



Earth Heart Farms

GLOBE Mission EARTH

Vicki Rae Harder-Thorne - Steward/Owner, Earth Heart Farms LLC

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FRIENDS OF
OTTAWA
NATIONAL WILDLIFE REFUGE

Thank you to *Friends of Ottawa National Wildlife Refuge* for giving us this opportunity to share our work!



And special thanks to *NOAA B-WET* funding of this project.

Teachers!
Apply to our Summer 2024
Professional Development!
Dates: June 10-12



<http://tiny.cc/Summer2024PD>

GLOBE Mission EARTH website:
www.globe.gov/web/mission-earth

 **GLOBE MISSION EARTH PRESENTS**
Professional Development (PD) Opportunity for Teachers
at EARTH HEART FARMS in Oak Harbor, Ohio
2659 S. Mud Creek Rd., Oak Harbor, Ohio 43449
June 10 - June 12, 2024 + optional Student Field Days

www.globe.gov
Partner

Do you love getting your students outside investigating nature? Join us!
\$100 Registration Fee. Opportunity to participate in GME research & receive a stipend!
SPACE IS LIMITED to 15 TEACHERS! APPLY by May 10, 2024:
<http://tiny.cc/Summer2024PD>

 **Great Lakes B-WET**
Bay Watershed Education and Training


Location of Earth Heart Farms
80 acres on the headwaters of the Lake Erie Basin in Ottawa County, Ohio
Family farm transitioned to native vegetation in 1992

Hydrosphere


Atmosphere


Arts


Fun!


GLOBE Protocols align with Ohio Science Standards:
<http://tiny.cc/GLOBEOhioStandards>

Whole Child


Pedosphere


Visit our GLOBE Mission EARTH website:
www.globe.gov/web/mission-earth
CONTACT: Sara Mierzwiak, Project Coordinator,
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Use your camera to view this QR Code to visit page →



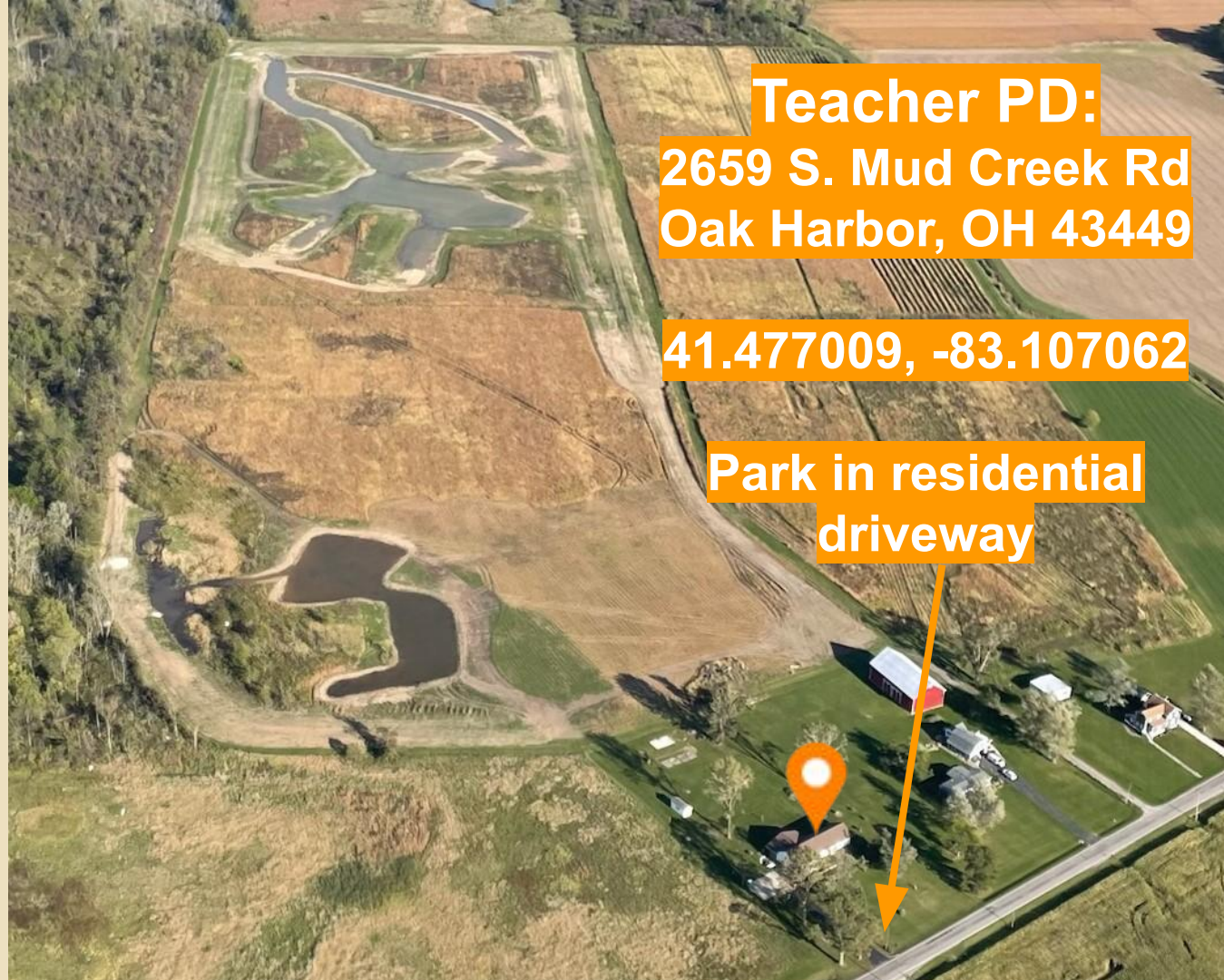
The Big Picture

- Earth Heart Farms: 80 acre former agricultural land, ongoing restoration
- Host to local K-12 Teachers & Students for outdoor learning
- Partnering with GLOBE Mission EARTH and the GLOBE Program (www.globe.gov)
- Students learn how to collect data: Atmosphere, Hydrosphere, Pedosphere, Biosphere
- Artistic expression - bringing the A into STEAM (drawing, poetry, music, etc.)

Welcome to Earth Heart Farms

**80 acres on the
headwaters of the
Lake Erie Basin
in Salem Township,
Ottawa County, Ohio.**

**Habitat regeneration
on a family farm that
transitioned to
conservation
practices in 1992.**



**Teacher PD:
2659 S. Mud Creek Rd
Oak Harbor, OH 43449**

41.477009, -83.107062

**Park in residential
driveway**

River Runner [website](#): follow a drop of water from EHF

Total Length: 1455 km

- 1. Unidentified River 871435 (5 km)
- 2. **Muddy Creek (4 km)**
- 3. Unidentified River 871306 (8 km)
- 4. Lake Erie (504 km)
- 5. Lake Ontario (485 km)
- 6. Saint Lawrence River (449 km)

Oak Harbor, Ohio, United States

Know one of these missing river names? Make a suggestion!

More Detail Faster

© Mapbox © OpenStreetMap Improve this map © Maxar

History of Earth Heart Farms

Homesteaded in the late 1800's by great-grandparents
Frederick & Augusta (Schlunz) Hehl.



Family farm transitioned to
native grassland in 1993
through the USDA
Conservation Reserve Program
& 3 decades of dedication by
Vic & Lois Rae (Hehl) Harder.

Farming continued through the 1900's by
grandparents Otto & Margaret (Pieplow) Hehl.



History of Earth Heart Farms

CRP helped restore the land to a prime habitat for wetland wildlife, including birds & pollinators of interest or concern.



Sedge Wren Habitat - restoration plan adapted



10-year Bald Eagle Restoration Program



Monarch Tagging - Green Creek Wildlife Society



Swarthy Skipper & Bolas Spider - 2 of 4 notable sightings at the 2022 BioBlitz

The grassland welcomed conservation, research and education groups to experience the effects of habitat restoration on biodiversity and resource quality.



International Birding Event - Black Swamp Bird Observatory

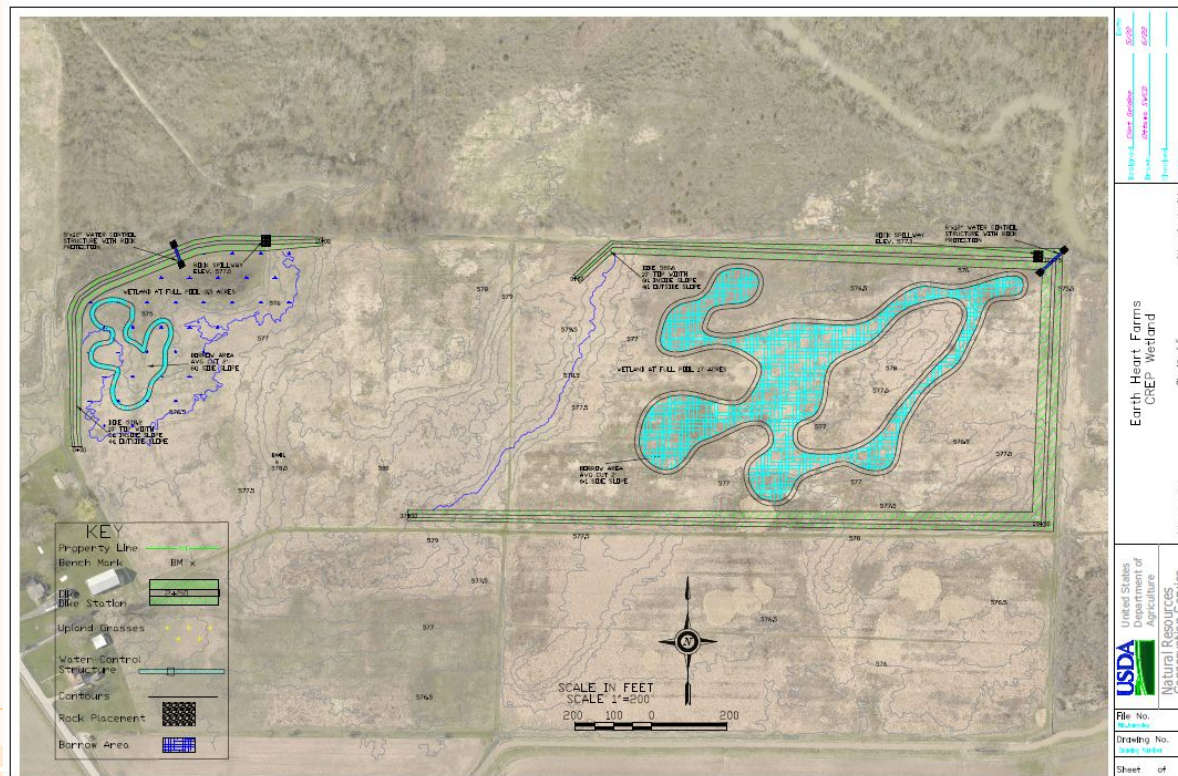


GLOBE Mission EARTH - Summer PD



History of Earth Heart Farms: Writing the Next Chapter

- CREP / H2Ohio programs to
- revitalize the existing habitat
 - enhance the wetland areas
 - add a riparian buffer - 2600 native trees and shrubs



An important change in plans was to protect an area where sedge wrens nested.



Photo courtesy R Jacobs

Sedge Area

Dogwood area being sprayed with Garlon

Restoration begins...

**October,
2022**

through

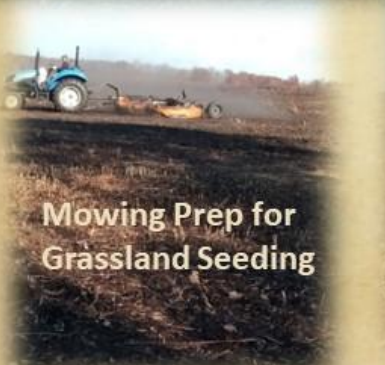
**April,
2023**



Aerial Spraying



Controlled Burn



**Mowing Prep for
Grassland Seeding**



**Invasive Woody
Plants Removed**



**Riparian Buffer Prepped
for Spring Planting**

Restoration: Controlled Burn

An integral part of site preparation, allowing control of invasive species prior to reseeding cool-season grasses and pollinators, and planting of riparian buffer.



Summer 2023
PD training in
garage and
outside
collecting
GLOBE data



A few hours after our PD

**Just 3 hours
after our
teachers
left, an F2
tornado
destroyed
the EHF
residence –
with no
human
injuries.**



Restoration: Tornado Recovery

**Restoration
began with
reconstruction
of the
residence.**



Restoration: Wetland, Grassland & Cranes

Excavation of enhanced wetland areas began in July 2023, just weeks after the June 15 tornado.



The GLOBE Program: www.globe.gov

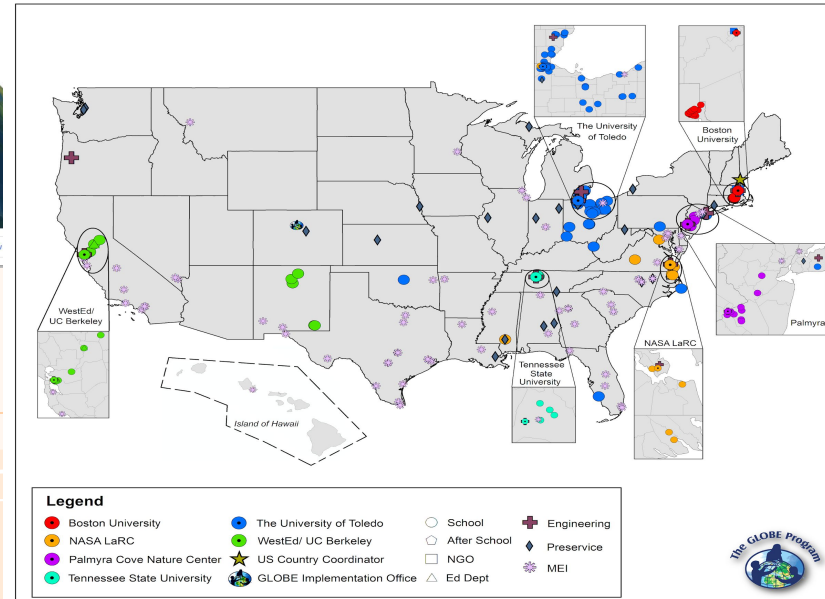
The screenshot shows the homepage of the GLOBE Program website. At the top, there is a navigation bar with the GLOBE logo, the text "THE GLOBE PROGRAM", the tagline "A Worldwide Science and Education Program", a search icon, a user profile picture, and a language dropdown set to "English". Below this is a secondary navigation menu with links for "About", "Get Started", "Get Trained", "Do GLOBE", "GLOBE Data", "Community", "News & Events", and "Support". The main content area features a large, colorful banner with a world map at the bottom. The banner contains several circular graphics illustrating various scientific and environmental themes: a sun, a city, a forest, a field of flowers, and a tree. The text on the banner reads: "2023 GLOBE International Virtual Science Symposium" and "Now entering its 10th year!". Navigation arrows are visible on the left and right sides of the banner, and a series of five dots at the bottom center indicates the current slide position.

GLOBE Mission Earth (GME)



Partners:

- University of Toledo
- NASA Langley
- Boston University
- Tennessee State University
- WestEd/UC Berkeley



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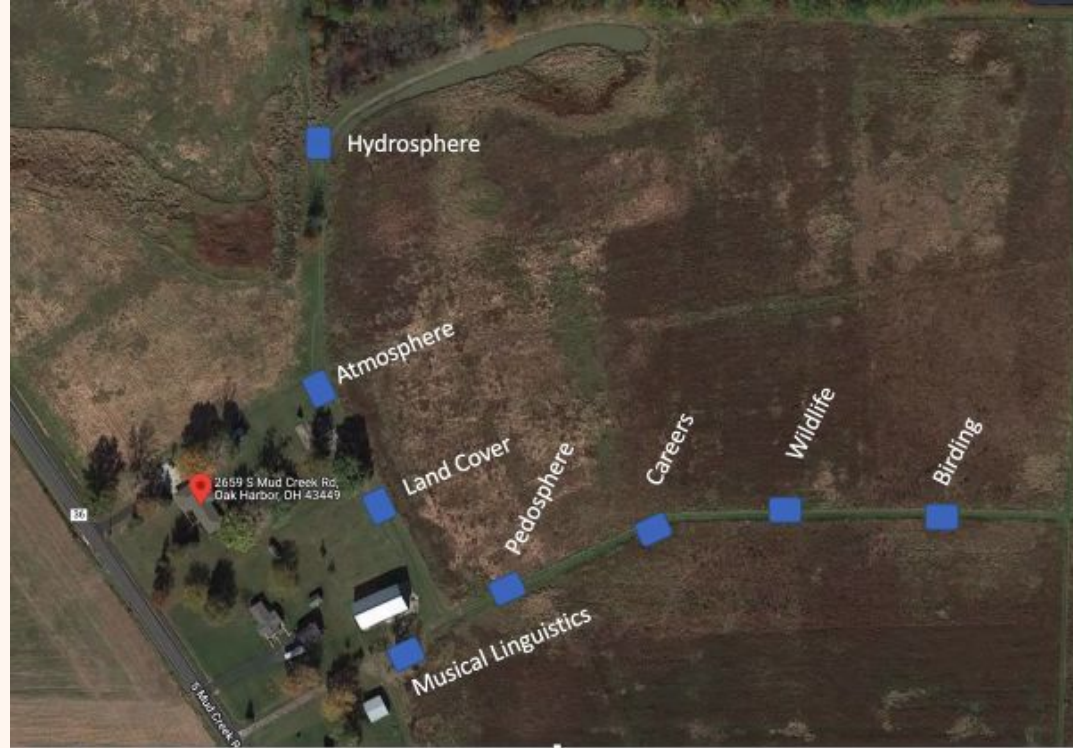
Hands-on SCIENCE!

A destination for teachers and students to:

- **connect with the land**
- **learn about the science of nutrient runoff & harmful algal blooms (HABs)**
- **see the effect of habitat on biodiversity & resource quality**
- **design stewardship projects to demonstrate personal impact on ecosystems**



| ACTIVITY | DESCRIPTION |
|-------------------|--|
| GLOBE Atmosphere | Explore the world around you with GLOBE! You will collect air temperature, surface temperature and clouds data using GLOBE protocols. |
| GLOBE Hydrosphere | Analyze the water bodies of Earth Heart Farms! You will analyze water from the EHF pond, ditch and river and compare them. Tests will include: water temperature, pH, dissolved oxygen, nitrate/nitrite and phosphate. |
| GLOBE Pedosphere | Investigate the soils of Earth Heart Farms! You will collect and analyze soil from EHF. Tests will include: soil temperature, soil characterization and soil infiltration. |
| GLOBE Biosphere | Land cover in relation to water sources, flora and fauna observations. |
| Birding | Learn how to identify birds and the importance of preserving these bird populations. |
| Wetland Wildlife | Get hands on and learn about what animals inhabit the wetlands and how H2Ohio projects benefit us all! |
| STEM Careers | Understand the variety and importance of STEM careers now and into the future as they relate to agriculture and natural resources. |



Lunch: Pack in/Pack out - students bring a pack lunch and take all trash with them

What to Wear: Long pants, long sleeves, coat, hat, gloves, bug spray, sunscreen, etc.

Data collection



Pedosphere:
“we got to shake bowls with soil in them and make the soil really thin and we got to take pictures of the soil.”



Atmosphere:
“We got to learn about the clouds and that was fun.”



Hydrosphere:
“You had to look at the turbidity of the water, the nitrite, and the nitrate levels. I liked how you were able to apply what you learned immediately into an experiment.”

Student comments about their experiences at EHF Field Days

"...it correlated to my (GLOBE science) project."



"Water spiders hover above water waiting for fish to come close."

"...if dirt has a lot of clay it can be easily manipulated and...if the dirt has a lot of silt and not a lot of clay it falls apart more easily."



"I learned about recording ground temperature, different flowers, and all the different insects."

Student comments about their experiences at EHF Field Days



"...we found 2 flowers that looked different from each other then (learned) they were the same species."

"...what we can do to help the earth and we are all a part of the environment so no matter what we will always affect it."



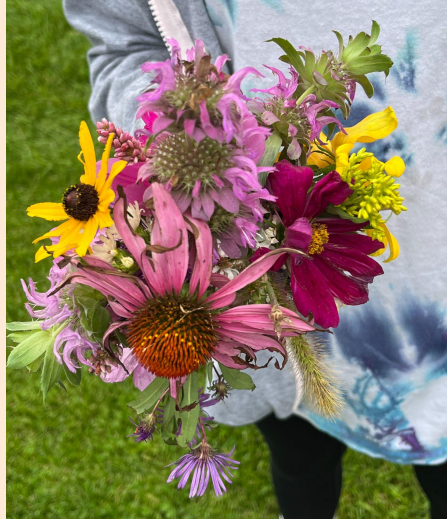
"I liked how she explained the animals and I got to hold a snake."

Fun!

"I like learning about habitats and what affects them."



"...first sighting of a Blue-Spotted Salamander!"



"...we actually did something!"

Play the Game: Do Science



American Geophysical Union Meeting




Students Presenting their Research



Kindergarten project # of worms vs. soil temperature

The Affect of Cloud Coverage on Surface Temperature

Reagan Clarke
Ottawa Hills High School



Abstract

Cloud coverage greatly affects the surface temperature. Clouds have the ability to block some of the sunlight that naturally heats the Earth. To test this I took the surface temperature of a homogeneous surface nine times, according to the GLOBE protocol. I also took down a 14 degree angle to observe cloud coverage. There are life jackets you can use to determine the height at which the clouds are. As cloud coverage decreases, surface temperature increases. This means that the clouds have the ability to block some of the sunlight that adds on to the Earth's natural heat.

Research Methods

Planning Investigations

Greeny Field is a grassy terrain that is mainly used for sports. The climate this time of year is normally chilly and cloudy with variable temperatures range from -3.5 degrees to 14 degrees Celsius. Some of the days that I collected data it was raining. This is normal during this time of year in northwestern Ohio. I will be using the cloud and surface temperature protocols. The cloud protocol entails a cloud chart that is used to classify the amount of cloud coverage. You are supposed to look down a 14 degree angle. The surface temperature protocol entails having an area free of shadows. This will give you the most accurate results. Hold the thermometer at arm length and set it in your own shadow and hold until the number stops moving. To calibrate the infrared thermometer use mass use the protocol on a bowl of ice that has been made a inch degrees Celsius. If the number your thermometer reads is within one degree of zero, your thermometer is correctly calibrated. This should happen every year. I will collect data for two weeks once a day. This will happen within an hour of sunrise because I am unable to be outside at solar noon.

Results

Analyzing Data

On average, as the amount of cloud coverage goes down, the surface temperature of Greeny field goes up. On the third day cloud coverage was down, but there was snow. Notably, the low cloud coverage. This shows that as the cloud coverage goes up, in general the surface temperature goes down. The season changing could have affected this data.

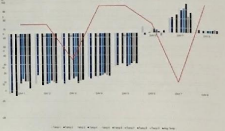



Figure #1
Surface Temperature (Celsius) vs. Date

Conclusions

Drawing Conclusions & Next Steps

In conclusion, as the amount of cloud coverage goes up, the surface temperature goes down. This shows that the affect of clouds is higher than the effect of greenhouse gasses. To improve upon this experiment, I could have done this over a longer period of time. I would like to do further research closer to a power plant or in a time where the seasons are not changing as much. This will give us more data on how emissions affect the surface temperature with less of a weather factor. I see no need to change the GLOBE protocol. This project would also have been greatly increased if I had a mentor. The last thing I would do better to focus on the research portion a little more than I have.



Research Question

How does the amount of cloud coverage affect the surface temperature of the Earth? This question is very important because human-made buildings, like factories, produce clouds. These factories are thought to heat the Earth's surface because of the asphalt and unarmored materials used to make these buildings. Maybe some of the results of the factory help to warm the Earth as well. This could give a deeper meaning to climate change. Many power plants produce steam clouds, while others add to the pollution of the area. Some of the pollutants are carbon monoxide, sulfur dioxide, and ozone. These gasses are meant to absorb and trap heat. Hypothesis: If the cloud coverage rises above 50%, then the ground temperature will rise by 10 degrees, because of the pollutants in the air.

Introduction

Content Knowledge

This topic addresses the impact of human existence on the Earth. Air Pollution can greatly affect the Earth's heating and cooling process. While my community doesn't suffer from air pollution, the air around us does. Most of the times you cannot see the smog in the air. The clouds that they create travel over to the places we live. Certain gases are released as power plants produce many items that we need. These gasses like carbon monoxide are possibly deadly. Factories contribute to the cloud content as well as the surface of the Earth warming. These are possibly constructed because they are made of asphalt. Asphalt can heat the Earth much more than the GLOBE being constructed from humans. This is because of their ability to trap the heat.



Discussion

Interpreting Data

The data show that most clouds block sunlight and therefore make the ground colder. This does not support my hypothesis. The clouds blocked enough of the sunlight to prevent further heating of the earth. This may have happened because of rain and snow. This study was only done for eight days, which prevents a complete look on the topic. Some other labs at my school used concrete and asphalt, while I only used grass. They found that grass is cooler than concrete and asphalt. Asphalt is meant to absorb heat, providing an explanation for these results. Possible sources of error are that the seasons were changing, and in the beginning there was snow.

Bibliography

THE GLOBE PROGRAM
Global Learning and Observations to Benefit the Environment

GLOBE Science Fairs and Conferences

Students Presenting their Research

Garden Surface Temperatures

Sean Ireland
Natural Science Technology Center



Introduction

Will the temperature of 4 different landscapes be around the same temperature.

I'm interested in how different landscapes affect the way temperature is held inside of them, how it cools off, and how human-made environments affect the temperature, compared to the wilderness temperature. Surface air temperature deals with surface temperature because of how the air temperature affects the land's temperature on the very top of the surface. I want to understand how air temperature affects the temperature of the land, how it increases it, how it decreases it, and how it leaves it at a standstill. Surface air temperature is affecting the land because of how the surface absorbs the temperature that the air and sun share with it, but it still gets cold at times. The surface can trap heat more efficiently because of the many materials that are in the soil. I want to find out what makes it so important that the land traps the heat, but also let's go of the heat. (L. Mahr)

The hypothesis is the forest will be the lowest temperature compared to the parking lot, field, and the flower bed. To understand why warm years tend to be dry, we have to examine how the sun's energy interacts with water that is in or on the ground. When there is above-average precipitation, the ground holds more water. When the sun's energy hits wet ground, a portion of it evaporates the water instead of warming the ground and the air, keeping temperatures lower. Also, above-average precipitation usually means more clouds, which prevents the sun's energy from even reaching the ground, and that also keeps temperatures cooler. (NCAA, Jake Crouch, 2017)

Hypothesis

The hypothesis is the forest will be the lowest temperature compared to the parking lot, field, and the flower bed.

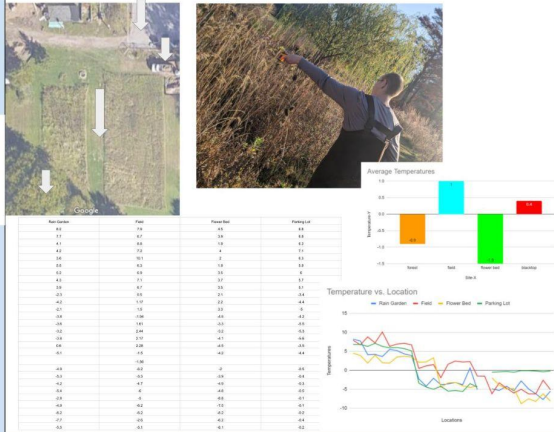
Objective

My objective is to collect temperature and look over them to see if there's a consistent temperature in 4 different types of environments.

Methods

- Research about gardens and temperatures
- Gather infrared thermometers, notebook, pencil, and people to help
- Select field, flower garden, forest, and blacktop
- Gather information about the locations and temperature intake
- Put information into graph
- Put graph onto poster
- Insert GLOBE observer app information

Flower bed has the lowest temperature average than the rest of the locations that have been chosen. -0.9(rain Garden), 1(Field), -1.5(Flower bed), and 0.4(Blacktop).



References

L. Mahr, 2002
NCAA, Jake Crouch, 2017

Abstract

I'm interested in how different landscapes affect the way temperatures are held inside of them, how it cools off, and how human-made environments affect the temperature, compared to the wilderness temperature. The forest will be the lowest temperature compared to the parking lot, field, and the flower bed. The hypothesis is the forest will be the lowest temperature compared to the parking lot, field, and the flower bed. I want to understand how air temperature affects the temperature of the land, how it increases it, how it decreases it, and how it leaves it at a standstill. Surface air temperature is affecting the land because of how the surface absorbs the temperature that the air and sun share with it, but it still gets cold at times. The surface can trap heat more efficiently because of the many materials that are in the soil. I want to find out what makes it so important that the land traps the heat, but also let's go of the heat. (L. Mahr)

- Research about gardens and temperatures
- Gather infrared thermometers, notebook, pencil, and people to help
- Select field, flower garden, forest, and blacktop
- Gather information about the locations and temperature intake
- Put information into graph
- Put graph onto poster
- Insert GLOBE observer app information

Results

My results that the four finishing averages for temperature for each landscape are: -0.9(rain Garden), 1(Field), -1.5(Flower bed), and 0.4(Blacktop).

| Location | Temp 1 | Temp 2 | Temp 3 | Temp 4 | Temp 5 | Temp 6 | Temp 7 | Temp 8 | Temp 9 | Temp 10 |
|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| Rain Garden | 58.5 | 59.0 | 59.5 | 60.0 | 60.5 | 61.0 | 61.5 | 62.0 | 62.5 | 63.0 |
| Field | 63.0 | 63.5 | 64.0 | 64.5 | 65.0 | 65.5 | 66.0 | 66.5 | 67.0 | 67.5 |
| Flower Bed | 57.0 | 57.5 | 58.0 | 58.5 | 59.0 | 59.5 | 60.0 | 60.5 | 61.0 | 61.5 |
| Blacktop | 61.0 | 61.5 | 62.0 | 62.5 | 63.0 | 63.5 | 64.0 | 64.5 | 65.0 | 65.5 |

Conclusion

I believe that the different landscapes store different heat, so the blacktop absorbed more heat, while the grass fed it into the ground, but the water cooled the ground off, so the more water there is, the cooler the landscape is.

Acknowledgments

I would like to thank my classmates for helping, Dr. Kevin Czajkowski for helping on my poster and giving me ideas for what to put on my poster and what to do for my data, my best friend for helping me get through when I almost gave up, and Mrs. Kubiak, Mr. Oswanski, and Mr. Steele for giving me ideas.



Presentation created by 3rd graders about GLOBE Clouds and Trees data

GLOBE Mission EARTH Website – Student Research

- Search for past student research projects
- Upload your students' projects
- Allows for review by GME Staff
- Can also submit to the GLOBE IVSS (International Virtual Science Symposium)

Student Research

Support
FAQs
Test Page

Student Research Reports

Click the button below to upload your research project:

Upload your research report

Edit my reports

If you would like your project also considered for the International Virtual Science Symposium (IVSS), please check that box during the upload process.

The GME Team can then review your project for you before it *officially* heads to the IVSS database. Learn more about the IVSS here: <https://www.globe.gov/news-events/globe-events/virtual-conferences>.

What and How to Submit:

Each student project should include the following components:

1. **Abstract or Summary:** 200 word or less description.
2. **Research Report:** Complete report as a .PDF or .DOCX/.DOC.
3. **Presentation:** *Either the link to a video hosted online (YouTube, Vimeo, TeacherTube, etc) or the presentation poster* (in .PDF or .PPT format). Do not upload the actual video, just the link/URL! Videos must be 10 minutes or less.
4. **Thumbnail Image:** An image to be displayed with the student report.
5. **Photo Release Forms:** All individuals who appear in photos or video must send in a **SIGNED PHOTO RELEASE FORM**. Save all the photo releases into one file.

Approved Student Projects

See below projects previously submitted by GLOBE Mission EARTH students and approved by GME Student Research Project Reviewers.

Click on the thumbnail to view each project. We encourage everyone to leave comments on our student projects by using the Add Comment field.

Open Filters

Sort By: Date | Title



05/09/2022

Influence of Luge Track Board Color on Ice Quality

The purpose of our project is to determine if the wall color of the boards on the side of a luge track influences the quality of the ice and how long it lasts. The GLOBE protocols we used were air temperature and surface temperature. The results of our research are that the color of the boards along the side of the luge track makes a difference in ice quality. When the boards are a lighter color, the ice quality is better and helps the ice to last longer in the spring. >>



05/06/2022

Screaming for Sunscreen: Which Popular Sunscreen Lotion Effectively Protects from Harmful UV Rays?

The purpose of this experiment is to determine which of the five popular brands of sunscreen tested will effectively protect from harmful UV rays.

IV heads were used to test the hypothesis that: Banana Boat Sport would

Do GLOBE, NASA, NOAA
Learning Activities



Connect to NOAA/
NASA professionals

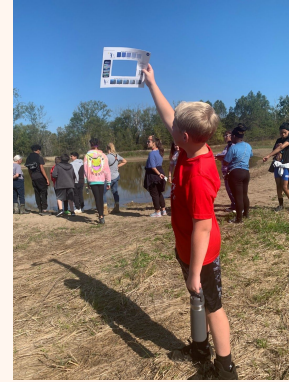


***You will
“Do Science”
as we want you
to have
your students
do in your
classrooms.***

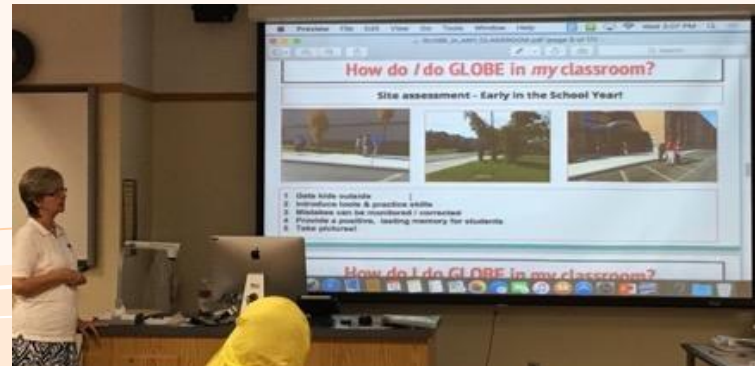
***Model what your
students should
be doing.***

***Support you
during the school
year.***

Receive training in GLOBE
protocols teachers and students



Develop an implementation plan after
your visit to Earth Heart Farms



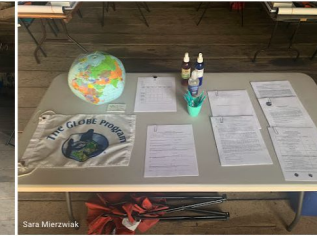
Earth Heart Farms Google Photo Album

<https://photos.app.goo.gl/NLRhuKsEQhc5CaQGA>

Fall and Spring Festivals
photos, and teachers
share their own photos
from their activities

Earth Heart Farms

Aug 16–Oct 14



Our impact:

- Students with limited access to nature got to experience it!
- Students who never held caterpillars (or snakes!) got to!
- Students who didn't know critters, including microbes, eat apple remnants thrown into the field, found out!
- Students created artwork and poetry reflecting on their experiences.
- Students have expressed interest in returning to EHF in a leadership role!

There are other examples we can share!
We hope you'll join our GLOBE Mission
EARTH family of teachers.



Meet the Team



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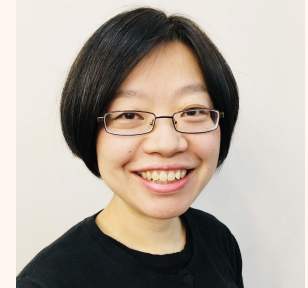
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Visit us at www.globe.gov/web/mission-earth

Thanks to Our Sponsors



The background of the image is a close-up photograph of autumn foliage, featuring various shades of red, orange, and brown leaves. A large, semi-transparent circular graphic is overlaid on the right side of the image, containing the text. The text is white and bold, with the word "QUESTIONS" in a larger font size and all caps.

Earth Heart Farms
GLOBE Mission EARTH

We welcome your
QUESTIONS.

Follow Our Progress

Follow our restoration,
educational &
stewardship projects:



[Earth Heart Farms LLC](#)

