Patrick Shults (00:13):

Welcome to the Forest Over Story podcast. This podcast explores forest stewardship in the Pacific Northwest, helping landowners and professionals gain new insights and information in the field of forest management. The forest over story is a product of the Washington State University Extension Forestry Program, and it's supported by the Washington Department of Natural Resources and the Society of American Foresters. All right, welcome back Forest Over story listeners. I am Patrick Schultz, extension forester for Washington State University here with another great episode in store. Today we're going to discuss pollinators. Everybody loves pollinators, but not everyone knows how forest support them. So here to help us understand that role is Rachel Zimmer with the US Forest Service. Rachel, how are you doing?

Rachel Zitomer (01:03):

Hi, I'm doing well, Patrick. Thank you so much for having me.

Patrick Shults (01:06):

I really appreciate you coming out or coming out tuning in more accurately. We've had you teach a few classes for us over the years and I don't know why, but it only recently occurred to me that you would be an excellent podcast guest. So I'm really excited to have you here. Maybe to start, we can have you share a little bit about your background and not just your work with pollinators, but sort of why you work with pollinators, what got you into this line of work.

Rachel Zitomer (01:42):

Sure. So yeah, as you mentioned in my intro, I currently work with the US Forest Service at the Pacific Northwest Research Station, but the stuff I'm going to be talking about today about pollinators will mostly be concerning my graduate work at Oregon State University. I just finished my doctoral degree in December of 2023, so I'm a newly minted PhD and that work focused on research involving intensively managed conifer forests and the pollinator communities. They contained, I got into pollinators from a background in botany as a great number of pollinator ecologists start as botanists and that was the same. And I really got interested in the intersection of pollinators with intensive forest management just because there's so little information out there about pollinators in forests like the Pacific Northwest is something like 50% forest and there's just, at the time that I started my doctorate, there's almost no information about what pollinators live in forest, what kind of habitats they use, anything like that.

(03:01):

Actually, the year I started my degree, some colleagues in my lab conducted a literature review that they published that found only 15 papers relevant to the subject of managed conover forests and pollinators. And that's compared to many, many hundreds, thousands of papers about pollinator ecology and agricultural settings because that's kind of the primary place where these guys get the most attention. So I just found it to be really exciting that there's so much to learn and luckily I think that the enthusiasm for this topic has just grown within the general pollinator ecologist community. A lot has been learned just in the last five or six years.

Patrick Shults (03:46):

Well, that's awesome. And I have to stop and say I'm sorry I didn't put the proper respect on your name and congratulations on your doctorate, Dr. Rachel er. So that's awesome. And I think you touched on something, which is why I was so excited to have you on. When we think about pollinators, we think about pollinator gardens, which are just flowers and annuals and maybe some shrubs, that kind of stuff, but we don't often think about forests when it comes to pollinators. But I suspect that that's an injustice and I'm sure we'll be getting into that. But maybe to kind of take a step further back before we dig into the

role of forests and supporting pollinators, why are pollinators important? What do they do and what issues are they facing?

Rachel Zitomer (04:45):

Yeah, that's a great question. I'm actually going to take a step even one further back maybe just quickly define what a pollinator is since that might've been a while since high school science for some listeners and remembering this, especially folks that are mostly dealing with forestry. So pollinators are basically animals that help plants reproduce by transferring pollen between flowers. Because flowers are Cecile, they stay in one place. So unlike a mobile animal, they can't mate and find mates on their own. So they need some kind of an agent to move pollen between flowers, and sometimes that's wind, but in many cases it's an animal like natural, a pollinator. So there's a lot of different types of animals that can be pollinators, those that include some mostly insects, especially in our region. So bees, wasps, beetles, flies, especially hover flies, butterflies. There are even some birds like hummingbirds and other birds that can be pollinators, even bats.

(06:00):

But in the Pacific Northwest, we're mostly talking about insects when we talk about pollinators and bees are really the most important pollinators. So that kind of gets a little bit to why these guys are important because they help plants reproduce. And just to get a sense of how important they are for plant reproduction, it's estimated that about 90% of flowering plants benefit from pollenators helping in the reproduction. So either they require it or it will increase the fruit set or seed set to have a pollinator visit. There's another estimate that about a third of the world's flowering plant species would just completely fail to reproduce an absence of pollinators, and half of them would suffer at least an 80% reduction in fruit production, and that also includes 80% of our crop species. So do keep in mind that obviously some of our stable crops like say rice, are wind pollinated, but even so, it's about 35% of global food production involves an animal, animal pollinator and the Pacific Northwest.

(07:15):

That includes some of our most important species of crops like apples, pears, hazelnuts, all our berries, blueberries, cane, berries, raspberries and blackberries, all kinds of fruits essentially. And it's estimated that just wild pollinators. So that's not counting commercial domesticated pollinators like honeybees just are wild insect pollinators contribute about $3 billion in pollination services just in the United States. So they're really important for our whole food system. And when you broaden out outside of our own food system, you think about the food system for non-human animals out there. Plants really are the basis of the food, web and pollinators help sustain plant populations and also provide fruit for jivers animals. And so it's really important just an overall food network stability.

Patrick Shults (08:19):

Yeah, I am glad you mentioned that, that 3 billion number I remember seeing, I think that study that said that it is just a staggering number to try to assess the financial value of something like pollinators is a really difficult task. And they even said that might be an underestimate. So that's just really kind of mind blowing how important pollinators are, especially here. Like you said, we we're an apple country and so many of our crops depend on it. So we've touched on why they're important, it's really obvious, but we also know that pollinators are facing some pretty serious issues. Issues. Can you speak a little to that?

Rachel Zitomer (08:57):

Sure, yeah, unfortunately, there's really a lot of threats to pollinators and we've seen the declines in a lot of major species over the past several decades. So some of the primary threats would include habitat loss and degradation, exposure to agrochemicals, and then climate change as well as pathogens. That's been a major cause of decline in some of the prominent B species that we've seen declines in. And we are

actually also starting to see some declines in pollinator dependent plant species as well. And just to get a sense of these declines, some of these species that are struggling were once really common and abundant. So for example, the Western Bumblebee was once one of the most common bumblebee species in the Pacific Northwest and as a pollinator ecologist specializing in bumblebees, I've never seen one in the state of Oregon. So it's a little bit crazy just how fast and how significant that decline has been.

Patrick Shults (10:06):

So we've talked a little about the issues they're facing. I mean on the topic of forest, what kind of pollinators do forests support and are there pollinators that forests exclusively support? Is there some species that rely or pretty much only hang out in the forest or are they kind of traveling all over?

Rachel Zitomer (10:30):

Yeah, that's a good question. So I would say that overall the forests in the Western US do support all the major insect pollinators. At least we see bees, mals and butterflies, beetles, hover flies, as well as some hummingbirds. But not all forests are going to be a suitable habitat for all pollinator species. It's really going to depend highly on the forest type, the forest structure as well as the forest age. There are apparently some forest dependent bee species and tropical forests, so that includes some species in the tribe, Mela panini, it's kind of a fun name that includes orchid bees and stingless bees. But I don't think that we've really identified a lot of kind forest obligate pollinator species in our more temperate Western us. It does seem, and this is kind of early days of understanding forest be biodiversity, but it appears that about a third of beef fauna in the northeastern US might be forest dependent.

(11:39):

And it seems like particularly there are species out there that specialize in deciduous forests, but really this is an area where a lot more work is needed to identify which species are forest dependent and what habitat needs they have in terms of forest characteristics and habitat amount. But it does seem likely that more pollinator species would be dependent on a broadly forest compared to a conifer forest, just because conifers are wind pollinated and the pollen that they provide is a pretty little nutritional value to an insect pollinator compared to a lot of broadleaf tree species that are insect pollinators. And so they offer more high quality floral rewards for visitors.

Patrick Shults (12:28):

Well, yeah, I mean that makes a lot of sense and I think that speaks directly to your graduate work as well. And yeah, I mean I would love to dig a little more into that structure mean. So when we see pretty intensively managed conifer plantations, we can sort of safely assume that pollinators are probably not using those as much as a more mixed deciduous Conor for forest or even a completely alder maple dominant forest. That's a fair assessment.

Rachel Zitomer (13:02):

I guess what I can say is that my work did focus on intensively managed conifer forests, so those are even age conifer plantations, and we actually did find a lot of wild bee diversity in those forests. I specifically was looking at wild bees and less so at the broader suite of insect pollinators, but we really saw almost all of that pollinator diversity very early in forest development. So I was looking at forests that had been clear cut and then were regenerating, and specifically I looked at 60 stands that were kind of different ages across a typical timber rotation for a Douglas first stand in western Oregon. And we saw 148 species, which is quite a lot of bee species in representing 24 genera, but they all occurred in the younger forests. We did see some bees in older forests, but there were no unique species in older forests that were specifically associated with older phases.

(14:12):

And really what we saw is that the vast majority of bee diversity is concentrated in the period prior to the canopy reestablishing. And really what that's probably linked to is light. When you remove canopy from a forest way more light penetrates down onto the forest floor and that promotes flowering plant species to grow down there. And flowering plant species provide the pollen nectar that bees are after. And when the canopy reestablishes, it really limits that light and limits the amount of blooming as well as the thermal conditions. Bees are, they don't have their own, they require a warm environment to keep them going and provide favorable conditions for foraging. So it's really dependent on canopy openness in a conifer forest. But in comparison, in a deciduous forest, you're going to see pollinators occurring in more open habitats, but you might also see pollinators occurring in older habitats.

(15:22):

So for example, early on in the spring, there's still a lot of light coming down onto the forest floor because there aren't leaves on the trees yet, and so there might be a lot of bees foraging in the understory and then later on during leaf out, some of those trees might also be providing flowers in the canopies. You might see bees kind of moving upwards in the strata of the forest to forage on trees that are higher up in the mid or upper canopy levels, whereas you're unlikely to see that with conifers just because yeah, there aren't really insect pollinated flowers up there to exploit. Does that make sense?

Patrick Shults (16:03):

Yeah, no, that makes perfect sense. And I'm a real sucker for a nice hardwood forest, so it's always nice to have that in my pocket to encourage folks to retain some of their hardwoods because those pollinator benefits. But it's also really interesting to hear that a counter for plantation can be really beneficial just kind of earlier in its development. I think that does make a lot of sense in those early sile conifer forests. There's going to be a lot more shrubs, it's just going to be a lot more diversity going on. And as you said, that's a functional light. And I think it's really interesting because it kind of contributes to this larger conversation where a lot of folks are really interested in promoting old growth, which is great. I obviously have nothing against that, but one of the things we're also lacking I think, across the landscape is more of that early SIL habitat, which is really beneficial, maybe just as beneficial to wildlife, not just pollinators, but all wildlife. I wonder though, because in those early sile situations, we really do tend to get a lot of noxious weeds, and I'm kind of curious from your perspective, our big favorite noxious weeds, scotch broom, blackberry, tanzi, how do those contribute to pollinators? Is there a silver lining there or is it kind of all bad? We get a lot of those in that early Conifer stuff.

Rachel Zitomer (17:36):

Sure. Yeah, that's a good question. So pollinators do definitely visit some of those invasive flowering plant species that would be considered noxious weeds. Actually, part of my doctoral work was specifically seeing what Bumblebee is, which is a one genus of bee is what they eat in these early cereal forests prior to canopy closure and what were their plot flowering plant preferences and their nutrient intake. And we did observe that they visited some of those noxious weeds like Stinky Bob, like Bull and Canada thistle, Harry Katzer, and then Himalayan Blackberry were all heavily visited and at some parts of the season those were even the most preferred species. But when I looked at it overall, we did not see that bees exhibited a preference for invasive or for non-native plant species over native species. So yeah, I think that they kind of use, but maybe don't prefer non-native flowering plant species.

Patrick Shults (18:43):

Okay, that that's good to know. I mean, it is for people that manage land and managing not just weeds is always going to be a big part of that. You kind of have to focus your efforts, and I'm always asking the question, I manage some property for Washington State University in Olympia, and I've been dealing with a lot of Tanzi this year, friend of mine or a wildlife ecologist friend of mine, I told him I've been

pulling tans and he said, you shouldn't pull tanzi, it's a source of pollen for late season pollen specifically, which can be hard to come by. Then that made me wonder, okay, am I doing the right thing, but if I don't pull it, then it's all tansy. So I guess this is not a question with a really solid answer, but just want your thoughts on it is how do we balance restoration with mitigating impacts on pollinators? Should we be pulling that tanza year, leaving it when it's late season pollen source?

Rachel Zitomer (19:47):

Yeah, I mean I think with any management question, it's really going to depend on a combination of what are the goals, what are the land use values, what are the resources that you have available? So there's not going to be a one size fits all, but in what you were just commenting about, maybe pulling tanzi for example. I do think that one thing that we can consider about removing invasives, if you're worried about that having a negative impact on the resources available for pollinators is whether we can replace some of those invasive species with native species. And that also if you've removed some plant species and replace them with others, that makes it also a little bit more difficult maybe for the invasive species to encroach and take over again. So that's kind of an added benefit and something that you mentioned is thinking about the seasonality of bloom of the species that removing the species that you're replacing them with, and then just overall, what are the resources that are available throughout the season to pollinators?

(20:57):

Because for example, if you're taking something out like a tanzi maybe, or in the systems that I was working in in grad school, often bull thistle is one of the only late flowering species that we would see that Bumblebee is visiting. So if we're going to remove those, it's great if we can provide something to kind of offer resources at that point in the season so that we're not leaving a resource gap in time. So some late flower native species that might be a good choice could be say golden rod or fireweed or gumweed or something like that, and just kind of thinking about making sure that we're not leaving them stranded if at all possible, if that makes sense.

Patrick Shults (21:47):

Yeah, I think on both accounts, those are really great answers and great advice, and it segues nicely into what I want to talk about next, which is what can landowners do and more where the rubber meets the road, what should landowners plant maybe in certain situations or how should they manage their forest to be providing habitat for pollinators? I think of a situation where someone does have a pretty intensively managed older conniver plantation. What are some things a person could do in that scenario to try to increase pollinator habitat?

Rachel Zitomer (22:32):

Yeah, so I mean, as I was saying before about the noxious weeds, really there's not going to be a one size fits all approach that will work best for everyone in every scenario, but what we can think about and keep in mind I guess, is what type of forest we have and how that corresponds to how pollinators use forest habitats. So in confer forests, as I mentioned, open areas usually have the greatest potential for be foraging habitat. So we can think about planting pollinator friendly flowering plant species to enhance forage opportunities in those more open areas, maybe right after a disturbance event or in places where there's, whether it's full standard placing or just maybe partial canopy removal. Also actions that maybe extend that pre canopy closure period or create persistent canopy gaps can be helpful in increasing the longevity of that pollinator habitat. And in a scenario where you already have maybe an older forest and it's not going anywhere, the canopy is established, I would say.

(23:48):

Yeah, thinking about the open spaces that you do have maybe in canopy gaps, what you can do to enhance pollinator habitat because bees do not just bees. Bees and other pollinators do use canopy gaps to forage in and forests. Something I didn't mention earlier about forest bee habitat is it's not only forage, right? It's not only what they eat because there's another dimension of bee habitat use and of pollen it or habitat use more generally, which is nesting habitat. We don't have that much information unfortunately about how pollinators use forested habitats for nesting just because those phases of life history are so much harder to see when insects are around flying, we can see what they're doing and when they're nesting, often those nest really cryptic. But we do know that a lot of pollinators nest in dead wood in cavities or in the stems of pithy plants, and actually the majority of our native bee species nest in the ground.

(24:55):

And there's some evidence that they might even prefer to be on forest edges, for example, as kind of possibly a sheltered area. Sorry, when I say that they might prefer to be on those edges that's specifically referring to bumblebees. There's some evidence that is a preferred area for them, and so paying careful attention to those edges can be something that could enhance be habitat keeping around some dead wood or fire safe brush piles. Some plants that have pithy stems like elderberry or cane berries, native cane berries, and just on a broader scale, if they were for example, doing a replant after harvesting, thinking about maybe doing some variable spacing that creates some kind of heterogeneity in the canopy so that there are more openings that pollinators can exploit in terms of foraging. So yeah, hopefully that makes sense. And even in kind of a more garden type of area, the same things can kind of apply. One thing to maybe keep in mind in those situations is keeping some bare ground, either creating bare ground or just allowing bare ground to exist can provide nest substrates for our soil nesting bees in addition to that dead wood like downwood or standing snags and even trimming some of our pithy stemmed plants in the spring that can create some nest sites for our stem nesting bees. So yeah, creating some stem, not just stem, sorry, creating some nesting opportunities is really helpful in a situation where it's not going to be necessarily the most holistically diverse.

Patrick Shults (26:58):

That was all excellent. It's all some very good practical advice for folks to be able to apply, some of which they can apply over the winter and hopes for getting some good use out of or some good pollinator habitat ready for the spring. I hope. And I have to point out that we have a wildlife biologist, Ken Bevis, that helps our extension program quite a bit, and he all but has Deadwood tattooed on his fingers. He's a very big Deadwood promoter and somewhere out there he's listening to this and smiling and it didn't really occur to me that deadwood down deadwood or snags or anything like that could support pollinators. So I think that's really interesting. I think that's really neat and generally what you're discussing, I want to point out to forest owners too, is introducing that heterogeneity both in structure and in species is always going to benefit forest health. So it's really compatible with good forest stewardship and for the most part it's pretty compatible seemingly with growing timber even because even the best timber growers end up with a root rot pocket that opens up a big canopy and there's a great opportunity to introduce some pollinator habitat in there as well. So thank you. I really appreciate all of this great advice you've given.

Rachel Zitomer (28:26):

Yeah, great. Yeah. Another thing I guess I would think to say is for those landowners that might have riparian habitat that they're taking care of, a lot of riparian shrubs and trees are really great pollinator forage, and that's not, as I said, sometimes those more woody dominated habitats we're not thinking of being that great as foraging opportunities for pollinators, but in the case of these broadleaf species like you find in riparian area, they can be really great. So if you are doing a riparian restoration staking willow

or thinking about some flowering species like, I don't know, maybe current or nine bark or something, those are also really great opportunities to enhance forage for bees.

Patrick Shults (29:15):

Yeah, that's really interesting. And one thing I get a lot of interest in from landowners is native food for us that'll incorporate lots of berry species currency you mentioned, or willow for basketry, cottonwood, things like that. I imagine those are pretty compatible or are pretty good for pollinators as well if someone was to use a gap and create a little food forest. Is that

Rachel Zitomer (29:41):

Fair? Yeah, it's a really nice that they are compatible in that way, obviously because pollination creates fruit, that's what gives us fruit set. And a lot of times when you are trying to enhance food for yourself or for birds or for other animals like that, you can also be enhancing pollinator habitat simultaneously. And I didn't even think of what you said with Willow that that has some uses in crafting and basket weaving and things like that. And it is also a really excellent early season source of flowers for our some early emerging views especially.

Patrick Shults (30:25):

Well, it really sounds like listeners have no excuse now to go out and start promoting Pollier habitat. So maybe the final question here is what are some ongoing resources they can check out over the winter to think about pollinator promoting projects?

Rachel Zitomer (30:44):

Yeah, I think that Xerces Society, which is X-E-R-C-E-S, Xes is a society provides some really great resources for considering pollinator habitat enhancement. They have some regional plant lists for pollinators and other beneficial insects. So you can go to their site and basically search by state or regions. So for example, they have a different list for the Maritime Northwest region and then for Inland and then for the Great Basin, they also have this great book called Attracting Native Pollinators, and it is more oriented towards orchards and gardens, but a lot of the practices could just as easily be used in a small forest by a small forest landowner. Our Oregon State University extension also made a really great video series on enhancing pollinator habitat on small forest properties, specifically I think it's called bees in the woods. So that's something to definitely check out. And some folks from OSU extension also published a really great guide on shrubs and trees for bees that came out of some work that was done in Eastern Oregon, and they put together a little guide for woody species that are beneficial.

(32:09):

Another thing, if folks are just feeling really, really jazzed about pollinators and want to become amateur pollinator scientists themselves, they can join some community science projects. There are some really great ones in the Pacific Northwest, like the Oregon be Atlas and the Washington B Atlas, as well as we've got regional bumblebee atlases like the Pacific Northwest Bumblebee Atlas, and that allows basically community science efforts, just regular folks going out and documenting B fauna that they see. And that really helps increase the general knowledge about be biodiversity and distributions and habitat use and all those things to help us fill in some of the many, many gaps that we have, as well as to improve our taxonomic resources and stuff like that. So they're really great projects to get involved in. I think

Patrick Shults (33:10):

That's awesome. I mean, I'm a huge fan of community science, so I'll probably check those out myself. I've not heard of them, but there's a lot of good resources you just mentioned, and we will be sure to link those in the description for folks that are interested. But I think it's time we kind of closed this out. I just

want to say thank you so much, Rachel for joining us. Do you have any other last calls, last bits for folks before we close out?

Rachel Zitomer (33:41):

I don't think so, but thanks so much for having me. It was great to get to talk a little bit more about Be as my favorite.

Patrick Shults (33:48):

All right, well, that's all for us. I, as usual checkout forestry.wsu.edu to learn about WSU extension forestry events going on in your area. Otherwise, we'll look forward to catching you at the next episode of the Forest Overstory.