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| Erin Welsh | Hi, I'm Erin Welsh and this is This Podcast Will Kill You. Welcome one and all to the TPWKY Book Club, where we get to read the most fascinating books in science and medicine and then bombard the authors of those books with questions for almost an hour. It's one of my favorite parts of making this podcast. We've gotten into some super interesting topics so far this season and there are even more fun books to come later this year. If you'd like to sneak a peek at the books we're featuring in the TPWKY Book Club this season, head over to our website thispodcastwillkillyou.com where you can find a link under EXTRAS to our bookshop.org affiliate account, which includes the book club list showing all of the books we've already covered this and last season and the other books we'll be covering throughout the rest of this season. And of course we love getting your book recommendations, so please keep sending them. There's always more room on my shelf. |
| | All right, let's get started with today's book club pick already. Conservation journalist and award winning author Ben Goldfarb joins me to chat about his recent book 'Crossings: How Road Ecology is Shaping the Future of our Planet'. In 'Crossings', Goldfarb, whose previous book 'Eager' delves into the secret lives of beavers, amazing, explores the varied impacts roads have on plants, animals, ecosystems, even human health. For something that many of us use on a daily basis, driving or biking to work or the grocery store, walking our dog alongside, taking a road trip, just living next to, roads don't factor into our thoughts very much. They're just there, acting as the means by which we get to our destination. Of course I'm sure we all have specific roads that hold special meaning for us. |
| | For instance, I did a good chunk of my PhD fieldwork along Pipeline Road in Gamboa in Panama. Some of my favorite or at least most memorable fieldwork times happened along that road. Going for a run along the road at dusk with motmots calling and coatis darting off into the forest; dragging for ticks and running into a wasp nest, dropping all of my gear to escape the stings but then having to like frantically run back in over and over again to retrieve all of my equipment piece by piece. But for the most part when I think of Pipeline Road or going to the Sun Road in Glacier National Park or the road to my mom's house in Kentucky where I spent most of my childhood, I think about these roads in relation to myself; what they have allowed me to do or see or experience or the memories they conjure. |
| | I don't often think of what these roads are doing to the ecosystems they're cutting through and how their construction utterly changed the life in that area. Or at least I didn't think about those things until I read 'Crossings'. 'Crossings' delves into the relatively recent field of road ecology which seeks to measure the impacts of roads on ecosystems and develop solutions to mitigate those impacts. This goes way beyond roadkill or even constructing wildlife-only overpasses on busy highways. We're talking tunnels for toads, the hidden depths revealed by bug splatter on your windshield, habitat fragmentation devastating charismatic megafauna populations, the health impacts of roads on humans disproportionately distributed along lines of race and class. There are so many dimensions of the effects roads can have on the land they transport us through and those that live in that land. |
| | And luckily, we have an excellent driver at the wheel for this road trip through the world of road ecology. I am so excited to share this fascinating conversation with you all and I know that it'll change the way you think about the roads that make up the background of so much of our life. So let's get right into it. |
| TPWKY | (transition theme) |
| Erin Welsh | Ben, thank you so much for joining me today. I am so thrilled to chat with you about your amazing book 'Crossings' and all things road ecology. But before we get into the history of road ecology and the impacts of roads and all that jazz, first, what constitutes a road? Does a hiking trail or bike path or wagon trail count? Dirt, gravel, pavement? Are there degrees of roads as it relates to effects on ecosystems? |

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| Ben Goldfarb | Yeah. Erin, well first of all thanks for having me and thanks for that kind of profound philosophical question. It's a really interesting one. I think that for the purposes of this book, I was really defining a road as a kind of a linear piece of infrastructure that conveys motorized vehicles. So a bike path wouldn't be a road or a hiking trail as you mentioned would not be a road. But it is kind of a fascinating issue because there are definitely wagon trails, for example, these super wide, often paved structures that were constructed in the 1800s before the internal combustion engine and the automobile. I mean certainly those were like roads in many particulars. So it's a difficult one to define. And maybe like the famous court definition of pornography, you just know it when you see it. |
| Erin Welsh | Exactly. All right. What is a road? Check. Got that answered. Now what is road ecology and how did you decide that you wanted to write a book about this field? |
| Ben Goldfarb | So road ecology is the field of science that looks at all of the different ways that roads and other transportation infrastructure affects nature. So you've got... Well I'm sure we'll talk about all of these different relationships and connections but everything from roadkill to the impacts of road noise pollution to all of the road salts that we add as a de-icing chemical and turns our rivers in lakes into brackish estuaries. You've got tire particles going into the environment and killing salmon in some cases. So road ecology is this big discipline that looks at all of those different relationships between roads and nature. It's this kind of emergent field of science that just examines the effects of our infrastructure on the natural world. |
| Erin Welsh | And how did you come across road ecology? Like when did you learn about it and then when did you start to feel so passionate about it that you're like hey, you know what, this is absolutely worthy of at least one book? |
| Ben Goldfarb | Yeah, it's a good question. My interest in the field really goes back more than a decade to 2013. I'm an environmental journalist and I report a lot on ecology and conservation biology. And I was in Montana writing about wildlife conservation and I had the chance to go up on a wildlife overpass, this bridge that had been built over Highway 93 north of Missoula to allow animals like grizzly bears and elk and moose and bobcats to cross this really busy highway. And I hadn't really thought much about roads before then. They're such a daily part of our lives that they're sort of invisible to us I think, they're so ubiquitous, we don't really think about them much. And I was certainly guilty of that. |
| | But standing up on this wildlife overpass, it just occurred to me, really for the first time in some ways I think, what a significant source of ecological change those roads are and also how cool and inspiring it was that scientists were trying to do something about it by building bridges and underpasses and tunnels and other structures that allow animals to kind of safely navigate this asphalt covered world we've created. So it was really that experience of standing up on that that wildlife overpass watching traffic kind of flow beneath our feet. That was what got me thinking about this issue and eventually it turned into the book. |
| Erin Welsh | Let's take a quick break and when we get back there's still so much more to discuss. |
| TPWKY | (transition theme) |

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| Erin Welsh | Welcome back, everyone. I've been chatting with Ben Goldfarb about his book 'Crossings: How Road Ecology is Shaping the Future of our Planet'. Let's get back into things. It's definitely something where like on the surface you're like oh, roads. And then once you start to dig deeper and deeper, you realize the effects are... It's not just roadkill, it's not just pollution, it's like all of these different aspects. And it's something that science has not really been thinking about in a formalized way for very long. But the sentiment behind road ecology or at least the recognition that roads have an impact on wildlife and ecosystems is much older than like the formalized field itself. Could you briefly take us through the history of road ecology from these early observations to this growing realization that hey, roads have an incredibly substantial impact on ecosystems and maybe we should do something about it? |
| Ben Goldfarb | Yeah. Absolutely. So really the history of road ecology, even though the term itself wasn't coined until the 1990s, really begins with the proliferation of the car, right. In the early 1900s cars are just suddenly everywhere, they're exploding all over the landscape. And it's funny, we think about America as having such a kind of a love of affair with the car. But when cars first became abundant in the early 20th century, most people hated the car. Right? This is this kind of terrifying new technology that's overtaking city streets and kicking out all the kids playing stickball and running over pedestrians, pedestrian death rates in the early 1900s were just astronomical, even much higher than they are today. And today they're still pretty high. So there were actually all of these protests against cars. Mothers and children out in the street protesting this terrifying new machine that was overrunning American life. |
| | And that's really kind of the intellectual tradition that road ecology emerges from in some ways. In the 1920s and 30s, all of these wildlife biologists say hey, cars are killing all of these humans and they're destroying the fabric of American society in some ways. What are they doing to wild animals? And so you've got all of these biologists driving around places like Iowa and Illinois, counting dead ground squirrels and garter snakes and woodpeckers and all kinds of other creatures, saying quite explicitly hey, these cars are... The roads are already stained with human blood, as one of these biologists put it. And they're also stained with the blood of wild animals. So that's really where road ecology comes from is this broader societal concern about about cars overtaking American life. The term itself wasn't coined until the 1990s when a landscape ecologist named Richard Forman at Harvard came up with the idea of road ecology. |
| | And that's kind of a cool story too. Richard was in his office one day with a bunch of his students and he was looking at this big picture of a forest. And he was kind of expounding on all of the different features of this aerial photo. Here's where the water runs and here's where the animals live and here's why the humans built their homes where they did. And suddenly he kind of looked at this road running right through the middle of the forest and said it's interesting, we know a lot about everything else in this picture ecologically but we don't know much about that thing, that road. Because again, I think that they are so abundant that we kind of take them for granted or ignore them. And that was really the epiphany that led to this idea of road ecology in the 1990s was that hey, these structures are everywhere. We've got 4 million miles of road in the US alone, 40 million miles around the world. What are they doing to our ecosystems? And that's really where the formalized study of road ecology emerged. |
| Erin Welsh | As it turns out, the roads are doing a lot to ecosystems. |
| Ben Goldfarb | Yeah. |

Erin Welsh

And I think for most people the first thing that comes to mind when asked about the impacts of roads on animals, or at least the first thing that came to mind for me was roadkill, which is a huge issue. But like we've kind of talked about, it's certainly not the only impact of roads. There's also noise pollution, other kinds of pollution, they create habitat for disease vectors, they cause erosions, fragment habitats, impede migration, allow access to forests for poaching or deforestation, and so many other things that you discuss in your book. And I won't ask you to go through each of these here because that's what the book is for. But why is it important to consider this whole picture when asking how a road impacts wildlife?

Ben Goldfarb

Yeah. It's a great question and I think that I mean look, ultimately the answer is what you just said. There are just so many different connections and relationships and a lot of them are really invisible to us in a lot of ways, right. As you said, roadkill is I think the first thing that pops into people's mind when they think about impacts of roads because roadkill is conspicuous. We've all seen the dead white tailed deer or a raccoon or a possum by the side of the highway, right, that's a very familiar sight to us. And I think we kind of blind ourselves to it in a lot of ways. But there's so many different ways that roads affect nature that you can't really see.

I often think about tire particles as being a good example of this. 6 million tons of tire particles enter the environment around the world every year, just an enormous amount of of little plastic and rubbery bits bleeding from our vehicles and entering nature. And a couple of years ago this big group of scientists in the state of Washington basically proved that it was these tire particles and specifically a chemical in them called 6PPD, an ozone protection chemical which nobody had ever heard of. That chemical in the tire particles was killing Coho salmon in the Puget Sound watershed just outside of Seattle in just enormous numbers. Every year there were these big Coho salmon die offs and that was all because of this obscure polysyllabic chemical that nobody had ever heard of in tire particles, right.

So that's just something that I think most people never think about when it comes to the impact of roads because you don't see it, you don't see all of those little microscopic tire particles entering nature. And unless you're actually walking along the stream, you don't see all of those dead fish. And yet this is this sort of biological apocalypse that's happening in some ways, at least in the watersheds that are affected. So I think that's why it's important to consider the whole picture, as you put it, because you've got the visible, conspicuous impacts like roadkill. But then you've got all of these other hidden, obscure impacts that really require dedicated scientific study to unravel.

Erin Welsh

One of the ones that you mentioned in your book or discussed in your book was the impact of noise pollution and the soundscapes of roads. And I was hoping you could take us through the phantom road study.

Ben Goldfarb

Yeah, that's one of my favorite bits of road ecological research and one of my favorite stories to tell in the book because I think it's so revealing in so many ways. So noise pollution from roads I think is one of the biggest sort of unsung crises due to roads. First for human beings, right, we know that there's lots of scientific literature showing that road noise pollution is elevating our blood pressures and our heart rates and making us more susceptible to stroke and cardiac disease and diabetes. Road noise pollution is literally taking years off of our lives and it's having similar impacts on wildlife, right. I mean really road noise pollution is a form of habitat loss. If you're a songbird who has to sing to attract a mate and your mate can't hear you over the rumble of engines and tires, you functionally can't live in that place, right?

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| | And so that was what this phantom road study that you mentioned was trying to get at is what is the impact of all of that road noise? So what these researchers in Idaho did was they took a recording of traffic and they played the traffic recording through speakers in this roadless forest in Idaho. So you're stripping away all of the other variables, right. There's no physical road there, there's no traffic. All there is is just the noise of the traffic. And basically what they found was that many migrating songbirds avoided that area because they didn't like the road noise and that the songbirds who did stick around were in worse body condition, they basically lost weight. |
| | And the reason for that is that if you're a little songbird you have to listen constantly for predators, right. You're at risk of being eaten all the time and you have to keep an ear out for the flap of a hawk's wings or the rustle of a fox creeping through the brush. But if you can't hear those subtle acoustic signals over the noise of traffic, you have to look out for predators instead. And every minute that you're looking around for hawks and foxes is a minute that you're not feeding, right. So you're not gaining as much calories and you're not as fit to complete your migration. So that was what that phantom road study really showed is that even the noise of traffic without the vehicles themselves is hugely detrimental to many, many species. |
| Erin Welsh | Was that the study that used the noise recording from going to the Sun Road? |
| Ben Goldfarb | Yeah, it was. I'm really glad you mentioned that, Erin, because I think that's a really important piece of this research, right. Is that as you say, the noise of traffic that they were using, it wasn't a recording from Broadway in New York City or I-90, a giant interstate highway, right. It was as you said, it was going to the Sun Road which is kind of the main road in Glacier National Park, a protected area, right. And yet even our protected areas, our national parks have lots of traffic running through them. So if animals aren't safe from road noise pollution in a national park, where are they safe? I think that really goes to show just how pervasive and widespread this problem is. |
| Erin Welsh | Yeah, that really blew me away. It was sort of like the punchline at the end was like and... And I've been on going to the Sun Road- |
| Ben Goldfarb | Yeah. |
| Erin Welsh | And I would absolutely describe it as like a beautiful, slow, scenic byway where everyone's stopping and looking at mountain goats. |
| Ben Goldfarb | Right. |
| Erin Welsh | And it's wonderful. But at the same time, to see the impact or to learn of the impact of that road was huge. And there's another point you brought up about the difference in like electric vehicles vs gas vehicles, gas powered vehicles and how at a certain point there's really no difference between them or the difference goes away because of just the sound of tires on the road. And it was just like what can we do about this? |

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| Ben Goldfarb | Yeah, yeah. I think that's a great point because people always say well isn't this problem going to go away once the entire fleet of vehicles in this country is electrified? And I mean as you say, the answer is really no. Because once you get to 35 miles an hour or so, the primary source of noise from cars is not the engine, it's the tires. So when you hear like the hiss of a highway off in the distance, what you're hearing is almost entirely tire noise. And tires have actually gotten quieter over time which is definitely a good thing but it's impossible to make them silent, right. So it's true that electrifying our vehicle fleet is not going to solve the problem of noise pollution. At least not in wild areas, I think it will be helpful in cities where the traffic is generally going at lower speeds and road noise pollution is a big problem for human health. I do think that electrification will help to some extent in urban areas. But for wildlife in rural places where the roads are mostly highways rather than little urban streets, yeah, I don't think that electrification is going to do a whole lot. |
| Erin Welsh | Let's take another quick break here. We'll be back before you know it. |
| TPWKY | (transition theme) |
| Erin Welsh | Welcome back, everyone. I'm here chatting with Ben Goldfarb about his book 'Crossings'. Let's get into some more questions. I definitely want to touch on the human health stuff in a bit but first, and I could also talk about noise pollution like all day- |
| Ben Goldfarb | Yeah, me too. |
| Erin Welsh | But I do want to get into a few of the other impacts of roads on ecosystems and wildlife. And one of the ones that you discuss in your book is how roads turn the landscape into fragments, essentially these islands. What does that fragmentation mean for the large carnivores such as the mountain lion P-22 whose home ranges are quite big, bigger than these islands that have been created from these roads? |
| Ben Goldfarb | Yeah, yeah. It's such a good and difficult question to address. So I think the first thing that you have to remember is that roadkill is really I mean as we've been talking about just the tip of the iceberg here, right, when it comes to how roads and traffic affect nature. And I think in many cases a bigger problem than roadkill is this barrier effect, right. So many busy highways have so much traffic that animals don't even attempt to cross, right. So they're not being killed by cars, they're just as you say kind of trapped in these little islands of habitat surrounded by these oceans of kind of impassible highway. And that's almost a bigger problem than roadkill itself, right? There are some terrible stories that I encountered and tell in this book of herds of deer and elk and antelope and other species that have actually starved en masse because they can't cross the highway to access the really good habitat, right. So again, they're not being hit by cars, they're just being prevented from moving around the landscape. |
| | And large carnivores as you said, Erin, are sort of the some of the poster species for this problem because they're animals that range widely. So it's very easy for their habitat to be fragmented by roads and they tend to be somewhat wary of humans and traffic. So they don't cross very readily. And those mountain lions that you mentioned in southern California outside of Los Angeles are a really good example of this. So the situation there is that there's this little population of mountain lions that live in the Santa Monica mountains and they're surrounded by some of the busiest freeways on earth. You've got the 101 and the 405 and these other superhighways, 10 lanes of traffic conveying hundreds of thousands of cars every day. And it's all but impossible for these animals to cross those highways. |

So as a result there's this little cluster of mountain lions and they can't leave their little island of habitat. And no new mountain lions can enter the little island of habitat from other areas. So this little cluster is basically stuck breeding with each other, right. And you there have been stories of male mountain lions who have mated it with their own daughters and granddaughters and even great granddaughters because they just can't find unrelated mates on this little island. And as a result the population has become very inbred over time, they're starting to suffer genetic defects, and they've entered what scientists call an extinction vortex, this kind of long term doom spiral if nothing is done to help them. But fortunately something is being done to help them.

At the start of our conversation I was talking about these wildlife bridges that allow animals to cross highway safely. And right now there's a very large and famous bridge being built over the 101 that will theoretically connect those mountain lions in the Santa Monica mountains with mountain lions elsewhere in California. So the problem is being addressed in this big bridge. This will be completed by 2025. And the hope is that the animals use it and there's enough kind of connectivity there that new mountain lions can enter the population and kind of refresh that stagnant gene pool.

Erin Welsh

Many of these road ecology conservation projects have been focused on charismatic megafauna like bears and cats. And I love charismatic megafauna too. But for the most part a lot of these projects have overlooked these more abundant species like reptiles and amphibians that are much more likely to be struck and killed by vehicles. What population level impacts have we seen with some of these species? And this part I found really interesting that you discussed was how death by roadkill differs from death in nature.

Ben Goldfarb

Yeah, yeah. I think you're exactly right that those reptiles and amphibians, we haven't really done much to help them. And I think the reason for that is that look, we I think understandably tend to be focused on preventing roadkill with large animals like deer and elk and moose that will mess you up when you hit them, right. Nobody wants to hit a big critter. That's how you total your car and actually hundreds of drivers die every year in collisions with large animals, right. So transportation departments are focused on preventing those dangerous crashes with the big critters. But nobody's ever totaled their car hitting a wood frog, right. So we kind of ignore I think those smaller animals in many cases which is problematic because as you say, there are these enormous population level impacts on those reptiles and amphibians.

These are animals that are incredibly susceptible to roadkill in part because the amphibians especially, they're migratory, right. On those warm, wet spring nights you've got in some places thousands of frogs and toads and salamanders all migrating from kind of the upland forests down to their breeding ponds to mate. And the issue is that we tend to build our roads in the low lying places where it's easy to construct roads and those are also the places where the water collects and the amphibians go to breed, right. So there are so many populations of amphibians out there that have been just totally demolished by roadkill because they're all on the march at night, they're not the brightest animals, they're not very responsive to traffic. They're all crossing the road at once. And even a few cars can basically kill dozens or hundreds of these poor small animals that drivers don't really see.

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| | And I think that you're your question about how death by roadkill kind of differs from death in nature is a really good one and it definitely applies to these frogs and salamanders. Because you think about in nature, right, generally predators are taking out the the sick, the old, the weak, kind of the most susceptible, vulnerable members of the population. Whereas cars don't discriminate like that, right? They're just going to crush everything in their path, including those those old big fertile females that frog and salamander populations really need to survive. So the strongest and most reproductively important members of the population are being killed by cars in a way they aren't being killed by natural predators. And so there aren't just lots of amphibians getting hit, it's the very individuals within the population that they need that are getting crushed. So I think that's a big part of why roads and traffic are so pernicious. |
| Erin Welsh | That chapter where you talked about these more abundant species, reptiles and amphibians, is filled with these really sad stories of dozens or hundreds of animals being killed by cars in one night. But it's also filled with this amazing imagery of people carrying frogs in buckets or toads in buckets or these toad tunnels or frog tunnels. I can't remember which is which. But just these incredible creative solutions that people have come up with for for getting these amphibians and reptiles safely to their destination. |
| Ben Goldfarb | Yeah, that was one of my favorite experiences working on the book was going to to Portland, Oregon where there's actually a frog shuttle. |
| Erin Welsh | Yes. |
| Ben Goldfarb | There's this little cohort of volunteers who go out on these warm wet nights when northern red-legged frogs migrate in Portland. And they're all moving from this big patch of forest down to a wetland. And unfortunately you've got Highway 30 right in the middle of those two habitats. So it's kind of a classic problem. And so I spent a night with these guys, just walking along the roadside along this kind of fence they had set up, looking for frogs that had hopped up against the fence and were sort of waiting for a ride. And then we would pick them up, put them in the buckets, and drive them from point A to point B so they wouldn't have to face traffic. So that kind of thing is wonderful, it's super heartwarming. |
| | In this case it's definitely prevented that population from going extinct, which might have happened other otherwise. But it's also an imperfect solution, right. And that would be a, a place where ideally I think you'd see some kind of wildlife crossing structure, right, an underpass probably that would allow those animals to cross the road safely without humans having to intervene. But again, the problem is that it's easy to convince a transportation department to build an underpass for deer because that underpass will prevent dozens of crashes and probably save human lives. It's harder to convince a government agency to spend a couple million dollars on a frog crossing, right. |
| Erin Welsh | Absolutely. You point out that it's awful to see so much roadkill but at the same time, its absence can be equally disturbing. Can you talk about that in the context of insects and the quote unquote "windshield phenomenon"? |

Ben Goldfarb

Yeah, certainly. So I mean that's the thing about roadkill, as you pointed out, right, is that yes, it's this terrible form of death and biodiversity decline. But it's also an indicator, right? When species are abundant we tend to hit a lot of them on the road, right. That's why you see a lot of white-tailed deer and gray squirrels and raccoons, right? Common creatures that cross roads a lot and unfortunately get hit. So when all of a sudden you stop seeing roadkill, that can be a troubling sign that a once abundant species is no longer quite so abundant, right. And in the context of the windshield phenomenon that's what we're seeing with insects, right. And this is this widely observed, somewhat anecdotal but I think increasingly there's peer reviewed research demonstrating this is true. Which is basically the idea that it used to be that when we would drive around our roads, especially in rural areas, we would hit a lot of insects, right. And your your windshield would be totally smudged with dead bees and wasps and flying ants and beetles and all kinds of critters, right, all of those insects.

And that was obviously sad but it also indicated that there were a lot of insects flying around for us to hit. And now what many, many people all over the world have observed is that we don't hit as many insects as we used to. You go on a long road trip and you don't have to squeegee off the windshield at the end of it because you just haven't been hitting all of those bugs. And that's a really troubling sign, right? It suggests that maybe there aren't as many insects out there to be hit. So it's that sort of thing. I mean roadkill is, yes, it's this tragedy, it is this form of biodiversity decline and collapse for some species. But it's also this indicator phenomenon that tells you a lot about the natural world. And in this case it's telling us that our, our insect populations are probably collapsing.

Erin Welsh

So we've touched on a lot of the ways that roads have negatively impacted animals and ecosystems. But one area that I found really fascinating that you explored in your book was how roads can create habitats or resources. Can you tell me about the necrobiome?

Ben Goldfarb

Yeah, definitely. And I think that's an important point, right, is that roads, yes, they destroy ecosystems but they're also ecosystems in their own, right in a sense. There are just so many of them that they're kind of this landscape type that many species have learned to take advantage of. And one really good example of that are scavengers, right. You've got crows and magpies and ravens and bald eagles and golden eagles and coyotes and vultures. All of these different species that eat carrion and have learned to eat roadkill. And that's what the necrobiome is, right, it's sort of a wonderful, relatively novel ecological term for this whole community of animals and plants and fungi and other organisms that have kind of learned to take advantage of carcasses of dead animals which are these kind of amazing resources in their own right.

And the roadside is this very rich and abundant necrobiome, right? There's lots unfortunately, there are lots of dead animals out there. But they're also resources. The problem is that they're dangerous resources, right? You could imagine if you're a bald eagle and you sit down on a dead deer and fill your belly with venison, well you're a couple pounds heavier at the end and it's harder to achieve lift off. So when you take off, you're at risk of being hit by the oncoming 18 wheeler yourself, right. So the road, yes, it is this ecosystem, it's this resource potentially for scavengers but it's also a really dangerous resource. And there's a risk of creating a kind of an ecological trap, this situation where you lure animals in with the promise of food and then you kill them.

So what some researchers, like a guy named Steve Slater with a group called HawkWatch have proposed is that we could go around taking these carcasses, this roadkill, and dragging those carcasses away from the shoulder. And if you just pull them 40 ft off the road, then all of these animals that really depend on roadkill now can kind of eat their fill safely without getting hit themselves. So that's kind of a cool way that you can take this necrobiome, take these carcasses and make them a really safe and productive resource for especially golden eagles, a species that really has come to depend on roadkill.

Erin Welsh

It's amazing how many different approaches you could or should take when it comes to roads and protecting wildlife. And part of that is because or the main reason is because the effects of roads on wildlife is context dependent. It depends on where the road is, how traveled it is, which animal species you're studying or plant species or fungal species. It depends on other factors. And it makes it challenging if not impossible to create a one size fits all solution for roads. And you touched on this a bit in terms of how a lot of places will prioritize these charismatic megafauna or just like larger animals or animals that are more risky to humans if a car hits one of them. But how can we prioritize these different features of road design to have as little impact on an ecosystem as possible?

Ben Goldfarb

Yeah. It's such an important question, especially given that we're entering what scientists have called the infrastructure tsunami, this kind of wave of new construction around the world, right. And here in the US, our highway network is mostly built already, right, we're not really building a lot of giant new interstates or anything like that. But other countries like Nepal and Myanmar and Kenya and Brazil, they're building major new highways right now. And of course those highways are important for human flourishing in a lot of ways, right. Infrastructure and roads, they're how we get to schools and hospitals and that's how farmers get their goods to market and so on, right. There are lots of human benefits of kind of this infrastructural connectivity. And I think it would be incredibly unjust to prevent other countries from building roads as we have.

But we also need, as you say, to kind of encourage those design techniques that don't destroy nature, right. Because we know that these countries like Nepal and Myanmar and Brazil are incredibly biodiverse and that this new construction is hugely dangerous and risky for tigers and elephants and gorillas and giant anteaters. I mean name a species of charismatic megafauna and new infrastructure is one of the the primary threats to its survival. So I think that the most important thing we can do is just avoid those critical habitats, right. Look, when we built the interstate highways here in the United States we just plowed them through every ecosystem we came upon, right. We cleaved old growth forests and wetlands and deserts and all kinds of other systems that are so important for biodiversity. And I think it's crucial that other countries don't make the same mistake. I think that's sort of the first step in road building now is just how do we spare those really crucial habitats that are going to be essential for the survival of wildlife?

And I think that really starts with data, right. You can't protect habitats unless you know where the wildlife lives. And there are so many wonderful road ecologists and wildlife biologists in all of those countries, many of whom I met while working on this book, who are doing exactly that, who are putting satellite collars on tigers and anteaters and other other critters, just trying to figure out where are the critical habitat areas? Where are the movement corridors that these animals are transiting through and how can we avoid building roads in the places that are going to be most catastrophic for wildlife?

Erin Welsh

There are some amazing innovative design features that you discuss in your book in terms of like looking ahead to the future as we construct roads, as we incentivize the incorporation of wildlife protective design. But in the US when we already have, for instance, all of these roads especially like the forest service roads that go through miles and miles and miles of already biodiverse habitat, what has worked in terms of taking these existing road structures and then incorporating different features? I know that in your book, I think you mentioned that the signs warning humans about wildlife don't really seem to work.

Ben Goldfarb

Right.

Erin Welsh

Animals get used to the reflectors that warn them away from roads. What has worked? What are some of the design features that have worked well with existing road structures?

Ben Goldfarb

Yeah. I think it really does come down to building more of these wildlife crossing structures, giving animals an opportunity to cross the road safely. And the design of those structures really depends on the species you're trying to help, right? Every organism has its own ecological niche; its own habitat requirements; its own sort of sensory experience of the world. And you have to think about that when you build these structures. One really good example of that is in Wyoming which is a very good state when it comes to this sort of thing, they've built lots of these crossings. And what they've found out is that mule deer will very happily go through underpasses and box culverts and other structures that go under the road.

Whereas other species like pronghorn antelope really have to go over the highway, right. And that's because antelope, they have incredible vision, they're amazingly far sighted, they're also the fastest terrestrial animal in North America. They're just incredibly good runners. So that's an organism, they don't want to be in a tight little culvert, they want to be out on top of a bridge where they can see their surroundings for many miles in every direction and be able to run away from predators if they have to, right. So you really have to think about the organism that you're trying to help when you build these structures.

But I think a really important point about these crossings is that they're good for humans as well, right. And that's a big part of why you see so many being built around the world now is that there's lots of data basically showing that even a $5 million overpass prevents enough of these dangerous expensive crashes involving wildlife to pay for its own costs over time. So I think that's one of the things that's really catalyzing a lot of the interest in these crossings is yes, they're they're good conservation tools, there's lots of data and evidence showing that they work. But they're also really good for human safety and for our own bottom line. So I think that's when I think about the future of roads and wildlife, I think it's going to involve a lot more of these crossings built with more ecological sensitivity, thinking differently about the kinds of organisms we're trying to help and what it will take to help them. And that's really the best tool we have at our disposal to help mitigate this problem.

Erin Welsh

Most of your book focuses on the impact of roads on ecosystems. But you also bring up in one of my favorite chapters how roads impact humans as well and how those impacts are disproportionately distributed across lines of race and class in the US. What are some of the health effects of living near roads? And how is this discrimination literally built into the way that cities were planned?

Ben Goldfarb

Yeah. It's such an important issue one that I really try to explore in the book. So look, I mean the health impacts of roads on humans are vast, right. We've talked about noise pollution which is literally taking years off of our lives. You've got of course air pollution which is a huge problem. You've got obviously pedestrian death which is a gigantic issue in the US and is actually becoming more of a problem. For many, many years pedestrian fatalities due to cars were declining. And in the last decade or so they've really been on the rise for reasons that are kind of complex and hard to figure out. So you've got all these different problems. We think about roads and cars I think as being these fundamentally positive things and we tend to associate them with human mobility and freedom. And yet they're really curtailing our lives in all kinds of different ways.

So roads are affecting us just as they're affecting wild animals but they're obviously not affecting all of us equally, right. I think that's a really important point as well because so many roads in urban areas were built in ways that deliberately targeted communities of color. In the middle of the 20th century as the interstate highways were being built, all of these quote unquote "urban reformers" basically wanted to get rid of all of the communities of color that they considered undesirable. And these new freeways that were being built were the way they could accomplish that. So in I mean practically every American city from Minneapolis to Miami to Los Angeles to Memphis to New York City, roads were built in ways that basically wiped out or displaced communities of color very, very intentionally.

And as a result today those communities still experience the legacy of those problems. We know that that people of color are much more susceptible to asthma and cancers associated with air pollution and other problems that roads create. And these urban freeways have really been tools of long term segregation. You just think about how a giant viaduct running through the middle of a city kind of cleaves the city in half and effectively destroys the connectivity of that city just as it destroys the connectivity of a mountain lion population. So I think that's a really important point to bear in mind is that roads and these giant highways that were built in the middle of the 20th century, they kind of inadvertently fragmented natural ecosystems. But I think they very deliberately fragmented human communities and urban ecosystems and we're still living with the consequences of that kind of racist and catastrophic planning.

Erin Welsh

In the first few months of the COVID pandemic, the world shut down, right? We experienced a remarkable cessation of human activity across the board. People stayed at home, people didn't drive their cars, shipping slowed, air travel declined. It was a very drastic, very dramatic change. What did this anthropause show us about restoring ecosystem health?

Ben Goldfarb

Yeah. Well first of all it was really kind of the greatest or at least biggest inadvertent experiment in the history of road ecology, right. I mean what happens when you shut down traffic for a few months? Well animals respond in all kinds of ways, right. We saw many more creatures moving into urban areas. Mountain lions walking down the street in some California cities for example. Obviously roadkill rates dramatically declined for all kinds of species. There's one study in Maine showing that twice as many frogs and salamanders survived their spring migration because there were no cars to hit them, right. So we know that this was an enormous benefit to wildlife as disastrous as it was of course for us as humans.

One of my favorite studies that I think reveals a lot about just how dramatically we've affected animals lives with our roads and traffic was done on on white-crowned sparrows in the Bay Area around San Francisco. And basically what these researchers showed is that they recorded the songs of white-crowned sparrows, these birds who like so many songbirds of course sing to attract mates. And what they found was that without the noise of traffic around, these male sparrows were able to sing much more intricate complex songs, right. Because for years they've been basically screaming to be heard over the noise of traffic and when you have to scream all the time you can't really sing a great song, right? But without all of that kind of low frequency rumble of traffic masking their song, they're able to again sing these much more elaborate songs that kind of veered into lower registers. They were able to express sort of the full complexity of their vocal range in a really interesting way.

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| | So to me what that shows is that look, we've done so much obviously to harm animals with roads and traffic and yet we haven't destroyed them, right. They're still living amongst us, just sort of waiting for their opportunity to flourish again. And obviously we'd never wish another pandemic or total cessation of human movement upon anyone, that was obviously a horrific couple of years and it's still ongoing in a lot of ways. And yet if we can figure out ways to more deliberately pull back traffic, whether that means potentially closing some roads seasonally to accommodate wildlife or removing some roads from the landscape as the forest service is doing in many places. These animals, they're still around, they're still amongst us just waiting for their chance to thrive. |
| TPWKY | (transition theme) |
| Erin Welsh | Ben, thank you so much for such a wonderful conversation. One of the things that I absolutely love about this podcast is how it has exposed me to new ideas or concepts that sometimes completely change the way that I see the world. Like how now I let my dog sniff to his heart's content or his nose's his content on our dog walks thanks to Ed Yong and his book 'An Immense World'. Or how I will never drive or walk along a road or especially scenic highway and not think about how that road has changed the life around it. And if you want to learn more and have your road view challenged, check out our website thispodcastwillkillyou.com where I'll post a link to where you can find 'Crossings' as well as a link to Ben's website. |
| | And don't forget you can check out our website for all sorts of other cool things including but not limited to transcripts, quarantini and placeborita recipes, show notes and references for all of our episodes, links to merch, our bookshop.org affiliate account, our Goodreads list, a firsthand account form, and music by Bloodmobile. Speaking of which, thank you to Bloodmobile for providing the music for this episode and all of our episodes. Thank you to Lianna Squillace and Tom Breyfogle for our amazing audio mixing. And thanks to you, listeners, for listening. I hope you liked this bonus episode and are a loving being part of the TPWKY Book Club. A special thank you as always to our fantastic generous patrons, we appreciate you so, so very much. Well until next time, keep washing those hands. |