Alexis Brewer - Episode One

AB: Humans are the ultimate habitat modifier. We change the plants that are there. We change ground cover by um, putting down concrete and asphalt. We put up these big buildings, um, and we provide food. So whether it's road killed animals , or landfills or even just our garbage can and our backyard or a dumpster, we are constantly providing or making food available for animals.

PS: Welcome to From the Field, a podcast logging real life scientists and their efforts to improve the world, one study at a time. I'm Priya Shelly. In this episode, I speak with Alexis Brewer, a doctoral candidate at the City University of New York in the ecology and evolutionary biology program. Alexis focuses her research on the intersection of urban ecology and scavenger ecology and how humans affect biodiversity.

When we drive on the highway or a wooded area, we occasionally come across an unfortunate animal that's been struck by a vehicle. And sometimes we even see other animals pecking away at the remains. This is an example of a human - wildlife interaction that Alexis is interested in studying.

So how does some one decide that they're going to study animal carcasses and what feeds off of them? Alexis is the first to admit that this, kind of gross, work wasn't necessarily what she thought about when her interest in wildlife began. In fact, it took a few meandering steps to get there.

Alexis Brewer: **I certainly was very interested in science and nature as a kid and my dad was really great. He's the one that he loves birding and he was always pointing out different animals and just being kind of endlessly patient.**

AB 00:01:28: **But when I went to college, I started studying neuroscience. And as much as I love that field, it really wasn't my ultimate passion. So I ended up taking time off after college and doing other things. I worked in a variety of fields.** I**, um, even dance professionally for a little while and then one day decided I was ready to go back to school.** So, um, **I kind of looked at what my passions were and ended up getting a masters in animal behavior and conservation where I studied how environmental degradation and habitat fragmentation affected howler monkey diets, like the actual nutritional components of their diet and really found out that I loved Kinda this chemical ecology background. Um, and, and research finding out, you know, what the building blocks are that are affecting behavior and diversity that we see in nature. Um**, **and then, and I really wanted to get my phd. I was so excited about that, but I didn't know what project I wanted to work on. But I wanted that focus, that same idea that I was looking for building blocks and kind of the fundamental mechanisms of what's driving change. Um, and that's kind of what led me to my current project. -beat-**

AB 00:05:28 **Scavenger ecology is really is about who is eating what much like predation or any other focus on feeding. But we're actually talking about how animal, what happens to animals when they die from other causes, you know, whether it's a disease or if they fall off a cliff and get hit by a car, for example, that that organism doesn't just sit there. Um, it's provides food for other words, for other species of all sorts. So we're really trying to look at that process of who finds the carcass, who eats the carcass and how they compete or facilitate each other's interactions.**

PS: As Alexis mentioned, humans interact with animals in a lot of different ways and one of the biggest ways is inadvertently feeding them. In doing so, people, have become active participants in the ecosystem and it's important to mitigate the negative affects on both the human and the animal in order to reduce conflict. It's a role that's vital to Alexis's research.

AB 00:36:19: I'm here in the northeast. We have black bears. You're out looking for food, you're happy to eat grasses and leaves and berries and the occasional carcass. If you find it. And here you come along a trashcan and it has cooked chicken and uh, and it smells delicious. And what are you going to do? Right? You're going to eat that trash. Um, but can we reduced that way? It's like the perfect meal and it probably has all sorts of other good stuff in it and some bad stuff.

AB 00:37:15 So, you know, you might eating plastics while you are eating that garbage. Um, and if you're on the person's side, now you have your garbage can ripped into. It's made a giant mess. You're probably, if you have pets, you're worried about your pets, your children. Um, and this creates a lot of space for conflict, but it doesn't necessarily need to, which is kind of when I start talking with the public often where I start. So I say, you know, let's first of all just accepted that bear is just being a bear. You know, they're not trying to cause problems, they're just hungry and you would be too. Um, but then we talk about ways to ameliorate that. So, um, whether it's, you know, getting that bear proof Trashcan, keeping your pets and doors. -BEAT- another common human wildlife conflict and urban areas are coyotes. People are always worried about their cats and their dogs getting eaten by coyotes and all sorts of other problems.

AB 00:38:16: Um, and so, you know, it leads to people often cities, um, or municipalities killing coyotes in urban locations. Um, but once again, that coyote is just being a coyote and sure they might eat our trash. They might occasionally take a cat or two. Um, but they're, you know, they're just trying to subsist in this environment that we've changed. And you know, you can talk to the public about keeping their cats inside, And the coyotes can just keep going about being a coyote and doing great things for the environment, liking, you know, controlling rat populations or deer populations - BEAT - So kind of having this healthy scavenger community and Predator community can help people. But first we have to see them as part of the environment and us as also like how our actions affect them, which is kind of the key for my research.

AB 00:42:15: I think it's really important to discuss how we're integral to it. it changes the way we think about ecology and urban ecology. And this is really where urban ecology is moving towards, is seeing humans as integral instead of the other and ecosystems. And the best part about seeing it is that way. First of all, it doesn't demonize us. So it's not that we're, this horrible thing happened in can the environment that we do bad things, you know, like we are creating climate change, we are, um, modifying habitats in ways that will create really lasting impacts and that can have a negative effect. But we can also modify our behaviors to have a positive impact. And getting people to think that way gets them what makes people hopeful frankly. And it also encourages the thing we have in nature. Even just realizing your lawn, your trash can even, it's supporting everything.

PS: When scavengers aren't eating our leftovers from the trash, they're often seeking out carcasses. To an onlooker, the decomposition of a carcass looks - and smells - pretty gross and the immediate reaction is probably to get away from it as quickly as possible. But if we look closer, we'll find that there's actually something really incredible happening. The

decomposition is achieved primarily through the work of invertebrates, like flies, maggots and beetles in addition to scavenger animals. Together they make quick work of the carcass and make it seem as if it wasn't even there.

AB: One of my favorite quotes from, from a, a forest manager about my job is there's a yuck factor to what I do. Uh, without a doubt. We have microbiota in our digestive system and are on our skin. Um, and every other animal is exactly the same. And so that those Microbiota don't stop functioning. When we stop functioning. They continue their own cellular processes. Their byproducts, their waste byproducts start building up an animal. So that is often what leads to a lot of purification. Insects find the carcasses very quickly and they will, either consume the carcass or lay eggs on the carcass and as their offspring hatch, that is what will consume the carcass.

AB: So flies are really in here in the northeast, are one of the biggest and invertebrate decomposers, but we also have carrion beetles that, um, will lay their eggs underneath carcasses and a variety of other Beatles species. So it's usually beetles and flies here. And in more warm and human habitats, um, you'll have more microbiota digesting carcasses as well. And there's actually a little bit of competition between the inverter invertebrates and the vertebrates. So the invertebrates release, um, essentially things that can both attract a scavenger, but eventually a vertebrate scavenger actually wants a pretty fresh carcass. So if the invertebrates, have the carcass for too long and a vertebrate doesn't find it, it will become too purified and they, unless they're very hungry a vertebrate, won't eat that carcass. if you have, say a lot of fly larvae, they, which is gross to think about, on a carcass, those fly larvae can actually also support vertebrates. So songbirds will come eat those. They're essentially maggots is what most people call them. So you know, the songbirds will come and they'll pick off maggots from the carcass. So it creates this own little micro ecosystem within just one essentially dead body, whatever species that happens to be.

PS: If you're not feeling it with the putrified carcasses, don't worry, you're not alone. The unappealing nature of decomposing carrion even has an affect on the amount of research that is being conducted in the science community. But Alexis shares that gathering the data is an important step towards truly understanding an ecosystem.

AB: W**hen you look at the literature and you look for predation, for example, you'll find thousands and thousands of articles. Even the same thing when we talk about herbivores or pretty much other, any other way of getting nutrition. It's very prevalent in the literature, but when you go look for scavenger research, it's orders of magnitude lower than anything else though that is changing in the last 10 or or even 15 years, scavenger research has become more popular, but it's definitely under studied. And part of that's because people find it gross. Frankly. I mean, you know, it's a weird thing, um, to think about.** - beat - A**s I have gotten into this project, I realized how fundamental scavenging is and what's amazing is that we can really capture a lot of different things in an ecosystem by studying scavengers. So we're not just looking at one species or even one group of species. We're looking at a really wide variety of animals that all provide different, slightly different ecosystem services and functions. And that means that we can really assess the health of an ecosystem better. Plus, we can increase our knowledge about how energy is getting transferred through a food web, which is really fundamental when we talk about how healthy and how well an ecosystem is functioning.**

PS: A food chain is a series of organisms that eat one another and energy and nutrients flow from one animal to the next. For example, when an acorn is eaten by a chipmunk, and a chipmunk is eaten by a fox. Food webs are a little more dynamic in the sense that they consist of several intersecting food chains and show the different things an animal can eat and be eaten by. Those food webs consist of a multitude of mammals and Alexis wants to research them ranging from the most traditional to the most unique.

AB: **In general, we're really looking at carnivores and omnivores. So the most common ones we talk about are bear, coyotes, raccoons, red foxes. But we also see some really non traditional scavengers sometimes when food is really scarce. So deer will scavenge. Um, there's some really interesting pictures from body farms where deer are actually eating bones, which could be a calcium thing, but it could also just be hungry.**

Um, and then we have another group of scavengers, which of course are obligates scavengers, which just mean that they have to scavenge to survive. Most of our carnivores and omnivores are, um, don't have to scavenge. They can predate different animals or eaten on meeting items. But the only obligate scavengers in the world are vultures. And so they're in avian species, obviously, and they are really have evolved to find carcasses. And by and large, they don't hunt. So they really can't survive if they don't find these carcasses. And, um, and consume them frankly.

PS: In vulture culture, it's pretty rare to eat anything but carrion. If the meat isn't fresh, they vulture still consumes rotten carcasses that may even be toxic to other animals. By doing this, vultures are preventing the spread of disease. Alexis shares the typical behavior of a vulture and how they're specifically designed to scavenge.

AB: Yeah, they're amazing. So Turkey vultures are, They're big birds. they have a pretty large wingspan. so they're able to soar and use very little energy while they're soaring. They're very metabolically efficient and they have this huge nasal cavity and this giant olfactory bulbs. So we're really just talking that they're essentially bloodhounds on wings. So they fly around and this very lazy pattern. That's often when people see them and they do this teeter tottering motion in the air, um, which allows them to essentially sent the air and as they get closer to a carcass, that's when they do that circling behavior that people really associate with vultures. It's also how they're also writing the thermals while they're doing that. So it's increasing their efficiency. Um, it's, if they're in the mornings, they, it's called kettling. Um, they will ride the thermals to get higher and higher as well. And that also creates circling behavior, but they're really doing most of their searching, um, through, you know, their sense of smell, which is, which is quite fascinating. And it's not unique in the bird world, but it is unusual. Very few birds rely on their sense of smell to find food.

~~T~~hey have pretty small beaks that's not this big eagle beak or even a heartbeat that's good at tearing things. You know, it's, it's actually that's not really there.

AB: Says they're not, predators aren't actually not good at doing that. Um, motion of ripping and tearing. Um, which is actually why they rely on mammals. Often with really large carcasses, the mammals will open the carcasses for their own purposes so they can eat the carcass. But when the mammals leave, then the vultures can partake. Um, and the same thing. They're claws. They're, there are not, um, their feet aren't these big talons. Like you would see once again in a, in a bird of a bird of prey, there is actually a

predator. They're kind of Wussy. Actually. They're not very, you know, they can't really grasp things exceptionally well. They can perch and they can walk and things like that, but that's about it.

PS: Vultures are starting to do something that doesn't involve teetering around corpses. They're visiting land fills and eating trash. In huge numbers. What does that do to the food web and the ecosystem overall?

Alexis has taken on projects to learn more about the behavior of vultures and their relationship with scavenging in human dominated landscapes.

AB So I work in New York State We have several projects. We have one project where we have gps tracking devices on Turkey vultures and black vultures. That's actually a collaboration with Hawk Mountain in Pennsylvania. And so that is very vulture specific as well as a stable isotope study looking at the diets of vultures, which is also obviously vulture directed.

AB So with the tracking data, we are actually looking at Geo space spatial data. They're actually these little backpacks that you put on, um, birds and put these little, you know, radio tracking. Um, and their back is a good place cause they can't mess with it. It's, it doesn't interfere with their flight. So yeah, they ended up being little birdie backpacks. And you know, these little trackers send us data for us. my study in particular, we're looking at actually human food sources. So, in this case, we're talking about landfills because they're stable and we know exactly where they are in space.

AB: And then we look to see how often the vultures are visiting landfills. Because if you talked to anybody that's been to a landfill or driven by a landfill or work in the landfill, they will tell you, you see vultures all the time. Um, dozens if not hundreds, depending on the actual site. And the thing is though, you can't vultures all kind of look the same. By **and large. There's very little, you can't say, okay, that's filter a and that's filter B. They all Kinda look the same so the question, is, is a vulture living in a landfill or did, are they visiting? Um, and what does that mean for their diet, their health, um, the over all population and even their foraging strategies. So, uh, this, and we're hopefully why I'm presenting this data in this, this fall. So it's very new. Um, but what we're finding is it's, it's very individual.**

AB: So you have some vultures that like landfills or spend a lot of time in landfills to be less anthropomorphic about it**. And other vultures that don't, that really avoid the landfills. And the thing is we don't know why. It could be life stage, it could be opportunity, it could be breeding status. So vultures communally roost when they're not breeding. And actually they share information about food probably unintentionally. But you can imagine if you were sleeping in a group and someone showed up, like smelling like a hamburger, you'd be like, I'm going to follow that person tomorrow and see if they get a hamburger. Right. And so the vulture equivalent happens. So maybe they're learning from each other and following each other to the landfill. Um, but if you're breeding, you kind of go off on your own. Um, so perhaps there not breeding near landfills. So, but it is really interesting that we're seeing this pretty big variation. But by and large, not only do vultures use landfills, they use specific landfills. So it is a little anthropomorphic, but they have a favorite landfill essentially. So even if they have 10 landfills in their home range, they will actually visit one landfill above all the others. So it is selective in some way.**

AB: That's one reason what, why vultures are so interesting to study in an urban context because they're doing what they always do and then people are doing what they always do. And we overlap in this way. Um, with very little actual true behavior change though we are interested to see what happens over time to see if vultures are changing their forging strategy to rely on these, um, consistent food sources. You know, um, normally scavenging is a time timely endeavor, so you have to really spend a lot of time searching for your food. And that's not the case if you know your landfills there every single day.

PS: Alexis and her team are also learning more about vultures diets by way of stable isotopes which is the newest part of their research. Looking at stable isotopes allows them the potential to see if the vultures diets mimic those of people or something more suitable to a traditional vulture diet. The results could reveal a lot about vulture behavior and their relationship with people.

AB: Stable isotope are a great way to study a variety of things and ecology. But the way that I use them is essentially looking at diet.So stabilize isotopes are what they sound like. They're stable, they don't degrade So if you remember in chemistry there was that atomic number that was always really annoying because it wouldn't just be 12, it'd be like 12 point blah blah, blah, blah. And you're like, why do I have to care? Like why do we care about these decimal places? Right? And that's all because of isotopes. So your normal carbon in the atmosphere, it just in the environment is carbon 12 and it's stable.

AB: and it's the most ubiquitous carbon. It's an every living thing. that's, um, the most common isotope. **But we also have this carbon 13 that stable and it just has one extra, you know, just a little bit heavier. It's uh, doesn't degrade over time. It's not carbon 14. Um, it doesn't have any difference in the charge cause it's just an extra neutron and it hangs out in the environment. But it's pretty, it's comparatively rare to carbon 12. And so what I actually do is I study the relationship between those two carbon sources as well. And we also use nitrogen as well. And the reason why this really esoteric thing matters is because all of our food has this isotopic ratio, um, that changes with different processes. So a lot of people, you're often finding variation basically from that ground level of you remember, I love looking at this building blocks that change things, right?**

AB: So we're talking, um, photosynthesis here, your primary producers are using isotopes in different ways based on their photosynthetic pathway. So whether you're a c for a plant or a C3 plant or a cams plant, you are kind of sucking up these isotopes and different amounts. And then an herbivore comes along and eats that plant. And so that herbivore now looks like the plant that I ate and then something comes along and eats that herbivore and that Predator looks like the herbivore, which looks like the plant. And so on and so forth. ~~Y~~You can trace where your carbon is coming from if you have a different enough habitat. the way that I use it is looking at this urban ecology is trying to find out if we can look at human food because human, especially in the United States, we eat a lot of corn and we feed our animals corn.

AB: Um, we are very corn based society the, the hypothesis that we're working with is that we can track the use of human human foods by animals, by studying their isotopes. Um, so we take a little sample. ~~-~~We actually use feathers for the vultures because it's noninvasive. They shed them naturally during molt and regrow them. And so we don't have to even touch the animal. We just need to find their feather. Um, which we usually

find that they're roosting locations and we compare it to essentially the environment and to humans to see if the vultures look isotopically more like people or more like the natural environment.

PS: Alexis's third project takes her all around New York State and city, where she places baited camera traps, which require a special permit, in various locales to observe the behavior of vertebrates and invertebrates in varying ecosystems.

AB: our third project or the other main project that I work on is actually a camera trapping study where we are capturing the entire scavenger diversity within New York state. So because they are interacting and affecting each other and affecting how the ecosystem functions, we believe it's very important to capture the whole community, um, in some way.

AB: Since I'm based in New York City, ~~I will,~~ and if I'm leaving the city ~~though~~, we do have sites down here, uh, we usually wake up and we go pick up our bait, which we use road field item, uh, animals that we have them. But if we don't, we will use chicken. Um, which are, we keep in tax that way. The animals have kind of this as naturally, you know, a natural of a carcass as they, as we can give them. And we drive to whatever site we're going to and we use, um, motion sensitive cameras to monitor the community. And the reason why we bait those cameras on everybody does, uh, because we are interested in scavengers and we want to make sure we capture the entire community.

AB: whenever we get to our site, we hike out, we place, um, about 12 cameras per location. And, um, the students always have a really fun time learning how to place the bait because they have to, uh, we, we essentially tie down our baits. The animals don't take it away from her camera, otherwise we'll lose a lot of data. And so they have to like learn how to handle that. When we first started the project and started taking students on, I thought it would, no one would want to do it. I was like, oh, this is kind of gross. The students love it. They're like, oh, I get to poke the chicken.

AB: Can I be the one that, um, and so, and then we weigh our, our bay, um, because we really want to know how quickly those, um, carcasses are getting removed from the environment. And if we're running, um, the studies where we're looking at what happens when the car cause aren't eaten by vertebrates. Bay as well as all those insects and invertebrates, um, to, to come and either feed or lay their eggs or whatever they do. And then we come back every three days and weigh the bait until it's gone, which doesn't take too long. Um, frankly, if the, especially if the vertebrates have access to the carcasses and then we take all those pictures back to the lab and we, um, process them for species and activity and all sorts of things.

PS: Some change in activity that Alexis has observed may have to do with the change of the seasons, especially in the winter where finding a food source can be the most challenging.

AB: So we definitely see changes in seasonality, um, with WHO's scavenging and some of that's because here in the northeast, most of our bears, uh, hibernate. So ~~-~~removing that large Predator from a community affects everything. So there's more food available for the smaller species and uh, that kind of releases some, some pressure from the smaller species. The other thing is that there's less food available.

AB: Very interestingly, some of our avian scavengers are actually more cooperative in or at least more tolerant in the winter. So we will find different species scavenging together at the same carcass at the same time. So we often see this in the corvids, so crows and bluejays will scavenge together, um, which I don't find in the summer. But we definitely see a little bit more tolerance in the winter, which is kind of contrary to theory. Um, and we're still playing with that data right now. But when we start talking about our mammalian species, especially the ones that have more similar traits, so we see more competitions.

AB: So, um, **raccoons and foxes for example, we find a lot of really direct competition across all the seasons actually. And that's because they're both mostly nocturnal. Um, and actually in really human dominated habitats, there's studies that are showing that they're actually more nocturnal to essentially avoid people When they function as a Predator, these raccoons and foxes, red foxes in particular do function slightly differently. But when they act as scavengers, they are occupying more similar niche space. So that increases their rate of competition. And unless they're raccoons once, can you often get groups of raccoons, which people call a gaze? can be quite aggressive and they can chase off a Red Fox because Red Fox is tend to be solitary.**

PS: The way animals have shaped themselves to accommodate human infrastructure may seem unsettling but it goes back to the understanding that humans are part of the landscape no matter how much we attempt to restore or re-wild landscapes. As much as a landscape is restored to how it may have looked before humans, we are still influencing the behavior of the landscape in many ways.

AB: I**'m certainly not anti rewilding, but I think what sometimes these programs miss, it's not a fix. I guess it's not like the end all be all because first of all, people are still going to use that space for still going to be part of, um, the habitat. So whether we're hiking, driving by or flying over in a plane, we're altering the habitat, um, with our presence. And even if in a perfect scenario, um, where you rewild successfully, it returns to whatever its previous state is, which it honestly probably won't, but let's just say it does and people don't go into it. We're still affecting that habitat through climate change and you know, just our overall, you know, we, we are in this new era, so it's always going to be different than it was. Um, so as part of rewilding, I think it's really important to discuss how we're integral to it.**

PS: By making this realization, it may be easier for us to have compassion for the environment.

AB: And it also encourages, you know, all the positive things that we have in nature. When you go out for a hike or you start even just looking in your backyard and realizing that your lawn and your garden and you are a trashcan even it are, they're all supporting all of these different, you know, animals and species and plants and insects. And you start seeing that appreciation grow in people. And then that's when people really want to protect nature, when they want to make a change and realize that they can make changes in their everyday life from, you know, in, in sometimes really small ways, um, that can make an impact on their local ecosystem. So we that can be things like planting local species to support insects, um, which will support your birds, which will, you know, it creates, once again, this kind of entire ecosystem that a human is part of. Um, and that we can affect every day.