THE
Foothill Advocate

MAY 2022 VOL. 21, NO. 1

Woolly milkweed on the McKenzie by Karen Orso

SFC Announces 1,729 Acres of Newly Protected Lands Through the Wright Ranch Conservation Easement!

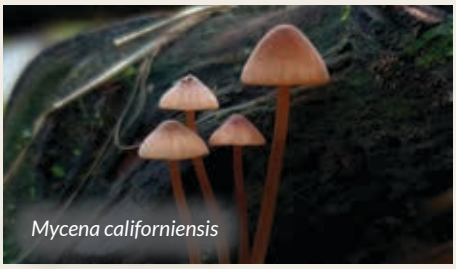
P.2

Youth Learn "Native Life Ways" from SFC's Youth Field Trips

P.3

Foothill Trees and Their Microbiomes

P.4



Mycena californiensis

Fungal Biodiversity in the Sierra Nevada Foothills

P.7

Spring greetings from the Board & Staff of Sierra Foothill Conservancy! We've been delighted to expand our public engagement programming this year and are overjoyed to once again see our youth, outdoor enthusiasts, tribal and research partners engaging with and learning from our foothill landscapes. The human species is inextricably linked to and part of our natural surroundings; we invite you to reconnect to the land that provides home, solace and nourishment through Sierra Foothill Conservancy. Thank you to our members, donors, landowners and partners who make our mission possible.

Enjoy the inspiration of the spring season,

BRIDGET FITHIAN
Executive Director

SFC Announces 1,729 Acres of Newly Protected Lands Through the Wright Ranch Conservation Easement!

Sierra Foothill Conservancy is thrilled to announce its latest land acquisition completed on April 13, 2022 - the 1,729-acre Wright Ranch conservation easement! Located in western Madera County along the Fresno River, the Wright Ranch's immense conservation value includes working rangeland, annual grassland, oak woodland, chaparral, mixed conifer forest, agricultural value, cultural and historic resources, wildlife and habitat values, open space, and scenic views – all of which are now protected in perpetuity.

WITH THE ADDITION OF THIS PROJECT, SFC'S TOTAL LANDS CONSERVED HAVE REACHED 52,495 ACRES.

SFC purchased the Wright Ranch conservation easement from partnering landowner, Mr. Michael Wright, utilizing competitive grant funding through the California Department of Fish and Wildlife and California Department of Conservation.

Cattle atop Potter Ridge

A healthy Fresno River riparian corridor.

The Wright Family has owned the 1,729-acre ranch for nearly 100 years, spanning three generations. The property is rich in cultural resources and has a fascinating history in mining and lumber operations. The property encompasses local geographic landmarks such as Potter Ridge, French Gulch, the western and northwestern edges of Buckeye Mountain, and over one mile of the Fresno River. There are even remnants on the property of the historic town of Grub Gulch, a community built by miners and loggers who utilized a flume on the property near the Fresno River.

The Wright Ranch conservation easement is strategically located in SFC's Fresno River Corridor Focus Area, helping to protect and connect private and public lands to create a corridor of conserved lands for the regional benefit of agriculture, habitat, wildlife, water resources, carbon storage, and climate adaptation. This project in particular serves as a critical first step in catalyzing conservation directly along the Fresno River.

The property's topography and habitat vary greatly, featuring a combination of mixed conifer forest, blue oak woodland and savannah, annual grasslands, chaparral, and a vibrant riparian corridor. The property provides a home to many species of wildlife, such as black bear, migratory deer herds, bobcat, mountain lion, coyote, and rabbit – with potential habitat for many other special status wildlife and native plant species including slender-stalked monkeyflower, orange lupine, Small's southern clarkia, Mariposa pussypaws, Madera leptosiphon, and Rawson's flaming trumpet. Additionally, the property secures permanent scenic value for the nearby Goldside Estates housing development as well as travelers along Highway 49 and Road 600.

Mr. Wright decided to pursue a perpetual conservation easement on the property because he desired to see the ranch's grazing use, open space, wildlife, and other conservation values protected for future generations. By partnering with SFC, Mr. Wright has insured that the agricultural and natural value of this well-managed ranch are protected in perpetuity. We look forward to celebrating this conservation easement achievement with Mr. Wright soon!

Youth Learn "Native Life Ways" from SFC's Youth Field Trips

SFC has had the honor of working closely with representatives from local tribes this year on several of our education program projects, including the creation of the new "Native Life-Ways" station for SFC's McKenzie Preserve youth field trip program, which serves over 800 local youth each year. This station engages student participants in many aspects of Native American life including medicine, food sources, tools, clothing, gathering methods, baskets, and more. Students examine and become familiar with Native food staples including acorn, elderberry, pine nut, sour berry, and learn about traditional medicine and plants used for various ailments. The program especially highlights the value of acorn, its health benefits and methods of production. Student participants can actually see and feel plant materials used in traditional basketry, types of baskets and their uses, and tools created from native plants such as a soap root brush and belt. A major goal of the new station is for local students to connect with the lives of Native people and their beautiful and healthful way of living. Thank you to our tribal partners for sharing these incredible traditions! SFC's Community Engagement Manager, Allyson Brooks, recently interviewed SFC's program partners and friends, Phyllis Hunter (Mono and Navajo) and Gladys McKinney (Southern Mono), on native plants and the importance of sharing native life ways:

How do you explain the role of native plants in our lives?

Phyllis: Native plants in our lives are very important! We use plants for our food, basketry, tools, and instruments. The plants are our lives.

Why is it important to pass this knowledge on to the next generation?

Gladys: It is important because the next generation can't learn everything from a book. They must have a teacher (people in our community) take them out and show them. For example, a neighbor called because she had a problem with a basket top. She was trying to learn based on written words, and instead I explained from experience. There are so many details that are lost from spoken to written word. Teaching takes time and willingness. My philosophy is, "I am going to teach you and you need to teach someone else."

Phyllis: It is important for us to pass our cultural knowledge to our younger generations, without this our culture will not continue.

How do traditional foods and storytelling help us understand who we are?

Gladys: Storytelling is passed down verbally. All we had was sharing and storytelling. For example, it is important for explaining why you might not eat this mushroom, or why you pick at certain times, etc. You must take people out and teach them or share when sitting by the fire because this is not taught in schools or classrooms.

Phyllis: Traditional foods are our way of passing on our culture. Storytelling is a teaching tool for our children, how we pass on knowledge to future generations.

What are the health benefits of a traditional diet?

Gladys: My dad's grandmother only spoke Mono. She died at 106. It all relates back to her diet. There were no refined sugars. Sweetness came from springtime manzanita flowers, honey, dried berries, rose hips. Sugar was limited to what they ate and the foods they ate were organic. We had brodiaea, wild onions (small but prolific), miner's lettuce, watercress, clover, and salt grass. Today you can buy all forms of sugar. Even when the settlers came in, they learned from us and had a healthy diet. Your grocery store was your front yard. You can also get different foods from different seasons when the foods are healthy and beneficial. For example, sour berry is full of vitamin C and ascorbic acid. If you let it dry and pound it, then combine with water, there is a sweet taste. Our main food was acorn (valley, live, blue, black, golden) which is gathered, stored, cleaned, and pounded. You get carbs, proteins, and good fats all from this one nut. It is so healthy. And then for transportation, you walk, so you need that energy. We also had black walnut which is full of nutrients. These are all still available, you just have to look for them.

Phyllis: Traditional diets give our body what it needs to sustain life. Our bodies are built for the environment around us. It feeds us spiritually as well, as we work through the process of hunting and gathering and feeding loved ones. The health benefits are obvious, because there are no artificial additives and it is all natural. Acorn is a superfood which was 50% of the California Indian diet. Polyphenols enter the body and seek out disease and halt it and create healing. On a personal note, when I prepare acorn for myself and loved ones, it benefits me both physically and spiritually.

BY CAROLIN FRANK

Foothill Trees and Their Microbiomes

Most people are familiar with the human microbiome and its importance to our health. Bacteria in our gut help us digest food, protect us against pathogens, regulate our immune system, and can even influence our mood. Because we depend on these microbes for our health, if the microbial community in our gut is out of balance, so are we. The same is true for all animals and plants, including forest trees. One way to think about this is to realize that microbes were here on Earth long before us, and that animals and plants have evolved in a microbial world, always with the option to outsource some of their functions to microbes. For example, when the first plants left water for land 450 MYA, they needed help from fungi in order to live in this new nutrient poor and dry environment.

Over the past couple of decades, science has moved from a perspective that forest trees compete with one another, to realizing what some indigenous cultures probably always knew -- that all trees in a forest are deeply interconnected. Many people have now heard of the mycorrhizal networks that connect trees underground. Amazingly, even trees of different species can support one another and transmit warnings of insect or pathogen attack through these fungal connections. But there's more: in addition to mycorrhizal fungi, trees host a multitude of microbes that colonize the roots, stems, leaves, and reproductive organs. They really colonize the entire plant – from its surfaces to the inside of cells! They are bacteria, fungi, oomycetes, and viruses, and to a lesser extent, archaea. Some of them are pathogens of course, like the sudden oak death agent, an oomycete that has devastated oaks in coastal California. But pathogens are exceptions—the microbiome is fundamental to plant health.

So how and why are these microbes beneficial to plants? Generally, their benefits fall in one of three categories; water and nutrient acquisition, defense, and protection against abiotic stress. Microbes can facilitate nutrient uptake, for example by turning phosphate into a form that is more easily assimilated by the plant. Ectomycorrhizal fungi extend the roots of trees and transfer nitrogen from the soil to the plant in exchange for carbon. Research in my lab has shown that it is not only legumes that have nitrogen fixing bacterial partners, but that forest conifers like limber pine and lodgepole pine do too, in their needles, and probably in roots, though we have yet to look there. The amount of nitrogen fixed by these microbes is much less than in legumes, but is probably still important for a forest conifer growing in nutrient limited soil.

Microbes can also break down rocks and transfer minerals to the plant host. Seedlings of the giant cardon cactus carry bacteria that help them establish on barren rock! And then there's defense: Microbes form a cooperative immune system with their plant host by directly fighting pathogenic microbes, or by simply taking up space and nutrients so that pathogens have difficulty colonizing. Or they can make leaves tougher and more difficult to penetrate for pathogens. Some bacteria make plant hormones like auxin and ethylene that help plants grow or regulate their stress response.

Both bacteria and fungi protect host trees from abiotic stress, including drought, which of course is very relevant right now in California. Many of these benefits have been studied intensely in agricultural crops, but not that much is known about their role in forest trees, despite the enormous ecological, recreational, and economic importance of forests. Together with scientists who work on Ponderosa pine genetics and its role in adaptation to drought, I'm planning to investigate the role of microbes in promoting drought tolerance in Ponderosa pine. This tree has experienced excess mortality in the past decade due to weakening by drought and subsequent susceptibility to bark beetles. **We're hoping that at some point we'll know how to not just select the most drought tolerant tree genotypes for reforestation, but to add the right microbes that will help seedlings grow in dry conditions.** This could be as simple as adding soil and leaf litter from dry areas—greenhouse experiments will tell.

The microbiome may be especially important for long lived forest trees. While trees are stuck with their genome and have generation times of several decades, their microbiomes are much more dynamic and can vary over time, potentially helping trees survive environmental fluctuations over their long lifespans. There's even some evidence that plants actively recruit the best microbial communities for a particular type of stress, for example by

exuding sugars and hormones from their roots that attract specific helper bacteria.

Our foothill trees are guaranteed to depend on microbiomes too, although relatively little is known about the microbial worlds of blue oaks, valley oaks, gray pines, and other trees growing here. But there are good reasons to start learning more about them. Just like trees are connected below-ground by their fungal network, they are connected above-ground by their foliar microbes, which are shared among trees of the same and different species. We know that microbiomes are disrupted in trees growing in urban environments, probably because of lack of access to the right microbes from a diversity of neighboring trees and shrubs. Therefore, **as we learn more about the microbiomes of trees, it's important to study forests that have experienced relatively little anthropogenic influence. Oak woodlands provide an excellent opportunity to uncover the wisdom embedded in old growth forests. These forests were never systematically logged like conifer forests at higher elevation, and there are many ancient trees still standing despite recent mass mortality from drought.** After years working on subalpine conifers, I'm very excited to finally begin tree microbiome research on Sierra Foothill Conservancy land in the lower Sierra Nevada foothills. One of the first things we're planning to do is to use DNA sequencing to characterize the fungal communities inside leaves (endophytes) of the blue oak and gray pine, not only to see who lives there, but also to learn how the microbial communities change across time and space. I am very lucky to have a new mycology graduate student, Chris Bivins, who shares my interest in the microbiomes of foothill trees, and to have access to SFC's Larrick Ranch CE to do this exciting work.

Katie Verrue

BY CHRIS BIVINS

Fungal Biodiversity in the Sierra Nevada Foothills

Lepista nuda

I have been a student of mycology (the study of fungi) for seven years. For the last four years, I have been fascinated by the enormous amount of fungal diversity that occurs in the Sierra Nevada foothill region. Besides the sheer number of species of fungi that occur in this region, the most intriguing thing to me is how understudied they are, despite the fact that their importance in contributing to a healthy ecosystem cannot be underestimated. Beyond the importance of breaking down and recycling dead organic matter, there is another major role fungi play in the foothill ecosystem. All of the major tree species that dominate the Sierra Nevada foothills fall into an ecological class that mycologists call "ectomycorrhizal". Ectomycorrhizal plants are characterized by an obligate, mutualistic symbiotic relationship with fungi, meaning that both members of the symbiosis benefit one another. In this symbiosis, fungi form a sheath of tissue around the growing root tips of plants and essentially act as extensions of the roots themselves. Thread-like fungal cells, called hyphae, emanate outward from the sheath of tissue surrounding a plant's root tips and extend outward in all directions throughout the soil. At the ends of the hyphae, water and minerals that trees need to grow are absorbed and subsequently transferred to the tree. In exchange, the tree provides its fungal partners with photosynthetically-derived sugars, fueling their growth and providing the fungi with the energy required to complete their life cycle. A single ectomycorrhizal tree can have dozens to hundreds of different species of fungi colonize their roots, leading to the formation of complex and highly diverse fungal communities. One of the most fascinating aspects of this symbiosis between plants and fungi is that neither the fungi nor the plants engaged in it can survive without one another. Therefore, without fungi, all of the trees that form the backbone of the Sierra Nevada foothill ecosystem would not exist. How is it then, that this topic has received such little attention from scientists in this region?

I have often pondered this question. Perhaps the foothills have been relatively ignored by mycologists who pass through them on their way to higher elevation localities like Lake Tahoe, Yosemite, and the other regions of the High Sierra. What is more likely the case is that the lack of public lands in the foothills relative to the High Sierra has prevented mycologists from thoroughly exploring the foothills and cataloging fungal diversity here. After all, there are numerous National Parks and National Forests throughout the High Sierra, and none in the foothill regions. Even state parks are relatively sparse here. Regardless of the reasons why, the foothills are extremely understudied and this needs to change. The foothills are extremely biodiverse, and with the spread of urbanization and the impacts of climate change driving species extinction, it is imperative that we catalog as much of the Earth's biodiversity before it is too late.

Anyone with a smartphone who spends time in the foothills can help document the fungal biodiversity in the Sierra Nevada foothills. The process is simple. Enable geotagging on your phone's camera app and download the app iNaturalist. Any time you encounter a fungus of any kind, take pictures of it. Be sure to include shots that capture the organism from a variety of angles, as various features (such as the gills, cap color, stem texture, the substrate from which the fungus is growing, etc) will be important for identification purposes later on. Then, upload these pictures to the website/app iNaturalist. There is a community of mycologists on iNaturalist who can help identify the fungi you encounter (or you can try to identify them yourself). The more people engage in this kind of citizen science, the better we can understand the diversity of fungi in the foothills. There is an unbelievable world of biodiversity waiting to be discovered by those who start to notice and pay attention to fungi. I guarantee that if you begin to spend more time appreciating these fascinating organisms, you will be blown away by the things you will find. You may even discover a new species!

Laccaria laccata

Note: iNaturalist is a joint initiative by the California Academy of Sciences and the National Geographic Society. The iNaturalist app is available for all smart devices. More information is available at inaturalist.org

SIERRA·FOOTHILL
25TH ANNIVERSARY
· CONSERVANCY ·

Post Office Box 691
Mariposa, CA 95338
sierrafoothill.org

2021-2022

Impact Report

3,602 acres	McKinney Ranch Conservation Easement
306 acres	Day Ranch Conservation Easement
226 acres	The Bill and Betty Stookey Preserve
1729 acres	Wright Ranch Conservation Easement

5,913 acres conserved

3,900 acres vernal pool habitat

8 miles of stream protected

331 acres forest and meadow restored

100 native plants planted

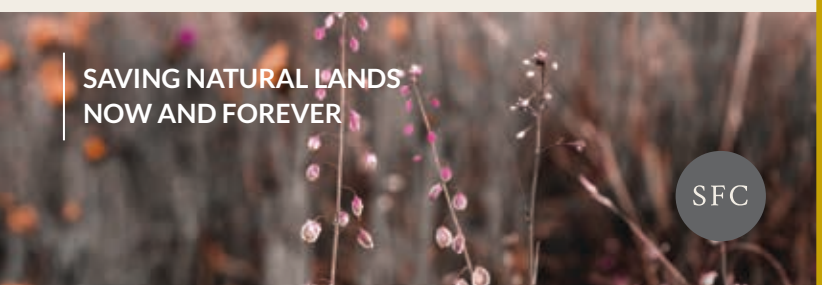
3,426 members, the largest membership base in our history

Habitat for 8 special status species saved.

- Spadefoot toads
- Bald and Golden eagles
- Western pond turtles
- Burrowing owl
- California Tiger Salamander
- Vernal Pool Fairy Shrimp
- Tricolored blackbird

52,495 TOTAL ACRES PROTECTED

Together we can protect 1,700 additional acres in the coming year.



Become a Member Today

Your membership support goes directly to saving local, natural lands now and forever!

$50 ANNUAL SFC MEMBER BENEFITS INCLUDE:

- Discount on SFC's Guided Hikes and Naturalist Classes
- Member-Only Event Invites
- Newsletter Subscription to SFC's Foothill Advocate
- 10% discount on Sierra Lands Beef Grassfed Beef Orders

To Sign Up Today

Scan the QR Code, sign up at www.sierrafoothill.org or fill out a donation envelope.