# Program Name: The Changing World of the Shenandoah Salamander

**Suggested Grade Level:** 4th

## Maximum Group Size for classroom presentation and activities: 25

**Time Consideration**:

Pre-visit: 30-minute class period for teacher-led pre-visit activities

Ranger-led Classroom Program: 1 hour

Post-visit: One or more class periods for teacher-led post-visit activities

# Overview

The National Park Service manages more than 415 park areas across the nation that were set aside to preserve and protect significant natural features and historic sites for all people to enjoy now and into the future. Protecting these special places *unimpaired* for the enjoyment of future generations has become increasingly difficult due in part to environmental threats such as pollution and climate change. Shenandoah National Park is a refuge for many animals and plants that are pressured by human activities and other land uses. Shenandoah is home for the Shenandoah salamander, an endangered species that lives nowhere else on the planet. Human-accelerated climate change could cause a serious decline in the population of the Shenandoah salamander. Students will learn about the environmental threats to the Shenandoah salamander and determine ways people can help protect species and care for their national parks and the environment.

## Learning Objectives

Following the ranger presentation and classroom activities, the students will be able to

1. define the mission of the National Park Service and name three national park areas and their significant features that are protected;
2. explain how Shenandoah National Park protects plants and animals, specifically the Shenandoah salamander;
3. identify three environmental and human influences that can impact the sensitive mountaintop ecosystem of the Shenandoah salamander;
4. explain climate change and its potential consequences on the Shenandoah salamander’s survival;
5. describe three ways that individuals can help reduce the impact of human accelerated climate change to help protect national parks and the environment.

## Virginia Science Standards of Learning

### Living Systems and Processes

4.3 The student will investigate and understand that organisms, including humans, interact with one another and with the nonliving components in the ecosystem. Key ideas include

1. interrelationships exist in populations, communities, and ecosystems;
2. food webs show the flow of energy within an ecosystem;
3. changes in an organism’s niche and habitat may occur at various stages in its life cycle.

Earth and Space Systems

4.4 The student will investigate and understand that weather conditions and phenomena affect ecosystems and can be predicted. Key ideas include

b) common and extreme weather events affect ecosystems; and

c) long term seasonal weather trends determine the climate of a region.

Earth Resources

4.8 The student will investigate and understand that Virginia has important natural resources. Key resources include

1. plants and animals;
2. forests, soil, and land.

# Background Information

The mission of the National Park Service and Shenandoah National Park is to preserve and protect the natural and cultural resources and leave them unimpaired for the enjoyment of future generations. There are more than 415 National Park areas across the nation that protect significant natural features, historic sites, and heritage areas.

Shenandoah National Park is one of these special places where visitors come to experience the mountain views, stroll through meadows and forests, hike to waterfalls, photograph wildflowers, and observe wildlife. Shenandoah National Park is a refuge for many animals and plants pressured by human activities and other land uses. There are more than 200 resident and migratory bird species, more than 50 species of mammals, more than 35 fish species, and 26 reptile species found in the Park.

Shenandoah is also home to 14 species of salamanders including the Shenandoah salamander (*Plethodon Shenandoah*) which is an endangered species that is only found in cool moist habitats on three high elevation peaks within Shenandoah National Park. Salamanders are amphibians, and like frogs, need water or moisture in which to reproduce. Many salamanders are considered to be at risk for survival due to the loss of or changes to their habitat. Although these secretive creatures are unknown to many people, they are important parts of terrestrial ecosystems in our natural world and are in serious need of our protection.

There are many plant and animal species worldwide that live in special habitats at higher elevations that are at risk of extinction. One contributing factor to this risk could be warming temperatures due to climate change. Climate change is predicted to result in dramatic changes in temperature and moisture conditions in the Appalachian Mountains, including the high elevation ecosystem where the Shenandoah salamander lives.

Around the world, scientists are studying potential impacts of a warming climate. Shenandoah National Park collaborated with the Smithsonian Institution, University of Virginia, US Geological Survey and other federal agencies to assess the potential climate change impacts on high-elevation ecosystems by studying the endangered Shenandoah salamander. Through this lesson, students will understand the plight of the Shenandoah salamander, will be able to educate others about the Shenandoah salamander and climate change, and will be able to make educated lifestyle choices to reduce their “ecological footprint.”

## Vocabulary

* **adapt** –to make fit or suitable by changing or adjusting
* **adaptation** – a special trait or characteristic that helps an organism survive

o **physical adaptation** –a part or function of the body that helps an organism survive. Examples include claws, thorns, long legs, camouflage, and mimicry

o **behavioral adaptation** –behaviors or actions thatallow an animal to respond to life needs. Examples include hibernation, migration, dormancy, instinct, and learned behavior

* **amphibian** –a cold-blooded vertebrate that spends some time on land but must breed and develop into an adult in moist areas. Frogs, salamanders, and toads are amphibians.
* **carbon dioxide** – a colorless gas released from the decomposition of organic materials (i.e. animal respiration, burning of fossil fuels.) Carbon dioxide in the Earth’s atmosphere keeps some of the Sun’s energy from radiating back into space, keeping the planet warm enough to support life.
* **cold-blooded** – body temperature varies with surrounding temperature
* **climate change** – long-term alteration in global weather patterns, especially noted as increases in temperature and storm activity and intensity. These changes can be a combination of natural and/or human-induced activities such as the greenhouse effect from the burning of fossil fuels.
* **endangered species** – a species whose numbers are so few, or are declining so quickly, that the animal, plant, or other organism may soon become extinct. Endangered species are protected under national or international law.
* **greenhouse effect** –warming of a planet’s atmosphere caused by solar radiation trapped by water vapor and carbon dioxide.
* **habitat** – environment in which a plant or animal lives
* **preservation** – to keep intact, guard from danger, harm, or injury

**protection** – the act of preventing something from being harmed or damaged, or the state of being kept safe

* **research** – the methodical investigation into a subject in order to discover facts, to establish or revise a theory, or to develop a plan of action based on the facts discovered
* **terrestrial** –living or growing on land rather than in the sea or the air

# Pre-Ranger Visit Activities

Complete the following pre-visit activities to prepare the students for the Shenandoah National Park ranger program in your classroom.

**Materials for Pre-Ranger Visit Activities**

Internet access and speakers for videos and research, *What Is a National Park?* activity sheet (attached), *KWL* activity sheet (attached)

1. **What Is a National Park?**

Individually or as a class, visit the National Park Service website. Use the *What Is a National Park?* activity sheet and find six different national park areas and identify a significant feature of each selected park area. Next, use the Shenandoah National Park website to learn about the park.

## The Changing World of the Shenandoah Salamander

1. Use the *KWL a*ctivity sheet and have the students record what they KNOW about the Shenandoah salamander and climate change in the “K” column, and then brainstorm with students about what they WANT to know and record it in the “W” column.
2. Watch the *The* *Shenandoah Salamander* video (link on Resources and References page). Challenge the students to listen for the following concepts in the video and record what they learn in the “L” column:
* What is the habitat of the Shenandoah salamander and its specific needs for survival? *(cool and moist environments on mountaintops in Shenandoah National Park)*
* What physical and behavioral adaptations does the Shenandoah salamander have to help it survive in its environment? *(moist skin, lives at high elevation under rocks where it is cool and moist)*
* Why is the Shenandoah salamander a federally endangered species? *(Rarity, restricted range)*
* What is climate? *(weather conditions prevailing over a period of years)*
* What is climate change and what causes it? *(Climate change is a long-term alteration in global weather patterns, especially noted as increases in temperature and storm activity and intensity. These changes can be a combination of natural and/or human-induced activities such as the greenhouse effect from the burning of fossil fuels.)*
* What is happening to the habitat of the Shenandoah salamander? *(Human activities are causing more greenhouse gas emissions which cause higher temperatures and lower humidity in salamander habitat.)*
* The Shenandoah salamander is an endangered species and found only in Shenandoah National Park. Its habitat is changing ~ getting drier and warmer due to climate change.
* What will happen to the Shenandoah salamander if its habitat continues to change due to a changing climate? *(Can it move somewhere else? Can it adapt? Will it become extinct?)*
1. **What’s the Word**?

Select one student to lead a word game with the rest of the class. Have the leader choose a vocabulary word. Mark a blank line for each letter of the word on the chalkboard. The rest of the class tries to guess the missing letters to discover the word. As the students make guesses, place correct letters on the appropriate blank lines. Write incorrect letters in a separate column to show which letters have been guessed. For each incorrect guess, the leader is awarded a letter from ADAPT. The leader “survives” if he/she spells ADAPT before the rest of the class correctly spells and defines the vocabulary word. Repeat with other players as time allows.

# Shenandoah National Park Ranger In-Classroom Program

The ranger-led classroom program is designed for a 60 minute class period. Approximately 1 week before the classroom program**,** the lead ranger will contact the lead teacher to coordinate the final details of the program day: location, starting time for the program, and whether multiple classes will be scheduled. Share program details with all participating teachers. Allow time for the ranger to set up activities and prepare for the students.

* Please stay in the classroom to assist the students and ranger during the presentation.
* Provide a writing board (chalk, dry erase, or smartboard) and a small table for the ranger’s use.
* The ranger will discuss with students what they have learned from their pre-visit activities. The ranger will cover topics including Shenandoah National Park, the Shenandoah salamander, and climate change and its potential effect on the Shenandoah salamander.
* Students will participate in lively educational activities led by the ranger and assisted by the teacher.
* The ranger concludes the program with an invitation to visit the park. The teacher is provided with an information packet for the classroom.

# Post-Ranger Visit Activities

Following the Shenandoah National Park ranger program in your classroom, complete as many of the following post-visit activities as possible to conclude the unit of study. Complete the Program Evaluation Form. Return the program evaluation to:

Shenandoah National Park

3655 US Hwy 211 East

Luray, VA 22835

Attention: Education Office

**Materials for Post-Ranger Visit Activities**

*NPS Arrowhead* sheet (attached), Shenandoah salamander *KWL* sheets from pre-visit activity #2, salamander books, materials for habitat dioramas

1. **NPS Arrowhead**

Provide each student a copy of the blank National Park Service arrowhead symbol and have them color and decorate it with words or phrases that were learned about the Shenandoah salamander’s adaptations, habitat, survival challenges due to climate change and things people can do to help Shenandoah National Park “preserve and protect” all Park treasures especially the Shenandoah salamander. Share completed artwork with school community and parents.

1. **It’s Salamander SHOWTIME!** Review the Shenandoah salamander KWL chart and read a salamander book. Using a sock puppet, toy salamander, or a finger puppet, have students create a puppet show/skit/drama telling the story of the Shenandoah salamander and climate change. Present their skit before an audience.

***Salamanders of the Southeast*** by Joe Mitchell (non-fiction)

***The Salamander Spell*** by E.D. Baker (fiction)

***Salamander Rain: A Lake and Pond Journal*** by Kristin Joy Pratt-Serafini (fiction)

[***Big Night for Salamanders*** b](http://www.amazon.com/Night-Salamanders-Sarah-Marwil-Lamstein/dp/1932425985/ref%3Dpd_sim_sbs_b_3)y Sarah Marwil Lamstein (fiction)

## Shenandoah Salamander Habitat

Have students make a Shenandoah salamander habitat/diorama in a shoebox and be able to describe its habitat requirements.

## Eluding Extinction

Investigate “success stories” of other imperiled species and how people can make a difference to help the environment and species in danger of extinction.

1. **Make a Difference!!!**

Have the students participate in a citizen science project at school. Students will be able to analyze and share their data, submit poems, artwork, and other classroom activities to the projects that have student publications. The following projects have their own protocols, lessons, and general information to get your students involved in “making a difference” in their world.

JourneyNorth (monarch butterflies)

Project Budburst

Classroom Feederwatch

North American Amphibian Monitoring Project

**Unit Assessment**

1. *What’s a National Park?* activity sheet
2. *KWL Rocks!* activity sheet
3. NPS Arrowhead drawings
4. Salamander skit
5. Salamander habitat diorama

## Going Further

1. Take a field trip to Shenandoah National Park to investigate ecosystems on a ranger-led program in the park.
2. Make Your School a “Schoolyard Habitat”. With teacher assistance, students can analyze, then apply appropriate habitat principles in their schoolyard.
3. *Virginia Naturally* School Recognition Program. The [Virginia Board of Education has recognized](https://www.dgif.virginia.gov/wp-content/uploads/DOE-Certificate.jpg) the *Virginia Naturally* School program as the official environmental education school recognition program for the state. This program recognizes the wonderful efforts of many Virginia schools to increase the environmental awareness and stewardship of our youngest citizens.

**Resources and References**

**Pre-Ranger Visit Activities**

What Is a National Park?

National Park Service home page for finding information about individual parks:

<http://www.nps.gov/index.htm>

Frequently asked questions about the National Park Service:

<http://www.nps.gov/faqs.htm>

Shenandoah National Park website:

<https://www.nps.gov/shen/index.htm>

## The Changing World of the Shenandoah Salamander

<https://www.nps.gov/teachers/classrooms/the-changing-world-of-the-shenandoah-salamander.htm>

Shenandoah Salamander Video

<https://www.nps.gov/media/video/view.htm?id=EECE7B58-D93D-1FC6-FECD0299BEF7FCA0>

**Post-Ranger Visit Activities**

Eluding Extinction

Peregrine Falcons at Shenandoah National Park:

<http://www.nps.gov/shen/naturescience/falcon.htm>

Endangered Species Success Stories, US Fish and Wildlife Service:

<https://www.fws.gov/endangered/map/index.html>

12 Conservation Success Stories:

<https://www.endangered.org/12-conservation-success-stories-for-endangered-species-day/>

Make a Difference!

Student involvement in citizen science; informative and inspirational articles

<https://www.edutopia.org/service-learning-citizen-science>

National Science Foundation’s website with answers to “What Can I Do To Help?”

<http://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=123903>

JourneyNorth (monarch butterflies): <http://www.journeynorth.org/>

Project Budburst: <http://www.budburst.org/>

Classroom Feederwatch: <http://www.birds.cornell.edu/pfw/>

North American Amphibian Monitoring Project: <http://www.pwrc.usgs.gov/naamp/>

**Going Further**

Ecosystems field trip to Shenandoah National Park

<https://www.nps.gov/teachers/classrooms/ecosystems-the-world-wide-web-of-life.htm>

Schoolyard Habitat Program

<https://www.dgif.virginia.gov/wildlife/habitat/schools/>

Virginia Naturally School Recognition Program

<https://www.dgif.virginia.gov/education/school-recognition/>

**Print resources**

Baker, E. D. *The Salamander Spell*. New York: Bloomsbury, 2007. (fiction)

Lamstein, Sarah, and Carol Benioff. *Big Night for Salamanders*. Honesdale, PA: Boyds Mills, 2010.

Mitchell, Joseph C., and Whit Gibbons. *Salamanders of the Southeast*. Athens:

University of Georgia, 2010.

Pratt-Serafini, Kristin Joy. *Salamander Rain: A Lake & Pond Journal*. Nevada City, CA: Dawn Publications, 2000.

**Pre-Ranger Visit Activity #1**

**What Is a National Park?**

1. Use the National Park Service website at<http://www.nps.gov/index.htm>
	* Find six different types of National Park Service units (park, seashore, battlefield, historic site, trail, and monument).
	* List one outstanding feature for each unit.
	1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ National Park

Feature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ National Seashore

Feature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ National Battlefield

Feature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ National Historic Site

Feature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ National Historic Trail

Feature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ National Monument

Feature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Use the Shenandoah National Park website at [www.nps.gov/shen.](http://www.nps.gov/shen)
	* What is an outstanding feature of Shenandoah? What makes it special?
	* Draw a picture of something that you’d like to see when you visit Shenandoah National Park.

**Pre-Ranger Visit Acivity #2**

**KWL Chart**

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Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

In the first column, write what you already knowabout climate change and the Shenandoah salamander. In the second column, write what you want to know about climate change and the Shenandoah salamander. **After** you have watched the video, write what you learned in the third column.

|  |  |  |
| --- | --- | --- |
| What I **K**now | What I **W**ant to Know | What I **L**earned |
|  |  |  |

**Post-Ranger Visit Activity #1**

Things I can do to help protect the Shenandoah salamander….

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