

Intro music - 8-10 seconds. Music is 'Ragtime Annie' as performed by George Ainley and the Stringfield Springers. Used with permission.

Elizabeth - Welcome to Bud Buds, the podcast that takes you into the unfurling realm of invasive plants and their seasonal changes, and what you might be witnessing out your window or in the woods in Vermont. I'm Elizabeth. I'm a scientist for the Vermont Department of Forests, Parks & Recreation. I'm joined today, as usual, by my co-host and bud, Lina...

Lina - Hello! I'm Lina, a natural resource steward for the Vermont Department of Forests, Parks, and Recreation. What are we talking about today, Elizabeth?

Elizabeth - The same thing we talk about every day, Lina.

Lina - plants that are trying to take over the world?

Elizabeth - Kinda... At the very least, we'll talk about plants that are having a negative impact on some natural communities here in Vermont. Today, we're going to talk about a plant that is out in force here in early spring.

Lina - is it violets?

Elizabeth - no, it's pretty pungent

Lina - is it ramps?

Elizabeth - no, it's invasive

Lina - oh, duh, I know. It's

Together - garlic mustard!

Elizabeth - Garlic mustard is known to have been an herb in kitchen gardens of Europe. And it's thought that European colonizers introduced the plant to this area, as far back as the 1800s or possibly earlier, so long ago that some people don't realize it is an introduced invasive plant.

Lina - fascinating! Garlic mustard has a couple adaptations that make it a particularly successful invasive plant. For one thing, it grows early in the season, and can get a jump start on photosynthesis and seed production compared to local plants. For another, it's highly adaptable and grows well in disturbed soils, along roadsides and trails, and it's very

shade tolerant so it can easily move into the forest once it's been established nearby. But probably the biggest deal is that garlic mustard is allelopathic, which means it can secrete chemicals from its roots into the soil that make it hard for other plants to grow nearby.

Elizabeth - Those are all pretty great adaptations from the perspective of garlic mustard, but can be bad news for other creatures in the ecosystem. For instance, those toxic chemical secretions, the allelopathy, are terrible news for nearby plants, and any animals that might want to eat them – like a delicate local butterfly called the West Virginia White butterfly. In fact, Garlic Mustard often displaces the local plants that animals like the West Virginia White rely on.

Lina - That's no good.

Elizabeth - Not only that, it's also what's called a toxic decoy. West Virginia Whites fly for about a month in early spring, drink some nectar, and lay their eggs. They have a preferred host plant to lay their eggs on; Garlic Mustard is closely related to that host plant and will confuse the West Virginia White, and they end up preferentially laying their eggs on Garlic Mustard leaves. This is bad news for the caterpillars, because they are unable to eat and grow on Garlic mustard, so after they hatch they die.

Lina - Oh, that's so sad.

Elizabeth - And it gets worse. Not only do the leaves kill the caterpillars, but the flowers don't blossom in time to be a good source of nectar for the adults. The population of this once abundant butterfly has dramatically decreased, and it's thought that the impacts of garlic mustard have played a key role.

Lina - Dang, so garlic mustard's allelopathy makes it impossible for West Virginia White host plants to survive, and then –between being a toxic decoy and it's untimely blooming – doesn't fill the gap it's created. It's easy to see how that would have a real impact on that little butterfly. And, I'd imagine, on anything else in the ecosystem that eats West Virginia White caterpillars or butterflies, or that relies on the plants the garlic mustard has displaced.

Elizabeth - Exactly.

Lina - Ok, so it didn't evolve here, it's taking over the space and resources of local plants, and it's causing harm to biodiversity in Vermont. I think it's safe to say that Garlic Mustard is a Grade A invasive plant.

Elizabeth - You're absolutely right.

Lina - You know I love to be right.

Elizabeth – exactly. Let's put that to the test - how do you know you're right when you identify garlic mustard in the wild?

Lina - truthfully, that would depend on what stage of life I see it in

Elizabeth - you mean its phenophase, aka an observable stage or phase in the annual life cycle of a plant or animal that usually lasts a few days or weeks and can be defined by a start and end point.

Lina - exactly. Garlic mustard has a two-year life cycle. In its first year, it only grows leaves. They are dark green and sort of heart shaped, with scalloped edges, and they grow in a low circle called a basal rosette. At this stage, the easiest way to recognize them is by the distinctive garlicky smell. Those rosettes even overwinter under the snow in Vermont. But in its second year...

Elizabeth - ...In its second year, garlic mustard really takes off. It gets tall – usually one to two feet

Lina - though I have seen garlic mustard plants almost as tall as me!

Elizabeth - wow! Pics or it didn't happen.

Lina - Don't worry. Pics of that giant garlic mustard, and of everything else we're describing, are in the show notes

Elizabeth - Anyway, in its second year, garlic mustard gets taller, its leaves stay heart shaped and scalloped and move to an alternate arrangement around the stem. In mid-spring, it sends up small clumps of four petaled white flowers.

Lina - Here in Burlington, that's happening already.

Elizabeth - I bet, but it can happen at different times in different elevations or latitudes.

Lina The good news is that garlic mustard is pretty easy to recognize – especially with that smell – and really easy to remove.

Elizabeth - All you have to do is yank it out by the roots. Ideally, you'd do that before its final

phenophase

Lina - say that ten times fast

Together - *Laughing, both attempt to say "final phenophase" ten times fast*

Elizabeth - because garlic mustard spreads by seed. If we can get it out before it sets seed, we dramatically reduce the risk of spreading it. Each second-year plant produces seedpods -

Lina - 22 seedpods on average -

Elizabeth - that each contain around 28 small black seeds, about the size of an ant.

Lina - Seed development usually happens in May, but can occur throughout the summer, and the adult plants will die and dry out after setting seed.

Elizabeth - The seeds usually germinate within one or two years but can survive in the seed bank for up to five.

Lina - Seeds are dispersed mainly by humans or wildlife

Elizabeth - and that's how the plant spreads.

Lina - But, if we get the plants out before they set seed – before their final phenophase –

Elizabeth - then we can spread the word and not the plant!

Lina - It is fun to remember that since garlic mustard was originally brought to this area as food, if you're confident in your ID

Elizabeth - and PLEASE use good judgement here

Lina - you can try cooking with it. Personally, I'm fond of garlic mustard pesto, though the leaves definitely taste better *before* the plant has made flowers.

Elizabeth - so get out there and find some garlic mustard. Remember to yank it out by the roots!

Lina - Yeah! Wait, and then what? How should people get rid of garlic mustard that they're not going to eat?

Elizabeth - Well, good question. It can get kind of gross, but it's pretty important. With invasive plants, we want to spread the word not the plant, so we have to be sure that the plants decompose before composting them, and that we never compost the seeds.

Lina - Decompose young or non-flowering plants by letting them rot in a bucket or bag in the sun – this makes sure if you need to transport it, that it doesn't spread. Once you have let the plants fully rot, you can contact your local composting facility about bringing them that material, or you can leave it where you found it.

Elizabeth - For flowering or seeded plants, you'll want to still let it rot, but that won't break down the seeds. So check with your composting facility about the temperature of their piles and whether they think that it can break down seeds, and as a last resort, you can throw that rotted material away. And definitely avoid home composting freshly pulled garlic mustard - you'll just spread the plant even more.

Lina - Oof, that is a lot of detail. Tell you what, we'll link to Department of Environmental Conservation instructions on how to get rid of yard waste and find a compost facility near you in the show notes.

Elizabeth - Great idea.

Lina - Thanks! If you do pull garlic mustard in Vermont, let us know where you found it and what you did with it

Elizabeth - and if you decide to cook with it, let us know what recipe you used and how it turned out.

Lina - as always, we'd like to acknowledge the financial and technical support provided by the USDA Forest Service, Northeastern Area State and Private Forestry that enables us to run projects and provide outreach such as this, and to our major project partner, the National Phenology Network, bringing together community members, scientists, managers, and educators, to advance the science of phenology.

Elizabeth - And a special thanks to you, our listeners, for being willing to

Together - Learn. Get involved. And make a difference!

Outro music - 8-10 seconds of 'Ragtime Annie' as performed by George Ainley and the Stringfield Springers, picking up where it left off at the beginning of the podcast