SCIENTISTS IN THE FIELD

WHERE SCIENCE MEETS ADVENTURE

DISCUSSION AND ACTIVITY GUIDE

Park Scientists: Gila Monsters, Geysers, and Grizzly Bears in America's Own Backyard
by Mary Kay Carson photographs by Tom Uhlman

About the Series

Park Scientists is part of the award-winning Scientists in the Field series, which began in 1999. This distinguished and innovative series examines the work of real-life scientists doing actual research. Young readers discover what it is like to be a working scientist, investigate an intriguing research project in action, and gain a wealth of knowledge about fascinating scientific topics. Outstanding writing and stellar photography are features of every book in the series. Reading levels vary, but the books will interest a wide range of readers.

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About the Book

Most of us have visited and enjoyed the beauty of at least one national park. How many of us know about the extensive scientific research being conducted by National Park scientists? The author Mary Kay Carson introduces readers to park scientists and describes ongoing research projects in Yellowstone, Saguaro, and the Great Smoky Mountains National Parks. Through the course of the book, she explains what makes research in the parks unique and important.

About the Author

Mary Kay Carson has always loved science, and earned her college degree in biology. After serving in the Peace Corps, Mary Kay began her award-winning writing career by working on a classroom magazine, *SuperScience,* for Scholastic. She became a freelance writer and has written more than thirty books for young people, including *Emi and the Rhino Scientist*. She lives in Cincinnati with her photographer husband, Tom Uhlman, and her dog, Ruby.

About the Photographer

Tom Uhlman has been a freelance photographer for more than twenty years. He enjoys taking all kinds of photographs, but his favorite is nature photography. He often works with his wife, Mary Kay Carson, on books for young readers.

Pre-Reading Activity

Visit a local park. Take an inventory of the natural resources within it. Why was this particular piece of property chosen to house a park? Now visit a vacant lot or an area of land without (or with very few) manmade structures. If we were in charge of granting park status, would we select this lot as one to which we would grant it? Think about any cherished outdoor spot. Is it within a park? What is it about these spaces, particularly the ones that are not within

a park, that captures our hearts? If your cherished space is not within a park, how would you feel about it being designated a park? Is there a difference between personal favorite spots and public spaces? Do they overlap? Why are some spaces parks and some not parks?

Discussion Questions

Our government has great respect for private property. Yet property owners do not have complete freedom to do as they please with their property. Explore the meaning and the limits of public property and private property.

Which national parks have you visited personally or learned about in books or videos? What are the special features that convinced our government to grant these locations national park status?

What are the differences between national monuments, national parks, national forests, national seashores, and national wilderness areas?

Some national parks are free to visit, but the majority of national parks charge an entrance fee. National parks are funded by taxes that we and our families pay. Should these national treasures charge a fee to enter?

Have you ever discovered a favorite restaurant, shop, or location that gradually becomes so popular that it is almost impossible to visit? Does our love for some locations cause harm to that location?

Car emissions, trash, sewage, and other visitor side effects cause huge problems for national parks. Should parks limit the number of people that have access?

Is it possible for a national park, over hundreds of years, to stop being worthy of national park status? Can you think of a scenario that would have our government revoke the status of a national park?

Applying and Extending Our Knowledge

This book limits its coverage of national parks to Yellowstone, Saguaro, and the Great Smoky Mountains. Yet we read on page 1 that we have fifty-eight national parks in our country. Each park has two chapters describing the park in terms of its scientists and the work they do with landforms, animals, plants, and other features.

- Outline the two chapters germane to one of the three national parks included in this book. Research another national park not included in this book and prepare a similar outline.
- Debate the merits and limitations of including these three national park representatives in this book. Make an argument for choosing three different parks. Prepare a Venn diagram or other graphic organizer comparing your choices with the author's.
- Several states in our country do not have a national park. Investigate the state parks in one of the states that does not have a national park. Make a case for granting national park status to one of the state parks. Make sure to list the pros and cons for changing the status. Outline any steps the state park would have to take to mitigate any of the cons listed.

In the book, we read that Yellowstone is the first national park in the world. Which country was the second to establish a national park?

- Find video links to compare Yellowstone with the first national park outside of the United States. Prepare a page for this park similar to the one for Yellowstone on page 2.
- Research other national parks around the world. If you were writing this book and including your three favorite parks anywhere in the world, which three parks would you select? Prepare a mixed-media presentation justifying your three park choices.
- Would your choices change if your goal was to pick three parks that had very little in common with one another or had the widest variety of scientific research opportunities?

Common Core Connection

CCSS.ELA-Literacy.RI.7.5 Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to the development of the ideas.
CCSS.ELA-Literacy.W.7.1 Write arguments to support claims with

clear reasons and relevant evidence.
CCSS.ELA-Literacy.W.7.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
CCSS.ELA-Literacy.RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
CCSS.ELA-Literacy.W.7.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
CCSS.ELA-Literacy.W.7.7 Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.

As you read through this book, create a picture glossary, of the animals (and, if you're feeling ambitious, plants too) that are mentioned or shown.

- Indicate which ones are found in all three parks, two parks, or exclusively in one park. Include scientific name, common name, range, description, habitat, diet, and any noteworthy facts (about behavior or endangered status, etc.). Group by families and then alphabetically by scientific name.
- Assign groups of students to catalog the animals in various national parks until the class has completed a survey of all fifty-eight national parks. In looking at the collated list of national park animals, which animals are most commonly found? What do we notice about animals that are endangered or threatened?

Common Core Connections

CCSS.ELA-Literacy.RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
CCSS.ELA-Literacy.RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6–8 texts and topics*.
CCSS.ELA-Literacy.SL.7.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.

On page 8 we read, "It's the system that's important to protect, like protecting a habitat instead of individual animals. 'We're here to protect Yellowstone's natural processes,' he says. 'So rather than build a permanent boardwalk around a [hot] spring, we'll continually move the boardwalk to keep everyone safe so the spring can move where it wishes.'"

- Are there any patterns over time in the direction these boardwalks have moved? Speculate on long-range projections for where the hot spring will be in, say, one hundred years. Is there any danger that the hot spring will shift out of its national park boundaries and into private property?
- All national parks change. Naturally occurring erosion, fires, earthquakes, etc., bring physical changes to the park. Search for images of Yellowstone in the 1870s and in regular increments of time up to today. Try to find images documenting the exact same location. Write a narrative describing the changes over time to the area.

Common Core Connections

CCSS.ELA-Literacy.W.7.1 Write arguments to support claims with clear reasons and relevant evidence.
CCSS.ELA-Literacy.W.7.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
CCSS.ELA-Literacy.W.7.7 Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.

On page 12, Hank Heasler probes the ground with a long pole. When he pulls this temperature probe (pole) out of the ground, a steam cloud follows—a mini fumarole. Then the author writes, "He stomps on the spot a few times to close it off." Earlier we read that Yellowstone has four times as many deaths from hydrothermal features as it does from grizzly bears.

- Research the chemical reactions caused by the sulfuric gas coming out of the fumarole. Prepare a poster or a slide showing the process of making sulfate salts. Explain the potential hazard to humans in the area if not for the

cold whipping wind dispersing the gas.

- Find an easy online recipe for making a salt crystal, and make one. Compare this process for making salt crystals (which is basically adding salt to boiling water, letting it soak into something, and then allowing it to dry in the sun) with the process for making sulfate salt.
- The ground in this area is yellowish from the sulfur, yet when we look closely at various areas of Yellowstone, we notice many other colors too. Make a hydrothermal color chart that links the various colors to the different gases, rocks, and other materials that produce that color.

On page 10 we see a graphic with mud pots, hot springs, cone geysers, and more.

- Prepare a set of posters that explain the similiarities and differences between these features.
- On page 8, in the "Trail of Eruptions" graphic, we read that some parts of Yellowstone get three times more rain and snow than surrounding areas. Explain how the trough created by volcanic craters (the Snake River Plain) contributes to a microclimate capable of producing so much more rain and snow than other locations very nearby.

Common Core Connection

CCSS.ELA-Literacy.W.7.7 Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.
CCSS.ELA-Literacy.RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts.
CCSS.ELA-Literacy.RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

Mark Haroldson is studying bear hibernation to discover what happens biologically during hibernation. We read, "The bears don't eat or drink, surviving instead off the stored fat they put on in autumn. They don't even urinate or poop. The bodies of hibernating bears somehow recycle the waste and use the proteins to make muscle. Medical scientists are studying the secrets of bear hibernation, says Mark. What they discover could someday help bedridden and ill humans." (p. 18)

- Research current theories about animal hibernation and speculate as to why bears do not get bed sores; how they manage to recycle waste products; how much weight they gain in autumn and lose by spring; how aware they are of their surroundings while hibernating. In formulating your hypotheses, suggest how one might go about testing them.
- Discuss in groups this quote from page 27: "Nearly four decades of collaring bears has made one thing clear to the Study Team: grizzlies do best where people are few and far between."
- Examine the wildlife in your own area. Have the group select an animal to study and then generate a list of five starting steps to follow that will maximize the chances for success of either increasing or decreasing the population of the animal selected. What information is required before one is able to manage any animal population?

Common Core Connections

CCSS.ELA-Literacy.W.7.7 Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.
CCSS.ELA-Literacy.SL.7.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.

Many of us have spotted the occasional lizard basking on a rock in the sun, but few of us have seen a live two-foot-long venomous Gila monster. Even scientists do not know all sorts of basic information about these reptiles, such as where or when their young are born. In fact the language on page 31 suggests that we are certain of very little when it comes to these large lizards.

- Write a mythological story for young students about the Gila monster that incorporates how it got its name and answers some of the questions scientists have about this animal. Or use your story to explain why science knows so little about the Gila monster. Keep in mind that scientists are currently using Gila monster venom for possible use in treating memory loss, attention deficit disorder, and more.

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Common Core Connections

CCSS.ELA-Literacy.W.7.3 Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.
CCSS.ELA-Literacy.W.7.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

On page 43, teens from Tucson High School tie a 50-centimeter string to the bridge of lensless glasses and a meter stick. They hold this stick out in front of them five meters away from the saguaro cactus they wish to measure.

- Make one of these measuring sticks and use it to measure telephone poles, trees, buildings, or other tall items. Explain how it works. Does it work no matter how short or tall the person wearing the glasses and holding the string is? Why?
- Look at the chart on page 43 and then look at the various saguaros that have humans in the picture. Copy the pictures and then make predictions about how tall and how old the various cacti are. Form your prediction in ranges of heights and ages that seem reasonable. Explain how you derived the numbers.
- Compare the pictures of the saguaro forest in 1935 and today (assume the picture was taken in 2011). How long will it take the "Today" picture to look like the picture in 1935? Show your calculations and explain your reasoning.

Common Core Connections

CCSS.ELA-Literacy.RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
CCSS.ELA-Literacy.RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

The Great Smoky Mountains National Park receives about nine million visitors each year, which is almost three times more visitors than Yellowstone and more than eight million more visitors than Saguaro National Park.

- Research the locations and demographics of each park and present a fact sheet showing your prediction for the top five reasons this park receives so many more visitors than the much bigger Yellowstone National Park and the much smaller Saguaro National Park.
- The Great Smoky Mountains National Park is a United Nations International Biosphere Reserve. What is an international biosphere reserve? Research how any location becomes an international biosphere reserve. Why are Yellowstone and the Great Smoky Mountains biospheres reserves, while Saguaro is not?
- Adapt the nomination form for becoming a biosphere reserve to use for an area of your school or your neighborhood that the class decides would be a good one to protect or develop into a park, research area, or simply a place that students would enjoy using more. Fill out the form and debate the merits of selecting this location.

We read that the Great Smoky Mountains National Park is the salamander capital of the world. We also learn that salamanders are often confused with lizards.

- Compare the salamanders in this chapter with the Gila monsters of Saguaro National Park. Prepare a Venn diagram of salamanders and lizards.
- We read that salamanders eat more prey per body weight of any animal in the park, including bears. Research salamander weight and food consumption. Calculate how much you would have to eat each day to eat at the same rate as a salamander. How much would a bear have to eat to compete with the mighty salamander eating machine?

Look at the graphic on page 54 and read the caption. Write a paragraph or two explaining what the Great Smoky Mountains area was like 20,000 years ago. Then write about a plausible scenario that resulted in the map of today. Continue writing about what will happen if we increase the global temperature by three degrees Celsius.

Common Core Connections

CCSS.ELA-Literacy.W.7.7 Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.
CSS.ELA-Literacy.RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

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CCSS.ELA-Literacy.SL.7.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
CCSS.ELA-Literacy.W.7.3 Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.
CCSS.ELA-Literacy.W.7.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

Amy Luxbacher, we read, is an evolutionary ecologist.

- Imagine that you are trying to recruit someone for this position in your imaginary science firm. Produce a recruiting poster and write a job description for an evolutionary ecologist. Be sure to explain the job duties, education required, knowledge base needed, work hours and conditions, and job benefits.

On page 62, we read, "Hundreds of fireflies blink all at the same time and in perfect unison! Like a string of flashing holiday lights, they flash on-off-on-off all together six times. It feels unreal, like some kind of enchanted dreamland. 'You're surrounded by fireflies,' describes Lynn. 'It's awe inspiring, it's rhythmic, and it's bright.'"

- Design an interpretive dance, a light show, or a skit on what it is like to be fireflies. Set your dance to music. Make costumes and design the lighting. Write poetry and put on a performance for an audience.
- Produce program notes that describe the science behind your various interpretations. Incorporate the charts on pages 64 and 66. Use the flash pattern graph on page 66 as the model for your music, movement, or poetry. Be sure to include the fact that other animals try to mimic fireflies for their own purposes.

Common Core Connections

CCSS.ELA-Literacy.W.7.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
CCSS.ELA-Literacy.RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
CCSS.ELA-Literacy.W.7.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
CCSS.ELA-Literacy.SL.7.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.

Further Reading

McHugh, Erin. *National Parks: A Kid's Guide to America's Parks, Monuments and Landmarks.* Black Dog & Leventhal, 2012.

Brown, Cynthia Light. *Discover National Monuments; National Parks: Natural Wonders.* Nomad Press, 2008.

Other Websites to Explore

National Park Service
www.nps.gov/index.htm
Home page for information on the National Park Service and the fifty-eight national parks.

Park Science
www.nature.nps.gov/parkscience
A research and resource-management bulletin of the U.S. National Park Service that reports the implications of recent and ongoing natural and social science and related cultural research policy planning.

Geysers and How They Work
www.nps.gov/yell/naturescience/geysers.htm
Provides information on the geology and "plumbing" of geysers and includes information on some of the specific geysers at Yellowstone National Park.

Gila Monsters
nationalzoo.si.edu/Animals/ReptilesAmphibians/Facts/FactSheets/Gilamonster.cfm
A fact sheet on Gila monsters from the National Zoo.

14 Fun Facts About Fireflies
blogs.smithsonianmag.com/science/2012/06/14-fun-facts-about-fireflies
Information from the online publication *Surprising Science* from the Smithsonian.
Plethodon jordani
amphibiaweb.org/cgi/amphib_query?where-genus=Plethodon&where-species=jordani&account=amphibiaweb
Information on the red-cheeked salamander from AmphibiaWeb

Grizzly Bear
www.nwf.org/wildlife/wildlife-library/mammals/grizzly-bear.aspx
Information and photographs of the grizzly bear from the National Wildlife Federation.

Guide created by:
Ed Spicer, curriculum consultant, and Lynn Rutan, retired middle-school librarian, now reviewer and blogger at *Bookends: the Booklist Youth Blog*.