Name ____________________________

Period ____ Date ________________

MILKWEED-BUG OBSERVATIONS

Part 1: Milkweed bugs are insects. Observe them carefully, then answer the questions and make accurate illustrations of the bugs.

1. Describe in detail the structures milkweed bugs use to get from place to place.

____

____

2. Describe in detail how milkweed bugs get information about their environment.

____

____

3. Describe the milkweed bug's mouth.

____

____

Part 2: Milkweed bugs do not all have the same markings. Observe how they are different and draw accurate pictures of the two different patterns.

Pattern 1		**Pattern 2**	
Back side	**Belly side**	**Back side**	**Belly side**

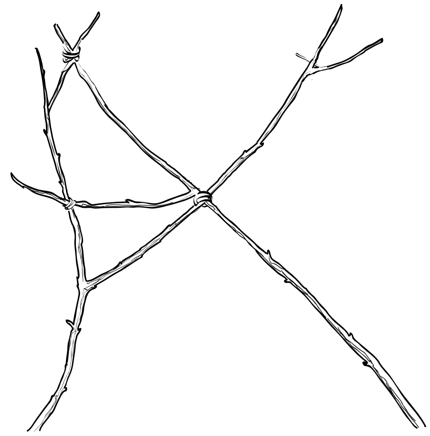
A HABITAT FOR MILKWEED BUGS (1 of 3)

Milkweed bugs, like all living things, need a supportive environment in which to live. The environment that provides for all the needs of an organism is its **habitat.**

There are four primary components that every terrestrial organism must have in its habitat in order to survive: air, water, food, and space.

A simple plastic bag can become a suitable habitat for milkweed bugs. Follow these directions.

Task 1: Assemble the twig structure



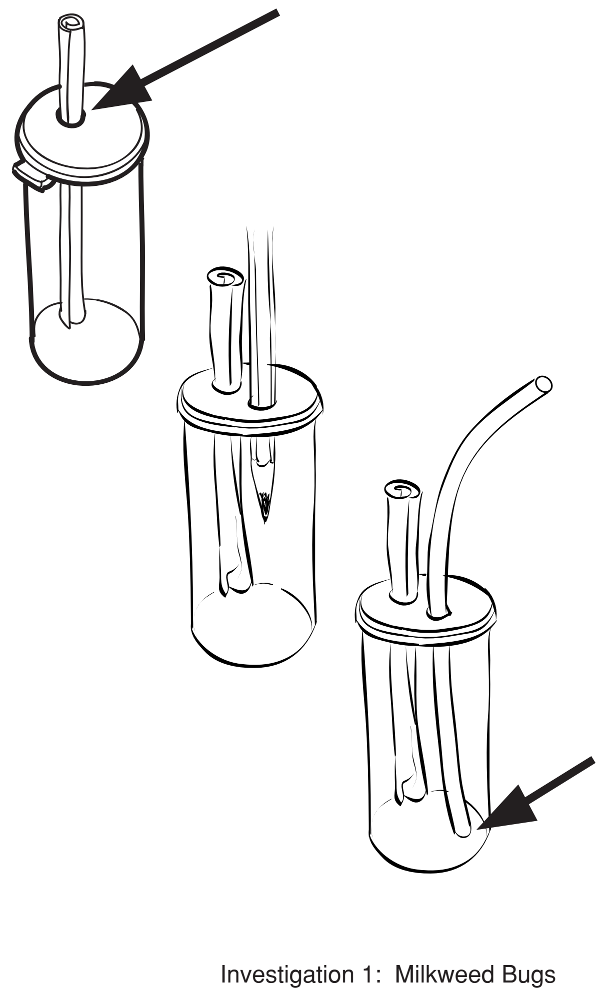
a. Find 3–4 thin twigs 20–30 cm long.

b. Study the illustration of a finished habitat bag (in task 6). Use rubber bands to assemble the twigs into a climbing structure.

c. Make sure the structure will fit inside a 4-liter bag, is fairly flat, and will support the food bundles and polyester wool high above the water fountain.

d. Label the bag with the group number.

Task 2: Assemble a water fountain



a. Remove the cap from a vial. Use the hole punch to make a hole near the center of the cap.

b. Roll a 10-cm square of paper towel into a tight cylinder and shove it through the hole to act as a wick. The part inside the vial should reach to the bottom of the vial.

c. Snap the cap on the vial. Use a sharp standard pencil to carefully poke a second hole in the vial cap. (Don't use the hole punch—the hole will be too big.) Twist the pencil a bit as you push it through the cap.

d. Push the flexible tubing through the second hole until the end of the tubing is on the bottom of the vial. Store the fountain in the bag.

A HABITAT FOR MILKWEED BUGS (2 of 3)

Task 3: Prepare food bundles

a. Count out about 100 shelled sunflower seeds.

b. Put about half of them in the center of a square of netting.

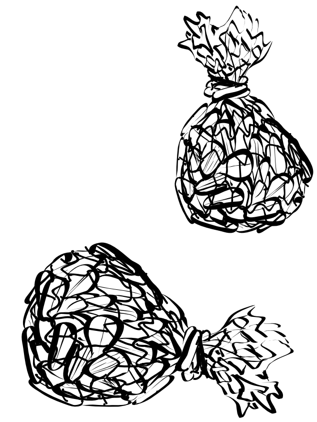
c. Enclose the seeds in the netting. Pull the netting around tightly to make a ball of seeds.

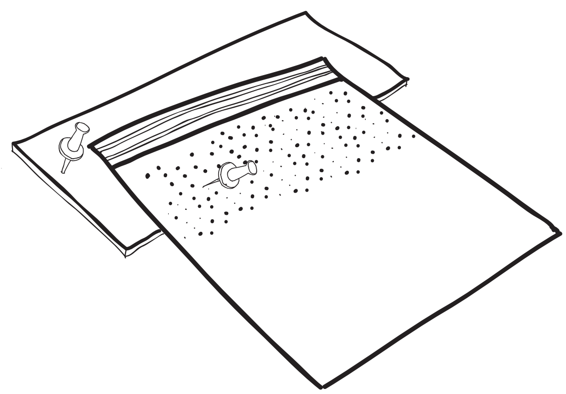
d. Use a rubber band to hold the bundle shut. Wrap the rubber band around the ends of the netting many times.

e. Repeat the process with the rest of the seeds to make a second food bundle.

f. Use a loop of the rubber band to hang each food bundle on a twig high in the habitat.

g. Put everything in the bag.





Task 4: Add ventilation and polyester wool

a. Take everything out of the bag.

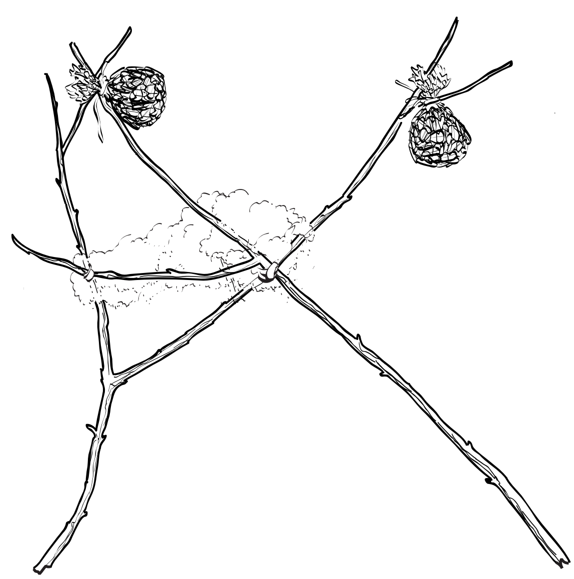
b. Lay the upper third of the bag on a piece of cardboard.

c. Use a pushpin to punch 100–200 holes in the upper third of the bag.

d. Take a wad of polyester wool about the size of a walnut. Stretch it out a bit.

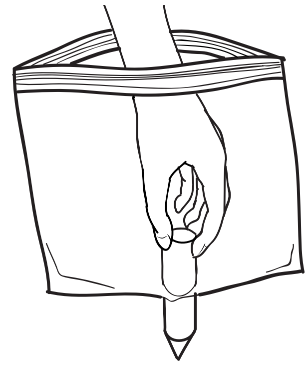
e. Connect ends of the stretched polyester wool between the twigs to provide a place for bugs to hide.

f. Put everything in the bag.



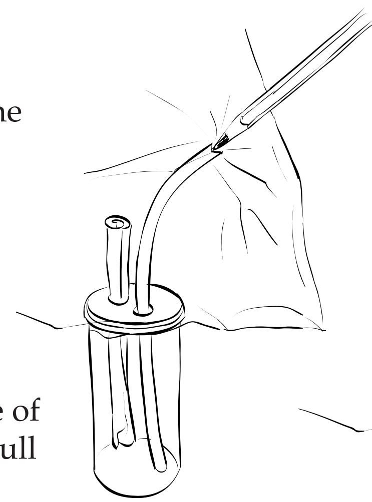
A HABITAT FOR MILKWEED BUGS (3 of 3)

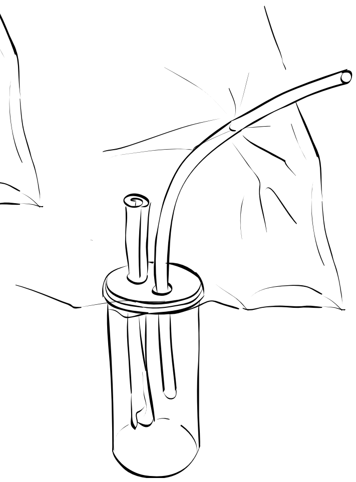
Task 5: Install the water fountain



a. Take everything out of the bag. Run the pointed dowel through the center of the bottom of the zip bag. Pull the dowel all the way through the bag.

b. Push the water-fountain vial through the hole in the bottom of the bag from the inside. The job may be a bit of a struggle—you must stretch the plastic as you force the vial through the hole. Push hard and slowly—the plastic will yield without tearing.





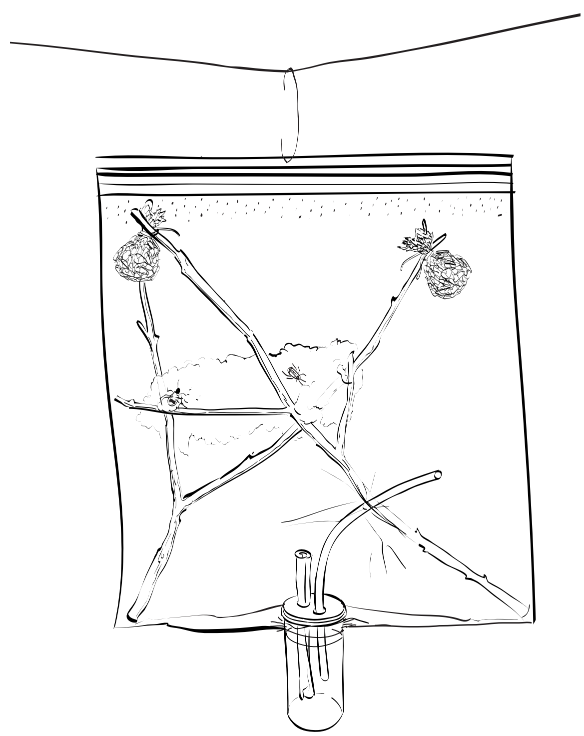
c. Rotate the vial so that the upper end of the tubing is against the inside of the bag. Make sure the end of the tubing is on the bottom of the vial.

d. Push the sharp pencil point through the side of the bag into the open end of the flexible tube.

e. Push the end of the tube through the side of the bag. Hold the vial in one hand and pull up on the tube to raise it several centimeters from the bottom of the vial. This will ensure that enough of the tubing extends outside the bag.

f. Return the twig structure with its food bundles and wool to the bag. Zip it shut.

Task 6: Complete the habitat



a. Open a large paper clip into a C hook.

b. Find the location at the top edge of the bag (above the zip) that allows the bag to hang level. Use a pushpin to poke a hole through the bag. Insert the paper-clip hook.

c. Hang the bag where your teacher has arranged to display the habitats.

d. Use a syringe to *slowly* fill the water fountain through the tube that extends outside the habitat bag.

Name ____________________________

Period ____ Date ________________

MILKWEED-BUG CHANGES

Date	Changes and observations

Name ___________________________

Period ____ Date _________________

MILKWEED-BUG CHANGES (Continued)

Date	Changes and observations

Name ____________________________

Period ____ Date ________________

ECOSYSTEM GLOSSARY

Name ______________________________

Period ____ Date __________________

ECOSYSTEM GLOSSARY (Continued)

ECOSYSTEM CARD-SORT RESULTS

Card	Individual	Population	Community	Ecosystem	Abiotic	Reason
Ants						
Brine Shrimp						
Butterflies, Bees, and Flowers						
California Gull						
Chickadees						
Chickens						
Clouds						
Deer						
Elodea and Guppies						
Fire						
Forest						
Fox						
Frogs						
Hawk						
Heat						
Hillside						
Lightning						
Mice						
Mushrooms						
Oak Trees						
Ocean						
Pond						
Poppies						
Prairie Dogs						
Rabbit						
Rabbits						
Rain						
Rocks						
Snails						
Snowflakes						
Sunlight						
Trees, Shrubs, and Grass						

Name ___________________________

Period ____ Date ________________

AMONG THE WILD CHIMPANZEES

1. How old was Jane Goodall when she began her research and what year was it? _______________
2. What were some of the tools and techniques she used to study the chimps? Give a few examples of the information she learned from using these tools.

3. How many generations of Flo's family did she observe in the video? Why is it important to study the same family group for so long?

4. How are observational studies of populations different from experimental studies? What is learned from these different kinds of population studies?

5. What were four important findings from this long-term study of the chimps in Gombe? Why was the work of Jane Goodall so significant?

6. Discuss some of the biotic and abiotic factors in the chimps' ecosystem that affect their behavior.

7. Define and provide at least one example of an individual, population, community, and ecosystem in Jane Goodall's chimpanzee study. (Use the back of this page.)

Name ____________________________

Period ____ Date ________________

MINIECOSYSTEM NEEDS

Part 1: After your group has studied the organisms on pages 64 to 68 in the resources book, list the organisms that belong in each ecosystem.

Aquatic ecosystem	Terrestrial ecosystem
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________

Part 2: Based on the information from the resources book and other readings, make a list of the abiotic factors in the environments of the organisms in each ecosystem.

Aquatic ecosystem	Terrestrial ecosystem
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________

Name ____________________________

Period ____ Date ________________

AQUATIC ORGANISM OBSERVATIONS

Date of initial observation ______________________________

Type of organism	Drawing and measurements	Potential food source	Potential predator

Describe evidence that a population is changing.

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Name ___________________________

Period ____ Date ________________

TERRESTRIAL ORGANISM OBSERVATIONS

Date of initial observation ____________________________________

Type of organism	Drawing and measurements	Potential food source	Potential predator

Describe evidence that a population is changing.

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Name ______________________

Period ____ Date ______________

THINKING ABOUT MONO LAKE

1. What one abiotic factor is the most important in the Mono Lake ecosystem? Why?

2. What two or three organisms are most important in the Mono Lake ecosystem?

3. What is the major issue concerning the well-being of the Mono Lake ecosystem?

4. Identify two biotic interactions that take place in the Mono Lake ecosystem.

5. Identify two examples of organisms interacting with abiotic factors in the Mono Lake ecosystem.

Name ______________________

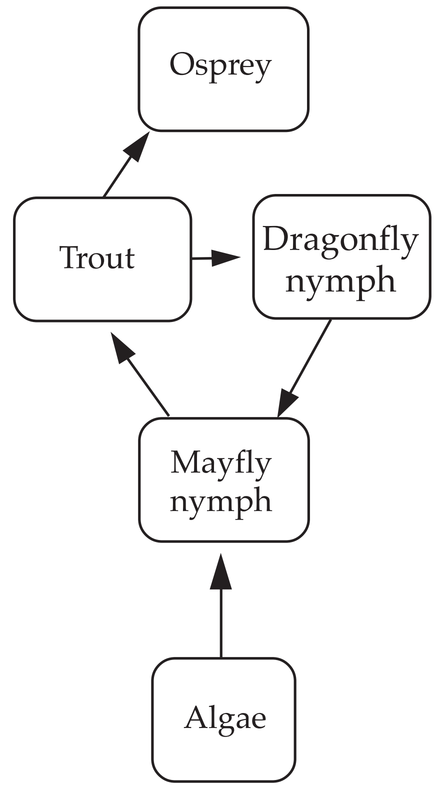
Period ____ Date ______________

RESPONSE SHEET: MONO LAKE

Susan and Marco went to the science museum and saw an exhibit about trout. They learned that trout eat mayfly nymphs and dragonfly nymphs. They thought it was interesting that the dragonfly nymphs also eat the mayfly nymphs. The mayflies feed on algae growing on rocks in rivers. Some of the trout are caught by ospreys that swoop down and pluck the trout out of the water with their talons.

Marco thought it would be fun to make a food web of the trout-stream ecosystem. When he showed it to Susan, she thought it needed a little more work.

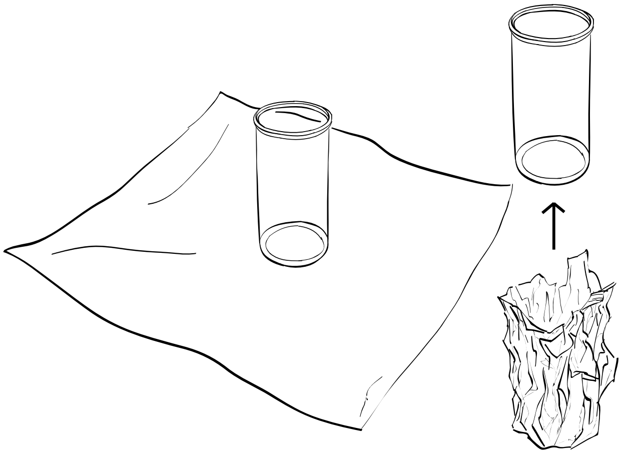
What corrections and additions do you think Susan suggested to Marco?



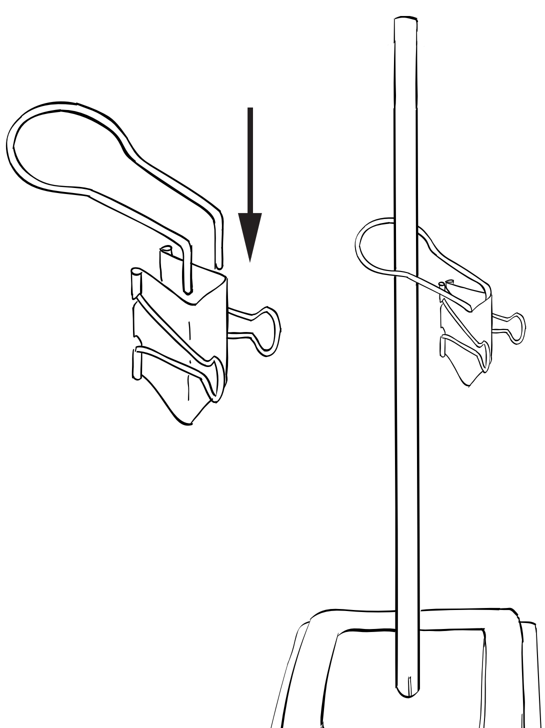
WATER-HEATING SETUP

Assemble this apparatus for measuring the energy in a cheese ball.

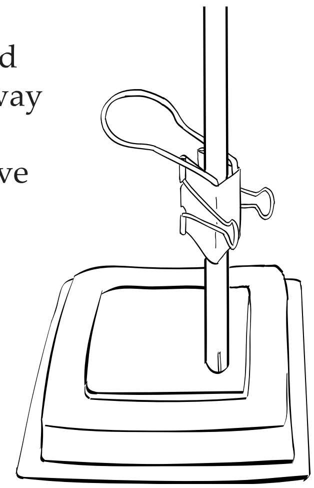
a. Form an aluminum cup by carefully molding the aluminum-foil square around a vial.



b. Squeeze the ring a bit and insert the downward tines into the binder clip. Slide the ring down over the dowel.

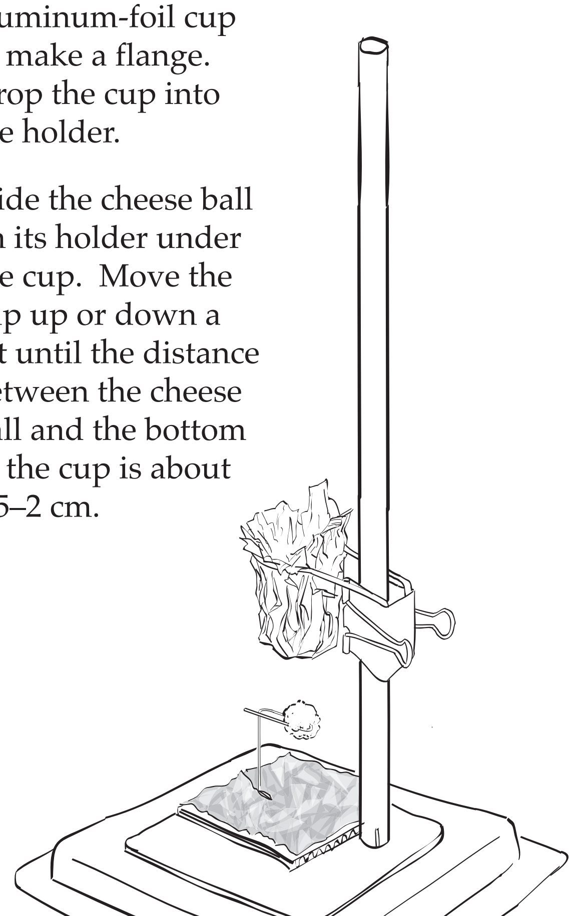


c. Open the clip and clamp it all the way onto the dowel about 10 cm above the base.



d. Spread the top of the aluminum-foil cup to make a flange. Drop the cup into the holder.

e. Slide the cheese ball on its holder under the cup. Move the clip up or down a bit until the distance between the cheese ball and the bottom of the cup is about 1.5–2 cm.



Name ______________________

Period ____ Date ______________

MEASURING FOOD ENERGY

The snack food we burned was ____

Fill in the data table.

Volume of water	
Final temperature	
Starting temperature	
Temperature change	

1. The unit used to measure heat energy is the **calorie.** One calorie (c) is the amount of heat needed to raise the temperature of 1 ml of water 1°C. Therefore, it would take 10 calories to raise the temperature of 1 ml of water 10°C. It would also take 10 calories to raise the temperature of 10 ml of water 1°C.

   Calculate the number of calories your sample of snack food produced when it burned.

2. If your suggested daily intake of calories is about 2000 calories a day, how many pieces of this snack food would you have to eat each day to meet your requirement?

3. Food calories are measured in **kilocalories** or **Calories.** A food Calorie is equal to 1000 calories. How many pieces of your snack food would you have to eat to get your suggested daily requirement of 2000 food Calories?

Name ____________________________

Period ____ Date ________________

FOOD-PRODUCERS EXPERIMENT

Purpose. To determine if there is an increase in the mass of plants when they produce food.

Experimental design

- Five-hundred grams of bean seeds were planted in each of six planting containers filled with clean, dry sand. One gram of dry fertilizer was added to the sand in each planter.
- The six planters were placed in six identical environment chambers where water, light, and air—oxygen (O_2), carbon dioxide (CO_2), and nitrogen (N_2)—could be controlled.
- After 3 weeks the seeds or plants were collected, dried, and weighed. The conditions and results of the experiment are recorded in the chart below.

	Conditions					Data		
	Water	**Light**	**O_2**	**CO_2**	**N_2**	**Starting mass**	**Ending mass**	**Mass change**
Environment A	Yes	Yes	Yes	Yes	Yes	500 g	551 g	
Environment B	Yes	Yes	Yes	Yes	No	500 g	552 g	
Environment C	Yes	Yes	Yes	No	Yes	500 g	500 g	
Environment D	Yes	Yes	No	Yes	Yes	500 g	549 g	
Environment E	Yes	No	Yes	Yes	Yes	500 g	500 g	
Environment F	No	Yes	Yes	Yes	Yes	500 g	500 g	

Results. Describe the role of the five environmental factors (water, light, etc.) on plant growth.

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Conclusions. What did you learn from the experiment about what plants need to produce food?

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Name ____________________

Period ____ Date ____________

MILKWEED-BUG REPRODUCTIVE POTENTIAL

Imagine that you have two milkweed bugs, one female and one male. There's plenty of food and everything else the bugs need to thrive. How big would the milkweed-bug population be after 2 months? After 4 months? After 6 months?

Here are some questions and answers about milkweed-bug natural history to help you calculate the population size.

Question	Answer
How long do milkweed bugs live?	4 months
How old is a female when she mates?	2 months
How many eggs does a typical female lay in a lifetime?	100
What is the ratio of males to females?	50/50

1. Guess the population size at the end of 1 year. ____________________

2. Calculate the population size after 2 months, 4 months...up to 1 year. Show your work on the facing page.

Population reduction	Parents (male and female)	Offspring (male and female)	Total population	Total elapsed time
	______ ♂ ______ ♀	______ ♂ ______ ♀		
	______ ♂ ______ ♀	______ ♂ ______ ♀		
	______ ♂ ______ ♀	______ ♂ ______ ♀		
	______ ♂ ______ ♀	______ ♂ ______ ♀		
	______ ♂ ______ ♀	______ ♂ ______ ♀		
	______ ♂ ______ ♀	______ ♂ ______ ♀		

Name ____________________________

Period _____ Date ________________

MILKWEED BUGS, LIMITED

The Milkweed Bugs, Limited simulation allows you to change five variables in order to find out how each one affects the size of a milkweed-bug population. The variables are

- Volume of space available to the population (400 to 1200 cubic centimeters)
- Percentage of females in any clutch of eggs (10 to 90%)
- Clutch frequency—age at which females reach reproductive maturity (2–3.9 months)
- Number of eggs per clutch (20 to 150)
- Survival rate of eggs (50 to 100%)

Work with the simulation to answer these questions.

1. Which variable has the largest effect on population size? What is your evidence?

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2. Which of the variables are biotic factors and which are abiotic factors?

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3. How does each variable act as a population limiting factor?

____

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____

____

4. Develop a question about milkweed-bug population growth and answer it using the model simulation. On the back of this page, write the question and what you found out.

MILKWEED-BUG HATCHING INVESTIGATION (1 of 2)

A class of high school biology students was asked to conduct some experiments to find out what variables affect the hatching of milkweed-bug eggs. They planned experiments that they thought would help them understand milkweed-bug egg hatching, gathered the data, and organized it for others to share. They did not have time to summarize the results of the experiments or draw conclusions from those results. Here is the first part of their report.

Title. Investigation into Three Variables That Might Affect Milkweed-Bug Egg Hatching

Purpose. All organisms have limits on their populations. One limit on the population of milkweed bugs might be egg hatching. We identified two ways the milkweed-bug population might be limited at the egg stage: the number of eggs that hatch and the length of time it takes eggs to hatch.

We decided to test three variables to see how they affect both the number of eggs that hatch and the length of time that elapses before eggs hatch. We tested three variables: temperature, humidity, and exposure to light.

Experimental design. A large colony of breeding milkweed bugs was available. One day before the experiments were scheduled to start, we put fresh pieces of polyester wool into the colony. The next day we had several thousand new eggs to use in our experiment. Three pieces of equipment were used to control the variables for the experiments.

1. A temperature-control device to maintain precise temperatures for extended periods of time.
2. A humidity-control device to maintain precise humidities for extended periods of time.
3. A light-control device to maintain precise exposure to light.

The standard hatching environment was established to be 25°C, 50% humidity, and 12 hours of light exposure each day.

One hundred milkweed-bug eggs were placed in each experimental setting. In the temperature experiments, humidity was maintained at 50% and light exposure controlled at 12 hours each day. Similarly, in the humidity experiment, temperature was maintained at 25°C and light exposure controlled at 12 hours each day. Every 5 days the eggs were observed, and the number of eggs that had hatched was recorded. Nymphs were removed to a supportive environment, and the unhatched eggs were returned to the experimental conditions. The experiments continued for 30 days.

MILKWEED-BUG HATCHING INVESTIGATION (2 of 2)

Data

Effect of Temperature on Milkweed-Bug Egg Hatching

Elapsed time in days →

Temperature (°C)	0 days	5 days	10 days	15 days	20 days	25 days	30 days
0°	0	0	0	0	0	0	0
5°	0	0	0	0	0	0	0
10°	0	0	0	10	23	26	28
20°	0	11	86	91	91	91	91
30°	0	36	94	95	95	95	95
40°	0	57	92	92	92	92	92
50°	0	0	0	0	0	0	0
60°	0	0	0	0	0	0	0

Effect of Humidity on Milkweed-Bug Egg Hatching

Elapsed time in days →

Humidity (%)	0 days	5 days	10 days	15 days	20 days	25 days	30 days
0%	0	26	80	96	96	96	96
25%	0	22	88	91	91	91	91
50%	0	28	90	95	95	95	95
75%	0	26	86	95	95	95	95
100%	0	21	87	96	96	96	96

Effect of Light Exposure on Milkweed-Bug Egg Hatching

Elapsed time in days →

Light (hours per day)	0 days	5 days	10 days	15 days	20 days	25 days	30 days
0	0	28	88	94	94	94	94
6	0	22	83	94	94	94	94
12	0	25	90	97	97	97	97
18	0	23	82	91	91	91	91
24	0	26	88	96	96	96	96

Name ______________________

Period ____ Date ______________

MILKWEED-BUG HATCHING ANALYSIS

Results. Summarize what you found out about the limiting effect of the three variables studied in the milkweed-bug hatching experiments.

Conclusions. Discuss the significance of the experimental results. What do the results suggest about ways that milkweed-bug populations are limited in nature?

ALGAE AND BRINE SHRIMP EXPERIMENTS (1 of 3)

Purpose. Lab experiments were set up to determine if the abiotic factors of light and temperature limit population growth of algae and brine shrimp.

Experimental design. Four populations of planktonic algae and four populations of brine shrimp were placed in the controlled environments described. Population sizes were measured once each month for a year.

Algae experiments—Four identical aquariums were set up. Each had the same amount of Mono Lake water, ample nutrients, including carbon dioxide, and a small starter population of algae.

Two aquariums were maintained at constant temperatures (one at low temperature and one at high temperature), and the light was varied.

Light 9–14 hours/day for these two aquariums

Temperature: 2°C

Temperature: 21°C

The other two aquariums were maintained with constant light (one 9 hours a day and one 14 hours a day), and temperature was varied.

Light 9 hours/day

Light 14 hours/day

Temperature varied from 2 to 21°C for these two aquariums

Brine shrimp experiments—Four identical aquariums were set up. Each had the same amount of Mono Lake water, ample food, and 1.0 g of brine shrimp eggs.

Two aquariums were maintained at constant temperatures (one at low temperature and one at high temperature), and the light was varied.

Light 9–14 hours/day for these two aquariums

Temperature: 2°C

Temperature: 21°C

The other two aquariums were maintained with constant light (one 9 hours a day and one 14 hours a day), and temperature was varied.

Light 9 hours/day

Light 14 hours/day

Temperature varied from 2 to 21°C for these two aquariums

ALGAE AND BRINE SHRIMP EXPERIMENTS (2 of 3)

Experimental procedure

The eight aquariums were set up as described and allowed to develop for 1 year.

The aquariums that received constant low light got 9 hours of light each day for a year. Nine hours of light represents the shortest days at Mono Lake. The high-light aquariums got 14 hours of light each day for a year.

The aquariums that received variable light got the amount of light each day that corresponds to the length of the day at Mono Lake—9 hours in January, gradually increasing to 14 hours in June and July, then declining back to 9 hours in December.

The aquariums maintained at a constant low temperature were at 2°C all the time for a year. Two degrees is the lowest temperature of Mono Lake in the winter. The high-temperature aquariums were maintained at 22°C throughout the year, Mono Lake's warmest.

The aquariums maintained at variable temperature started out cold (2°C) in January, warmed gradually to 22°C in July and August, and then cooled to 2°C by December.

Populations were sampled once at the end of every month. A 100-ml sample of algae water was removed and processed to see how much chlorophyll a was present. The amount of chlorophyll a, reported in micrograms per milliliter (µg/ml), is directly related to the size of the population.

Populations of brine shrimp were counted directly by placing a 5-ml sample of culture water under a microscope and counting all the shrimp of any size (larvae, juvenile, and adult). The result was converted to the number of brine shrimp per cubic meter (m^3) of water.

ALGAE AND BRINE SHRIMP EXPERIMENTS (3 of 3)

Results

Planktonic algae experiments

Algae population in micrograms of chlorophyll a per milliliter (μg/ml)

Conditions	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Light 9–14 hr./day; Temperature: 2°C	1	3	27	68	86	91	92	96	94	92	93	95
Light 9–14 hr./day; Temperature: 21°C	1	5	33	88	90	91	94	97	96	97	98	94
Light 9 hr./day; Temperature varied from 2 to 21°C	1	2	10	31	55	82	92	96	94	89	92	93
Light 14 hr./day; Temperature varied from 2 to 21°C	1	3	19	43	86	91	94	97	96	97	98	94

Brine shrimp experiments

Brine shrimp population in thousands of individuals per cubic meter

Conditions	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Light 9–14 hr./day; Temperature: 2°C	0	0	0	0	0	0	0	0	0	0	0	0
Light 9–14 hr./day; Temperature: 21°C	3	40	54	58	57	54	53	45	53	68	70	74
Light 9 hr./day; Temperature varied from 2 to 21°C	0	0	2	25	55	51	49	48	22	9	1	0
Light 14 hr./day; Temperature varied from 2 to 21°C	0	0	3	22	56	55	51	48	25	8	2	0

Name ______________________

Period ____ Date ______________

ALGAE AND BRINE SHRIMP EXPERIMENTS ANALYSIS

Conclusions

1. Based on the experimental results, what factors placed limits on the algae populations? What is your evidence?

2. Based on the experimental results, what factors placed limits on the brine shrimp populations? What is your evidence?

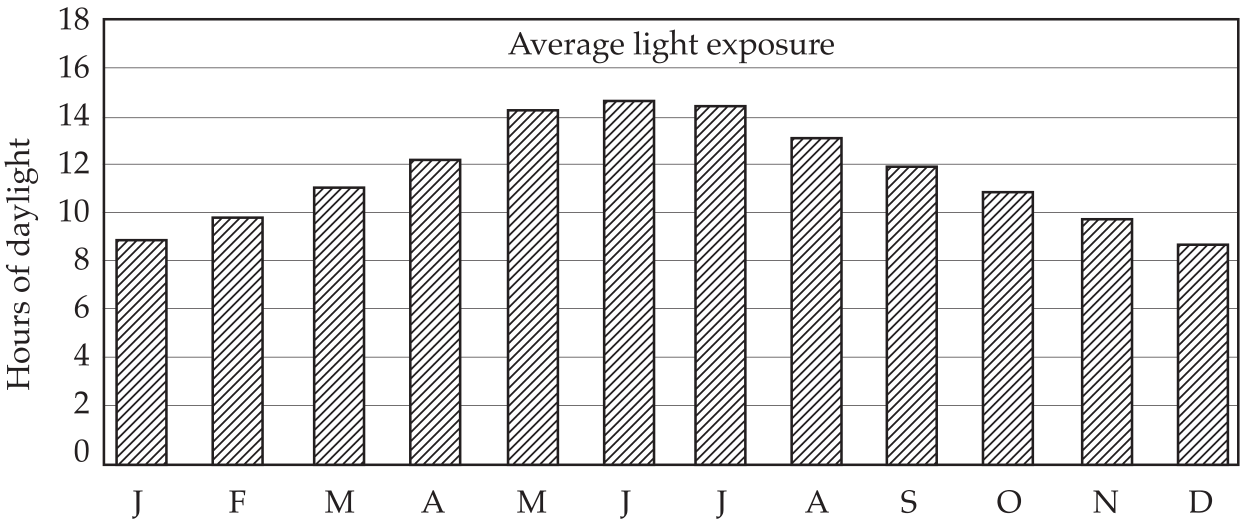
3. What additional abiotic and biotic factors might limit population size in Mono Lake?

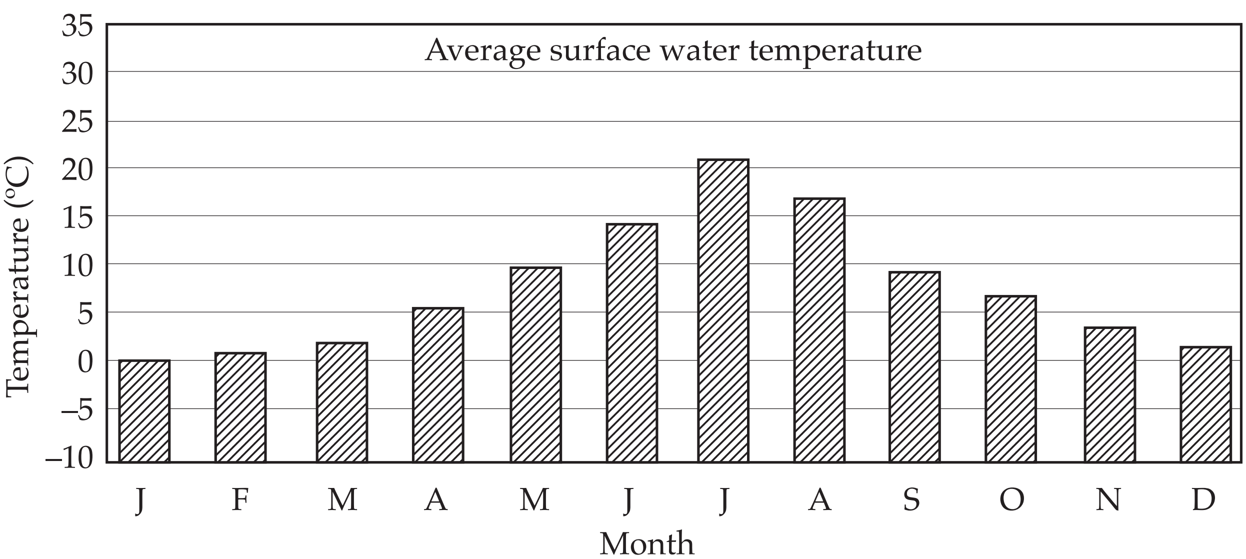
MONO LAKE DATA (1 of 3)

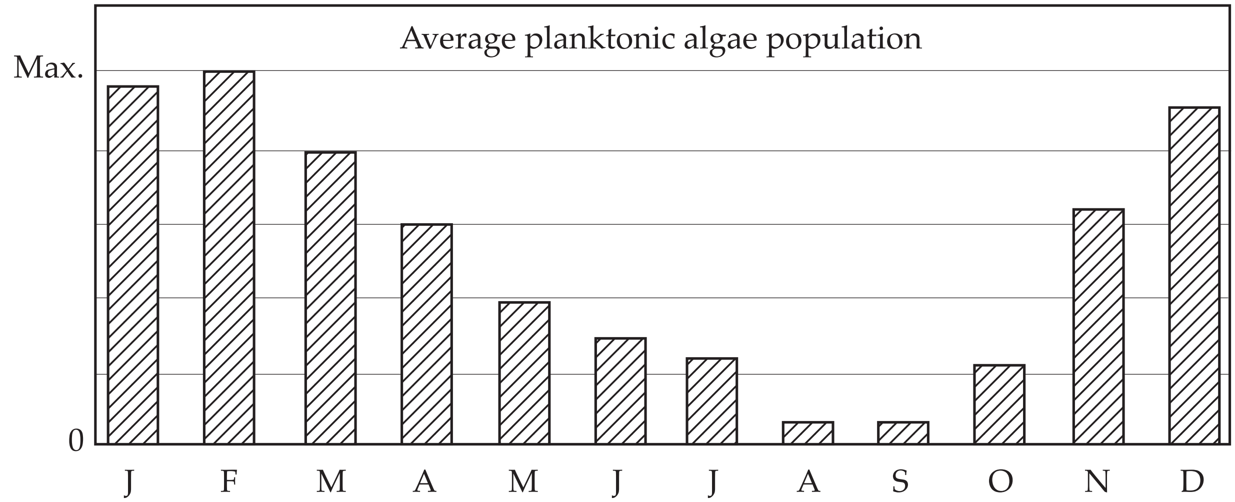
Because of its unique ecology, Mono Lake has been an interesting place for scientists to study. Good scientific study involves accurate data recording. A lot is known about the organisms that live in the lake and the abiotic conditions that affect the organisms in the ecosystem.

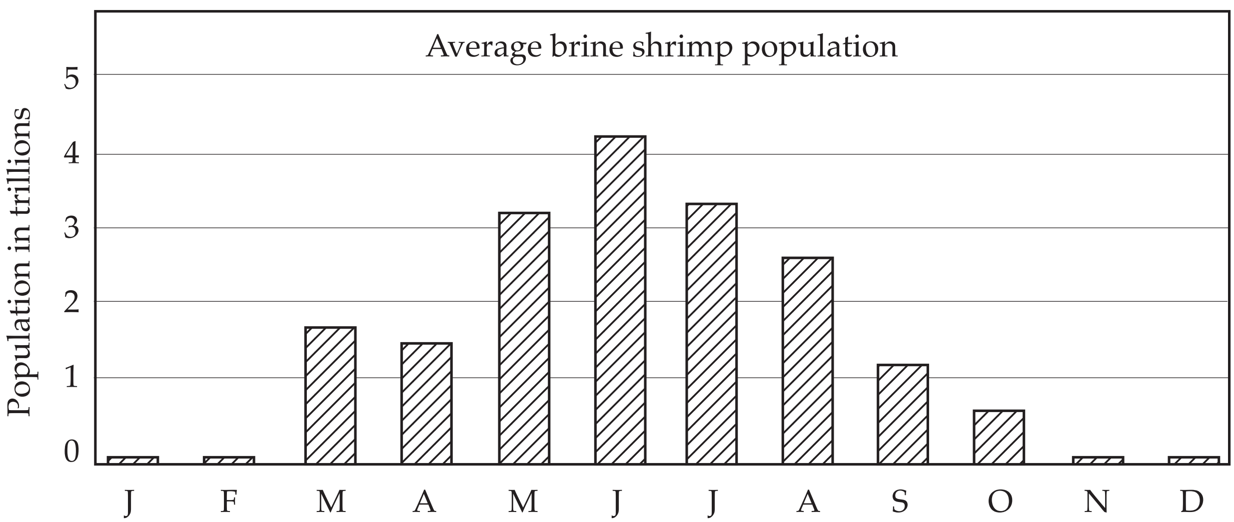
These three pages have graphs that show how some of the populations in the Mono Lake ecosystem vary over the course of a year and how the abiotic factors change over the course of a year.

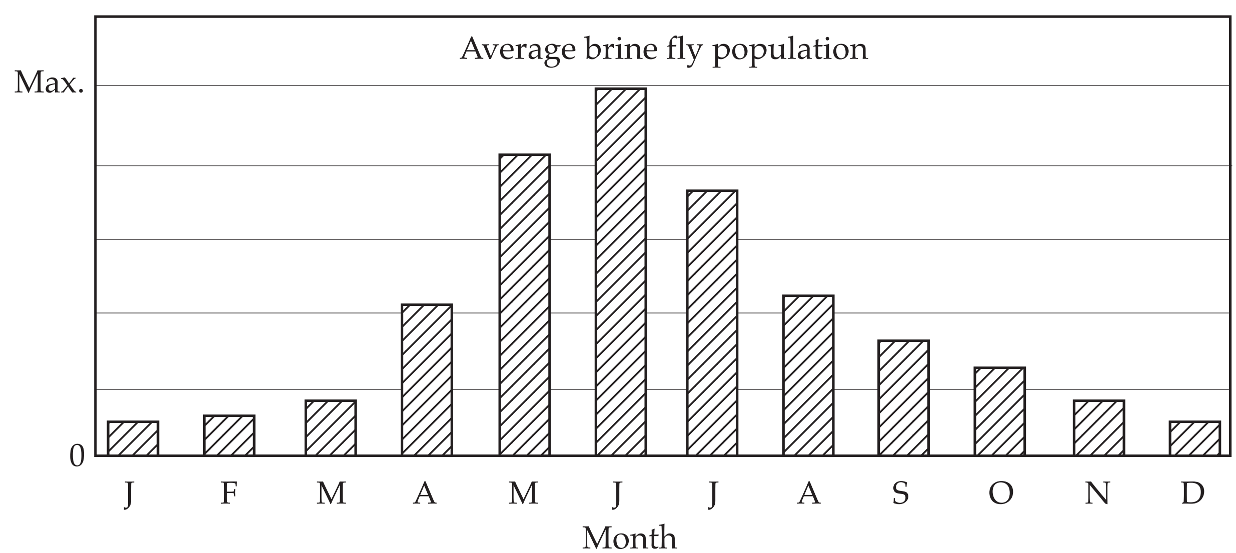
Study the graphs. Look for relationships between populations of different species and between organisms and abiotic factors in the ecosystem.



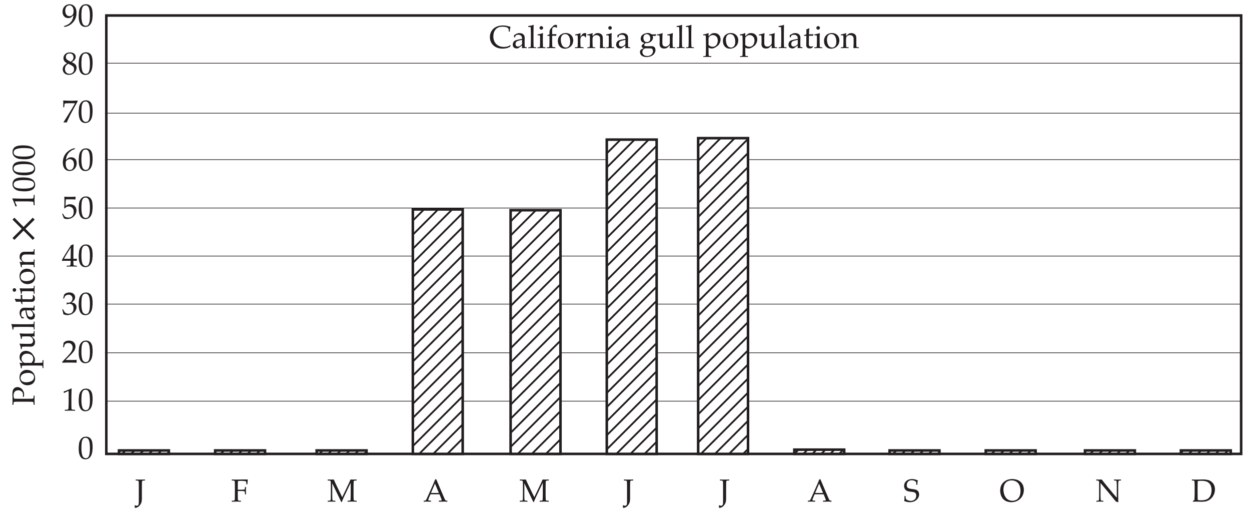


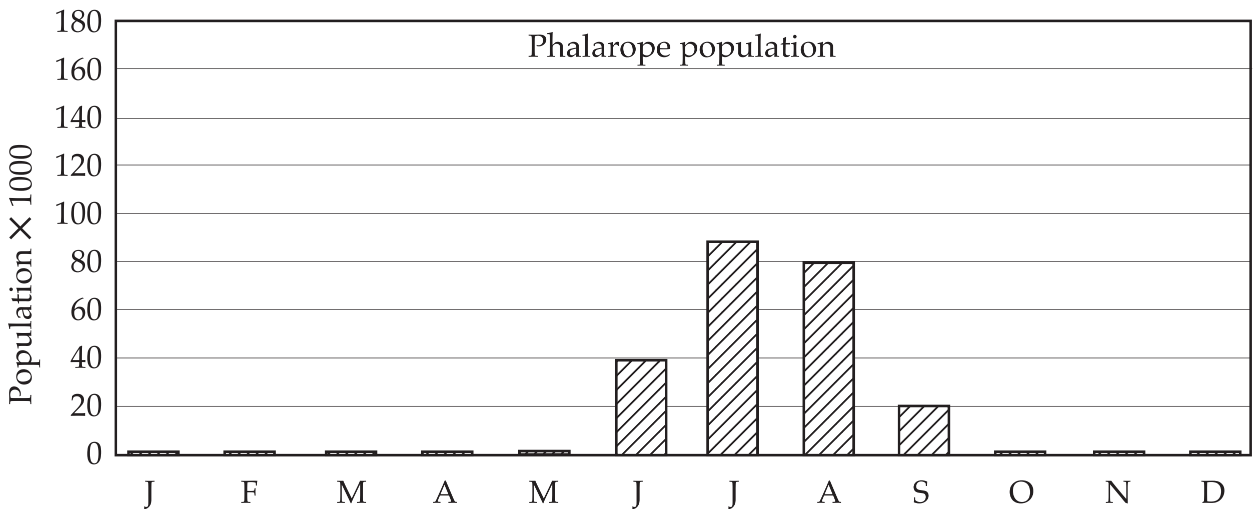

Average planktonic algae population
Max.
0
J F M A M J J A S O N D

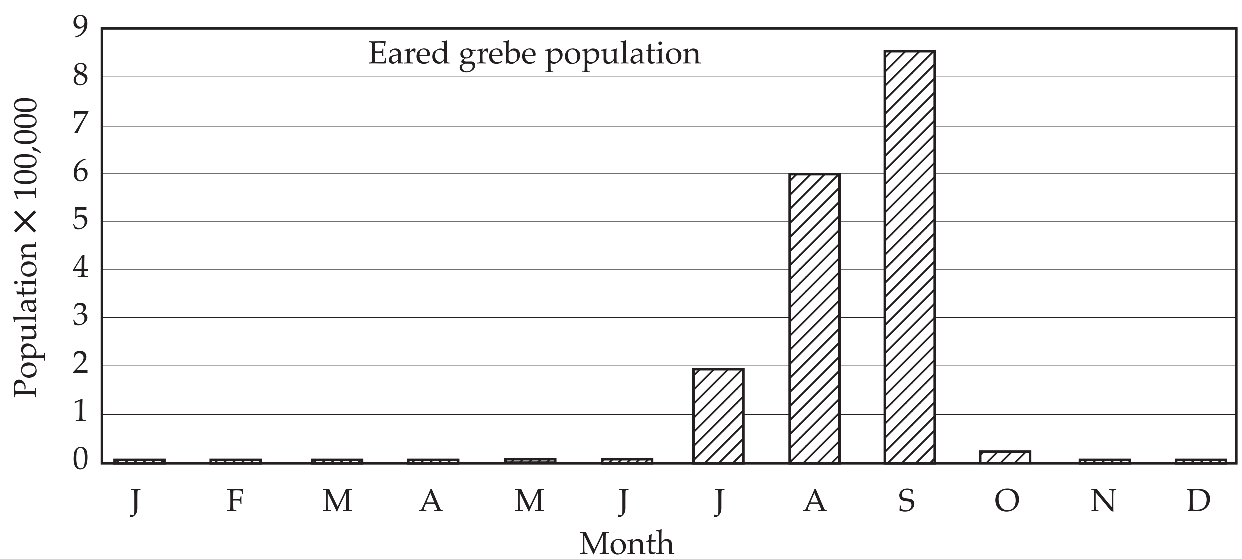

Average brine shrimp population
Population in trillions
5
4
3
2
1
0
J F M A M J J A S O N D


Average brine fly population
Max.
0
J F M A M J J A S O N D
Month

MONO LAKE DATA (3 of 3)







Name ____________________

Period ____ Date ____________

ANALYSIS OF MONO LAKE DATA

1. When does the planktonic algae population peak? When does the brine shrimp population peak? What explanation do you have for the timing of each peak?

2. What is the relationship between water temperature and the other organisms in the Mono Lake ecosystem?

3. Discuss the population graphs of the birds (gulls, phalaropes, and grebes).

4. What is the relationship between the birds and the other organisms?

5. What do you think is going on with the populations at Mono Lake in April?

ECOSCENARIO PROJECT GUIDELINES (1 of 3)

Research and Preparation. Working together as a group, look over the resources and figure out which ones will help you answer these questions.

- ☐ What kind of environment is this? Where is it?
  (Hint: look for information about rain or other precipitation, climate, sunlight, elevation, temperatures, latitude, freshwater or seawater, etc.)

- ☐ What are the main organisms that are important in this ecosystem?
  (Hint: look for information about the trophic levels, like primary producers or plants, what organisms eat the producers, what eats them, etc.)

- ☐ What are the main abiotic factors that affect this ecosystem?
  (Hint: look for information about changing water levels, temperature, light levels, salinity, pollution, etc.)

- ☐ What are the main ways that people affect this ecosystem?
  (Hint: look for information about building or construction, logging, diverting freshwater, hunting, or anything else humans do that affects nature.)

Be sure to take notes, highlight passages, and write down the source of the information and where you found it.

Food Web. With your group members, develop a food web of the most important organisms. This will help you develop your poster and your individual reports. Start by identifying the producers in your ecosystem. Next, determine what organisms are the primary consumers. Next, identify what eats these and so on.

- ☐ Include at least three producers and their consumers in your food web.
- ☐ Color-code them so that **producers are green** and **consumers are red.**
- ☐ Include at least 10 organisms, but no more than 15.
- ☐ Draw arrows to show which organisms eat which others.

Abiotic Factors. Make a list of the most important abiotic factors that affect this ecosystem. This will help you develop your poster and your individual reports.

- ☐ List the main abiotic factors in the ecosystem (no more than three).
- ☐ Identify the population(s) affected by the factor.
- ☐ Describe the factor's effect on the ecosystem.

ECOSCENARIO PROJECT GUIDELINES (2 of 3)

Human Impact. Make a list of the most important human effects on this ecosystem. Add these to the food web. Color-code these in **black.**

☐ Describe the human impacts (no more than two).

☐ Identify the population(s) affected by humans.

☐ Describe the effect on the ecosystem.

Poster. After you have done your research for your individual reports, work with your group members to develop a poster to present to the rest of the class. Your poster will help you tell the story of your ecosystem to the rest of the class.

Pick one population that you think will be the best to help other people understand your ecosystem. Work together to figure out how to share the story of your ecosystem with the rest of the class. Include diagrams, pictures, drawings, graphs, or other ways to make the information easy to understand.

Posters should include

☐ Title and description

- Briefly describe the ecosystem.
- Tell or show where the ecosystem is.
- Mention similar ecosystems in other places on Earth.

☐ Food web

- Diagram organisms in trophic levels: producers, consumers, and so forth.
- Include 10–15 organisms in the food web.
- Draw arrows to show energy flow in the ecosystem.

☐ Abiotic factors

- Identify two or three abiotic factors that define your ecosystem.
- Describe how these abiotic factors influence the ecosystem.

☐ Human impact

- Identify an issue arising from human impact in your ecosystem.
- Describe the effect of humans on the populations in your ecosystem.
- Discuss possible actions that could be taken to reduce the impact.

ECOSCENARIO PROJECT GUIDELINES (3 of 3)

Presentation. In your presentation, include information about one important population in this ecosystem.

☐ Cover its role in the ecosystem.

☐ Describe the effect of abiotic factors on the population.

☐ Describe the effect of humans on the population.

As you tell the story of your ecosystem, use the food web on your poster, plus any other diagrams or visual aids that you think will help other students understand.

Individual Report. After you have completed your food web (including trophic levels, abiotic factors, and human impact) with your group, decide as a group which population each person will study for individual reports. **Each group must have individual reports for a producer, a primary consumer, and a secondary consumer.**

Individual reports will include

☐ A description of one key population's role in the ecosystem, including where it lives, what it eats, what eats it, and any other interactions or important behaviors.

☐ A discussion of the population's abiotic needs and interactions.

☐ An example of human impact on the population.

Include diagrams, pictures, drawings, graphs, or other ways to make the information easy to understand. Each individual report should be about three pages long, but it may be shorter or longer, depending on what you need to say.

Grading. Grades will be based on group work and individual work.

The group grade considers
- Poster
- Report
- Group assessment

The individual grade considers
- Group participation
- Individual report
- Self-assessment

Name ______________________

Period ____ Date ______________

ECOSCENARIO PRESENTATION NOTES

Ecosystem ______________________ Abiotic issues ______________________ ______________________ ______________________ Trophic issues ______________________ ______________________ ______________________ Human issues ______________________ ______________________ ______________________ Comments ______________________ ______________________ ______________________ ______________________	Ecosystem ______________________ Abiotic issues ______________________ ______________________ ______________________ Trophic issues ______________________ ______________________ ______________________ Human issues ______________________ ______________________ ______________________ Comments ______________________ ______________________ ______________________ ______________________
Ecosystem ______________________ Abiotic issues ______________________ ______________________ ______________________ Trophic issues ______________________ ______________________ ______________________ Human issues ______________________ ______________________ ______________________ Comments ______________________ ______________________ ______________________ ______________________	Ecosystem ______________________ Abiotic issues ______________________ ______________________ ______________________ Trophic issues ______________________ ______________________ ______________________ Human issues ______________________ ______________________ ______________________ Comments ______________________ ______________________ ______________________ ______________________

Name ____________________

Period ____ Date ____________

ECOSCENARIO PRESENTATION NOTES (Continued)

Ecosystem ____________ Abiotic issues ____________ ____________ ____________ Trophic issues ____________ ____________ ____________ Human issues ____________ ____________ ____________ Comments ____________ ____________ ____________ ____________	Ecosystem ____________ Abiotic issues ____________ ____________ ____________ Trophic issues ____________ ____________ ____________ Human issues ____________ ____________ ____________ Comments ____________ ____________ ____________ ____________
Ecosystem ____________ Abiotic issues ____________ ____________ ____________ Trophic issues ____________ ____________ ____________ Human issues ____________ ____________ ____________ Comments ____________ ____________ ____________ ____________	Ecosystem ____________ Abiotic issues ____________ ____________ ____________ Trophic issues ____________ ____________ ____________ Human issues ____________ ____________ ____________ Comments ____________ ____________ ____________ ____________

Name ______________________

Period ____ Date ______________

STRANGERS IN PARADISE

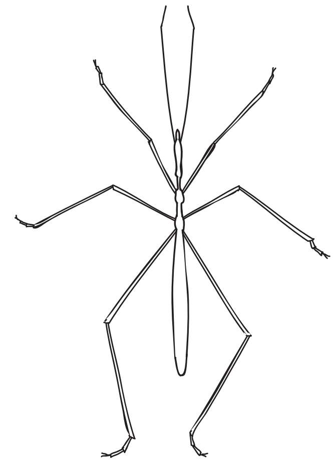
Organism	Adaptation	Survival advantage
Monk seal		
‘Akiapola‘au bird		
Carnivorous caterpillar		
Banana poka		
Wild pig		
Frigate bird		
Green sea turtle		
Rat		

Name ____________________________

Period ____ Date ________________

WALKINGSTICK PREDATION: BUSH ENVIRONMENT

You are a predator. You prey on walkingsticks. This is what the walkingstick looks like.



a. Open the walkingstick multimedia program to Level 1—Eat Insects.

b. Select the 30 Clicks to Eat Insects button.

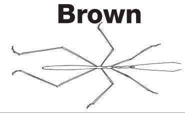
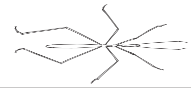
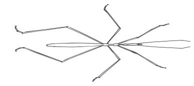
c. Use your 30 clicks to eat as many walkingsticks as you can.

d. Then click the Results button.

e. Record your results in the table below.

f. Click Start Over and select 30 Seconds to Eat Insects. Eat as many insects as you can in 30 seconds.

g. Record your results in the table below.

		Brown 	Green-brown 	Green 
30 clicks	Eaten			
	Survived			
30 seconds	Eaten			
	Survived			

Write responses to these items on the blank page facing this one.

1. Which color of walkingstick was easiest to find? Which was hardest? Why do you think that was the case?
2. Which color of walkingstick survived best when there was a time limit on feeding? Why do you think that color survived best?
3. Discuss the results of the walkingstick predation in terms of adaptations.

Name ____________________________

Period ____ Date ________________

FIVE GENERATIONS OF WALKINGSTICKS

Population 1

Five generations of walkingsticks living in the bush environment

	Brown			Green-brown			Green		
	Initial	Eaten	Survived	Initial	Eaten	Survived	Initial	Eaten	Survived
Generation 1	16			16			16		
Generation 2									
Generation 3									
Generation 4									
Generation 5									

Population 2

Select a new environment (wood chips or bamboo), and find out what happens to the population after five generations.

Five generations of walkingsticks living in the ____________________ environment

	Brown			Green-brown			Green		
	Initial	Eaten	Survived	Initial	Eaten	Survived	Initial	Eaten	Survived
Generation 1	16			16			16		
Generation 2									
Generation 3									
Generation 4									
Generation 5									

Graph results

Make bar graphs to show the number of surviving walkingsticks of each color over a period of five generations. Graph the walkingsticks in the bush environment in the upper graph. Graph the walkingsticks in the wood-chip or bamboo environment in the lower graph.

Use colored pencils or pens to represent each color of walkingstick. Identify your color code here.

☐ **= Brown walkingsticks**

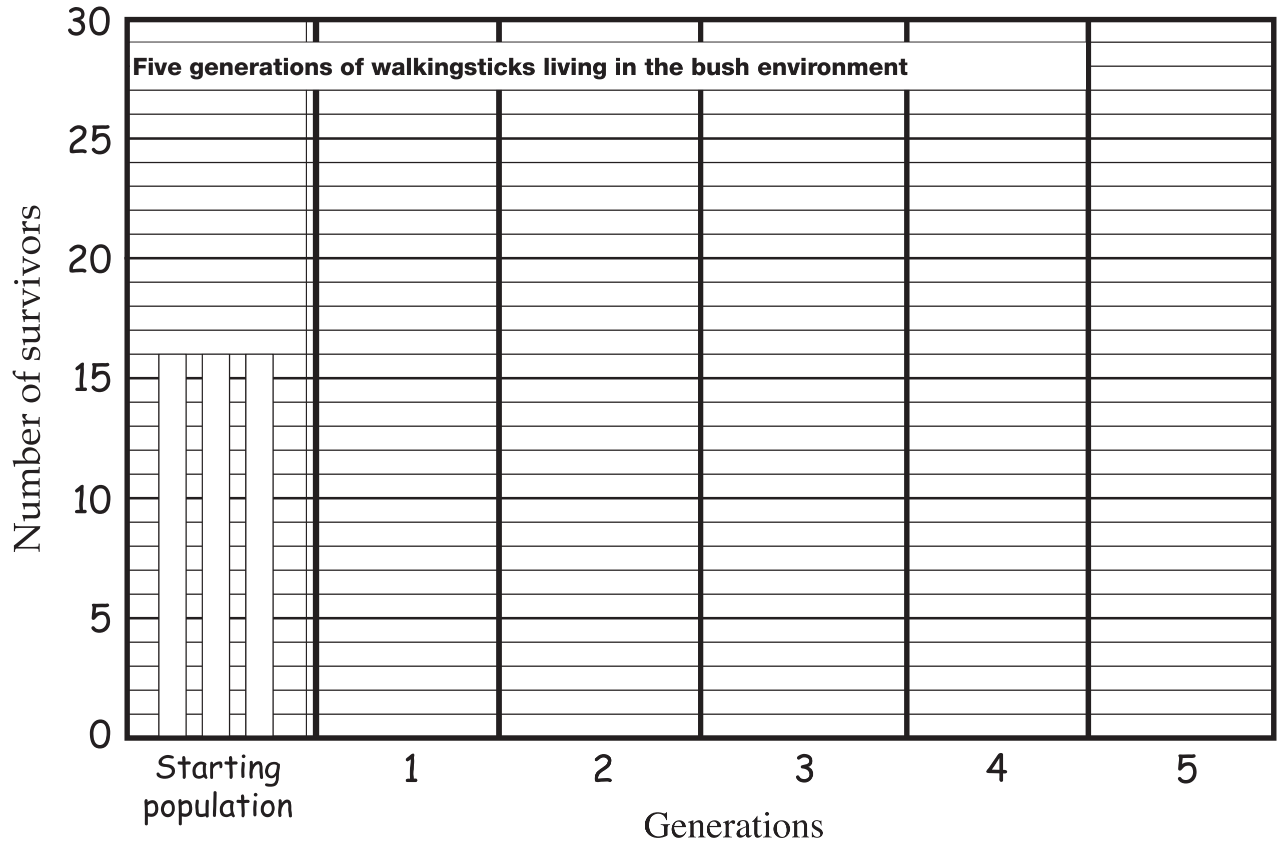
☐ **= Green-brown walkingsticks**

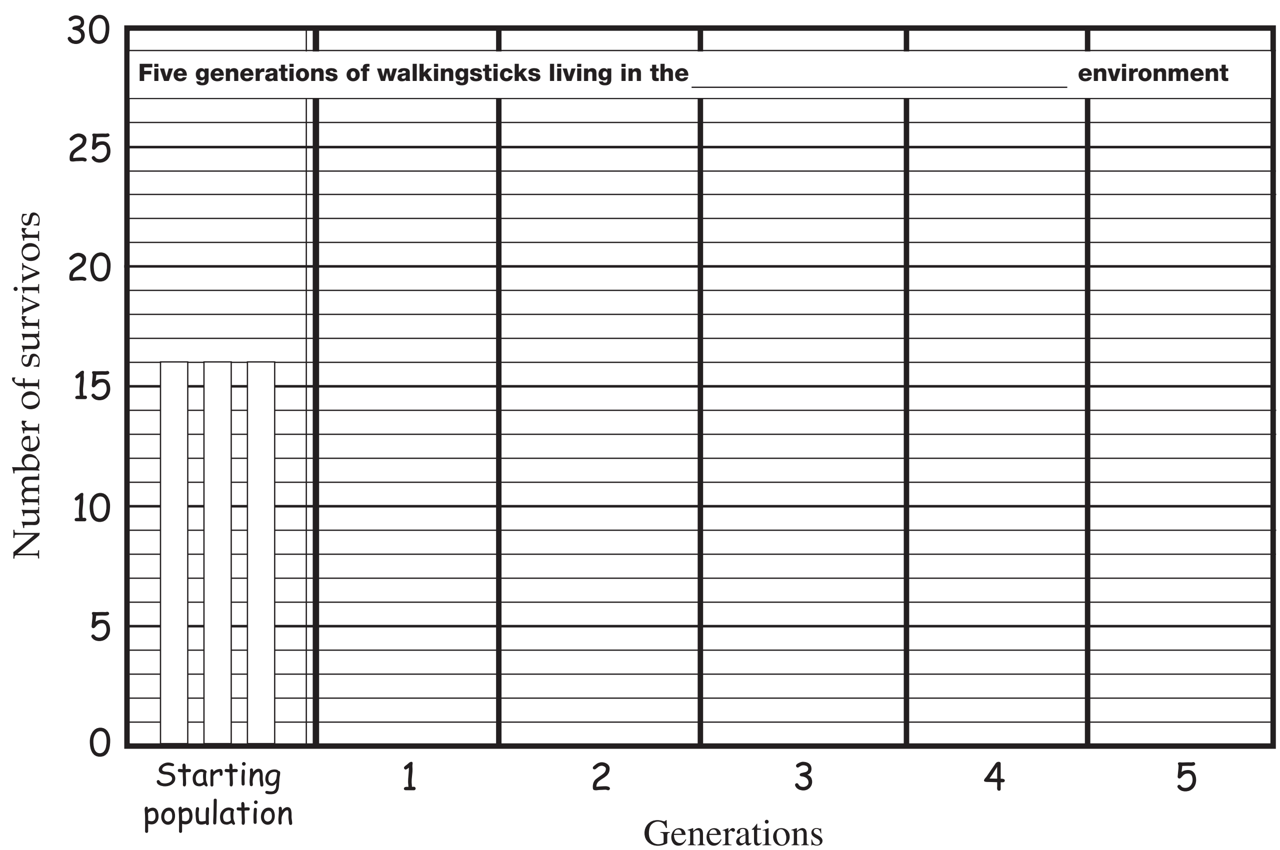
☐ **= Green walkingsticks**

Name ____________________________

Period ____ Date ________________

WALKINGSTICK POPULATION GRAPHS





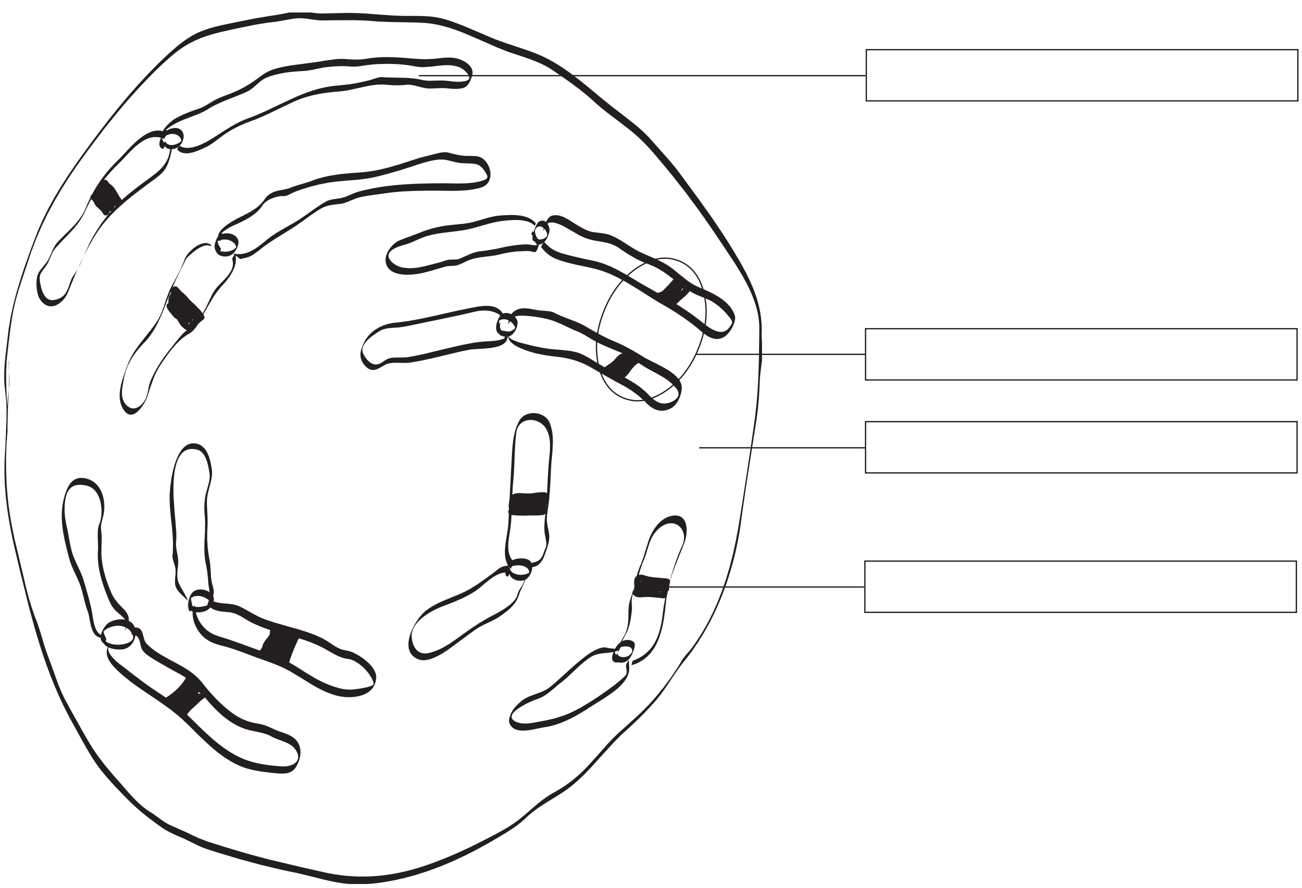
Name ______________________

Period ____ Date______________

GENETICS VOCABULARY

The offspring of organisms often grow up to look like one or both of their parents. This is because offspring inherit information from their parents that directs their development.

The inherited information is located in the __________ of every cell in the organism. The information is coded in the huge ______ molecule. The huge molecules are coiled into compact hot dog–shaped structures called ___________. _______________ are always present in almost identical pairs. Locations on chromosomes that affect features of organisms are called _______________. A gene is composed of ____________________. An organism's unique combination of genes is its ______________. The traits produced by an organism's genes is its _____________. Alleles that have more influence in determining traits are __________ alleles. Alleles that have less influence in determining traits are _________________ alleles.



LARKEY BREEDING RECORD