



United States Department of Agriculture

# NSI: NATURE SCIENCE INVESTIGATOR

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Forest Service

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# NSI: NATURE SCIENCE INVESTIGATOR

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Cradle of Forestry in America Interpretive Association

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## Special Thanks

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## Welcome to the NSI Team

The excitement of the natural world is all around you. From insects, birds, and mammals to plants, weather, and recreation, scientists study all parts of the environment and society. Use this guide to become a scientist by investigating the natural world around you.

Grab a pen or pencil to complete the activities on each page. All of these activities can be done outside in a campground or in a local park. Some of the activities can be done at home in your backyard or even indoors. Ask a family member or friend to help you, or do it by yourself. Remember to be safe and have fun.

*Be the next great nature scientist!*



USDA Forest Service photo by  
Brandan W. Schulze.

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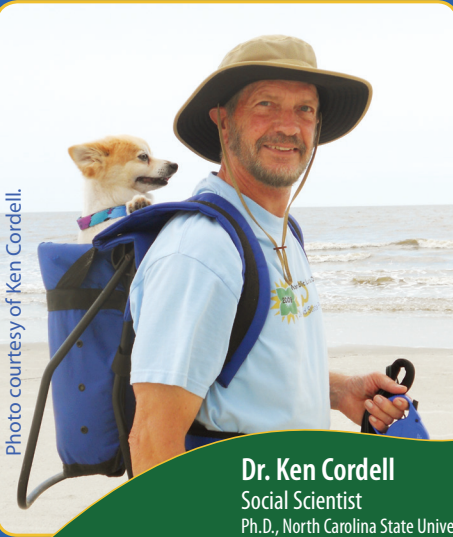
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UNIVERSITY OF  
GEORGIA

Project BudBurst  
Timing is everything!

Photo courtesy of Ken Cordell.



**Dr. Ken Cordell**  
Social Scientist  
Ph.D., North Carolina State University  
USDA Forest Service scientist

## Meet a Social Scientist!

Dr. Ken Cordell is a social scientist who asks questions about how people value and use our natural lands. He looks at trends in outdoor activity participation, such as yearly changes in the numbers of hikers or campers. This can help natural land managers better protect the natural resources.

### Word Game

Use the words listed below and arrange them so that the boxes spell the word "VALUE."

(Hint: There may be more than one way to solve the word game.)

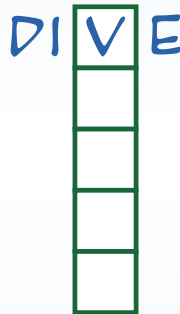
WALK

RUN

ORIENTEER

BIRDWATCH

DIVE



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## Be a Social Scientist...

**A social scientist studies the values, opinions, beliefs, attitudes, and actions of individuals and groups of people.**

Look or walk around the natural area. How many visitors do you see visiting this location?  
Observe and record for 10 minutes.

☐ 0-10

☐ 11-30

☐ 31 or more

Go outside to observe visitors. Fill in the chart below by counting the number of people you observe doing each recreation activity. If the weather is keeping you inside, think about which activities you have seen people taking part in during your time here and record those observations.

Activity	Number of Participants	Activity	Number of Participants
Camping		Hiking	
Kayaking/canoeing		Watching wildlife	
Picnicking		Biking	
Swimming		Lounging/relaxing	
Fishing/hunting		Other	

## Like Social Science? Do More!

Interview a family member or friend about his or her use of this natural area. Record the responses here or on page 14. Ask the person:

1. How often do you come here?
2. Why do you/did you choose this location?
3. What is your favorite characteristic of this location?

Next, interview another friend or family member. Compare the answers. If you were the land manager, what could you do to improve his or her experience?

**NEED  
MORE  
SPACE?**

**PAGE 14**

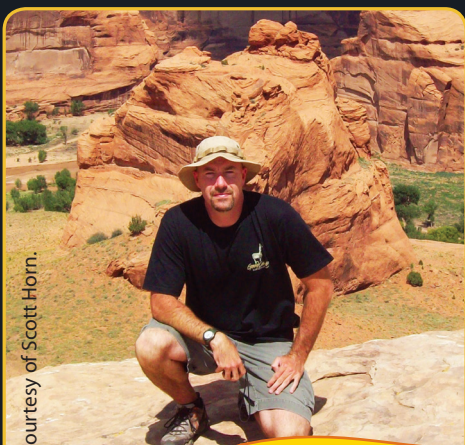


### Outdoor Tip:

Before you start an activity, always tell an adult where you are going and how long you expect to be gone!



Photo courtesy of Scott Horn.



**Mr. Scott Horn**  
Entomologist  
M.S., University of Georgia  
USDA Forest Service scientist

## Meet an Entomologist!

Scott Horn is an entomologist who asks questions about the impacts of forest management on insect communities. He is interested in how pollinator insects, such as bees, are affected by invasive plant species. Invasive species are any plant, animal, or organism that is not native to the ecosystem it is in and is likely to cause harm to the environment, the economy, or human health.

## Word Game

Use the words listed below and arrange them so that the boxes spell the word "INSECT."

(Hint: There may be more than one way to solve the word game.)

MOSQUITO

BEETLE

CRICKET

MOTH

TERMITE

DRAGONFLY

TERMITE

I

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**An entomologist**  
studies insects  
and how they  
interact with the  
environment.

## Be an Entomologist...

Some scientists sketch interesting things they find. Find an insect that interests you. Draw it below or create a model of it using items found around you.

Plants are often home to small insects. Open this booklet to page 14 and place it underneath a bush or small tree. Without hurting the plant, gently shake its branches. Once you're done shaking the branches, inspect the booklet you placed beneath the plant for insects. Remember to respect the insects. Record what you found below.

**Number of insects:** \_\_\_\_\_

**Number of different kinds of insects:** \_\_\_\_\_

## Like Entomology? Do More!

Pick two locations around you: one that humans use a lot (picnic area or campsite) and another that humans do not use often. Find as many different insects as you can in five minutes and record the results at each location.

### Number of Insects

**Location #1 (high human use):** \_\_\_\_\_

**Location #2 (low human use):** \_\_\_\_\_



### Outdoor Tip:

For the safety of the animals and yourself,  
remember to use only your observation skills  
when working with insects.





Photo courtesy of Yvette Ortega.

**Ms. Yvette Ortega**  
Ecologist  
M.S., University of California, Berkeley  
USDA Forest Service scientist

## Meet an Ecologist!

Yvette Ortega is an ecologist who asks questions about the impact of habitat conditions on various animals and their life histories. She wants to know how animals, such as fishers (a type of mammal), or songbirds are impacted by changes in their habitat.

## Word Game

Use the words listed below and arrange them so that the boxes spell the word "ECOLOGY."

(Hint: There may be more than one way to solve the word game.)

PLANTS

ECOSYSTEM

NATURE

ORGANISM

BIOLOGY

POPULATION

SPECIES

NATURE

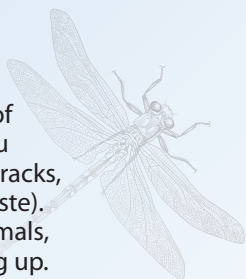
E

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An ecologist studies how plants, animals, and nature's forces interact.

## Be an Ecologist...

Whether big or small, animals (including humans) leave signs of activity all around the forest. You might see antlers, fur, feathers, tracks, leftover food, or scat (animal waste). Explore and find evidence of animals, but make sure not to pick anything up.



What was your most exciting discovery?

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## Start a game of animal charades!

Behavior is how animals interact with the environment and other animals. Animal behavior is really interesting. Pick your five favorite animals and act out their behaviors. See if anyone can guess which animal you are.

## Like Ecology? Do More!

Animal behavior we see in nature often involves food. Use the information below to evaluate whether this natural area has enough food sources for animals. Check the box next to each when you have found the food source.



- ☐ Deer and many insects eat green plants such as *new leaves and grasses*.



- ☐ Hummingbirds and many insects need *nectar from flowers* to survive.



- ☐ Bears and some birds rely heavily on *fruit* in their diets.



- ☐ Birds also eat *insects* as a part of their diet.

### Outdoor Tip:

Remember to wash your hands with soap and water after playing outside!





Photo courtesy of Quin Holifield.



**Dr. Quin Holifield (right)**  
Soil Scientist  
Ph.D., State University of New York College of  
Environmental Science and Forestry (SUNY/ESF)  
USDA Forest Service scientist

## Meet a Soil Scientist!

Dr. Quin Holifield (on the right) is a soil scientist who asks questions about how soil affects the health of plants and animals. She wants to know if organisms living in the soil could indicate the health of plants and animals in the area.

## Word Game

**Unscramble the letters to discover the word.**

(Hint: Each word was used in the “Meet a Scientist” section above.)

OLIS \_\_\_\_\_

GOSNSARMI \_\_\_\_\_

MASNLIA \_\_\_\_\_

TICETSINS \_\_\_\_\_

EAHHLT \_\_\_\_\_

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## Be a Soil Scientist...

**A soil scientist is concerned with the physical, chemical, and biological characteristics and behavior of soils, as well as soil management for many different uses.**

Using only soil from your area, search for different types of soil. Remember to look for different colors, grain sizes (i.e., large, small), textures (i.e., hard, soft), and moisture levels (i.e., wet, dry). How many did you discover?

---

Pick a soil that interests you. Rub a sample of the soil in the box below. Describe what makes it interesting.

## Like Soil Science? Do More!

A handful of healthy soil can be home to billions of living organisms, especially decomposers such as fungi, bacteria, and insects. Soil can also contain non-living things such as water, rocks, and sand.

Without hurting any plants, take a handful of soil. Search for evidence of living and non-living things.

### Outdoor Tip:

Let the plants live! Avoid digging up or stepping on living plants by staying on the trail or in designated campground areas.



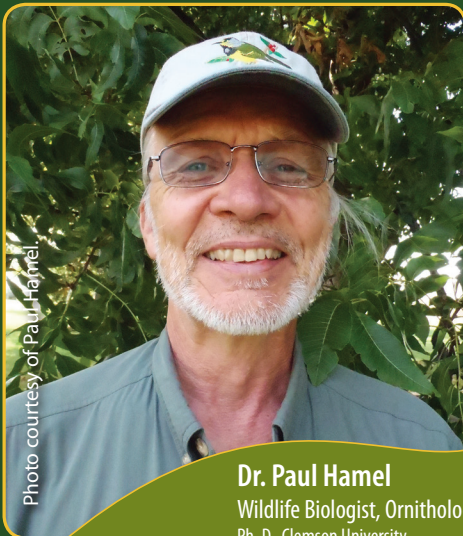


Photo courtesy of Paul Hamel.

### **Dr. Paul Hamel**

Wildlife Biologist, Ornithologist  
Ph. D., Clemson University  
USDA Forest Service scientist

## **Meet an Ornithologist!**

Dr. Paul Hamel is an ornithologist who asks questions about the balance between living a comfortable human life and maintaining good habitat for migratory birds. Migratory birds are birds that have the characteristic of moving from one place to another on a periodic basis.

## **Word Game**

**Unscramble the letters to discover the word.**

(Hint: Each word was used in the "Meet a Scientist" section above.)

**TAHITAB** \_\_\_\_\_

**BSDRI** \_\_\_\_\_

**LEBACNA** \_\_\_\_\_

**GITRAYROM** \_\_\_\_\_

**DECIRPIO** \_\_\_\_\_

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<http://www.naturalinquirer.org>

**An  
ornithologist  
studies birds.**

## Be an Ornithologist...

Each bird species has unique features that set it apart from others. Compare the two pictures below. Circle, list, or discuss as many differences as you can find between the birds.



**Great Egret**

Photo: Lee Kamey, U.S. Fish and Wildlife Service



**American Goldfinch**

Photo: Dave Menke, U.S. Fish and Wildlife Service

## Like Ornithology? Do More!

Birds call and sing to communicate with other birds. Find a location nearby to sit or stand quietly for 5 minutes. Your location is the "X," and the arrow is pointing in the direction you are facing. When you hear a bird, mark its location in the square relative to your location.



To learn  
more about  
birds, use  
the QR code

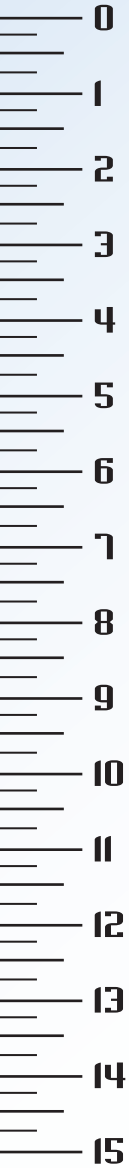
with your smartphone  
to get the free Merlin  
Bird app.



### Outdoor Tip:

Never touch or pick up young birds, bird eggs, or a bird's nest! You may attract predators to the nest of young birds.

CENTIMETERS





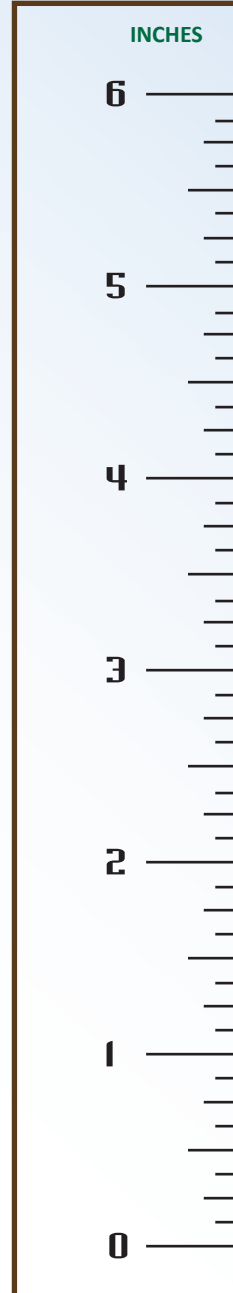


Photo courtesy of Doug Demarest



### Dr. Trista Patterson

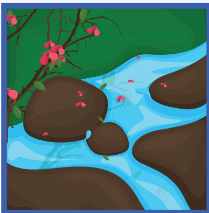
Economist  
Ph.D., University of Maryland  
USDA Forest Service scientist

## Meet an Ecological Economist!

Dr. Trista Patterson is an ecological economist who asks questions about the dollar value that we place on natural resources.

## Matching Game

Use a line to match the natural resource from the top row with the ecosystem service it provides humans on the bottom row.



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## Be an Ecological Economist...



**An ecological economist** studies the dollar value of natural resources.

Ecosystem services are benefits that ecosystems, or parts of an ecosystem, provide to humans. Ecosystem services, such as wetlands for flood control or bats for pest management, are valuable because they help humans. Other examples are shown in the matching game.

Find two or more ecosystem services around you right now. Use the chart below to show how you value each service in dollars per day. Ask your friends or family how they value each service, too.

Item or Ecosystem Service	Your Value/Price (\$ per day)	Others' Value/Price (\$ per day)
Bats as pest control	\$5 per day	\$7 per day

Using the values you discovered in the chart above, which ecosystem service do you feel is most important? Why?

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## Like Ecological Economics? Do More!

Balancing the health of the environment with human development can be challenging. Imagine you have unlimited money and a lot of land. What would you like your land to look like? Draw your design below.

List how your design respects the environment.

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### Outdoor Tip:

Many people value natural areas as a way to relax and escape from daily life. Always try to "leave no trace" in our natural lands by respecting other visitors, picking up trash, and leaving natural items where you found them!



Photo courtesy of Brian Potter.



**Dr. Brian Potter**  
Atmospheric Scientist  
Ph.D., University of Washington  
USDA Forest Service scientist

## Meet an Atmospheric Scientist!

Dr. Brian Potter is an atmospheric scientist. He asks questions about the impact of weather on wildfires and how wildfires may affect the weather.

### Word Game

**Unscramble the letters to discover the word.**

(Hint: Each word was used in the "Meet a Scientist" section above.)

TWEREHA \_\_\_\_\_

LIDSWERFI \_\_\_\_\_

PACMTI \_\_\_\_\_

TSICETINS \_\_\_\_\_

OHETACMSIPR \_\_\_\_\_



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**An atmospheric scientist studies how air behaves and how that behavior affects the different types of weather we experience on Earth.**



## Be an Atmospheric Scientist...

Go outside and describe the current weather using your senses. If the weather is keeping you inside, look out the window and use your imagination.

What percent of the sky (out of 100 percent) is covered in clouds? \_\_\_\_\_

Cloud shape can tell us a lot about the weather conditions. Sketch the shape of the clouds you see.

## Like Atmospheric Science? Do More!

Imagine you are on television as a weather expert. Use the information you gathered above to create a weather report. Announce your report to your friends and family. Make sure to include air temperature, rainfall, and safety information.

### ***Tweet your weather report!***

Use Twitter to tweet @naturalinquirer about your weather report.



### **Outdoor Tip:**

**Weather changes throughout the day. Make sure to check for hazardous weather before you begin outdoor activities each day and plan accordingly.**





Photo courtesy of Serra Hoagland.



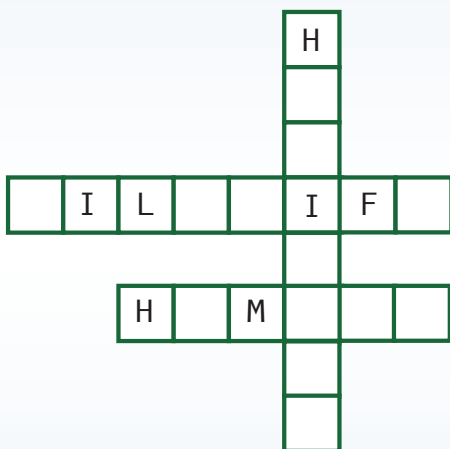
**Dr. Serra Hoagland**  
Biological Scientist  
Ph.D., Northern Arizona University  
USDA Forest Service scientist

## Meet a Biological Scientist!

Dr. Serra Hoagland is a biological scientist who asks questions regarding the conservation of wildlife. She is particularly interested in examining how areas with healthy habitats are connected across a landscape. She is also interested in the impact of wildlife interactions with humans.

### Word Game

Correctly fill in the boxes so they spell three of the words from the information used in the “Meet a Scientist” section above.



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**A biological scientist studies many different types of organisms from endangered birds to large predators.**

## Be a Biological Scientist...

Feeding wildlife, illegal hunting, and car collisions with animals on roadways are all examples of negative human-wildlife interactions. These issues can threaten animal health. Look around you. Can you find any negative human-wildlife interactions?

Use the space below to design one or more signs that teach or warn visitors about a negative human-wildlife issue.

## Like Biological Science? Do More!

### *Help protect this wildlife area!*

Littering is another negative human-wildlife interaction. Litter is the leaving or dumping of man-made trash in the environment. It can hurt wildlife if they eat it, get caught in it, or if it pollutes their habitat. To help, follow these steps:

1. Examine the area. What types of litter do you see? How could it hurt animals?
2. Set a goal and make a plan to clean up the litter.
3. Get an adult, friends, or friends and family members to join.
4. BE SAFE! Wear gloves and do not pick up glass or other sharp items.
5. Dispose of trash properly.
6. Celebrate your accomplishment.

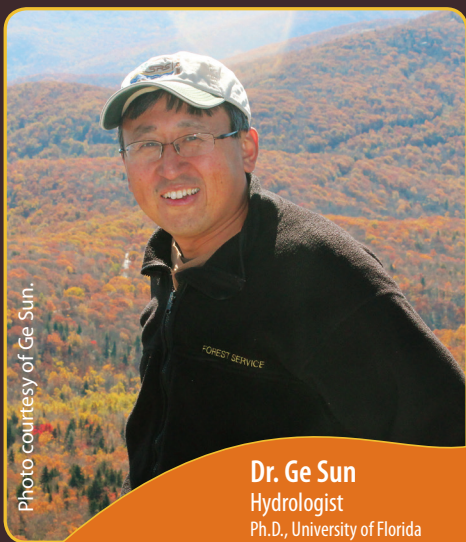


### **Outdoor Tip:**

**Make sure you observe animals from a safe distance! Trying to handle or get too close to wild animals can cause them to become stressed or defensive.**



Photo courtesy of Ge Sun.



**Dr. Ge Sun**  
Hydrologist  
Ph.D., University of Florida  
USDA Forest Service scientist

## Meet a Hydrologist!

Dr. Ge Sun is a hydrologist who asks questions about the impact of plants on the water cycle and the use of water by plants throughout a watershed. He is particularly interested in how climate change may affect the water cycle.

## What Is a Watershed?

Freshwater moves through the water cycle in many ways. One visible way is in streams and rivers. Below is the pattern that streams and rivers make in a watershed.



Use the grid on the right to make a watershed diagram. Each river has its own coordinates (X,Y) that you can plot. Connect the points with lines to make your rivers.

Learn more about the natural world:  
<http://www.naturalinquirer.org>

**A hydrologist studies the water cycle. Studying the water cycle means tracking water movement through the environment.**

## Be a Hydrologist...

Go outside and use your senses to observe the water cycle in action. What do you observe?

Imagine you are a water droplet gathered with other water droplets in a cloud. It is about to rain. Write a story, a poem, or draw a cartoon about your travels through the stages of the water cycle.

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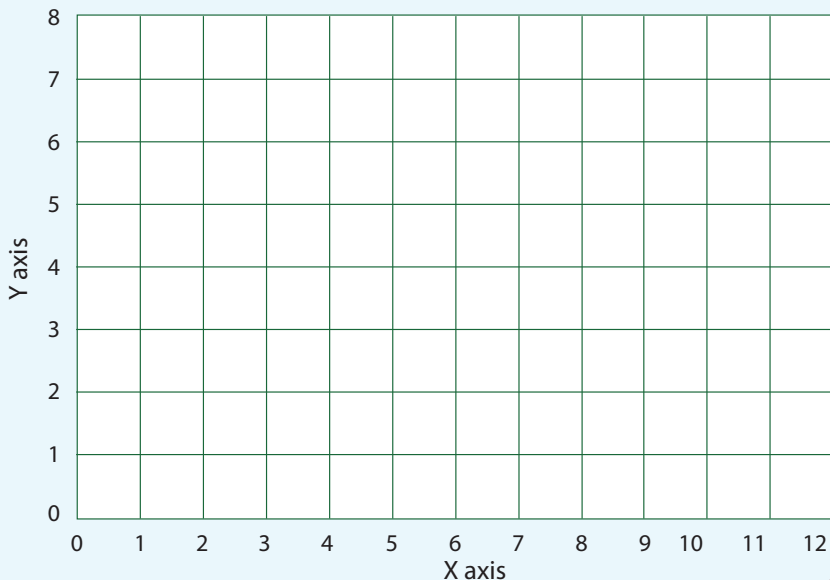
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PAGE 14

NEED MORE SPACE?

## Create Your Own Watershed Diagram



**Main River:** (0,5) (3,3) (6,6) (8,3) (12,6)

**River A:** (3,7) (4,6) (5,7) (6,6)

**River B:** (4,0) (5,1) (6,4) (8,3)

On your diagram, two smaller rivers should feed into a larger river.

### Outdoor Tip:

Drinking water straight from a stream, lake, or pond is dangerous. Make sure to bring a water filter or full water bottles with you for your outdoor activities.



Photo courtesy of NEON, Inc.



**Dr. Courtney Meier**

Plant Ecologist

Ph.D., University of Colorado-Boulder  
National Ecological Observatory Network

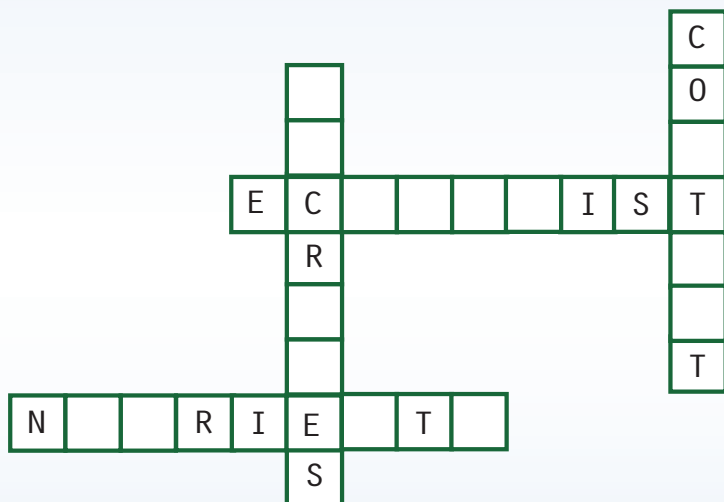
## Meet a Plant Ecologist!

Dr. Courtney Meier is a plant ecologist at the National Ecological Observatory Network. He investigates links between plants, soil microbes, nutrients, and plant growth within the context of environmental change.



## Word Game

Correctly fill in the boxes so they spell four of the words from the information used in the “Meet a Scientist” section above.



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## Be a Plant Ecologist...

**Plant ecologists** study the locations and types of plants in an area, the effects of the environment such as soil and climate on plants, and interactions between plants and other organisms.

Can plants talk? Even though plants can't speak, they can tell us stories about changes in our environment. Plant ecologists listen to the stories plants tell by watching for changes in plant leaves, flowers, and fruit. Choose a tree or shrub near you to observe and find out what your plant is telling you about its environment.



### Today is:

Month      Day      Year

### My plant is a:

- |                                |                                     |
|--------------------------------|-------------------------------------|
| <input type="checkbox"/> Tree  | <input type="checkbox"/> Wildflower |
| <input type="checkbox"/> Shrub | <input type="checkbox"/> Grass      |

### Today my plant has:

(Check all that apply!)

- |  |  |
|--|--|
| <input type="checkbox"/> No leaves             | <input type="checkbox"/> Leaves falling  |
| <input type="checkbox"/> A few leaves          | <input type="checkbox"/> Flowers         |
| <input type="checkbox"/> Many leaves           | <input type="checkbox"/> Fruits or seeds |
| <input type="checkbox"/> Leaves changing color |  |

### Here's what my plant looks like now:

PAGE 14

NEED  
MORE  
SPACE?

*Draw a picture of your plant here.*

Plants change with the seasons.  
How do you think your plant will  
look a few months from now?  
Explain why.

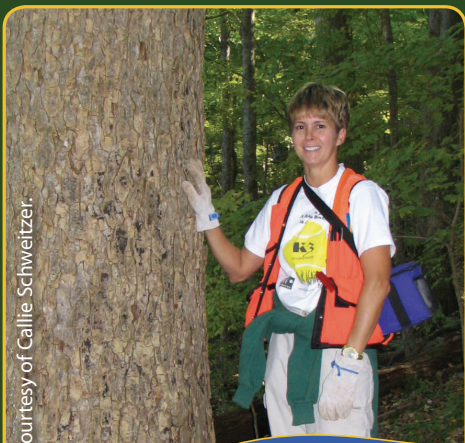


### Outdoor Tip:

What are the plants at your home or school doing now? Scientists at Project BudBurst want to know. Become a citizen scientist with Project BudBurst. Learn more at [www.budburst.org](http://www.budburst.org).

**Project BudBurst**  
Timing is everything!

Photo courtesy of Callie Schweitzer.



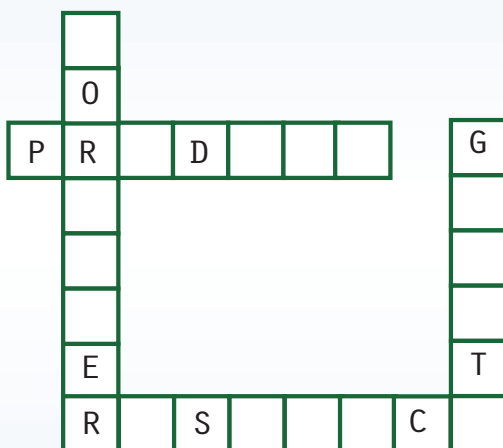
**Dr. Callie Schweitzer**  
Research Forester  
Ph.D., Penn State University  
USDA Forest Service scientist

## Meet a Research Forester!

Dr. Callie Schweitzer is a research forester who asks questions about how to predict tree growth and which tree species grow best.

## Word Game

Correctly fill in the boxes so they spell four of the words from the information used in the "Meet a Scientist" section above.



Learn more about the natural world:  
<http://www.naturalinquirer.org>

**A research forester studies how forests respond to human actions and disturbances such as fire, drought, and timber harvesting.**

## Be a Research Forester...

Look around for evidence of disturbances. Disturbances could be wind-toppled trees, burn scars, crushed flowers, or cut trees. Pick one of those plants and use your imagination to write a story, song, or poem about what happened to the plant.

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PAGE 14

NEED  
MORE  
SPACE?

Most plants need water, nutrients, and sunlight to survive and grow well. **See who can find the tallest tree!** Stand underneath it and look up.

Use the space to the right to sketch the shape of this tree. What makes this shape different from other trees?

## Like Research Forestry? Do More!

Focus on your favorite spot in this natural area. Do you see wildflowers? Vines? Trees? Grasses?

Foresters often want to know which plants are most common in an area. Estimate what percent of the area each plant type covers. Make your percentages total 100 percent, and record the percentages below:

Trees: \_\_\_\_\_ Grasses: \_\_\_\_\_ Shrubs: \_\_\_\_\_  
Vines: \_\_\_\_\_ Wildflowers: \_\_\_\_\_

### Outdoor Tip:

Be careful with tree bark. Trees need bark to protect themselves, so do not peel it off or cut into it.



**Student  
Editorial Review  
Board**

South Jackson  
Elementary School  
5th Grade

Teachers:  
Stephen Lush  
Christina Holton  
(Not Shown)



Photo courtesy of Brian Cooke.

## **Web Resources**

### ***Natural Inquirer***

<http://www.naturalinquirer.org>

### **Discover the Forest**

<http://www.discovertheforest.org>

### **Federal Recreation & Camping Information**

<http://www.recreation.gov>

### **Project BudBurst**

<http://www.budburst.org>