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David Todd [00:00:03] Well, good morning. I'm David Todd. And I have the privilege of being here with Eric Munscher.

David Todd [00:00:09] With his permission, we plan on recording this interview for research and educational work on behalf of a non-profit group called the Conservation History Association of Texas, and for a book and a website ...for this manuscript that we're preparing for, Texas A&M University Press. The Briscoe Center is ... acts as our archive for long-term storage and public access.

David Todd [00:00:41] He would have all rights to use the recording as he sees fit. It is his. And with that little preamble, I wanted to make sure that this is all agreeable with Mr. Munscher.

Eric Munscher [00:00:53] That sounds great.

David Todd [00:00:54] Super. Good. Good. Well, I am doubly excited. I'm really glad that you can be with us today.

David Todd [00:01:01] Well, let's get started then.

David Todd [00:01:03] It is Monday, September 18th, 2023. It is about 10:10 in the morning, Central Time. And my name, as I said, is David Todd, and I am representing the Conservation History Association of Texas. I am based in Austin, and this is a remote interview with Eric Munscher, who's based in the Houston, Texas area.

David Todd [00:01:31] Mr. Munscher is a regional scientist. He works as a deputy project manager and biologist at SWCA Environmental Consultants in Houston, and he specializes in advising on projects that somehow involved the Endangered Species Act or waters of the United States. And he often deals in issues that arise with federal and state agencies.

David Todd [00:01:56] One of his very interesting projects, and some of this is really done outside of his work at SWCA, focuses on studying the alligator snapping turtle and its conservation.

David Todd [00:02:08] And we were hoping that we might hear some more about that this morning, along with Mr. Munscher's general background and training and experiences.

David Todd [00:02:17] So, with that little introduction, I thought we might launch by just asking him about his childhood and early years and if maybe, Mr. Munscher, you could point to any people or events in your young life that might have influenced your interest in animals and reptiles in particular.

Eric Munscher [00:02:40] Yeah. So, I think I was pretty much a typical toddler with his love and fascination of dinosaurs, and I think most kids share that passion of the grandeur of such large, magnificent animals. And through my early years, that is really what I wanted to be. I wanted to be somebody who studied dinosaurs and the fascination of being a paleontologist, digging up the past and studying those species.

Eric Munscher [00:03:15] But through time, going through high school and in college I was introduced to their kind of their living descendants and got a lot more interest in studying the present day.

Eric Munscher [00:03:31] And I really have two people to really thank for that shift. And, in that, being my parents, my mom and dad were your typical Pennsylvanian parents where, you know, 9 to 5 jobs. My older brother and sister, I have a 13-year older brother and 11-year older sister. So, I was the baby of the family. And they never really wanted to advance in in schooling. My brother went to the army. My sister went to art school.

Eric Munscher [00:04:09] I was the first of the three children to go to college. And my parents really fostered my love of education and academia and just wanting to keep learning, enough that when I made the honor roll, distinguished honor roll in high school, they came to me and were like, "Your brother and sister never showed this interest that you are excelling at it. What do you want? Do you want money? Do you want like a new computer?" I said, "No, I want a snake."

Eric Munscher [00:04:44] And they looked at each other and were like, "Okay." They didn't push back. They knew that I was really interested in things like that. And they let me run with it.

Eric Munscher [00:04:55] They bought me my first reptile pet. It was a little ball python named Sid that we had for the next 17 years.

Eric Munscher [00:05:04] And through Sid, I was able to teach my parents the importance of snakes and other reptiles and that they fostered then a love for everything creepy-crawly that a lot of people tend to have issues for it too.

Eric Munscher [00:05:18] When I got to graduate high school, I went to Penn State. I am a native Pennsylvanian. And so typically what Pennsylvanians do is they go to Penn State. I met the Penn State herpetologist at the time, Dr. Brian Hauge. He was doing this seven-credit study in Belize when I was a freshman. For 40 days, go down to Belize and we'd study tropical ecology in the rainforest of Belize. And for that 40-day time span, I was attached to Dr. Hauge's hip. I learned everything from him.

Eric Munscher [00:05:53] We studied Belizean turtles. We found 13 different species of snake in Belize, including a Mayan coral snake, which was just an absolutely gorgeous snake. I found it walking to dinner one night. Mind you, I was 18, super excitable at the time. I remember seeing the snake, running to the bar in the ecolodge that we were staying at, because that's where Dr. Haig was, and telling him, "Red touches yellow. Red touches yellow", which is the pattern for American coral snakes.

Eric Munscher [00:06:25] That pattern only really works for coral snakes in the United States and Central America. Once you get south, the genus leaves that color pattern alone. You can get yourself into some trouble by grabbing a snake that might not just be red touches yellow.

Eric Munscher [00:06:41] But yeah, we spent 40 days in Belize studying all different species of snake and turtle and I really ... the turtle ecology that Dr. Hauge taught me down there really captivated me. I really learned a lot, especially with what a population ecologist is. That's what Dr. Hauge is. He likes to study things over time and seeing how long and how well populations are maintaining themselves through a period of time.

Eric Munscher [00:07:09] And turtles are extremely long-lived animals. Some turtles live well past humans. You're talking over 200 years for Galapagos tortoises and so forth. And some smaller turtles like box turtles are known to live over a hundred years.

Eric Munscher [00:07:23] So, species like that, they have what's also known as delayed sexual maturity, very similar to people. It takes a very long time for turtles to become reproductive.

Eric Munscher [00:07:34] So, you're looking at a species that can easily be taking advantage of it, because if you remove large adults from a population, what you're essentially doing is removing the breeding population, and it's going to take a very long time for those young to replace that breeding population.

Eric Munscher [00:07:53] That really interested me. And that's what I went to school for. At Penn State, went through the Wildlife and Forestry Program and the Animal Sciences program, got my bachelor's degree there, in those. And then, moved to graduate school at the University of North Florida with Dr. Joseph Butler, who was studying diamondback terrapins at the time, which is a coastal water species of turtles, actually the only official brackish water species of turtle in the world where it lives in the coastal waterways between the ocean and the mainland, where you're looking at water and salinity around 10 to 15 parts per thousand. So it's not ocean water salty, but it's a lot saltier than freshwater.

Eric Munscher [00:08:41] And his study was doing nesting ecology for the diamondback terrapin and he had a nesting beach that he was finding 500 nests a year on this beach. And of those 500 nests he'd find 90 to 95% of them were predated by raccoon.

Eric Munscher [00:08:59] So, my study going in was to monitor the nesting beach, like he had over the years prior, and remove the raccoon. And I was actually the first person in the country allowed to lethally remove the raccoon from a turtle nesting beach. I ended up removing 30 of those from the beach over that year and I dropped the 90% predation rate down to 7% after removing 30 raccoons.

Eric Munscher [00:09:26] So, going through my graduate degree process just kept reinvigorating the whole desire for doing turtle research.

Eric Munscher [00:09:38] And through that time, Dr. Brian Hauge and I had kept in contact, and I was actually helping Dr. Brian Hauge at Penn State (glossed over this). But at Penn State, while I was doing the Belize work with Dr. Brian Hauge, he also did a class during Penn State's spring break every year where he would take students down to Florida to a site just outside of Orlando called Wekiwa Springs State Park. It is one of the most amazing state parks in all of the United States. I've been through (let's see now), there are 42 states in the US, and I would

say, well, Wekiwa Springs State Park is still one of my favorites. It's kind of a home away from home.

Eric Munscher [00:10:21] I did that class of Dr. Brian Hauge's for two years, and then for the next two years before I graduated Penn State, and went to UNF, I was his teaching assistant. And that class simply was a research project that Dr. Brian Hauge had on studying the long-term population ecology of Wekiwa Springs State Parks turtle assemblage.

Eric Munscher [00:10:44] So from 1999 to 2004, I helped Dr. Hauge with that, and then I moved to Florida to do my grad work with Dr. Joseph Butler. And late in 2004, Dr. Brian Hauge got a job offer in Washington, and he called me, and he said, "Since you're in Florida, I want you to take over the Wekiwa Springs State Park study. It's been going on for five years. It would be very unfortunate for us to lose it..." Since he was moving to Washington State, cross-country, would not be able to keep the study going.

Eric Munscher [00:11:14] So, I took over the study and over the next 20 years now, the study's still going. It hits its 25th year next year. It's the second longest study of freshwater turtles in Florida. I was also able to add through our great work at that site, eight more study sites. The Florida Fish and Wildlife, Florida Department of Environmental Protection, loved the work we were doing. So, they allowed us and wanted us to add other spring study sites.

Eric Munscher [00:11:41] So, now we have nine study sites in Florida. Some are on their 25th year, some are on their 15th year, some are on their 10th year. One, we just started two years ago.

Eric Munscher [00:11:51] So, it's, the process is continuing to new areas, learning new things and trying to fit that puzzle together, how these freshwater turtles of Florida are doing within these protected systems. Even though they're protected state parks and preserves, there are anthropogenic impacts that are really affecting wildlife and turtles in general, that we're learning, especially over these long periods of time.

Eric Munscher [00:12:14] Twenty-five years is a very long period of time, and a lot of studies don't make it that long because of cost and time commitment. And due to that longevity, we're really getting to understand what those populations are going through, and how they're looking through time.

David Todd [00:12:30] That is so cool. And just to be able to see these fluctuations that, you know, may not appear until, like you said, with these very long-lived species for, I don't know, years, decades. Who knows?

Eric Munscher [00:12:44] That's it exactly.

David Todd [00:12:44] That's very cool. Well, well, let's hold that thought, and just go back a little bit, because clearly this all has a long trajectory for you. And I want to make sure we get the beginning point.

David Todd [00:13:00] I think that you told us about your childhood and early years and then something about your schooling. And clearly you've had a lot of formal schooling and you had wonderful upbringing with your parents that were very supportive. But I think a third sort of leg of the stool is often what folks learn from sort of the public media, you know, some people

watch TV, some people will see movies, some people read books. And I was wondering if any of those ...

Eric Munscher [00:13:29] Absolutely.

David Todd [00:13:29] Kind of natural opportunities were important to you.

Eric Munscher [00:13:34] So a lot of people, I think, in my line of work will agree with me, in just about the man's sheer honesty, the way he comes across on film, is Steve Irwin. He was beloved. And, you know, he, a lot of people think we was kind of comical and he didn't know what he was doing. He was comical, but he knew what he was doing. He was a champion for wildlife.

Eric Munscher [00:13:58] And I grew up during the time when his show was on. And it was just, it was odd seeing somebody who absolutely loved reptiles and amphibians, because it's again, it's not something that a lot of people do. A lot of reptiles and amphibians are typically, you know, pushed aside, and especially snakes. Snakes are feared, crocodilians are feared.

Eric Munscher [00:14:25] And he brought a lot of education and humanity to his show, showing that while you shouldn't really ... They should be respected and understood, and not outright feared.

Eric Munscher [00:14:41] And through his work, helped with conserving so many different species of reptiles and amphibians. And still, to this day, through the way he raised his kids before his passing, you can see it on his children, you know, with the Australia Zoo, that was definitely a lasting impact in my career as a herpetologist.

Eric Munscher [00:15:06] So, you may want to just elaborate. So, his kids have gone on to be associated with the Australian Zoo? Is that right?

Eric Munscher [00:15:13] So he, him and his wife, inherited the Australian Zoo, I believe, from his father. And his wife kept it going and now his two children. I think his daughter is now in her mid, late twenties. His son's in his late teens. I think his son was only three when he passed away, but they've taken over the duties. And his son looks like a spitting image of him and he's doing things that Steve was doing on film, where he's educating about saltwater crocodiles or he's educating about the tiger snakes of Australia, things like that, or the large monitor lizards of Australia.

Eric Munscher [00:15:48] He's taking on that task and showing these species that a lot of people either have never heard of, and/or they just outright fear and showing that they are really important for their ecosystem. You know, saltwater crocs are apex predator.

Eric Munscher [00:16:02] A lot of people don't realize that ecosystems are really driven top-to-bottom. You need that apex predator in your ecosystem to really drive the processes of that ecosystem.

Eric Munscher [00:16:15] One of my favorite books written is by William Stolzenburg. The book is called, "Where the Wild Things Were". It is a book dedicated on ecosystem tropes, on a lot of people originally thought it's bottom-up, that the ecosystem is being driven from your plants all the way up to your alpha predators.

Eric Munscher [00:16:36] And through recent research, on multiple different species, in multiple different genre, it's the other way around. It's top-to-bottom, your apex predator's really driving that ecosystem.

Eric Munscher [00:16:47] And one of the easiest and best examples you can say is the wolves of Yellowstone. So, Yellowstone, you know, had the wolf persecution back in, I believe, the late sixties, where they basically removed the population of wolves from the park. And during that time period, the elk population exploded, and when the elk population exploded, the aspen trees and everything the elk ate severely got impacted, enough so that a lot of the riparian zones on the streams that go through the Yellowstone Park were suffering from lack of riparian zone and shade, which contributed detrimental effects to the fish in the stream.

Eric Munscher [00:17:29] So, you have a cascade effect of what's happening with the lack of a wolf. The elk are running over the Yellowstone, causing major changes to the system, enough so that you are losing fish species in the rivers.

Eric Munscher [00:17:43] When you reintroduced the wolf, the elk don't just, the wolves don't just eat a ton of elk, because the wolves don't. If the wolves take down one elk, that's going to feed the wolves for a while. It's the actual mentality that the wolf puts in the elk. The elk know where the wolves live and they refuse to go in those areas. So, the wolves maintain that ecosystem through presence, not just through predation.

David Todd [00:18:12] That's fascinating. So, it's not that they affect the numbers themselves.

Eric Munscher [00:18:17] Yes.

David Todd [00:18:17] It's more like they're affecting the behavior and their, I guess, their herding or their location - makes them a little bit more wary of what might be lurking out there.

David Todd [00:18:28] Very cool. Great.

David Todd [00:18:32] Well, so you mentioned a TV show, a book. Anything else? A movie?

Eric Munscher [00:18:42] A movie? Off the top of my head, I really can't think of any movie wise. It really was Steve Irwin's show. Numerous books, but William Stolzenburg's "Where the Wild Things Were" is definitely one that I love. David Quammen's "Song of the Dodos" is another great one.

David Todd [00:19:06] This is great.

David Todd [00:19:07] Well, it's just wonderful to see and hear what feeds, you know, biologists and scientists like yourself and inspires them to do what they do. So thank you.

David Todd [00:19:20] So, maybe as a next chapter in your life, we could talk a little bit about the start of your career. You know, that's often a big hurdle, and I'm wondering how you first got started once you left graduate school.

Eric Munscher [00:19:34] Yeah. So, I actually had no idea that environmental consulting was a job option. The whole grad school idea was "go to grad school". Then you go to get your Ph.D. and post-doc, professorship. That was my track.

Eric Munscher [00:19:49] And my wife and I ended up having our son pretty early. We have a 17-year old, a 14-year old and a 3-year old now. But having our first child kind of changed those plans.

Eric Munscher [00:20:01] And I had a friend that was in the consulting business, and he said that his company, SWCA (at the time he was working for us), he said that they had a really large project in Florida that they wanted help with. It was a 700-mile pipeline from Mississippi to Miami. And by Florida regulations, you had to have somebody who was experienced with Florida Army Corps of Engineers and water agency methods, the regulations, and I did. I actually had worked seasonally doing some wetland work up until that point.

Eric Munscher [00:20:36] So, I was hired by SWCA to do this 700-mile pipeline for the next four months. And my boss at the time, loved the work I did, and offered to pay for our move to Houston from Jacksonville, Florida, after that project was over. And I've been with the SWCA ever since. I love the work. The work as an environmental consultant is varied, so it's really hard to become bored, because every project is different. Every project has its major needs, whether it be wetland-associated and having to deal with the Army Corps of Engineers, or it's species-associated, and you have to deal with U.S. Fish and Wildlife or EPA or even state agencies.

David Todd [00:21:21] That's interesting. So, different subjects and different partners and participants. That's interesting.

Eric Munscher [00:21:27] Depending on the client and the location and what could possibly be on the project site, depending on the ranges of species, you could have multiple species on one project.

David Todd [00:21:41] Wow. Well, I'm sure you've studied many species. Maybe the species that we could treat today is this alligator snapping turtle. Can you just give us a really basic precis of, you know, a pretty fundamental introduction to the life history and the ecological niche of the alligator snapping turtle?

Eric Munscher [00:22:07] So, it is North America's largest hard-shelled turtle. Actually, recent research by Steven F. Austin graduate student David Rosenbaum, found that they can get over 200 pounds. He actually caught a 211-pound individual, I think two years ago now up in, east of the Dallas area.

Eric Munscher [00:22:25] So, it is a quite a big animal. I've seen numerous ones, over the 130, 140-pound range in my career.

Eric Munscher [00:22:33] It is a very long-lived turtle. Some people believe they can live over a hundred years. There haven't been any studies that have shown that yet, but it's believed, and most turtles do live a very long time.

Eric Munscher [00:22:43] This particular species is a riverine species. It loves to live in deep water, dark water, rivers, streams. They're associated with the watershed of large rivers and stream areas - perennially running, typically, water bodies. So, that means year-round water.

Eric Munscher [00:23:07] The species isn't known as a basking turtle. So, this large snapping turtle does not come out of the water often. In fact, large males ... And the male is the larger of the sexes. The species has marked sexual dimorphism where the male gets a lot larger - as I said, possibly 200 pounds. The female might not reach 70 pounds. Large females get around that weight range 70, 75 pounds.

Eric Munscher [00:23:35] This particular species likes the, as I mentioned, dark, running water with riparian zones. So they want that forested riparian zone.

Eric Munscher [00:23:42] And the only time the species leaves the water really is for the females to lay eggs. And the females will go up into that riparian zone and lay her nest.

Eric Munscher [00:23:53] At times, you can get extensive movements from males just could be that the males moving from one population of females to another. Those extensive movements aren't exactly understood yet. I actually in my study had one that moved just about 20 river miles in a year. And they typically don't. They typically move a mile, two miles.

Eric Munscher [00:24:17] The species is what's known as a specialist. Actually, if you see pictures of the alligator snapping turtles head, it will always have its mouth open. It's a defensive posture, but it's also posture for predation where they have their mouth open in the water column. And their tongue is a modified lure. Their tongue looks like a worm and it dangles in the water column. And it's there to attract fish in there.

Eric Munscher [00:24:43] Their primary food source is fish. They will eat anything. They are a typical carnivorous turtle where they'll eat the carrion on the bottom of the water body. They'll eat detritus. They'll eat algae, but primarily it's fish. And for alligator snapping turtle researchers, that's how we bait them to our traps. We use big chunks of fish.

David Todd [00:25:11] That's fascinating. So, you talked a little bit about their longevity, their favored ecosystem, the predation. Do you know much about their behavior? I mean, you mentioned mobility, anything about their mating systems.

Eric Munscher [00:25:29] And so it is a microhabitat specialist. So, they like what's called, "structure". And structure, instream structures, is typically fallen-down trees, logjams, cut banks where the river has carved out a shelf in its banks. Those are the habitats that the turtle will hunker down in and do its predation, where it's opening its mouth and luring the fish in.

Eric Munscher [00:25:55] The mating season is, it depends on the range, where you are in the range, but typically from March to July. The turtle does range from western Florida to Texas, up to Illinois, Indiana. Those two states, I believe that the population's currently extirpated from both the states. So, the range has been a little bit redacted.

Eric Munscher [00:26:20] It seems to be doing fairly well in Texas and in states like Alabama, Florida. States like Mississippi and Louisiana have had some harvest issues in the past. Mississippi, I believe, has come a long way with their regulations. I think Louisiana, you're still allowed to take one per person per day, which does impact populations of long-lived species like alligator snapping turtles negatively.

David Todd [00:26:49] Okay. It's great. You know, lots of aspects to this animal.

David Todd [00:26:58] So, tell me what your first encounter might have been with a alligator snapping turtle.

Eric Munscher [00:27:05] Yeah. So, there are two species currently recognized for alligator snapping turtle. You have the Suwannee alligator snapping turtle, which is in the Suwannee River drainage of Georgia and Florida. And then you have the Western alligator snapping turtle, which has the rest of the range, so western Florida to Texas, up to, used to be Indiana, Illinois.

Eric Munscher [00:27:24] My first experience with alligator snapping turtles was with the Suwannee alligator snapping turtle. Back in 2010, we were doing our Florida spring turtle sampling. This was in Manatee Springs, which is, just in the Chiefland area of Florida, kind of in the Big Bend area of Florida, where Tallahassee is. And I was snorkeling in crystal-clear spring water. Typically, we don't see snapping turtles in that. It's all other species of turtle like soft shells and river cooters and mud and musk turtles.

Eric Munscher [00:27:57] And I was coming around a big cypress tree and this big cypress tree had a hollow in it. And I saw a head sticking out of that hollow. And it was a juvenile alligator snapping turtle, a Suwannee alligator snapping turtle.

Eric Munscher [00:28:10] And the funny thing about the story is, before that day, Dr. Brian Hauge was with us, and we were talking about what would be the coolest turtle to possibly see in this spring, because it was a new study site to us. And it was within the range of the out of the Suwannee alligator snapping turtle. We thought was unlikely, because they like the dark river water rather than the crystal-clear spring water. But we didn't really take into account that juvenile turtles will use anything. And this was a very small juvenile alligator snapping turtle just looking for a good spot and food.

Eric Munscher [00:28:43] And I take the little turtle (he's a little 8-pound individual) out of the hollow, and I'm holding it behind my back. And I got to Dr. Brian Hauge and I asked him, "What do you think I caught at the boil of the spring?" And he just had a smile on his face. He's like, "No, you didn't". I pulled it out.

Eric Munscher [00:29:02] And sure enough, it's one of three alligator snapping turtles we have in that spring now, which is not a lot. It's not the typical habitat for them, but they do venture into those habitats, which is neat to see. They will go in and utilize it in some fashion.

Eric Munscher [00:29:19] That's great. Well, I'm sure that made your day. What a nice surprise.

Eric Munscher [00:29:24] Yes.

David Todd [00:29:24] Well, let's talk about trends. So, I understand that Texas Parks and Wildlife put the turtle on its protected list at '87, if I'm not wrong.

Eric Munscher [00:29:36] Right.

David Todd [00:29:37] And then the U.S. Fish and Wildlife Service recently proposed the alligator snapping turtle for threatened status in November of '21.

Eric Munscher [00:29:46] Right.

David Todd [00:29:46] And I thought maybe you could sort of back up and sort of talk about the population and the range trends, things that, you know, folks have discussed and have been concerned about.

Eric Munscher [00:29:58] So, kind of getting back to what I said earlier, in that you have to have these long-term projects to get an idea of population shifts over time. And this particular species doesn't have many. It's a harder animal to deal with because they get big. So, it takes a lot of effort and time to actually work with them.

Eric Munscher [00:30:21] So, we've had traps where we've caught five alligator snapping turtles in one trap, and the trap weighed nearly 400 pounds. So, dealing with that mass, and fighting those turtles to get out of those traps, so you can work the animal up. It takes a lot of effort.

Eric Munscher [00:30:35] So, a lot of these studies that are on the alligator snapping turtle are actually shorter time period studies. So, your graduate student studies are typically a season or two where they might be looking at range distribution or diets or movement - shorter-term studies where you can get an idea of what's going on in that time span.

Eric Munscher [00:30:54] So, with the trends of population, we're really looking at certain areas, or for this Suwannee alligator snapping turtle, there has been a study, it's been going on, I think, for 12 years now, that has gotten some really amazing data. Travis Thomas and Kevin Enge, from Florida, have been doing this amazing study on that species and getting a really good idea of how that population in the Suwannee River is doing.

Eric Munscher [00:31:21] In the western span, it's been largely missing up until like the past seven years or so, especially in Texas, where in Texas, prior to us doing the Buffalo Bayou study, the only work in Texas had been range studies, and some like thermoregulation studies of how the turtle handles cold or warm temperatures.

Eric Munscher [00:31:49] But in 2016, we actually lucked upon a study of a lifetime in Buffalo Bayou, which is the heart of Houston. Buffalo Bayou carves its way right through downtown Houston. It is a old river. It is a modified river. It is now the largest flood conveyance of Houston.

Eric Munscher [00:32:12] And we had a study at Memorial Park back in 2016 that was just looking at a bioassessment of the park. The park wanted to know what species live in the park, and we added traps to Buffalo Bayou at that point, thinking we're going to check off the typical turtles - red-eared sliders, spiny softshell, maybe, maybe a cooter, the river cooter, at that time.

Eric Munscher [00:32:34] We put traps in and the next day we caught a juvenile, even smaller than the one I caught in Florida. This was like a 4-pound, little alligator snapping turtle.

Eric Munscher [00:32:45] And at that point, we called Texas Parks and Wildlife and told them what we had. This is a juvenile turtle. This shows breeding. Because prior to that, it was just thought that there might be some relic, old individuals in Buffalo Bayou, that's not providing a actual breeding population. This little guy prove that they were they were breeding.

Eric Munscher [00:33:06] So we got the turtle added to our permit right away and the next day we ended up catching five more, including a 96-pound male, and two big females that are in the trap with him and we knew we were on to something and his was just one little site.

Eric Munscher [00:33:24] And through that time span now, from 2016 to current, we're up to 142 alligator snapping turtles within Buffalo Bayou, from downtown Houston to the Barker Dam area of Houston, which is about 28 total river miles. In that 28-river mile distance, you're looking at city park area, with Memorial Park, which is great habitat, lots of residential, so lots of housing where it could be, you know, million-dollar mansions and large HOAs like that, or heavy commercial.

Eric Munscher [00:34:06] So, it's a really atypical habitat, because in in Houston, the building zones are pretty ... you can build where you want. So, they build right up to the bayou a lot of times.

Eric Munscher [00:34:18] So, you have atypical habitat for this species where I would never have dreamed that this major dense population of this iconic and potentially threatened species would be in the fourth largest city in the country.

Eric Munscher [00:34:33] And the bayou's just somehow been able to preserve itself as fantastic habitat for that turtle and for other species. We actually see lots of giant alligator gar in the same bayou. We know that there are coyotes that use the banks of the bayou. We've seen various really neat species of bird using it, and there's a lot of habitat available, even though it's in downtown Houston.

David Todd [00:35:07] May I hold you right there.

Eric Munscher [00:35:08] Yeah.

David Todd [00:35:09] I think we're getting some background chatter. Is your door closed?

Eric Munscher [00:35:14] It is. It might be through the wall.

David Todd [00:35:16] Okay. All right.

Eric Munscher [00:35:17] I'm sorry.

David Todd [00:35:19] That's okay. That goes with the territory. You've done what you can. So, that's cool.

David Todd [00:35:29] Sorry to take you off track there.

Eric Munscher [00:35:31] Yes.

David Todd [00:35:31] So, very interesting, you got this atypical urban habitat with buildings right up to the edge of Buffalo Bayou, and yet you're finding, not just alligator snapping turtles, but also alligator gar and coyotes and neat species of birds. Tell me a little it more about the surprise that you have there.

Eric Munscher [00:35:52] Yeah, it's really come to a point where I appreciate the Bayou for being able to persevere through a city that has, you know, 4 million, 5 million people in it. And

it's now, it's being, it's treated as the largest flood conveyance. So, everything in Houston really floods to Buffalo Bayou. And it has the dam systems in the west, the Barker and Addicks dams, that really manage that flood conveyance.

Eric Munscher [00:36:18] And just being able to see what that bayou does during flood periods. So, during normal flow, the bayou is about 300 cubic feet per second of flow. That's not much. That's actually a really good flow regime to trap alligator snapping turtles and for species to utilize it. We have seen that volume go overnight to 3000 cubic feet per second due to rainfall. And during Hurricane Harvey, I believe it was over 30,000 cubic feet per second.

Eric Munscher [00:36:52] And these turtles just haven't started living here in the past decade. Some of these animals we are catching 130, 140 pound individuals. They're probably 80-plus years old. They've seen numerous floods. And it doesn't seem to bother them.

Eric Munscher [00:37:10] We actually did a very neat movement study in Buffalo Bayou. It was funded by Texas Parks and Wildlife. Kelly Norrid, wildlife biologist, really helped us out with that funding and helped us out with that project, where we monitored ten individuals of our population that we had marked. And they're PIT tags, so, whenever we catch an alligator snapping turtle, we take a whole bunch of different measurements on it. We hard-mark the shell with a number code. That turtle only gets that code, and then we insert a microchip in each turtle. Just in case something happens to that hard notch code, we have a microchip in each turtle that has a 13-digit bar code that only that turtle gets. So, that turtle has two different marking methods so we know who it is if we catch it again.

Eric Munscher [00:37:54] So, we actually attached ten radio devices to turtles at two different sites. So, we had six at one site, four at the other. And these sites were in the Memorial Park region, and there was about a five-mile stretch in between them. Those turtles never saw one another. They never traveled that far. And we got some really neat microhabitat data from that where the males really hunkered down and they utilized their microhabitat and didn't move much. Our furthest male movement might have been just over two miles.

Eric Munscher [00:38:27] Our females moved. It was pretty neat. We had one female that was in a little drainage off of Buffalo Bayou, a little cut, and she liked that. But when one of our big male individuals that we were tracking moved into that cut, she bolted.

Eric Munscher [00:38:46] So, it was really interesting seeing some behavioral dynamics where the female didn't want anything to do with the male. And we had some females that would move three, four miles in in a relatively small timespan. You're talking about a month. And they would do that that movement multiple times. So, it wasn't just a one-shot thing - I'm they'd go up here and take a look what's up here? She knew what was up there. That was part for her habitat. That was part of her range. She would go up there, come back, go back up there.

David Todd [00:39:15] That's interesting.

David Todd [00:39:17] Well, and so, thinking about the trends that I guess have, you know, brought some level of concern at the state and the federal government, is it more that there just hasn't been a lot of study and so there's a gap there and, you know, there's curiosity about if something's going wrong? Or, do you think that there's evidence that things are going

wrong, and so that's the reason for the concern, which I guess dates back to the early eighties, when I think Peter Pritchard was first raising the flag.

Eric Munscher [00:39:49] Absolutely. That would be another book that I should have mentioned earlier. Peter Pritchard's alligator snapping turtle book is fantastic and it's one of my favorite books I have in my library. Actually, Peter signed it before he passed. Yeah, that's a special one.

Eric Munscher [00:40:07] So, actually, to answer your question there is no. I consider parts of the species' biology and ecology data-deficient. And really, it's the population analyses of the species, because you have to have so many years to get to that point. It's really hard for a lot of researchers to find the funding and the time to get 7 to 10 years of data, if not more.

Eric Munscher [00:40:31] But there definitely is something going wrong, and there has been for the species. It is a very large species, as I've noted, and due to its size, it has been harvested for meat. And getting back to that, if you are a species that exhibits delayed sexual maturity and you're removing large individuals, including large females, you're really going to crash a population quickly.

Eric Munscher [00:40:59] And what we're seeing now is a range redaction, actually. I work with a lot of alligator snapping turtle researchers from across the range, including researchers in Illinois, Indiana, Oklahoma, Missouri. And we're actually now working on the International Union for Conservation Need report for the alligator snapping turtle, the IUCN report, and just talking to some of them, the populations of Illinois and Indiana are probably extirpated. The species can no longer be found in the wild in breeding populations, in viable populations, in either state. And we believe the same thing for Kansas, where it's probably largely extirpated from Kansas. So, that's three states where the species should range from that are probably no longer part of its range viably.

Eric Munscher [00:41:49] So it's a pretty significant range redaction.

Eric Munscher [00:41:51] And we know in Louisiana there's been several studies where the Louisiana populations definitely had been impacted by harvest. There's a paper by Huntzinger et al. in 2019 that studies, I think, the three most western river drainages in Louisiana. And I think they only caught 14 or 15 turtles during that study period, which is not many. Some studies can catch that in a trapping session, which is a weekend. So, there are definitely areas that the species has been impacted.

Eric Munscher [00:42:25] And that's what the U.S. Fish and Wildlife listing is about, because we don't know population-wise how well they're doing.

Eric Munscher [00:42:32] We know in states like in Texas where we've had range studies, we've had three range studies now where we kind of have a great idea of where the species ranges across the state. But we don't know what that means for population-wise. We know that they're in the county. We know they're in the river. But in some areas, the same turtle's caught in that river. So, if you're putting traps out, you're only catching the same turtle or two, it doesn't make me believe that there's a viable population. It makes me think that there's a relic population.

Eric Munscher [00:43:02] So, that's why a place like Buffalo Bayou is important, because we have a very viable breeding population. We catch lots of adult males and females and they are breeding. We catch lots of, lots of juveniles.

Eric Munscher [00:43:15] And the same thing with the study out in Florida that I think they have shown that they have a very good healthy population there of that species.

Eric Munscher [00:43:24] But again, it's only one stretch of the river and not the entire range of the animal.

Eric Munscher [00:43:30] So, there are definitely issues for both where there should be a push to do some more long-term analysis on populations where you think you might have a good healthy population at a site - put five years or ten years of study to it, get a couple of grad students and just carry the project forward, and do something long-term to see how well that population is doing.

Eric Munscher [00:43:51] And the Buffalo Bayou project was a ten-year design study. We go into a study site for our long-term analysis and we want ten years. If we're seeing really interesting things, we'll add time to it, as long as the state agencies see value in it. In Florida, we're up to 25 years at one of our state parks because there's just so much value coming out in publications and knowledge of what's happening in that ecosystem.

Eric Munscher [00:44:16] And we already have, I think, four papers out Buffalo Bayou right now, of that population. And we're going to be putting together a really neat one at the ten-year time span. That will be the first ten-year population model for the Western alligator snapping turtle in Texas.

David Todd [00:44:37] That is, that's impressive. Well, you all are very productive and diligent on this stuff.

David Todd [00:44:42] You know, one question that occurs to me is that, so, Peter Prichard, who, even I as a layperson knows, was just almost god-like in the reptilian, turtle world. And I'm curious why his petition for listing 40 years ago didn't gain the kind of traction that you might imagine somebody of his stature would trigger. I think, you know, why it's taken so long for somebody like you to sort of take up the ball and run with it.

Eric Munscher [00:45:19] I honestly think it's due, at that time span, we knew so little. There was not enough information to add to his argument, which was correct.

Eric Munscher [00:45:31] Now, there are a lot of researchers. Dr. John Carr out of Louisiana. Dr. Michael Dreslik out of Illinois, Dr. Day Ligon of Missouri, Dr. Daren Riedle out of Kansas, have dedicated a lot of their career to this species, and we know a lot more now about its natural history, its ecology, its conservation needs, than we did at Peter Pritchard's time when he when he made that pitch.

Eric Munscher [00:46:00] And especially, I think with, over that time span, with all those researchers I named, and many, many more, the key gap and just lack of understanding a population model or, you know, a long-term study where you get an idea of what the ebb and flow of the population is doing. In that time, that ten-year time span, do you have a big dip? Was there a die-off? Did they come back from that? Could you tell if there has been harvest? Are you catching any of your older animals?

Eric Munscher [00:46:34] There's a lot of questions that can be answered from a long-term study that just unfortunately is lacking over a lot of the range.

David Todd [00:46:43] Okay. Well, I guess it's a project worthy of your interest and time - a real challenge.

David Todd [00:46:52] Well, so, I think you mentioned that one of the factors that may have been contributing to the concern, and the redaction in its range, and decline perhaps in its populations, is overharvest. Maybe you can talk about some incidents regarding that and if there are any other effects. I mean, I've heard that there's, you know, poaching and smuggling and ...

Eric Munscher [00:47:17] Absolutely.

David Todd [00:47:18] You know, pet trade. There are a lot of things which I'm sure you know much more about. But maybe you can go through some of those that rise to the top of the list for you.

Eric Munscher [00:47:27] So, a lot of the turtle research that I do is through the organization, an organization called the Turtle Survival Alliance. I'm the North American research director for the Turtle Survival Alliance. And through that (it's a global nonprofit dedicated to zero turtle extinctions going forward), so, they get a lot of, we have projects across the globe and we have intel on people in the know on various species of what's going on with, as you mentioned, poaching, overharvest.

Eric Munscher [00:47:59] A lot of it's been driven by what was called the Chinese turtle crisis back in the late nineties. Southeast Asia really has had a lot of need and interest in harvesting turtle species, not just their own, but globally, because of either for consumption, so eating meat, turtle meat. A lot of that is garnered from the belief that if you're eating turtle meat, you get longevity from it because they are a long-lived species.

Eric Munscher [00:48:32] And the other is from if you're a small, pretty turtle, it's a status symbol. So, for instance, there's a turtle in the Northeast called the bog turtle. It's a really small turtle. It is actually the smallest North American turtle. There's one smaller in Mexico. I should say, it's actually the smallest United States turtle: the thing's tiny, like four-inch carapace. But it has really bright orange cheeks. And the rest of the turtle's typically brownish-black. It's a really cute, pretty turtle.

Eric Munscher [00:49:05] And it's been heavily poached. And it's on the black market. You could see listings for thousands and thousands of dollars for a little turtle.

Eric Munscher [00:49:17] And for demand like that, it really creates issues because people are willing to break the law and to poach animals.

Eric Munscher [00:49:27] And we've actually seen, unfortunately, use of scientific literature to find study sites where the poachers will go attack a study site.

Eric Munscher [00:49:38] So, poaching for most turtle species is an issue.

Eric Munscher [00:49:41] For the alligator snapping turtle, it is really the harvest that's the issue for these guys, and that is local and international because there is a local harvest for Louisiana. It is part of the Louisiana culture as well to harvest alligator snapping turtle. So, for that species, I would say that the overharvesting is the number one.

Eric Munscher [00:50:05] Number two issue is probably fish hook ingestion. As I mentioned earlier, as a fish specialist, a lot of people put trot lines out with multiple hooks and they can be left out. There'll be derelict traps and you'll come across turtles trapped on the hook and they've died because of ingesting the hooks.

Eric Munscher [00:50:28] Multiple researchers now are looking into actually using like metal detectors on their turtles, to see if they get any metal detector ping to notice that the turtle may have swallowed the hook. Some researchers have funding for X-ray machines they take in the field and they'll X-ray the turtle, showing that the turtle has a hook or multiple hooks.

Eric Munscher [00:50:52] And usually that's a fatal thing for a turtle if it has a hook in it. It's really hard for that to, depending on if the hook is made out of material that will dissolve quickly, that could lead to a mortality event.

Eric Munscher [00:51:04] We've seen it in Buffalo Bayou. Buffalo Bayou is a site where a lot of people do alligator gar fishing. And we have come across mortality events in Buffalo Bayou because of the alligator snapping turtle ingesting the hook.

Eric Munscher [00:51:19] Then your other major issue for alligator snapping turtle is habitat loss. And so they are, as I mentioned earlier, a riverine species, but what's really important for them is having a riparian zone. And a lot of the time you're losing that riparian zone that goes along the river. And if you don't have that riparian zone, it's really hard for the females to have successful nesting.

Eric Munscher [00:51:45] Most turtle species have extreme nest predation rates. As I mentioned, with my graduate project with diamondback terrapins. A lot of people see 90 to almost 100% nest predation on their study sites for various species.

Eric Munscher [00:51:59] So, the reason why turtles live so long is they already have that built-in issue where you're going to have everything in the world's going to eat a turtle egg. It's a high-energy dense food source. If you're a hatchling, you're pretty easy to eat and lots of things eat a hatchling.

Eric Munscher [00:52:15] So your two life stages already are basically food for numerous species.

Eric Munscher [00:52:22] It takes a very long time for you to become an adult until you're safe. And even at that point, when you're an adult and you're supposed to be safe, now, due to overharvesting by people, that life stage is getting impacted.

Eric Munscher [00:52:36] So, all of that together, you're seeing populations crash for various species, to the point where some species have gone extinct in the wild.

Eric Munscher [00:52:44] And the Turtle Survival Alliance is actually breeding lots of species that have had that issue in captivity so that we have assurance colonies, so that we can do

governmental programs where we can get access to the habitat and do releases and put the animal back in the wild at some point.

David Todd [00:53:09] So, I think you mentioned this earlier, but maybe just to sort of put a fine point on it, the alligator snapping turtles, as I understand it, need this riparian corridor with mature, I guess, forests or something to provide a shelf for them to nest on. But I think you mentioned that Buffalo Bayou is this major flood conveyance, and you know, Houston gets hit by these major deluges, you know, hurricanes and less. And so, is the maintenance of Buffalo Bayou as a flood channel an issue for the alligator snapping turtle?

Eric Munscher [00:53:54] If they would, if agencies would do in-stream work, I could see there being direct impacts to them. Thankfully, that largely, I don't think, hasn't been done for a while. Harris County Flood Control does do some debris cleanup after large storms, including Hurricane Harvey. We were actually trapping right after that and we saw barges out there doing clearings, and we haven't noticed any impacts from that. The riparian zone on Buffalo Bayou in areas is surprisingly fantastic. It's just, I think, it's to the point where it's because of where it's at. Buffalo Bayou is impacted due to Houston, but it's also protected due to Houston.

Eric Munscher [00:54:36] So poaching and whatnot in Buffalo Bayou would be extremely hard to do. And thankfully, I don't think that would be an issue for our population because of where it's located.

Eric Munscher [00:54:48] Our major issue, I think, honestly, is fishing tackle in Buffalo Bayou, where our riparian zone looks healthy. And I don't think that we'll lose large adult individuals to poaching. But, we do lose large individuals to hook ingestion.

David Todd [00:55:08] Maybe you can just flesh out that mention that you had there - that poaching is probably not an issue in Houston. And is that just because more eyes and ears and witnesses?

Eric Munscher [00:55:18] Exactly. We actually get a lot of interest when we go out and trap. I've had to get access to various points on Buffalo Bayou. So, we'll contact an HOA and ask an HOA if we can gain access to their portion of Buffalo Bayou. We've contacted Memorial Park, the Houston Parks Department, even various landowners. You know, in the 610 region of downtown, we actually had a landowner, who used to own a large veterinarian building that was washed away due to Hurricane Harvey, allow us to have access to his bank for a while. Harris County Flood Control gives us access to a lot of their boat ramps and a lot of their sites.

David Todd [00:56:02] And it's just, it really is kind of a partnership through a lot of entities to get this project to have as much success as it's had because gaining access is really the major issue into Buffalo Bayou, because of the building - you have people's backyards go right up to bayou.

Eric Munscher [00:56:25] And it's a really hard bayou and water body to boat. A lot of studies go by boat where you can set traps from the boat and boat the length of your waterway. Buffalo Bayou, you can't. It gets really shallow. You have to pick your boat up. It's just not adventitious to researchers and time to boat the distance.

Eric Munscher [00:56:44] So, we find areas where we try to make a three-mile gap because we know our animals. That's kind of the max movement, three miles. So, we know if we do a three-mile gap, we know we're going to catch new animals in that three miles.

Eric Munscher [00:56:57] So, we're trying to fill in that hole from downtown Houston to the dams. We're trying to fill in that whole section of Buffalo Bayou with gaps where we expect at that point we should see movement. We should be catching turtles in between those gaps to get an idea of the true population of Buffalo Bayou.

David Todd [00:57:20] Okay. So, while we're talking about hydrology and the impacts from storms, and I think what you mentioned before in Buffalo Bayou can be an issue. I imagine that on some of these rivers where alligator snapping turtles are seen, there are big reservoirs, some of which, you know, make these hydroelectric releases.

Eric Munscher [00:57:47] Yes.

David Todd [00:57:47] Or they have to do a release when they expect a big storm coming through for flood control reasons. Is that an issue for alligator snapping turtles?

Eric Munscher [00:57:56] So, it's a good question. And it's actually come up with a lot of AST researchers is the whole dam situation and a lot of habitat is understudied. Just based off of our experience with the dam releases in Buffalo Bayou, I would think maybe at the vicinity of the dam release, the turtles will know what's going on and move. But overall, I don't think it affects them simply because of our experience with some of the worst flooding that Houston's had in recent memory.

Eric Munscher [00:58:27] We have a pretty neat story with Buffalo Bayou, where in February of 2017, we caught this 90-pound alligator snapping turtle in downtown Houston, by one of the really well-known restaurants in that area. Caught him; marked him. He has his microchip.

Eric Munscher [00:58:46] Come Harvey, we get a call from the SPCA and that they had, the Houston PD Department picked up an alligator snapping turtle walking Memorial Drive. This was right after the storm. So Memorial Drive still had some water on it. And they moved the turtle to the SPCA. [Excuse me.].

Eric Munscher [00:59:10] We get the call the next morning from Texas Parks and Wildlife, Kelly Nord, myself and Jordan Gray from Service five Alliance all met at the SPCA there to see the turtle. And I walked in and I noticed right away that the turtles notched. So I'm like, "That's one of our turtles".

Eric Munscher [00:59:28] And we talked to ... where he was found, and where he was picked up on Memorial Drive. I have a point. I know where he was picked up, and I know where he was caught. And that was all of 2000 feet. So, the worst flood in Houston in U.S. history moved the turtle 2000 feet. No, he moved himself 2000 feet. It didn't affect him.

Eric Munscher [00:59:50] I still, seeing all these major floods that we've had since then - the Tax Day flood, May Flood, and various other floods that we've had, that have come through Buffalo Bayou, it doesn't seem to affect them at all.

David Todd [01:00:04] Well, if my Houston geography's right if you if you caught him originally in downtown and you found him later in Memorial Park...

Eric Munscher [01:00:14] No, this was Memorial Drive across the street from where he was originally captured. Memorial Drive's the road that parallels Buffalo Bayou.

David Todd [01:00:21] Okay.

Eric Munscher [01:00:22] He was cut 20 feet from where he was originally caught.

David Todd [01:00:27] But upstream?

Eric Munscher [01:00:28] Half a mile. This was yeah, this would be upstream.

David Todd [01:00:31] So, I mean, despite 30,000 cubic feet per second - many, many cubic feet per second - coming through, he somehow managed to move against the grain, upriver. Remarkable.

Eric Munscher [01:00:45] And they're known, you know, when it floods, it creates new habitat, new chances. Animals are curious, just like people. He could be looking for a new food source or a new habitat. This was a big old male. His nickname now is Harvey.

Eric Munscher [01:01:00] Another really interesting tidbit about Harvey is that Kelly Norrid from Texas Parks and Wildlife noticed he had buckshot in his shell. When we were releasing him, there was buckshot in the back of his shell. And how long has it been since somebody has been carrying around a shotgun in downtown Houston? Probably a while. The turtle is old.

David Todd [01:01:23] That is extraordinary.

David Todd [01:01:26] Well, so, one other question about water and these alligator snapping turtles. You know, Houston has a lot of sources of pollution, you know, runoff and so on. And I imagine there are loads in Buffalo Bayou or maybe in other parts of southeast Texas where you've got mercury, or you've got PCBs or heavy metals of some kind. Do you find that in these turtles? You know, is that an impact that you're concerned about?

Eric Munscher [01:01:58] So that study is not something we've tackled yet. We haven't done any mercury testing on our animals. Stephen F. Austin grad students, I believe, have, or are currently doing a mercury study on their animals that they've caught in various sites across Texas.

Eric Munscher [01:02:16] So I'm not positive. I wouldn't doubt it.

Eric Munscher [01:02:20] They are a bioaccumulator. So, being a major predator in their habitats, they are going to accumulate what they eat. So, if the fish are accumulating it, and they're eating all the fish, they are going to accumulate it.

Eric Munscher [01:02:36] Whether or not it negatively affects them, I don't know. We catch a lot of very old turtles, very large turtles that have been around a lot longer than I have.

Eric Munscher [01:02:48] I wouldn't eat turtle.

David Todd [01:02:54] Yeah. Who knows what might be inside.

David Todd [01:03:00] So, speaking of eating them, I think you had touched on this earlier that Louisiana still has a legal harvest.

Eric Munscher [01:03:13] Yes.

David Todd [01:03:13] And yet, I think you also mentioned that three of the basins in western Louisiana are pretty fished out. And I'm curious if that kind of pressure in Louisiana and the fact that it's legal causes pressure in the adjacent state, Texas, where it's not, to poach.

Eric Munscher [01:03:33] Yes.

David Todd [01:03:33] Do you see any of that?

Eric Munscher [01:03:34] There is a direct story from that. I think this was 2018 where there were a couple of Louisiana guys that were caught violating the Lacey Act. I think they ended up having 64 alligator snapping turtles in their possession that were caught from Texas. Those animals were then housed at the U.S. Fish and Wildlife Fish Hatchery in Louisiana.

Eric Munscher [01:04:02] I was actually invited by Texas Parks and Wildlife to come up and help the Stephen F. Austin grad student at the time outrig 26 of those animals with telemetry devices so that we could put them back in Texas and track them and see what they were doing. And I think his study is still ongoing where he's tracking the movements of those released animals.

Eric Munscher [01:04:27] But I believe that the three that were caught violating the Lacey Act ended up getting a few years in prison.

Eric Munscher [01:04:35] And I wouldn't doubt that that's happened a lot. In Texas, what 94% of the state is privately owned? So, it's really hard to get an understanding of what's going on in people's properties that abut major rivers.

Eric Munscher [01:04:48] And in Arkansas, I don't know if anyone really has an idea of what's going on in southern Arkansas, that could be an impact from Louisiana.

Eric Munscher [01:04:59] Mississippi used to have its own harvest as well. And I believe that that's finally been stopped. And I have a buddy of mine who works for U.S. Fish Wildlife now, Luke Pearson, who did his master's, Ph.D., and Post-doc, I think, in Mississippi on alligator snapping turtles. He's got more alligator snapping turtles than anybody alive, I think, at this point. He found them all over the state, but only a few really, I think, viable, really good populations.

David Todd [01:05:29] Okay, Well, you've gone down the list of different impacts on these marvelous creatures. Is there something that we haven't mentioned? I mean you talked about the harvest issue and the hooks and, you know, briefly about the hydrology and water quality. Is there anything that we might be missing that you wanted to add?

Eric Munscher [01:05:54] I, I would say the major issue going forward I see is just instream impacts. If people or projects remove microhabitat, it really can affect the species. They, that is their habitat that they rely on for bedding down or for feeding. So, if a waterbody's scoured clean of that, that's really leaving the water body kind of useless in some ways to the species.

David Todd [01:06:28] Gotcha. Okay. So, the macrohabitat may be largely intact, but these little micro niches ...

Eric Munscher [01:06:37] Yes.

David Todd [01:06:37] May be affected in some way in that could be a problem.

Eric Munscher [01:06:39] And it could cause movement where the species or the animals that are using that might not have moved before. And if you remove that habitat, they'll have to move and find new habitat where it could be already being used by others, where the species is pretty aggressive. It's known to be aggressive to each other in other parts of the country. Researchers have seen male/male combat and injury.

Eric Munscher [01:07:07] In Buffalo Bayou, surprisingly, with how many we have had marked, especially big males, we don't see that. And I simply think it's because of how much available habitat Buffalo Bayou has that there is no real need for the males to combat one another for it.

David Todd [01:07:25] Okay. Well, as you mentioned, you, I guess, as an individual and through your partnerships with Parks and Wildlife, and through your role through Turtle Survival Alliance, have been really involved in research about the alligator snapping turtles. And I was wondering if we could talk a little bit about both your research and then also some of the research that's been useful to you from other folks.

David Todd [01:07:55] And I thought maybe as a first question, you know, given that there are these gaps that I think you said that you really only started studying these in earnest about seven or eight years ago. What does that mean for how you, you know, what sort of challenges there might be for trying to understand these creatures?

Eric Munscher [01:08:20] So, I think we lucked upon a really good study site for this question because it seems to be very dense. I've actually had a couple other alligator snapping turtle researchers like Dr. Day Ligon and his wife, Denise Thompson from Missouri. They came down and because I think they had a hard time envisioning catching alligator snapping turtles where high rises are. And they got down and trapped with us for a weekend.

Eric Munscher [01:08:51] And we caught 19 turtles in that weekend. And they were just dumbfounded that there were so many, that it was so dense. At that time, we caught the largest I think they had seen. It was a 133-pound individual that we nicknamed El Gigante.

Eric Munscher [01:09:09] And I think having this study site kind of gives us a lot of opportunity to answer some questions.

Eric Munscher [01:09:17] Previous to Buffalo Bayou, the species was not known to inhabit city centers. And now we know they, the studies in Tuscaloosa, in Alabama, there's a study being done by Andy Coleman there. He's catching them in that city center. There has been work in the Dallas-Fort Worth area - they're being caught up there.

Eric Munscher [01:09:36] So, they're utilizing habitat that previously probably would have been considered atypical and degraded. And researchers probably would have just ignored. And apparently the turtle doesn't care. It actually can thrive in these situations.

Eric Munscher [01:09:54] And in Buffalo Bayou's instance, if the habitat's left alone enough where it offers the turtle what it needs, it will thrive. And that's what we're seeing is a very dense, very viable population of the animal in the midst of urban sprawl.

Eric Munscher [01:10:12] And if it can handle this habitat, you know, if precautions are taken with overharvesting and with maybe fishing regulations, then the species probably has a good opportunity to come back in areas where it might have been impacted before, you know, in a few generations.

David Todd [01:10:37] Yeah, that seems like an encouraging sign that, you know, for all the slings and arrows of living in Houston and in Buffalo Bayou in particular, this, this creature seems to be, you know, pretty persistent and resilient.

David Todd [01:10:56] So, one of the things I think has been really interesting from the little I've learned about alligator snapping turtles is that there's a lot of knowledge that's just out there in the general public, especially in more rural areas, about this creature that may not be formally academic or, you know, people who've got, you know, higher degrees of education like you.

Eric Munscher [01:11:17] Absolutely.

David Todd [01:11:18] But they do know that their local flora and fauna.

Eric Munscher [01:11:22] And it's an iconic species. So, the University of Houston, a good friend of mine, Mandi Gordon, did a study and myself and my co-researcher Arron Tuggle, with the rest of the TSA helped her. It was another statewide assessment in Texas. It was doing, it was a tandem statewide assessment with David Rosenbaum out at SFA. But she was looking at different counties, different waterways than he was - kind of filling in gaps between the two.

Eric Munscher [01:11:56] And we published a paper from her study that was using Local Ecological Knowledge, "LEK", where she did interviews on countless landowners and river agencies and using iNaturalist, VertNet, and things like that on localities where people are saying they've seen alligator snapping turtles. And then going back and trying to vet a lot of that.

Eric Munscher [01:12:22] As it became a really nice paper and I think a template that could be used for that species elsewhere across its range and other species. This is right. There is a, there is that local ecological knowledge. People know the animals that live in their backyard. They've seen them. You, as a researcher, don't have access to that area. They do. And their fathers and grandfathers and so forth have. And there's things that are probably passed down generations, especially with long-lived species like alligator snapping turtles.

David Todd [01:12:57] That's very cool. So, you get this longitudinal data that may be really difficult to replicate if you're a grad student and you've got, you know, a year or two and then you've got to graduate.

Eric Munscher [01:13:09] Exactly.

David Todd [01:13:10] You can't come back again and again to study this creature.

David Todd [01:13:16] Well, you know, you mentioned at one point, that part of the problem with really getting to know this turtle is that it's a large fearsome creature. And so I'm curious, how do you capture these guys? What sort of trapping techniques do you use? You know, what is the process of getting them to the shore so that you can examine them?

Eric Munscher [01:13:43] So, we use a single-throated hoop net that's typically a three-foot wide, ten-foot long hoop net that we'll put facing downstream. So, it carries the bait scent. We'll bait it with either a whole fish or a big chunk of fish, typically tilapia or catfish, something that they have access to in their habitat.

Eric Munscher [01:14:07] And you would think why would they eat tilapia? Well, tilapia are everywhere now, and they do eat it.

Eric Munscher [01:14:15] So, we'll bait the trap with the fish. And they are, turtles, for their part, are voracious eaters. They will eat and eat and eat. And if the conditions are great, if it's not too hot, not too cold, the turtle's going to be interested in the food. So, it's going to come to that scent, it's going to investigate. And it's going to get in that net. And their eyesight's not the best. They rely on those other sensory organs. And once they're in that net, it's hard for them to figure out where the opening of the net is.

Eric Munscher [01:14:48] Not saying they can't. We've definitely have had turtles escape. I would love to have a camera that can see through that chocolate-milk water to see what the turtle's actually doing within the trap. That would be really neat. But for the most part, I think that the capture rate, when they get in, is pretty high.

Eric Munscher [01:15:02] And when we get ... our research crew's typically four people. We'll have a scribe. That's usually my daughter. She's 14. She'll write down all of our notes for us and then we'll have three researchers. And I try to keep a team of 3 to 4 because of dealing with large turtles, because you'll have to have one to two people fight the turtle, and pull him or her out of the trap. And one person fighting the trap.

Eric Munscher [01:15:32] Because these turtles, their feet are the size of my hand. And their claws are the size of my fingers. So, they're trying their best to either get into the substrate and pull themselves out of your grasp, or they're going to get their claws stuck in the net.

Eric Munscher [01:15:50] So you have to fight them getting their claws stuck out of the net.

Eric Munscher [01:15:52] And so it's a multi-person process. It's exhausting. It's dirty.

Eric Munscher [01:15:57] As I said, we've had traps with five turtles in them that nearly weighed 400 pounds. So having more crew at that point is good. We've had crew of up to seven, eight people help, where people are holding the net, and we're just selecting the easiest turtle to take out at that point, get the smallest turtle at that point, so the big ones aren't going to beat it up. And then do that - smallest to biggest. Leave the big guy alone so we can deal with him last.

Eric Munscher [01:16:22] And it can be a multi-hour process.

Eric Munscher [01:16:24] We take a lot of measurements because we want to, over time, with this big ten-year paper that we're planning for a population assessment, we also want to do a growth analysis. That's something that really hasn't been done either, because to do

growth modeling, you need a lot of recapture data. So, over the ten-year period, we actually have decent growth recapture data now on our seven-year. We hope to have enough to do the first growth model for the species as well.

Eric Munscher [01:16:49] We take a whole bunch of different measurements. We mark them. We kind of do a general health assessment, where we look to see if the turtle's been damaged in any way, if it's been bitten by another alligator snapping turtle, or if it got shot. Or, you know, you never know what you're going to find.

Eric Munscher [01:17:04] We had, in Florida, we had a large river cooter that was target practice unfortunately by somebody.

Eric Munscher [01:17:13] So, we take a whole bunch of different notes and data on the species. We do wand them for metals. So, we have a metal detector that we use to make sure that if they ingested any metal. I don't have the funding yet. I hope one day to get funding for a X-ray machine. They're pricey. But it'd be great to be able to visualize and quantify the locality, and how many hooks that the turtles are ingesting.

Eric Munscher [01:17:42] And, after that, each turtle is, the last thing that we do is we put the microchip in and the microchip is inserted via a needle. It's actually the exact same microchip that a dog or cat gets at the vet. The same style PIT tag. It's called Passive Integrated Transponder tag. And then once that turtle gets that, we put some New Skin on the hole, on the wound, to seal it, and we let the turtle go. And we hope to see it again in a year or so.

David Todd [01:18:13] That's great.

David Todd [01:18:16] Well, so this is looking mostly at, of course, live turtles. I'm curious if, in the course of your studies of alligator snapping turtles, if you've been able to find anything in the, you know, the archives, you know, like fossil turtles or, you know, turtles that were collected 100 years ago or 50 years ago, that may have been interesting to you.

Eric Munscher [01:18:45] So, there is one record from the Brazos River that's always been intriguing to any alligator snapping turtle researcher because it's never been corroborated. There's been a few trapping sessions in the Brazos River to try to catch alligator snapping turtles in them, and with no luck so far.

Eric Munscher [01:19:05] Occasionally, if you go to like these fishing forums and read fisherman, their accounts, and they'll say they hooked a giant turtle on a line in the Brazos River. And it just piques my interest because the Buffalo Bayou is so close to the Brazos, geographically. I just don't know why the species would not be in parts of the Brazos. The Brazos has a super flashy flood system too. It has very tall banks and sees a lot of water, but so do lots of other rivers that the species is in.

Eric Munscher [01:19:39] So, it is intriguing why it hasn't been found yet in it, and I think it might just be relegated to the very far regions of the Brazos River. That might be better for the species. So, the very southern parts of it where the Brazos Bend State Park is. In fact, the Brazos Bend State Park staff in the past have mentioned seeing alligator snapping turtles there.

Eric Munscher [01:20:00] The problem with that area of the river is the presence of an abundance of alligators. And for any AST researcher, that is like the worst thing to catch in a

trap. It is just such a pain. For one. if it's alive, it will let you know it's alive. It's going to be a pain to get it out of the trap. More than likely, it's going to drown. And I hate killing a giant gator for no reason.

David Todd [01:20:28] Okay, well, you've told us...

David Todd [01:20:32] [Excuse me. Go ahead, please.]

Eric Munscher [01:20:32] Sorry. I just remembered it.

Eric Munscher [01:20:34] So, in July, early July, late June, we were notified of a observation of two adult individuals and a third that they did not directly see. This was a fisherman on the San Bernard River. And we got two, we got photos of two adult individuals. And the San Bernard River is actually southwest of the Brazos. So, we have two adults and possibly a third that were noticed in there.

Eric Munscher [01:21:05] And there was a brief survey, I think, in the San Bernard by Rosenbaum. They did one trapping session, didn't catch any. But seeing these potential three animals, we are writing a proposal to add it to our survey regime, and we plan on studying that system next year, especially during the breeding season, where, if there are turtles in that river system, we should be able to get them.

Eric Munscher [01:21:28] It will be really interesting, because that observation of those adults actually corroborated the presence of Brazoria County record and a San Bernard River record. So, a new county to the species, new river to the species.

David Todd [01:21:43] Well, that's exciting to think that maybe the range is expanding or it's bigger than you believed. That seems like a positive sign.

Eric Munscher [01:21:50] Absolutely. Through these statewide studies and through local ecological knowledge, they actually have been able to fill in a couple of counties over the last five years.

David Todd [01:22:00] Cool.

David Todd [01:22:02] Well, I think you've given us a wonderful overview of the, you know, the ecology and population biology and some of the impacts and your study programs.

David Todd [01:22:14] How about if we talk, as we start to wrap up, about what you think would be effective ways to conserve and restore alligator snapping turtles.

Eric Munscher [01:22:26] So, I really think it's education on why riparian systems and why leaving water bodies as they are really, with the microhabitats especially, leaving them as they are, especially if, you know, alligator snapping turtles are in the system.

Eric Munscher [01:22:43] It's important because they're utilizing it and they're being successful at that point. And riparian zones are super important for the species, and not just for that species, but for a lot of species in that river system.

Eric Munscher [01:22:54] As I mentioned, the Yellowstone, losing the riparian zone for a lot of fish species, is impactful. A lot of fish species actually rely on that shade provided for laying

their eggs because if you don't have that, then the water overheats. I don't know if that will directly affect species that live in Buffalo Bayou, or southeastern species, but it has been noted that it affects fish species elsewhere.

Eric Munscher [01:23:21] And then education overall of fishing tackle use or development or maybe using tackle that is known to dissolve quickly. So, it might be a short-term impact to the animal. It swallows the hook; that hook will be gone in a week or two, where it's not going to affect that turtle, where it might make it starve if that hook is in its throat or in its stomach.

Eric Munscher [01:23:47] If that hook goes away quickly, then that turtle can recoup and it will be fine, rather than losing that turtle to it to hook.

David Todd [01:23:56] That's fascinating. So, there are materials that you can build hooks out of that degrade?

Eric Munscher [01:24:02] I've heard (I'm not an active fisherman myself), I've heard that there are hooks that dissolve quicker than others. And I would think that that would be something nice to try to get mandated, especially in Buffalo Bayou, where the only fish they're going after is the alligator gar. The use of smaller hooks rather than the giant hooks, or hooks that have materials that are made of erosional materials rather than not.

David Todd [01:24:37] It sounds like a number of these hooks that you mention aren't from people who are actively fishing, but they're actually from trot lines that have been left ...

Eric Munscher [01:24:48] Yes.

David Todd [01:24:48] To sort of passively fish. Do you think that there's any way to regulate or limit the use of trot lines?

Eric Munscher [01:24:57] So, I think a lot of states actually have those regulations down, that you have to have, you know, your fishing license, you have to ... and I believe that leaving derelict trot lines, I believe is a finable offense in lots of states.

Eric Munscher [01:25:14] It's just, it's hard for game wardens to monitor a lot of that because of the range. You know, with Texas especially, 94% of it, it's private land. It's really hard to get an idea of what's going on in rivers that aren't near city centers, or they're encapsulated by private property.

David Todd [01:25:38] Yeah, it's one of those things that sounds like a good idea, but it may be difficult in practice.

Eric Munscher [01:25:42] Yeah.

David Todd [01:25:47] So, I think that one of the issues that you have touched on is the overharvest and perhaps black market trade in these turtles. And I'm wondering if there's any sort of better mouse traps there - genetic tracing, perhaps?

Eric Munscher [01:26:11] Great question. So, actually, the Turtle Survival Alliance has been trying to spearhead this in a lot of ways, using advanced genetic labs like the Tangled Bank lab that's run by J.J. Apodaca. He's actually helped with a lot of a lot of alligator snapping turtle

genetic studies recently. He actually published one in the Southeastern Naturalist special edition, where he was looking at the speciation of the genus.

Eric Munscher [01:26:40] So, he was looking at if there are more species within the genus. Right now, there're two viable. In 2014, Travis Thomas, et al., described three. They were supposed to be, they were pushing for a third species of alligator snapping turtle called the Apalachicola snapping turtle. That got refuted a year later by another paper saying there wasn't enough information.

Eric Munscher [01:27:03] J.J.'s paper that just came out kind of pushes the envelope back towards maybe there's, it should be. We need a little bit more data, but maybe there should be three species of alligator snapping turtle.

Eric Munscher [01:27:13] But, getting back to your question about genetics, well, he's also doing a box turtle genome map, where he's trying to do box turtles across the range, each species. So that box turtles right now are one of the main species of turtle that the Turtle Survival Alliance gets wind of as being shipped to China for pet trade. So, a lot of populations of box turtles across the country are dwindling.

Eric Munscher [01:27:39] And this idea is we get a lot of those turtles through shipments, through busts at airports, and then we don't know what to do with them. We can't put them back because we don't know where they came from.

Eric Munscher [01:27:52] But, if you take their blood and their DNA, you run it and you get an idea of where that DNA ranges from, then you have a better idea and then you can release them.

Eric Munscher [01:28:03] And that's what J.J. did for the 26 alligator snapping turtles that Texas Parks and Wildlife and U.S. Fish and Wildlife released from that Lacey Act violation. So, we knew what river drainage they came from. Some from the Sabine, some from the Trinity. And they were allowed to be released into those watersheds again.

Eric Munscher [01:28:24] So, the idea is to create these genome maps for species that are heavily poached, heavily for pet trade or whatnot, and that we can actually get them back, either through international means if they are busted in Hong Kong or whatnot, or if they're busted from one of our own airports where they can go to into stasis somewhere.

Eric Munscher [01:28:45] Like Turtle Survival Alliance has lots of people take turtles to house until we know what to do with them, until U.S. Fish and Wildlife says what we can do with them.

Eric Munscher [01:28:55] And being able to have the genome map for the box turtle especially is going to help us be able to release box turtles back into the wild rather than having to keep hundreds or thousands of box turtles as pets, which is not good for the species and hard for the people.

David Todd [01:29:14] So, I've heard that with some species that are either in bad shape or uncertain shape, that there are efforts to captive breed and release. Is that something that you see as viable for the alligator snapping turtle?

Eric Munscher [01:29:31] So, there is the Tishomingo fish hatchery up in Oklahoma is actually, they have a captive population there that they do breeding. The Illinois group, Dr. Mike Dreslik and Ethan Kessler, actually released a bunch into the Illinois range up there to see if they could reestablish a population.

Eric Munscher [01:29:57] So, there are some reintroduction projects going on.

Eric Munscher [01:30:01] I believe there is actually one also going on in eastern Louisiana, where Louisiana Fish and Wildlife is doing some reintroductions of young alligator snapping turtles to sites, and seeing if they can go back in and recapture those individuals, you know, a year or two later.

Eric Munscher [01:30:18] So, there is some of this going on.

Eric Munscher [01:30:20] And I think in certain instances in Louisiana, I would see it being successful if the turtles are left alone, there's no reason why it wouldn't be successful.

Eric Munscher [01:30:29] With the northern range, unfortunately, I was notified at the Turtle Survival Alliance conference this past July that more likely it's failed, and they don't believe that the turtle is going to be viable in the northern stretches anymore.

Eric Munscher [01:30:44] And in Kansas, I'm not sure yet. That state's very similar to Texas in that a lot of the property is private, but that private property actually goes into the rivers. So, it's really hard to gain access and do work for a certain species in Kansas.

David Todd [01:31:03] So, I guess in Texas, just to distinguish the property laws from Kansas, if it's a navigable stream, I guess you do have access.

Eric Munscher [01:31:13] Correct.

David Todd [01:31:13] And so you can do studies and releases and so on, but not so in Kansas.

Eric Munscher [01:31:19] Not so in Kansas.

David Todd [01:31:21] So, the situation in Illinois is troubling. Do you think that there's some level where, if the population submerges below some kind of de minimis level, you can't just reboot this with a release?

Eric Munscher [01:31:37] I think there's some of that. And also, I think due to losing the existing population there, what they're seeing is the change in temperatures. It's, it might now be due to global warming issues. It might be too cold for the species to actually live in a viable population there. They actually have...

Eric Munscher [01:32:02] Well, dang it. I lost my train of thought. I wonder where I was going with that.

Eric Munscher [01:32:10] So they released, I think, 30 or so of them. And they, I think they were able to recapture a handful, but ... now I can't remember the, what the main reason, one of the main things I was going for there has just alluded me.

David Todd [01:32:28] So, just, I'm curious if there's some level where if the population gets so low that even if you do a captive release, it's not likely to be successful. And then I think you were explaining that well, maybe it's a climate change problem.

Eric Munscher [01:32:45] Yeah, that's definitely can impact a lot of turtle species going forward because turtles, most turtle species, have temperature-dependent sex determination. So, depending on how hot the nest is, you get males, females or males. In lots of species, the male window is either hot, or it's either cold or hot. The females are in the middle. It's very ... yeah, it's interesting. And that could be really detrimental to many species. If it gets too hot, you're developing all males, where the sex ratio is going to crash for females and you're going to lose that breeding potential.

Eric Munscher [01:33:23] So, they're seeing that in sea turtles in some areas, where sea turtle nests might come out all one sex. So, that could be detrimental.

Eric Munscher [01:33:33] For species that are riparian specialists, for ASTs, I would think as long as the riparian zone is healthy, that should limit that because the riparian zones are going to block a lot of the direct sunlight that sea turtles have on just a beach front.

Eric Munscher [01:33:48] But one of the interesting things that I do remember that I was going to mention is that the species is not a basking turtle. They thermoregulate very well within their water column. They have been found to bask in Illinois and Indiana, because the water column is so much colder up there, they actually have to bask to thermoregulate.

David Todd [01:34:16] I see. So, the populations in maybe non-basking groups ...

Eric Munscher [01:34:22] Yes.

David Todd [01:34:22] Like in Texas may be a little bit less, I don't know, vulnerable to temperature swings.

Eric Munscher [01:34:29] Yes.

David Todd [01:34:29] Gotcha. Okay. Well. Let's see.

David Todd [01:34:38] I'd like to talk a little bit about institutions as we start to wind up. One is you're the research director, as I understand, for the Turtle Survival Alliance. And I was hoping you could talk a little bit about that group and, you know, if there might be ways that you can link the alligator snapping turtles' fortunes, for good or bad, with other turtles that you have been looking at.

Eric Munscher [01:35:06] Sure. So, the Turtle Survival Alliance actually caught wind of my group at the time, when I took the Wekiwa Springs study over from Dr. Hauge. The Florida Fish and Wildlife, FDEP, asked to have a couple of other parks added. So, at that point, we're studying four parks. The Turtle Survival Alliance is a global non-profit that holds a yearly turtle symposium for freshwater turtles and tortoise research. They held it in Orlando that year, and I was, I had my Wekiwa Springs study planned for that time period, and they contacted me if they could use the study as the symposium, a field trip.

Eric Munscher [01:35:45] I said, "Great, yeah." Get 20 international people to come and swim Wekiwa Springs for turtles and they'll have a blast. And it was a great time. We ended up

catching almost 200 turtles of eight species. So, people from Egypt and Malaysia, India got to see species they'd never seen before and swim in crystal-clear water doing it.

Eric Munscher [01:36:04] And the Turtle Survival Alliance liked it so much that the next symposium they asked if our group would like to be their official research group, and then, through them, we could expand elsewhere. And now we have nine study sites in Florida. We have one in New Jersey, one in Pennsylvania, one in Tennessee, one in Washington state, three in Texas, one in Belize, and soon to be one in Costa Rica.

David Todd [01:36:34] That's impressive.

David Todd [01:36:35] And it's really driven through volunteerism and students. A lot of projects, especially the larger projects, we really pushed along through student involvement, whether it be from the University of North Florida, which is my alma mater, from my grad study, or through University of Florida, having friends that are professors there, and then word of mouth.

Eric Munscher [01:36:56] We are a non-profit that really loves getting the public involved. And we have, you know, there's regulations in some of our study sites that have alligators where we can't have kids in the water, but some study sites are perfectly safe. So we've had people there. You know, kids that are 12 years old get in the water and catch turtles with us.

Eric Munscher [01:37:14] And one of those kids now is a freshman in college and has just become a turtle rock star. So it's pretty neat seeing how our projects have influenced people to continue on their career path of being the next turtle researchers.

Eric Munscher [01:37:32] And these projects are all kind of geared for turtle assemblages, largely. All the turtle, all the Florida projects are "catch every turtle you see." We take data on every single one. We will then look to see what data we have for each one and publish papers accordingly by species, genus or assemblage.

Eric Munscher [01:37:50] There are a couple of projects like the alligator snapping turtle project in Buffalo Bayou, where that's the species. If we catch anything else, we release it. We don't take any data on it. We are only looking for the alligator snapping turtle.

Eric Munscher [01:38:03] We have one in Pennsylvania on the wood turtle. We have a project in New Jersey on the bog turtle.

Eric Munscher [01:38:10] And the whole idea is to go into these three sites with a ten-year program, at least - get that ten-year window where we can do a population model that hopefully, if the population is showing some interesting data, then do another ten years and see, you know, here's your first ten years, your next ten years. What changes in that ecosystem have occurred during that ten-year span? Is there a water quality difference that we can add to the model? Is there human impact that we can add to the model? Things like that.

Eric Munscher [01:38:39] And over that time span, through the Turtle Survival Alliance, we've gotten funding for other shorter-term projects - so, movement studies. We did a year-long movement study on the Florida peninsula cooter, the Florida red-bellied cooter. That was our first graduate student project, and she was a student out of Jacksonville State University in

Jacksonville, Florida, who did a year-long study on both those species. Movement had never been looked at. Found that they can move a lot. It was a really neat study.

Eric Munscher [01:39:08] Then we did one for the alligator snapping turtles here. We have a tracking study being done on bog turtles. We did one in Belize on the Tabasco mud turtle with our second grad student.

Eric Munscher [01:39:20] So we're trying to get graduate student projects in now to fill in some natural history knowledge that are lacking on certain species.

Eric Munscher [01:39:29] Some other things that we would like to do would be dietary stuff in the future for some, nesting habitat for some.

Eric Munscher [01:39:37] I got funding recently to do a new tracking study with alligator snapping turtles using satellite tags. And it's only for females. I want to tag 20 female alligator snapping turtles with these satellite tags so that when they come out of the water column, that satellite tag starts pinging. And I can tell where she went. I can tell what time she spent at a site. So, it's going to allow me to tell if she nested or not probably. If she's sitting in an area for a longer period of time, that's where she nested.

Eric Munscher [01:40:07] So, we get an idea of what habitat they're using in the Buffalo Bayou area, the riparian column. So, we can kind of help with conserving that riparian zone through their use.

Eric Munscher [01:40:19] So, it's really trying to fill in. The population analysis is the key point because a lot of species don't have it. And that's our forte. That's what we really are is population ecologists.

Eric Munscher [01:40:30] But then, through that, we can fill in all the other knowledge gaps on life history parameters that aren't really known for these species - movement, diet, nesting.

David Todd [01:40:41] That's fascinating. Well, I love the way, you know, you're following your curiosity.

David Todd [01:40:45] And I'm wondering, as you study the, you know, these different species, you know, whether wood turtles, bog turtles, cooters, you know, red sliders, all these things, are you seeing any sort of themes that are running through all these populations and species? You know, is the alligator snapping turtle unique, or does it have some sort of shared impacts and problems?

Eric Munscher [01:41:11] So, what we're seeing is if you're in a protected habitat, so, if you are a protected state park preserve and the impacts are slight, the survival rate (and that's a parameter that we can calculate doing our population model), the survival rates high, you're showing 90% or higher survival. And that's great for an adult turtle because that shows that adult turtle's living her or his life and replacing themselves.

Eric Munscher [01:41:40] That's the key point for turtles, is that with how much nest predation they have, a female turtle who might lay to nests a year, depending on the species, she might lay a total of 40 to 50 eggs. She's lucky to have one egg survive to adulthood to replace her.

Eric Munscher [01:41:59] So, having her be able to live that long life drives that population.

Eric Munscher [01:42:05] So, and so, in healthy habitats, and protected habitats, so that's what we're seeing, is that left alone, they tend to be good. They tend to be able to manage themselves, even with all of the subsidized predator issues, with the raccoon population explosion, things like that - the mesopredator issues. They can handle that as long as we don't exacerbate it.

David Todd [01:42:30] Okay. So, another question, sort of related to institutions. You mentioned the Turtle Survival Alliance and all the interesting programs you've got there. You've also got this day job with SWCA. And I'm curious, you know, what sort of overlap, if any, you see between your work, 9 to 5, and then this volunteer, pro-bono work that you do on the alligator snapping turtle.

Eric Munscher [01:43:01] Yes. So, depending on the species, as I mentioned earlier, if you work with something long enough and gain the trust of the state agencies and work with them and get them knowledge that they require and want, you can really become known as somebody who cares for the animal, who can be trusted for the animal and get, you know, get scientific permits and whatnot.

Eric Munscher [01:43:25] And having that trust and that knowledge base, if you get a project where the species might have an impact or you need to study the species, you're allowed to. And working with SWCA, that's what I'm seeing - is as I carried the gopher tortoise permit for over a decade and I got to use that gopher tortoise permit from Florida on some big pipeline projects in Alabama, Mississippi, and that really helped our client out. I was able to use my permit and my science to help the species out in that regard too, to help it through the permitting process for the pipeline to avoid those burrows.

Eric Munscher [01:44:03] And then for the alligator snapping turtle, with all of our research having various agencies like Harris County Flood Control coming to us, so that we can help monitor their projects and make sure that there's no impacts to alligator snapping turtles.

David Todd [01:44:18] That's great.

David Todd [01:44:20] Well, I think that you may have kind of suggested this by just talking about your network within the Turtle Survival Alliance, but I was hoping that you could talk a little bit about the herper community, which seems like this unusual group of people who, unlike, you know, a lot of us who see a reptile and we, you know, we flinch. We run away from the alligator or the snake. Or we don't have the same kind of affinity for something that's cold-blooded. Your folks go right on in and seem interested. So, I was wonder if you could talk about herpers.

Eric Munscher [01:45:02] Absolutely. So, it's interesting. I think there are various groups of us, but all together, I think we love the unloved. And I don't know what lends that to. And maybe it's just simply because we understand at an inherent level that they're important, and we see past the danger. We understand, yes, the animal should be respected. Absolutely. Maybe not feared, respected, understood in their process and what they do to the ecosystem.

Eric Munscher [01:45:36] Case in point: the gopher tortoise is a keystone species. It is an ecosystem engineer, where it is now known that that tortoise is responsible for over 400 other species utilizing it in some way, whether it be its burrow, whether that tortoise's eating

seeds, the way the tortoise has to eat the seeds to germinate them, where the plant's relying on the tortoise to germinate the seeds for it.

Eric Munscher [01:46:02] Without that tortoise, the ecosystem would collapse. So that tortoise is extremely important.

Eric Munscher [01:46:07] Alligators are ecosystem engineers. They're extremely important to their system.

Eric Munscher [01:46:12] And just everything has its place.

Eric Munscher [01:46:14] And just with the wolf in Yellowstone example, if it goes missing, you will notice the ecosystem is going to show you stress response. There's going to be an issue that will come in the years to come.

Eric Munscher [01:46:27] And with herps, it's just a, I think that, they lend a kind of a fantasy aspect to it too. As growing up as kids, you know, with the dinosaurs and, you know, that mythical amazing creature that is no longer here. Some people still love, you know, the paleontologists, those that work in finding old bones and old dinosaurs. But the people who want to handle living animals get to kind of do that with reptiles and amphibians and fill in some of that gap and just the fascination of how varied they are.

Eric Munscher [01:47:08] And across the world now, there are so many different species of snake and frog. Turtles: there's over 300 species of freshwater turtle that I bet you people don't know, at all. And seeing their life history stages and seeing what environments they use is fascinating.

Eric Munscher [01:47:28] And it provides, for a person like me who's really become interested in their careers based off of population analysis, turtles really provide me that route, because if you find a healthy turtle population, you can study it for your career like Dr. Peter Pritchard did and so many others. You will, you can, I'll have turtles I've marked in Buffalo Bayou that I will catch when I'm in my seventies and eighties, if I'm lucky to still trap them. They will persist and they will outlive me.

David Todd [01:48:01] Good. Good. Well, they'll be your fellow travelers for many years to come.

David Todd [01:48:07] So, maybe you can weave this together. You were talking about these, you know, you're interested in populations and ecosystems. And when we were first speaking, you gave this wonderful example of the wolf in Yellowstone and the impact on the elk, the impact in turn on the aspens, and in turn on the fish. And I'm curious if you see the alligator snapping turtle as being some kind of an important cog in the ecosystems that you've been looking at.

Eric Munscher [01:48:43] Absolutely. Based off of its microhabitat, being a microhabitat specialist, they're also, I think, known that they can actually kind of carve out some of that habitat themselves, and widen it, make it useful for other species.

Eric Munscher [01:48:59] They're voracious predators, so being able to have them in an ecosystem can help drive fish populations and monitor fish populations.

Eric Munscher [01:49:10] And the snapping turtles are also known as the kind of the cleanup crew. Alligator snapping turtles will eat detritus and carrion as well as common snapping turtles, where they can help clean the bottom of the waterways that they reside in.

Eric Munscher [01:49:26] And just if they're in healthy populations like that, they can really help with those ecosystem dynamics and help the ecosystem go.

David Todd [01:49:37] Very cool. Well, I just had one last question and let you maybe go to lunch. It's getting to be that time.

Eric Munscher [01:49:45] I was getting some team chatter.

David Todd [01:49:49] Okay. All right. Well, let me be quick then.

David Todd [01:49:53] So, one of the things that that I've just been very excited about to hear you talk about the alligator snapping turtle is its persistence in an urban ecosystem. And it just gives me great hope, personally, that if the alligator snapping turtles can do well, maybe other species can do well despite their proximity to all sorts of impacts. And I was wondering if you could just maybe talk about, you know, your take-away from the fact that you found these populations in Buffalo Bayou.

Eric Munscher [01:50:28] Absolutely. So Buffalo Bayou is not the only bayou we found them in. Actually we have now three other bayous that we have observations and or small populations in - Little Cypress Creek, Cypress Creek, Spring Creek - all across the Houston watershed - we have found alligator snapping turtles in bayou habitats.

Eric Munscher [01:50:44] And this shows that they have the ability to persist in an atypical habitat. It might not be degraded to them. In our eyes, it could look that way, but to them they're making it work and persisting and thriving in it.

Eric Munscher [01:50:57] And it kind of lends to other species. We actually have, through SWCA, we have found very healthy populations of mussels in Lake Houston - lots of different species of mussels, too. We actually published a really neat paper on Lake Houston mussel assemblage.

Eric Munscher [01:51:13] And we know that various species, like the coyote, is doing very well in Houston.

Eric Munscher [01:51:18] And there's enough data coming across urban centers in the United States that there is a new journal that's only been around for now five or ten years or so that's called "The Urban Naturalist". It's out of the naturalist regime of journals, so the "Southeastern Naturalist", "Northeastern Naturalist", "Caribbean Naturalist".

Eric Munscher [01:51:40] It's a relatively new one. It's called "The Urban Naturalist", and it's focused on urban habitats, urban research. And we published our first alligator snapping turtle paper in that in 2020.

David Todd [01:51:53] Great. Well, it's fun to coexist with these creatures, you know, cheek by jowl sometimes.

David Todd [01:52:02] Thank you so much for telling us about all you've learned about the alligator snapping turtle. And then this larger world of of turtles and reptiles that you've had so much experience with. So.

Eric Munscher [01:52:13] Happy to. It was fun.

David Todd [01:52:14] Is there anything you'd like to add before we wrap up?

Eric Munscher [01:52:18] I would just say that always stay curious. There's so much to learn. You know, we think we know so much about species that have been studied for 100 years, and we're finding things that we had no idea about on species that literally are the most documented turtle species in the United States - the painted turtle. We found some really interesting stuff within the last five years.

Eric Munscher [01:52:37] So you never know.

David Todd [01:52:40] Great. Well, I know what you want for Christmas. I guess it's just new, new information.

David Todd [01:52:46] So I wish you the best there. I'll let you run on. Thank you so much for your time.

Eric Munscher [01:52:53] Thank you. Have a good rest of your day.

David Todd [01:52:55] Yeah, I have a button here. I'm going to stop the recording.

Eric Munscher [01:52:58] Okay.

David Todd [01:52:58] And before I do that, again, just thank you so much.

Eric Munscher [01:53:01] Absolutely. Thank you, David.

David Todd [01:53:03] All right, Bye now.

Eric Munscher [01:53:04] Bye.