



Summer Smorgasbord of Environmental Learning: Keystone Plants, Caterpillars, and You!

Americans have always had a love affair with our front lawns. That affair got very intense in the 1950's when home landscaping became something we engaged in for the purpose of showing off our meticulous carpets of mowed grass. We framed them with sheared hedges of ornamental shrubs, accented them with dahlias and roses and decorated them with all things like plastic pink flamingos, wishing wells, and garden gnomes. With a booming post war economy and the desire to have the perfect lawn, synthetic chemicals for fertilizing that carpet flooded the marketplace. Then came the pesticides to ensure certain death to any insect that dared venture near it. The perfect lawn became *the* symbol of success, prosperity, and the American dream.

Sadly, that dream has become one of our worst ecological nightmares. Collectively we have more than 40 million acres of lawns in the U.S., an area roughly the size of New England. And when it comes to envisioning the lawn as a kind of ecosystem, these monocultures might as well be concrete dipped in poison. As far as insects are concerned, and the wildlife that feed on them, lawns and the non-native plants that decorate them are veritable food deserts.



Insects are the basis of all life on this planet and although there are billions and billions of them, a staggering number of insects are going extinct. And for the most part, it's human actions like creating pristine lawns that are to blame. Most insects are very picky eaters. Roughly 90% will eat and reproduce on only very few specific native plant species. When the native plants are gone, so go the insects. And because insects are *the key food* source for birds, amphibians, rodents, and other mammals, that dependence on specific native plants can decimate entire food webs. Landscapes that consist mainly of invasive or non-native plants and monocultures of lawn grasses become ecological dead zones.

Here's a mind-blowing fact to consider... of all the insects in the world perhaps the most important (besides the pollinators) are the soft bodied ones that feed birds and rodents. We're talking caterpillars. An influential ecological researcher, Douglas Tallamy, who is a professor in the Department of Entomology and Wildlife Ecology at University of Delaware, has shone a spotlight on the fact that the basis of life may actually be a handful of crucial plants we can call [keystone plants](#) and the caterpillars that eat them.



Male Eastern Bluebird feeding caterpillars to a chick. Photo from countrysidevetnj.com

In his most recent book, [Nature's Best Hope](#), we learn that for birds, caterpillars are the perfect superfood. They are high in protein and fats and are the best source of healthy carotenoids during the breeding season. Carotenoids are the compounds in fruits and veggies that give them orange and yellow colors (think of the orange color in carrots). Carotenoids stimulate immune systems, improve color vision, serve as antioxidants, and make male bird feathers colorful. Brightly colored feathers on males signal that they are healthy and healthy males are desirable mates for female birds. In spring, one of the only sources of carotenoids available to male birds are caterpillars that feed on leaves



with the compounds in them. It's not an overstatement to say that mating success in birds depends on caterpillars. Researchers have found that caterpillars are so important to breeding birds that many species may not be able to breed at all in habitats without lots of caterpillars.

Then come the baby birds that need to be fed. Baby birds eat a lot and often so they can grow fast and get out of the nest where they are very vulnerable to predators. After years of ornithological research to prove a point, one of the most complete records about how many caterpillars it takes to raise a nest of chicks was recorded in 1961 by a researcher named Richard Brewer studying Carolina chickadees. Over the course of a typical nesting period (16 days) chickadee parents delivered **6000 to 9000 caterpillars** before the babies fledged and then continued to feed them for three weeks afterwards. The number of caterpillars needed to raise all the baby birds in the world is mind boggling.

So, what does mother nature grow to feed the billions and billions of hungry caterpillars? Tallamy and his research assistant Kimberly Shropshire did years of painstaking research to determine that just a few key plant genera in every region of the country act as host plants for most of the Lepidoptera. Turns out it's not enough just to be a native species, but native plants vary in their ability to sustain the Lepidoptera that fuel regional ecological food webs. Tallamy and Shropshire determined that only about 5 percent of the local plant genera hosted 70 to 75 percent of the local moth and butterfly species! These 5 percenters are in fact **keystone plants**. In summary, *"a landscape without keystone genera will support 70 to 75 percent fewer caterpillar species than a landscape with keystone genera even though the keystone-less landscape may contain 95 percent of the native plant genera in the area."* (Tallamy, *Nature's Best Hope*, 2019). In short, without the keystone plants, the food web falls apart.

What is the most productive keystone genera? Of the 2137 genera of native plants that grow in the lower 48 states, the mightiest of them all are the oaks. In the mid-Atlantic region, oaks support 557 species of Lepidoptera caterpillars, more than any other plant in the region. No human made bird feeder can compete with the power of the oaks when it comes to feeding birds.

Thankfully for those of us who want to help wildlife, Tallamy and Shropshire's research on the ranking of native plants for caterpillars has become the basis for a search tool developed by the National Wildlife Federation. This [Native Plant Finder](#) allows users to plug in their ZIP code to find trees, shrubs, and flowering plants native to their region that support caterpillars. Anyone interested in changing the home landscape paradigm can find out what to plant to create a healthy habitat for wildlife just by entering their 5-digit location code.



Variable oakleaf caterpillar feeding on oak leaf; photo by David Barnett

Clearly, it's imperative that we rethink our home landscapes. Growing sustainable landscapes with diverse native species help support pollinators, sequester carbon, capture runoff, and create functional habitats. And by planting just a few keystone species, we can feed the hungry caterpillars so they in turn will feed the baby birds and mice etc. who will feed all the other animals in the food web. If you want to see examples, Duke Farms is a great place to visit to see landscape restoration in action!



People throw up their hands and whine that our environmental problems are too big and there's nothing they can do. But there is in fact so much we can do. Go to the Native Plant Finder, enter your zip code, get your plant list, then head to a local nursery that carries native plants. Purchase an oak or another keystone plant and plant it in your yard; better yet plant lots of them. Imagine if everyone did. Imagine...

Activity: Find Keystone Plants for your Yard

- Visit the NWF [Native Plant Finder](#) site. Plug in your zip code and explore the keystone plants for your area.
- Choose the top 5 keystone trees in the tree category. Check out the number of Lepidoptera species on each.
- Add up the numbers. How many species of caterpillars do just 5 keystone trees support?

Additional Resources

[Nature's Best Hope; NWF Presentation](#)

[Nature's Best Hope](#)

Narango, D.L., D.W. Tallamy, and P.P. Marra. 2017. Native Plants improve breeding and foraging habitat for an insectivorous bird. *Biological Conservation* 213;42-50.

[Landscaping for Birds](#)

[Gardening for Wildlife](#)

[Where to buy Native Plants in New Jersey: The Native Plant Society of New Jersey resource list:](#)



Whether you are aligning your curriculum to The Next Generation Science Standards or referencing the New Jersey Student Learning Standards, the ecosystems thread runs K-12. These are just a few examples from NGSS:

MS-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics

Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations

HS-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales

HS-LS2-2 Ecosystems: Interactions, Energy, and Dynamics

Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales

For more information about content connections, contact Kate Reilly, Manager of Education, Duke Farms. kreilly@dukefarms.org

And to foster caterpillar respect with our youngest nature lovers don't forget ...

