



Activity #3

# Summer Every Day and Winter Every Night?

## ● ● ● In Advance *Student Assignment*

- Assign the Student Page “Is it REALLY Summer Every Day and Winter Every Night?” (pp. 30-31) as homework. (See Class Period One Materials and Setup for details.)

## ● ● ● Class Period One *Optional Class Discussion*

### Materials & Setup \_\_\_\_\_

*For each student*

- Student Page “Is It Really Summer Every Day and Winter Every Night?” (pp. 30-31)
- This homework assignment involves downloading information from the Internet. If you would prefer providing the tables and graphs rather than requiring students to download them, do this ahead of time and make one copy per student.

### Instructions \_\_\_\_\_

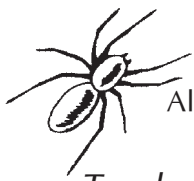
- 1) Discuss student responses to the questions on the student page. Ask students to speculate about how plants and animals might be adapted for living in an environment marked by such dramatic daytime and nighttime temperature differences.

### Journal Ideas \_\_\_\_\_

- Write a one-page entry that describes what you think environmental conditions are like in the alpine/aeolian ecosystem, based on what you have learned so far.
- Have you been to the summit of Haleakalā or another extreme climate? What was it like there? How do people protect themselves against the extremes?
- Imagine what it would be like to be a plant or animal in the alpine/aeolian zone. One researcher said it would be like standing out in a cinder field all day long with no hat and no sunscreen. Then night falls and you have no jacket, but you can’t move. What kinds of analogies would you come up with? Write or draw or make up a chant or a song about living in the alpine/aeolian zone.

### Assessment Tools \_\_\_\_\_

- Class participation
- Student Page “Is It Really Summer Every Day and Winter Every Night?” (teacher version, pp. 28-29)
- Journal entries



Teacher Version

## Is It REALLY Summer Every Day and Winter Every Night?

The high mountains of Hawai‘i have what is called a tropical alpine environment. High mountains in other countries within the tropics, such as Peru, New Guinea, and Venezuela, have some things in common with the Hawaiian Islands. One of the interesting similarities is there is a greater temperature change between day and night than there is between summer and winter. This means that the plants and animals living here are adapted to extreme daily fluctuations.

This feature led one scientist to say that in these environments, it is “summer every day and winter every night.” But you shouldn’t take his word for it. See for yourself!

### Instructions

Find out if day-night temperature differences really are greater than summer-winter temperature differences on the upper slopes of Haleakalā.

- 1) Download your data from the Western Regional Climate Center at <<http://www.wrcc.dri.edu/>>.
  - Select “Western U.S. Climate Historical Summaries.” Scroll down to the colored map and select Hawai‘i.
  - Select “Haleakalā Ranger Station.”
  - Click on the table on the right side, “Period of Record Monthly Climate Summary” and print it.
  - Scroll down the left side, find “Period of Record General Climate Summary Tables” and select “Temperature.” Click on the table and print it.
  - To see the extreme temperatures in chart form, select “Daily Extremes and Averages.” Click on the graph and print it.
- 2) Using the Monthly Climate Summary, find the annual average maximum and minimum temperatures on the far right side of the page. Circle those numbers on the table.

What is the difference between these temperatures? 18.1° F

*This gives you the difference between the average day and night temperatures.*

- 3) Using the same table, look at “Average Max. Temperature” and find the highest and lowest numbers. Circle those numbers on the table.

In which month is the highest average maximum temperature? August

In which month is the lowest average maximum temperature? February

What is the difference between these two numbers? 14.7° F

*This gives you the difference in the daytime temperatures between winter and summer.*



- 4) Do you think it is fair to say that at the upper elevations of Haleakalā, it is “summer every day and winter every night”? Why or why not?

Taking an overall view based on the above information, the answer would be “yes.” The day-night temperature differences are greater than the summer-winter differences. Students may, however, look for additional sources of information to analyze such as diurnal cycles of temperature during different months to come up with a more in-depth answer.

- 5) The climate summary information you are using from the Internet is based on readings from a station at approximately 2134 meters (7000 feet). How would you expect day-night temperature differences in the summit area (where the alpine/aeolian zone is located) to compare to temperatures from a lower elevation? Explain your answer.

Well-reasoned answers are acceptable. Answers are likely to predict greater temperature variations because of increased solar radiation intensity during the day and higher elevations causing lower night time temperatures.

- 6) Using the General Climate Summary table, look under the column “Daily Extremes.” Here you can see the hottest and coldest temperatures that have occurred at the Haleakala Ranger Station over the last 50 years.

Now look at the graph “Daily Temperature Averages and Extremes” for a picture of how much the extreme temperatures differ from the averages. Explain how considering the extreme temperatures rather than simply average temperatures helps one understand the severe climate that the plants and animals of the alpine/aeolian region have to live in.

Answers should take into account the fact that temperatures generally vary much more than the averages suggest. The difference between the average minimum and maximum temperatures tends to be around 20° F. The difference between the extreme minimum and maximum temperatures tends to be around 35° F.

- 7) How do you think plants and animals are adapted to living in an environment marked by dramatic fluctuations between daytime and nighttime temperatures? Explain.

Well-reasoned answers are acceptable.



# Is It REALLY Summer Every Day and Winter Every Night?

The high mountains of Hawai‘i have what is called a “tropical alpine environment.” High mountains in other countries within the tropics, such as Peru, New Guinea, and Venezuela have some things in common with the Hawaiian Islands. One of the interesting similarities is there is a greater temperature change between day and night than there is between summer and winter. This means that the plants and animals living here are adapted to extreme daily fluctuations.

This feature led one scientist to say that in these environments, it is “summer every day and winter every night.” But you shouldn’t take his word for it. See for yourself!

## Instructions

Find out if day-night temperature differences really are greater than summer-winter temperature differences on the upper slopes of Haleakalā.

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  - To see the extreme temperatures in chart form, select “Daily Extremes and Averages.” Click on the graph and print it.
- 2) Using the Monthly Climate Summary, find the annual average maximum and minimum temperatures on the far right side of the page. Circle those numbers on the table.

What is the difference between these temperatures? \_\_\_\_\_

*This gives you the difference between the average day and night temperatures.*

- 3) Using the same table, look at “Average Max. Temperature” and find the highest and lowest numbers. Circle those numbers on the table.

In which month is the highest average maximum temperature? \_\_\_\_\_

In which month is the lowest average maximum temperature? \_\_\_\_\_

What is the difference between these two numbers? \_\_\_\_\_

*This gives you the difference in the daytime temperatures between winter and summer.*



- 4) Do you think it is fair to say that, at the upper elevations of Haleakalā, it is “summer every day and winter every night”? Why or why not?
  
- 5) The climate summary information you are using from the Internet is based on readings from a station at approximately 2134 meters (7000 feet) at the lower edge of the alpine/aeolian zone. How would you expect day-night temperature differences in the summit area (the upper reaches of the alpine/aeolian zone) to compare to temperatures from the lower elevation? Explain your answer.
  
- 6) Using the General Climate Summary table look under the column “Daily Extremes.” Here you can see the hottest and coldest temperatures that have occurred at the Haleakala Ranger Station over the last 50 years.

Now look at the graph “Daily Temperature Averages and Extremes” for a picture of how much the extreme temperatures differ from the averages. Explain how considering the extreme temperatures rather than simply average temperatures helps one understand the severe climate that the plants and animals of the alpine/aeolian region have to live in.

- 7) How do you think plants and animals are adapted to living in an environment marked by dramatic fluctuations between daytime and nighttime temperatures? Explain.