



Nature Notes

Anatomy of a Hanging Garden

Did you know that hanging gardens come in many forms and structures? That some are simple, while others complex? Have you ever heard of drip lines or window blinds or colluvial fans? I hadn't. Until I took Walt Fertig's Zion Canyon Field Institute class on hanging gardens.

As the seven of us piled out of the shuttle bus at Zion Lodge, Walt—a consulting botanist for Zion National Park since 2006—pointed out some large horizontal cracks in the cliffs across the road framed by cottonwoods; plants cascaded from the cracks, which were surrounded by white stains—the salts left behind as water evaporates. “That’s the simplest form of hanging garden,” Walt explained. “It’s called a ‘spring-line’ or ‘drip-line,’ and a group of plants called ‘clingers’ are the first to get established on them.”

Walt, who is currently updating and expanding what is known about Zion’s plants for the benefit of biologists, interpreters, and the general public, went on to explain how hanging gardens are formed at the contact between the Navajo Sandstone cliffs and the underlying Kayenta formation. While the Navajo acts like a sponge to water with its large pores between sand grains, the Kayenta’s clay and shale composition makes it far less permeable. The effect—as water strikes the Kayenta and is forced out sideways—is like “water hitting a downspout on the roof of your house,” explained Walt.

We saw this principle in action as we arrived at our first destination, the Lower Emerald Pool. The wall above the pool seeped water, and water tumbled over an overhang from the Middle Pools above. Here, Walt pointed out several plants that are well-adapted to



Mixed-color columbines at Weeping Rock may be Foster’s columbine (*Aquilegia fosteri*)—found only in Zion Canyon—or a hybrid of Foster’s and the golden columbine. Photo by Amy Gaiennie

this wet and shaded environment. Golden columbines (*Aquilegia chrysantha*) at the base of the wall spread in lacey, delicate bouquets. Their bright petals, lengthened backward into spurs and knobbed at the ends, resemble jesters’ caps. The flowers called shooting stars (*Dodecatheon pulchellum* var. *zionense*) had already gone to seed. When they bloom in the spring, their pinkish-purple petals are bent backwards, giving the impression of motion, like the trail of a meteoroid. Finally, Walt pointed out a helleborine still blooming amid a tangle of leaves. It is one of only a few orchid species in Zion and has one of the largest flowers.

The hanging garden at Emerald Pools is an example of a complex hanging garden. As water seeps across the face of a cliff, the cliff erodes inward. This causes an overhang or roof to form—creating shade—and gives a concave shape to the structure. A fan of de-

bris—the colluvial fan—develops at the base of the wall as rocks fall down from above the eroding cliff, offering a new surface on which plants may grow. The most complex hanging gardens have drip lines, overhanging roofs, debris fans, and even structures called plunge pools and window blinds.

The simplest form of hanging garden is called a “spring - or drip-line.”

As we climbed the stairs to our next destination—Weeping Rock—Walt pointed out the “window blind” on the cliff to our right. Here, the entire cliff face oozed water, and

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What's Roaming in Zion?

Wild Turkeys (*Meleagris gallopavo*) are a common sight around Zion Lodge, often seen ambling among the visitors who are eating their lunches and ice cream cones in the shade of the cottonwood tree. The turkeys roost in the cottonwoods in the evening along the Virgin River. If you pause and listen closely, you may hear their gobbling.

Tarantula Hawks (*Pepsis sp.*) cruise four to ten feet in the air, seeking tarantula burrows. If the female wasp locates a burrow, she will attempt to lure the spider from its hole by touching its silken door. If she successfully defeats the tarantula in the battle that ensues, the spider will become the food for the next generation of tarantula hawks.

White-lined Sphinx Moths (*Hyles lineata*) are out pollinating. These hummingbirds of the night whisk pollen from one flower to another, guided by the reflective white petals of the sacred datura, also known as moon lily.

Please don't feed wildlife or approach too closely. Although they look tame because they are habituated to people, they will defend themselves and their young if they feel threatened.

What's Blooming in Zion?

Bridges Evening-primrose (*Oenothera longissima*-Evening-primrose Family) is still open well into the morning in the shaded oases along the Watchman Trail. Look for tall stalks and bright yellow flowers blooming among the other wetland plants.

Sacred Datura (*Datura wrightii*-Potato Family) is blooming along the Pa'rus and Watchman Trails. Watch for their trumpet-like white flowers with a hint of purple.

Blueleaf Aster (*Aster glaucodes*-Composite Family) gets its name from its pale bluish-green leaves. It forms masses of pale foliage along roadsides and on trails throughout Zion Canyon.

Remember, it is against park policy to pick flowers. Please heed signs that say, "Stick to the Trail," and give plants a chance.

In Search of the Zion Narrows' Net-winged Midge

Many of us have heard of the Zion sweetpea and the Zion snail, but who would have thought there would be an endemic fly in Zion National Park? This unique creature has only been found in The Narrows of the Virgin River and has been observed and collected only three times in the past century. Known as the Zion net-winged midge (*Blepharicera zionensis* Alexander), it is a member of the family Blephariceridae, one of approximately 17,000 species of flies known from North America. Only a handful of entomologists can recognize a net-winged midge at a glance. One of these is Amanda Jacobson, a Ph.D. student at the University of Tennessee in Knoxville. Her research includes a detailed study of the genetics and morphology of this genus of flies, and she needs specimens for DNA analysis.

Unfortunately, her resources do not include a budget for a collecting trip to Zion. Fortunately, there is a tiny network of people who care about rare flies, and one of them is a volunteer at Zion National Park (me). So I went to The Narrows in search of flies and found hundreds resting on House Rock and in overhanging scour holes on the cliffs.

Now why would anybody care about an obscure fly that occurs only in a National Park? Partly because it is a potential indicator of water quality, and partly because it is a very interesting creature for its own sake.

The life of the net-winged midge is hasty and brief, and amazingly well adapted for life in mountain streams or waterfalls. Eggs lie dormant, stuck to submerged rocks until spring snowmelt, and then hatch at about the same time. Larvae are streamlined and have hydraulic suction cups to enable them to cling to rocks in swift currents. They scrape the rocks for algae and diatoms that only thrive in clean water. Pupae cling to stones on the downstream sides of submerged rocks, where they can get plenty of oxygen and grow quickly into adults. The adults explode to the surface by riding air bubbles and are able to unfold their wings and fly immediately on exposure to air. They congregate on the undersides of rocks overhanging swift streams or the undersides of riparian leaves.

Females are predators on smaller, soft-bodied flying insects. Males, if they eat at all, are thought to consume nectar. Life for adults probably only lasts a week or two. Following mating and laying eggs for the next generation in water, the adults add their bodies to the riparian and floating plant and animal material.

Why would anybody care about an obscure fly that occurs only in Zion National Park?

One of the most remarkable characteristics of this genus is the complex eye structures of the adults. These are clearly divided into two sets of eyes, one brown, large, and on top of the head, the other smaller, blackish, and on the underside of the head. Between them is a sort of eyelash structure that may give them the name (*Blepharo*= Greek for "eyelash"). Each set is a compound eye, comprised of hundreds of faceted simple eyes. The exact function of these two sets of eyes is not known. They almost certainly function like bifocals, with the ability to see different things. My observations are that

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Adult net-winged midge. Photo by Ken Kingsley

Hikers Beware!

Itch, itch, scratch, scratch. The symptoms are diagnostic; you have wandered too close to western poison ivy, or *Toxicodendron rydbergii*. As both the Latin and common names imply, this is not a plant you want to rub shins with while hiking Zion's trails. Alas, most of us have experienced the rash caused by irritating oils from this plant.

Being ultra sensitive to the irritating urushiol (oo-roo-she-all) compounds, I am always on the lookout for poison ivy's diagnostic three part leaf, called a compound leaf, which is sometimes confused with the compound leaf of the friendlier boxelder tree. In the West, poison ivy is a shrub that does not usually climb other plants as it does in the East. In Utah, it is reported to rarely grow over 12 inches (30 cm) tall. It has a stalked middle leaflet and the leaflets can be either smooth or toothed, and rarely lobed. These leaves are red in the spring, green in the summer, and then turn red, yellow, or orange in the autumn. As the summer progresses, look for tiny greenish flowers with five petals, and then clusters of whitish berries. A saying that will help visitors to remember poison ivy's



"Leaves of three, let them be; berries white, poisonous sight." Photo by Amy Gaiennie

traits is, "Leaves of three, let it be; berries white, poisonous sight."

If you have a close encounter with poison ivy, act quickly to remove the irritating oils, ideally within two hours after contact. Washing with water and soap alone won't cut it. The dreaded urushiol oil stays active for years, with herbarium specimens 100 years old causing dermatitis. Although there are many specific products available to remove the sticky oils in poison ivy, most organic solvents such as rubbing alcohol will work. Some skin products designed as pore mini-

mizers, containing 2% salicylic acid and skin soothers, have also been known to be effective. A doctor may need to see severe allergic reactions and can prescribe steroids to combat the toughest cases, which have weeping blisters.

Native people did not have access to cures such as steroids but used alternative plants. The good news is that in Zion's arid landscape, it is fairly easy to avoid blundering into a patch of this plant. It favors wet nooks on trails such as Emerald Pools, Weeping Rock, the Riverside Walk, The Narrows, and an area of the Watchman Trail where a seep crosses the path.

As with most things, there is a bright side to the occurrence of poison ivy in Zion; humans seem to be the only animal that are adversely affected by the itchy oils. Deer and birds eat the foliage and fruits, and wood rats construct nests with its branches. As you enjoy the seasonal colors of poison ivy at a distance, know it is an important part of the web of life in Zion National Park.

- Sonja Hartmann



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On August 1, 1929, the first issue of *Nature Notes* was published. Written and produced by the Education Departments at Zion and Bryce Canyon, its purpose was to provide information to "those interested in the educational opportunities, the natural history, the scientific features or the scenic beauties of this region." Eighty years later, *Nature Notes* continues this tradition by covering subjects pertinent to Zion National Park and its employees.

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the flies are very good at seeing a hand coming toward them (predator avoidance) and they do not often, if ever, get caught in spider webs (an abundant hazard in their environment). So maybe these eye structures are really good at seeing two different types of dangers. On the other hand, the upper eyes may detect potential prey flying by, while the close-focus lower eyes may be good at seeing little insects well enough to grab them. We may never know how these eyes work, but they are certainly different from the eyes of any other insects, and we may learn something useful if we study them closely.

Our fly is poorly known, and its relationships are not understood—its nearest kin are thought to live hundreds of miles away in California. How one came to live in Zion is one of nature's great mysteries. Perhaps Amanda Jacobson will find some new clues that will help science understand the Zion net-winged midge and its environment.

- Ken Kingsley

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plants grew all across it. As the sun suddenly emerged from behind rain clouds, the wall beyond the window blind ignited. The red and yellow of columbines flamed against the emerald of moss.

From this viewpoint, the complexity of Weeping Rock was almost overwhelming. My eyes scanned the roof overhang above us, dripping water and ferns, then moved to the dark mineral grooves on the wall behind us. Next, knobs and turrets of rock—under curtains of water—caught my eyes; then, tiny grottoes in the wall holding ferns and the leaves of shooting stars.

"Weeping Rock has it all," concluded Walt. "It is an example of one of the most complex types of hanging gardens."

I now understand much better what that means. Drip lines, window blinds, overhangs, colluvial fans—all contribute to the anatomy of a hanging garden—a place of exquisite and compelling beauty.

- Amy Gaiennie