NATURALIST'S CORNER

Every spear of grass – the frames, limbs, organs,
of men and women, and all that concerns them,
All these to me are unspeakably perfect miracles.
~ *Walt Whitman, Leaves of Grass*

Leaves of Grass and Every Other Plant

I must have been infused by the spirit of Walt Whitman this summer. I've recently become quite fascinated by leaves. Although his collection of poems, *Leaves of Grass,* is not about leaves at all, but about the joys and musings of being human, his *Poem of Perfect Miracles* resonates with me.

Now comes the season we say goodbye to deciduous leaves. Of course, we will continue to see evergreen leaves throughout winter. The noticeable differences between evergreen and deciduous leaves only scratch the surface of the marvelous diversity of leaves in nature. There are hairy leaves, huge leaves, tiny leaves, juicy leaves, leaves underwater, leaves underground, leaves that are spines, leaves that make tree trunks, even flattened stems that look like and act like leaves. What's more, most all share a common function — photosynthesis. So why in the world are there so many different leaves? Environment has a lot to do with it.

I took the opportunity to do a lot of traveling this year: to Costa Rica with the Naturalists' Club and to Hawaii to bag my 50th state. Banana "trees" grow in both places. In Costa Rica I learned that the "trunk" of the banana plant is not woody at all. It is actually made up of a very dense collection of leaves compacted into a pseudostem, or false stem making the banana plant the largest herbaceous flowering plant in the world.

Water, whether too much or too little, is a primary driving force for many differences in plant leaves. In Costa Rica I learned that a pointed tip is common in leaves from the tropics. Called a drip edge, it ushers away excess water after plentiful and frequent rains. Many plant leaves in drier areas have hairs, some to the point of being fuzzy. Some leaf hairs serve to dissuade munching insects. Other leaves have hairs that trap small quantities of water, reducing the humidity differential between the inside of the leaf and the outside environment.

In Joshua Tree National Park, where the Colorado Desert (a portion of the Sonoran Desert) meets the Mojave Desert, Teddy Bear Cactus, Hedgehog Cactus, and other cacti abound. They are replete with spines, which are actually extremely modified leaves. Spines arise from growth areas called areoles, a unique characteristic of the cactus family. Cacti don't have leaves at all but carry out the job of photosynthesis through their massive succulent stems.

Native only to the Mojave Desert is the weird and wonderful Joshua Tree. It is not a tree at all but rather the largest member of the *Yucca* genus. It does indeed have leaves: needle sharp 5 to 9-inch long stiff, fibrous, icepick-shaped leaves. I have yet to see a more unpalatable leaf.

Up on the top of the dry side of Haleakala on the island of Maui grows a beautiful silvery plant, native to Hawaii and endemic to Haleakala, called Silversword. It is aptly named. I wonder why its leaves are not a chloroplast-rich green? The roseate formation of leaves on this plant serves many functions in the desert. The leaves are spikey and so keep most grazing herbivores at bay. The leaves are also fortified with a thick cuticle that prevents water loss, furry such that they catch drifting moisture from passing clouds, and pointed upward, thereby directing condensing moisture down to the base of the plant. Finally, their silvery color reflects the intense, heat-generating sunlight. Ingenious. Haleakala is one of the first National Parks to be enclosed by a fence in order to protect Silversword and other amazing plants from nibbling by wild goats, rooting by wild hogs, trampling by cattle and other threats from introduced troublemakers.

On the island of Kauai I was introduced to a tree called Koa. Humanity is the introduced troublemaker here who, in seeking its exquisitely beautiful and useful wood and creating pastureland for cattle, has drastically diminished the population of large Koa trees. There are still youngsters around, but the huge mature specimens prized for dugout canoes are extremely rare. What I thought were sickle-shaped leaves are actually flattened branches, green with chloroplasts. Hundreds litter the floor below each tree. I found only one on such a tree sprouting petioles of tiny, oppositely arranged leaves. Apparently, the majority of the food-making is done by these tough, compressed leaf-like branches, themselves.

This summer, I've also had occasion to take a few canoe trips back home on familiar territory. Most paddles were with Naturalists' Club members. Here I am getting to know leaves dealing with a problem opposite that facing desert plants – too much water. Since they are surrounded by water, submerged plants have no need for waxy cuticles that typically coat evergreen leaves to prevent desiccation. Nor do underwater leaves sport stomata, openings through which terrestrial leaves exchange gases. Gases and nutrients infuse directly into plant tissues from the surrounding waters. Land-bound leaves sport stomata mainly on their lower surface in order to reduce loss of water vapor. In contrast, floating leaves, like white water lily and duckweed, have stomata primarily on the top surface as that is the only surface exposed to the air. Leaves of aquatic plants also house large air spaces allowing the leaf to float on top of the water or hover near the surface where sunlight is readily available.

No matter where they are found, plants develop leaves to meet the rigors of their particular environment. For example, on your next hike in the woods, notice that leaves of many species of broad-leafed trees are larger on small saplings than on adult trees. When a tree towers over others in the canopy, leaves tend to be smaller to reduce transpiration because the tree doesn't have to compete for light anymore. I invite you to contemplate these "unspeakably perfect miracles" on your frequent hikes outdoors. *~ Nancy Condon*