



Save the Pill Bugs!

RESEARCH:

What are pill bugs?

Don't call them bugs or insects, pill bugs are crustaceans related to shrimp and lobsters. Pill bugs have gills they breathe through, 14 legs, and are usually brown or grey in color. They tend to roll into a ball when threatened, and feed mostly on dead, moldy leaves and rotting wood.

Are pill bugs native to Arizona?

No, pill bugs were brought to Arizona unknowingly by settlers long ago.

What is an ideal habitat for pill bugs?

Composting heaps or moist gardens are ideal habitats for pill bugs.

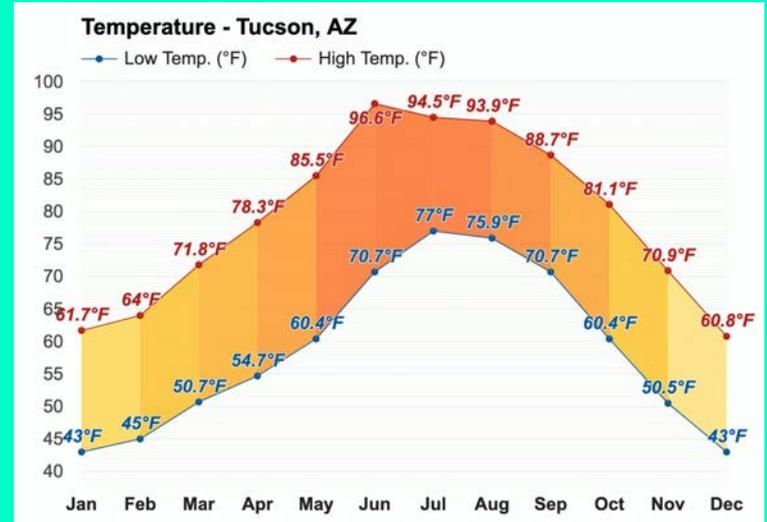
Why are pill bugs important to the world and us?

Pill bugs are important to our world because they are decomposers, which means they eat dead or decaying things and return nutrients to the soil. They are even more important to us because we need to keep them alive in the classroom for third grade students to use year after year.



PROBLEM:

How can we build a habitat that keeps pill bugs healthy and alive for the class next year during all seasons in Tucson, AZ?



What it does:

We will work in pairs to design and build 8 different prototypes. Each prototype has the following criteria and constraints.

Criteria:	Constraints:
<ul style="list-style-type: none">● Shade structure must hold the temperature constant● Soil/dirt must be present● Must have a structure for pill bugs to hide under● Must have a water source or material to hold moisture● Food source	<ul style="list-style-type: none">● You can only use materials provided to you by the teacher or recycled from home (don't spend any money)● Time (4 days, 30 minutes each day to build prototype, 1 day to test)● You must use one 14" L x 8" W x 4⁷/₈"H clear plastic shoe box (Space)

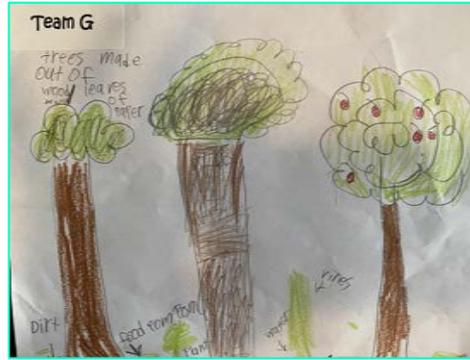
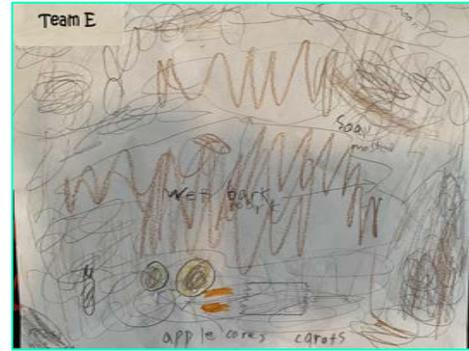
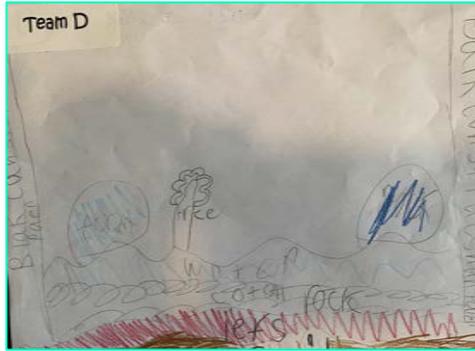
MATERIALS:

- Water
- Soil
- Rocks
- Dead leaves
- Rotting wood
- Construction and white lined paper
- Cotton and Pom Pom balls
- Tissue paper
- Rotting fruit
- Pieces of cardboard
- Pipe cleaners
- Q-tips
- Molding clay
- Felt
- Scotch Tape
- Yarn
- Paper towels
- Paper towel and toilet paper rolls
- Plastic shoe box
- Pinecones



Note: Each prototype had a different design and materials used.

MORE DESIGNS:



PROTOTYPES AND TESTING:

Using an infrared thermometer, temperature of the soil in each prototype was taken at 8:30 a.m. when the prototypes were placed in the school courtyard, and then temperatures were taken again 5 hours later at 1:30 p.m.



MORE PROTOTYPES:



DATA AND RESULTS:

Prototype	Temperature of soil under shade structure at start of test at 8:30 a.m.	Temperature of soil under shade structure at end of test at 1:30 p.m.	Difference in starting and ending temperature	Did it use only the specified materials?
A	50.2°F	65.5°F	15.3°F	NO
B	52.5°F	72.1°F	19.6°F	YES
C	55.2°F	75.7°F	20.5°F	YES
D	52.3°F	54.9°F	2.6°F	YES
E	59.2°F	68.7°F	9.5°F	YES
F	53.1°F	76.2°F	23.1°F	YES
G	59.2°F	81.5°F	22.3°F	YES
H	52.7°F	93.9°F	41.2°F	YES

LIMITATIONS AND IMPLICATIONS:

Limitations:

- Prototypes were tested on concrete, testing on dirt might have resulted in different outcomes
- Prototypes with shade structures such as roofs, or ramadas had a hard time staying up to provide proper shade
- Working in teams and agreeing on items for each habitat was challenging

Implications:

- Our prototypes needed longer testing time. Testing in each season would bring more accurate results- this would be for **future research**
 - The prototypes needed a constant source of water to keep the soil moist
 - These prototypes will be helpful to other classes who also use organism in science or to farmers and gardeners who want to keep pill bugs alive to assist with composting
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CONCLUSION:

After testing and reviewing the results, we concluded as a class that prototype D was the most successful in maintaining a constant temperature in the 5 hour time period, followed closely by prototype E. Prototype D only had a 2.6°F increase in temperature, and prototype E had a 9.5°F increase. All of the other prototypes had an increase in temperature ranging from 15.3°F - 41.2°F . We noticed both prototypes that had the smallest increase used similar materials. Both groups D and E watered the soil prior to placing rocks, leaves, and rotting tree debris into their prototypes.

CONCLUSION CONT.

After analyzing the results and seeing other groups prototypes, we decided to make the following changes in our prototype next time.

Group A: We thought our prototype was better than some of the other prototypes. Next time, we will only use rocks, soil, the candy boxes, and leaf debris. We would keep the candy boxes because we think the shade helped keep our temperature low. Our temperature only increased 15.3°F which is about 12°F more than prototype D. **Group B:** Next time we will water our soil. We thought making little ponds with clay might help keep the temperature cooler, but it did not work. **Group C:** On our next prototype we will not worry about the tissue paper bush and use rocks and soil instead. **Group D:** We think our prototype was close to perfect. We would add more wet cotton balls next time to keep more moisture in the box. We think this might help lower the temperature by the 2.6°F it increased in prototype 1. **Group E:** Next time we will add wet cotton balls to help reflect the sun and add more moisture. **Group F:** We needed to add water to the soil and more leaves and rocks. **Group G:** We think we needed more water in our prototype. We also would take away the cotton balls. **Group H:** Next time we will cover the soil completely with rocks and leaves. We will also take away the blue paper because we think it absorbed heat from the sun and caused our prototype to have the highest temperature of 41.2°F .

STUDENT LAB NOTEBOOK IMAGES:

What do Pill Bugs need to survive and thrive?

rotten food/grass	DIRT
damp places	
shade/cover	

Our Problem: How can we build a habitat that makes pill bugs happy with success for our class?

Criteria	Constraints
rotten leaves	1. you can only use materials provided to you by the teacher or recycled from home
damp towels	2. time spent matters
rocks	time
shade	3. you must use one of the sites for your habitat
	paper bushes

Results and Conclusions

AFTER LOOKING AT THE DATA AND ALL OF THE HABITAT DESIGNS, WHAT WOULD YOU CHANGE ABOUT YOUR PROTOTYPE?

FOOD more plants, more rocks, less leaves, smaller chairs

WHAT ARE LIMITATIONS TO YOUR HABITAT?

We had everything we needed

WHERE ELSE COULD YOU USE WHAT YOU LEARNED?

to build things

What do Pill Bugs need to survive and thrive?

Food water rocks
dark soil dirt



Our Problem: A water bottle water and a plant water thing and position a out it in a dark place

Criteria	Constraints
water bottle leaves	1. must be dry & sealed
apples rocks dirt	2. you can't use anything
soil water sand	teacher or class clean
leaves	can't spend any money
	actions
	3. you must make

AFTER LOOKING AT THE DATA AND ALL OF THE HABITAT DESIGNS, WHAT WOULD YOU CHANGE ABOUT YOUR PROTOTYPE?

we should of put shade

WHAT ARE LIMITATIONS TO YOUR HABITAT?

we were short on time

WHERE ELSE COULD YOU USE WHAT YOU LEARNED?

If we are working in the zoo on habitats.

Testing Time!

Record the results for your prototype

Test 1: Testing conditions (temperature, shade, wind, sunny?)

clear, blue sky 8:30 AM

Did you meet the criteria?	Did you follow the constraints?	Temperature under structure at start of test	Temperature under structure at the end of test	Difference temperature
yes	yes	55.2	75.7	20.

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