

Putting Some Numbers on *Leave the Leaves*

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We relish insect life during the growing season, monarchs on milkweed and bumblebees on bee balm. The adult phase of insects is shockingly brief, only one to ten percent of an insect's life is as an adult, but are we managing our landscapes to protect animals over the many months when they are out of sight? We do not see them because the insects and spiders have evolved spectacular ways to hide during their off seasons, they disguise and secret themselves away so that they can make it to another short-lived adult phase when they reproduce and start the cycle over. Eggs are camouflaged and hidden under leaves, chrysalis lie in the fallen leaves and can look for all the world like just another leaf, larvae mimic bird droppings, cocoons mimic sticks or silk threads tie on pieces of leaves, pupating insects hide amongst the leaves, nestle in the soil, in tree tops, in hollow stems, sequester in rock piles, in decaying branches, in bark crevices.

Keep in mind, we are experiencing "an insect apocalypse, a giant insect ecosystem is collapsing due to humans." Michael McCarthy *The Guardian*, 2017. Worldwide we have lost 50 to 75% of total insect biomass. Here we think about E.O. Wilson's famous proclamation "insects: the little things that run the world." Pesticides, monoculture agriculture, light pollution, native plants pushed out by invasives, and habitat degradation and loss are reasons. Habitat loss is in part the removal and destruction of leaves. Insects and animals have evolved with trees and leaves for hundreds of millions of years and as expected have developed mutually beneficial relationships with them. And here we go pulling out the blower, the Muzak of modern lives.

We have all heard the call to action to "leave the leaves," the ecological essentialness for doing so is now much better understood thanks to a recent study by Dr. Max Ferlauto, State Entomologist for the Maryland Natural Heritage Program. He and his team undertook a two-year experiment to quantify the difference in insect emergence from ground where leaves are always undisturbed and ground where leaves are always removed. A former student of our hero, University of Delaware Entomologist Doug Tallamy, Dr. Ferlauto's eye-opening work revealed what occurs when we toy with millions of years of coevolution. Dr. Ferlauto chose 20 sites where the stewards of the land did not use pesticides, he installed emergence traps (tents) each covering a square meter and collected the insects that emerged from 1 March until June 30 from both the leaf and leafless sites. He collected almost 2000 species of insects and spiders where leaves were retained, moths and butterflies (about 20 will emerge), non-stinging beneficial parasitic wasps (about 300), beetles (almost 400), spiders (more than 100) and flies of various kinds (more than 1000).

Where leaves were habitually removed the average loss of butterflies and moths was 45%, of spiders 56%, beetles 24%. "A lot of species have two generations. Two generations mean the leaves are essential all of the time, leaves are important habitat for insects, but it doesn't end after winter," Ferlauto added. He found in his study plots that there was no moment of "peak of emergence," a point where the insects were gone. "They increased through spring and into July so that in July we were actually getting more insects emerging than we were in March and April." If lawn companies that rely on pesticides to manage the grass or if mosquito spraying companies are employed, the emergence would likely have been dramatically lower.

The thriving ecosystems that arise in spring from the leaf plots are a balance of predator and prey, and the prey are key to biocontrol of pests. Without prey, it can lead one down a treacherous path of contemplating hiring pesticide-spraying landscape companies to fog trees and shrubs to try to control the pests that invade once the ecosystem is disrupted beyond self-restoration. Further research occurring at Dr Ferlauto's sites revealed that if there was longstanding leaf removal, soil carbon was reduced by up to 24%. Soil carbon (organic matter is mostly carbon) is the glue that holds the soil together in aggregates, allowing aeration and moisture retention while resisting erosion. It is the main food in the soil food web and is the source of terrestrial plant nutrition. *And* keeping carbon in the soil offsets climate change.

In Doug Tallamy's latest book *How Can I Help? Saving Nature with Your Yard*, he, as always, tells it like it is. "Most people remove leaves, then replace them with expensive mulch in the hope that the mulch will perform the same ecological duties as leaves. It won't." He warns we are creating inhospitable landscapes. Dr. Tallamy outlines four main reasons to leave the leaves. They are the home of many creatures imperative to the food web. Many moths, including the luna moth, spend fall, winter, and spring within a cocoon nestled in the leaf litter. "The Luna moth in its chrysalis stage does not enjoy being run through a lawnmower." Second, the decaying leaves are a food source for caterpillars and other insects that are the food for birds and their babies and frogs and salamanders and on along the food chain. His third reason is that most of the nutrients trees used the previous year are in those leaves, they are broken down and then returned to the trees, nature's perfect recycling. "When we remove leaves from our properties, we are slowly starving our trees." Dr. Tallamy's fourth reason is that the leaves create moist conditions for the protection of the massive soil community vital to all life that is out of sight to we humans, there are more species living in the soil than above it, and they require humidity to survive.

Practical suggestions, what to do with the leaves according to Dr Ferlauto and Dr. Tallamy. Expand beds and reduce lawn!, "expand beds under trees to at least their driplines for soft landings of insects and animals that drop to the ground, rake the leaves into these large beds in the fall and plant right through the decaying leaves in the spring." Composting leaves, he does not want to diminish the value of homegrown compost, but it does kill the animals and insects if they cannot make their way out or if they are starved for oxygen. Lastly, he reminds us that besides losing habitat the number one destroyer of insects is insecticides. "Insecticides kill far more of the natural enemies of insects than the pests themselves, which then enable pest populations to explode." A thin layer of leaves on the lawn over the winter can be beneficial at returning nutrients. Otherwise, the words to live by are move them whole, do not shred, and only compost if you have to, rake and relocate, and emulate the forest floor. And plant an oak tree and leave the leaves that fall beneath it.