

FROM CANOPY TO CLASSROOM

Connecting forest wildlife research to classroom exercises for middle school students

By Savannah Finch, Adam Duarte, Donald Brown, and Jennifer Duarte

▲ **Savannah Finch presenting her pathway to a wildlife career to students at Tenino Middle School.**
Adam Duarte

In the middle school gymnasium of the rural town of Tenino, Washington, we asked students to tell us about a personal wildlife encounter, and several hands popped up. Their eyes lit up with excitement as they went into unprompted detail about where they were, what the animals looked like and what the animals were doing. One student saw a deer with large antlers grazing in their backyard and another witnessed a bird catching a fish in a lake. We could have spent our entire time with the students listening to their stories. As scientists from the U.S. Department of Agriculture Forest Service Pacific Northwest Research Station, we were seeking to connect this passion about

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wildlife encounters to their perceptions and interest in STEM (science, technology, engineering and mathematics) careers.

A widening gap exists between students' attitudes toward the utility of science and their individual achievements and career choices within STEM (Knezek et al. 2013). STEM classes can be particularly challenging for students, and poor performance, or the perceived difficulty of these classes, can reduce interest in pursuing a STEM career (Wang 2013, Gossen and Ivey 2023). When students view science as a difficult subject, they associate STEM careers with these challenges, due in part to their limited knowledge of possible career pathways. Incorporating learning activities that are engaging and inspire students' confidence in their abilities can increase interest in STEM fields (Hayden et al. 2011, Knezek et al. 2013).

Exposing students to different career possibilities is an important factor influencing interest in STEM (Wyss et al. 2012). Directly hearing from experts at an early age provides deeper insight into careers students may have not previously considered. Learning about the required education to pursue these paths highlights the importance of current academic efforts that can shape future opportunities. Particularly in STEM fields, students can discover the wide range of science-related careers, which may spark an interest in the sciences. As students learn about how scientists pursued their passions and became experts in their respective fields, they may make connections with their current interests and understand that becoming a scientist is an achievable goal. An ongoing collaboration between the USDA Forest Service Pacific Northwest Research Station and Tenino Middle School promotes student interest in science and math through classroom and outdoor learning activities.

CONNECTING STUDENTS TO NATURE

A small, tight-knit community in rural Washington, Tenino has two elementary schools (grades K-2 and 3-5), one middle school and one high school. Every September on the fifth day of school, teachers take the newly minted sixth-grade class on a four-day, three-night trip to Cispus Learning Center, colloquially referred to as Cispus. Cispus is located on the Gifford Pinchot National Forest, providing an outdoor learning environment for students of various ages in some of the most scenic forests in the Pacific Northwest. The idea of going without their phones and electronics for four days convinces many students the whole experience is going to be terrible, but most students quickly forget about devices once they are immersed in songs, routines and outdoor environments at camp.

Before our collaboration, Tenino students would experience Cispus the same way every year: they would all go on a hike and work through a ropes challenge course; participate in multiple classes where they learned about plant identification, first aid, food webs, archery and fire-building; and enjoy themed activities such as activity night, campfire night and skit night. The annual outdoor education experience

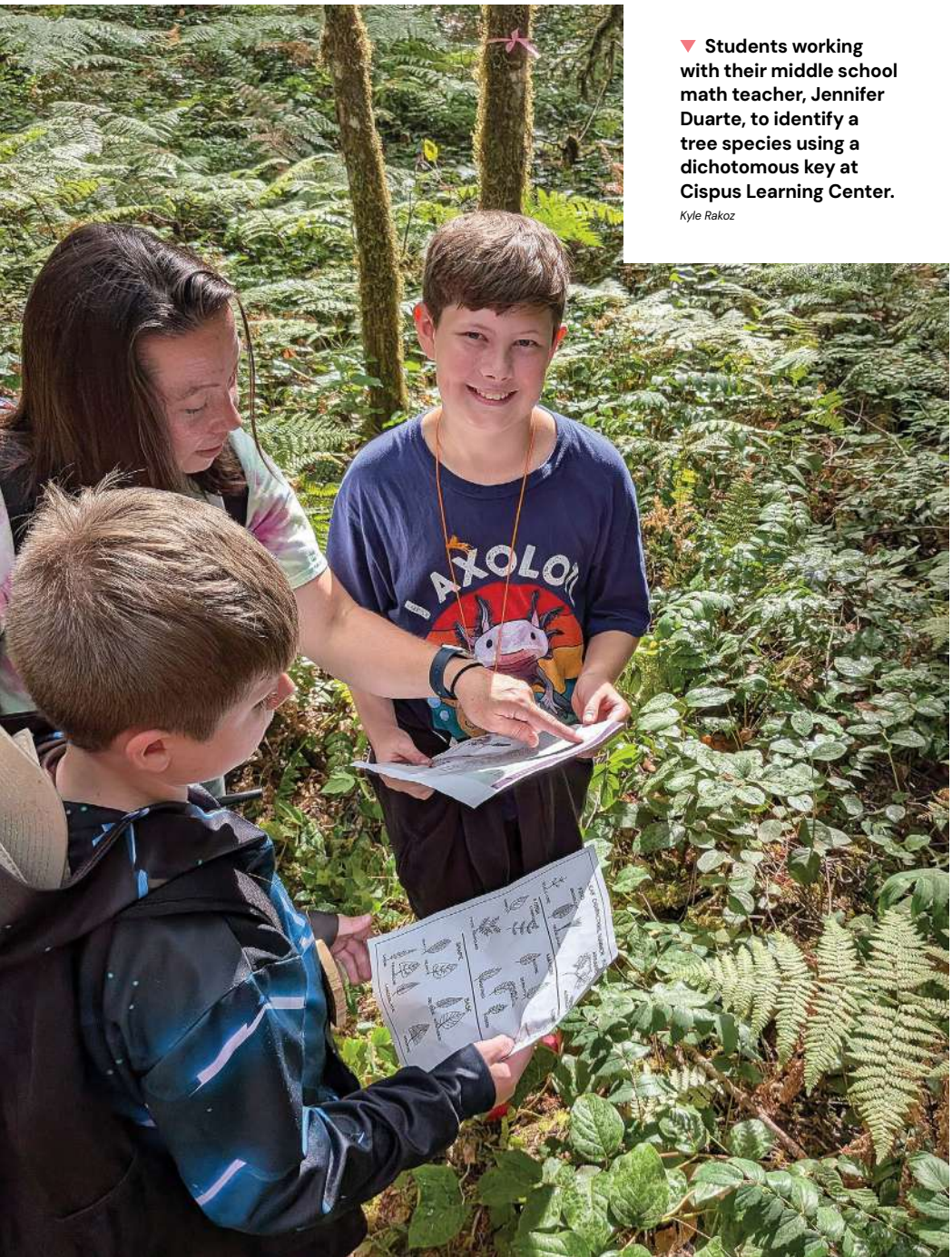


▼ **Led by Donald Brown, Tenino Middle School students work through a field exercise using a dichotomous key at Cispus Learning Center.**
Kyle Rakoz

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at Cispus has been successful over the years as a memorable bonding experience for Tenino students, who often choose to come back as camp counselors in high school. Still, each year, Tenino teachers look for ways to improve upon the previous year.

We were interested in strengthening our outreach to the local community, and after learning about the success of the annual Cispus trip, offered to incorporate our wildlife ecology expertise into the program. In the spring of 2024, we began initial discussions with Tenino Middle School teachers about how we could contribute to the Cispus experience. In particular, we had four objectives. First, we aimed to demystify what a scientist is, what it takes to become a scientist and some of the pathways to get there. In our view, knowing what different professions are and how to navigate career pathways represent some of the largest barriers to attracting young professionals to the field. Second, we wanted students to become familiar with the phases of the research cycle, particularly aspects of data collection, processing and analysis. Third, we wanted to show students how to relate to the data in a meaningful way and to be able to use it for classroom exercises throughout the school year. Fourth, we wanted them to have fun! Through a series of discussions, we designed indoor and outdoor learning activities that teachers implemented during the 2024-2025 and 2025-2026 school years.



▼ Students working with their middle school math teacher, Jennifer Duarte, to identify a tree species using a dichotomous key at Cispus Learning Center.
Kyle Rakoz

TRANSFORMING STUDENTS' PERCEPTIONS OF STEM

For our first objective, we sought to expand the students' understanding of what a scientist is through a short interactive presentation. We asked students to describe what they think a scientist does. Most answers suggested a laboratory chemist. We explained that many scientists work outside doing a wide variety of things, from studying water chemistry to vegetation and, for us, wildlife.

We emphasized the importance of a well-rounded education for scientists, including how we routinely use skills and knowledge learned in math, language arts, geography and history to design studies, test hypotheses and share results. For example, we showed how we use math to better understand wildlife species distributions, population trends and responses to environmental changes.

We also told personal stories and displayed presentation slides filled with pictures of our individual journeys to become wildlife

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Students completing a test set with the camera trap they set up at Cispus Learning Center, taken by another camera trap set up nearby.
Adam Duarte

scientists, providing the students real-world examples of different pathways to this career. We discussed our interests as children and young adults, the spark that led us to pursue wildlife degrees and the education and post-education paths each of us took that led us to becoming wildlife scientists.

We finished the presentation with an introduction to passive wildlife monitoring using autonomous recording units and camera traps, setting the stage for a field exercise at Cispus where the students deployed these monitoring devices.

In 2025, we included a learning exercise after the presentation that introduced students to a dichotomous key: a tool used to identify organisms based on their characteristics. We first conducted a classroom training exercise, where we walked the students through the structure of dichotomous keys, and then each student was given a piece of candy and tasked with identifying it by its "scientific name" using the provided key. Students individually shared their answers with a classroom instructor, and for students that had misidentified their candy, the instructor walked through the key with them to reach the correct "species." With the anticipation of a sweet treat after this exercise, students were keen to identify their candy correctly. This introductory exercise was for the students to practice the skill of species identification that they would later implement at a higher level with tree species at Cispus.

FIELD-BASED EXERCISES

Our second objective focused on connecting students' Cispus experience to field data collection for research. Once the students arrived at Cispus, teachers and counselors guided them in groups on a one-mile out-and-back walk to a waterfall. Along this walk, designated groups would stop at a station with a field instructor.

In 2024, our outdoor learning exercise was centered on passive wildlife monitoring. We taught students how to set up autonomous recording units and camera traps, and we discussed how these data were used in research. This approach made a direct link between technology and wildlife monitoring. We had students turn on the units and strap them to trees. For the camera traps, we had the entire group complete a test set by giving their best "Sasquatch pose" to trigger the cameras. The students then finished their walk to the waterfall.

In 2025, we expanded the lesson by adding a field-based component that allowed students to practice the identification skills they had learned from the candy exercise. Students were placed in groups of three to four and tasked with identifying a tree using a dichotomous key. Once each group successfully identified their tree, they were asked to read natural history accounts of their species and share an interesting fact about it with everyone.

COMBINING DATA WITH LESSON PLANS

Our third objective sought to connect student classroom learning exercises with local research in a meaningful way. We compiled wildlife audio and camera data collected from the silvicultural options

study (Curtis et al. 2004), a long-term forest experiment located in the Capitol State Forest and led by the Washington State Department of Natural Resources and the Pacific Northwest Research Station. The aim of this study was to examine silvicultural options for young Douglas-fir forests to balance the visual appearances of harvesting activities for public acceptance and timber yield. A second objective was to examine long-term effects on wildlife diversity and forest composition and structure. Many Tenino students regularly recreate at Capitol State Forest, and we wanted them to work with data from a familiar place to help them see the connection between our professional work and their personal experiences. Using the data collected from Capitol State Forest in 2024, we summarized avian species detections from autonomous recording units and provided camera trap photos for students to use in the classroom.

The wildlife data we provided are currently integrated into learning activities in the sixth-grade math classroom. One of the biggest challenges all teachers face is student engagement. It is difficult for a student to learn if they don't want to be at school, are distracted by their phone or refuse to do work by putting their head on their desk. Teachers engage students in the lesson by first asking them what they remember about Cispus, guiding the conversation to focus on the field studies they participated in and showing photos taken by the camera traps the students deployed.

Following the Cispus discussion, the teachers transition to a brief explanation of the Capitol State Forest data. They share about how the scientists who helped the students set up camera traps at Cispus used those same camera traps at Capitol State Forest. Students then work in groups to go through the photos and fill out a data collection sheet. Once the groups finish recording their data, the classroom discusses what patterns they notice. The teachers found that the first day of the project had nearly 100% student engagement. Nearly everyone is excited to go through the photos and see what they can find. Students that usually sit with their heads down are enthusiastically telling their group that they see a pair of eyes in a photo.

Over the next few days, students create dot plots using the data from an assigned category (i.e., deer, bear, human activity, no visible activity) and use these plots to create histograms and box plots, merging classroom teaching objectives with the wildlife data we provided. Usually, when asked to display data in math class, students don't understand how they would ever need to use these skills. Making the concept real, connecting it to real people and real careers—that means something.

Teachers can integrate fun projects like this into their lessons. However, connecting the lessons to people and places they have experiences with deepens their understanding of the material by encouraging internal motivation that drives student achievement (Harackiewicz et al. 2016). Students that are typically unmotivated to complete work in class might show up ready to work on the task at hand, and this shift in motivation could change the trajectory of a student's educational career. Providing examples of real-world applications of the content being taught gives students a purpose beyond learning.

IF NOT YOU, THEN WHO?

The role of wildlife biologists in helping to tackle pressing natural resource issues is now more important than ever. When you ask a wildlife biologist how they chose their career, most will offer a story about how an emotional connection with the outdoors helped form their career path. Yet, most young adults may not have similar experiences to draw from, and contemporary youth are increasingly disconnected from the outdoors for various reasons.

Admittedly, putting ourselves in front of hundreds of students was intimidating, given we lack formal instructional training for primary and secondary education. Two factors helped us overcome this initial stage fright. First, we developed a close partnership with the teachers at the school. They reviewed and provided feedback on our lesson plans, materials, expectations and timelines. This improved our ability to communicate effectively with students and aligned our expectations closer to reality. Teachers were also empowered to engage in conversations with us to better understand our objectives and data and how they can effectively incorporate them into classroom exercises. Second, we made considerable investments in planning, but we continued to be open to the idea of failing forward. In both years, we made a number of adjustments on the fly, finding in real time that some things worked well in practice and some didn't. These adjustments are allowing us to improve our learning activities with the students over time.

We recognize that finding time to invest in outdoor education in the same way we did may seem unrealistic for some

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wildlife professionals. But we found that most of the investment into our program took place at the beginning. As we learn how to implement our approach, we become more efficient, and we believe this would be the case for others who implemented this type of program, too. However, there are also certainly other ways to contribute to fostering connections between contemporary youth and the outdoors, such as volunteering to run wildlife booths at events, helping with your local youth hunter education and experience efforts, opening up and advertising departmental graduate research seminars with your local schools and much more. Programs like those at Cispus are an amazing opportunity to foster connections between the youth and natural resources, but in reality, the funding for such programs fluctuates and often must come from multiple sources. Serving as volunteers helps these programs continue to be successful.

We hope this article inspires wildlife professionals to keep going outside, but this time to go outside of your comfort zone and invest in efforts like this. Our program may simply serve as an opportunity for some students to connect with their classroom exercises in a more meaningful way. For others, it may help form a better understanding of a career as a wildlife professional. Both of these outcomes represent success in our opinion.

Our mission is for our work to serve as a catalyst for students to form a connection or help nurture an existing connection with natural resources surrounding their community and beyond. By extension, our society will continue to value wildlife conservation and management. And who knows? You may find yourself inspiring the next cohort of wildlife biologists to carry forward the mission. ■



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