

PIT-FALL ACTIVITY

**Modified from
Chihuahuan Desert Nature Park
JORNADA BASIN SCHOOLYARD
LONG-TERM ECOLOGICAL RESEARCH (LTER) PROJECT
Created by Ray Bowers**

PIT-FALL ACTIVITY

TEACHER INFORMATION

ABSTRACT: Students will collect data on the types and numbers of ground arthropods collected in pit-fall traps around their school. This data will allow students to investigate habitat preferences in different arthropod groups as well as changes in ground arthropod populations during the year. They will then compare their data to the data collected by Dr. Diana Northup in Carlsbad Caverns.

GRADE LEVEL (S): 3--12

OBJECTIVES: Students will:

- Record and graph arthropod numbers collected in pit-fall traps during the school year
- Draw conclusions about the seasonal ground arthropod populations
- Compare arthropod data from their schoolyard to data from Carlsbad Cavern, NM

NATIONAL STANDARDS:

Science as Inquiry – Development of:

- Abilities necessary to do scientific inquiry (3-12)
- Understandings about scientific inquiry (3-12)

Life Science – Development of an understanding of:

- Characteristics of organisms (K-4)
- Organisms and the environment (K-4)
- Diversity and adaptations of organisms (5-8)
- Behavior of organisms (9-12)

NEW MEXICO STANDARDS:

Strand I: Scientific Thinking and Practice

Standard I: Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.

- | | |
|--------------------|---|
| 5-8 Benchmark I: | Use scientific methods to develop questions, design and conduct experiments using appropriate technologies, analyze and evaluate results, make predictions, and communicate findings. |
| 9-12 Benchmark I: | Use accepted scientific methods to collect, analyze, and interpret data and observations and to design and conduct scientific investigations and communicate results. |
| 5-8 Benchmark II: | Understand the processes of scientific investigation and how scientific inquiry results in scientific knowledge. |
| 9-12 Benchmark II: | Understand that scientific processes produce scientific knowledge that is continually evaluated, validated, revised, or rejected. |

Strand II: Content of Science

Standard II (Life Science): Understand the properties, structures, and processes of living things and the interdependence of living things and their environments.

5-8 Benchmark I: Explain the diverse structures and functions of living things and the complex relationships between living things and their environments.

9-12 Benchmark I: Understand how the survival of species depends on biodiversity and on complex interactions, including the cycling of matter and the flow of energy.

MATERIALS:

- colored pencils
- graph paper
- Data charts from Carlsbad Caverns
- "Arthropod Pit-Fall Charts"
- inexpensive "artist" paint brush
- empty 35mm film canisters
- collecting jars
- 75% AGW (alcohol, glycerin, and water) or Rubbing alcohol
- Dixie® cup insert
- 16 oz Solo® plastic cup
- 10 inch forceps
- plastic petri dishes
- Dissecting Microscope
- Arthropod or insect identification books such as Peterson Field Guide to the Insects, Golden Guide to Familiar American Insects and Golden Guide to Spiders and Their Kin

BACKGROUND: Many arthropods are found on the ground around the schoolyard. The simplest technique to study the ground arthropods is a pit-fall trap. This is a container that is buried in the ground to catch any arthropods that fall into the trap.

PROCEDURES:

The solution (AGW)

- AGW is a mixture of 75ml of denatured ethyl alcohol, 10ml glycerin, and 10ml water. The glycerin is used to protect the small organisms if the solution evaporates. If "rubbing alcohol" or 70% isopropyl is used add 5ml of glycerin to each pint.

The pit-fall trap

- Bury a 16oz Solo® cup level with the ground surface.
- Cut the stem off of a Dixie® cup insert to make a funnel. Place this funnel on a 16oz Solo® plastic cup.
- Place a six-inch square piece of tile over the cup so that an inch space is provided above the cup. Using small rocks to support the tile can do this. Often floor covering dealers will donate spare tiles to schools.

The Collection and Processing

1. Choose two areas in the schoolyard to sample. You could choose the areas or walk with the class around the schoolyard and let the students choose the areas they want to study.
2. One area should have more organic matter, plant matter, than the other. This will be somewhat comparable to the bat cave with its bat guano and sand passage with less organic matter.
3. Each pit-fall site area should have a three-meter Habitat Protocol done for the pit-fall site to identify the conditions around the site.
4. Divide the class into two groups. One group will set their pitfall traps along a line at one site, and the other group will set their traps along a line at the other site. Each trap should be about 25cm (10 in) from the next trap.
5. Students can work in groups of up to four per pit-fall site for this activity, but a group of two would be better. The members of the groups can be rotated depending on the number of sites and class size.
6. Students should check the traps, and collect the arthropods that are present. Look into the trap before removing the funnel in case there is anything that stings or bites. Release any small lizards or snakes that may have fallen into the trap. Arthropods will be collected and placed into collecting jars with AGW. Empty 18 oz plastic peanut butter jars work well.
7. One student can be the identifier and the other student can be the recorder. The recorder should make sure all of the information at the top of the "Arthropod Pitfall Daily Chart" is completed as well as record what arthropods are found and the number of each kind. Students can take turns being the identifier and recorder.
8. Remove the large arthropods with a forceps and place each type of arthropod in a different dish. Identify and record each type of arthropod. These can be saved in film canisters that are half full of AGW.
9. To look for small arthropods, pour some of the AGW from the collecting bottle into a petri dish near the dissecting microscope. Place the petri dish on the microscope stage and use a small paintbrush to pick up any arthropods observed. Place the arthropods into a film canister that is half full of AGW. Place each type of arthropod in a different film canister. Most photography developing stores will give you all the empty film canisters you want. Continue until the entire sample has been checked.
10. After all of the arthropods in the petri dish have been removed carefully pour the liquid in the dish into an empty bottle, this can be reused. Since only one student can use the microscope at a time, the students can take turns removing the arthropods. If there are four students in a group, while part of the group works the other members of the group could be doing other schoolwork.
11. All of the members of the sample team should record the information on the "Pitfall Daily Chart" and report their results to the class. If the class continues to Pitfall Activity for a month, monthly results can be recorded.
12. The class results will be recorded on the "Pitfall Daily Class Average Chart." A transparency of the "Pitfall Daily Class Average Chart" helps in recording class results and sharing them with the whole class. Each student should keep a "Pitfall Daily Class Average Chart."
13. At the bottom of the page record the total number for the types of organisms and the total number of organisms. Divide the totals by the number of traps to get an average.
14. Using the "Pitfall Daily Class Average Chart," make a bar graph of the types of organisms per trap and another bar graph for the average totals of the types and number of organisms. Use different colored pencils for each type of organism or bar graph. If a site has more organisms than spaces available on the graph, two columns may be needed for a site (see the sample for flbd).

15. The Cave data from Dr Diana Northup should be graphed. Use the same format on the graphs as the schoolyard graphs.
16. When the activity is completed dig up the traps or if they will be used later place the tile directly on the can and cover the tile with soil. Make a map with the trap locations so they can be found later.

CONCLUSIONS: Allow the students to draw conclusions from the graphs and monthly charts. Why was it necessary to calculate an average? How does the schoolyard data compare with the data from Carlsbad Caverns? Do some arthropods have seasonal fluctuations? Do the Carlsbad Caverns' arthropods have a season fluctuation? Do some arthropods prefer certain areas of the schoolyard or the caverns? Does the weather affect the number or type of arthropods collected?

EXTENSIONS: This activity could be continued during the school year with monthly averages calculated. A variation of this activity could involve using different types of bait in the bottom of the cup. Some cups could have fruits, meat, or syrup. This could be a contrast to traps without bait.

BAT CAVE DAILEY AVERAGE CHART

COLLECTOR Dr. Diana Northup NUMBER OF TRAPS 10 DATE 4 July, 1987 .

PIT-FALL LOCATION Bat Cave, Carlsbad Cavern National Park, NM .

WEATHER in the cave; see the Cave CLimate Comparison Activity .

Name of Arthropod (Types / Trap)	Number of Arthropods (Number / Trap)
Guano moth	31 (3.1)
Black beetle	16 (1.6)
Rhadine beetle	2 (0.2)
Dark	5 (0.5)
<u>Ceuthophilus carlsbadensis</u> cave cricket	1 (0.1)
Flea	1 (0.1)
Total: 6 types of organism (0.6)	Total: 56 organisms (5.6)

SAND PASSAGE DAILEY AVERAGE CHART

COLLECTOR Dr. Diana Northup NUMBER OF TRAPS 10 DATE 4 July, 1987 .

PIT-FALL LOCATION Sand Passage, Carlsbad Cavern National Park, NM .

WEATHER in the cave; see the Cave Climate Comparison Activity .

Name of Arthropod	Number of Arthropods (Number / Trap)
Diplura	14 (1.4)
Rhadine beetle	11 (11)
<u>Ceuthophilus longipies</u> Cave cricket	8 (0.8)
Intermediate	17 (1.7)
Dark	8 (0.8)
Total: ____ types of organism (____)	Total: ____ organisms (____)

SAMPLES

PIT-FALL DAILEY CHART

STUDENT NAME Wong Scorpion Lee and Anita Ant

PIT-FALL LOCATION in front flower bed (flbd) of El Paso Middle School, Las Cruces, NM

WEATHER cloudy with light rain, 55°F.

Date	Name of Arthropod	Number of Arthropods
23Sep,02	Araneida, spider	1
23Sep,02	Collembola, springtails	1
23Sep,02	Formicidae, ants	65
23Sep,02	Coleoptera, beetles	26

PIT-FALL DAILEY CLASS AVERAGE CHART

CLASS Ms Northup, 8th per NUMBER OF TRAPS 10 DATE 23Sep,02 .

PIT-FALL LOCATION in front flower bed of El Paso Middle School, Las Cruces, NM (flbd)

WEATHER cloudy with light rain, 55°F .

Name of Arthropod	Number of Arthropods (Number / Trap)
Araneida, spiders	1+1+1+1= 4 (0.4)
Coleoptera, beetles	26+6+21+6+2+1+1+4+35= 102 (10.2)
Collembola, springtails	1+1+2+11+32= 47 (4.7)
Formicidae, ants	65+17+65+17+4+4+1+1= 174 (17.4)
Acari, mites	4 (0.4)
Protura	1 (0.1)
Diptera	1+3= 4 (0.4)
Total: 7 types of organism (0.7)	Total: 336 organisms (33.6)

PIT-FALL MONTHLY CHART

CLASS NAME Ms Northup, 8th per.

LOCATION in front flower bed of El Paso Middle School, Las Cruces, NM.

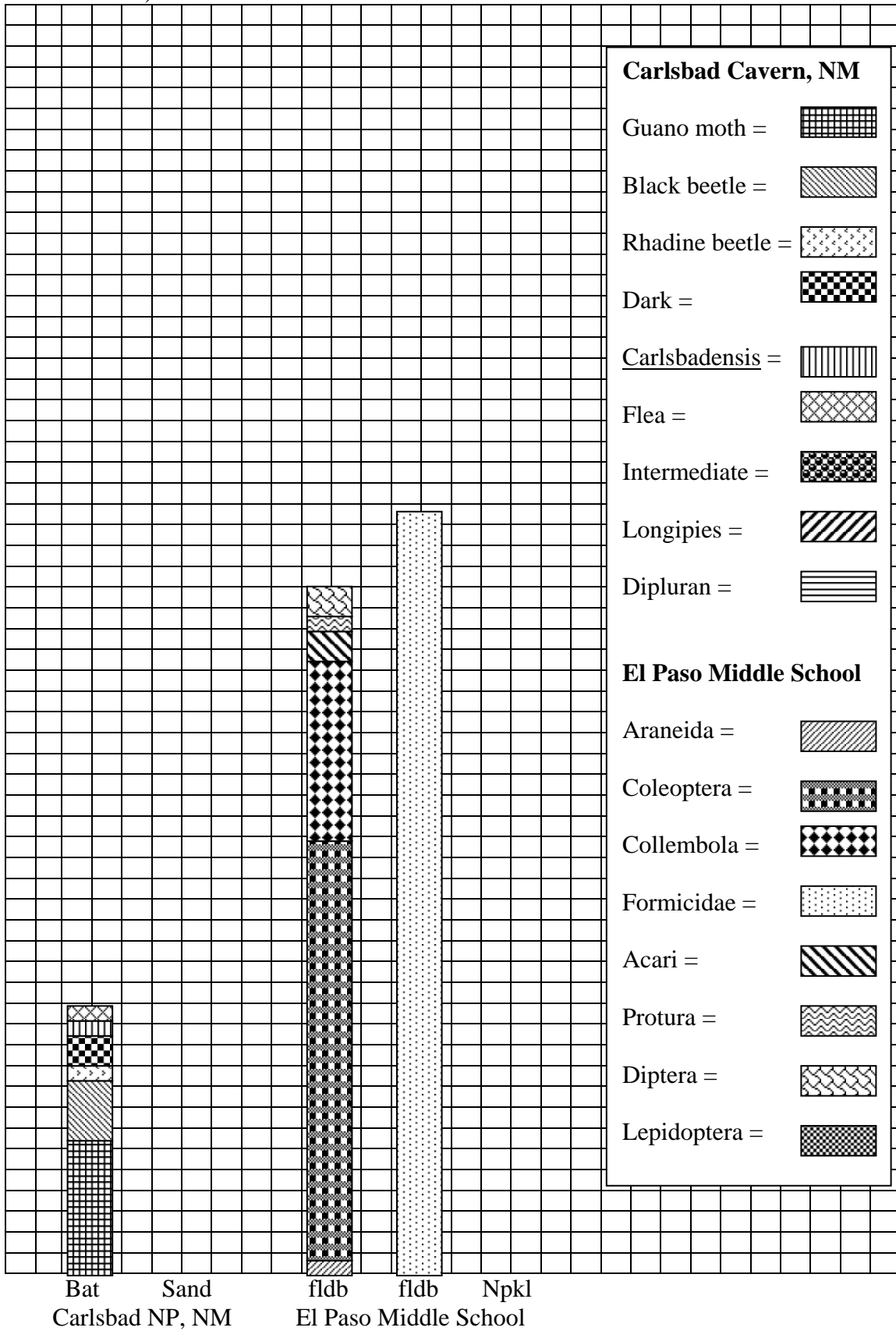
SITE DESCRIPTION flower bed in front of school.

Numbers per Month

Names of Arthropods	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Scorpiones, scorpion		3							
Araneae, spiders		18							
Collembola, springtails		97							
Tysanura, bristletails		3							
Orthoptera, crickets		10							
Hymenoptera, ants		200							
Acari, mites		15							
Protura		2							
Diptera		3							
<i>Total</i>		351							

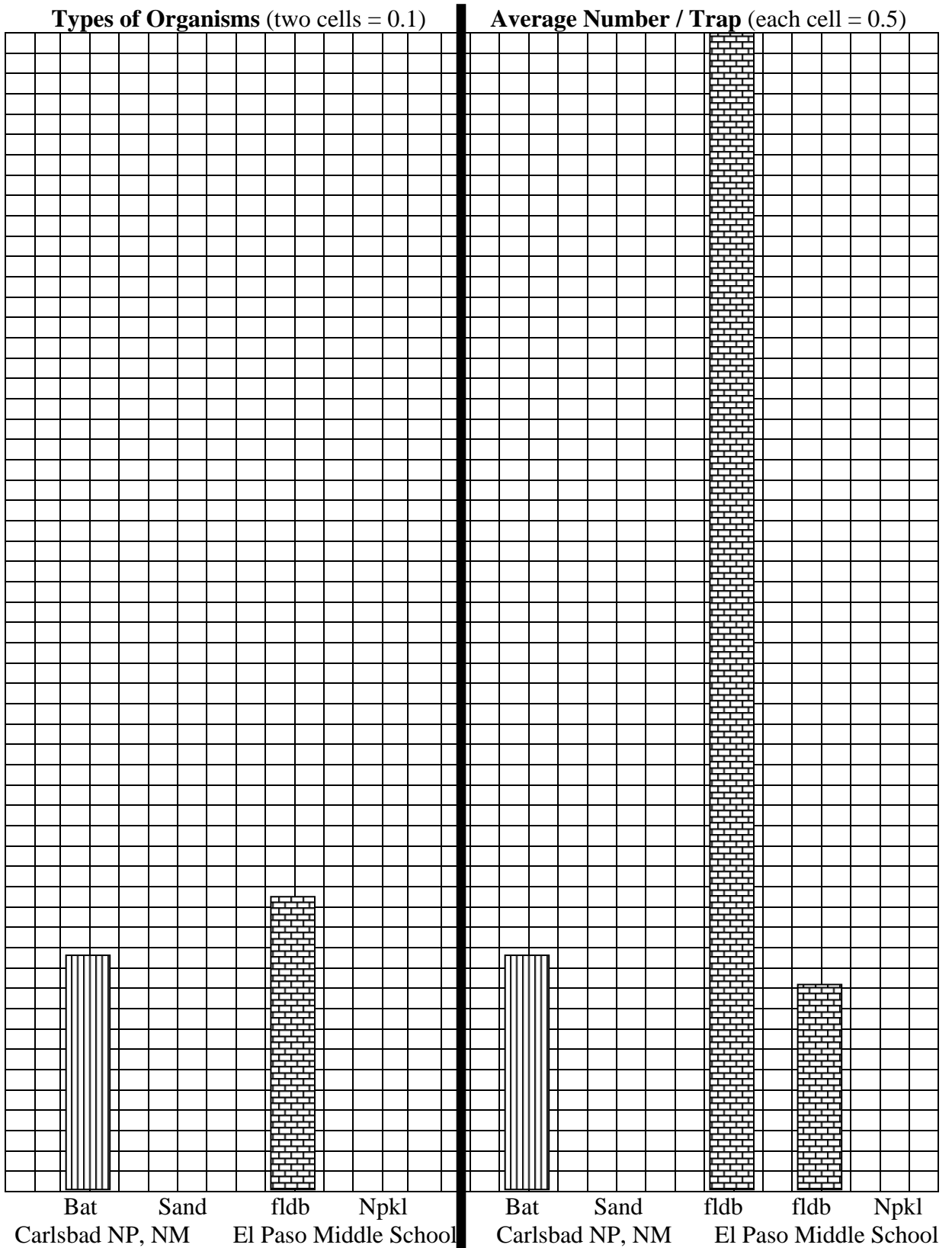
Average Number of Organisms / Trap

Average
Number (each cell = 0.5)



Class Averages / Trap

Average
Number



PIT-FALL ACTIVITY

PIT-FALL ACTIVITY

Student Name _____

QUESTION: How does the ground arthropod population compare to the arthropods in Carlsbad Caverns?

MATERIALS:

- colored pencils
- graph paper
- Data charts from Carlsbad Caverns
- "Arthropod Pit-Fall Charts"
- inexpensive "artist" paint brush
- empty 35mm film canisters
- collecting jar
- 75% AGW (alcohol, glycerin, and water) or Rubbing alcohol
- Dixie® cup insert
- 16 oz Solo® plastic cup
- 10 inch forceps
- plastic petri dishes
- Dissecting Microscope
- Arthropod or insect identification books such as Peterson Field Guide to the Insects, Golden Guide to Familiar American Insects and Golden Guide to Spiders and Their Kin

BACKGROUND: Many arthropods are found on the ground around the schoolyard. The simplest technique to study the ground arthropods is a pit-fall trap. This is a container that is buried in the ground to catch any arthropods that fall into the trap.

METHODS:

The pit-fall trap

- Bury a 16oz Solo® cup level with the ground surface.
- Cut the stem off of a Dixie® cup insert to make a funnel. Place this funnel on a 16oz Solo® plastic cup.
- Place a six-inch square piece of tile over the cup so that an inch space is provided above the cup. Using small rocks to support the tile can do this.

The Collection and Processing

1. Two areas in the schoolyard will be sampled.
2. One area should have more organic matter, plant matter, than the other. This will be somewhat comparable to the bat cave with its bat guano and sand passage with less organic matter.
3. Each pit-fall site area should have a three-meter Habitat Protocol done for the pit-fall site to identify the conditions around the site.
4. Set your pitfall traps at one of the sites. Each trap should be about 25cm (10 in) from the next trap.
5. Work in groups of two to set a trap.

6. Check the trap each day, and collect the arthropods that are present. Look into the trap before removing the funnel in case there is anything that stings or bites. Release any small lizards or snakes that may have fallen into the trap. Arthropods will be collected and placed into a collecting jar of AGW.
7. Use the resources provided by the teacher to identify the arthropods in the sample. One student can be the identifier and the other student can be the recorder. The recorder should make sure all of the information at the top of the "Arthropod Pitfall Daily Chart" is completed as well as record what arthropods are found and the number of each kind. Take turns being the identifier and recorder.
8. Remove the large arthropods with a forceps and place each type of arthropod in a different petri dish. Identify and record each type of arthropod. These can be saved in film canisters that are half full of AGW.
9. To look for small arthropods, pour some of the AGW from the collecting bottle into a petri dish near the dissecting microscope. Place the petri dish on the microscope stage and use a small paintbrush to pick up any arthropods observed. Place the arthropods into a film canister that is half full of AGW. Place each type of arthropod in a different film canister. Continue until the entire sample has been checked.
10. After all of the arthropods in the petri dish have been removed carefully pour the liquid in the dish into an empty bottle, this can be reused. Since only one student can use the microscope at a time, the students can take turns removing the arthropods.
11. All of the members of the sample team should record the information on their "Pitfall Daily Chart" and report their results to the class.
12. The class results will be recorded on the "Pitfall Daily Class Average Chart." Each student should keep a "Pitfall Daily Class Average Chart."
13. At the bottom of the page record the total number for the types of organisms and the total number of organisms. Divide the totals by the number of traps to get an average.
14. Using the "Pitfall Daily Class Average Chart," make a bar graph of the types of organisms per trap and another bar graph for the average totals of the types and number of organisms. Use different colored pencils for each type of organism or bar graph.
15. The Cave data from Dr Diana Northup should also be graphed.
16. When the activity is completed dig up the traps or if they will be used later place the tile directly on the can and cover the tile with soil. Make a map with the trap locations so they can be found later.

RESULTS: See the Arthropod Pit-Fall Monthly Chart and graph.

CONCLUSIONS:

PIT-FALL DAILEY CHART

STUDENT NAME _____

PIT-FALL LOCATION _____

WEATHER _____

Date	Name of Arthropod	Number of Arthropods

