GUIDE FOR EDUCATORS: HIGH SCHOOL TO ADULT

PATH OF THE PANTHER

Interdisciplinary ideas and activities for learning about environmental conservation concepts: **endangered species recovery** and the role of **wildlife corridors** PathofthePanther.com

DISCOVER THE FLORIDA PANTHER AND THE FLORIDA WILDLIFE CORRIDOR

This guide offers a rich exploration of the Florida panther and the Florida Wildlife Corridor, designed for high school to adult audiences. Through the lens of the film *Path of the Panther*, you'll gain unique insights into the lives and struggles of this endangered species. With stunning visuals and informative narration, the film underscores the critical need for conservation, emphasizing the protection of natural habitats and biodiversity. Viewing the film connects us to wild places, wherever we are.

Aligned with **national (NGSS) and Florida science standards**, the guide's activities cover **core life science concepts** and practices. Learners will tackle real-life issues and data, with cross-disciplinary connections to **art**, **history**, **geography**, **language arts**, **math/data literacy**, **technology**, and more. This holistic approach helps learners appreciate the value of resilient ecosystems and the delicate balance between human and wildlife needs.

Whether in formal or informal settings, educators can adapt these activities for their audiences, presenting them as a unit or as stand-alone activities. Most are designed for about 100 minutes, or two class periods, but they can be modified for different learning environments. The guide features a diverse mix of media, including film clips, maps, photography, interactive tools including National Geographic's MapMaker and ArcGIS StoryMaps, and engaging citizen science opportunities. Learning about the Florida Wildlife Corridor serves as a springboard to understanding wildlife corridors and conservation efforts worldwide.

The Florida panther stands as a global icon for wildlife conservation and human interaction with natural environments. Once nearly extinct in the 1950s, the Florida panther was among the first to be listed as an endangered species in the U.S. in 1973. Today, its population has grown from about 30 adults to nearly 200, symbolizing the success and ongoing necessity of dedicated conservation efforts.

ESSENTIAL QUESTIONS

- Why are biodiversity and wildlife connectivity important?
- What is the role of a wildlife corridor?
- Why does conservation matter?
- Why should I care?
- What can I do to help?

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strategies for protection.

Identify threats to the

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Create webs to explore trophic level interactions.

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Explore panther history and graph population change.

Analyze data and defend or refute a claim.

Use GIS mapping tools to explore panther geography and estimate populations.



Analyze observation data in iNaturalist's Florida Wildlife Corridor project.

Consider factors in vehicle collisions and find solutions.

Find common ground through discussion of corridor issues from different viewpoints.

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LEARNING ABOUT WILDLIFE CORRIDORS

The **Florida Wildlife Corridor** is a network of connected lands and waters essential for the survival of diverse wildlife species, including the endangered Florida panther. This corridor facilitates the movement of animals across habitats, supports biodiversity, and helps maintain healthy ecosystems by linking conservation areas throughout the state. By learning about this unique conservation area, students will gain a deeper understanding of the importance of conservation efforts and the impacts that humans can have on our environment. Exploring the Florida Wildlife Corridor will help students develop a sense of responsibility toward preserving our natural resources for future generations.

Why should we care?

Caring about the Florida panther and the wildlife corridor is crucial because they represent the health and sustainability of our ecosystems, supporting biodiversity and preventing habitat fragmentation. Protecting these elements ensures the survival of numerous species interconnected within ecosystems, maintaining a natural balance benefiting both wildlife and human communities. The Florida panther and other wildlife, however, face a multitude of new challenges, including habitat fragmentation and vehicle collisions, as humans and development encroach on wild Florida. Protecting this land contributes to the <u>health of Florida's water</u> in rivers and streams and underground in aquifers, as well as to the flow of critical waters of the Everglades. The interacting systems of the geosphere, biosphere, hydrosphere, and atmosphere in and around the Florida Wildlife Corridor are a microcosm of our planet's vital balance.

What can we do?

These key areas of action hold a world of possibilities for all of us. To help, we can:

- O educate ourselves about the science and interdisciplinary nature of biodiversity, wild places, and resilient ecosystems for humans and wildlife;
- O foster and connect with wild, biodiverse places and the people and organizations supporting them–wherever we are; and
- O take action by observing, analyzing, expressing, and communicating through words and visuals what needs to happen. Visit <u>wildpath.com</u> and follow
 @PathofthePanther on social media to see how you can help protect our wildlife and lands.

Finally, we encourage you to share this resource widely. Spreading the word about these invaluable resources can enrich the educational experiences of learners and educators of all ages and backgrounds.



MORE PATH OF THE PANTHER RESOURCES

For more resources, discussion topics, and activity ideas for grades K-12+, see the <u>Path of</u> <u>the Panther education page</u> (<u>pathofthepanther.com/learn</u>). You will also find a Film Discussion Guide, film clips, and activity guides for elementary and middle school students—all designed to enhance the educational experience of watching the documentary. You can view the **Path of the Panther** film on **Disney+** and **Hulu**.

THANK YOU for making *Path of the Panther* part of your teaching. Help us learn what resonated with you and your students by tagging **@PathofthePanther** on social media.



1 THE ENDANGERED FLORIDA PANTHER: A COMPLEX SOCIAL-ECOLOGICAL STORY

In this activity, students engage with the **Path of the Panther** film to build understanding of the complex story of the Florida panther and the land they and other species inhabit. This lesson is flexible for high school introductory biology students, with adaptations for advanced life science courses, adult courses, and nonformal education groups.

For younger audiences, students analyze **Path of the Panther** film clips to learn the story of this endangered species. Students will recognize the challenges of tracking and protecting this elusive big cat, as they build understanding of threats the Florida panther faces from hunting, habitat destruction, vehicle collisions, and disease. To demonstrate their learning, students create posters with proposals for addressing threats and limiting factors as a way to protect the panther and its habitat.

For advanced high school and adult audiences, participants watch the full *Path of the Panther* film or the clips provided, capturing notes on panther life history, human-wildlife challenges, tracking panthers, and progress and threats to recovery. They engage in small group discussions, then demonstrate learning and insights by creating posters with proposals for protecting the panther and its habitat.

Proposals from this activity will be useful as an additional resource in Activity 8: Florida Wildlife Corridor Voices Roundtable.

KEY TERMS

- endangered species
- populationwildlife tracking
- limiting factor

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50 minutes

Life Sciences, General

Government, Geography,

► Grades 9-Adult

to Advanced

BACKGROUND

The film Path of the Panther provides a window into the ecosystems that support wildlife within the Florida Wildlife Corridor, the human impacts affecting wildlife populations, and the actions of people who are committed to conservation. The Florida panther, once roaming habitats throughout the southeast United States, is now found only in the southern region of Florida. The Florida Wildlife Corridor, designed to facilitate movement of wildlife, allows species to roam freely across diverse ecosystems. This network of connected public and private lands provides a natural habitat for countless endangered species, including the Florida panther.

Endangered species are organisms threatened by extinction, often due to habitat loss or loss of genetic diversity. Habitat loss can happen naturally or as a result of human-caused threats such as land development, habitat fragmentation, hunting, or vehicle collisions.

Limiting factors in nature can also constrain the size of a **population**. Examples of limiting factors include scarce food sources, few mates, and competition for resources. Often, a population is affected by several limiting factors at once. Over time, limiting factors can cause population growth to slow and then stop as a population reaches the carrying capacity of the ecosystem. In addition to habitat loss, vehicle collisions, and hunting, the Florida panther population has been influenced by limiting factors including disease and a decrease in genetic diversity.

STANDARDS

This activity addresses the following:

NGSS: HS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

Florida NGSS: SC.912.L.17.6: Discuss, compare, and negotiate methods to balance the needs of humans with the needs of the environment.

AP Environmental Science: EIN-2.M: Describe the effects of urbanization on the environment.

Students will:

- O identify threats to the Florida panther population;
- O discuss and evaluate different solutions to threats to the panther habitat and population; and
- O propose strategies for protecting the Florida panther from extinction.

Gather and/or print materials:

- O Handout: Journey of the Endangered Florida Panther or Endangered Florida Panther Notes (1 per pair or small group)
- O Film Clips: pathofthepanther.com/resources

Set up technology:

- O Large poster paper (1 per pair or small group)
- O Markers (1 per pair or small group)
- O Sticky notes (optional)
- O Reference: Endangered Species, Limiting Factors

Have students view as a whole class the film *Path of the Panther* or the selected film clips provided. Alternatively, viewing in pairs or small groups could give students an opportunity for more discussion. This assignment could also be completed as homework prior to group discussions and proposal development.

5 MIN INTRODUCE THE ACTIVITY

- 1. Build interest and access prior knowledge with a short discussion. Ask:
 - What large animals/predators live in your local ecosystems? What large predators have you seen, or what have you not seen that you think lives near you?
 - How do you think the population of large wild animals, such as black bears or mountain lions, has changed since 1900? What might have led to those changes? Generate ideas around changes in habitat locally and more broadly for large mammals, including how they and humans interact.





PREPARATION

OBJECTIVES

THE ENDANGERED FLORIDA PANTHER: A COMPLEX SOCIAL-ECOLOGICAL STORY

2. Explain that while black bears live all over North America, big cats are much less common. Explain to students that to find out more, they will view clips from the *Path of the Panther* documentary film. They will examine how threats and <u>limiting factors</u> have caused the population of one of North America's big cats, the Florida panther, to decrease so much that it's been listed as an <u>endangered species</u>. Then they will create a proposal to address those factors to better protect the panther.

30 MIN VIEW CLIPS OR 90 MIN FULL FILM

- **3.** Determine which handout to use with students: Journey of the Endangered Florida Panther (for clips) or Endangered Florida Panther Notes (for the full film).
- **4.** Give pairs or small groups the handout to prompt note-taking as they view the film or clips. Rewind as needed to clarify information in the videos.
 - If watching clips, pause after each clip and discuss as a class the key points, using the following prompt:
 - What factors have limited the panther population, past and present? Have students circle or highlight notes referring to threats or limiting factors.
 - If watching the full film, have students take notes in the graphic organizer as they view the film.

Have students circle or highlight notes referring to threats or limiting factors.

15 MIN DISCUSS AND DEVELOP A PROPOSAL TO PROTECT THE FLORIDA PANTHER

- **5.** Organize students into small groups for a short discussion. Each group should have a facilitator, a timekeeper, and a recorder to summarize. First, ask each group member to share a quote or scene that was significant to them and explain why. Then have groups discuss ideas for the following:
 - What threats exist for the Florida panther?
 - What opportunities are presented in the film for solutions?
- **6.** Propose to students this key question: *What do panthers need to continue increasing their population*? Have students follow the prompt on the handout to develop their ideas.
- 7. Have students use large paper and markers to create a poster with their proposal ideas. Each group can post their proposal on the walls and present it to the class, or groups can move around the room as a "gallery walk," seeing each group's ideas and adding more ideas to posters using sticky notes.
- 8. To wrap up the discussion, students can talk about any valuable new ideas added to their posters. They can also take a moment to reflect and jot down and/or share something they have learned using the prompt "I used to think.... Now I think..." Collect ideas as they leave to gauge understanding.

MORE TO EXPLORE

ENDANGERED SPECIES RESEARCH

Have the group do some research on endangered species in their area (by county with <u>this tool</u>) and then find out the threats to those species. How similar are the threats to those of the Florida panther? Have wildlife corridors or other conservation strategies been put in place to address the needs of these endangered species?



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PATH OF THE PANTHER

JOURNEY OF THE ENDANGERED FLORIDA PANTHER

View clips from *Path of the Panther* to gather evidence about impacts on this endangered species, and discover how people have been working to help this species survive. Then use this information to propose strategies for protection.

CLIP 1: A Florida Highway

- 1. What two different settings are presented in this clip? Describe what you see and hear in each.
- 2. What is the primary cause of panther deaths in Florida?
- 3. Where in Florida do these panthers live?

CLIP 2: Threats to the Panther

- 4. How does wildlife photographer Carlton Ward Jr. describe the panther?
- 5. What is meant by this quote: "...there are so few panthers that extinction could be just around the corner"?
- 6. According to the film, what are three ways the Florida panther has been negatively impacted, causing a decrease in the population?

CLIP 3: Hope for Movement North

- 7. What do Brian and Carlton do to try to find panthers?
- 8. Why are they eager to see a female panther in the northern Everglades?







- 9. Why is it so difficult to track the Florida panther?
- 10. How many panthers are believed to be in the northern Everglades, north of the Caloosahatchee River?



- 11. Why is Carlton so happy, and then heartbroken, by what he sees?
- 12. What are two more threats to the panther population?
- 13. "What the panther needs, what the whole ecosystem needs, is that lifeline to the north." In the quote above, what do you think a "lifeline to the north" could be?

WRAP-UP ASSIGNMENT: What are the Solutions?

Consider the threats to the endangered Florida panther (see your answers to questions 2, 6, and 12). What solutions are needed to reduce those threats? Create a proposal to protect the Florida panther from extinction. Present a poster that includes:

- The three solutions
- How each solution will help to reduce a threat
- Details about how to make the solution happen



PATH OF THE PANTHER

ENDANGERED FLORIDA PANTHER NOTES

View Path of the Panther and capture notes for each of the key themes below, using the questions for guidance. Note key scenes, quotes, moments, or new questions you have. Then, use this information to inform a proposal for protection.

Humans and Wildlife in the Florida Landscape	Panther Ecology Past and Present
O What settings are portrayed in the film?	O Where do panthers live? What are their ranges historically and currently?
 O Describe connections and relationships among the Miccosukee tribe, panthers, and the land. O In what ways are panther ranges and new development interconnected? 	 O Describe social interactions and hunting style. O What limiting factors impact the population?
Threats to the Panther Population	Tracking and Documenting Panthers
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ASSIGNMENT: Propose Solutions

Consider threats to the Florida panther from your notes and discussion. What solutions could address those threats? Create a proposal to protect the Florida panther from extinction. Present as a poster that includes:

- The major threats
- > 2-3 proposed solutions, with explanations for how each solution would help reduce or eliminate the threat
- Ideas for how to make the solution happen



2 FOOD WEBS IN THE CORRIDOR



- Grades 9-Adult
- Life Sciences, General to Advanced
- Writing, Social Studies, Activism, Government, and Technology Connections

In this activity, **high school students** and **adult learners** explore how ecological systems are interconnected and more complex than linear food chains. Students use research and wildlife images from the Florida Wildlife Corridor to distinguish between producers, consumers, and decomposers, build food webs, and identify trophic level interactions. They consider a variety of scenarios of human and environmental impacts on these interactions and use evidence to support a claim about impacts on their food webs. The activity culminates with discussion of the Florida panther as an apex predator with significant influence on the rest of the web.

KEY TERMS

- apex predator
- decomposer
- food web
- keystone species
- predator
- primary consumer

- primary producer
- scavenger
- secondary consumer
- ► tertiary consumer
- trophic cascade

BACKGROUND

The Florida Wildlife Corridor sustains a complex network of interconnected **food webs** crucial for the survival of its diverse flora and fauna. At its heart lies the delicate balance between predators, prey, and plants, all intricately linked in a web of dependencies.

Starting with plants, the corridor hosts a rich array of species including saw palmetto, wildflowers, and various grasses. These **primary producers** form the foundation of the food web, providing sustenance for herbivores, or **primary consumers**, such as white-tailed deer, rabbits, and various species of insects. For instance, the white-tailed deer feeds on a variety of vegetation including palmetto leaves and grasses, while insects like butterflies rely on nectar from wildflowers for sustenance.

Moving up the food chain, **predators** like the Florida panther and black bear depend on these herbivores for their survival. The Florida panther preys on deer, controlling their population and ensuring the health of the ecosystem. Similarly, black bears feed on a range of vegetation and animals, playing a vital role in maintaining ecological balance.

Scavengers such as vultures and raccoons contribute to the food web by consuming carrion and recycling nutrients back into the ecosystem. Additionally, birds of prey like the bald eagle and osprey hunt small mammals and fish, further diversifying the trophic interactions within the corridor.



FOOD WEBS IN THE CORRIDOR

In this interconnected web of life, each species plays a vital role in regulating populations and maintaining the health of the ecosystem. Here, the Florida panther is both an apex predator and keystone species with significant influence on the rest of the web. Protecting and preserving the Florida Wildlife Corridor is essential not only for the survival of its inhabitants but also for ensuring the resilience of the entire region.

A trophic cascade is a chain reaction within an ecosystem triggered by changes in the population of a particular species, leading to significant alterations in the abundance and behavior of other species within the food web. Typically, it starts with the alteration of the population density of a top predator, which then affects the population of its prey, subsequently influencing the population of lower

trophic levels. This can result in complex and sometimes unexpected shifts in species composition, biodiversity, and ecosystem dynamics, ultimately impacting the structure and function of the entire ecosystem. For example, the decline of wolves in Yellowstone National Park led to an increase in elk populations, which then overgrazed vegetation, negatively impacting songbird populations and altering the flow of rivers due to destabilized riverbanks.

In the Yellowstone region and within the Florida Wildlife Corridor, biologists investigate trophic relationships by studying populations, interactions, and ecosystem dynamics, using methods like field observations and mathematical modeling. Their work builds understanding of the mechanisms driving trophic cascades and guides conservation efforts.

> O Handout: Trophic Level Interactions Data Table (1 per small group)

(1 per small group, color printed

O Handout: Species Cards

on cardstock if possible)

O Handout: Food Web Impacts

O Handout: Scenario Cards

(1 per small group)

(1 per small group)

Students will:

- O explore the impact of one keystone species on an entire ecosystem by investigating impacts of the reintroduction of the gray wolf in the Greater Yellowstone Ecosystem;
- O use wildlife images from the Florida Wildlife Corridor to create food webs, distinguish between producers, consumers, and decomposers, and identify trophic level interactions; and
- O consider human and environmental impacts, and use evidence to evaluate the claim that changes in an ecosystem can impact the number and kind of species in an ecosystem.

Gather and/or print materials:

- O Video: "Wolves of Yellowstone" (5:19)
- O Online resource: Wolves Keep Yellowstone in Balance (optional)
- O Article: The Big Scientific Debate: Trophic Cascades (optional)
- O Slides: Food Webs in the Corridor
- O Video: "Wildlife by Camera Trap" (1:35)
- O Sticky notes (5-7 per student)

Set up technology:

Determine whether students will use individual computers or small groups will share computers to conduct species research.

Additional preparation:

- O Determine how students will view the Species Cards and Scenario Cards. For example, you can: provide cards to students digitally; display cards in a central location for students to view and choose from; or print and cut out one set of Species Cards and one set of Scenario Cards for each small group.
- O Determine how students will model the flow of energy among organisms. For example, you can print out or draw and cut out arrows for students to place in between Species Cards; or provide student pairs with mini whiteboards, chalkboards, or paper to draw the arrows on in between Species Cards.

STANDARDS

This activity addresses the following:

NGSS: HS-LS2-6: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

Florida NGSS: SC.912.L.17.9:

Use a food web to identify and distinguish producers, consumers, and decomposers.



OBJECTIVES

15 MIN INTRODUCE A COMPLEX FOOD WEB AND TROPHIC CASCADE

- Begin by having students view a video of ecosystem dynamics: <u>"Wolves of Yellowstone</u>" (5:19). Have them take notes on the wildlife and plants in the video, the interactions among them, and also environmental impacts. Preview the questions below with students so they know what to listen for as they watch:
 - What is a keystone species, and what is the example of one in the Yellowstone ecosystem?
 - What is one negative impact of the missing wolves in Yellowstone?
 - What is one positive impact of the reintroduction of wolves into Yellowstone?
- **2.** Facilitate a discussion using the previewed questions and the following questions, to engage students in a deeper conversation about the interconnected nature of food webs in an ecosystem, and also what they know about Florida ecosystems:
 - How does the presence of a keystone species impact the food web within the ecosystem?
 - How does a trophic cascade influence other species in a complex system?
 - What are examples of keystone species in Florida?
 - What are examples of Florida ecosystems that may be susceptible to ecological change and trophic cascade?

To reinforce the concept of a trophic cascade, you can also provide the <u>Wolves Keep</u> <u>Yellowstone</u> in Balance infographic.

15 MIN INTRODUCE CAMERA TRAPS AND ECOLOGICAL INTERACTIONS

- **3.** Project the slide with the camera trap image of a bobcat jumping over a log with a hare in its mouth.
 - Note on camera traps: Explain that many of Carlton Ward Jr.'s wildlife photos and videos are from camera traps placed in the wild. These cameras have sensors that take a photo or video when sensing movement. Because they "capture" only the photos of wildlife, use of camera traps can be a minimally invasive approach to species monitoring.
- **4.** In pairs, have students discuss the trophic relationship represented in this photo. Students should identify that the sun provides energy for the plants, which then might be eaten by the hare, which then provides energy to the bobcat as its predator.
- 5. Show students the video clip "Wildlife by Camera Trap" (1:35). Ask students to identify primary producers, primary consumers, secondary consumers, and tertiary consumers as they watch the video, writing examples of each on sticky notes. Give small groups an opportunity to compile and compare their sticky notes to check understanding of producers and consumers. Discuss as a whole class as needed. Talk about how camera traps can provide useful research data on the presence and behavior of wildlife, including tertiary consumers, or apex predators, such as panthers and alligators.



15 MIN RESEARCH SPECIES INTERACTIONS

- **6.** Provide each small group with a printed copy of the Species Cards (can be cut into cards in advance) with Florida Wildlife Corridor species.
- 7. Have students choose 4-5 organisms from the cards and research their trophic level interactions. Students can use <u>Wildlife Profiles</u> for research, which has key information on most of the species within the camera trap images. Have students record their research in the Trophic Level Interactions Data Table handout. If they find a species not represented in the cards that involves a trophic level interaction, have them create a new card with the name and a sketch of the organism. Students may choose to add organisms in the photos, including the marsh rabbit, mole cricket, amphiuma, American beautyberry, etc.

10 MIN CONSTRUCT FOOD CHAINS AND FOOD WEBS

- **8.** Students can now use their research to construct a food chain by arranging the Species Cards in order of energy transfer, using arrows to model the direction of energy flow. A model is provided in the slides.
- **9.** Next, have each group partner with another small group to construct a food web by connecting multiple food chains. A model is provided in the slides.

10 MIN ADD SCENARIOS TO FOOD WEBS

- **10.** Next, display the Scenario Cards in a central location, or provide each group with their own set of cards.
- **11.** Instruct students to randomly choose and read two or three Scenario Cards, and then discuss how each impacts their food web. Have them record ideas in the Food Web Impacts handout.

5 MIN USE EVIDENCE TO SUPPORT A CLAIM

12. Provide students with the claim below. Have students use evidence from the Scenario Cards and their Food Web Impacts chart to evaluate the claim and provide reasoning, using the claim as a sentence stem:

"Changes in the ecosystem can result in changes in the number and kinds of organisms in that ecosystem is supported by evidence because..."

 Student sample: I think the claim: Changes in ecosystems can result in changes in the number and kinds of organisms in that ecosystem is supported by evidence because... vehicle collisions account for 59% of Florida panther deaths. If a major highway is built in a panther's range, then the number of panthers will decrease due to vehicle collisions. Or, if saw palmettos are protected, then the number of honey bees could increase since they pollinate saw palmettos. The number of black bears could also increase since black bears eat saw palmetto berries and honey.

MORE TO EXPLORE

WILDLIFE RESEARCH WITH CAMERA TRAPS

Have students learn more about the <u>camera trap network</u> that Carlton Ward's team uses to track Florida panthers and other wildlife. Discuss the potential for using low-cost camera traps on your school campus to determine wildlife species present beyond school hours. Your students can also help with actual camera trap research by identifying species in online projects included on <u>InstantWild.zsl.org</u> or the <u>Zooniverse.org</u>.

COMMUNICATE AUTHENTICALLY

Have students meet with or write to local lawmakers regarding whether or not additional lands should be preserved within the Florida Wildlife Corridor. Optionally, you could extend corridor connections to your local community. Have students use the claim they constructed during the activity to support their argument. Empower students to choose how to communicate, for example, by writing a letter, drafting an email, creating a social media post, and so on.



FOOD WEBS IN THE CORRIDOR

10 MIN CONNECT TO THE FLORIDA PANTHER

- **13.** Use the slides to display a photo captured from a camera on the GPS collar of a white-tailed deer carcass being eaten by a panther.
- **14.** Provide each student with one sticky note to use to respond to the following prompt: Describe one trophic cascade effect that could result from extinction of the Florida panther in its ecosystem.
- **15.** Have students place their sticky notes on the board or in a central location when they are done, and have them read their peers' responses.
- **16.** Discuss how a trophic cascade similar to the one that occurred in Yellowstone could occur in south Florida if the panther, or another apex predator, became fully extinct.

MORE TO EXPLORE

EVERGLADES GHOST ORCHIDS

Have students watch Wildpath's <u>"Chasing Ghosts" video</u>, and then determine how this endangered orchid is part of the Everglades' food webs. (Explain that camera trap images in the film were the first-ever records of a pollination of the ghost orchid.) How does this species contribute to a biodiverse ecosystem?





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TROPHIC LEVEL INTERACTIONS DATA TABLE

Choose 4-5 organisms from the Species Cards to conduct further research on before constructing food chains and food webs. Use the blank Species Cards to create additional cards for organisms you discover through your research. For example, if you learn that white-tailed deer use the American beautyberry as an energy source, draw it on one of the blank cards to use for your food chain or web. You can start here: <u>myfwc.com/wildlifehabitats/profiles/</u>.





SPECIES CARDS





A **black bear** travels through its vast range near a 500-year-old cypress tree.



A **sphinx moth** potentially pollinates a rare ghost orchid within the Florida Panther National Wildlife Refuge.



A male **Florida panther** leaps over swamp water as he patrols his territory in Florida Panther National Wildlife Refuge.



A **burrowing owl** in the Everglades Headwaters area holds a mole cricket, possibly its next meal.



The Osceola variety of the **American turkey** thrives in Florida woodlands and swamps, here south of the Caloosahatchee River.



Carrying a **marsh rabbit**, a **bobcat** flies over a swamped log in the Florida Panther National Wildlife Refuge.



SPECIES CARDS CONTINUED





A **manatee** mother and calf seek refuge from the cold Gulf of Mexico in the spring-fed Crystal River National Wildlife Refuge.



A **double-crested cormorant** dries its wings from a submerged log in the spring-fed Rainbow River.



Longleaf pines stand over an understory of palmettos and wire grass in Ocala National Forest.



A **raccoon** eyes the camera trap set in the Fakahatchee Strand within the Florida Panther National Wildlife Refuge.



Otters hunt along submerged swamp trails in the Florida Panther National Wildlife Refuge.



An **American alligator** carries a large salamander called an amphiuma through a cypress forest.



SPECIES CARDS CONTINUED





Coyotes, considered an invasive species, can survive in habitats with few panthers as predators.



Wild hogs, an invasive species destructive to native landscapes and ranchlands, are a food source for Florida panthers.



A **grasshopper sparrow**, among the most endangered birds in North America, perches in the Everglades Headwaters area.



A **white-tailed deer** grazes in a protected area of longleaf pine and grass habitat north of the Caloosahatchee River.



A **Virginia opossum** moves through grassland of a protected area north of the Caloosahatchee River.



Sea grasses grow in bays, lagoons, and shallow coastal waters, providing habitat for a diversity of marine animals.





Species name:	Species name:
Species name:	Species name:
Species name:	Species name:



PATH OF THE PANTHER

SCENARIO CARDS

Read and analyze these scenarios, considering how your food web could be affected. Record your analysis in the Food Web Impacts handout.

SCENARIO:

A ranch owner gets a conservation easement (compensation for not selling their land for development) for a significant portion of their land.

RESEARCH:

- O Florida's 47,500 farms and ranches utilize 9.7 million acres.
- O A male panther can make a territory more than 200 to 250 square miles in size.
- O Florida's Wildlife Corridor encompasses nearly 18 million acres, including almost 10 million acres of protected conservation lands, and 8 million acres make up the unprotected lands that link the protected areas where animals are free to roam.
- O Conservation easements provide financial alternatives to selling ranch land to developers.

SCENARIO:

A major highway is built.

RESEARCH:

- O According to the Florida Wildlife Commission:
 - Vehicle collisions account for 59% of Florida panther deaths; and
 - 75% of a panther's diet is composed of wild hog, white-tailed deer, and raccoons.
- O Florida drivers saw an estimated 30% increase in animal collision claims in 2021 (deer, armadillo, raccoon, panther, black bear).
- O Building roads and highways can lead to habitat fragmentation. This can disrupt wildlife movement, lead to isolated populations, and hinder the flow of genetic diversity among different parts of the ecosystem.

SCENARIO:

Rising sea levels and storm surges increase the salinity of groundwater.

RESEARCH:

- O When plants are stressed by salinization, they are more susceptible to mortality.
- O In a grassland diversity experiment, researchers showed that high plant diversity results in an increased number of herbivores, or primary consumers.
- O Destruction of forests to build neighborhoods, shopping malls, etc. can result in increased erosion and flooding, because the intricate root systems that once held the soil in place and absorbed excess water are no longer present to provide natural stabilization and drainage.

SCENARIO:

The local deer population is hunted to extinction.

RESEARCH:

- O Deer are the primary hosts for adult blacklegged ticks and are an important tick transport mechanism.
- O Florida panthers are the leading cause of mortality for white-tailed deer in southwest Florida.
- O Research reveals regular predation on deer by alligators greater than 1.8 meters in length.
- O Study shows that white-tailed deer can help forests regrow after being used for agricultural purposes by dispersing the seeds of plants, such as forest herbs. They do this by eating and later defecating these seeds, resulting in these seeds traveling long distances.





SCENARIO:

In July of 2018, the Florida Department of Agriculture and Consumer Services (FDACS) started requiring a permit to harvest and sell saw palmetto berries in the state.

RESEARCH:

- O Saw palmetto flowers are insect-pollinated and are used extensively by honey bees.
- O Black bears, white-tailed deer, and feral hogs eat the fruits of saw palmetto.
- O Saw palmetto flowers attract more than 300 species of pollinators.

SCENARIO:

A county ordinance passes to protect all live oak trees over a certain size from being cut down by developers.

RESEARCH:

- O Live oaks serve as habitats and food sources for hundreds of plants and animals, including mosses, ferns, lichens, squirrels, and moth and butterfly larvae.
- O Live oaks can store and sequester 92 pounds of carbon a year.
- O A study found that a 4°C increase (caused by increased greenhouse gasses, such as carbon dioxide), reduced energy transfer in aquatic food webs by up to 56% and ultimately led to a reduction in overall biomass.

SCENARIO:

The longleaf pine habitat that was virtually destroyed by logging (97% reduction) is undergoing significant restoration throughout Florida.

RESEARCH:

- O Longleaf pine forests are home to one of the most endangered bird species, the grasshopper sparrow.
- O Longleaf pine forests support clean water by filtering and purifying rainwater, reducing erosion, controlling flooding, recharging aquifers, and maintaining watershed health, while also providing essential habitat for a variety of species.

SCENARIO:

Wilderness preserves periodically facilitate prescribed fires or controlled burns.

RESEARCH:

- O Lightning causes wildfires that can burn out of control and destroy large swaths of habitat for many animals.
- O Fire has been linked to improved health of palmetto flatwoods.







FOOD WEB IMPACTS

PATH OF THE PANTHER

Using the Scenario Cards, analyze how each chosen Scenario Card could potentially impact your food web.

Scenario Description	Which organism is directly impacted?	How does this impact the overall food web?
Prescribed burns improve primary producer health, preventing devastating fires.	Palmettos	Prescribed burns improve the health of palmettos, which in turn provides food for black bears, deer, etc., and habitats for the endangered scrub jay.



3 FLORIDA'S PANTHER POPULATION: A STRUGGLE FOR SURVIVAL



- Grades 9-Adult
- Life Sciences, General to Advanced
- Social Studies and Art Connections

In this activity, students explore data trends and impacts on the Florida panther population during the past 500 years, using readings for historical context. After analyzing readings and visuals, students use data they found to create a graph of the Florida panther population. Students then infuse art with data to develop a creative visualization of the Florida panther's story of survival.

For younger audiences, or if time is limited, students can gather the data by working in five small groups to analyze text and resources for one time period. Each group then shares with the whole class and creates the graph together.

For advanced high school and adult audiences, participants can gather the data by analyzing texts individually through station rotation or independent work.

KEY TERMS

immigration/emigration
 mortality

natalitypopulation

BACKGROUND

The struggle for survival in the Florida panther **population** has been a long and challenging one. Florida panthers once roamed throughout the southeastern United States. As a result of habitat loss, hunting, and other human activities, their population dwindled to dangerously low levels by the mid-20th century. In the 1970s, the Florida panther population reached a critical point, on the brink of extinction. Habitat fragmentation and vehicular collisions have continued to threaten the panther population, as their ability to roam and find mates has been restricted. Small population size also led to genetic defects and reduced reproductive success which compounded the **mortality** rate.

Conservation efforts today focus on increasing the Florida panther population by reversing threats and boosting **natality** rates. A group of mountain lions that biologists relocated from Texas helped to boost the population, as this human-influenced **emigration** was successful in strengthening the genetic makeup of the Florida panthers. Habitat restoration projects reconnect fragmented habitats and create wildlife corridors where panthers and other species can travel. Construction of wildlife crossings and fencing along roads helps to reduce the number of panthers killed by vehicle collisions. These and other land conservation efforts and panther protections have helped the population grow from 20-30 individuals in the 1970s to more than 200 today.



FLORIDA'S PANTHER POPULATION: A STRUGGLE FOR SURVIVAL

OBJECTIVES

stage of growth.

Students will:

Gather and/or print materials:

- O Video: <u>"Threats to the Panther"</u> (2:19)
- O Handout series: The Florida Panther Over 500 Years (1 per small group or station)
- O Slides: Florida's Panther Population: A Struggle for Survival (1 per small group or station; also project for whole class viewing)
- O Handout: Florida Panther Population: Changes Over Time (1 per student or small group)
- O Handout: Key Terms + Ecological Impacts (1 per student)
- O Online resource: Art-ivism by Jill Pelto jillpelto.com

Set up technology:

Determine how you will have students analyze texts and resources:

O identify and describe factors that affect population size; and

O analyze data to construct population graphs and determine the population's

- O Option 1: Set up five stations where students will move through each. At each station, include one copy of one time period from the handout series and, optionally, the slides. Give each student, or each group, the handout, Florida Panther Population: Changes Over Time.
- O Option 2: If time is limited, divide students into five small groups. Make sure each group has a computer and student handouts and slides. Each small group will be responsible for one time period and will present to the class.
- O Option 3: Provide the handout series and share slides for individual students or participants to analyze independently.

10 MIN INTRODUCE THE STORY OF THE FLORIDA PANTHER POPULATION **OVER TIME**

- 1. Engage students in a discussion about human-wildlife interactions, allowing them to share their own insights. Ask students to list ways that humans interact with wildlife populations. What different opinions do people have about wildlife? In what ways might these interactions be negative or positive for the wildlife? Ask students what positive and negative impacts they think humans might have on the Florida panther.
- 2. Introduce three key questions students will explore throughout the activity:
 - What factors have affected the population of Florida panthers over the last 500 years?
 - How has the panther population changed?
 - What might future population trends look like?
- 3. Show the "Threats to the Panther" (2:19) film clip about panther hunting and habitat destruction.
- 4. Have students reflect using the following prompt:
 - How have humans impacted the panther's population over time?

STANDARDS

This activity addresses the following:

NGSS: HS-LS2-1: Use mathematical/ computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

Florida NGSS: SC.912.L.17.5:

Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.

AP Env. Sci: EIN-4.B. Explain how species become endangered and strategies to combat the problem.





PREPARATION

FLORIDA'S PANTHER POPULATION: A STRUGGLE FOR SURVIVAL

30 MIN ANALYZE TEXTS AND RESOURCES

- 5. Have students rotate through stations or work in small groups (based on whether you chose Option 1 or 2 in Preparation) to read and analyze **informational texts** and/ or **slides** for specific time periods and learn about and identify the factors that have affected the Florida panther population.
- 6. Students should capture what they learn in the Florida Panther Population handout, either individually or in small groups. If time is limited, each student in a small group can read and analyze the informational resources for one assigned time period. They can then share their findings with their group members to fill in the remaining time periods.
- 7. Have students break into or return to small groups and fill out the Key Terms + Ecological Impacts handout, working together to define key terms and identify examples of ecological impacts of Florida panthers over time.
- **8.** Review key terms and ecological impacts handout as a whole group to check for understanding.

10 MIN COMMUNICATING THE PANTHER POPULATION STORY THROUGH ART AND DATA

- **9.** Have students create a graph visual that portrays the story of the Florida panther population from 1900 to the present using the data from their historical analysis. Have them consider these key questions:
 - How has the Florida panther population changed over time?
 - What factors have affected the population?
- **10.** First, show students <u>Jill Pelto's website</u> featuring her creative intersection of art with environmental data.
- Provide students with supplies to transform their Panther population graphs into an Environmental "Art-ivism" piece focused on the panther's struggle for survival. Remind students to keep their population line visible, but encourage them to create whatever art piece that inspires them regarding the Florida Wildlife Corridor.

MORE TO EXPLORE

ENLARGE AND ENHANCE THE ART PROJECT

Consider having your students integrate more historical context into their graphs through a timeline or other visuals, using a larger canvas as needed.

USE FLORIDA PANTHER ART TO EDUCATE OTHERS

Determine with students some possibilities for sharing their artwork with a broader audience, to tell the story of this endangered species.





FLORIDA'S PANTHER POPULATION: A STRUGGLE FOR SURVIVAL

10 MIN CLOSING

- **12.** Post graphs on the walls and have students move around in a gallery walk, or have a few students share their visuals. How do their pieces demonstrate the key questions?
- **13.** Have students reflect on this question:
 - What might future population trends look like for the Florida panther?

During Art Basel Miami 2018, Diana Garcia puts finishing touches on her mural honoring the first female Florida panther to reclaim territory in the Northern Everglades.





FLORIDA PANTHER POPULATION: **CHANGES OVER TIME**

PATH OF THE PANTHER

	1500-1800	1800-1960s	1960s-2010	2010-Present	Future
Factors affecting panther population size:	Natíve tríbes líved alongsíde panthers				
Estimated numbers of panthers:	1500: 3000	1900: 1965:	1995: 2000: 2003: 2005: 2008:	2023:	





PATH OF THE PANTHER

KEY TERMS + ECOLOGICAL IMPACTS

From prior knowledge and text analysis, summarize each of these terms with (1) a definition and (2) an example of ecological impact on the Florida panther over time.

population	limiting factors
carrying capacity	immigration/emigration
an entre liter	
mortaiity	natanty



POPULATION DYNAMICS AND CARRYING CAPACITY



- Grades 9-Adult
- Life Sciences, General to Advanced
- Data Literacy, Social Studies, and Art Connections

This activity builds on the historical human impacts on panther populations in Activity 3, focusing on population dynamics and carrying capacity. After graphing the data, students estimate the carrying capacity of the Florida panther population and compare it to Yellowstone's gray wolf carrying capacity. Students determine the stage of panther population growth and use evidence and reasoning to defend or refute a claim as to whether or not the Florida panther is likely to reach carrying capacity in the future.

For younger audiences, students can use the table provided to graph the panther population from 1900. Additionally, students should watch the introductory video for logistic and exponential growth models.

For advanced high school and adult audiences, participants can complete Activity 3 before doing this activity, to gather and graph the data. Additionally, participants can choose to watch the introductory or advanced video for logistic and exponential growth functions in population ecology.

KEY TERMS

carrying capacity
 exponential growth

logistic growth

BACKGROUND

The Florida panther population has changed dramatically in the last 500 years. Once a healthy population of at least 3,000 individuals, the population plummeted due to habitat loss, hunting, and other human activities during the 19th and 20th centuries. Efforts to save the Florida panther from extinction have resulted in an increase from a critically low population of 20–30 individuals in the 1970s to approximately 200 today. Because Florida panthers play critical ecological roles as apex predators and keystone species, biologists' work involves monitoring how increases or decreases in the panther population would influence the ecosystems within



POPULATION DYNAMICS AND CARRYING CAPACITY

the Florida Wildlife Corridor. Researchers monitor carrying capacity to assess factors such as food availability, water sources, shelter, and other resources, in order to estimate how many animals an area can support without degrading the environment or leading to population crashes. If a population were to exceed the carrying capacity of its habitat, this could lead to resource depletion, increased competition, and heightened human-wildlife conflicts. Conversely, if a population falls below the carrying capacity, it may indicate habitat degradation or limited resources, necessitating habitat restoration or other management actions. Populations experiencing exponential growth will eventually deplete resources. Populations experiencing logistic growth increase more slowly until the population reaches its carrying capacity, influenced by limiting factors in the ecosystem. As a population grows, it can eventually overshoot the carrying capacity, leading to a die-off, and fluctuate back and forth around the carrying capacity in an unstable or stable equilibrium.

Monitoring the panther population to determine its stage of growth (logistic or exponential) in relation to carrying capacity helps conservationists implement strategies to maintain a sustainable balance. These strategies might include habitat preservation, wildlife corridor connectivity enhancement, and measures to reduce human impacts like road mortality and habitat fragmentation. By managing the population within the carrying capacity of the habitat, scientists aim to ensure the long-term survival of Florida panthers while maintaining the health of the entire ecosystem within the wildlife corridor.

Florida panther conservationists may look to the reintroduction of the gray wolf within the Greater Yellowstone Ecosystem as a model of population growth for an apex predator that was previously absent from its ecosystem.

STANDARDS

This activity addresses the following:

NGSS: HS-LS2-1: Use mathematical/ computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

Florida NGSS: SC.912.L.17.5:

Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.

AP Env. Sci: ERT-3.E. Describe the impact of carrying capacity on ecosystems.

Students will:

OBJECTIVES

PREPARATION

- O identify and describe factors that affect population size;
- O analyze data to construct population graphs and determine the population's stage of growth; and
- O use evidence and reasoning to defend or refute a claim regarding whether or not a population has reached carrying capacity.

Gather and/or print materials:

- O Video: <u>"Threats to the Panther"</u> (2:19) (optional)
- O Slides: <u>Population Dynamics</u> and Carrying Capacity
- O Handout: Florida Panther Population Analysis (1 per student or small group)

Set up technology:

O Determine if students will be using graphs from Activity 3 or the table provided to graph the population.

5 MIN RECONNECT WITH THE FLORIDA PANTHER'S STRUGGLE FOR SURVIVAL

- **1.** Ask students to brainstorm some of the ecological challenges that the Florida panther population has experienced from human impacts.
- **2.** If students have not previously viewed the "Threats to the Panther" video clip, watch it now and add ideas to the brainstorming list.





POPULATION DYNAMICS AND CARRYING CAPACITY

15 MIN GRAPH THE FLORIDA PANTHER POPULATION

- **3.** Have students create a population graph for the Florida panther population from 1900-present day, by completing Part 1 in the Florida Panther Population Analysis handout. A model has been provided in the slides. Note that unconnected data points represent incomplete census data.
- **4.** As a class or group, watch one of these videos that illustrates carrying capacity, logistic growth, and exponential growth of a population:
 - **a.** For younger audiences or introductory biology students, watch this <u>video</u>, "Exponential and Logistic Growth in Populations" (7:32).
 - b. For advanced high school and adult audiences, consider watching this <u>video</u>, "Logistic Growth Versus Exponential Growth" (10:02) if students are using functions and ecological equations in their coursework.
- 5. Have students use their data to answer Part 1, questions 1 and 2 in the handout, and use the terms from the video to consider which type of growth the Florida panther population is experiencing. Students should conclude that the Florida panther is in the logistic growth stage of carrying capacity, and that habitat destruction from human development and hunting has led to the panther population's near extinction.

15 MIN INVESTIGATE THE GRAY WOLF POPULATION'S CARRYING CAPACITY

- **6.** Use the slides to have students compare the history of the Florida panther population to the history of the Yellowstone gray wolf population. First, show students a historic image illustrating the excessive extermination of wolves and explain to them that wolves were hunted to extinction in the Greater Yellowstone Area.
- 7. Then show students the *History of the Wolf Population in Yellowstone National Park* graph. Explain that the population extends across the Greater Yellowstone Ecosystem, but the Yellowstone National Park wolf packs have been carefully monitored, with population size measured annually, so the regional population is larger. Have students answer Part 2, question 1 in the handout to identify the stage where the wolf population is according to the graph.
- 8. Explain to students that the gray wolf population has been fluctuating between about 90 and 120 individuals since 2009, as can be seen in the blue oval on the next graph in the slides, which suggests that the gray wolf population fluctuations in Yellowstone National Park may have reached carrying capacity. Additional considerations include prey populations, migration, and changes to federal and state protections which have led to increased trophy hunting in recent years. Continued careful monitoring of this population over time will help researchers understand the population dynamics of these wolf packs. Ask students to use evidence from the gray wolf population graph to **support** or **refute** the claim: *The gray wolf in Yellowstone National Park has successfully recovered*, Part 2, question 2 in the handout. Have students share out with the whole class. Help students recognize that scientists may differ in their assessments of the health and growth of the wolf populations. (Note: According to <u>these data</u> for gray wolves in Yellowstone National Park, shown in the graph for this activity, the wolves are not experiencing exponential growth after unstable equilibrium.)
- **9.** Show the two population graphs: Florida panther and Yellowstone gray wolf, also on the handout. Have students discuss the two graphs with a partner and then as a class. Have them build on their analysis for the final question in Part 2, question 3 on the handout: Do you think the Florida panther population will reach carrying capacity? If yes, how? If no, why not?

MORE TO EXPLORE

POPULATION DYNAMICS EXPLORATION

Identify local species students are interested in that are endangered, threatened, introduced, or invasive. Have students choose a species and research the population changes, limiting factors, growth, carrying capacity, and mortality/ natality. Discuss, using the following prompt: In what ways might changes in populations of these species directly affect other populations?





POPULATION DYNAMICS AND CARRYING CAPACITY

15 MIN WHOLE CLASS DISCUSSION

10. If time allows, have an active whole-class discussion using "concentric circles." Organize students who say "yes" to the question above in an inner circle, with students who say "no" in an outer circle. Each student pair shares their evidence for whether or not they think the panther population will reach carrying capacity. (Students in the inner circle do not move, while the students in the outer circle rotate when a 90 second timer is up.) Students share evidence from the graphs to support their positions as the outer circle rotates around the inner circle. Complete three or more rounds of concentric circles to ensure students have ample opportunity to share and listen to opposing viewpoints.

MORE TO EXPLORE

COMPARE RESEARCH EFFORTS FOR THE WOLF AND PANTHER

Have students explore in-depth the population research strategies for these two keystone species. Find out more about Yellowstone's wolf population research and management with this <u>2022 report</u> from the National Park Service. A number of Florida Fish and Wildlife Conservation Commission Panther Program resources are included <u>here</u>.





PATH OF THE PANTHER

Part 1: Panther Population Over Time

First, use data from the table provided to graph the change in panther population since 1900. Then follow the instructions with the remaining graphs to analyze the data further and compare with the Yellowstone wolf population.

Year	1900	1965	1981	1985	1995	2000	2003	2008	2024
Pop (est)	500	20	19	30	25	50	80	118	200





Time



1. Which stage in the graph above do you think the Florida panther population is in at this time? Why?

2. Which significant events in the history of the Florida panther may have influenced its population stage?

Part 2: Compare Wolf and Panther Data



- 1. Which stage do you think the gray wolf population in the Yellowstone National Park is currently experiencing (logistic growth, exponential growth, carrying capacity/equilibrium)?
- 2. SUPPORT or REFUTE the claim: The gray wolf in Yellowstone National Park has successfully recovered.
- 3. Compare the History of the Florida Panther Population and Carrying Capacity graphs. Do you think the Florida panther population will reach carrying capacity? Support your answer with evidence.



5 MODELING PANTHER TERRITORY AND PATHWAYS



- Grades 9-Adult
- Life Sciences, General to Advanced
- Math and Geography Connections

In this activity, students explore and evaluate the importance of the Florida Wildlife Corridor in supporting wildlife. They first analyze photography of the Florida panther from corridor lands to help them visualize broader territory characteristics. They use a GIS mapping tool to view lands with open space and human development and then create models for territory that Florida panthers would require to survive and thrive, based on the geography of their local communities. They identify potential locations for wildlife corridors and crossings based on their exploration and evaluation.

For younger audiences, such as introductory biology classes, students can collaborate through the StoryMap exploration, jigsaw discussion, and MapMaker analysis activities with connection points to check for understanding between each step.

For advanced high school and adult audiences, participants can explore StoryMap and MapMaker in pairs or independently to allow for advanced learner-centered investigation.

KEY TERMS

- fragmented habitat
 territory
- wildlife corridor
 wildlife crossing

BACKGROUND

Large mammals, including the endangered Florida Panther, need expansive **territories** to survive and thrive, but rapid land development for houses and roads is encroaching on their habitats. Wildlife corridors connect habitats fragmented by human activity, protecting critical areas for wildlife and people. They enable animals to travel safely between larger wild spaces, provide clean water for humans, and maintain healthy ecosystems. Wildlife corridors can include meadows, forests, protected lands, and also aquatic and marine areas. Human-made structures like highway overpasses, underpasses, tunnels, viaducts, and canopy bridges,



MODELING PANTHER TERRITORY AND PATHWAYS

known as **wildlife crossings**, help animals navigate barriers like highways within these corridors.

The Florida Wildlife Corridor is vital for the survival and expansion of Florida panther populations, especially given their need for vast territories. Male panthers require areas of 200 to 250 square miles to hunt, find mates, and establish dominance. Isolated habitats limit their movement and ability to find mates outside their immediate gene pool. These corridors, composed of protected lands and natural areas, connect **fragmented habitats**, allowing panthers to safely roam, find food, and access genetically diverse mates, which prevents inbreeding and supports population growth.

However, the Florida Wildlife Corridor faces threats from habitat fragmentation due to human development and highspeed traffic, which pose a danger to panthers crossing roads. Conservation efforts focus on securing land, building wildlife crossings, and raising awareness about the importance of protecting these corridors and their ecosystems for the future of the Florida panther and other species.

O Online Resource: National

Geographic MapMaker

Territory (1 per pair)

O Handout: Explore and Estimate

Panther Numbers, Habitat, and

O Handout: Develop an Argument Based on Evidence (1 per small group)

Students will:

- O access prior knowledge about Florida panthers and visualize characteristics of panther territory;
- O build background on the Florida panther and the Florida Wildlife Corridor;
- O apply learning to develop a geographic model of panther populations relative to suitable habitat in their local community and beyond; and
- O evaluate locations for wildlife corridors and crossings in Florida based on their research and geographic models.

Gather and/or print materials:

- O Slides: <u>Modeling Panther</u> <u>Territory and Pathways</u>
- O Video: <u>Wildpath.com</u> (1:04; scroll down to find)
- O Handout: Build Background on the Corridor and Panther (1 per student)
- O Online Resource: <u>Connecting the</u> <u>Corridor StoryMap</u>

Set up technology:

Determine whether students will use individual computers, or if pairs or small groups will share computers to view and interact with the <u>Connecting the Corridor StoryMap</u> and National Geographic <u>MapMaker</u>.

Additional preparation:

- O Familiarize yourself with <u>MapMaker</u> to be ready to guide students as needed. Decide which unit of measurement students will use for MapMaker (e.g., Imperial, metric).
- O Optional: For younger/introductory biology students, consider creating groups for the jigsaw and MapMaker activities:
 - Divide students into five small groups to prepare for the jigsaw activity. Groups of mixed ability can work well in the initial groupings. Each group will be responsible for researching an assigned question number during the activity. Within their groups they can share a device or work individually.
 - Identify pairs of students to work together on the MapMaker Activity. They can share a device or each have a device. Pairing allows them to have a partner for problem-solving as they learn a new technology tool.

STANDARDS

This activity addresses the following:

NGSS: HS-LS2-1: Use mathematical/ computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

NGSS: HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Florida NGSS: SC.912.L.17.11:

Analyze the distribution of organisms and how that distribution is influenced by the interactions between the biotic and abiotic factors within an environment.





PREPARATION

10 MIN DISCUSS THE STORY A FLORIDA PANTHER PHOTO TELLS

- Project the photo of the panther near a highway overpass from the slides. Have students study the photo silently for one minute to take a "slow look," recording details of what they see. Have a short whole-class discussion about what students already know about the Florida panther and new perspectives from this photograph. Ask: What story does this image tell? Next have them do the same for one minute with the second photo, of a panther in a wild setting.
- 2. Next, have students close their eyes and visualize one of the two photos in step 1, envisioning the panther in its location. Then have them imagine flying over this place, with a bird's eye view, for 15-20 seconds. Ask them to sketch or write what the geography or setting might look like for a one-mile radius around this panther. Give them a few minutes to share with a partner or small group.
- **3.** Ask students to think about how much territory beyond that one-mile radius a panther might need for its range, e.g. how many square miles, and record students' estimates on the board.
- 4. Show the Wildpath video (1:04; scroll down <u>this page</u>) and prompt students to add to their drawing (or list) human impacts that might be present in the panther's radius as they watch. In the video, have them find the answer to the question: *How much territory does a male panther require*? (200 square miles; and females stay closer to birthplaces, roaming about 50 square miles) Have a class discussion about the pressures on panthers' territory.
- 5. Use the video and other text on Wildpath.com to develop a definition of "wildlife corridor" as a group. Tell students that in this activity they will use a website and online GIS (geographic information system) to explore the geography of the Florida Wildlife Corridor.

25 MIN EXPLORE THE STORYMAP

- 6. For younger audiences, organize students into five groups and distribute a copy of the Build Background on the Corridor and Panther handout to each small group. Assign each group a single question; their goal is to become an expert group for that question. Together they will explore the <u>Connecting the Corridor StoryMap</u> and <u>Wildpath site</u> (linked in StoryMap) to answer their assigned question in the handout. Sharing a single device to view the StoryMap may encourage collaboration. Older students or adults may prefer to explore independently.
- 7. Reorganize students into a jigsaw group (optional) in which each group consists of students representing questions 1-5. While students share what they learned, have other students record the information on the handout. Circulate to encourage students to record important information and to keep them on task. For older audiences, consider small group discussions.

MORE TO EXPLORE

RESEARCH AND CREATE WILDLIFE CORRIDOR AND PATHWAY MODELS

Have students work with Florida Wildlife Corridor maps and the MapMaker tool to explore the land in your area and its connections to protected lands in the corridor. What land is currently wildlife habitat, in the form of parks or preserves? Is there land that could help to connect these areas? Consider partnering with an art or engineering class to have students create wildlife corridor models, featuring wildlife crossings as well.



MODELING PANTHER TERRITORY AND PATHWAYS

25 MIN ANALYZE SATELLITE IMAGERY TO ESTIMATE POPULATION AND HABITAT SUITABILITY

8. Organize students into pairs. Distribute a copy of the handout Explore and Estimate Panther Numbers, Habitat, and Territory to each pair. Review the directions, model the steps together as a class, and answer any questions students may have.



9. See the slides for samples of how student maps should appear as they work through the steps.

TIP: Enough time is included here so that students will not feel rushed completing each of the steps, since using MapMaker may be new to them. If time is limited, consider assigning this section as homework.

25 MIN DEVELOP AN ARGUMENT BASED ON EVIDENCE

- **10.** Display the slide with a map of the Florida Wildlife Corridor and have students discuss it in small groups (either their initial group or jigsaw group). Distribute a copy of the handout Develop an Argument Based on Evidence. Prompt students to discuss the questions and record notes using both the map and what they have learned about the Florida panther.
- **11.** Facilitate a class discussion to close out the activity. Each group can share their answer to one question.

5 MIN REFLECT

- **12.** Ask students to respond to one of these questions in writing, handing it to you as an "exit ticket" when they leave the room:
 - Describe what makes a successful wildlife corridor.
 - How might the Florida Wildlife Corridor benefit species other than panthers?
 - How might the Florida Wildlife Corridor help the Florida panther population grow?

MORE TO EXPLORE

STUDY HUMAN IMPACTS ON BLACK BEAR M34'S PATH

Have students use the <u>Bear</u> <u>Necessities StoryMap</u> and videos included for a closer look at how one species responds to land development and habitat fragmentation. If time is limited, display the "A Closer Look" graphic with a swipe feature (scroll down about halfway) that compares a particular area of habitat in 2008 and 2020.

EXPLORE WILDLIFE CORRIDORS AROUND THE WORLD

Have students research other wildlife (e.g., pronghorn, tigers) that might benefit from the establishment of wildlife corridors. Students can learn from <u>this</u> <u>StoryMap</u> featuring land conservation goals and the role of wildlife corridors in the western U.S. and also <u>this project in Brazil</u>. Find more about international efforts to create ecological corridors <u>here</u>.





BUILD BACKGROUND ON THE CORRIDOR AND PANTHER

PATH OF THE PANTHER

Explore the <u>Connecting the Corridor StoryMap</u> and the <u>wildpath.com/florida-wildlife-corridor</u> webpage (also linked in StoryMap) to answer the questions. Aim for accurate, detailed, and thorough answers.

Question	Answer Supported by Evidence from the StoryMap
 Identify two ways the Florida Wildlife Corridor Act will protect land in the Florida Wildlife Corridor. 	
2. Describe the land that makes up the Florida Wildlife Corridor. How many acres make up the Florida Wildlife Corridor network? And how many of those acres are already protected?	
3. Describe Florida's history of land conservation.	
4. Explain how the Florida panther, along with many other species, might benefit if the opportunity areas of the Florida Wildlife Corridor were also protected.	
5. View the map of Florida in the StoryMap (click on +/- to see more or less of the map) and find the protected land closest to you. Click on the yellow tab and identify the location name, number of acres, and species currently on the land.	



EXPLORE AND ESTIMATE PANTHER NUMBERS, HABITAT, AND TERRITORY

Use National Geographic's MapMaker to explore connecting wild areas through the lens of your local community. Follow the steps in the checklist, recording information and observations in the data table as you move through the checklist.

Go to <u>mapmaker.nationalgeographic.org</u> and select "Launch MapMaker."
Click on the Search icon in the upper left toolbar, and type in your county and state. Write your county name in the data table on the next page.
Click on the Sketch icon in the bottom toolbar. Select the Line tool. Change the color to yellow.
Use the Line tool to outline the boundaries of your county. County boundaries appear on the map in purple. (Tip: Click once to set each point and lines; Double-click to release when you have closed the polygon shape. Create a polygon roughly along curved boundaries—no need to be exact.) To fix a mistake, click on the Arrow tool in Sketch, click on the line, and click delete.
Click on the Basemaps icon in the bottom toolbar, and select Imagery (without labels) as your Basemap. You should now see a satellite view of Florida with your county outlined in yellow. In the data chart, describe the types of land use.
Optional: Click on the Sketch icon and select the Polygon tool. Change the symbol to diagonal and outline each undeveloped area (no towns, agriculture, roads, or other buildings).
$\Box \text{ Click on the Measure} icon in the bottom toolbar and select the Measure icon that pops up.}$
Now select the icon for measuring Area in the Measure box. Using this tool, outline the borders of your county to calculate the area and perimeter. (You can select the system of measurement, so check with your teacher.) Record the county area measurement in the data table and answer the related questions.
Using the same technique, draw polygons around each undeveloped polygon and calculate their area. The Area tool will reset with each new measurement, so record each area, then click New Measurement to measure the next. Add the areas together to get the total area of green space and record that number. Answer the related questions.
□ Study the map you've created to help in answering the remaining questions at the end.



PATH OF THE PANTHER



NAME of county:	Studying the satellite image of your county, briefly describe the land use (e.g., urban, suburban, rural, or combination).
Record the AREA OF YOUR COUNTY (include unit of measurement):	Each panther needs square miles of territory to roam. If all the land in the county is available and appropriate panther habitat, calculate the number of panthers your county could support. Explain your reasoning.
Estimate THE AMOUNT OF LAND AVAILABLE TO PANTHERS—by adding the areas of polygons of undeveloped land:	Does the available land in your county seem like suitable habitat for panthers? Explain. How many panthers do you think could live in your county based on your analysis? Justify your response.





Study the map you created. Describe the areas that might be available for panthers. What do these look like? Are these areas connected?

Are there human-made structures or developments that seem to fragment suitable panther habitat? Describe.

Would you recommend creating one or more wildlife crossings in your county? Where and why?

Are there areas of undeveloped land that, if developed, might fragment wildlife habitat? Describe these areas.

What else would you like to know about this land that you can't determine from looking at satellite imagery? How might you find out this information?





DEVELOP AN ARGUMENT BASED ON EVIDENCE

With your group, study the map of the Florida Wildlife Corridor, using information in the map key. Building on what you've learned throughout this exercise, discuss and answer the questions below.

1. Identify panther habitat versus developed areas. How does this relate to your county?

2. Describe the information the map provides about the intersection of human development and panther habitat.

3. Suggest how ranchland might provide key habitat/corridors for wildlife.

4. How might wildlife corridors benefit both panthers and humans in Florida?



A CORRIDOR BIODIVERSITY STUDY



- Grades 9-Adult
- Life Sciences, General to Advanced
- Data Literacy and Geography Connections

In this activity, students investigate Florida Wildlife Corridor biodiversity data using iNaturalist.org-a citizen science project and online social network of naturalists, citizen scientists, and biologists built on the concept of mapping and sharing observations of biodiversity across the globe. Students locate the Florida Wildlife Corridor project page and follow steps to explore the vast amount of data contributed about organisms within the Florida Wildlife Corridor, which is increasing every day. In exploring the data, students determine the number of species people have observed (more than 13,500), the number of observations posted (more than 1.2 million), and the observers (more than 34,000). They then explore observations displayed on the map. They view commonly observed species, often with impressive photography, and consider human behavior with iNaturalist and why some species are represented more than others. Students also filter the data to see which species are vulnerable (threatened or endangered in the U.S.).

This exploration builds data and geographic literacy and also provides a strong foundation for becoming an observer and posting citizen science data. Students optionally make short presentations about their key findings from the data. Finally, students consider land use in their communities and possibilities for providing suitable habitat for plants and animals nearby.

KEY TERMS

- ▶ bias
- biodiversity
- citizen scientist
- endemic
- habitat fragmentation
- species richness

BACKGROUND

Florida has an astounding diversity of organisms: roughly 700 vertebrates; more than 30,000 invertebrates; and more than 4,000 native plant species. Florida hosts the greatest diversity of plant families in the United States, and 300 plants, 40 vertebrates, and 400 invertebrates are **endemic**—found nowhere else in the world. Florida's **species richness** creates a web of interconnectedness. Diverse plant communities provide food and habitat for a variety of insects and animals, which in turn play crucial roles in pollination, seed dispersal, and nutrient cycling.

The Florida Wildlife Corridor is crucial in protecting this **biodiversity**, as it combats **habitat fragmentation** while connecting and protecting large swathes of natural landscapes. By maintaining continuous wildlife pathways, the corridor allows animals to migrate, find mates, and access different parts of their range, which is essential for genetic diversity and species resilience. Moreover, it supports diverse ecosystems by providing habitats for a wide variety of plants and animals, promoting ecological processes and interactions that are vital for a healthy environment. In this way, the Florida Wildlife Corridor serves as a buffer against the negative impacts of urbanization and agricultural expansion, increasing sustainability and biodiversity.

The Florida Wildlife Corridor Project on iNaturalist.org includes mapped data for more than one million observations of nearly 14,000 species in the Florida Wildlife Corridor. Acting as citizen scientists, more than 34,000 professional and amateur naturalists have uploaded photographs or sound recordings as evidence of organisms they observed. Exploring this data provides a glimpse into the vast species richness, the variety of organisms in marine and terrestrial environments, and also the people who are active in observing and documenting this life. Note that iNaturalist data is "presence only" and does not represent the distribution and abundance of species. Human behavior and **bias** factor into the species observed and their locations. For example, observations are concentrated in more accessible areas. and charismatic fauna have a lot of photographers seeking them. Wildlife appearance and behavior is also at play, as some species hide well or move too quickly for observers to photograph.

Students will:

OBJECTIVES

PREPARATION

- O analyze citizen science data included in the iNaturalist Florida Wildlife Corridor project;
- O propose ideas for increasing biodiversity in their communities in order to provide suitable habitat and improve connections with other wildlands, such as the Florida Wildlife Corridor.

Optionally, students conduct a biodiversity survey on school grounds or in an area nearby, also viewing existing iNaturalist data for the area.

Gather and/or print materials:

- O Video: <u>"Camera Trapping"</u> (4:03)
- O Slides: Analyzing Biodiversity Data
- O Handout: Data Exploration: Florida Wildlife Corridor Biodiversity

O Online Resource: <u>iNaturalist.org</u> <u>Florida Wildlife Corridor Project</u> (Or find from the top navigation on iNaturalist.org; go to Community>Projects> Search "Florida Wildlife Corridor" in the search mid-page.)

Set up technology:

Have small groups of two or three share computers to analyze biodiversity data.

STANDARDS

This activity addresses the following:

NGSS HS-LS2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

Florida NGSS SC.912.L.17.11:

Analyze the distribution of organisms and how that distribution is influenced by the interactions between the biotic and abiotic factors within an environment.

AP Environmental Science EIN-1.C.1:

Biodiversity enhances ecosystem productivity and stability.

EDUCATOR TIPS: EXPLORE INATURALIST'S DATA: Take time to familiarize yourself with tips for navigating iNaturalist's global dataset using this <u>short</u> help page. You may also find this <u>iNaturalist Teacher's Guide</u> helpful, especially if planning for your students to make their own iNaturalist observations.

A CORRIDOR BIODIVERSITY STUDY

10 MIN INTRODUCE THE UNIQUE BIODIVERSITY OF FLORIDA

- 1. Tell students that they will be exploring the biota of the Florida Wildlife Corridor through the online contributions of data by thousands of citizen scientists. First, view the video clip "Camera Trapping" (4:03) from *Path of the Panther*, and have students list every organism they observe. Then discuss the following:
 - In what ways might *other species* of a habitat affect (positively or negatively) panther survival, migration, and population growth?
 - How might *abiotic elements* of a habitat affect panther survival, migration, and population growth?
 - How might land development influence biodiversity?
 - What makes Florida's biodiversity so unique?
- **2.** Project the slides with Florida biodiversity categories and see who might come close to estimating. Discuss anything surprising to them about these facts.

30 MIN EXPLORE THE FLORIDA WILDLIFE CORRIDOR INATURALIST PROJECT

- **3.** Have students work in pairs or small groups and provide the handout: Data Exploration: Florida Wildlife Corridor Biodiversity.
- 4. Using the introductory text on the handout, discuss what iNaturalist is and why its data is useful for science. Explain that observations contributed to iNaturalist with sufficient evidence (photo, sound recording, identification by other naturalists) become "research grade" (marked "RG"), at which point that data is incorporated into the Global Biological Information Facility (GBIF.org), available for research purposes. The iNaturalist platform provides an opportunity to dive into millions of observations that are also linked to encyclopedic information, making this platform a dynamic field guide that enables exploration of biodiversity globally.
- 5. Have students locate the Florida Wildlife Corridor project on iNaturalist.org, by selecting Community> Projects > Florida Wildlife Corridor (they should see a thumbnail of a bear leaning against a tree). Have them work through the handout, giving them leeway to explore the vast amount of species data, filtering to see different taxa, and learning about the data that makes up each observation. This provides a strong foundation for contributing observations as citizen scientists in the future.
 - When viewing the Florida Wildlife Corridor Project map (scroll down on main project page), students will see a pixelated orange spread covering the yellow bordered corridor. Zooming in further reveals multi-colored tags. Have students select some of those tags and try to determine what each represents:
 - Green = Plants
 - Red = Insects, Molluscs, Arachnids
 - Blue = Ray finned fishes, Birds, Amphibians, Reptiles, Mammals, and "Other Animals"
 - Pink (kind of a Magenta) = Fungi Including Lichens
 - Brown Red = Kelp, Diatoms, and Allies
 - Purple = Protozoans
 - Gray = Unknown, Prokaryotes, Bacteria, and Viruses

MORE TO EXPLORE

RESEARCH AND CREATE WILDLIFE CORRIDOR AND PATHWAY MODELS

Have students work with <u>Florida</u> <u>Wildlife Corridor maps</u> and the <u>MapMaker</u> tool to explore the land in your area and its connections to protected lands in the corridor. What land is currently wildlife habitat, in the form of parks or preserves? Is there land that could help to connect these areas? Consider partnering with an art or engineering class to have students create wildlife corridor models, featuring <u>wildlife crossings</u> as well.





A CORRIDOR BIODIVERSITY STUDY

6. As students complete sections of the handout, take time to discuss findings. If time allows, have them make a short presentation of new insights about biodiversity in the corridor. Reinforce in the discussion how iNaturalist data is "presence only," with observations in areas that are more easily accessible, such as parks; charismatic fauna have a lot of photographers seeking them. In other words, iNaturalist does not represent the distribution and abundance of species, but it is increasingly valuable due to its large and growing database and photos showing behaviors and interactions among species. It also provides a forum for discussing species identification and behavior, as well as building networks among amateur and professional naturalists.

10 MIN EVALUATE OPPORTUNITIES FOR PROTECTING BIODIVERSITY

- 7. Have students focus more closely on where they live, zooming in on the iNaturalist satellite map via the explore section at the top of the page, or using the search tool if needed. Ask: How might land use nearby affect biodiversity in our local area? Are there obvious connections or corridors from the local area to larger areas of wildlands? Have students describe the level of habitat fragmentation they see. Ask: How can habitats, ecosystems, and biodiversity be protected and supported?
- **8.** As an exit ticket, have students write three ideas to help increase the species richness in their communities. What would provide suitable habitat and improve connections with other wildlands?



MORE TO EXPLORE

USE INATURALIST FOR A SCHOOL-BASED SPECIES INVENTORY

Once students have explored iNaturalist observation data in this activity, they may be ready to conduct a species inventory of wild organisms around their school or in a nearby greenspace. Consult the iNaturalist Teacher's Guide for tips on whether to use the iNaturalist app, the Seek app, or to skip the screens and use paper data sheets or sketching instead (an excellent way to help students build observation skills). Discuss the potential connections of the biodiversity in your area to the Florida Wildlife Corridor or other critical environments for wildlife.

CREATE FLORIDA WILDLIFE CORRIDOR ARTWORK

Give students an opportunity to create a collage of Florida Wildlife Corridor species in the shape or silhouette of a panther. Have them compose the artwork with images of the biodiversity—including humans—that are part of and benefit from the wildlife corridor. This could be a digital collage or a physical art project.

RE-WILD A LOCAL SPACE TO BOOST BIODIVERSITY

Have students research efforts to "re-wild" land. Have them consider how this might be possible in their local area or on school grounds, to expand pathways for plants, wildlife, and other organisms. What native species would help to support local wildlife? Students can develop proposals that could result in more biodiversity. Then, invite a guest from your local extension office or a Master Naturalist to discuss students' ideas and further develop a plan to present to the school administration.



DATA EXPLORATION: FLORIDA WILDLIFE CORRIDOR BIODIVERSITY

PATH OF THE PANTHER

Go to the Florida Wildlife Corridor Project on iNaturalist.org, and see what you can learn from the data.

iNaturalist is a citizen science project and online social network of naturalists, citizen scientists, and biologists built for mapping and sharing observations of biodiversity across the globe. Looking at others' observations can be an excellent introduction to the tool and the data. Once you've become familiar with how iNaturalist observations work, you can create an account, follow the how-to tutorial, and contribute your own. (Note: You must be 13 years or older to create an account.)

1. Before you look, what do you expect the most commonly observed species to be? List a few ideas:

2. At the top of the project page, find the totals (rounded) for these three:

Total number of OBSERVATIONS contributed within the Corridor:	Total number of SPECIES observed:	Total number of OBSERVERS contributing observations:		
See the list of Most Observed Species (at	right). Are any of the species you wrote in y	our answer to Question 1?		
Select View All to see more. What do you think makes different species "most observed"?				
Why might some organisms be less repres	ented? What characteristics of an organism	n might lead to fewer observations?		



3. Go BACK to the main PROJECT PAGE. Scroll down to see the MAP of observations. Zoom in and out, and navigate up, down, and all around the corridor (marked as yellow).

What do you notice about the corridor? Describe it.

Zoom in to see the colored tags*, and click on some. What do the colors represent?

*Those placed outside the corridor in this project have their locations obscured, often to protect rare or threatened organisms.

4. Scroll back up and find and select STATS. Roll over the middle circular graphic to see the different groupings of species, including fungi, plants, birds, mammals, insects, etc., and the total number of species documented in the project.

What's surprising about these statistics to you? What questions do you have?

5. Also on the STATS page, scroll through some of the MOST COMMENTS AND FAVES.

What stands out to you in this collection? Why do you think these observations made the list?

Click on a few of the **small circles**, to learn about who is making observations. Most top **Observers** include information about their interests or background. Describe three who are documenting biodiversity.



6. Go back to the main Florida Wildlife Corridor PROJECT PAGE, and click on the OBSERVATIONS tab. Next, click Search to see the project data under the "Explore" view. Select the Filters function, and select for Threatened, Introduced, and a species of your choice. Fill in numbers and examples for each:

# of Threatened species:	# of Introduced species:	Your choice of species: #:
Examples:	Examples:	Examples:

7. Working with large datasets can lead to new questions. What questions would you want to try to answer about Florida Wildlife Corridor Biodiversity using this project's data?



PATH OF THE PANTHER

7 EXPLORING THE NUMBER ONE CAUSE OF PANTHER DEATHS



- Grades 9-Adult
- ► Biology
- Data Literacy, and Language Arts Connections

In this activity, students explore narratives and data about human-wildlife interactions in the Florida Wildlife Corridor as they consider the importance of protecting the Florida panther from vehicle collisions. They read informational texts and also analyze data in graphs and in online GIS maps. They then develop possible solutions for panther-vehicle collisions.

For younger audiences, such as introductory biology classes, this activity supports critical thinking and analysis through the use of a Claim-Evidence-Reasoning exercise.

For adult audiences, this activity provides an opportunity to consider the role that zoos, state governments, and other organizations serve in supporting panther rehabilitation. Consider putting additional time into discussing videos and drilling into map data for local areas.

KEY TERMS

human-wildlife conflictwildlife corridors

wildlife crossings

BACKGROUND

Panthers born in Florida today face pressures of living near cities and towns with rapid population growth and development. That proximity brings peril, especially in Southwest Florida, where expanding roads are constantly squeezing the wildlands. The leading documented cause of death for panthers is collision with cars and trucks on the expanding network of roadways that cut through the Florida Wildlife Corridor. Vehicle collisions claim the lives of nearly 30 panthers each year. When a female panther is killed or injured and leaves behind offspring, the kittens are often unable to survive on their own. For orphaned kittens and other panthers who have suffered from conflict or cannot be returned to the wild, Florida's accredited zoos offer sanctuary.



EXPLORING THE NUMBER ONE CAUSE OF PANTHER DEATHS

Students will:

- O analyze vehicle collision numbers and locations;
- O complete a Claim-Evidence-Reasoning exercise proposing new locations for wildlife crossings; and
- O read informational text on seven panthers currently residing in Florida zoos to identify patterns and strategies.

Gather and/or print materials:

- O Slides: Exploring the Number One Cause of Panther Deaths
- O Video: "Tres" (3:20) from Path of the Panther
- O Video: <u>"Endangered Florida Panther</u> <u>On Wrong Side of Fence, Lured Back</u> <u>to Safety"</u> (0:35)
- O Handout: Florida Panther Deaths From Vehicle Collisions (1 per student)
- O Handout: Wildlife Crossings Claim-Evidence-Reasoning (1 per student)
- O Video: <u>"Connecting with</u> <u>Broketail"</u> (11:51)
- O Online Map: FDOT Wildlife Bridge Crossings
- O Handout: Meet the Survivors (1 per student)

Set up technology:

Ideally, video clips and the online map will be projected for the whole class.

15 MIN ANALYZE DATA ABOUT VEHICLE COLLISIONS

- Show students the video clip "Tres" (3:20) from Path of the Panther on vehicle collisions. Then show the news clip "Endangered Florida Panther On Wrong Side of Fence, Lured Back to Safety" (0:35).
- **2.** Give one copy of the Florida Panther Deaths From Vehicle Collisions handout to each student. Use the slides to project the graphs in full color. Have students independently explore the data in the graphs and answer the questions. Possible responses:
 - 1. Describe the overall trend depicted in the first graph. Use specific data points to support your response. One trend shows an increase in vehicle collisions over time. Until 2003 there were fewer than 10 each year, but after 2003 the numbers increased to more than 30 in 2015, with a slight downward trend after 2015.
 - 2. Around what year do you see a shift in the data? Why do you think that shift might have occurred? Students may identify the increase in collisions (from 2000-2015), caused by factors such as growth in human population, more roads and vehicle traffic, less habitat due to development. Students may point out the slight decrease from 2015 to 2023, possibly a result of the building of pathways over or under roadways, speed limits, signage, public awareness about protecting panthers, etc.
 - 3. Using the second graph, identify the county or counties with the highest number of panther-vehicle collisions. *Collier and Hendry*.
 - 4. Explain why you think the county or counties identified in the question above might have more collisions than other Florida counties. Answers may vary, but may include high population density of people and/or panthers, increased development, decreased panther habitat, more roads, more vehicles on the roads, and/or higher speed limits.

STANDARDS

This activity addresses the following:

NGSS: HS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

Florida NGSS: SC.912.L.17.6:

Discuss, compare, and negotiate methods to balance the needs of humans with the needs of the environment.

Florida NGSS: SC.912.L.17.17:

Analyze the potential costs and benefits of various conservation practices and the role of technology in conservation efforts.



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PREPARATION

OBJECTIVES

EXPLORING THE NUMBER ONE CAUSE OF PANTHER DEATHS

20 MIN MAKE AND SUPPORT A CLAIM ABOUT WILDLIFE CROSSINGS

- **3.** Distribute a copy of the Wildlife Crossings Claim-Evidence-Reasoning handout to each student. Show students the video "Connecting with Broketail" (11:51), featuring wildlife crossings, and have them answer questions 1 and 2 in the handout.
- **4.** Allow students to work with a partner or small group. Have each pair analyze the online map "FDOT Wildlife Bridge Crossings" and answer questions 3–5 in the handout.
- **5.** Next, have students complete the Claim-Evidence-Reasoning chart. They should develop a claim about where additional wildlife crossings are needed, supported with evidence from the data in the graphs, videos, or maps.
- **6.** Have students describe their reasoning, answering the why and how of their claim and relating the evidence they provided from any of the resources they explored in the activity. Invite pairs to share their Claim-Evidence-Reasoning with the whole class.

15 MIN LOOK FOR PATTERNS AMONG PANTHERS SURVIVING HUMAN-WILDLIFE CONFLICT

- 7. Distribute copies of the Meet the Survivors handout to each student. Explain that they will read about seven Florida panthers currently residing in zoos.
- 8. Discuss the concept of patterns in data with students: Patterns are shared characteristics or events among data, although not all of the data may follow the pattern exactly. Ask students to identify patterns in the data (for example, interactions with humans result in capture, female panthers were unable to care for kittens, vehicle collisions).
- **9.** Wrap up with a whole-class discussion using the following prompt: *Why are wildlife crossings that provide safe passage under or over roads so important for the Florida panther?*

TIP: To focus more deeply on gathering information from the readings and engaging students through stories of the "Survivors," you can change the order to feature this section first. The Claim-Evidence-Reasoning presentations can be the final step in the activity.

MORE TO EXPLORE

RESEARCH WILDLIFE PROTECTION IN OTHER LOCATIONS

Research how a <u>mountain lion</u> <u>named P-22</u> living in the Hollywood Hills has inspired the building of an \$85 million wildlife crossing.

EXPLORE GLOBAL CORRIDOR CONNECTIONS

Connect to global issues with human-wildlife conflict including farmers and leopards/tigers in India, ranchers and wolves in North America, or elephants and crops in Africa. Show this <u>Wild</u> <u>Hope "Road Warriors" video</u> about innovative wildlife crossing projects in Brazil, including treetop overpasses for tree-dwelling species in the Amazon.





FLORIDA PANTHER DEATHS FROM VEHICLE COLLISIONS

PATH OF THE PANTHER

The number one cause of panther deaths in Florida is vehicle collisions. To find patterns and make inferences based on the data, explore the two graphs shown in the slides and answer the questions. You will apply information here and in the next exercise to propose new locations for wildlife crossings in a Claim-Evidence-Reasoning exercise.

1. Describe the overall trend depicted in the first graph. Use specific data points to support your response.

2. Around what year do you see a shift in the data? Why do you think that shift might have occurred?

3. Using the second graph, identify the county or counties with the highest number of panther-vehicle collisions.

4. Explain why you think the county or counties identified in the question above might have more collisions than other Florida counties.



WILDLIFE CROSSINGS CLAIM-EVIDENCE-REASONING

Part 1: Watch the "Connecting with Broketail" video on wildlife crossings. Discuss questions 1 and 2 with a partner or small group.

1. Share something from the video that was new or interesting to you.

2. Discuss the value of wildlife crossings for both panthers and humans.

Part 2: Study the online map FDOT Wildlife Bridge Crossings showing crossings in central/south Florida.

- 3. What do you notice about the location of wildlife crossings? How do these locations relate to your answer to Question 2 above?
- 4. Can we eliminate roads-why or why not?
- 5. What else can we do to make roads safer for wildlife and humans?





PART 3: Complete the Claim-Evidence-Reasoning chart below.

Make a claim about where additional wildlife crossings should be built:

Provide evidence for your claim. (Evidence might come from a graph, video, or map.)

Describe your reasoning. (Answer the why and how of your claim and relate the evidence you provided.)



MEET THE SURVIVORS

Humans and wildlife sometimes interact in ways that result in negative outcomes for either or both of them. For example, wolves preying on livestock can lead to loss of property for the rancher; a vehicle collision can result in loss of life for a deer and vehicle damage for the human; or elephants trampling freshly sowed crops can be a devastating loss for a subsistence farmer. There are strategies that humans can employ to reduce these problematic outcomes. Dogs such as the Great Pyrenees excel at protecting herds from wolves; wildlife bridges and fences can keep animals off of highways; and bees have been used to deter elephants from crop fields.

Incidents of human-wildlife conflict increase as humans continue to move into and develop wild areas. The Florida panther is no exception. As their habitat decreases due to human activity, panthers are forced to come into closer proximity to humans, leading to vehicle collisions, predation of domestic animals, increased exposure to disease, and increased risk of being removed from the wild as a nuisance or safety risk to humans.

Read about each of these seven panthers. As you read, think about how each panther ended up in a zoo in Florida. **Can you identify any patterns across the different stories?**

WALTER / ZOOTAMPA

PATH OF THE PANTHER

Walter was found in the Northern Everglades west of Lake Okeechobee in 2017, with his left front foot caught in a snare trap presumably put out by a landowner trying to control predators like coyotes. After multiple surgeries at ZooTampa, it was determined that Walter's foot could not be repaired, and he could not be returned to the wild. He was given a new permanent home at the zoo and named for a donor who helped fund his care. His keepers say that Walter enjoys the sunshine and taking naps on the top of his platform in his habitat, which he shares with fellow panthers Lucy and Micanopy.

ATHENA / NAPLES ZOO

Athena was born into a litter of four kittens in 2017 being observed by National Park Service biologists in Big Cypress National Preserve. Biologists later noticed that the mother had moved three of the kittens but had left Athena at the original den site when she was just a few weeks old. Attempts to reunite Athena with her family were unsuccessful, leading to the decision to remove her from the wild. Research suggests that a kitten needs to live at least six months with its mother to be a candidate for successful reintroduction into the wild. Athena was rehabilitated behind the scenes before being given a permanent home at Naples Zoo.

CYPRESS / WHITE OAK CONSERVATION, NEAR JACKSONVILLE

Cypress and his brother, Pepper, were born in 2019 near Immokalee to FP256, who was wearing a tracking collar. The state panther team observed that FP256 was so severely affected by the neurological disorder feline leukomyelopathy (FLM) that she would likely not survive, and certainly not successfully raise kittens. The two kittens were initially hand-raised at ZooTampa and monitored for signs of FLM before being provided a long-term home at White Oak Conservation near Jacksonville. Researchers are still investigating the source of the disease that ultimately claimed their mother.

SAKATA / HOMOSASSA SPRINGS WILDLIFE STATE PARK

As a two-month-old kitten in 2016, Sakata was discovered abandoned and sleeping in a field at the Sakata Research Station near Fort Myers. Biologists tried to locate his mother and concluded that the kitten had likely become lost in a rare circumstance when two mothers with kittens crossed paths and Sakata attempted to follow the wrong mother. Sakata's mother was never found, and the lost kitten was taken to Naples Zoo for medical care before finding a permanent home at Homosassa Springs Wildlife State Park, joining Yuma, another male panther who was rescued as an orphan.



PATH OF THE PANTHER

MAHALA / ZOO MIAMI

In 2014, Mahala was found hiding in a bougainvillea bush beside a tennis court in Naples. Her mother had been hit by a car nearby, sustaining only minor injuries, and was seen walking away from the area with her other kittens. After multiple attempts to reunite the lone kitten with her family, biologists rescued her, as she was too young to survive in the wild on her own. In 2015, she was given a home at Zoo Miami, where she lives today. Soon after, her mother was hit by another car and died. It is not known whether Mahala's siblings survived.

MICANOPY / ZOOTAMPA

Micanopy was removed from the wild in 2016 because he was preying on pets in a rural neighborhood of Immokalee. He was kept for a one-month quarantine to ensure he hadn't contracted feline leukemia from eating domestic cats, which could endanger the wild panther population. He was returned to the wild as far from people as possible but came back to residential areas. The Interagency Florida Panther Response Team decided his behavior was a public safety concern and permanently removed him from the wild. He was a young cat who possibly lost his mother early and learned to hunt domestic animals for easy food. ZooTampa saved Micanopy from euthanasia by welcoming him back a second time.

SASSY / PALM BEACH ZOO

When her mother was killed by a car on the Tamiami Trail near Naples in 2015, Sassy was too young to survive on her own. Florida Fish and Wildlife Conservation Commissions biologists successfully trapped her near where her mom was struck and took her to Naples Zoo for medical care. They were not able to catch her two siblings. They found one dead from starvation, and the other likely suffered the same fate. After Sassy was nursed back to health, she was provided a permanent home in a new panther habitat at Palm Beach Zoo, where she has actively climbed a catwalk from one part of her exhibit to another.

1. Identify at least two patterns evident in these panther stories.

2. Suggest how providing these panthers sanctuary at zoos might benefit the entire Florida panther population.

3. Identify two strategies that could help protect the endangered Florida panther, while still permitting humans to meet their needs. Include the potential costs and benefits of your strategies.





- Grades 9-Adult
- Biology
- Civics and Language Arts Connections

In this activity, students begin by recognizing their varied perspectives and values through an active exercise. They then view a clip from *Path of the Panther*, noting different perspectives and values of supporters of the Florida Wildlife Corridor. Students consider additional constituent groups that could influence decision-making and policies at the state level about land use related to the corridor—such as land developers, transportation planners, or new residents moving to Florida. Students work in small groups to explore a constituent perspective. They develop a position that will be valuable in discussing that perspective, then engage in a roundtable discussion to share their perspective, listen, and ask questions. Students then work together to develop a proposal to lawmakers determining the fate of Florida land.

All groups should benefit from the opportunity to have a discussion representing different viewpoints. **Younger audiences** may need some guidance in understanding the different constituent roles, as well as leeway to develop a variety of ideas. **Older audiences** will likely have more life experience to bring to research and discussion, so allowing time to develop their points for discussion will add richness to the roundtable phase.

KEY TERMS

 collaborative decision-making constituentperspective



BACKGROUND

Once unlikely allies, a group of business leaders, conservationists, and cattle ranchers gathered at the Nature Conservancy's Disney Wilderness Preserve to celebrate the Florida Wildlife Corridor Act, signed by Governor Ron DeSantis in July 2021.

In spring 2021, the Path of the Panther team, supported by the National Geographic Society, urged state leaders to protect the Florida panther and its habitat. Floridians had shown strong support for conservation in a 2014 ballot initiative. The unanimous passage of the Act advanced a bipartisan vision, prioritizing wild places for both the public and policymakers.

However, passing the Act was just the first step in creating a permanently protected patchwork of lands. A variety of **constituents**, with different **perspectives** but finding common ground, are using the new legislation to accelerate land conservation and achieve permanent protection of the corridor. Since the Act's signing, nearly \$1 billion has been committed by state and federal governments for corridor protection.

The survival of the Florida panther is at stake; it needs an expanded range throughout Florida and beyond. Of the corridor's 18 million acres, eight millionmostly working farms and ranches-are vulnerable to development. Continued **collaborative decision-making** will be critical to realizing the full vision of the Florida Wildlife Corridor.

-Adapted from the book Path of the Panther, Chapter 5, by Tori Linder, Managing Director and Impact Producer, 2023.

O Handout: Constituent Voices Cards

per student)

sticky notes

O Video: <u>"Toll Roads"</u> (3:00)

O Chart paper, markers, and

O Video: "The Florida Wildlife

Corridor Act" (3:41)

(print and cut enough for one card

STANDARDS

This activity addresses the following:

NGSS: HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Florida NGSS: SC.912.L.17.12:

Discuss the political, social, and environmental consequences of sustainable use of land.

Florida NGSS: SC.912.L.17.13:

Discuss the need for adequate monitoring of environmental parameters when making policy decisions.

Students will:

- O identify different constituents or viewpoints related to decisions for land use in Florida;
- O develop and discuss a position to support the perspective of a constituent group; and
- O design a proposal for Florida land and the Florida Wildlife Corridor that considers the values and perspectives of each constituent group.

Gather and/or print materials:

- O Masking tape or rope for "Take a Stand" in Step 1
- O Slides: <u>Florida Wildlife Corridor</u> <u>Voices Roundtable</u>
- O Video: <u>"Saving the Florida Wildlife</u> <u>Corridor"</u> (10:08; also includes link to full film, 27:58)
- O Handout: Florida Wildlife Corridor Voices Roundtable (1 per student)

Set up technology:

- Each small group will need to share a computer for online research.
- You may choose to have students use presentation software instead of chart paper and markers.





PREPARATION

OBJECTIVES

5 MIN EXPLORE STUDENTS' PERSPECTIVES

- 1. Begin with a "Take a Stand" activity to focus students on their own perspectives and values. In an open area such as a hallway, gym, or outdoors, place and secure rope or tape on the ground. One end will represent "strongly agree" and the other end "strongly disagree," with the middle as "neutral." There should be enough room for students to spread out along the line shoulder-to-shoulder. Read a series of statements, below, and have students line up along a continuum based on their own values/perspectives. After reading each, ask for two or three volunteers along the continuum to share why they chose their spot.
 - Pepperoni is the best pizza topping.
 - Florida's beaches are the best in the world.
 - Panthers are the most important animal in Florida.
 - I would hike some or all of the 1,400 mile Florida Trail.
 - I am connected to the Florida Wildlife Corridor.
 - People need to protect as much Florida land as possible from development.
 - People should be able to build on land anywhere in Florida for housing, roads, and for other economic purposes.
 - Panther range should expand throughout all of Florida.

Students should notice that people hold different perspectives, typically based on a combination of experience, background, interests, or knowledge. Explain that in today's activity, students will explore different perspectives of constituents connected to the Florida Wildlife Corridor.

25 MIN DETERMINE THE KEY VOICES AND DEVELOP A POSITION

- **2.** Have students talk in pairs or small groups, making a list of key constituents or influencers they think would have an interest in decision-making related to Florida's land and the Florida Wildlife Corridor.
- 3. Show the short film (10:08) "Saving the Florida Wildlife Corridor" (scroll down on this webpage). Ask students to add to their lists the roles of those in the film who take a stand about the corridor and land development.
- **4.** Have a class discussion about the different voices, those they saw in the film and also those from the list made before the film. List "Florida Wildlife Corridor Voices" on the board. The list from the video will include:
 - Conservationist / Photographer
 - Rancher
 - Fishing Guide
 - Tourism Operator/Indigenous Leader
 - Tree Farmer
 - More student ideas may include:
 - Home Builder
 - Commercial Builder
 - Transportation Planners
 - New Florida Residents

MORE TO EXPLORE

VALUES REFLECTION

In small groups, have students come up with more prompts for "Take a Stand" that reflect the perspectives of different constituents. Mix up the prompts and facilitate again. After each prompt, invite a student to share aloud or do a pair-share.





- 5. Next, distribute one copy of the Florida Wildlife Corridor Voices Roundtable handout and one individual Constituent Voices Card to each student. Organize students into small groups so that each group has the same Constituent Voices Cards. For 10 minutes, students will review their Constituent Voices Card and its resources, and follow Step 1 in the FWC Voices Roundtable handout. Each group will prepare a 30-second (3-4 sentence) opening statement that summarizes their perspective, including evidence from resources to support their proposed outcomes. They will develop their position using the prompts below (and on the handout) as a guide. Show the model in the slides for a possible Carlton Ward Jr. statement.
 - What are three main outcomes your constituent would like to see in a proposal?
 - What is critical/need to have? What is nice to have?
 - Are there any external pressures or constraints that might influence the constituent's perspective?

15 MIN DISCUSS POSITIONS AND DEVELOP RECOMMENDATIONS

- 6. Next, students move to **Step 2** in the handout, where each group presents their 30-second opening statement. Other groups should refrain from making comments but can take notes during this time. After all groups have presented, each student can ask one question of any group.
- 7. Have students go back to their small group and draft three recommendations from their perspective on how they would like decisions to be made about Florida's land. Each group member will then write all three recommendations on separate sticky notes. (Each student will need their own set of recommendation sticky notes for Step 3.)

20 MIN FACILITATE A ROUNDTABLE DISCUSSION TO DEVELOP A PROPOSAL

- 8. Direct students' attention to **Step 3** in the handout. Create new groups with one member from each constituent group. Groups bring their notes together to discuss. Using chart paper or a white board, each constituent representative should post their sticky notes with recommendations. Have small groups select one student to organize the sticky notes as the group discusses and comes to consensus on which address all constituent needs.
- **9.** Explain that students will engage in a mediated roundtable. The purpose of this roundtable is for different constituents to listen to the values and perspective of others in an organized way. Ask: *Why do you think the word roundtable might be relevant here*? Point out that a "roundtable discussion" enables all voices to have an equal position at the "table," with no one voice at the "head" of the table. As a group, set expectations and highlight some tools of mediation: empathy, listening, structure, gratitude, and acknowledgment of perspectives/possible biases. Use the slides also to explain your role as mediator.

MORE TO EXPLORE

LISTEN TO DIVERSE VOICES ON A HIGHWAY PROJECT

Show the Path of the Panther video clip, <u>"Toll Roads"</u> (3:00) with footage from an actual hearing where different constituents presented their perspectives within the potential of road-building on the Florida Wildlife Corridor and more.





- **10.** As part of the roundtable, students collaborate to make a proposal for Florida's land that considers the values and perspectives of each constituent group. As part of their proposal, have students discuss how to prioritize use of state tax funds for land use. They should consider how to allot funds across these necessary industries and programs:
 - Transportation
 - Land protection and management
 - Tourist development
 - Endangered species and wildlife monitoring, research, and rehabilitation

Have each group create a simple pie graph to illustrate how they would divide and distribute 100% of a budget across each of these areas. Ask: *Would you divide the tax funds evenly between these four areas?* Or divide differently for each? Ask students to be prepared to explain why, and also how their budget relates to the recommendations in their proposal.

10 MIN PRESENT AND DEBRIEF

- **11.** Following the roundtable, give each group a few minutes to share their proposal. Then, debrief the experience as a class. Ask:
 - Were constituents able to collaborate, even with different perspectives?
 - What are some ways that you communicated well as a group? What would you change?
 - How did your perspective shift, if at all, after conversation with other constituents?
- **12.** If time allows, watch the video clip, "The Florida Wildlife Corridor Act" (3:41), and discuss:
 - What do you imagine the constituents were feeling at this moment?
 - Which constituent perspective did you connect with most? Why?
 - What would be your next steps as that individual?

MORE TO EXPLORE

PERSPECTIVES ON A LOCAL ISSUE

Have students identify an issue in their own community related to wildlife and humans. Ask: Who and what are the different constituents, perspectives, and possible outcomes if constituents collaborate? Have students research independently or in small groups and create a presentation or poster to teach others about the issue, perspectives, and outcomes.





Your goal with this roundtable session will be to find agreement among the constituents representing different perspectives about land use in Florida, and then to draft a land management proposal for Florida's land that meets the needs of all constituents as best as possible. This process is not a debate, but instead a mediation where the group members come to an agreement in order to make decisions.

You will have resources related to a constituent with interests in Florida land and/or the Florida Wildlife Corridor. Your group's task will be (1) to define and present the position for your assigned voice representing that perspective. (2) After a class discussion, you will make recommendations for land use. You will next move into mixed groups, representing multiple constituents, for a (3) roundtable discussion and drafting of a land management proposal.

CONSTITUENT GROUP:

STEP 1: : Research, Write, and Present an Opening Statement

Your group (representing one constituent) will have 10 minutes to look through information and prepare a 30 second (3-4 sentences) opening statement about your viewpoints, perspective, and needs. Use the questions below to help you develop the position. You can also use any links provided to find additional information to support your position.

- What are three main outcomes your group, considering the constituent perspective, would like to see related to Florida's land?
- Which of the above are critical/need to have? Which are nice to have?
- Are there any external pressures or constraints that might influence the constituent's perspective?

Summarize this position in 3-4 sentences:

PATH OF THE PANTHER



STEP 2: Presentation, Questions, and Recommendations

Each group now presents their position to the class. After all groups have presented, each student may ask one question of any group. Then, each group meets again to develop three recommendations that they would like to see happen that align with the outcomes stated in your position.

After drafting your recommendations, each group member will write all three recommendations on separate sticky notes. Each student will need their own set of recommendation sticky notes for Step 3.

STEP 3: Develop a Proposal with a Mixed Group of Constituents

Next, you will move into a new group that includes one member of each constituent group. In this group, you have 10 minutes for sharing everyone's ideas and creating a Florida land proposal that meets one or more of everyone's recommendations. Use the chart paper and the recommendations on the sticky notes to rearrange and organize ideas until the proposal addresses each constituent's needs.

The proposal should consider the values and perspectives of each constituent. Include in the presentation a pie graph for how to allocate percentages of resources in the budget for:

- Transportation
- Land management
- Tourist development
- Endangered species management/monitoring/research/rehabilitation

The proposal should also include examples of how your recommendations would be part of the above categories.



10 MINS

20 MINS

CONSTITUENT: TOURISM OPERATOR AND INDIGENOUS LEADER

"As an indigenous person growing up with the Miccosukee people, we're always taught to always think about the future generations. I'm just being what the Miccosukee people raise our people to be, good stewards of the environment and of our people. Over the years, we've noticed a decline in the wildlife populations because of the disconnection of the landscapes. All this disconnection causes a lot of human and animal conflict. And if we want to protect the bear, if we want to protect the panther, they need to have wide open spaces to roam [...] So when you're looking at the overall ecosystem of the Greater Everglades, I would rather see a farmer own a piece of land because when he quits farming, the land can eventually reclaim itself. But if you get rid of that farmer and you put a shopping mall in there, then you've lost that natural element to that environment. [...] Tourism brings in a lot of money from the outside world to Florida. And you have to have that healthy environment for tourists to wanna come back to enjoy those experiences."

-Betty Osceola

Additional resource: https://www.semtribe.com/culture/seminoles-and-the-land

CONSTITUENT: CATTLE RANCHER

"I'm a sixth generation Florida rancher. Our family moved down here in 1850, middle of 1850, brought their cattle with them and we have the seventh and eighth generation living on the ranch. [...] My dad saw the change. He saw that people will move here and we couldn't stop them. He'd always say, 'You know, people don't come here to see a subdivision. They come here to see our scenic landscape.' Florida's got such a unique landscape and you fall in love with it when you're raised with it. Ranch land gives the state so many benefits, the greenspace and the clean air they're providing, the recharge area, the home for the endangered species. Most of your wildlife need bigger areas to live on. So you gotta have that continuous area for them to roam. You take one section out of it and it stops them from traveling. If we was surrounded on all four sides of development, it would be hard to ranch. The ranching business is not the most profitable business there is. So there's other things you gotta learn how to do and keep your land intact. You will find if you would keep your ranch, do a conservation easement, you'll find a way to make a living with it. Every rancher I know that went ahead and sold their land to a developer, there's not one of them that didn't come back and say, 'I wish I wouldn't have done that.' Once we lose the Florida Wildlife Corridor, we've lost it all."

-Carl Lightsey

Additional resource: https://www.floridabeef.org/raising-beef/cattle-in-florida



CONSTITUENT: FISHING GUIDE

"We've done a tremendous job over the past 50 years in setting the pace for conservation in Florida. And now we need to finish that journey because we're fighting a tremendous onslaught of development, 100,000 acres a year lost to housing and to roads and to shopping malls. By 2070, if development continues at the same pace, we're projected to lose 5 million acres of rural and natural land in the state of Florida. And that's nearly all the missing links in the Florida Wildlife Corridor. If we don't protect the Corridor now, most of our state parks and national parks are gonna be islands surrounded by development. And that's a world I want my kids to inherit."

-Benny Blanco

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Additional resource: https://florida-guides.com/about/

CONSTITUENT: TREE FARMER

"People have this vision of what a logger is and it's not what I think of myself. We cultivate our product and then we harvest it and we replant it. One of the tools we have is conservation easements. Conservation easements are a legacy tool because it means that as a landowner, you have put restrictions on that land that last forever. Wind Bend will never be a strip mall, it will never be a housing development. You give up your development rights and it helps the landowner because they receive payment for those rights that they give up. Critters don't know boundaries, they don't know property lines. They just go where they have to go. So it's important that we have these corridors so that these critters that are so important to us are able to move at their own natural pace. Private lands and agriculture are what provide those habitats that are so vital ... It's incredible how compatible Florida agriculture and wildlife are, even in the logging woods. I think we enhance our wildlife population more than we do to destroy it. Agriculture by and large is good for wildlife. We're seeing more and more conversion ... from timber to development. That's concerning, but most of the neighbors that we have are just as determined as we are to not develop. I've heard of a phrase that the last crop that will grow on these lands is houses. That's not a good option."

-Lynetta Griner

Additional resource: <u>https://www.flforestry.org/about-us/fl-forests-facts/</u>





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CONSTITUENT: HOME BUILDER

"In Florida, construction contributed \$75 billion (5.1%) of the state's GDP of \$1.5 trillion ... Construction (residential + nonresidential) employed 7.9 million workers in July 2023, an increase of 198,000 (2.5%) from July 2022 and an increase of 4.8% from February 2020, the peak pre-pandemic month. Construction employment in Florida in July 2023 totaled 612,700, an increase of 7,800 (1.3%) from July 2022 and an increase of 35,300 or 6.1% from February 2020."

Source: https://www.agc.org/sites/default/files/users/user21902/FL-US%20construction%20fact%20sheet_92023.pdf

Additional resource: https://babcockranch.com/our-homes/builders/

CONSTITUENT: COMMERCIAL BUILDER

"In Florida, construction contributed \$75 billion (5.1%) of the state's GDP of \$1.5 trillion."

Source: https://www.agc.org/sites/default/files/users/user21902/FL-US%20construction%20fact%20sheet_92023.pdf

"Florida's commercial real estate industry is booming. According to recent numbers, commercial real estate contributed almost \$190 billion to the state's economy, making it the third most of any state. Florida also ranked third in commercial real estate spending – at almost \$100 billion ... With billions of dollars contributed annually to Florida's economy, commercial real estate is big business for Realtors."

Source: https://www.floridarealtors.org/membership/specialties/commercial

Additional resource: https://www.floridarealtors.org/newsroom/market-data



CONSTITUENT: TRANSPORTATION CONTRACTOR

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> "Florida is currently experiencing unprecedented population growth and is projected to grow by 1,000 people every day over the next 30 years – with some areas of the state currently experiencing more than 20 percent growth rates. As the state continues to experience rapid population and tourism growth, the Moving Florida Forward Infrastructure Initiative focuses on critical improvements to ensure that transportation infrastructure can meet the demands of current and future residents and visitors, including investments in major interstates and arterial roadways to ensure people and goods can move safely throughout the state."

"With the \$4 billion dedicated for Moving Florida Forward's initiative and the Department's work program, FDOT's total budget for the next 5 years totals over \$68 Billion in transportation investments."

Source: https://www.fdot.gov/movingfloridaforward/landing

Additional resource: <u>https://highways.dot.gov/federal-lands/wildlife-crossings</u>

CONSTITUENT: NEW FLORIDA RESIDENT

"...population growth and is projected to grow by 1,000 people every day over the next 30 years."

Source: https://www.fdot.gov/movingfloridaforward/landing

"There are many reasons to consider moving to the Sunshine State. With hundreds of miles of beaches, nearly 230 sunny days a year, abundant theme parks and so much more to offer, Florida became the nation's fastest-growing state for the first time since 1957, according to the 2022 U.S. Census Bureau ... In 2022, Florida had the highest net migration increase of all the states. According to U.S. Census data, 738,969 residents moved into the state, while 489,905 residents moved out, meaning Florida gained a net population of 249,064 people that year. This growth can be attributed to a variety of factors, including Florida's warm, sunny climate, job opportunities, diversity and more."

Source: https://www.forbes.com/home-improvement/moving-services/florida-moving-statistics/

Additional resource: https://www.redfin.com/state/Florida/housing-market





TAKE LEARNING FURTHER

ACTION IDEAS: WHAT CAN STUDENTS DO?

Through the activities in this guide, students and adults can develop a deeper understanding of biology, ecology, and connections between humans and their environment. There is so much more they can do to deepen their learning while making an impact—now and in the future.

The Florida Wildlife Corridor is not yet complete. Habitat destruction is still a threat in Florida and in other areas around the world. Help students understand that they can take action and make a difference in these ways and more:

- EXPERIENCE the habitats and biodiversity of the Florida Wildlife Corridor. Plan ways to visit and explore through the corridor's parks and preserves. On <u>this site</u>, learners can find Florida Wildlife Corridor places and identify those they'd like to visit.
- O **FOLLOW PROGRESS** with the corridor on <u>pathofthepanther.com</u>. Talk with friends and family about why it's important. Share the film with them, and discuss opportunities for taking action.
- O WRITE POLICYMAKERS about the importance of protecting the Florida panther's habitat and the Florida Wildlife Corridor. Go to <u>pathofthepanther</u>. <u>com/takeaction</u> for details on how to write to policymakers.
- O **IF OUTSIDE OF FLORIDA,** research nearby wildlife corridors or local keystone species and write to policymakers and government officials about conservation there.

Provide opportunities to create art, poetry, essays, or fiction honoring or sharing the story of the Florida panther or the Florida Wildlife Corridor. Seek opportunities to develop research or participate in citizen science by contacting nearby parks, preserves, and universities.





CREDITS AND RESOURCES

CREDITS

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