frontiers FOR YOUNG MINDS

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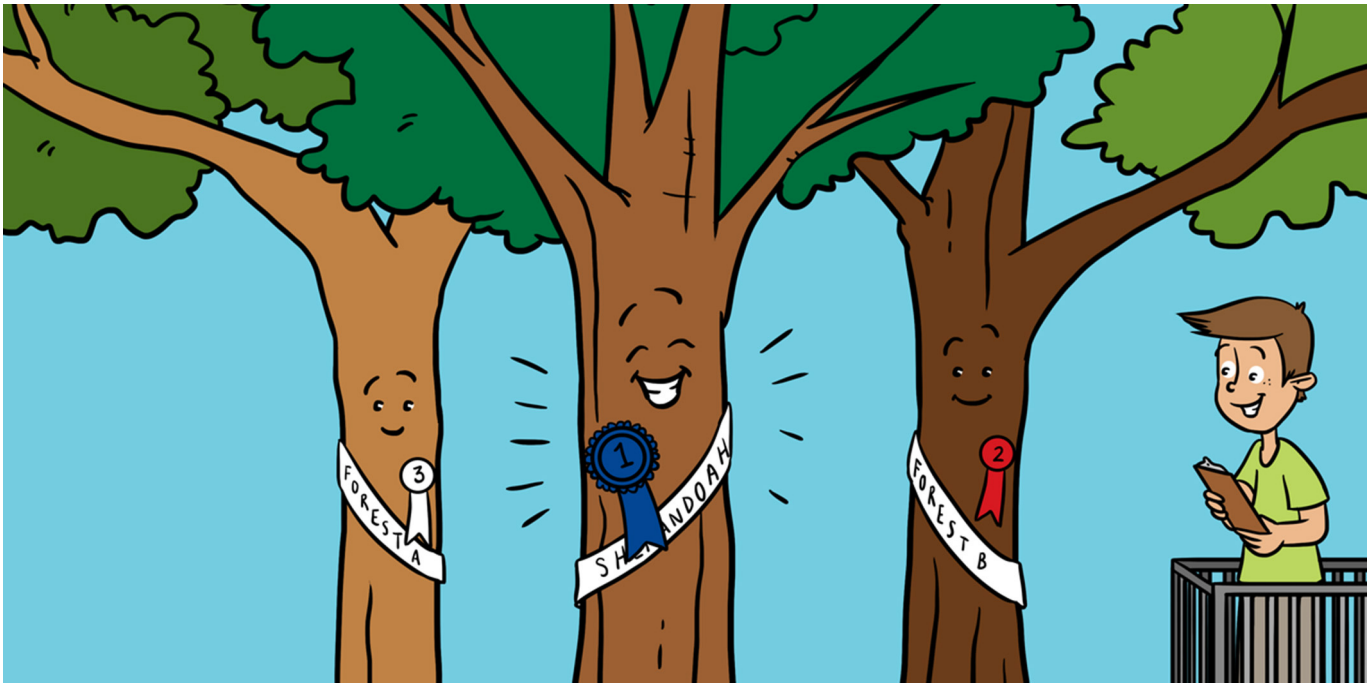
Published: 13 June 2022
doi: 10.3389/frym.2022.729784



DO PARKS HELP FORESTS?

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YOUNG REVIEWERS:

EL
AGE: 14

MOAB CHARTER SCHOOL
AGES: 11–12

National Parks were created to help protect nature. But does that protection really matter? Are forests inside parks actually any better off than nearby forests outside of parks? How could you even tell? To find out, we studied thousands of trees inside of parks. We measured every tree's diameter to see how big it was and returned 4 years later to see how they had changed. Then we compared the trees in parks to thousands of other trees that had been measured in similar unprotected forests nearby. It turns out that there are more trees growing in parks, and large trees are much more common. Trees in parks are less likely to die, but due to their large size, they grow more slowly. Parks even have more dead trees and dead wood on the forest floor. All of these things are signs of a healthy forest.

WHAT DO PARKS PROTECT?

National Parks in the United States protect important places. Some of these places are important because they include natural wonders, like the Grand Canyon, or contain large areas of forest, like Shenandoah

National Park. In these parks, plants and animals can live far from any humans that might bother them. Some parks, however, protect places that are not large wildernesses. These smaller parks often protect places that are important in history. Such parks could include the site of a Civil War battle, such as Gettysburg, or the houses where famous Americans like George Washington or Booker T. Washington grew up.

We expect the large, wild parks to protect the plants and animals that live there, but what about small parks? Little parks often include fields, farms, and old buildings that show us what life was like in the past. These parks have forests, but the forests are usually small and scattered around the park. You might think that small forests that are close to places where people live or work do not get much benefit from being in a park. But there is one big difference between parks and other areas. Even in small parks, people are not allowed to cut down trees to use for wood, but outside of parks, people can do that.

We wanted to find out if parks are doing a good job at protecting forests. To do this, we compared forests inside of parks with similar nearby forests outside of parks. Since the forests we compared are close to each other, any differences we see are probably caused by the protection provided by the park. If the forests in the parks are in better shape than the forests outside the parks, we could conclude that the parks are making a big difference. On the other hand, if forests inside and outside of parks are basically the same, then the parks are not helping the forests very much. We also wanted to know if park size makes a difference—in other words, are forests in small parks protected as much as forests in large parks?

WHAT MAKES A GOOD FOREST?

PERMANENT PLOT

A place that scientists visit many times to see how forests are changing.

Before we can see if parks are helping to protect forests, we need to know what we are looking for. When scientists study forests, they often use what are called **permanent plots**. Permanent plots are places in the forest that scientists visit for many years, so they can see how the trees grow and change. For this study, park scientists visited 2,000 permanent plots in 50 national parks in the northeastern United States. The parks are on the east coast between Maine and Virginia, and near the Great Lakes in the Midwest. We also used information other scientists collected from over 22,500 plots outside of parks. Scientists visit the permanent plots again and again, over many years. Hundreds of thousands of trees grow in these plots, and scientists measured every one!

DIAMETER AT BREAST HEIGHT (DBH)

A measure of how wide a tree is at 1.37 m off the ground. DBH provides a measure of a tree's overall size.

When we looked at the forests in each plot, we were especially interested in the sizes of the trees. While all forests have trees, not all forests have *large* trees. Scientists determine the size of a tree by measuring its **diameter at breast height** (**DBH**) (Figure 1). This is simply

a measure of how wide the tree is at 1.37 meters off the ground, about chest high on an adult. Trees that have a 30 cm DBH are considered large and those that have a 60 cm DBH are classified as very large. Large and very large trees are important, as many animal species, including many birds, will only live in forests with lots of large trees [1]. Therefore, we hoped that parks would have a lot of large trees.

Figure 1

A park scientist measures the DBH of a tree at Saratoga National Historical Park (New York, USA).

Figure 1

By coming back to the same permanent plots, we could also measure how fast the trees grew and how often they died. It takes a long time to grow a large tree in a healthy forest, so if trees are dying often, they will never grow to be large. Trees in parks should die less often, because people cannot cut them down.

Dead trees are also important to forests. Dead trees can be divided into two types: **snags** and **coarse woody debris** (**CWD**). Snags (Figure 2) are trees that have died but are still standing. CWD (Figure 3) consists of large pieces of wood on the forest floor that come from falling trees or large branches. Many species, such as insects and mushrooms, only live in dead wood and would not be in a forest without those dead trees [2]. Some weasel-like mammals, such as American martens and fishers, use holes in large CWD and snags as dens to raise their young [3]. Even trees can benefit from CWD. Tree seedings are often found on CWD because the dead wood holds rainwater that helps the seedlings grow [4]. So, forests in parks should have more snags and CWD than unprotected forests outside of parks.

SNAG

A dead tree that is still standing.

COARSE WOODY DEBRIS (CWD)

Large pieces of dead wood on the forest floor.

WHAT WE FOUND

We found that the forests in the parks are in better shape than the forests outside the parks. Of the 50 parks we studied, 46 had more large and very large trees than nearby forests! The trees inside the parks were growing more slowly, probably because they are bigger. In 31 parks, trees were less likely to die than those in forests outside the parks. In 8

Figure 2

A snag provides a good home for oyster mushrooms in Acadia National Park (Maine, USA).

Figure 2

Figure 3

This coarse woody debris in Acadia National Park (Maine, USA) supports many other species, including tree seedlings and a thick coating of moss.

Figure 3

parks, the trees were *more* likely to die. These were usually either new parks, or parks that were turning fields back into forests. Some of these new younger forests were similar to forests outside the parks, but as time passes, they should grow to have many large trees. Finally, there were 11 parks that we only visited once, so we could not tell what was happening to the trees over time. We also found that there was more dead wood in the parks than outside the parks. Of the 50 parks, 38 had more large snags and 48 had more CWD. In fact, park forests had over double the CWD of nearby forests.

WHAT DOES IT MEAN?

We found that the protection provided by parks *did* make a big difference to forests. Compared to forests outside of parks, the forests inside parks had many more large trees. The trees in parks were also less likely to die, and forests in parks had more snags and more CWD than forests outside parks. This means that animals that need large living or dead trees can find homes in parks, even if they can not live in the forests outside of parks.

When we looked at the small parks, we found that they were usually protecting the forests just as well as the larger parks did. Although they are small, these parks are playing a big role in protecting nature. This is all good news—not just for large national parks, but for any small parks! Protecting trees is important not just for the trees themselves, but also for the many other species that rely on trees to survive. Our research shows that parks of any size can help safeguard all the species that live in forests.

ORIGINAL SOURCE ARTICLE

Miller, K. M., Dieffenbach, F. W., Campbell, J. P., Cass, W. B., Comiskey, J. A., Matthews, E. R., et al. 2016. National Parks in the eastern United States harbor important older forest structure compared with matrix forests. *Ecosphere*. 7:e01404. doi: 10.1002/ecs2.1404

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SUBMITTED: 23 June 2021; **ACCEPTED:** 13 May 2022;
PUBLISHED ONLINE: 13 June 2022.

EDITOR: Rebecca Weissinger, National Park Service, United States

SCIENCE MENTORS: Joan West and Mike Tercek

CITATION: Schmit JP, Miller K, Matthews ER and Brolis A (2022) Do Parks Help Forests? Front. Young Minds 10:729784. doi: 10.3389/frym.2022.729784

CONFLICT OF INTEREST: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

YOUNG REVIEWERS

EL, AGE: 14

My name is Stella but I go by El (they/them). Some of my hobbies include acting, cosplay, reading and almost everything science-related. One topic I am currently looking into/studying is forensic science. My favorite subject in school is Science but Reading/English is a close second. I love to read and often find myself up late at night hyper-focused on a book. A food I really like is chicken-flavored ramen. When I am older I hope to have a career in forensic pathology.

MOAB CHARTER SCHOOL, AGES: 11–12

We are a unique human sixth grade class in Moab, Utah. We consist of seven students with interests such as rocks, Minecraft, longboarding, cosplay, animals, and dirt biking. Our favorite subjects are math and science and we also like doing community service projects. We enjoy living in and exploring the desert of southern Utah.

AUTHORS

JOHN PAUL SCHMIT

John Paul started camping and exploring nature in middle school and has liked working outdoors ever since. He also enjoys learning about mathematics. As an ecologist for the National Park Service, he gets to combine both interests. John Paul helps to monitor natural resources in parks, like forests and streams, and then uses math and statistics to understand how they are changing. This information can help people make better decisions to protect the parks. *john_schmit@nps.gov

KATHRYN MILLER

Kate has always been fascinated by nature, but she did not realize people could make a living studying nature until college. After her first forest ecology class, she switched majors from English to natural resource management, and never looked back. She went on to get an M.S. and Ph.D. in ecology and biological sciences. Kate

is an ecologist with the National Park Service, where she monitors forest health in 20 parks in the eastern U.S., to help parks better manage their forests. When not working, Kate enjoys gardening, hiking, and foraging for edible plants and fungi.

ELIZABETH R. MATTHEWS

Liz grew up in a city but spent her childhood summers in the mountains of North Carolina, where her interest in nature and love of eastern deciduous forests was born. After majoring in natural resources in college, she moved to North Carolina to work for a conservation organization, where she got her hands dirty doing ecological restoration. She went on to get a Ph.D. in plant ecology, and after a detour to California, returned to the eastern deciduous forest as a botanist, and later program manager, with the National Park Service.

ANDREJS BROLIS

Andrejs has always been a city boy who loved nature. Although he grew up in the suburbs of Washington DC, he spent most of his summer tromping around forests and playing in creeks. After graduating from Virginia Commonwealth University with a degree in biology, he spent the next few years exploring our public lands by hiking the Pacific Crest and Continental Divide National scenic trails. Wanting to return to greener forests, Andrejs moved back east and began working with the National Park Service. He is now a biologist overseeing forest and water monitoring for the NPS Inventory and Monitoring Program.