Holly Jones: Bison Wallow and if you haven't ever seen a picture of bison wallowing, I highly recommend that you find a picture of them wallowing. It looks so weird. Bison are these gigantic you know, multiple ton animals and when they wallow their legs looks so tiny, that it almost looks like in a photo, like their proportions are off. So check that out some time, definitely.

Priya Shelly: Welcome to From the Field a podcast logging real life scientists and their efforts to improve the world one study at a time. I'm Priya Shelly.

Friends of Nachusa Grasslands is a conservancy in north-central Illinois. It's about a 2 hour drive West of Chicago. They are focused on restoring 3,600 acres of tall grass prairie and introduced a small herd of bison to the landscape in October of 2014. In this episode, I speak with a scientist who witnessed the reintroduction of the herd and who monitors the herd's growth within the restored prairie ecosystem.

HJ: My name is Holly Jones and I'm an assistant professor at Northern Illinois University. My focus is on restoration ecology and conservation biology.

One of the, I guess most serendipitous things of my career, is that I started at NIU just two years before these bison were reintroduced.

One of those places was Wind Cave National Park and so Wind Cave National Park had this herd of Bison. What was unique about these bison compared to a lot of the bison that people see out in the world today is that they're genetically pure line of bison.

Many of the bison out in the world today actually have cattle genetics and were interbred with cattle to create….beefalo…what ranchers really wanted was cow a type meat that stood up to really intense winters, The Wind Cave National Park line is genetically pure and that's the line of bison that's been re-introduced to Nachusa.

When I first step foot in Nachusa, the project director, Bill Clyman took me around and showed me all these different places where the Nature Conservancy had been restoring prairie. And he told me that they were really hoping and getting very serious about reintroducing Bison out on the landscape. And that's when I knew I really needed to start collecting some data. So then we had some data before the bison were reintroduced out onto the landscape.

PS: Holly knew that this was a special moment.

HJ: I vividly remember the first time I saw bison grazing in Nachusa. Sunrises in the Midwest and especially in the prairie mid west are incredible because you can see basically for miles. And so the sky is already incredibly beautiful. When we pulled up, we just see bison, just the silhouette of bison.

It is like the most American sort of landscape you can witness when you have these you know, bison surrounded by prairie, these huge majestic charismatic creatures. There's nothing like it.

PS: Holly didn't always know that she would be on the forefront of restoration ecology. She started by following her passion for being outside.

HJ: I grew up in Iowa. I was always interested in the outdoors. My great grandparents owned a farm and I spent a lot of time out there learning how to fish with my great grandpa and grandma. And I was really, really interested in science and when I got into high school, I had taken all the science that my high school had to offer. There was this vocational school in Iowa that offered this marine biology class. So I was trained to scuba dive in a pool in Iowa and I did my first open water dive in Grey's Lake which had the visibility of about 4 inches. And then as a part of that class was got to go down to FL for spring break and we got to go scuba diving and the professor for that class ~~was~~ her name was Dr. Styles and she was this really intelligent lady and we went down to FL and we walked along the beaches with her and she knew everything she could identify every single thing on the beach, every fish under water and every invertebrate under water and I was just outstounded of that knowledge and I was excited about the potential of having such knowledge and beginning to give it to other people as I got older……Iowa despite having that vocational class, doesn't have a lot of marine biology, so I went to Santa Cruz… I really thought I would do marine biology forever….then I met this professor. He was the co founder of this non profit called Island Conservation and so I did really well in his class so he invited me to work for his none profit. So this changed my trajectory and so I got out of the water and onto the islands, so even – It's like my own personal story of evolution – I came out of the water and started crawling on the land for a little while.The coolest part of my job is to be able to create the base for science or the base for scientific evidence to help us better preserve the species that aren't doing so well and how to restore the environments that we've damaged. For the most part I'm super hopeful…. kid interruption…i'm sorry can you hang on for a second?….sorry….children!! That is real life!

HJ: This is one of the first study's to my knowledge that looks at bison impact in restored prairie and that's really important because prairies change a lot in their time since restoration, so prairies two years after restoration are completely different than those from 25 years after restoration, in plants and biodiversity they can support.

I think that's what really unique about this study. It's giving us a window into what happens in restored prairie in a place where plants are already preceding through this succession process and what happens when we reintroduce these grazers bc that is certainly not necessarily how prairies evolved to begin with so we didn't have prairies of different ages back when prairies evolved, they just all evolved together with bison. So it'll be interesting to see the results and the differences we see in these restored prairies vs what we know to be true in areas that haven't been plowed before.

PS: Today's restored tall grass prairie still pales in comparison from when Bison first roamed the lands of North America.

HJ: So, back in the day Illinois looked like a tall grass prairie. The prairie was so tall that you wouldn't be able to see said Bison. That's what Illinois used to look like until a lot

of the European settlers started realizing that this was an area of really high productive soils, our prairies started to be converted to those farms.

The reason why we have such productive soils, is not only for reasons of geology and glaciation depositing a lot of rich soils, b/c tall grass prairie, even though it is so tall up above ground, so tall that you can't even see a bison, below ground is even taller so the root systems of prairie plants are incredible. Incredibly deep – 10 to 15 feet deep in some cases so with those rich roots, it created rich soil, that's really good for agricultural crops….

But as more and more settlers arrived, they began hunting bison not only for food but they wanted to drive native Americans main food sources down, in order to push native Americans out of the land that they wanted, and by the late 1800, bison were hunted to near extinction.

PS: Despite the near disappearance of the entire prairie ecosystem, a small piece managed to keep its roots planted and was discovered about 30 years ago.

HJ*:* So the story of how Nachusa came about is such a cool one. There was this husband wife naturalist powerhouse couple and their names were Doug and dot wade.

They were really well known throughout the Midwest, especially because they were a big part in the prairie restoration movement. So everyone had realized that most of the prairies were gone.

So Doug and Dot Wade were driving through what's now Nachusa. And what was then field of corn and beans similar to what most of Illinois is. And they were drive along and their windows were down and they heard the call of the upland sandpiper.

The upland sandpiper is this iconic prairie species. It's only found in prairies.

Doug and dot immediately got out of their car and started poking around in the field. They walked around and walked around until they found a small knob of prairie. And by knobs, I mean this sort of high rocky area, that hadn't been plowed. And they started to see some really cool plants that are prairie obligate species, so those that are only found in prairies.

And they told the nature conservancy about it and the nature conservancy is this non profit that's dedicated to preserving nature, and the Nature Conservancy bought the then thousand acre plot of land just 15 minutes before it was set to go to auction as 5 acre housing plots with street names like big blue stem and Indian grass, which are prairie plants. So two of the remnants now left out at Nachusa are named after Doug and Dot. It's just this wonderful story of two people making what's now a gigantic difference.

PS: Add Bison to the mix and a dramatic shift begins to occur.

HJ: Bison are what scientists call bio-ecosystem engineers, meaning they make a big impact on the ecosystem and change it really significantly from when we don't have bison.

And when they wallow, which basically means when they lie on the ground and rub their bodies all around and create big open patches of bare ground. The ecosystem consequences of this wallowing, which they do to itch and to get parasites off of them, are really profound.

In an area that normally has 6 foot tall grasses, you have completely bare ground. These can be really big depressions, in the spring they can fill up with water and They become ephemeral ponds and breeding grounds for amphibians and invertebrates that wouldn't normally be there.

Also because of this disturbance out on the landscape, there's a new niche for new plants to come back up as well.

Bison are wandering fertilizer nutrient providers as well and they walk all over and produce really nice nutrient deposits that my team and I step on all the time out on the landscape, increase nitrogen cycling, which can be really important for plant growth.

The other thing that we know is that with their grazing, there is often higher productivity and that means more plants growing and more plants growing more biomass. Prairies are carbon sponges, so they soak up carbon, which is obviously really important in the age of climate change, where carbon dioxide and some other forms of carbon are some of the biggest green house gases that we have to worry about. So prairies suck up that carbon and they often hold it down in their really deep roots and so bison grazing can actually increase that process of carbon sequestration.

The other thing they do is just create a mixed environment and that's really important because some animals, like birds for example, some birds like the upland sandpiper I was talking about, really like short grass and if you don't have grazers out on the landscape then you don't any habitat for the upland sandpipers and other birds like tall grasses and dense grass and if you don't have both tall and short grasses out on the landscape, you can't support a wide diversity of grassland birds.

PS: To keep track of the ever growing ecosystem, Holly uses the help of drones to monitor these changes.

HJ: It's incredible, the richness of data we can get by flying this drone in such a short time. With a drone, it took us two weeks to fly the entire preserve. The preserve is 3600 acres, so it's a really big area and there's not way that we could quantify productivity and plant growth in every single bit of that preserve by doing on the ground work. But my eyes in the sky can help us do some quantifying of the vegetation community, of productivity, we can look at where bison are grazing because it can predict grazing lawns, we can build 3d models of vegetation out there, all in two weeks of work.

Drones definitely have the potential to do bad but for science they're doing a lot of good, They're really important as we study climate change because I can compare things like productivity, carbon cycling, what the plants are doing. On years we have big droughts and years we don't, and I can then look at what the climate scientists are telling us about what's going to happen in the future and predict then how the prairie is going to respond. So it's a really important tool and I'm excited to use out there.

PS Within these small pockets of resurgence, Holly sees a glimmer of hope for the United States to reconnect with its natural beauty and resources.

HJ: I think it's really easy to lose hope in today's day and age because of all the bad ways that humans have impacted ecosystems. But there are a few things that certainly bring me hope and I hope bring people hope too.

The first thing is agriculture which tends to be one of the biggest causes of biodiversity loss and the loss of ecosystems. We're actually getting better at growing more food on smaller amounts of land, there's actually a trend towards agricultural abandonment of lands and those lands that are no longer fields that used to be fields are these prime areas for restoration, so people should be really hopeful about that. Here in Illinois with prairie restoration, yeah we've lost 99,99% of prairies but there are people are working day in and day out to restore these lands, so yeah it's really easy to get down on people that we've damaged the environment but people are the only creatures on earth that actually have the capacity to restore the ecosystems that we've damaged and this is happening at big scales all over the globe and we've spent billions of dollars trying to restore different parts of the ecosystem. I wish we didn't have to but it should bring people hope. Restoration is in its infancy, we just got our first text book, you know in the 1990's so we still have a lot to learn, it's really new, so it's a really inspiring time, a great time to be out there in restoration and even if people aren't interested in science, they can go out there and get their hands dirty, I encourage people and students I teach to understand that they have agency in what's happening in the world and go out and lend a helping hand and don't despair, go out and pick up a shovel!