

Rukmini

Hey everybody, this is Rukmini from NRPA and you're listening to the Guardians of Greenspaces podcast, the show that explores water conservation from a park-and-recreation maintenance lens.

Today we're talking about green infrastructure and riparian zones with Kelli Ondracek from Houston. We'll discuss what she's learned from restoring riparian zones over the last 7 years—including her tips for making green infrastructure maintenance as easy as possible.

Okay, can we just start with a brief introduction?

Kelli Ondracek

I'm Kelli Ondracek, I'm the Natural Resources Manager with the Houston Parks and Recreation Department.

Rukmini

Thanks for being here with us.

So we wanted to have this conversation with you because we know that there are so many types of green infrastructure. And so we had part one of green infrastructure come out already last week. And so it's such a vast field that we figured, you know, might as well do a part two and dig in deeper to some other types of green infrastructure. So I think today we want to talk about riparian zones and we want to talk about tree based green infrastructure. So I'll just ask a question like, can you give us some background on what that looks like in Houston, just so we can get an idea of where you're speaking from?

Kelli Ondracek

Yeah, in Houston, we have a big reforestation initiative along our waterways and it's our riparian restoration initiative. Riparian habitat is the habitat along a waterway and much of Houston actually was historic coastal prairie habitat and really you would see most of the trees that you saw in Houston lining these waterways.

Houston is known as Bayou City. We have a lot of bayous that cross Houston and run down into Galveston Bay. And over time, a lot of that riparian habitat has been lost. So some of it was lost because they channelized some of the bayous and to get the water to move out of

the city quicker. And some of it was just lost from regular development. There's a lot of development along the bayou systems, in many cases right up to the edge of the bayous in Houston. So much of that forested buffer was cleared in Houston.

And so we started this initiative back in 2017 and we had two pilot projects. And one was for restoring the riparian forest in a park that the riparian forest had completely been cleared from that. So it was just mowed grass all the way down to the bayou. And then another one, there was still existing forest there. And so it was us going in to enhance that forest. And over time, we've been working our way through that initiative.

There are 70 parks in Houston that are adjacent to waterways out of our 382 total parks. And so we're in progress of 35 of those. So some of them are completed and we're just going back on an annual or twice a year maintenance at those sites. Some of them we are at multiple days a week still working on those sites, but we're working our way through the 70 sites.

Rukmini

And can you talk a little bit about the mechanism through which riparian restoration supports green stormwater infrastructure and water conservation? So how does that work?

Kelli Ondracek

Yeah, so the forested areas along these waterways act really as vegetated buffers. In Houston, the state agency of our water quality is the Texas Commission on Environmental Quality, and they test all the waterways in Houston. Many of them did not meet standards for contact recreation, and they're actually one of our biggest funders for this project to help improve water quality in Houston. And so, we're recreating these buffers. They help with non-point source pollution. So it's the pollution that is pesticides and fertilizers that people are using in their yards or your car's leaking oil and that runs onto the ground.

And then every time it rains, all of that flows down, across our parkland, across your lawns and into the bayous. And so by having this forested buffer, that vegetation kind of traps that sediment and pollutants and the microbes in the soil help to break those chemicals down. And what comes out on the other side is better for our water quality in Houston. And so having that throughout the city, throughout our bayou system, creating these forested buffers is really helping with water quality.

We do have a lot of green infrastructure, other projects we have land preservation in Houston, we do prairie restoration and so all of those combined are helping to improve the

water quality. It also helps with conservation-- those areas store the water, they slow the water before it enters the bayou and we really try to reduce water use in those areas. We don't set up irrigation in our riparian sites. We hand water for a couple of years and then the trees are on their own. use native species so they're adapted to the climate and really trying to reduce the use of water also.

Rukmini

And I wanna ask about challenges and barriers that you've experienced with this. I mean, you've mentioned that you're first, you're doing this, you know, going back now what, seven years? And so I wonder like, you know, what kind of lessons have you learned through that time?

Kelli Ondracek

We've learned a lot of lessons. So we have our standards now and some of that was based on trial and error and we set up plots along the way to see what worked best for maintenance. I think establishing what maintenance works for each site is best. So we have a standard planting spacing so that we can get our mowers between the trees for the first couple of years.

We have our standard maintenance where if we plan to go out and do a little bit of weed eating around the trees and to keep the vines off of them and the sites that are older, we only go back once or twice a year. So we have that maintenance schedule and sometimes we adapt to it. Sometimes the grasses and vines aren't bad in a certain area, so we don't mow at all. And I have a couple of sites like that that we've never needed to mow.

I think it's setting a standard maintenance of what's working, maybe doing those pilot projects, which really helped us by having those two, they were different types of projects so that we could use what we learned in those sites to guide the rest of this initiative to see what worked and just planning for maybe a different maintenance than what people are used to. We also have natural resources staff really come in and maintain those areas. And we learned that it was just more effective to have a group of people that were well-trained at maintaining these areas rather than expecting everyone to be able to do it. And so I think that was one thing that we found to be effective. And sometimes we ask for help when we get others in, but we make sure and train them before they do.

Rukmini

Can you talk a little bit more about some other things you might have learned from those pilot projects? So I know you, I heard you mention the need for maintenance professionals to be trained in green infrastructure areas. And that's something that we've heard across other episodes as well as, you know, this is a different type of maintenance and it doesn't look the same. But what else did you learn from those pilot projects that you're kind of still using?

Kelli Ondracek

We had one of our sites that was completely absent of trees. We did vegetation plots throughout it and then we changed our mowing or our maintenance cycle of the grasses in between the trees and monitored that for two years. So we had one section where we laid down mats to suppress the grasses and another section we tilled, another section we herbicided, another section we just mowed and so then we monitored those plots to see what was most effective and what was easiest and most cost effective also.

And for us, it was mowing in between the trees to keep that maintenance. We also were a little bit surprised at how much we would have to water these sites. A lot of our riparian sites are built up higher than the rest of the park if they came in and channelized the adjacent waterway, the soil was more compact and it was higher. And so for those we had to adjust and we had to water the trees more frequently.

Sometimes we have to go in and do soil amendments. So I think each site's different. Even within the same park, different areas of that park are different. So we had one site where the trees just grew really, really quickly. They did very, very well. And then just, you know, a hundred feet away there was compact soil.

And so we really struggled to get the trees established and for those we just had to adjust our tree planning. So we planted trees that when we had some tree loss, we came in and we planted hardier trees, trees that could survive with less water. And so that one section of our riparian site just has less diversity. And so we adjust like that at our sites all the time and just have that, that openness to allow for differences in each of our sites.

Rukmini

What are the best practices that you've learned around maintaining these green infrastructure sites that you could offer as people, other agencies, are getting invested into green infrastructure? Are there any like principles or best practices that you hold in mind?

Kelli Ondracek

You know, we adjust for specific situations. So we come in and we talk to the communities before we do the plantings. And sometimes the communities are really nervous about a crime, you know, if we're establishing a forested area where one hasn't existed. And so we'll adjust some of our tree plantings based on that. Maybe we plant the trees a little bit more spaced apart. Maybe we don't do as many understory species or potentially we mow it for more years than we normally would until they get comfortable with it. So some of that plays into our maintenance and in our initial site set up.

I think for really it's the natural resources staff that are maintaining these sites. And so we have in some areas come in and put signage really to identify that this is natural resources, don't come in with mowers. I think we've had more issues with that than them coming in with weed eaters and hitting our trees with the weed eaters and killing the trees.

We've tried to, I think one important thing is to identify the boundary signs that say no mow zones, even if we do mow occasionally, help to identify that it's a different type of maintenance in the area, and that seems to help. And then community outreach and then staff training. We always try to present on our projects at the beginning of the year to the rest of the staff so that they know that we have a project coming and they're aware that they've been mowing this site, but now it's going to be reforested. So identifying those in the field and then also sending out information about the new projects, I think has been helpful with maintenance.

We set up maintenance guides for each of our sites. So we have a general riparian maintenance that we give to natural resources staff that talks about mowing cycles in the warmer months versus the cooler months. Then for each site, we tend to adjust the maintenance if certain like frequent mowing isn't needed. Every year in the winter in Houston, we do staff training for all of our employees, new and old employees, they go through training. So anyone that's coming into one of our green infrastructure sites has to go through training before they do any maintenance in there. So that's part of their initial onboarding with the Parks Department is that if they're going to be maintaining that site, then they go through a training.

Rukmini

But like those are the things that time and experience get you, I guess that you just have to, like you said, learn by trial and error.

Kelli Ondracek

Yeah, yeah and also you know some of the species that we're using -- we've really, we really know our species in Houston now. We know the ones that are very adaptable, the ones that really need more shade or they can't get established, the ones that grow faster. So we always try to put those in to make the sites look good immediately so learning what species are going to help in each site I think is helpful also. We have a list of 96 species in Houston that are native to the Houston area. And we did a lot of research on historic presence in Houston and came up with this list that has really been great.

We try to grow some of the species that we can't purchase from a vendor, especially a lot of our understory species are kind of rare, so they're hard to get. So we try to collect as much of that as possible. But for our nature preserves in particular, those are our really good, more pristine habitats in Houston. We want to have sources from the Houston area. So we try to select vendors that are collecting seeds locally from Southeast Texas and then we purchase from those vendors and that helps us to really get not only species but the specific individuals that are adapted to the Houston area and not try to mix in species that are collected from other areas across the country.

Rukmini

I want to ask, you know, the narrative that I'm hearing is that, you know, as the years go by, it gets easier and quicker and sort of more natural to continue to do this program. But it seems like in the beginning you had, you know, some time where you were just putting in work to figure out, you know, what is actually going to be sustaining, you know, for longevity purposes.

So I want to ask, you know, how did you keep your stakeholders on board? You know, kind of what suggestions do you have for other agencies who might just be starting out with their green infrastructure programs and who might not have, you know, those more aesthetic sites or whatever it may be to get community or to get, you know, folks higher up invested in

this program? Do you have any tips on how to talk about, you know, those first difficult years?

Kelli Ondracek

Yeah, I think if you know most of our projects are grant funded so I think if any initial grants are applied for, maybe putting in a little bit of research money for that first planting to to test you know species and you know maintenance methods for individual sites I think would be helpful. But also there's a lot of cities and counties that are doing work, green infrastructure work, and land preservation work across the country. And I think that maybe finding one closest to you because that would, you would probably share species and potential like soil similarities and stuff like that. And asking for what they've done. I have connections with a lot of different cities. So I think that it's helpful to kind of run that by others who have done similar things and maybe not have to start from scratch.

Rukmini

Can I ask what lessons you may have learned from other folks who are doing great infrastructure locally to you?

Kelli Ondracek

Yeah, I mean, we, I have used like our public works department has done bioswales and so we've worked with them. I talked to other cities around Houston that are doing plant propagation, even nonprofit organizations. There's a lot around Houston that are propagating native plants, which we do. And we all share information with each other on, know, what's what seed you're collecting that are harder to germinate or take longer to germinate and or you're not being successful. Here's some tips. So we have an extensive network of partners in Houston that we can reach out to and we always share information when we're collecting data also.

Rukmini

Do you recommend experimenting for other agencies and putting that kind of time and effort in the beginning and like kind of how has that supported you moving forward?

Kelli Ondracek

Yeah, I think it was helpful for us because we had never done a riparian restoration before and doing the experimental plots, we didn't really know how much maintenance they were going to be. So I hadn't announced the full riparian initiative yet. And, and I didn't know if it was feasible to do the full initiative when we started that first project. And so it was actually six different types of plots that we did and we laid them all out and they were a half acre each, but we doubled them. Each experiment was a full acre. And then we had vegetation plots within those to monitor it. And so it was really helpful.

I mean, it showed that the tilling of the site made invasive species explode. And when we put the mats down, it was very expensive. So I don't think we could have afforded to do that anyway, but we had a huge tree mortality because the water couldn't get to the trees. It suppressed the herbaceous vegetation, but it also killed a lot of the trees. And so I just think having that information up front guided us and what the right thing to do was. We don't herbicide the grasses before we do a planting now because we had an acre that we herbicided there. And really it destroyed the lawn grass, which is short anyway. And then it supported the growth of taller, herbaceous vegetation.

And so now we know that if you just mow in between your trees, then you just keep short grass and there's less competition with your trees. If you don't mow as frequently, you'll get some of the taller stuff in, but really it's the easiest, the cheapest maintenance method. And so I'm not really sure that we could have been confident in our what we were doing for maintenance if we hadn't done those vegetation plots at first. And so I think it was very helpful.

Of course, we still get things that surprise us. We had a hurricane this year and we had huge trees come down on some of our smaller plantings. And so there's always a surprise and something new to learn. But I think moving through and doing a lot of these projects has helped us kind of become experts in how to restore riparian habitat, at least in this area.

Rukmini

I want to ask about your volunteer program because I know that for a lot of agencies, staff capacity and just number of staff is always an issue with, you know, trying to achieve big programs that maybe you don't just have the hours, the labor hours for. So I want to ask how your partnerships kind of support that ongoing maintenance for these sites.

Kelli Ondracek



Yeah, we couldn't do our work without volunteers. So from our plant propagation, we have a greenhouse and we meet regularly with our volunteers. Three days a month, we're working with volunteers to propagate native plants. And then all of our tree planting events at our riparian sites are volunteers.

So we purchase the trees or we grow the trees and we bring them out to the sites and we try to prep as much as possible so that the volunteers can have fun and don't have to work too hard. But they come out and they plant all of our trees with us and we have regular volunteers, we have new volunteers, we have partnerships with school groups that come out. And so really that's how we get a lot of our tree planting and prairie planting labor is for volunteers that are coming in and planting with us. And a lot of them are from the community. And so they're restoring their own parks. And then we get that support for trying to protect that habitat from the local community.

Rukmini

I'm hearing that you're like kind of designing or planning what vegetation, what it looks like, all that stuff to benefit the community and for them to feel safe in their parks. And then they kind of reciprocate by like coming out and planting stuff and getting invested in cheerleading. We heard in our community engagement episode that like, it's even a funding boost sometimes when they're community members, talk about how important this work is. It can help send more dollars into these types of programming.

Kelli Ondracek

Yeah, I think that the community support is extremely important. We have to have it for our sites. And so usually we set the broad goals, right? We have our riparian initiative. We identify the parks adjacent to waterways and we go, we select a park. We get funding, we go into that park and then we reach out to the community. That's when we start talking to the community about the design, about how much they want to be engaged in the restoration project. And then we just move on from there.

And then after the project, sometimes they come in and help us with the maintenance. if we have to come in and do any replanting of trees. We have one site where the community offered to water the trees when we planted them. We've had sites where we were planting trees and community members that didn't hear about the project came out and planted with us on the same day they saw us out there planting.

And then we almost always get less complaints, right? If the community was doing it, right? They don't complain about the action that they took. So they were involved in it. They learned about it while they were helping us restore the park. And so then they support it and communicate with other community members that haven't been involved and let them know.

And we also put signage out at all of our sites. have interpretive signage throughout all of our right parent sites talking about wildlife and water quality, water conservation and erosion control. So we talk about all of the benefits of these projects and get a lot of support from that.

Rukmini

I do want to ask what type of complaints you get at sites where this isn't possible or maybe what complaints were you getting that prompted you to do more community engagement? What are the typical things that you hear?

Kelli Ondracek

Yeah, in general, most people support trees. People like trees. So we get less complaints about the trees. But sometimes we get complaints about the grasses that are growing in between the trees, especially at the sites that were mowed park all the way down to the bayou. Then we plant a grid of trees and it looks nice and everybody likes it at first. But we don't maintain in between the trees as we do regular park. So that grass gets taller.

Our main maintenance is to focus on supporting the tree growth, not to make it look neat and clean in between the trees. And so sometimes we get complaints from people that we're not mowing in between the trees. And we tend to mow, especially if there's tall things and vines in the trees, we tend to mow for two years. And it helps people get used to seeing vegetation there with the trees. We don't mow at the regular maintenance cycle.

But sometimes we don't. So we'll put no mow signs, especially if we decide not to mow at all, we'll put no mow signs. But it is kind of a process for the community to get used to a site that was previously mowed that now has tall grass in it. And so we try to let the communities know that we tend to maintain for two years. But once the trees get

established, they get large canopy, they'll kind of shade out the grasses and it won't need as much maintenance, but it's never going to be short grass like it is in the park.

It seems a little bit easier in these riparian sites because they are along waterways. Many of them do flood, so there's not other amenities that are already there. And so that seems to be a little bit easier as far as complaints go.

Rukmini

Speaking of making things easy, is there anything that you found as you've been sort of developing your green infrastructure maintenance protocols over time? Is there anything that you found that has made maintaining these infrastructures easier? Any like, you know, best practices or tips you could offer to try to make sure that there's long-term sustainable maintenance that's as light a lift as possible on the people who are doing that?

Kelli Ondracek

Yeah, I mean, I think it's pretty useful to put tree cuffs around the trees if you're going to be weed eating. We found that the weed, even when you're trying not to hit the trees, the weed eaters will hit the trees. And so we put tree cuffs.

We've found that there's a certain mowing cycle that is helpful because once it gets too high, you can't get in with a regular zero turn mower. And then you have to bring in a tractor, is, you know, mostly too big to fit in between the trees.

So I think that would be different for every site, having whatever your site, how quickly the grass grows, having that cycle to where you do it less than normal, but just enough to where you can still get in with your equipment is important.

And then I think for watering trees, that's a really big maintenance component is keeping the trees alive. So having the cycle to where you're keeping your trees healthy and not letting them be stressed because I think there's a point where the trees can't come back if you're not watering them enough and then all of your efforts wasted.

So I think the mowing and the watering are the main things that that's our main maintenance for the trees. When we plant them, we plant and we mulch one time. And then after that, it's just mowing and watering until the trees get established. And then after that, maintenance is just you know they start to fill in on their own they they'll seed themselves and trees once we're not mowing in there the trees will start growing on their

own and you'll get seedlings of native trees popping up which is the point where I'm really excited that the site's taking over and establishing on its own.

Then really we come in once or twice a year and if there's a invasive tree that popped up we come and remove that and if there's vines that are growing on our trees we'll cut those but really after about five years in Houston is when I've seen that the trees really get large enough to where you don't have to worry about any herbaceous vegetation taking over. You don't have to mow, none of that's going to get taller than the trees and they start seeding themselves. And so then it's a two year maintenance, really easy after that.

Rukmini

So, you've been doing this project for many years now. I want to ask, how has it developed over time? So, what do you see now looking forward as the growth of this program in the riparian zones?

Kelli Ondracek

I think we are better able to anticipate what's going to happen now. We were a little bit surprised over the past few years because we kept hitting a drought in the summertime. And so we were having huge tree losses and that's something that we really hadn't experienced prior to the past couple of years. And so now we're prepared and we took on less large tree planting projects.

And so we're mixing those with some of our existing forest where we just do tree seedlings and they don't need water because they're under existing trees and they're in an existing forest. So we're trying to mix those more and really balance our watering.

Some of the drought seasons, we had to go back to tree plantings that were six years old. And so we were not used to that. Normally we do two to three years and then we stop our watering of the trees and they're fine after that.

Some of those droughts hit us so hard. I think we've learned lessons like that over time. I've also learned some lessons in our really frequently flooded areas that if we were planting really large like 15 gallon trees and in those areas where we're you know running water coming through that those trees would just get washed away but if we had a five gallon tree or a seedling it would just get bent over.

We learn that in those areas that are frequently flooded to plant smaller trees. So there's just little things like that that I think we're happy to share that information. think some of that will change based on the location where people are doing the projects. But yeah, I think those we've learned a lot of little things like that over time that have helped us.

Rukmini

Thank you Kelli, for sharing your expertise on maintaining green infrastructure in riparian zones and its impact on water conservation. Check out our other episodes on water conservation tools, including natural water area maintenance, on Guardians of Greenspaces. We appreciate everyone listening and reminder— answer our key question and you could win a \$50 NRPA store gift card!

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