



Bat, What Can We Do?

9-12 grade

Themes: Bat Week, wildlife disease, human interaction

Location:

Remote learning modification: Lesson can be taught over Zoom or Google Classrooms. Encourage students to take a bat walk if insects are still out in your area (June-September) You can also [watch bat cams](#).

Lesson can be taught in the classroom. If you have the ability to take students on a bat-trip, we recommend doing so. See bottom of the lesson for places to view bats.

Standards:

NGSS

HS-LS2-7

Design, evaluate and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

LS2.C Moreover, anthropogenic changes (induced by human activity) in the environment--including habitat destruction, pollution, introduction of invasive species, overexploitation and climate change-- can disrupt an ecosystem and threaten the survival of some species.

CCSS

RST.11-12.8

Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

WHST.9-12.7

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

WA ESE Standard 1

Ecological, Social, and Economic Systems: Students develop knowledge of the interconnections and interdependency of ecological, social, and economic systems. They demonstrate understanding of how the health of these systems determines the sustainability of natural and human communities at local, regional, national, tribal, and global levels.

Materials:

WDFW PowerPoints, WDFW bat analysis worksheet, computer, word processing software. Other materials may vary depending on student project needs.

Modifications, Adaptations:

For COVID-19 distance learning, or other remote learning modification, look for **Remote learning modifications** throughout the lesson plan.

Vocabulary:

Endangered species: A species of plant or animal that is at serious risk of extinction.

Threatened species: A species that is declining, and if not protected may become endangered.

Extinct: A species that is no longer in existence.

White-nose syndrome: Visible growth on the muzzle and hairless parts of a bat, caused by a fungus (*Pseudogymnoascus destructans*) that lives in cold, moist environments.

Infectious disease: Diseases caused by microorganisms such as bacteria, viruses, parasites, or fungi that can be spread, directly or indirectly, from one organism to another.

Torpor: A state of decreased physiological activity in an animal, usually by a reduced body temperature and metabolic rate. Torpor enables animals to survive periods of reduced food availability.

Hibernation: An inactive state resembling deep sleep where the body temperatures lower, breathing and heart rate slows.

Anthropogenic: Human caused, or human generated.

Ecosystem Services: Benefits people obtain from ecosystems.

Hibernacula: The shelter of a hibernating animal over winter.

Colony: A group of bats.

Roost: A place where winged animals rest or sleep.

Maternity colonies: temporary association of reproductive female bats for giving birth to, nursing, and weaning their young, also called pups.

Objectives:

Students will...

1. Explain at least one reason for the decline of bats in North America.
2. Describe the effects of the decline of bats on people and the environment.
3. Analyze potential barriers surrounding the recovery of bats and examine strategies to resolve those issues.
4. Create a project that answers a self-generated question concerning how humans can help bats thrive.
5. Evaluate the efficacy of their project and their data.

Procedure:

This lesson is designed to be taught over multiple class periods. To give students time to research, design and implement their project, we recommend giving them a one to two month time frame with regular check-ins.

Part A: Introduction to bats:

Remote learning modification: This lesson can be taught over Zoom or Google Classrooms.

- Gather information about student knowledge by asking questions such as:
 1. What do bats eat?
 2. Where do bats live?
 3. When are bats active?
 4. Do bats provide us with services? If so, what kind?

Discuss student answers and provide feedback as your knowledge allows.



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Procedure Continued:

- As a class, watch the webinar: [Tequila to Pest Control: How Bats are Important to Ecosystems and Economies](#). You may want to pre-load the video. You have to register with your name and e-mail to watch the video, but it is a free, comprehensive resource. Start the webinar at 2:50 and end it at 29:05.

Have students discuss in pairs three ways bats are important to humans and what may happen if bats continue to decline. **Remote learning modification:** Disperse up students into Zoom/Google Hangout breakout rooms. Write the prompt on the screen so they remember what they are discussing.

Have students fill out the bat analysis worksheet as homework or fill out the sheet together as a class.

Part B: introduction to white-nose syndrome:

Introduce students to concept of infectious disease. Have them consider:

- What causes infectious disease?
- What are symptoms of infectious disease?
- How does infectious disease spread?

[Watch this six minute video](#) on how researchers in Michigan are studying the infectious fungal disease, white-nose syndrome (WNS) which affects bats. After the video, talk about how, or if this research could help out bats. Then [watch this short video](#) on what researchers in Washington are doing to study WNS.

Present the PowerPoint, White-Nose Syndrome: A Deadly Bat Disease to the class. Make sure that presenter notes are turned on. The PowerPoint will introduce bats to students, and will also reiterate bat/COVID-19 myths and safety around bats.

After the PowerPoint, ask students to brainstorm a handful of ways bat extinction would affect humans. Then have them generate questions that will serve as the basis for their research project. Some examples include:

- How can 10th graders at our high school help bats thrive in our community?
- What are some ways families can promote the health of bats in North America?
- What research needs to be done to better combat WNS?
- Why are some bats not harmed by WNS?
- How can we work with wind companies to make turbines safer for bats?

Students should generate a list of at least three questions. Ask them to spend a half hour researching their three questions and have them narrow down their list to the one question they are most interested in answering.

Part C: The research project

Inform students they will be working over the next couple of months to answer their chosen question. They must thoroughly research their topic using resources from the library, Internet, state and federal wildlife agencies, and bat-focused non-profit organizations. Their project could vary from creating a bat-friendly garden in their yard/local church/community center to researching ways wildlife agencies are working to prevent the spread of WNS, to

creating an educational video combating common bat myths. The students' research should be comprehensive, and draw from multiple scientific and governmental sources.

Teacher's choice: You can pair students in groups, have them choose their own groups or allow them to work individually. If students are working in groups or pairs, they must choose one question as the basis for their research project.

You should evaluate, provide feedback and approve student projects before they begin. Students should outline potential steps they are going to take to answer their question. Provide students with a timeline of project goals and deadlines so they do not wait until the last minute to begin.

A short paper (three to five pages) should accompany their project. The paper should introduce the question they answered and should outline the steps they took to answer that question and any challenges they may have faced. Students should address how effective their project was and how they chose to measure their effectiveness. Students should cite corroborating sources and identify sources that challenge their conclusion. The paper should cite a minimum of three to five technical sources. Sources should be credible and pass the Currency Reliability Authority Purpose/point of view (CRAP) test. [This website introduces students to the C.R.A.P method](#) and shows them how to find credible sources.

If doing a hands on project like building a bat box or creating a bat garden, students should use their sources to evaluate: 1. What species lives in that area 2. Preferred habitat and roost placement. Students may need to get in contact with a local bat conservationist or bat biologist for more information.

Students can focus their project in their community, in the state, or in North America. Students are discouraged from focusing on a species outside of North America or the United States.

Remote learning modification: If you choose to allow students to work in a group, have them share work over Google Drive. If they must meet (for example to create a garden), make sure they are feeling well, working six-feet apart and wearing appropriate face coverings.

 **Idea:** Show off your students' work! Share student projects from this lesson with WDFW
Facebook: @WashingtonFishWildlife
Instagram: @TheWDFW
Twitter: @WDFW
#WildWashington #WildWa #BatWeek #BatHero



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Additional Lessons:

The following lessons also focus on bats and are at a high school grade level.

[Working the Night Shift](#)

[Fungus Among Us](#)

[Heroes of the Night](#)

[Bat Squad](#)

[Lessons for K-8](#)

[White Nose Syndrome](#)

Additional Resources :

You can use the following resources to build onto this lesson, or share these resources with students for their research project.

- [Bat Blitz Webinar October 22nd, 29th 2020-Project WILD](#)
- [Living With Bats webpage-WDFW](#)
- [Living with bats PDF- WDFW](#)
- [Bat Conservation Plan-WDFW](#)
- [White nose syndrome PSA-WDFW](#)
- [White nose syndrome in Washington-WDFW](#)
- [Taking the Night Shift blog-WDFW](#)
- [Post bat house specifications-WDFW](#)
- [Bat Resources-Arizona Fish and Game](#)
- [EduBat](#)
- [About Bats-Bat Conservation International \(BCI\)](#)
- [Experience a virtual batnado-BCI](#)
- [Fly through Bracken Cave like a bat](#)
- [Why are bats important graphic-BCI](#)
- [Bats and COVID-19 Updates \(with video\)-BCI](#)
- [Bats and COVID-19 Overview-BCI](#)
- [Bat videos-National Park Service](#)
- [Northwest Bats-Bats Northwest](#)
- [Bat Cams-Bats Northwest](#)
- [Bat Watching 101-Bats Northwest](#)
- [Bats About Town](#)

Additional Resources Continued:

- [What you can do-Western Bat Working Group](#)
- [Make your own bat detector](#)
- [White nose syndrome video game](#)
- [Bat Information-EduBat](#)
- [StoryMap of white nose syndrome](#)
- [White nose syndrome video](#)
- [Stopping spread of WNS in Washington](#)
- [White nose detected in second county in Washington](#)
- [Bat science at Twilight-NW Trek](#)
- [Bat guano- NW Trek](#)
- [Apply to monitor bats at NW Trek](#)
- [Virtual community trainings-Wildlife Acoustics](#)
- [North American bat monitoring program- United States Geological Survey](#)
- [Citizen science wildlife monitoring-Conservation Northwest](#)

Bat viewing locations

This list is not exhaustive and bats are often found in both urban and rural settings during evenings. Look anywhere with a lot of insects! Bats can be seen between June and September.

- [Green Lake- Seattle](#)
- [Point Defiance Park-Tacoma](#)
- [Northwest Trek-Eatonville](#)
- [Woodard Bay-Olympia](#)
- [Capitol Lake-Olympia](#)
- [Little Pend Oreille National Wildlife Refuge-Colville](#)
- [Moses Coulee Preserve-Waterville](#)
- [Mid-Columbia National Wildlife Refuge-Othello](#)