

**David:** Welcome to this episode of State of Change, the podcast where we explore how climate change is affecting wildlife in the garden state. I'm David Wheeler, the director of the Conserve Wildlife Foundation of New Jersey.

So many species of wildlife benefit people in ways big and small, some easy to see and others indirectly. Perhaps no group is as irreplaceable both to people and to a balanced natural world all around us as pollinators, which includes bees, butterflies, flies, beetles, moths and other insects.

How do pollinators help us? Our sustenance. One out of three bites of food, thank you pollinators. Our health. The air we breathe and many of the medicines we depend on, thank you pollinators. Our economy, over 200 billion dollars provided to us annually, benefits provided to us across the globe and a balanced ecology. Thank you again pollinators.

But these insects are facing declines of staggering proportions. With threats ranging from habitat destruction to pesticide overuse. Climate change however is putting their very futures in jeopardy.

**Blaine:** Just a three degree change Celsius, this is what is predicted by the end of the century and published in many journals of science. We can predict that more than half the species of insects on Earth would lose half their geographic range, likely pushing most of them to the brink of extinction. What does this potential event foretell to life on Earth and us humans who are a part of that system? I think we know the answer to that.

**David:** That's Blaine Rothhauser a conservation scientist and ecological restoration practitioner with GZA Environmental. He's also an expert on pollination and the species involved in it. It's a scary thought he raises when it comes to the future but look to the past and we can find an amazing story of millions of years of evolution and co-existence on Earth.

The many life forms that call our planet home have evolved close relationships with other species. So many species, like humans, often depend on others for their survival.

Those colorful and fragrant flowers that humans have grown to love did not develop like that to decorate our homes or to be given as gifts. The colorful petals and sweet smells evolved to attract insects and other animals into the flower.

This attraction is necessary for one of the most important biological processes on earth to be successful, pollination.

**Blaine:** How does pollination work? Well it's a bit of passive and incidental tomfoolery on behalf of both parties in the equation, the insect and the flower. Both parties are drawn to the other by an endless trial and error scheme that in the end results in the perfect relationship.

Flowers are the ultimate tricksters. They deploy an arsenal of fun house mirrors. Like sexy irresistible corollas that look like the genitalia of insects that it's trying to attract. Some are complete with alluring scents that mimic the insect, and the act of mating with the flower results in a pollination scam of sorts.

Conversely some flowers mimic territorial males where the intruder will attack it and the fight results in pollination. Flowers that smell like sh... oh you know what I'm gonna say. Poop of mammals to attract flies. Evolution really holds no bounds when it comes to tricks between pollinators and plants.

**David:** The most common method of pollination is through the use of other living and moving creatures to transfer the pollen from plant to plant. Since plants can not get up and move themselves, they rely on pollinators.

**Blaine:** Entomophily, this big fancy way to say pollination by insects, if it were to go away, swallowed up by the adverse effects of the Anthropocene we find ourselves in, would probably cause a regional then global collapse in ecological function.

**Blaine:** Ecology is a supercomputer, we're tweaking things and we're turning this dial left when it should go right a couple of notches. We're playing a game with a massive mega-computer that is our ecology.

We're playing a really high stakes game of poker. We see the signs. We're reading the tea leaves through the insects and we're messing with these systems because we basically have to support another billion maybe two billion people by the turn of the century. When in my mind as an ecologist we're already at the Earth's carrying capacity as it is.

The bees are taking the biggest hit. Neonicotinoids pop right into my brain. We spread them so liberally on our big cash crops. Neonicotinoids are threatening insects anywhere that they're used.

**David:** A class of pesticides that are chemically similar to nicotine. They have been associated with colony collapse disorder in bees and other destructive environmental effects. The three main neonicotinoids have been banned in the European Union and many American states have placed restrictions on their usage.

**Blaine:** Most agricultural scientists would say the bees, especially honey bees, other bees as the heavy lifters but that's not really 100% accurate. The major insect taxa that deploy an arsenal of missionaries include beetles, wasps, flies, midges, ants. Those are also major pollinators of fields, hill and dale.

I missed probably the most important group to me, and that's Lepidoptera, the moths and butterflies. Dear to me because I do a lot of my scientific work with them. This group really are unsung and underappreciated as pollinators and ecological workhorses. They fill so many niche functions in every nook and cranny. We just ignore them as those little brown jobs and worthless hexapods here to chew on our clothes and destroy our gardens but they really tell us so much about the ecological health of our local areas.

**David:** Moths are heavily affected by humanity's never ending quest to eradicate pest insects. As climate change looms, moths and other insects face a likelihood of an increase in pesticide use in the near future.

**Blaine:** Another threat to insects is biological control agents, bacillus thuringiensis, the infamous BT that we use to control gypsy moths populations. Unfortunately these are not host specific, meaning they kill non-target species. Of course, this all bodes ill as climate change allows the natal home range of pathogens and the target species you're trying to kill with control agents move further north.

In turn, if gypsy moths migrate north due to climate change it has a long term negative trend for those forests, and you've gotta use BT up north, well that's gonna kill more non-target species. You get where I'm going with this right? Constant negative feedbacks.

**David:** Most of all, insects need a habitat to live in. As human pave over more and more land and climate change begins the wholesale relocation of those habitats, pollinator insects and other species find fewer suitable habitats.

**Blaine:** Things have changed in the last 100 years and we look at anthropogenic change and how that's affected local environments through fragmentation.

**David:** Fragmenting a habitat breaks it up into smaller pieces that are cut off from each other. Like a new development splitting a forest in two.

**Blaine:** If you take two mega-developments and separate a forest corridor on both sides, you take away species abilities to genetically spread pools. You compromise a species ability to assure its survival in the long term by keeping its populations at the levels it needs to be to assure their long term survival. That's one direct effect of fragmentation.

Of course it opens up cancerous veins into those remaining forests . Invasive species can now work their way into it. That has a cavalcade of domino effects within complex ecological food chains.

Opening up holes for invasive plants to get a foothold and create monocultures over what was once natal systems. All of these processes have negative feedback systems that in fact drive the extinctions of not just our pollinating community but biodiversity in general.

**David:** Often environmental issues seem separate from human problems. If a species goes extinct we may lament it and feel a sense of loss but our daily lives would seem to go on unchanged. If pollinators were to disappear, humans themselves would feel immediate pain.

**Blaine:** As I said earlier, insects are intricately woven into all complex food webs, so it is not hyperbole to say we would experience an extinction event. The first not by a cosmological or planetary catastrophe.

One out of three bites of food you take has a pollinator associated with it. It's not a stretch to say insect pollinators, if we continue to usher in their extinctions, would have an immediate or quick downturn in humanity's ability to self perpetuate past the 21st century.

The crazy thing about all this gloom and doom caused by the news of pollinator declines is we can change it in a second with little time and effort. It comes down to a few simple words, they are re-wild it and they will come.

Why does every American need a giant lawn? I call it the green smear. Why do we need the green smear? Why can't we live among a natal environment? Where everything is functioning for our benefit 24/7 365. Let's convert our lawns, what I continue to call the green smear, to naturalized landscapes.

Guess what, once you do this its gonna change your life. I guarantee it. You're gonna have a place to go to de-fragment your hard drive. The daily grind. You'll come home and a whole new world is awaiting if you pull back the onion of this disgusting non-natal environment and let a whole new universe bake and baste your visual cortex with life on earth the way it was meant to be.