



Encyclopedia of Life

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## Bittersweet Nightshade Podcast and Scientist Interview

*Solanum dulcamara*

Some species are born invaders, like bittersweet nightshade, a non-native vine with purple flowers and red berries. So what makes it such a successful space invader while other foreign plants never make it? It turns out the answer may be right underfoot. Ecologists Jean Burns and Angela Brandt have devised clever experiments to get to the root of the matter.

### Transcript

**Ari:** From the Encyclopedia of Life, this is One Species at a Time. I'm Ari Daniel.

Have you ever wondered what makes an invasive species set up shop somewhere it doesn't belong? In other words:

**Burns:** Why are some species able to invade, and others are not?

**Ari:** Jean Burns is an ecologist at Case Western Reserve University, and her research is offering a clue to that riddle, and also helping to determine which places are most vulnerable to species invasions. Burns offered to tell me more on a cold, rainy morning on a farm turned outdoor laboratory outside of Cleveland, Ohio. She spends a lot of time here, examining what seems like a simple question.

**Burns:** Where do organisms live, and why this place and not that place?

**Ari:** And although the question is simple, the answer, and the implications of that answer, are anything but. Let's start with where her organisms of choice – plants – put down their roots – the dirt. She kneels down, and rubs a moist handful between her fingers.

**Burns:** So what we see, as humans – it's brown, it's muddy – it looks to us like a nice tilled field that's pretty uniform. But from the perspective of, say, a seedling that's germinating in a little patch of that soil, what that seedling is experiencing is the bacteria and the fungi that are right next to it in the soil.

**Ari:** Those bacteria and fungi aren't spread out evenly. Drop one seed at your toes, and toss another one a few feet away, and the seeds may find themselves in vastly different worlds of dirt. To a seed, that can mean the difference between germination and decomposition. That's because the bacteria and fungi interact with the plants, sometimes helping one another, sometimes hurting.

And Burns wants to know how these tiny dynamics in the dirt add up to determine why invasive plants grow where they grow.

**Burns:** Invasive species are species that have come from somewhere else, and they have become often really problematic in the places where they invade.

**Ari:** Burns has a pretty clever experiment underway to figure out what makes certain patches of soil vulnerable to plant invasion or not. To see the set up, we head indoors, inside her lab on the other side of the farm. Ecologist Angela Brandt dumps out a box of plastic party toothpicks onto a table. She's gluing a tiny seed to each one.

**Brandt:** Yeah, it's a good downtime rainy day activity.

**Ari tape:** So what kind of seed is that?

**Brandt:** This is *Solanum dulcamara*, commonly known as bittersweet nightshade. It's an ornamental vine – it has very beautiful purple flowers and red berries. And it's not native to North America.

**Ari:** In fact, none of the seeds in this study are from here. The half dozen species they're testing are all invasive. And by the end of the experiment, this team of ecologists will have glued over 100,000 seeds from these plants to individual party toothpicks. That's step one. Step two happens back outside on the farm.

Nestled in the dirt are a series of large plastic pots, each one containing a spray of those plastic toothpicks sticking into the ground. Burns crouches down beside one of the pots with a healthy horsetail plant.

**Burns:** Ah, this is an excellent example where you see this plant is right next to that toothpick because that seed was glued on there.

**Ari:** The horsetail was planted first. Then Burns added seeds of a different species glued to a bunch of other toothpicks. In this pot, that second species – the bittersweet nightshade – is just emerging from the soil. So the second plant is invading the first one. And if the flip is true too – if the first can invade the second, then it's a sign of coexistence.

And this ties in to the whole notion of invasive species – species that don't belong – because when they first appear on the scene, there are, by definition, very few of them. They're arriving in a place where the odds are against them. But a successful invasive...

**Burns:** ...it's able to germinate and to grow and to persist. That's basically what invaders have to do when they're introduced to a native community that's already established, and they have to be able to overcome that competitive disadvantage.

**Ari:** Burns' research may help us get smarter about how to prevent, or at least slow down, species invasions – by figuring out which kinds of soil and the swarms of bacteria within those soils – are most vulnerable to invasive plant species taking root. Down the line, she's hoping to ID the specific bacteria species that promote certain plants to establish themselves in the soil.

But that's not all. Burns says her work can also inform how we restore places transformed by people. Take a nearby patch of land that's just been turned over to the Cleveland Metroparks.

**Burns:** It's a golf course. It's been a golf course for a hundred years. And what they would like to do is restore it into a native maple hardwood forest. And one of their questions, then, is how do they need to treat that soil in order to make their restoration plan really work?

**Ari:** It's the kind of riddle that Burns' research might just solve. By exploring how a bunch of invasive plants are duking it out – each with their own microscopic army in the dirt – she's coming to understand how to put back the plants that used to stand guard here in the first place.

**Ari:** Check out [eol.org](http://eol.org) for some photos of Jean Burns, her plants, and all those toothpicks.

Our series, One Species at a Time, is produced by Atlantic Public Media in Woods Hole, Massachusetts. I'm Ari Daniel.

## Meet the Scientist

Meet Ecologist Jean Burns, who was featured in our Bittersweet nightshade podcast:



### **Where do you work?**

I work at the Department of Biology, Case Western Reserve University, Cleveland, OH USA.

### **What do you study?**

I study the ecology of plant community assembly and biological invasions.

### **What are three titles you would give yourself?**

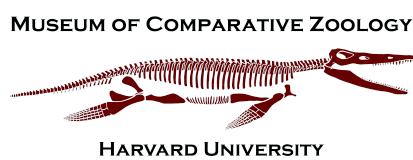
Ecologist, mentor, plant fanatic.

### **What do you like to do when you are not working?**

Jog, yoga. Read for pleasure. My latest favorite: Susan Cain's "Quiet, the power of introverts in a world that can't stop talking."

### **What do you like most about science?**

Science is a very creative field, which might come as a surprise to many of us raised with big science text books that emphasize facts over discovery. I love the creativity of asking new questions, thinking of new ways to address those questions, and finding out the answers, especially when those answers surprise us!



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