HOW DOES ASPHALT AFFECT SOIL TEMPERATURE. Suzanna Patia Vang. vangsuzanna123@gmail.com. 751 Hudson Avenue, Akron, Ohio 44306-1956

The purpose of this project was to find out if a surface with a high albedo (the amount of light energy that is reflected.) such as asphalt affected surrounding short-grass soil temperature. The hypothesis was the closer the soil is to the asphalt the warmer the short-grass soil temperature will be. The GLOBE Program protocol for collecting soil temperature was followed using a Taylor 2” Bithermal Dial soil thermometer, spike, and Garmin eTrex Venture GPS unit. Four data collection points were identified at the site, which was at the teacher’s parking lot, at the edge of the asphalt, five meters and ten meters away from the asphalt into the short-grass. The data was also collected 5 centimeters and 10 centimeters into the short-grass soil, at each site. The data supported the hypothesis twelve out of the twelve days data was collected. The data was collected for 12 consecutive days, during the month of November. Several factors during the twelve days affecting the data were snow, ice, and rain. The data, however, showed there was minimal affect snow, ice, or rain had overall. Other relevant research can be done in the future such as extending planting seasons in close proximity to asphalt areas, further understanding the transfer of heat from asphalt areas to surrounding short-grass areas, or coloring asphalt a lighter color in an attempt to minimize this phenomenon.

PROBLEM

What affect does asphalt have on soil temperature. Will the temperature get warmer or colder the farther away you are from the asphalt?

PURPOSE

The purpose of this experiment was to find out if soil temperature will change the farther away you are from asphalt. I became interested in this experiment when I found out not a lot of people have done research about soil temperature on asphalt. The information that was gained will help others because it will help with global warming since asphalt has a part to do with global warming.

HYPOTHESIS

If you get farther away from asphalt then the soil temperature will change because the asphalt will affect the soil temperature.

MATERIALS

•Taylor 2” Bithermal Dial Soil Thermometer

•Nail (around 12cm long)

•Fluke 63 IR Temperature Reader

•Tape Measure

•Globe Flag

•Garman Etrex GPS

•Oven Mitt

•Watch

METHOD

1. Pick your sites, the first site is at the asphalt (parking lot), the second site used was 5 meters away from the first site, the last site was 10 meters away from the first site.
2. Use a nail marked at 5cm and 10cm
3. Use the nail and push though the soil to the marked 5cm, then take out
4. Put soil thermometer into 5cm hole wait 1 minute, take out and repeat a second time if the temperature is not the same repeat till the temperatures are the same
5. Take nail and put into same hole to the marked 10cm, then take out
6. Put soil thermometer into 10cm hole wait a minute, then take out (repeat if temperatures are not the same)
7. Repeat to next to 5 meters and 10 meters sites

RESULTS

**Surface temperature**

**Day1** (13:50-13:51)

11.6˚c, 11.0˚c, 11.4˚c, 10.8˚c, 10.8˚c, 11.2˚c, 11.4˚c, 11.2˚c, 10.8˚c with an average of 11.13˚c

Cloud cover: broken (50-90%)

Cloud type: cumulonimbus

**Soil temperature**

**Day1** (13:49-13:52)

(at point, 5meters, and 10 meters)

(5cm) 15˚c, 11˚c, 10˚c with an average of 12˚c

(10cm) 12˚c, 10˚c, 9˚c with an average of 10.3˚

**Surface temperature**

**Day2** (13:45-13:46)

5.2˚c, 5.6˚c, 5.8˚c, 5.4˚c, 5.4˚c 5.2˚c, 5.4˚c, 5.6˚c, 5.6˚c with an average of 5.5˚c

Cloud cover: overcast (90-100%)

Cloud type: cumulonimbus

**Soil temperature**

**Day2** (13:45- 13:47)

(at point, 5meters, and 10 meters)

(5cm) 8˚c, 5˚c, 5˚c with an average of 6˚c

(10cm) 6˚c, 5˚c, 5˚c with an average of 5.3˚c

**Surface temperature**

**Day3** (13:52-13:53)

1.8˚c, 1.8˚c, 2.6˚c, 1.8˚c, 2.2˚c, 1.8˚c, 2.8˚c, 2.0˚c, 2.8˚c with an average of 2.2˚c

Cloud cover: overcast (90-100%)

Cloud type: cumulonimbus

**Soil temperature**

**Day3** (13:48-13:50)

(at point, 5meters, and 10 meters)

(5cm) 6˚c, 5˚c, 4˚c with an average of 5˚c

(10cm) 4°c, 5°c, 3°c with an average of 4°c

**Surface temperature**

**Day4** (13:47-13:48)

3.6°c, 3.6°c, 3.8°c, 4.4°c, 4.0°c 4.6°c, 4.6°c, 4.2°c, 3.6°c with an average of 4.1**°**c

Cloud cover: sky obscured (90-100%)

Cloud type: nimbostratus

**Soil temperature**

**Day4** (13:52-13:54)

(at point, 5meters, and 10 meters)

(5cm) 7°c, 5°c, 6°c with an average of 6°c

(10cm) 6°c, 5°c, 5°c with an average of 5.3°c

**Surface temperature**

**Day5** (13:49-13:50)

4.0°c, 0.2°c, 4.5°c, 0.4°c, 3.4°c, 1.6°c, 0.2°c, 0.8°c with an average of 1.9°c

Cloud cover: sky obscured (90-100%)

Cloud type: cumulonimbus

**Soil temperature**

**Day5** (13:45-13:47)

(at point, 5meters, and 10 meters)

(5cm) 2°c, 3°c, 2°c with an average of 2.3°c

(10cm) 2°c, 2°c, 1°c with an average of 1.7°c

**Surface temperature**

**Day6** (13:46-13:47)

-1.0°c -0.4°c, -0.4°c, -0.2°c, -0.2°c, -0.4°c, 0.2°c, -0.4°c -0.4°c with an average of -0.1°c

Cloud cover: sky obscured (90-100%)

Cloud type: nimbostratus

**Soil temperature**

**Day6** (13:48-13:50)

(at point, 5meters, and 10 meters)

(5cm) 3°c, 4°c, 4°c with an average of 3.7°c

(10cm) 3°c, 3°c, 4°c with average of 3.3°c

**Surface temperature**

**Day7** (15:03-15:04)

-2.6°c, -2.2°c, -2.0°c, -1.6°c, -2.2°c, -2.2°c, -1.8°c, -2.6°c, -2.0°c with an average of -1.5°c

Cloud cover: overcast (90-100%)

Cloud type: altostratus

**Soil temperature**

**Day7** (15:00-15:03)

(at point, 5meters, and 10 meters)

(5cm) 1°c, 1°c, 2°c with an average of 1.3°c

(10cm) 2°c, 0°c, 1°c with an average of 1°c

**Surface temperature**

**Day8** (16:39-16:40)

2.8°c, 3.4°c, 3.6°c, 3.6°c, 3.6°c, 3.4°c, 3.6°c, 3.6°c, 3.6°c with an average of 3.5°c

Cloud cover: sky obscured (90-100%)

Cloud type: stratus

**Soil temperature**

**Day8** (14:56-14:58)

(at point, 5meters, and 10 meters)

(5cm) 1°c, 5°c, 2°c with an average of 2.7°c

(10cm) 3°c, 2°c, 2°c with an average of 2.3°c

**Surface temperature**

**Day9** (16:38-16:39)

0.6°c, 1.6°c, 1.0°c, 1.4°c, 1.6°c, 1.0°c, 0.4°c, 0.6°c, 1.4°c with an average of 1.07°c

Cloud cover: broken (50-90%)

Cloud type: stratus

**Soil temperature**

**Day9** (13:53-13:55)

(at point, 5meters, and 10 meters)

(5cm) 3°c, 4°c, 4°c with an average of 3.7°c

(10cm) 0°c, 2°c, 2°c with an average of 1.3°c

**Surface temperature**

**Day10** (13:51-13:52)

4.2°c, 4.4°c, 4.0°c, 3.8°c, 4.4°c, 4.8°c, 3.6°c, 3.8°c, 4.2°c with an average of 3.7°c

Cloud cover: overcast (90-100%)

Cloud type: stratus

**Soil temperature**

**Day10** (13:43-13:55)
(at point, 5meters, and 10 meters)

(5cm) 9°c, 5°c, 2°c with an average of 5.2°c

(10cm) 5°c, 4°c, 2°c with an average of 3.7°c

**Surface temperature**

**Day11** (14:02-14:03)

2.6°c, 2.8°c, 2.4°c, 2.2°c, 2.4°c, 2.6°c, 2.6°c, 2.7°c with an average of 2.27°c

Cloud cover: sky obscured (90-100%)

Cloud type: nimbostratus

**Soil temperature**

**Day11** (13:42-13:44)

(at point, 5meters, and 10 meters)

(5cm) 2°c, 2°c, 0°c with an average of 1.3°c

(10cm) 0°c, 0°c, 2°c with an average of 0.7°c

**Surface temperature**

**Day12** (12:12-12:13)

-3.6°c, -4.2°c, -3.8°c, -4.6°c, -4.2°c, -4.2°c, -4,6°c, -4.4°c, -5.0°c with an average of -4.3°c

Cloud cover: sky obscured (90-100%)

Cloud type: stratus

**Soil temperature**

**Day12** (13:54-13:58)

(at point, 5meters, and 10 meters)

(5cm) 4°c, 0°c, 1°c with an average of 1.7°c

(10cm) 1°c, 0°c, 1°c with an average of 0.7°c

CONCLUSION

My hypothesis is that if you get farther away from asphalt then the soil temperature will change because the asphalt will affect the soil temperature. My hypothesis supported 12 out of the 12 days I collected data.

I found out that the soil temperature does change the farther away you are from the asphalt. The soil temperature is warmer the closer you are to the asphalt, and colder the farther away you are. Therefore, the soil temperature does change the farther away you are from the asphalt.

Something I would change about this project is I would do it when it’s warmer outside. Snow was a problem when taking the temperatures, because sometimes the snow would get in the way of getting an exact 5cm, 10 cm deep hole. Other errors and problems I came across was lack of data from other schools to support my project.

REFERENCES

Frantz, S. Teacher, Roswell Kent Middle School. Personal communication 2014-2015.

Globe Program. Data retrieved 2014-2015 from http://www.globe.gov.

Lor, M. Student, Roswell Kent Middle School. Personal communication 2014-2015.

National Air and Space Administration. Data retrieved 2014-2015 from http://www.nasa.gov.

National Oceanic and Atmospheric Administration. Data retrieved 2014-2015 from

http://www.noaa.gov.

Whaley, D. Teacher, Roswell Kent Middle School. Personal communication 2014-2015.