

Learning About Culture and Sustainable Harvesting of Native Plants

Garden-based teaching can foster appreciation of indigenous knowledge.

By Eileen Merritt, Alex Peterson, Stacy Evans, Sallie A. Marston, and Steven Zuiker

The United States is divided into 15 broad ecological regions, each one home to a variety of fascinating native plants. For people who have visited or lived in the desert Southwest, just the word *creosote* may summon a memory. The fragrance of creosote leaves after a rainfall in the desert can evoke a powerful sense of place. Strong scents can also signal that a plant may have medicinal qualities. Indigenous communities such as the Tohono O'odham, Pueblo, and Navajo have inhabited Southwest deserts

for centuries and have developed deep knowledge about the plants that coexist with them. Many have found creosote, or segai, to be useful for a variety of medicinal purposes (Nabhan 1985). It has antimicrobial, antifungal, and antibacterial properties, making it a useful ingredient for a soothing salve. Below, we describe a lesson on salve making using creosote plants that values indigenous knowledge and highlights sustainable harvesting practices.

If you come upon a scraggly creosote bush in the desert, it may not

be immediately apparent why it's so special (see Figure 1). A closer look can inspire a greater appreciation for creosote (see Figure 2). Creosote bushes are found in and around the Southwest deserts (Mojave, Chihuahuan, and Sonoran) at elevations below 5,000 feet. A creosote bush ring in the Mojave Desert is one of the oldest living things on Earth—approximately 11,700 years old! How does creosote manage to survive despite scorching temperatures and little rainfall? This evergreen plant secretes resins, which serve many purposes. The resins create a waxy coating on the leaf surface, limiting water loss and reducing transpiration. Because the combination of chemical compounds in creosote resin taste terrible, it repels most herbivores. Creosote typically flowers several times within a season, providing sustenance for small mammals, reptiles, and insects, including 22 species of bees that pollinate it. Its small fuzzy fruits sustain desert woodrats and kangaroo rats. Desert tortoises often burrow under creosote bushes for shelter and shade. Desert tortoise habitats that are found in schoolyards across our region often contain creosote bushes, allowing the possibility of direct observations of this relationship. You may not have creosote in your habitat, but you likely have similar examples of plants native to your region to explore!

FIGURE 1

Creosote bush.



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DIFFERENT LENSES FOR VIEWING NATURE

Drawing students' attention to specific native plants and their niche within an ecoregion can help them develop respect and appreciation for the natural world. Robin Kimmerer is a scientist who describes two ways of knowing a plant: the scientific way and the Indigenous way (Tonino 2016). Scientists often observe and characterize physical attributes, conducting experiments that focus on what plants can provide for humans. Indigenous knowledge is systematically empirical too, but is also relational (Aikenhead and Michell 2011). Indigenous perspectives view other organisms as equals in the web of life, with their own agency and value irrespective of human needs. This distinction is important because treating plants as just objects removes them from our circle of ethical responsibility. The Indigenous way of investigating the natural world is place-based, emphasizing "what's happening between two organisms is always particular and localized, unique in space and time" (Tonino 2016). This way of knowing always considers individual objects *in relation* to other organisms and is more holistic. The traditional knowledge of creosote among Southwestern native people can be emphasized and appreciated when studying natural resources with your class.

AN ECOREGIONAL APPROACH TO SCHOOL GARDENS

Both Indigenous and western science value the importance of sharing knowledge—whether through scientific reports or by demonstrating practices and storytelling. At this juncture on our planet, both indigenous and scientific worldviews are needed to create balance. Through phenomena-driven inquiry, children can also build knowledge about the

FIGURE 2

Creosote in bloom.



connections between places, plants, and people in their ecoregion and come to appreciate indigenous ways of knowing the natural world.

To explore how teachers can create opportunities to learn in school gardens, we convened K–5 educators from the desert Southwest ecoregion for a conference on garden-based science teaching. Organizing gardening around the distinctive geography that participants share enabled us to collaboratively develop place-based and culturally responsive resources for educators and students living in the North American desert ecoregion. Drawing on our collective discussions, we describe an activity from our conference that was developed and refined by a team of educators and students in the Tucson Unified School District and appreciated by conference participants. This activity highlights nature-culture relations in indigenous communities. It is our hope that an

ecoregional approach to school gardening will inspire and enable educators to adapt (and share) activities like this one in their own ecoregions. In this way, garden-based science teaching can acknowledge both Indigenous and western scientific ways of knowing (e.g., Bang and Marin 2015).

LESSON 1: INTRODUCING CREOSOTE TO STUDENTS

When making salve with elementary students, we suggest a short sensory activity based on a desert phenomenon to introduce the plant. Educators who live in U.S. desert regions might ask: Have you noticed how the desert smells differently after a rain? What does it smell like? Elicit students' prior knowledge about the plant, encouraging them to share what they know about it. Some students may know of the medicinal properties of creosote and can share this with their peers.

Next, guide students to make observations of a creosote bush. You can use photographs or videos if creosote is not growing nearby, or use a different plant that will be the ingredient for salve making. However, studying a live plant allows students to use their senses and connect with the plant more meaningfully than through media. Ask students to:

- Draw a picture of the plant that includes all of the parts they observe, and write a description of what they notice about the plant (scent, texture, etc.)
- Label what function or job each part has.

Follow-up questions can guide them to specific structures, such as: How does it reproduce? How does it protect itself? Where does it get food (this may lead to a discussion of photosynthesis, where a follow-up question might be: If

the leaves are so small, how does it make enough food to grow?)

Finally, help students consider creosote in relation to other organisms in a desert ecosystem. What does this plant provide for other organisms, and what does it need from the environment around it? To help them consider this more fully, ask them to close their eyes and imagine what other organisms a creosote bush would encounter in the desert at night and share their answers with a shoulder partner.

After making observations and considering how creosote might be connected to native wildlife, extend their knowledge by sharing a video (e.g., FWCE Wildlife Ecology 2017) or a short text passage (e.g., Duhamel 2014). Allow them to add to their drawing/notes as they read or watch the video. The text highlights the medicinal qualities of the plant, which will be perfect background for the next lesson. To close this lesson, assess students by asking them to re-

spond orally or in writing to the question: Do you think creosote plants will still be alive in the wild in 1000 years? Use evidence from your drawing and notes to support your argument.

LESSON 2: SALVE MAKING

The next day, explain that indigenous communities have discovered many qualities of creosote that make it useful to humans, and they will learn about how to use part of the plant to make salve, while also respecting the plant and the community of other organisms that depends on it.

HOW TO MAKE SALVE

Ingredients

- 1 C creosote or other medicinal plant leaves
- 1 C sunflower oil or other oil with neutral scent
- 3 Tbsp Cosmetic grade beeswax

FIGURE 3

Demonstration of how to remove dried creosote leaves from stems.



Materials

- crock pot or double boiler and burner
- mesh strainer
- ladle
- 1 qt. Mason jar
- 2 oz. metal tins with lids

Making salve from plant leaves takes several weeks and is done in steps. This time frame allows student interest and excitement to build as they observe and anticipate each part of the process.

Step 1: Sustainably harvest creosote leaves

Harvesting leaves for medicinal purposes creates an opportunity to emphasize that people and animals who live in the area can utilize the plant without taking too much from it. Creosote bushes are resilient but cannot be easily replaced if they are destroyed. While many seeds are produced, only a few will germinate. And similar to other desert plants, the creosote grows slowly (about a foot in 10 years). Navajo elders teach younger generations to show respect for the natural world and that it is unethical for people who do not live in a community to extract resources and sell them to make money.

To help students understand sustainable harvesting, explain that when removing leaves to eat or use for a product, it's important to take only 30% of the leaves and remove leaves from the oldest part of the plant—old growth is a darker shade of green than new growth—to sustain the plant. Harvesting in this way allows the gathering of enough leaves to make salve without harming the plant. If you have creosote in your schoolyard, have students participate in harvesting. Have them calculate how many leaves they can pick to stick to the 30% goal.

FIGURE 4

An educator carefully ladles liquid salve into a container.



They can either remove a few stems, or some of the leaves, and then find a place where they can dry for use in the next step. Another connection with their school garden might be made by teaching about how to harvest leafy greens such as kale or swiss chard or herbs. Many gardeners continuously harvest leaves from these plants during a long growing cycle without destroying the plant.

This activity provides an opportunity to convey the message that using only what we need leaves resources for future use.

Step 2: Combine leaves and oil

Remove and crumble the dried leaves (Figure 3). The infusion process re-

quires equal parts of leaves and oil. Any kind of oil will work, but it's best to choose one without a scent, such as sunflower oil. Combine and mix the leaves with the oil and put the mixture in a glass jar to sit on a sunny classroom window for students to observe. The sun heats the oil and infuses it with plant essences. When you open the jar and can smell a strong, pleasing scent, you know that the oil has been infused and is ready for the next step. Students will enjoy taking turns opening the jar and deciding together when the oil is ready to use for salve.

Step 3: Combine oil and wax

Combine the two substances (oil and wax) in the crockpot, heating until

Safety Precautions

Safety considerations vary based on the age of participants. Creosote plant parts should not be ingested. Salve should only be used for cuts/scrapes on skin. Discussing salve use with students presents an opportunity to emphasize safe uses of medicines. For example, the medicines we ingest are different from the ones we put on our skin and have different ingredients/purposes. It's important to note there are commercial chemicals called creosote, such as coal tar creosote, which is a petroleum product. These are toxic and not related to the creosote shrub we describe here.

the wax melts (Figure 4). A teacher or adult volunteer can ladle it in the containers. Ask students to observe and discuss the properties of this new substance as it solidifies.

Step 4: Uses and safety

After the salve has cooled, talk with students about how and when it might be used. Tell them that indigenous people living in the desert apply the salve to cuts and scrapes to aid in healing. Consider sending a note home about its ingredients, with background explaining how it was made and can be used. We supplied small canisters for students that were labeled with a sticker to identify the product. As with any medicine, use a small amount at first, to make sure that the users are not allergic to any of the ingredients in the salve.

LESSONS LEARNED

At the end of the salve-making activity, we reflected with educators about the lesson. One participant appreciated the precedents set about being respectful and contemplating where the plants come from and how to care for them.

Taking only what you need keeps the ecosystem in balance and reserves the rest for use if needed later. This is a practice that many communities (particularly indigenous communities) value and share, but it might be a new idea for some students. Educators at our conference enjoyed learning about the unique adaptations of creosote, but a similar lesson could be taught with plants native to other ecoregions such as calendula, sage, or thyme.

Activities such as those described here draw attention to different ways that people can use resources in a way that maintains balance in natural and human communities. For a lesson plan describing this activity in more detail, as well as some other garden-based science teaching ideas, visit our website (www.schoolgardenalmanac.org/home). The sustainable harvesting of plants for medicines or food provides an opportunity to highlight how Indigenous communities use traditional knowledge to protect and sustain resources. Framing a harvesting activity in this way may help students learn to appreciate and show respect for the natural resources that they use every day. ●

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Eileen Merritt (egmerritt@vt.edu) is a research scientist at Virginia Tech in Blacksburg, Virginia. **Alex Peterson** is a student at the University of Arizona (UA) in Tucson, Arizona. **Stacy Evans** is the ecology and food literacy program coordinator for Tucson Unified School District. **Sallie A. Marston** is a professor in the School of Geography and Development, and the director and co-founder of the UA Community and School Garden Program. **Steve Zuiker** is an associate professor of the Learning Sciences at Arizona State University in Tempe, Arizona.