

# Why You Should Grow Native Plants in Your Garden

Entomologist Doug Tallamy explains how doing so can help insects and birds

Emily Underwood, [Knowable Magazine](#)  
September 7, 2023



*Having native plants in a garden can create a good environment for caterpillars, which are hearty food for birds [Dario Sanches via Wikimedia Commons under CC By-SA 2.0](#)*

As a boy growing up in the 1960s, Doug Tallamy made daily visits to a pond on one of the last empty lots in his suburban New Jersey neighborhood. It was teeming with dragonflies and water beetles, polliwogs and frogs—until bulldozers arrived, burying the pond and its inhabitants.

That early loss sparked a lifelong passion for understanding nature. Tallamy became an entomologist, studying insect behaviors like egg dumping, in which female insects leave their own eggs in another female's nest, and paternal care, in which male insects such as giant water beetles carry their egg broods on their backs. It also spurred Tallamy's interest in protecting and restoring habitat. Although he couldn't save that pond, Tallamy now realizes there had been nothing to stop him from digging another pond in his own backyard 50 yards away to create a refuge for the dragonflies and polliwogs. "My parents probably would have helped me—it would have been great," he says.

Half a century later, Tallamy is alarmed by the loss of insect abundance and diversity on nearly every continent, from butterflies and bumblebees to tiger beetles and aquatic insects such as stone flies. Habitat destruction from agriculture, development and encroachment by invasive non-native plants is one major driver of the declines, experts agree.

Getting people to care about the loss of insects can be difficult, Tallamy admits. But lots of people care deeply about the creatures that rely on those insects for food, such as the world's rapidly declining bird populations. Through his books and lectures, Tallamy has inspired many people to convert their gardens, neighborhoods and city parks into prime bug habitat, mostly by growing the native plants that insects such as butterflies have evolved to use for food and shelter.

*Knowable* magazine talked with Tallamy, of the University of Delaware, about his ongoing efforts and why he's focused on getting kids involved—one yard at a time. This conversation has been edited for length and clarity.

**Your early research focused on insect behavior—specifically, how insects take care of their offspring. But now you're doing something quite different. How do you describe what you study now?**

I study how the plants we choose to put in our human-dominated landscapes impact food webs, which then impact pretty much all of biodiversity. There's a heavy conservation bent to it. The bottom line is that 78 percent of the entire United States is privately owned, and 85 percent east of the Mississippi is privately owned. We've got parks, we've got preserves, but the parks and preserves are not enough. We're going to have to practice conservation on private property, and that involves the public. They are the new managers of biodiversity, and they don't know it.

My research is designed to generate simple background information and real data that will convince people that, "Hey, I really do have a responsibility as a landowner." It's all very simple stuff, but focused on the simple questions that I get all the time, about why is this necessary and what am I supposed to do? And we back it up with data.

**How can the study of insects inform those decisions?**

That's a good question. The answer is that plants are capturing energy from the Sun and turning it into the food that supports the rest of life on Earth. If you don't get that food to the animals, you don't have any animals, and then biodiversity crashes. You don't have functioning ecosystems.

It turns out that insects are the primary dispersers of that plant energy —and not just any insects, it's really caterpillars dominating that process. Caterpillars are transferring more energy from plants to other animals than any other type of plant eater.

I didn't know that when I started this research, but it means understanding plant-insect interactions is really, really important. We have these major initiatives across the globe, like the Trillion Tree Campaign. They're all focused on climate change, but not biodiversity. In the Trillion Tree program, for example, they're planting eucalyptus everywhere. Most of the places the trees are being planted, they're not supporting insects, even though they grow fast. It would work better in terms of mitigating the biodiversity crisis if we chose the right trees—and that's where the knowledge of insects comes in.



*Native oak trees, in the genus *Quercus*, provide habitat for hundreds of species of insects and other animals. [Charlie Day via Flickr under CC By-ND 2.0](#)*

## **How do you figure out which plants insects prefer?**

Some of our early studies were common garden experiments, where you grow a native plant next to a plant from the same genus that's not

native. For example, you could compare a native sugar maple tree that evolved in North America to a maple from Norway. Then we measured how much insects use these plants—eating them and reproducing on them. We demonstrated that even when you have a plant that’s a close relative of a native, on average insect use is reduced by 68 percent.

### **Why can’t the insects use these non-native plants?**

Plants do not want to be eaten by insects, so they protect their tissues in many ways, but typically with chemicals. Let’s just use the monarch butterfly as an example. It is a specialist on milkweed, and it has to specialize, because milkweeds are toxic plants. Milkweed defends itself with compounds called cardiac glycosides, which can cause heart failure, and with a sticky, milky-white latex that pours out from its veins.

If you don’t have the adaptations to get around these defenses, you can’t eat milkweed, and most insects don’t have those specific adaptations. Monarch caterpillars have developed behavioral adaptations that block the flow of that sticky latex—they snip through the midrib of a leaf, blocking the flow of latex to the rest of the leaf. And they have physiological adaptations that allow them to eat the cardiac glycosides without, you know, dying.



*Specialists like monarch butterflies will lay their eggs only on certain milkweed species, like this swamp milkweed. Jim Hudgins, USFWS via Flickr, Public Domain*

What's interesting about the monarch is that it is not an exception. Ninety percent of the insects that eat plants are host plant specialists. They've developed very specialized enzymes that store, excrete and detoxify the compounds of a particular plant lineage, as well as life history adaptations and behaviors that minimize the insects' exposure to those compounds, so that the insect can eat that plant.

So, that's 90 percent of the insects that are out there. Ten percent are called generalists, and they can eat a much wider variety of plants, because they're really good at detoxifying lots of chemicals. But even the most generalized insects, at least in the United States, can eat only 14 percent of the plant lineages that are available to it. So even a generalist is excluded from 86 percent of the plants that are out there.

And that is why our insects generally can't switch quickly from eating native plants to eating plants from other continents. Those plants haven't been here long enough for the insects to evolve the adaptations required to get around the plants' defenses. People think insects evolve quickly, and they do when you're spraying insecticides on them and there's only a few that survive and then the next generation of insects has resistance. But when it comes to switching host plants, it takes thousands of years, according to the data that we have. It does not happen quickly at all.

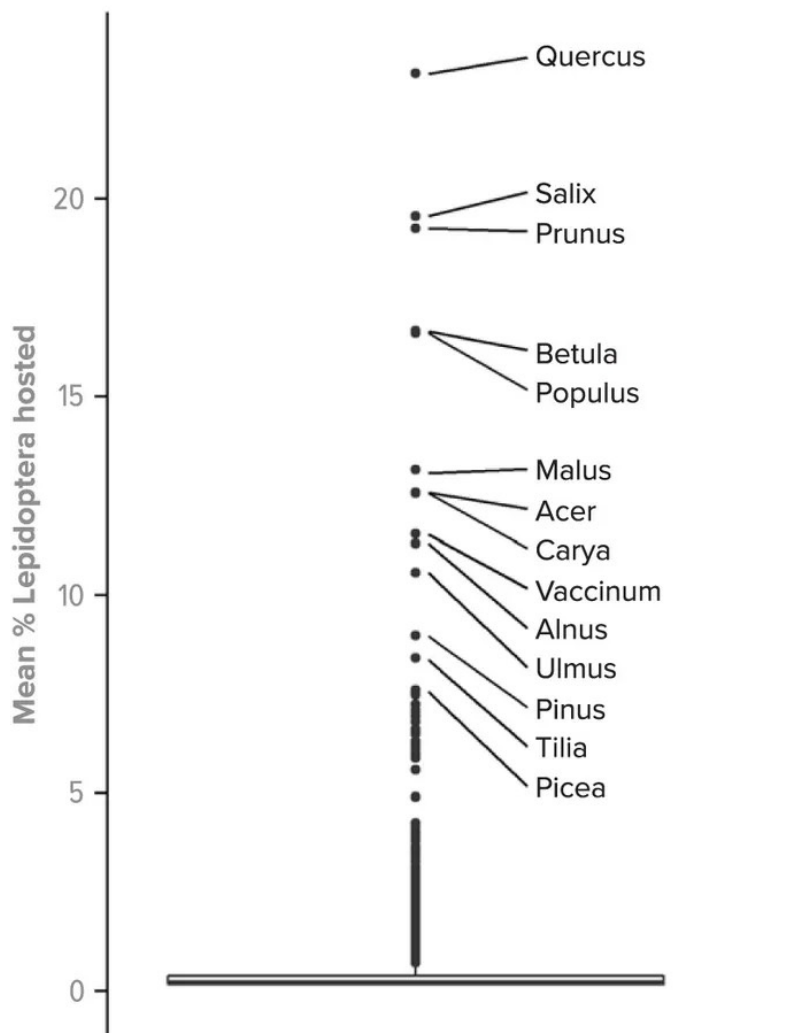
**Some researchers, such as Art Shapiro at the University of California, Davis, have argued that insects are better at adapting to use non-native plants than you just suggested—how do you respond to skeptics?**

Most of Shapiro's examples are of host range expansion, not host switching. Host range expansion is when an insect already has the adaptations required to exploit a new host. Like the black swallowtail is a specialist on the carrot family. When we brought Queen Anne's lace, parsley and dill to this country, the black swallowtail already had the adaptations required to eat those plants. So it started using them as well. That can happen very quickly. But even with host range

expansion, most of our native Lepidoptera cannot use non-native plants.

I am talking about host switching, not host range expansion. In host switching, new adaptations are required to adapt to plants in novel lineages with phytochemical defenses the insect has never before encountered in its evolutionary history. It happens, but rarely and very slowly.

### ‘Superhost’ plants for butterflies and moths



SOURCE: ADAPTED FROM D.L. NARANGO ET AL / NATURE COMMUNICATIONS 2020

KNOWABLE MAGAZINE

*Certain plant genera are more important than others in supporting insect populations. Of the plant groups found across the U.S., oaks (Quercus genus)*

*stand out as superhosts for the order Lepidoptera, which includes moths and butterflies, Tallamy and colleagues have found. Adapted from D.L. Narango et al. / Nature Communications 2020 / Knowable Magazine*

## **How do scientists figure out how long it takes?**

We can estimate how long it takes insects to switch hosts by looking at how fast native insects start using non-native plants. There are lots of examples but one we have hundreds of years of data on is the European lineage of the common reed, *Phragmites australis*. It has been in the United States for 400-plus years. In Europe, it supports 176 species of insects. After 400 years here, it supports only five species, and those are host range expansions. Switching to a new host is really hard.

## **How are insects faring in the world today?**

Terribly. Over the last 25 to 30 years, we've lost more than 45 percent of the insects on the planet. The entomologist David Wagner calls it "death by a thousand cuts" because there are a lot of reasons we're losing insects. But one of them is the replacement of native plants with the non-native plants.

## **How much is the loss of native plants contributing to the decline in insects? Do scientists know?**

It depends where you are. If you're in the Midwest, with industrial agriculture, and they've removed all the native plants and replaced them with either soybeans, corn or lawn, that's a huge cut. But if you're someplace else—say, in the middle of 135 million acres of residential landscape—that depends on the residents' plant choices. It also depends on whether you employ insecticides or a mosquito fogger—which kills all the insects, not just mosquitoes—and other major causes of insect decline, like light pollution. When you turn on your porch light at night, it attracts a lot of nocturnal insects, particularly those moths that create the caterpillars that run the food web. They fly around and around the light, die from exhaustion, bang into the light, get incinerated.

So we don't want to claim that non-native plants are the one thing causing insect declines, but it is one of the things. You know, the most common tree in Puerto Rico is now the African rubber tree—we're talking about huge displacements of native plant communities with plants that really don't support the insects that used to be supported.

### **Do you find it difficult to get people to understand the importance of insects?**

I have been surprised at how easy it is, actually. They don't come to my talks liking insects, but I give them a very logical, step-by-step reason why insects are important. A lot of people do like birds, and the bottom line is, plants are the best bird feeders, because they create the best bird food: insects. When I tell them that, and that most birds can't reproduce eating just seeds, they realize, "Oh, I can't just put out a suet ball and expect the birds to be OK."

But part of the problem is that if somebody invites me to give a talk, it's usually the choir that already appreciates insects that invites me. Reaching the non-choir is more of a challenge. But still, when I have the chance to build the story, there's a lot of acceptance. I've gotten very little pushback, even from the lawn industry, which I have not been nice to.

### **Are all insects created equal when it comes to supporting birds? Caterpillars are clearly important, but what about the aphids eating the hellebores on my porch?**

Look at the biomass. It takes 250 aphids, on average, to equal the average biomass of one caterpillar. So you're a bird trying to feed your baby—are you going to feed them aphids? Some of our smaller birds do chase aphids around, they're opportunistic, but they're going to take the caterpillar over an aphid every single time.

Similarly, there are a lot of beetles out there, but they aren't great food either. I talk about caterpillars being like little sausages, while beetles are like little tanks. Much of a beetle is exoskeleton; that's made of

chitin, and it's indigestible. They've got a lot of pointy edges, so it's just not a very good food for most of the things that are eating insects.

**You've written several books geared to a public audience now, Bringing Nature Home, Nature's Best Hope and The Nature of Oaks. What prompted you to write them?**

As you know, I did a lot of work on egg dumping and parental care and how cucumber beetles choose their mates. It was all interesting stuff. David Attenborough even came and filmed in my lab.

But nobody cares why a cucumber beetle chooses its mate. What they do care about is how the loss of insects affects birds. When they hear these statistics about the population of North American birds dropping by 30 percent since the 1970s—that's three billion birds lost—they think they're powerless. But my message is: You are not powerless, and it's pretty easy to do something. You just have to choose the right plants.

I got questions from people who wanted to know: What can we read about this? So I said, OK, I will write a pamphlet, and that pamphlet became *Bringing Nature Home*, and that was the first book. I figured nobody was going to read it, and that'll be the end of that, but I was wrong. People did read it and they're still reading it, which means the timing was right.

**Can you elaborate on what you think we should be doing with our yards, for people who haven't read your books?**

There are particular native plants that are particularly good at supporting native insects. So, for example, 14 percent of our native plants—just 14 percent—are creating 90 percent of the caterpillars that drive those food webs. If you don't have these plants in your landscape, it could be a 100 percent native landscape, but it still will not support the food web.

So having those keystone plants around is critical, which means you have to identify them. It took us two years of searching host plant records for the last hundred years, but now we have a ranked list of every plant genus in this country for every county. That has been so popular we're actually doing the same thing now for every ecoregion in the world. North America's done; Japan, Singapore, India and Australia, all of Europe, those are all done at this point, although the data aren't publicly available yet.

The other major message is to reduce the area you have in lawn. Lawn is a status symbol. It's not a good reason to crash biodiversity around the globe. Let's start by cutting it in half. If we have 44 million acres of lawn, let's cut that down to 22 million acres. Let's plant the rest of it and call it our homegrown national park.

The key is to reach all those property owners and let them know that they are an essential part of conservation. If we could reach 20 million acres in homegrown national park, that's more acreage than all of our major national parks combined.

### **What about the need to reduce water consumption? Can we do that and grow native plants?**

The goals are completely aligned. In California, you have a really powerful message: We don't have enough water for lawns, so we're going to give you a \$3-per-square-foot rebate for every square foot of lawn you replace with plants that are adapted to low water conditions. And there's nothing better than California native plants—many of which have evolved to survive on very little water—to do that.

### **You've just written a new version of Nature's Best Hope, geared toward kids. Why?**

I get emails all the time telling me, what I should be doing, and one of the very consistent messages is, you've got to talk to the kids, you've got to start giving talks in schools. But there are thousands of schools out there, I can't go to all of them. So my publisher, Timber Press,

said, let's do a middle school version and see how it goes, maybe it'll be used in classrooms.

Our kids are the future stewards of the planet. But many of them are afraid of nature, because the media has taught them if you go outside, you're going to get eaten by a mountain lion, or you're going to get West Nile virus, or something else bad is going to happen to you. We need to introduce kids to the marvels of nature and get them to love it so that they will take care of it.

**I think a lot of kids are really worried about climate change and feel scared or powerless. What do you hope they will do after reading the book?**

Well, you said it yourself: Feel empowered. Feel like there are things they can do where they live. If they live in the middle of a city with no land at all, they can get into container gardening. They can become activists. They can volunteer at preserves that are in their city.

If they're in an apartment, they can adopt a tree on their block and plant a bed under it, so that the caterpillars that develop on that tree can drop down and make it to adulthood in the ground under the tree. Right now, it's typically lawn right up to the trunk, which the mower goes over. But 93 percent of caterpillars don't develop on trees. They wiggle their way underneath the ground to pupate, or they spin a cocoon in the leaf litter.

The way we landscape now has no leaf litter—it's rock hard under there. So planting ground cover or anything that keeps the mowers out of there, making it a no-walk zone, will help. The tree will love it—it will live longer. And it will make it a viable space where the caterpillar can complete its development.

If everybody in an apartment building adopted all the trees on the landscape, that would be a huge step forward.

**How do you feel about how the native gardening movement has taken off? Are you satisfied?**

I'm impressed by how it has taken off. I can't keep up with it. But we also have a long way to go. We need to get to the point where it really does go viral and grows exponentially.

It's about transferring the responsibility for keeping ecosystems healthy to individuals, but there are a lot of individuals out there. If you're talking about the world, that's eight billion people. And every one of them depends on a healthy ecosystem. The responsibility of maintaining the health of that ecosystem belongs to all of us, not just a few conservation biologists. It's everybody's responsibility.