

ScienceNews

EDUCATOR GUIDE



KADOORIE FARM AND BOTANIC GARDEN, B.P.L. CHAN ET AL/SCIENTIFIC REPORTS 2020

November 21, 2020

A Rope Bridge Restored an Ape Highway



SOCIETY FOR SCIENCE & THE PUBLIC

About this Guide

In this Guide, based on the online *Science News* article "[A rope bridge restored a highway through the trees for endangered gibbons](#)," students will learn about how researchers used engineering to help an endangered species navigate its habitat after a natural disaster. Then, students will explore other examples of solutions to habitat fragmentation and discuss the importance of conservation.

This Guide includes:

Article-based Comprehension Q&A — Students will answer questions about the online *Science News* article "[A rope bridge restored a highway through the trees for endangered gibbons](#)," which describes how researchers helped critically endangered Hainan gibbons in China navigate a gully after a landslide. A version of the story, "A rope bridge restored an ape highway," can be found in the November 21, 2020 issue of *Science News*. Related standards include NGSS-DCI: HS-ESS3; HS-LS2; HS-ETS1.

Student Comprehension Worksheet — These questions are formatted so it's easy to print them out as a worksheet.

Cross-curricular Discussion Q&A — Students will learn about the effects of habitat fragmentation on species, explore scientists' process for designing and engineering solutions to the problem, and discuss the importance of conservation. Related standards include NGSS-DCI: HS-ESS3; HS-LS2; HS-ETS1.

Student Discussion Worksheet — These questions are formatted so it's easy to print them out as a worksheet.

Article-based Comprehension, Q&A

Directions for teachers: After your students read the online *Science News* article "[A rope bridge restored a highway through the trees for endangered gibbons](#)," ask them to answer the following questions. A version of the story, "A rope bridge restored an ape highway," can be found in the November 21, 2020 issue of *Science News*.

1. What happened on China's Hainan Island in 2014? How did the event affect the island's gibbons?

A landslide carved a 15-meter-wide gully through the island's rainforest, damaging gibbons' typical route through the forest. After the damage, gibbons were forced to leap across the gully.

2. Based on the information given in the article, how would you define habitat fragmentation?

Habitat fragmentation is when the physical environment inhabited by a species is altered in a way that divides and isolates smaller populations of the species.

3. In general, why is habitat fragmentation bad for gibbons?

The fragmented rainforest could divide the gibbons into smaller populations, leading to inbreeding and those small populations dying out. Fragmentation could also force gibbons to travel over the ground more often, where they are susceptible to potentially harmful parasites, getting hit by cars and fights with other animals.

4. What solution did scientists come up with to repair the damage?

Scientists built a rope bridge across the gully that they hoped gibbons would use to safely cross the gully while trees grow back.

5. How did gibbons respond to the scientists' solution? Did all gibbons respond in the same way?

The gibbons were slow to use the bridge, but eventually did 176 days after scientists installed it. Many gibbons preferred to walk along one rope while using the other rope as a handrail, or to climb along the ropes using their arms and legs. Male gibbons were not observed using the bridge.

6. How did the gibbons' response compare with the scientists' expectations?

The gibbons' use of the bridge differed from scientists' expectations. The researchers had thought the gibbons would swing under the rope bridge using their arms, similar to how they swing among trees.

7. What does primatologist Susan Cheyne say about the solution's potential for wider use?

Hainan gibbons are typically not interested in using new things, so the fact that the animals crossed the rope bridge suggests the solution is effective and well-suited for primates. Conservation groups focused on other primate species might be able to use rope bridges.

8. Could the solution benefit animals other than primates? Explain.

Yes. Scientists observed squirrels and a rodent using the rope bridge. Marsupials might also use rope bridges depending on where the bridges are located, the scientists say.

Student Comprehension Worksheet

Directions: Read the online *Science News* article "[A rope bridge restored a highway through the trees for endangered gibbons](#)," then answer the following questions. A version of the story, "A rope bridge restored an ape highway," can be found in the November 21, 2020 issue of *Science News*.

- 1. What happened on China's Hainan Island in 2014? How did the event affect the island's gibbons?**
- 2. Based on the information given in the article, how would you define habitat fragmentation?**
- 3. In general, why is habitat fragmentation bad for gibbons?**
- 4. What solution did scientists come up with to repair the damage?**
- 5. How did gibbons respond to the scientists' solution? Did all gibbons respond in the same way?**
- 6. How did the gibbons' response compare with the scientists' expectations?**
- 7. What does primatologist Susan Cheyne say about the solution's potential for wider use?**
- 8. Could the solution benefit animals other than primates? Explain.**

Cross-curricular Discussion, Q&A**Directions for teachers:**

Ask students to read the online *Science News* article "[A rope bridge restored a highway through the trees for endangered gibbons.](#)" Another version of the story, "A rope bridge restored an ape highway," appears in the November 21, 2020 issue of *Science News*.

As a class, discuss the first two sets of questions to get students thinking about the impact of habitat fragmentation on species and the steps needed for designing and engineering a solution. Then, divide students into groups to find and discuss their own example of an engineered habitat highway. Finally, bring the class back together to review the group examples and discuss the third set of questions, which address the importance of conservation and ways to prioritize conservation efforts.

As an optional extension, have students research an endangered species that is affected by habitat fragmentation and design an engineering solution to help mitigate the issue.

Want to make it a virtual lesson? Post the online *Science News* article "[A rope bridge restored a highway through the trees for endangered gibbons](#)" to your learning management system. Discuss the article and questions with your class either on a discussion board or via video conference. Use virtual breakout rooms or shared documents for the group discussions.

Defining the problem

1. What problem were scientists trying to solve according to the article? What population was affected by this problem?

A 2014 landslide on China's Hainan Island removed many mature trees that critically endangered Hainan gibbons used to navigate the rainforest. This forced the gibbons to leap across a gully to continue using their preferred tree highway.

2. What are the potential short-term impacts of this problem for the affected population?

Leaping across the gully is potentially dangerous for the gibbons. Instead of sturdy branches to grab onto, the apes have flimsy palm fronds. Students may say that the gibbons are at risk of falling into the gully and getting injured or killed.

3. What are the potential long-term impacts of this problem for the affected population? What do you think is the long-term effect of habitat fragmentation around the world?

A fragmented habitat could divide the gibbon population into smaller breeding groups, leading to inbreeding and local groups dying out — and increasing the likelihood that the critically endangered species could become extinct. The gibbons also might be forced to travel across the cleared area on the ground more often, which exposes them to possible life-threatening dangers including car traffic, parasites and predators. The long-term effect of worldwide habitat fragmentation is decreasing biodiversity.

Analyzing the solution

Think about how scientists might have used the engineering design process to create a solution to the problem.

1. What three main steps do you think the scientists took to come up with a solution? Identify what important parts of the solution were likely determined at each step.

Student answers will vary but should include the three general steps mentioned in the sample answer below.

First, scientists had to do background research on gibbon physiology and behavior to determine what type of structure the animals were most likely to use. Scientists also had to research the rainforest area where the landslide occurred to determine how to design the structure so it could fit well into the environment. Scientists decided that a bridge was the most suitable structure.

Scientists then had to define the specific requirements needed to develop the bridge. They had to decide on the bridge's materials, weight capacity, dimensions and how to anchor the bridge in the rainforest, among other requirements. Scientists decided that a rope bridge was the best option.

The last step was for scientists to develop and test a prototype. The testing should have pointed to any needed changes. If changes were made, the prototype would be retested and reevaluated.

2. Was the solution successful? Did any problems remain?

Though it took time for gibbons to start using the rope bridge, female and juvenile gibbons used the structure to cross the washed-out section of the rainforest. Male gibbons never used the bridge. Students may say that the results suggest at least some gibbons still leaped across the gully, which means the solution was only partially successful.

3. Propose a change to the design to make it more effective. What next steps would you take?

A bridge could be designed specifically for male gibbons. Male gibbons might have different behavior and tendencies than female and juvenile gibbons. Experimenting with a different design, such as a single rope, might make a difference for male gibbons.

Exploring conservation efforts

In a group, find another example of an engineered solution that has tried to reunite animal populations divided by habitat fragmentation. Use the questions in the sections above to define the problem and analyze the solution. Then, with your example in mind, discuss the following questions. Use additional resources as necessary, and make sure to cite your sources. Be prepared to present your example to the class.

1. How does the solution discussed in the *Science News* article compare with your example? Explain how the two solutions are similar and how they are different.

Student answers will vary but should address similarities or differences of the design goals, engineering methodologies and outcomes.

2. What is wildlife conservation and why is it important?

Wildlife conservation is the care and protection of plants, animals and other organisms so that they continue to thrive and exist for future generations. Wildlife conservation is important not only for the protection of specific plant and animal populations, but also for maintaining biodiversity, genetic variation in populations, healthy food webs and ecosystem structures, and natural cycles of resources. All of these aspects help protect human health as well.

3. Apart from restoring fragmented habitats, what are other common conservation strategies? How does policy play a role in these efforts?

Student answers will vary but could include protecting areas of land and ocean for plants and animals, removing invasive species, creating strategic hunting and fishing policies to help protect and control animal populations, and the establishment the Endangered Species Act. Policy is used to inform and enforce important conservation efforts.

4. What types of organisms do people often prioritize for conservation? How should we prioritize wildlife conservation efforts?

Student answers will vary but may highlight that humans are likely to prioritize animals that are charismatic (furry, soft, big-eyed, etc.) before other, less charming animals or plants that may be just as or more important to ecosystems. Wildlife conservation efforts should be prioritized based on the efforts' potential to sustain natural resources and healthy, biodiverse ecosystems. Species that are at high risk of extinction and conservation efforts that are likely to have the most impact should be prioritized first.

Applying your knowledge

As an extension, research an endangered species that is affected by habitat fragmentation and design an engineering solution to help remedy the issue. Use the steps you defined in “Analyzing the solution” to draw up a plan to create and test a prototype.

Student Discussion Worksheet

Directions: After reading the online *Science News* article "[A rope bridge restored a highway through the trees for endangered gibbons](#)," answer the first two sets of questions with your class.

Defining the problem

1. What problem were scientists trying to solve according to the article? What population was affected by this problem?
2. What are the potential short-term impacts of this problem for the affected population?
3. What are the potential long-term impacts of this problem for the affected population? What do you think is the long-term effect of habitat fragmentation around the world?

Analyzing the solution

Think about how scientists might have used the engineering design process to create a solution to the problem.

1. What three main steps do you think the scientists took to come up with a solution? Identify what important parts of the solution were likely determined at each step.
2. Was the solution successful? Did any problems remain?
3. Propose a change to the design to make it more effective. What next steps would you take?

Exploring conservation efforts

In a group, find another example of an engineered solution that has tried to reunite animal populations divided by habitat fragmentation. Use the questions in the sections above to define the problem and analyze the solution. Then, with your example in mind, discuss the following questions. Use additional resources as necessary, and make sure to cite your sources. Be prepared to present your example to the class.

1. How does the solution discussed in the *Science News* article compare with your example? Explain how the two solutions are similar and how they are different.
2. What is wildlife conservation and why is it important?
3. Apart from restoring fragmented habitats, what are other common conservation strategies? How does policy play a role in these efforts?
4. What types of organisms do people often prioritize for conservation? How should we prioritize wildlife conservation efforts?

Applying your knowledge

As an extension, research an endangered species that is affected by habitat fragmentation and design an engineering solution to help remedy the issue. Use the steps you defined in “Analyzing the solution” to draw up a plan to create and test a prototype?