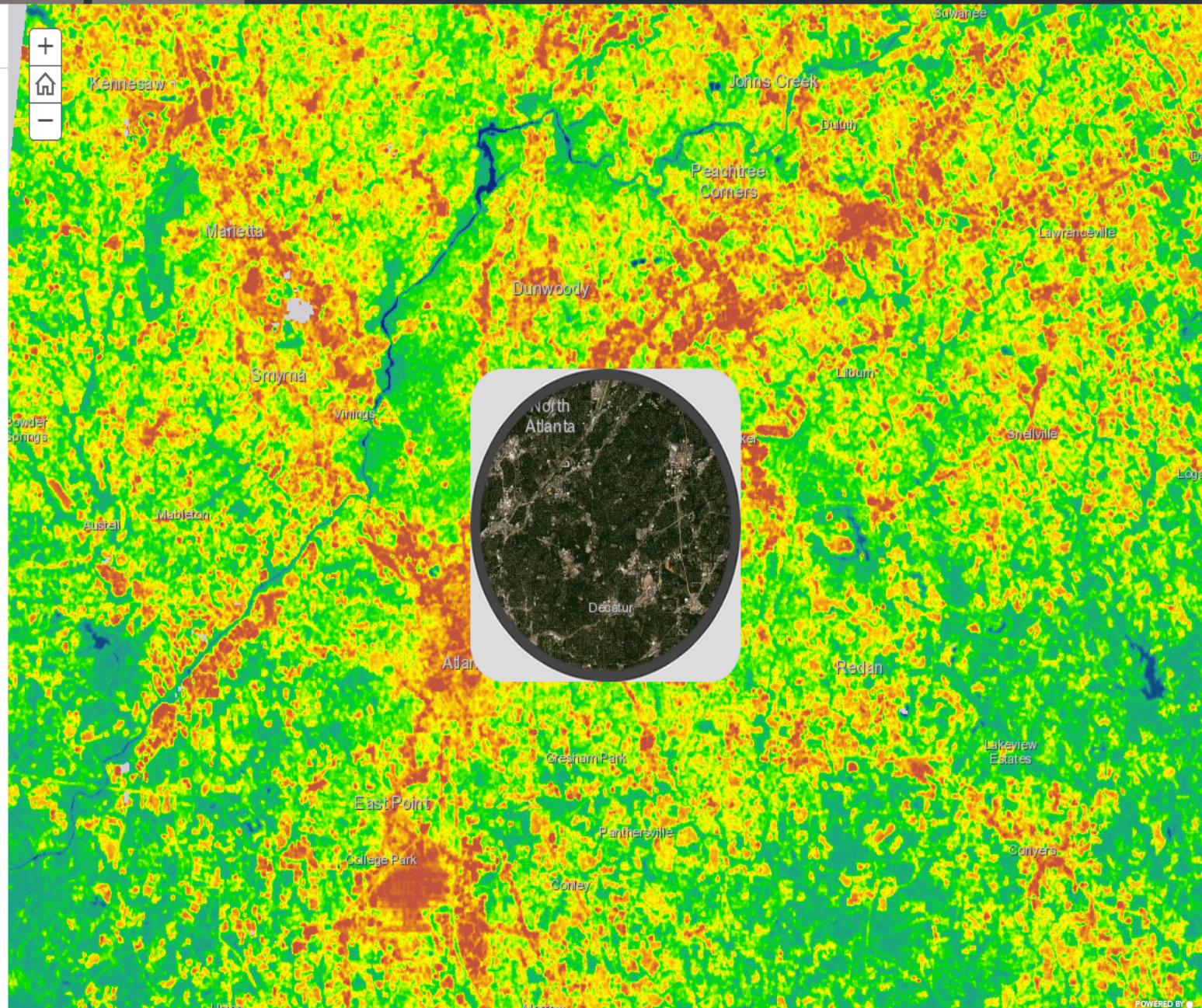


Instructions:

Adjust the spyglass to view how surface temperature differs between materials.



Spyglass



Creation of Urban Heat Islands



Surface Temperature of Urban Areas

Question B.1: Fill in the following chart with three different surface types that you identify in the image of Atlanta, Georgia. Next, fill in the surface temperature of that material.

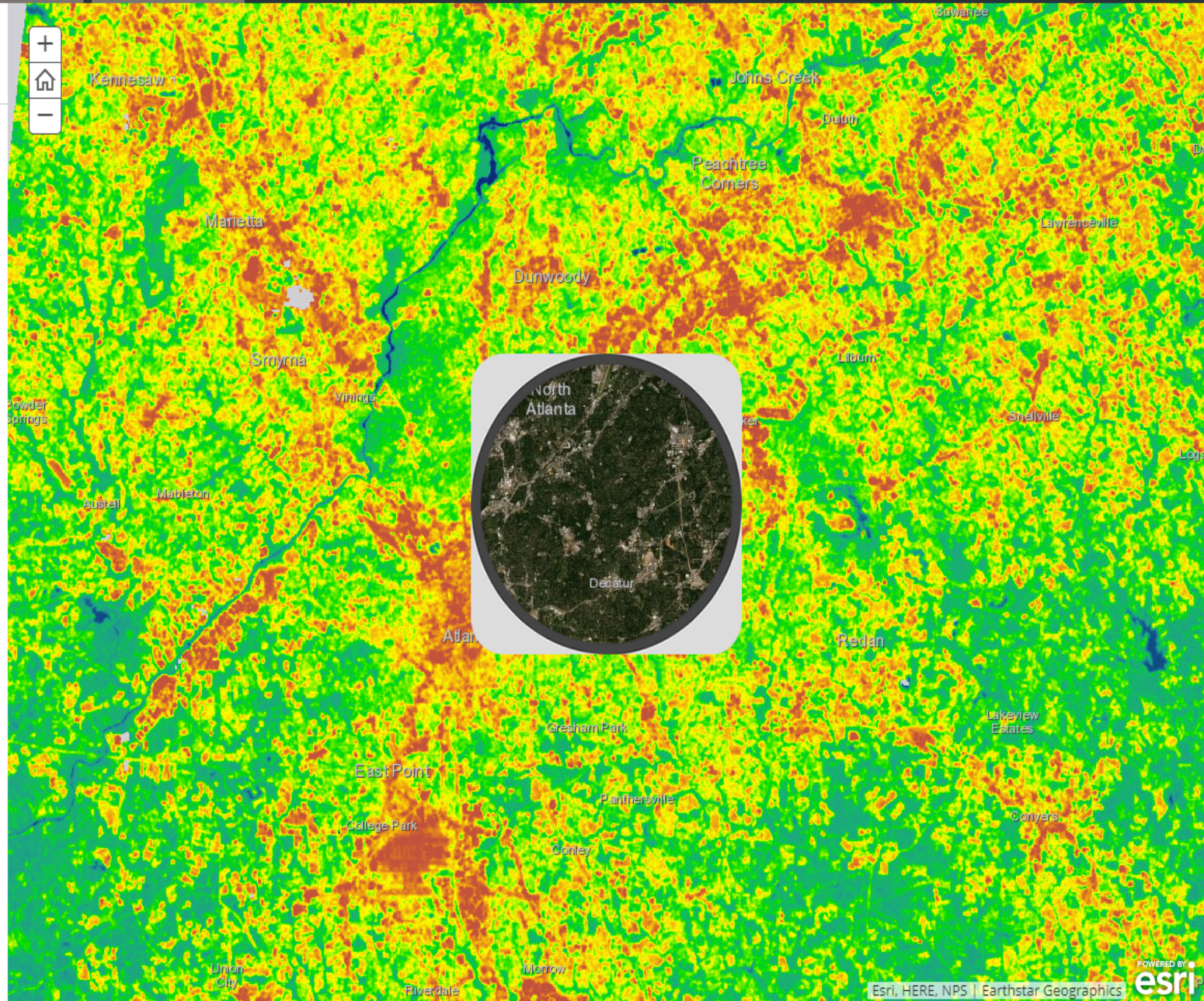
Item (object or organism)	Artificial or Natural?	Temperature
1.		
2.		
3.		
4.		
5.		

Question B.2: What patterns do you see?

Question B.3: What do these patterns mean?

Plotting Temperature: Bar Graph

Look back at the chart you filled out in Question 1. Now, we will create a bar graph that displays the different temperatures of each of the surfaces you



Creation of Urban Heat Islands



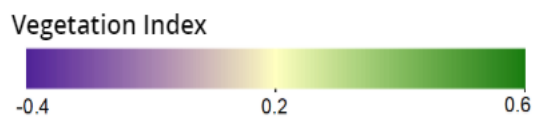
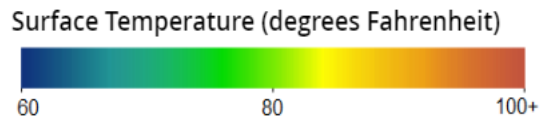
Surface Temperature of Urban Areas

Relationship Between Surface Temperature and Vegetation

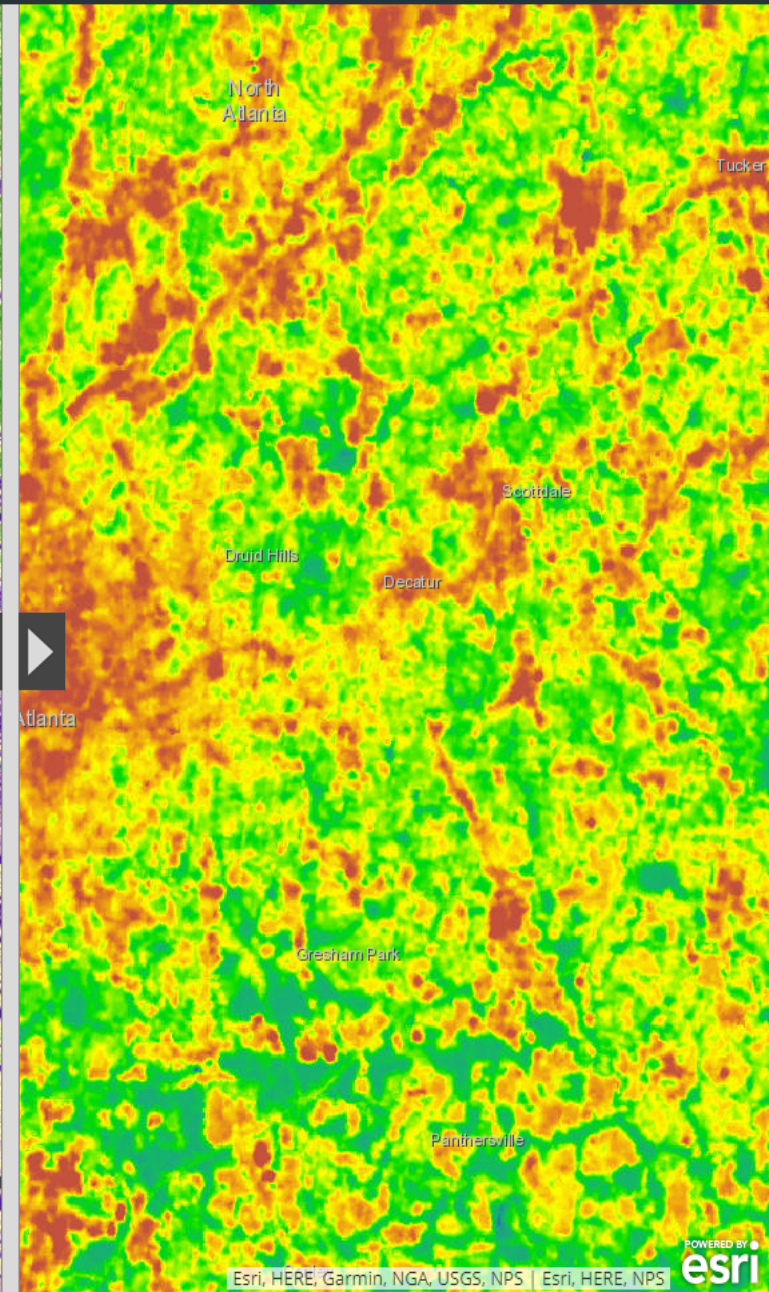
Once again, the image to the right shows Atlanta, Georgia. This time we will compare surface temperature and vegetation.

Data: Landsat Provisional Surface Temperature
Credit: Landsat Level 2 Surface Temperature Science Product courtesy of the U.S. Geological Survey

Data: Landsat Normalized Difference Vegetation Index
Credit: Landsat Product courtesy of the U.S. Geological Survey



Vegetation Index is a measure of how much near-infrared radiation is reflected at the surface and can be used to identify the locations of plants. On the legend above, green areas with a vegetation index closer to 1 contain plant life, while purple areas less than 0 represent areas that do not contain plant life.



Creation of Urban Heat Islands



Surface Temperature of Urban Areas

Come up with a research question you would like to know the answer to.

Surface Temperature Changes

Note:

For the next activity, please visit the Earth System Data Explorer directly at the following hyperlink: [Earth System Data Explorer](#)

When you arrive at the Earth System Data Explorer you should see a page similar to the image shown on the right.

Imagine that you are the city planner for Atlanta, Georgia. You have heard about the Urban Heat Island Effect, and would like to collect data on its impact to Atlanta, Georgia. You will use the Earth System Data Explorer to make a line plot of skin temperature changes throughout the city into surrounding areas.

1. Navigate to 'Data Set', 'Geosphere', 'All Data', 'Skin Temperature', and select the data set called 'Daytime Skin Temperature'.
2. Select the option for 'Longitude Plot'.
3. Enter the coordinates '33.75 N' and '86 W' and '82 W'. Change the date to show 'July 2018'.
4. Select 'Update Plot'. Now you should be viewing a line graph of skin temperature changes along the latitude containing Atlanta, Georgia and its surrounding areas.



My NASA Data Home Video Tutorials

Earth System Data Explorer

Data Set: Update Plots:

One Plot: Annotations:

Plot Options:

Print... Link... Animate Correlation Viewer Google Earth Show Values Export to Desktop Application Save As...



Compute: over:

My selections:

Select:





What Are Urban Heat Islands?

An urban heat island occurs when a city experiences much warmer temperatures than nearby rural areas. The sun's heat and light reach the city and the country in the same way. The difference in temperature between urban and less-developed rural areas has to do with how well the surfaces in each environment absorb and hold heat.

Instructions:

Watch the NASA Youtube video on the Earth's Energy Budget, review the vocabulary, and then answer the questions.

Air Temperature: Describes the temperature of air close to the surface (about 2 meters above the surface).

Albedo: the fraction of sunlight that is reflected by a surface or body (such as vegetation or a cloud)

Radiation: the emission of energy as particles or waves. X-rays, visible light, infrared, microwave, and radio waves are all examples of radiation.

Rural: A geographic area in the countryside or away from cities and towns, typically with agricultural or natural land cover.

Skin Temperature: Describes the temperature of the top few centimeters of a surface



Creation of Urban Heat Islands



What Are Urban Heat Islands?

Question C.4: In what form is the majority of energy released from the Earth's surface in?

Question C.5: Why does the air above hot pavement appear to shimmer?

Question C.6: How does evaporation cool the Earth's surface?

Image: Earth's energy budget describes the balance between the radiant energy that reaches Earth from the sun and the energy that flows from Earth back out to space

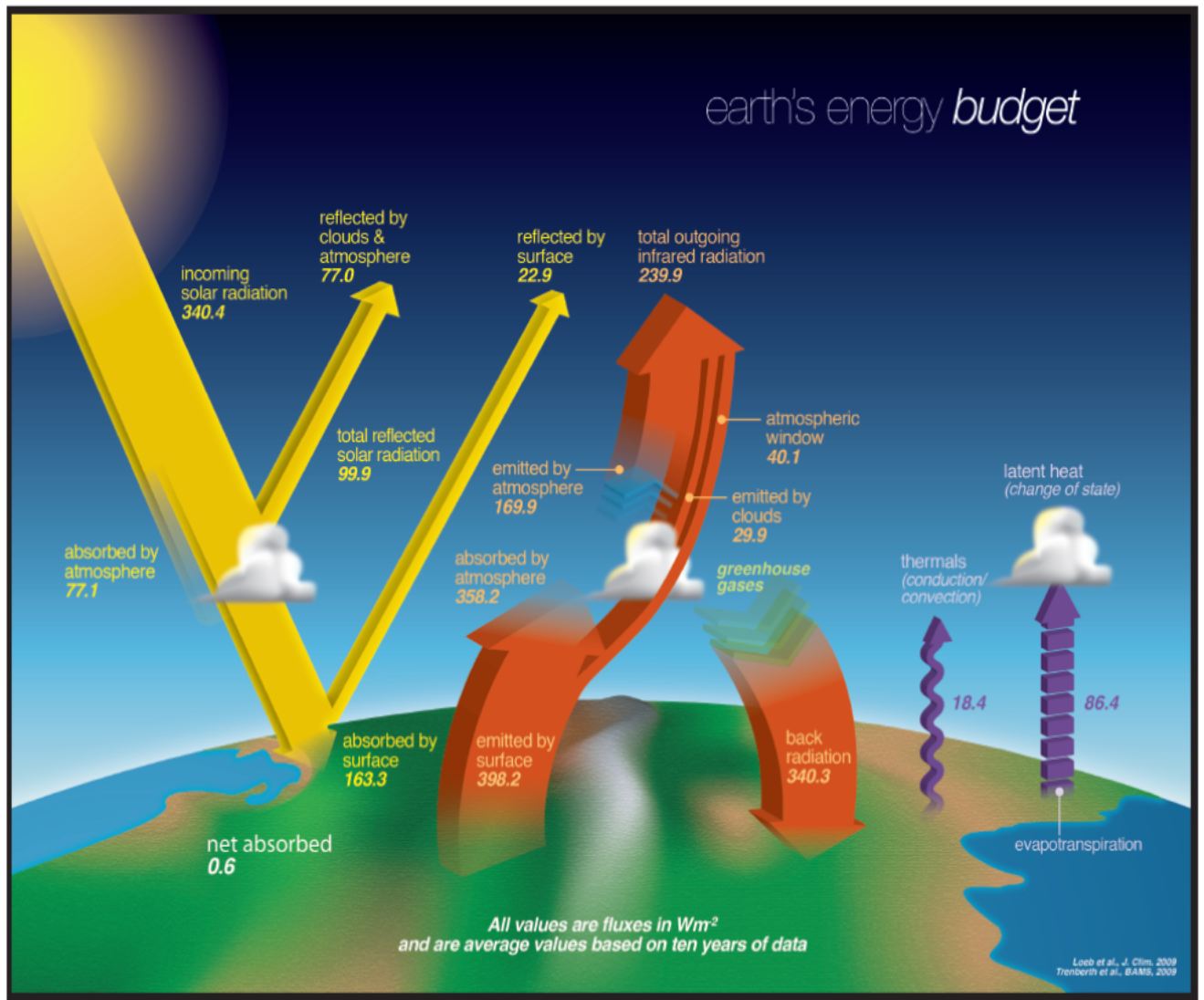
Credits: NASA

What is Albedo and How is it Related to Energy?

Part of the reason for differences in surface temperature over different types of surfaces comes from differences in **Albedo**. As mentioned on the previous slide, some materials reflect more sunlight than others. This has a lot to do with the color of the surface. Have you ever noticed that you get hotter outside in the summer when you wear black and you feel cooler when you wear white? This is the effect of Albedo.

Albedo indicates what percentage of the incoming solar radiation (sunlight) is reflected by a surface. The less albedo a surface has, the more energy contained in solar radiation (sunlight) is getting absorbed. So if the moon has an albedo of 6%, that means 6% of the incoming solar energy that reaches the moon's surface is reflected and the other 94% of the energy is absorbed by the surface.

National Aeronautics and Space Administration



Creation of Urban Heat Islands



C-CAP Land Cover Atlas



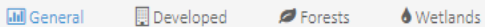
Future of Urban Heat Islands

3. Notice the legend. Based on the map alone, has there been a change in land use for this county?

Land Cover Changes



4. Look through the 'General', 'Developed', 'Forests', and 'Wetlands'



Question D.1: What is the percentage of San Diego County that has changed? (Listed under 'General' tab)

Question D.2: Between 1996 and 2010, did development increase or decrease? By how much?

Question D.3: Between 1996 and 2010, did forested areas increase or decrease? By how much?

Question D.4: Repeat steps 1-4 for a coastal county of your choice. Look for the same results that you found in questions 1-3. How does the county you chose compare to San Diego County?

Counties | Watersheds

State/Territory | County/Island | Select On Map

From 1996 To 2010

General | Developed | Forests | Wetlands

Visualize and explore observed land cover changes for your region and time frame of interest.

To Start

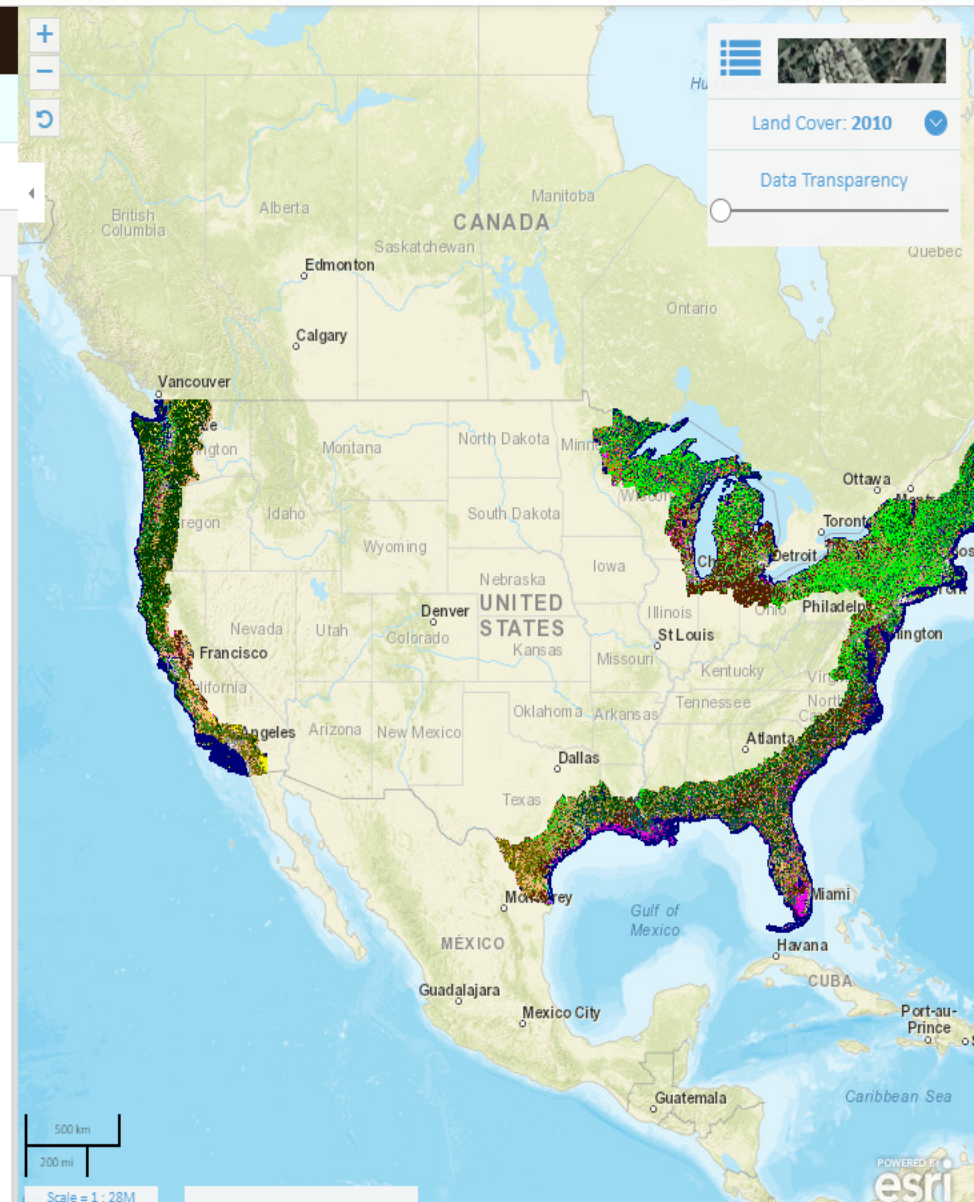
- ✓ Select a state
- ✓ Pick a county or watershed
- ✓ Select a time frame
- ✓ Explore!

[See Hints](#)

New in this version

- ✓ Choose between Counties or Watersheds
- ✓ Year 2010 data available for all regions
- ✓ "Region Map" to select a geography using a map
- ✓ "Share Map" now provides shortened URL
- ✓ "Share Map" lets you share via Facebook or Twitter or Google+

[View Disclaimer](#)



Creation of Urban Heat Islands



A Case Study: Peachtree Road Race in Atlanta, Georgia Design an Experiment

As a city planner, you have been tasked with coming up with a way to alleviate the effects of the Urban Heat Island Effect for the upcoming Peachtree Road Race in Atlanta, Georgia.

You have decided that easiest way to cool the area off would be to change the material of the roofs in the area. Decide on a material and create an experiment that you could use to see if the rooftops will be effective. Fill in the blanks with information about your experiment.

Question E.3:

Material to be placed on rooftops:

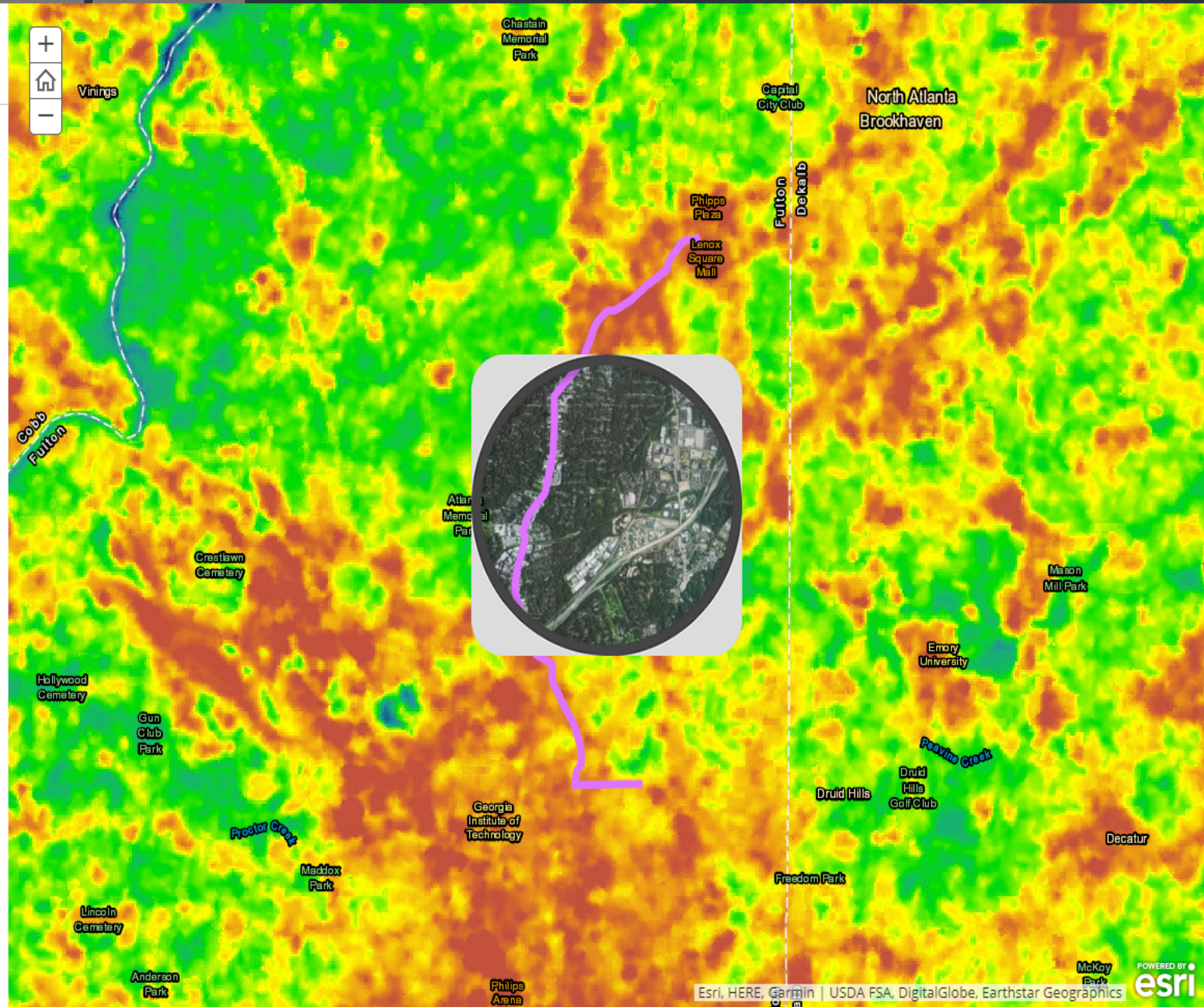
What evidence do you have to claim that this material will cool off parts of the city?

Design of the experiment: (What will you measure? How will you measure it?)

How will you measure the effectiveness of your experiment? What is your control?

Rooftop Temperatures

Shown to the right is a graph displaying the temperatures of different types of



Creation of Urban Heat Islands



My NASA Data

The [My NASA Data](#) website offers a variety of opportunities to explore Earth Science phenomena of the [Atmosphere](#), [Biosphere](#), [Cryosphere](#), [Geosphere](#), and [Hydrosphere](#) using uniquely NASA related content. Come and explore the site to learn about the following content types in each of the sphere pages:

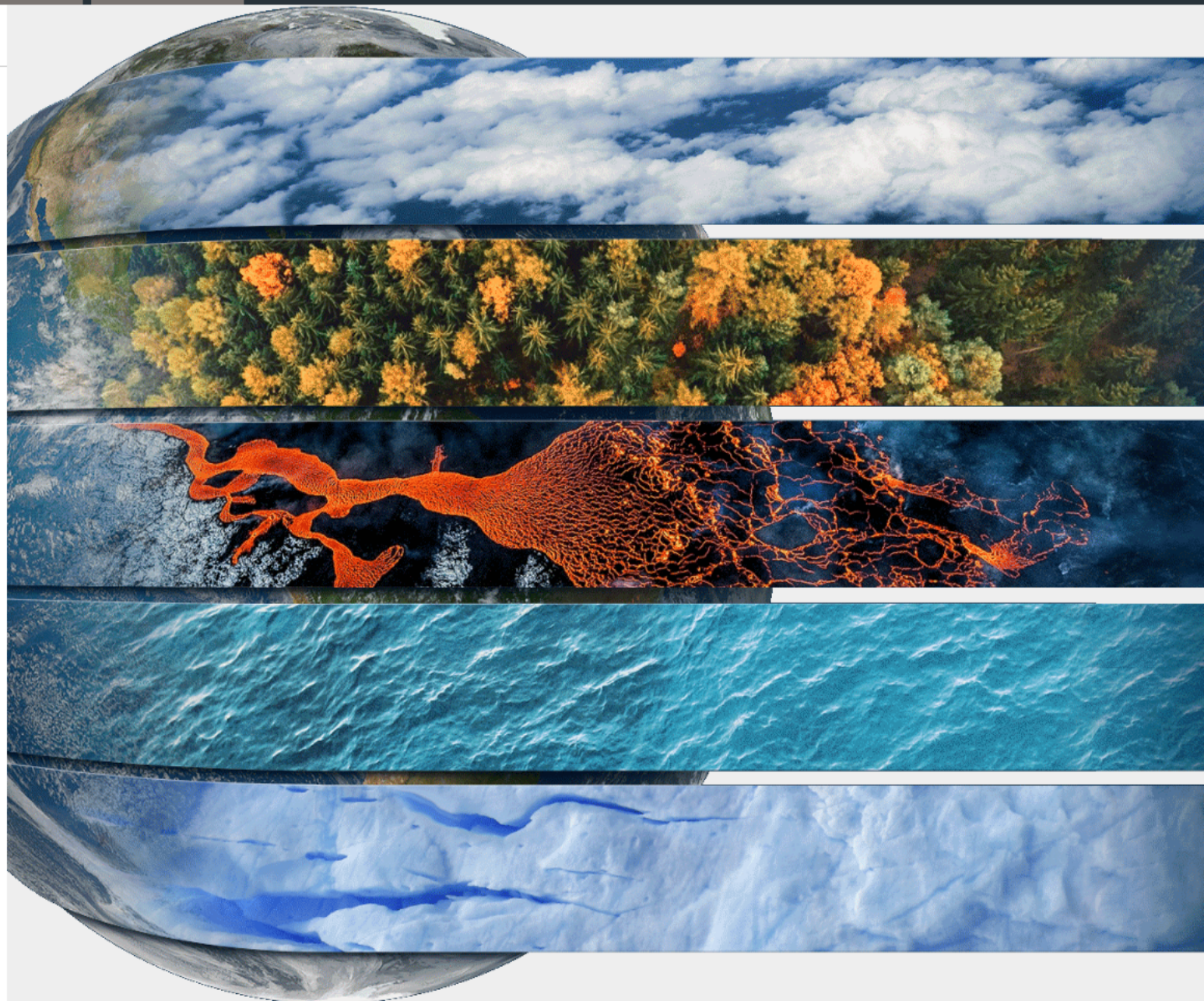
- [Maps, Data, and Models](#)
- [Lesson Plans](#)
- [STEM Career Connections](#)
- [GLOBE Connections](#)
- [Data Visualization: Earth System Data Explorer](#)
- [Related Resources](#)

Earth System Data Explorer

Learn how to visualize data on the [Earth System Data Explorer](#) using the instructional guide.

Why Does NASA Study the Urban Heat Island Effect?

NASA studies urban heat islands because they can impact human health. In the middle of an already hot sun, the urban heat island effect can be deadly.





Creation of Urban Heat Islands

The GLOBE Program

Getting Started with the Surface Temperature Field Campaign

Overview

Urban Heat Island Effect-Surface Temperature Field Campaign is focused on looking at the impact urbanization has on the Earth's surface temperature and how the surface temperature changes the dynamics of the Earth's atmosphere. Studying the energy cycle is fundamental to understanding how the Earth's spheres function within its system. The surface temperature measurements contribute data a) not normally collected by weather agencies, b) for climate studies and c) for ground-truthing satellite data.

What Data to Collect:

Dr. C needs YOU to collect and submit the following data to GLOBE:

- Cloud Data
- Air Temperature
- Surface Temperature

To get started, use the following links to download the:

1. [Surface Temperature Field Campaign Teacher's Participation Guide](#)
2. [Surface Temperature Protocol](#)
3. [Surface Temperature Data Sheet](#)
4. [Surface Temperature eTraining](#)

Questions?

Contact Dr. Kevin Czajkowski, kevin.czajkowski@utoledo.edu

Surface Temperature Protocol



Welcome

Introduction

Protocols

Learning Activities

Purpose

To measure surface temperature.

Overview

Surface temperature is measured with a hand-held Infrared Thermometer (IRT) that, when necessary, is wrapped in a thermal glove or has been placed outdoors for at least 30 minutes prior to data collection. The instrument is pointed at the ground to take surface temperature readings. [Cloud Protocols](#) are performed along with the [Surface Temperature Protocol](#).

Student Outcomes

Students will learn to use an infrared thermometer, and understand how different surfaces radiate energy.

Science Concepts

Earth and Space Sciences

- Clouds affect weather and climate. The diurnal and seasonal motion of the sun across the sky can be observed and described.
- Materials from human societies affect the chemical cycles of Earth. The Sun is a major source of energy for Earth surface processes. The Sun is a major source of energy at Earth's surface. Solar isolation drives atmospheric and ocean circulation.

Physical Sciences

- Heat transfer occurs by radiation, conduction, and convection. Light radiation interacts with matter.

Life Sciences

Sunlight is the major source of energy for ecosystems. Energy for life derives mainly from the Sun.

General Science

Visual models help us to analyze and interpret data.

Geography

- The temperature variability of a location affects the characteristics of Earth's physical geographic system. The nature and extent of cloud cover affects the characteristics of Earth's physical geographic system. The nature and extent of precipitation affects the characteristics of Earth's physical geographic system. Human activities can modify the physical environment.

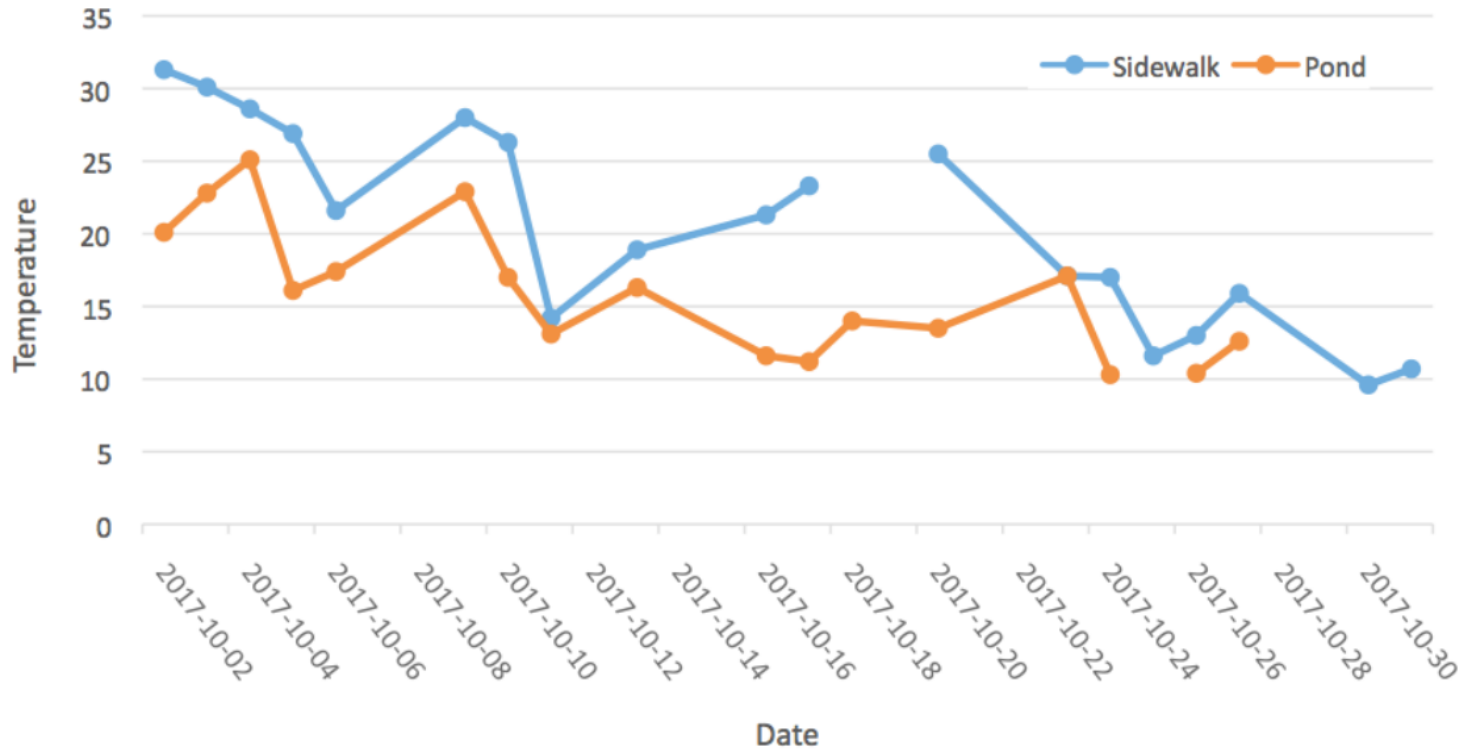
Scientific Inquiry Abilities

Inquiry skills

- Students will learn to use an infrared thermometer. Use appropriate tools and techniques. Identify answerable questions. Design and conduct scientific investigations. Use appropriate mathematics to analyze data. Develop descriptions and predictions using evidence. Recognize and analyze alternative explanations. Communicate procedures, descriptions, and predictions. Use a thermometer to measure

Activity: Analyze Shumate Middle School Data – using Data Literacy Cubes

Average October Surface Temperature (°C)
Shumate Middle School



National Aeronautics and Space Administration

Graph Cube

5. Who would be interested in this graph?

my NASA data
Graph Cube

1. Examine the graph.

Graph Cube

4. Brainstorm a question that you can answer using these data.

Graph Cube

6. Assess the data values.

Graph Cube

2. Summarize the graph.

my NASA data
Graph Cube


3. Analyze the graph.

Graph Cube


www.nasa.gov

NP-2019-04-029-LaRC


Data Literacy Cubes

National Aeronautics and Space Administration 

Map Cube




1. Examine the map.




Map Cube

2. Where on Earth is this map?




Map Cube

3. Summarize the map.




Map Cube

5. When were the data on this map collected?




Map Cube

6. Ask a question about the map.




Map Cube

4. Analyze the map.




Map Cube


www.nasa.gov NP-2019-04-029-LaRC

National Aeronautics and Space Administration 

Graph Cube




5. Who would be interested in this graph?




Graph Cube

1. Examine the graph.




Graph Cube

4. Brainstorm a question that you can answer using these data.




Graph Cube

6. Assess the data values.




Graph Cube

2. Summarize the graph.




Graph Cube

3. Analyze the graph.




Graph Cube


www.nasa.gov NP-2019-04-029-LaRC

National Aeronautics and Space Administration 

Data Cube




1. Summarize the data.




Data Cube

3. Analyze the data.




Data Cube

2. Describe the data.




Data Cube

4. Assess the data values.




Data Cube

5. Create questions using the data.



Data Cube

6. Apply the data.



Data Cube

www.nasa.gov NP-2019-04-029-LaRC



Data Literacy Cube Questions

Map Cube Questions

1. Examine the map

- A. The color of the oceans
- B. The color of the continents

2. Where on Earth is this map?

- A. A place I recognize on the map
- B. Another place I know on the map

3. Summarize the map

- A. The different colors represent different things
- B. The color of the oceans
- C. The color of the continents
- D. The color of the clouds

4. Analyze the map

- A. The area of the oceans
- B. The area of the continents

5. When were the data collected?

- A. The date of the data collection
- B. A key word on the map

6. Ask a question about the map

- A. How does the data change over time?
- B. I wonder if the data is accurate
- C. How is the data collected?
- D. How many data points are there?



Map Cube Questions

1. Examine the map.

- A. The colors that show the most representation
- B. The colors that show the least representation
- C. I observe a pattern which shows a trend

2. Where on Earth is this map?

- A. A place I recognize on the map is _____
- B. Another place I know on the map is _____
- C. A region I recognize is _____

3. Summarize the map.

- A. The scale of the colors represents _____
- B. The unit for the variable is _____
- C. This variable explains _____

4. Analyze the map.

- A. The area/s with the highest values is _____
- B. The area/s with the lowest values is _____
- C. The values change from _____ to _____

5. When were the data on this map collected?

- A. The time frame for the map is _____
- B. If the time frame/area etc. change, the data would _____

6. Ask a question about the map.

- A. I wonder if _____
- B. How many...? How long...? How often...?

Map Cube Questions

1. Examine the map.

- A. What do the colors that show the most represent?
- B. What do the colors that show the least represent?
- C. What pattern do you observe?

2. Where on Earth is this map?

- A. What is the latitude and longitude range?
- B. Identify a place you recognize and its approximate latitude and longitude.
- C. What type of map projection is this?

3. Summarize the map.

- A. What is the scale on the map?
- B. What variable is represented?
- C. What is the range and unit for the scale?

4. Analyze the map.

- A. What patterns are there for the high values?
- B. What patterns are there for the low values?
- C. How do the values change by area?

5. When were the data on this map collected?

- A. What time frame is represented?
- B. Compare this map to a map for a different time frame for the same variable.
- C. What are the similarities and differences?

6. Ask a question about the map.

- A. Form a hypothesis about the data displayed on the map.
- B. What inference can you make about the cause of the data displayed?
- C. Compare this map to another map for a different variable for the same geographic area. What are the similarities and differences?



Data Cube Questions

1. Summarize the data.

- A. The data are displayed in a (table, chart, etc.) _____.
- B. The title tells me the data are about _____.
- C. The variable measured is _____.
- D. The lowest value is _____.
- E. The highest value is _____.

2. Describe the data.

- A. The data were collected using _____ (i.e. thermometer, instrument, etc.).
- B. The data are collected every _____ (day, week, month, quarter, year, etc.).
- C. The unit used to describe the data is _____.

3. Analyze the data.

- A. The geographic area of Earth where the data were collected is _____.
- B. The time range is from _____ to _____.
- C. These data show that _____.

4. Assess the data values.

- A. The mean is _____. The median is _____. The mode is _____.
- B. The highest value is _____. The lowest value is _____.
- C. This variable belongs in the _____ sphere of the Earth System.

5. Create questions using the data.

- A. I wonder...
- B. If _____ changed, then the data would (increase/decrease/stay the same) _____.
- C. How does...?
- D. Why...?

6. Apply the data.

- A. These data help us understand _____.
- B. These data can explain why _____ happens.
- C. Technology was used to get these data by _____.

Beginner

A

Intermediate

B

Advanced

C

English Language Learners

D

A

B

C



D



Graph Cube Activity



- Divide into groups
- Use Shumate Middle School Graphs
- Use the Graph Cubes and one differentiated question sheet from your table
- Explore these maps using the cube and cards as your guide
- Share out (End by 11:10 AM)

Setting students up for success:

1. What modifications may you want to make?
2. What should students be doing?
How will they demonstrate success?
3. How do we measure success?

Keeping the End in Mind for your Students

International Virtual Science Symposium (IVSS)



Research Question Progression

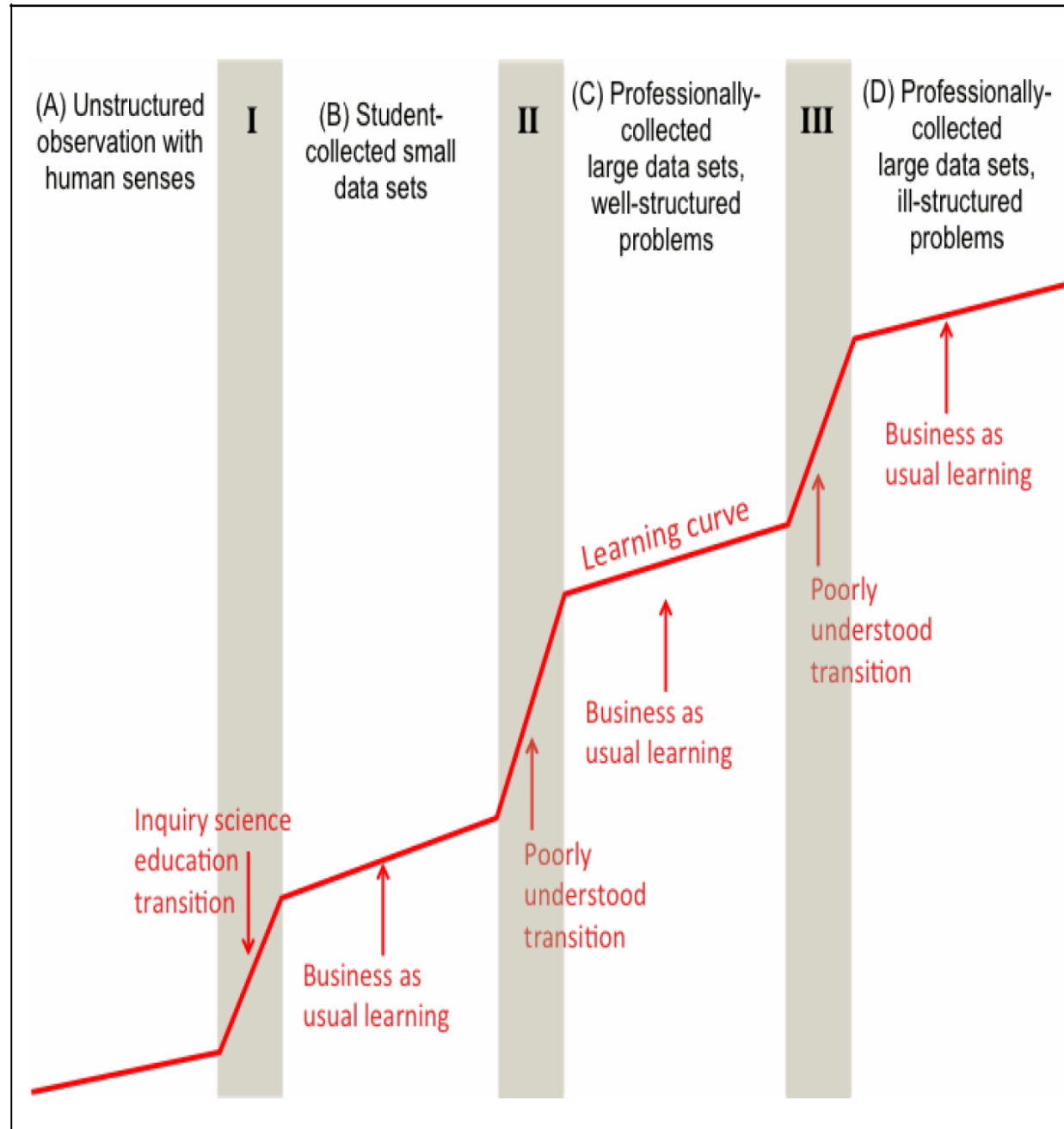


Figure 1 sketches the broad outline of a sequence of stages that could culminate in an individual who can use large, professionally collected datasets to solve the sort of ill-structured, complex problems that abound in adult life.

In domains (A) and (B), people are directly engaged with materials and phenomena of the real world, whereas in domains (C) and (D) they are engaged with representations.

STUDENT OUTCOME: Students will be prepared to submit to their research to the [GLOBE International Virtual Science Symposium](#).

(RUBRICS Link is at the bottom of document.)

TIMELINE IVSS:

□ 12 weeks prior to IVSS deadline: Assign Groups:

- Student groups assigned
- Research question assigned to student groups

□ 10-11 weeks prior to IVSS: *The Research Question and Revision of Research Question*

- Three types of Research Questions:
 - **Descriptive.** When a study is designed primarily to describe what is going on or what exists.
 - Public opinion polls compared to GLOBE data can be used to describe we are simply interested in describing something.
 - **Relational.** When a study is designed to look at the relationships between two or more variables.
 - How does __ and __ compare?
 - **Causal.** When a study is designed to determine whether one or more variables causes or affects one or more outcome variables. n
 - What affect does __ have on __?
- Write a one sentence HYPOTHESIS that answers your question.

□ 4-9 weeks prior to IVSS: *Collect Data and UPLOAD to GLOBE website*

- Determine equipment need to perform field work
- Design data collection plan
 - Determine frequency of data collection
 - Decide where will data be collected
 - Identify who will collect data
 - Identify who will enter data into GLOBE database
- Data Collection from:
 - Field work from data collection plan
 - GLOBE Visualization Tool
 - NASA Satellite data/images

□ 6 weeks prior to IVSS: *Write Introduction*

- Obtain poster template and IVSS rubric
- Write about the following:
 - Describe the problem you are trying to solve
 - State of the science of your topics
 - Why is this research important to your group?
 - What is the community connection of your research?

□ 5 weeks prior to IVSS: *Write About Your Research Method*

- Write about the following:
 - Describe what you did for your research.

IVSS Planning Guide

IVSS Submission Webpage

Poster Template

Home > News & Events > Events > Virtual Science Symposia > 2019 International Virtual Science Symposium > Instructions

Share

2019 International Virtual Science Symposium

Instructions

Rubrics and Badges

Resources

FAQs

Virtual Science Symposium Reports

List of Judges

Students Needing Mentors

Shareable Images

Metrics

2019 GLOBE IVSS - Instructions

Instrucciones en Español

Please send translated instructions to help@globe.gov. Thank you!

How and What to Submit:

Each student project should include the following components and should be submitted via the Virtual Science Symposium Report Tool. Make sure to have all the items prepared when accessing the tool.


- Abstract or Summary:** A 200 word or less description of the research project.
- Research Report:** The complete research report as .PDF or .DOCX/.DOC. If including more than one language, make sure the report is just one file. Elements of the Research Report are described in the rubrics.
- Badge Description:** For any of the optional badges (you may select up to three), include a short summary of how each badge has been completed.
- Presentation:** Either the link to an uploaded video hosted on an online video sharing site (YouTube, Vimeo, TeacherTube, etc) or the presentation poster. Please do not upload the actual video, just the video link! Whether presented as a video, a narrated PowerPoint, or as a poster, the presentation should describe the student research. Videos should be 10 minutes or less.
- Thumbnail Image:** An image to be displayed with the student report.
- Photo Release Forms:** All individuals who appear in photos or video must send in a [photo release](#). Save all the photo releases into one file.

Reports are due 10 April 2019. Project submitted after this date will not be scored.

<https://www.globe.gov/news-events/globe-events/virtual-conferences/2019-international-virtual-science-symposium/instructions>

Concise Title of Less Than 15 Words That Summarizes the Study

School Logo Collaboration Team Names
School Name



Abstract
Describe the planning process

- Consider (you don't need all):
 - Research context and objectives described
 - Research question posed
 - Methods summarized
 - Results stated
 - Conclusions stated
- Include 3 to 5 key words to emphasize the big ideas


Research Question
Asking Questions

- Explains why this is an important question and of scientific interest
- Involves an aspect of Earth's environment about a local or global issue
- Considers ideas that previous investigations did not address
- Reflects on depth/knowledge of the content area
- Question is clearly stated
- Not answerable through scientific research appropriate to the scope of the report (i.e., scientifically feasible)

Introduction
Content Knowledge

- Brief (180 to 300 words)
- Describes the environmental or societal problem the research question addresses
- States the importance or significance of the research, establishes relevance to a community
- Accurately uses relevant scientific and disciplinary understanding of basic scientific concepts and fundamental principles covered in the GLOBE protocols
- A 1-2 paragraph research review demonstrating what you know already about this topic includes 3 to 5 citations in text, including at least one primary source in a "peer-reviewed" journal

Field Photos
(requires release forms)



Research Methods
Planning Investigations

- Includes a map and description of the study site with mention of:
 - (1) the area of study (2) climate characteristics, and (3) basic aspects of land cover
- Describes the GLOBE protocols and NASA assets to be used
- Describes organization for data collection, including instrument calibration, preparation of all materials, and tools and equipment to be used
- Data collection strategy including how the time of day of data collection would be selected, how frequently data would be collected, and the timing and location of sample collection and measurements

Carrying Out Investigations
Describe what happened

- Describe the GLOBE protocols and NASA assets actually used
- Describe data collection activities including description of the specific locations or sites where data sampling occurred
- Describe the specifics about the data (e.g., frequency of data, amounts of data)
- Describe the steps for data collection (e.g., frequency of sampling or measurement activities in the protocol used, the role of each team member in collecting data, etc.)

Map of Study Site(s)

GLOBE Badges

- As a Collaborator**
Globe members are listed including students from the same school or schools that worked the world along with clearly defined roles, how they support one another, and description of each member's contribution. The description should include the advantages of the collaboration. If the student collaborated with students from another school, describe how working with other schools improved the research.
- As a Data Scientist**
The report includes in-depth analysis of students' variables as well as other data sources, including direct observation of their data and collection about past, present or future events, or use data to answer questions or solve problems in the reportorial system. Consider data from other schools to data available from other students.
- As an Engineer**
The report uses student-generated systems of evidence to describe engineering problems, levels of evaluation through engineering, or optimizes a design to address a real-world problem, and describes the potential impact of the engineering products or processes.
- Make an Impact**
The report clearly identifies how a local issue led to the research question or makes connections between local and global impacts. The students used to clearly describe or show how the research contributed to a positive impact on their community through making recommendations or taking action based on findings.
- As a STEM Professional**
The report clearly describes collaboration with a STEM professional that enhanced the research methods, contributed to improved precision, and supported more sophisticated analysis and interpretation of results.
- As a STEM Role Model**
The report describes or shows how the student shared the story of their research in creative ways. This could be in a thematic presentation, a blog, language arts writing, speaking, or any other way to creatively share what the student learned.

Results
Analyzing Data

- Addresses the research question(s)
- Describes the procedures for data analysis including the mathematical calculations used
- Includes a detailed analysis of the data
- Tables and graphs show patterns or trends in the data
- Print screen of GLOBE visualization page

Figure #1

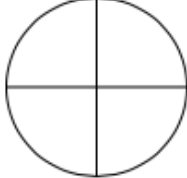
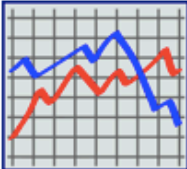


Figure #2



Discussion
Interpreting Data

- Discusses the meaning of the results
- Discusses how/why the results support the hypothesis or one of the specific locations or sites where data sampling occurred
- Presents a clear, complete and thoughtful discussion of the limitations of the methods and the data used
- Compares results with similar studies
- Suggests possible sources of error

Conclusions
Drawing Conclusions & Next Steps

- Conclusions are supported by the results
- Gives a thorough and thoughtful explanation as to how the conclusion was reached
- Suggests improvements to the methods
- Discusses implications for future research
- Recommends follow-up research or actions to be taken
- Discusses possible future protocols that could be used
- Discusses the impact of working with a project partner

Bibliography
References

- Cites peer literature correctly (for scientific results only; protocols and research)
- Lists [GLOBE protocols](#) and NASA assets used
- Provides sources beyond those provided by GLOBE

<https://www.globe.gov/web/united-states-of-america/home/student-research-symposia/student-resources>

IVSS Rubrics

Each of the rubrics below will be used to evaluate the reports. There are required report components for each grade band. See <https://www.globe.gov/news-events/globe-events/virtual-conferences/2019-international-virtual-science-symposium/rubrics-and-badges>

GLOBE INTERNATIONAL VIRTUAL SCIENCE SYMPOSIUM—BADGES AND CRITERIA FOR K–2 SCIENCE PROJECTS

GLOBE INTERNATIONAL SCIENCE SYMPOSIUM STUDENT RESEARCH BADGE (ALL PROJECTS—OVERALL REPORT)

★★★★	★★★	★★	★	
<ul style="list-style-type: none"> Report contains all of the criteria listed below and makes clear connections among them. The report is well organized, neat and well presented. The writing is clear and focused. The report contains the five elements required for acceptance, clearly labeled. 	<ul style="list-style-type: none"> Report contains all of the elements and most of the criteria listed below. The report is well organized, neat and well presented. The writing is clear. The report contains the five elements required for acceptance, clearly labeled. 	<ul style="list-style-type: none"> Report contains most of the criteria listed below. The report is well organized. The report contains the five elements required for acceptance, clearly labeled. 	<ul style="list-style-type: none"> Report contains the five elements required for acceptance, clearly labeled. (1, 2, 3, 4 & 6) 	<ul style="list-style-type: none"> Report submitted, but does not contain all five elements required for acceptance.

GLOBE INTERNATIONAL VIRTUAL SCIENCE SYMPOSIUM—BADGES AND CRITERIA FOR 3–5 SCIENCE PROJECTS

GLOBE INTERNATIONAL SCIENCE SYMPOSIUM STUDENT RESEARCH BADGE (ALL PROJECTS—OVERALL REPORT)

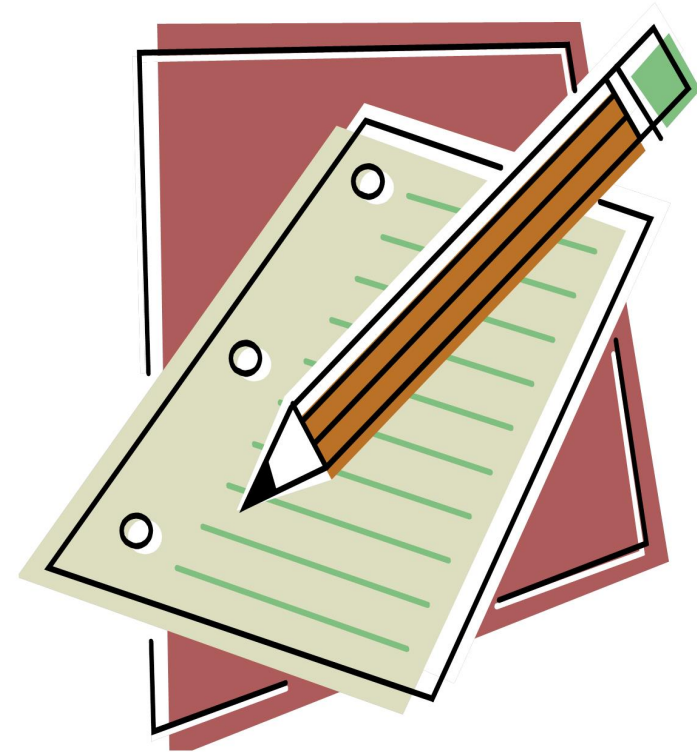
★★★★	★★★	★★	★	
<ul style="list-style-type: none"> Report contains all of the criteria listed below and makes clear connections among them. The report is well organized, neat and well presented. The writing is clear and concise. The report contains the five elements required for acceptance, clearly labeled. Members of the project team respond to judges' comments with additional insights gained. 	<ul style="list-style-type: none"> Report contains all of the elements and most of the criteria listed below and makes clear connections among them. The report is well organized, neat and well presented. The writing is clear. The report contains the five elements required for acceptance, clearly labeled. 	<ul style="list-style-type: none"> Report contains most of the criteria listed below. The report is well organized. The report contains the five elements required for acceptance, clearly labeled. 	<ul style="list-style-type: none"> Report contains the five elements required for acceptance, clearly labeled. (1, 2, 3, 5 & 7) 	<ul style="list-style-type: none"> Report submitted, but does not contain all five elements required for acceptance.

Questions

- **What do you need to implement the UHIE campaign?**
- **How will you engage your teachers in the UHIE campaign?**



Exit Slips



QR Code for GME Presentations



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YouTube channel: <http://tinyurl.com/globemissionearth>

webinars

Twitter: [@globemissionear](https://twitter.com/globemissionear)

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