



## Bribery Can Be Beautiful

**1** While walking down this trail, you'll encounter many different kinds of wildflowers. A flower represents a visual beacon to hungry pollinators. Plants cannot move about freely, yet most need to cross-fertilize to insure the greatest variability in their offspring. The coevolutionary solution is to bribe insects and birds to act as sexual go betweens, and to carry the pollen between plants. The animals are doing this not for the plant, but for themselves: they fly to the blooms to collect the sugary nectar or the protein-rich pollen for their own use – either to feed themselves or their young. But some (or often a lot!) of pollen gets deposited on the body of the animal and can be transferred to the next flower that the animal visits before the animal has a chance to groom the pollen off of its body. Flowers that reflect ultraviolet light, such as yellow blooms of many flowers, are highly visible to insects which can see ultraviolet light (unlike humans!). All sorts of insects that seek nectar or pollen, such as tiny beetles, tiny wasps, bees, and flower flies, can be found working the flowers. The more complex blooms of the lupines and red flowered Indian warriors, however, require a more specialized anatomy to gain access to the nectar and pollen. It takes a heavy bee to force apart the petals and get at the rewards within the flowers. Butterflies or hummingbirds, however, snake in their long tongues to obtain the nectar, and so avoid the need to part the stiff petals.

## In Defense Of Territory

**2** The trail to the right will lead you down to the lake-bed and the floating observation platform. Red-winged blackbirds are common this time of year. Territory formation and courtship occur in early spring, while nest building and breeding take place in May or June. The jet-black males, sporting on their wings epaulets of brilliant red with a yellow bar, fly between favorite perches in their territory. They alternate active displaying with periods of quiet and feeding. Occasionally, you will see one engaged in "song flight", a slow stalling flight with the red wing patches fully exposed. A male's song serves to ward off competing males as well as to advertise his presence to female blackbirds. Territorial males chase away or fight off intruders, and during the fiercest encounters pairs even fall out of the sky while locked in combat. The prize is the territory itself, which may contain several different females and their nests. The winning male has access to all of the females in the territory, but doesn't help at all in the nest construction or incubation of the eggs, and only aids a little in the feeding of the voracious young. Much more secretive, the females have brown streaked breasts, and are considerably harder to spot amongst the vegetation.

## Thievery in the plant world

**3** The red blooms of Indian Warrior, and later in the season the closely related Indian Paintbrush, grace the trail in spring. These plants are hemiparasites. Like most other plants, their leaves contain chlorophyll (as can be seen by the green color) and thus they can harvest the sun's energy to turn atmospheric carbon dioxide into sugars that are then used to make other organic molecules needed for life. But unlike most other plants, they do not obtain all other nutrients (such as minerals and water) they need from the soil...instead, their roots tap into the roots of nearby plants, allowing the hemiparasite to obtain some of these nutrients, and sometimes also organic molecules, from the vascular system of the host plant. Other hemiparasitic plants include the mistletoes, which you may encounter on your hike, which produces their own sugars at some point in their lifecycle but otherwise need a host plant – in this case, tapping into the vascular system in branches of trees – to obtain other nutrients. True parasites, which obtain all molecules needed for life from a host plant, also exist in the plant world; in Lake County, broom-rape and dodder can be found in various plant communities, and might be encountered at the Boggs Lake Preserve as well.

## Born In Fire

**4** Most of the landscape along the south and east side of clear lake was produced by volcanic activity within the last few million years, and some of it within the last few thousand years. Volcanic cones poured out flows of light and dark lavas, and spewed great quantities of ash, cinders and rock fragments over the countryside. Boggs Lake was created when a lava flow formed a dam that impounds water during the wet season. A body of molten rock lies only about six miles below the surface, and new eruptions are still possible according to geologists.

## Too Much Water, Or Too Little, Brings Death

**5** Boggs Lake is in a basin that has no outlet, and so when water enters faster than it can evaporate, the lake level raises. In 1982 and 1983, there was so much rain that the lake water entered into the surrounding forest, drowning the pine trees at the forest's edge. The dead and dying trees were attacked by beetles, and woodpeckers were subsequently drawn to the abundant insect food supply. Now, ravaged by the host of animal chewers and the elements, these dead trees are in various stages of collapse. On the forest floor their decomposition will continue, and their nutrients will be eventually recycled into the soil where they can be taken up by other plant life. Too little water, however, can also lead to the death of the trees. A series of drought years has weakened many of the pines, and once again made them vulnerable to beetle attack. Red needles point out the afflicted trees. This is a natural process. Any species can only thrive under a certain restricted set of conditions, and will expand its population in favorable years, and reduce in numbers when the local environment is no longer as hospitable. A forest, like all of nature, is dynamic and ever changing.

## A Flower Is Only Pretty If It has To Be

**6** The clumpy plants in front of you are California Fescue, a native grass species. Like all grasses, the California Fescue is a flowering plant – but don't expect to see pretty, showy flowers with colorful petals or strong odors! Plant species invest in producing showy flowers or aromatic scents only if they need to attract a pollinator to move pollen between flowers. Many flowering plant species, however, have flowers comprising only the male and female organs, and the tiny male pollen grains are shed directly into the air, where the wind currents are relied carry it to the receptive female stigmas of other plants. Such a hit-or-miss process can only work if the pollen is produced in prodigious quantities, and any hay fever sufferer can attest to the vast quantities of pollen in the air in spring!

## There's More To Water-life Than Just Water-fowl

**7** Now that the lake is full, it is teeming with life. Western pond turtles can be seen in the lake, along the shore, and even in the nearby woods. Adult beetles, mayflies, phantom midges, dragonflies, and damselflies flew to the lake to mate and lay their eggs. Those eggs have now hatched and the immature insects are prowling beneath the surface. The transparent phantom midges drift at whatever water level they want with the aid of silvery gas bladders, and lash out at any smaller animal that gets too close with their prehensile antenna. Clam shrimp, copepod, seed shrimp, and water flea eggs hatched as the water rose. Most of these crustaceans increase in numbers rapidly through parthenogenesis, which in Greek literally means "virgin birth"; some parthenogenic animals are born/hatched pregnant, and in other species males are entirely unknown! The lake is also rich in vertebrate life. Pacific Tree frog males can be heard calling all around the lake in their efforts to attract females, and the resulting tadpoles will fill the water along with those of Western Toads. Pairs of newts can be seen swimming at the surface, and their larvae share the lake with the other amphibians. The natives are endangered by introduced Bullfrogs and fish, but whenever the lake dries up completely these foreign predators are eliminated. Native Californians have learned how to persevere during times of drought.

## The Preserve's First Human Visitors

8 Relative to today's human populations, the Native Americans who lived here before Europeans arrived were sparse in number. Population numbers largely reflected the abundance of the floral and faunal resources that supported them. Some estimates suggest a population of about 300,000 in the entire state before the European invasion, and numbers were cut in half by 1834. Before the influx of the strangers, who enforced their will with superior technology, war-like nature, limitless numbers, and old world diseases, the Indians lived as part of the ecosystem and tended to the land and its inhabitants, upon which they directly depended for their livelihood. In this area, it was the Pomo that utilized the natural resources to survive. They probably visited Boggs Lake when it was most productive. Acorns, berries, bulbs, tule, and grass seeds were gathered during the proper seasons. Rabbits, deer, quail and waterfowl were hunted with arrows, nets, or traps. Baskets, with duck heads attached, served as decoys to allow the hunters to get closer to the birds. Quail were caught when they ran into long tubular basket traps of gradually constricting diameter. Lake reeds and abundant stones provided abundant building materials for the simple temporary structures needed, and the tules also served for boat construction. Ceremonial rain rocks and other artifacts attest to their former presence, but the Native Americans themselves are gone from this ecosystem.

## Floral Restaurants Aren't Open Forever

9 Two different species of Manzanita bushes line the trail, and in mid-winter through early spring their urn shaped flowers are very attractive to long tongued bees, bee flies, and butterflies that can withdraw the hidden nectar through the narrow openings. Some short tongued bees short circuit the system by biting through the base of the flowers to obtain the sugary elixir. Since they don't enter the flowers properly, the flowers aren't pollinated by their visits. However, developing berries soon show that enough of the flowers manage to get pollinated by the legitimate pollinators. Chipmunks, raccoons, skunks, coyotes, bears, birds, and other animals will benefit from these fleshy fruits, but the local environment is no longer hospitable to new manzanita bushes. The old ones will slowly die out as the forest continues to encroach on their habitat. Even the pines will disappear, as they too are replaced by the oaks through the normal process of ecological succession. In this area, fire is one of the few forces that could set back the clock to an earlier phase, changing the environment so it is once more suitable to new manzanita and pine growth.

## Underground Vegetarians

10 If you walk out a little into this meadow, you'll come across gopher mounds. When gophers dig through the soil in search of roots and bulbs that they feed upon, or excavate the tunnels in which they live, a lot of loose soil is produced that has to be pushed out of the way. Unlike moles, which push the dirt up vertical shafts, gophers create diagonal tunnels to get the soil above ground. The push it out in all directions from the opening, so it resembles a river

delta, and then plug the hole before they descend below ground. Plugging the hole makes it more difficult for predators such as weasels or gopher snakes to gain entry. Now and then, gophers sit at the opening of their holes to survey the surface world, and sample some of the above-ground vegetation. At times like this they are easy prey for airborne hawks and prowling mammalian carnivores such as coyotes and bobcats. Apparently aware of this danger, gophers sometimes pull plants beneath the surface from the relative safety of their burrows.

## Any Seed Is Better Than No Seed - and Don't Miss The Woodpecker Granary!

11 The yellow violets are showy, attractive flowers. Dark lines on the petals, known as nectar guides, lead the visiting bees and flower flies toward the important parts of the flower. While gathering nectar and pollen, the insects inadvertently cross fertilize different violet plants. This method provides for a lot of genetic recombination, and is the best way to produce variability in the next year's crop of plants. Nevertheless, in most plants there is some provision for self-fertilization if insect visits do not occur. Any seed is better than no seed. In violets, pollination is not over after all the showy insect flowers have withered away. Additional small flowers are produced that never open. Self-fertilization occurs within them, insuring violet seeds will be produced even if no insects found the pretty, open flowers earlier in the spring. And, don't forget to admire the Acorn woodpecker granary tree. The amount of work the woodpeckers invest in creating holes that are just right for storing acorns (which they eat, as a carbohydrate source, when other food is scarce) is really quite amazing. They are skilled woodworkers!

## A Meadow Of Floral Gems

12 The meadow in front of you is bedecked with jewels of the plant world. This is one of the places on the preserve where the rare plants grow. Please don't walk in this open area; compacting the soil in the wet season can damage the plants' wet-meadow habitat and decrease their ability to survive. Amongst the special species are Many-flowered Navarettia and several species of Downingia, which germinate with early rains and likely are abundant now in the meadow. They are adapted for seasonally wet areas, habitats that dry out completely later in the year. Every year The Nature Conservancy monitors the populations to determine how well populations of these rare species are doing, and whether or not some management change is needed. Their uniqueness, together with their role in maintaining a healthy ecosystem, should be enough to motivate us to protect them, although their preservations could also additionally reward us if humankind someday discover a medicinal or other value to the chemicals that they manufacture within their tissues. These rare species, and the rare habitats in which they exist, are ecologically fragile with a tenuous hold on existence, but with the help of sound management and scientific insights, and especially your cooperation in respecting their habitats and educating others on how to appreciate and respect these species, we will be able to insure that they will survive.

# BOGGS LAKE

SELF GUIDED NATURE TRAIL

## SPRING GUIDE

by  
**Larry Serpa**  
(The Nature Conservancy)  
and  
**Cathy Koehler**  
(Lake County Land Trust)

Descriptions in this trail guide correspond to a series of twelve numbered signposts. The approximately ¾ mile long route proceeds through the forest, and provides excellent views of the lake and other natural communities before it loops back to the parking lot. Hiking it will give you a little exercise in a beautiful environment, and the information in this guide highlights some of the wonderful natural history that you will encounter as you enjoy the hike.

**We ask that you stay on the marked trails and keep all dogs on a leash. Thank you**

Boggs Lake Preserve has been owned and managed by The Nature Conservancy since 1972 and has been co-managed by the Lake County Land Trust since 2011. For donations and further information about the Lake County Land Trust please call: (707) 262 0707 or email: [lclt@lakecountylandtrust.org](mailto:lclt@lakecountylandtrust.org)