Glossary

accumulate (ə **kyü** m(y)e lāt): To increase gradually in amount as time passes.

aquatic (ə **kwä** tik): (1) Living or found in, on, or near water; (2) of or relating to the animals or plants that live in, on, or near water.

emerge (i **mərj**): To become known or visible.

fry (**frī**): Recently hatched or juvenile fishes.

habitat (**ha** bə tat): The place or environment where a plant or animal naturally or normally lives and grows.

land use (**land yüs**): How people are using the land.

mean (**mēn**): The average of a set of values.

migratory (**mī** grə **tȯr** ē): Having a characteristic of moving from one place to another on a periodic basis.

regulate (**re** gyə lāt): To set or adjust the amount, degree, or rate of something.

sample (**sam** pəl): A small subset group, representative of the entire group.

sediment (**se** də mənt): Soil particles carried along in streams and rivers, some of which may settle to the bottom.

simulate (**sim** yə lāt): To create the appearance or effect of something for purposes of evaluation.

tributary (**tri** byə ter ē): A stream that flows into a larger stream or river or into a lake.

variable (**ver** ē ə bəl): Subject to changes.

variability (ver ē ə **bi**-lə tē): The degree to which something is variable.

variation (ver ē **ā** shən): A change in the form, position, condition, or amount of something.

watershed (**wä** tər **shed**): The area that drains to a common waterway, such as a stream, lake, estuary, wetland, aquifer, or even the ocean.

Accented syllables are in **bold**. Marks and definitions are from http://www.merriam-webster.com. Definitions are limited to the word's meaning in the article.

The definition of watershed is taken directly from the U.S. Environmental Protection Agency (http://www.epa.gov).

FACTivity

Time Needed

- One class period for graphing data or 3 to 4 weeks for downloading and graphing data
- 3 to 4 weeks for observation involving 5 to 10 minutes per day
- One class period for analysis, reporting, and discussion

Materials (for each small group)

- Observational tools appropriate for the event, such as binoculars or butterfly nets
- Graph paper and pencil
- Copy of the log sheet on page 103
- Daily access to a computer with Internet access (optional) or your teacher will provide daily data (from a Web site)

The question you will answer in this FACTivity is: How do air temperature patterns relate to a yearly natural event?

Your teacher will divide your class into groups. Your group will select an event to study. Identify a natural event that is at least partly dependent upon the air temperature for its occurrence. Your group may select an event from the following list, or identify a yearly natural event of your own:

1. The emergence of a particular species of leaves.
2. The emergence of a particular species of flowers.
3. The first sighting of butterflies.
4. The first sighting of a particular **migratory** bird species.
5. The first occurrence of the developmental stage of an amphibian species.
6. The first leaf color change in the fall.
7. The first frost.
8. The first snowfall.

Identify a yearly natural event that you expect to occur in your area within the next 3 to 4 weeks.

As a group, write down exactly what you will be looking for in the event. For example, you might write: "We are looking for the first sign of autumn color change in the maple tree in the front school yard, beside the front stairs. Color change means any change on any part of a leaf on that tree, from green to red, yellow, orange, or brown."

After you have identified and described your event, look at the science log sheet on page 103. Your group will need three to four copies of the log sheet.

You will either access http://www.weather.noaa.gov every day to record hourly temperatures, or your teacher will provide this information to you.

As an alternative, you may record your own hourly temperatures using an outdoor thermometer. If you choose this method, you may have to fill in nighttime temperatures and weekend temperatures from http://www.weather.noaa.gov.

Observe daily, watching for your event to happen. When your event happens, record the date. At this point, you may stop recording the hourly temperature.

Using your completed log sheet, calculate the average daytime temperature and average nighttime temperature for each week. For this FACTivity, daytime temperatures include those from 9:00 a.m. until 8:00 p.m. Nighttime temperatures include those from 9:00 p.m. until 8:00 a.m.

Make a graph of the two daily temperature averages across the weeks leading up to your event. (See **figure 16** for an example.) You may need to make three or four graphs, one for each week. Blank graph paper is located on page 123.

Your group will analyze your graphs as you think about your event. What patterns do you see in the air temperature in the weeks and days leading up to your event? How could these patterns affect the timing of your event? Write your observations and analysis, using complete sentences. Report your results to the class. Your teacher will hold a class discussion about the patterns you noticed in your data. Compare and contrast between different events.

To find hourly temperatures, visit http://weather.noaa.gov. Select your State and then select your location. Select the location that is nearest to you.

This Web site displays hourly weather data for the past 3 days. Record the hourly temperatures using the log sheet. On Monday, record air temperature from over the weekend.

Project BudBurst™
Timing is everything!

Plants are all around us. Changes in emergence of plants each year can tell scientists about changes in climate. Contribute your observations of plants at home, at school, or at local parks with Project BudBurst (http://www.budburst.org), a citizen science project that allows you to become the scientist. Use the QR (Quick Response) code to start collecting data for science.

Group Members: _____

Event: _____

_____

Log of Hourly Temperatures by Week

Week of _____

	Sun	Mon	Tue	Wed	Thurs	Fri	Sat
	Degrees Fahrenheit						
12 am							
1 am							
2 am							
3 am							
4 am							
5 am							
6 am							
7 am							
8 am							
9 am							
10 am							
11 am							
12 pm							
1 pm							
2 pm							
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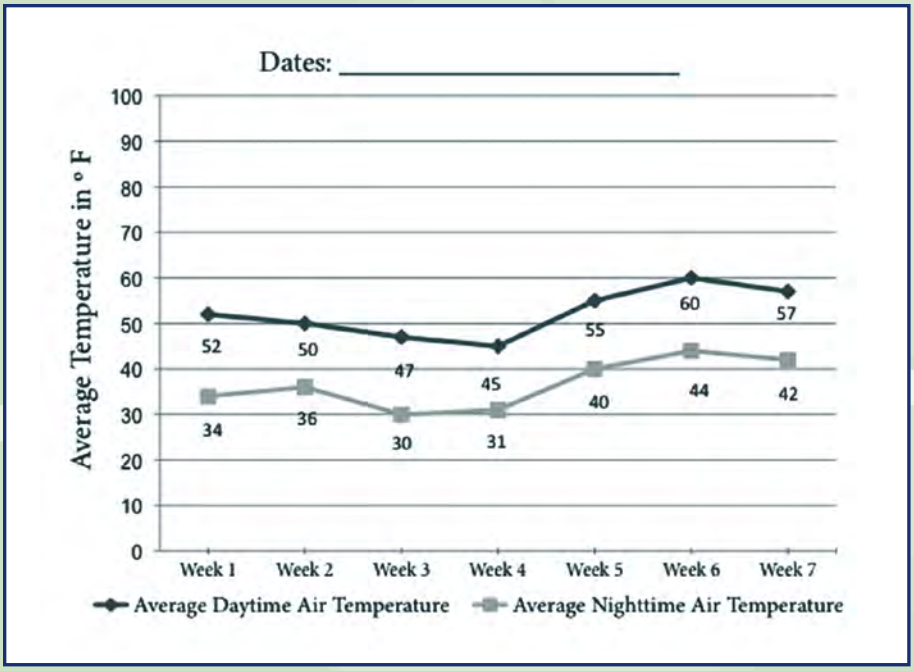

Figure 16. An example of a graph showing air temperatures over time. Illustration by Stephanie Pfeiffer.

FACTivity Extension

As a class, compare and contrast this FACTivity with the salmon research in the article.

What's in a Name?

Time travel is the concept of moving either forward or backward in time. In this article, the emergence of young fish from an earlier developmental stage was timed, in a way, by using a value called temperature units.

Web Resources

National Oceanic and Atmospheric Administration, Chinook Salmon
http://www.nmfs.noaa.gov/pr/species/fish/chinooksalmon.htm

National Park Service, Elwha River Restoration
http://www.nps.gov/olym/naturescience/elwha-ecosystem-restoration.htm

National Oceanic and Atmospheric Administration, Fisheries: Elwha Restoration
https://www.youtube.com/watch?v=TP9z5S5oivo

Project Budburst/National Geographic Growing Degree Days Tool
http://budburst.org/documents/871408/1044448/FS_Unit_3.pdf/5b4c635f-2d09-4055-a881-35a174d0085d

Project Budburst
http://www.budburst.org

USA National Phenology Network
https://www.usanpn.org/

Natural Inquirer Connections

You may want to reference these *Natural Inquirer* articles for additional information and FACTivities:

- For more on the impact of dams, read "Mussel Mania" on page 74 of this edition of *Natural Inquirer*.
- For more information on salmon and their ecosystems, read "Food for the Soil" in the *Natural Inquirer* monograph.

These articles, along with others, can be found at: http://www.naturalinquirer.org/all-issues.html.