

Season 3, Episode 6: Compost Systems and Contamination

Host: ESF President Joanie Mahoney

Guest: Doug Daley

Doug Daley: I wanted to get in a little more on the ground floor so I could influence some of the decision making. A lot of the people had shifted their focus during the early days of the environmental movement and I was starting to feel like, there's a lot of things that are being overlooked that we should be training, educating our new engineers.

Failure is an outcome of taking a risk, doing something that's a little beyond your comfort zone. And I never intended to fail obviously, but I didn't want to have regrets later in my life. An example of how the approach to environmental problems changed, shifting the philosophy to bring in experts from across the country, ESF had talent and in creative talent that could develop an innovative approach.

Joanie Mahoney: Thank you and welcome to Campus Conversations: The Podcast. I am Joanie Mahoney, and I have the honor of serving as the president of SUNY ESF, and I've been enjoying a series of conversations with our esteemed faculty here about who they are and what work they do here at the college. And today is my honor to welcome Doug Daley.

Doug Daley: Thanks, Joanie, glad to be here.

Joanie Mahoney: And I've been looking forward to doing this with you because your path toward higher ed is a little different than some of the other faculty members that I've had the opportunity to interview. So why don't we just start out by just telling people a little bit about you?

Doug Daley: Sure. And it was more than a little different, it was extremely different. I grew up in central New York and like many of our current engineering students, I was told by my high school guidance counselor, you're good at math and science and you should take a look at engineering programs, so I did that.

And back in the day, I went through the SUNY application book that they had and I just applied to every school that had engineering programs, and SUNY ESF was one of them. And to be quite honest, I had absolutely no idea what forest engineering was when I applied, but I was outdoorsy and I said, I could see myself doing something in the forest, whatever that is.

Joanie Mahoney: It's interesting because you put all this thought into marketing and enticing students and going out and trying to encourage folks to enroll here. And then you hear something that's simple, which is, I knew I was good at math and

science and I was looking for an engineering program, and we labeled it Forest Engineering, and the rest is history, right?

Doug Daley: Yeah. In the 60s and 70s, there was a lot of forest engineering programs in the United States and around the world. And through evolution, there are, as far as I know, no forest engineering programs left in the United States. They've evolved into biological agricultural engineering, or in our cases, environmental resources engineering.

Not to give too much away, but I was a member of the last freshman class to enter ESF in 1978 before we went to a full transfer status institution for undergraduate. And the program evolved as the environmental movement evolved through the 70s and 80s. And I had the benefit of also staying for a master's degree in the Environmental Resources Engineering Graduate Program. So I was able to modify my resume sufficiently to say that I had background in environmental engineering so that when I started looking for professional career track, I didn't have to explain to every single person what forest engineering was.

Joanie Mahoney: I would imagine, and you and I have had the opportunity to talk about this, you weren't actually building forests?

Doug Daley: No, we weren't building forests. What I told people, basically, it's civil engineering in the woods for the forest products industry. And so a lot of my background in that in terms of water management, soils management, and the interaction with the ecosystems was really grounded in what I learned here in forest engineering.

Joanie Mahoney: So you went straight through your masters?

Doug Daley: I did, I was not astute enough to be aware that in 1982 I graduated in the midst of a recession. So I was out there banging the bushes to try to find jobs, but there weren't many to be had. And an opportunity came up to do the master's degree, I said, well, it's better to be an underpaid graduate student than an auto work engineer.

Joanie Mahoney: I imagine like a lot of people, you look back on that and think, that was adversity at the moment, but I'm glad it went that way because it led to exactly where you are now.

Doug Daley: And that's one of the things I continue to tell my engineering students, is there's always opportunity out there, you just have to be, in some cases, more patient than in other times. But that was the beauty of the engineering program for me, is it gave me that foundation that I could choose my path after graduation.

I finished the master's degree, focused a lot on water resources engineering. And then because of various circumstances, I ended up with a position as an intern for the city of Wichita, Kansas. Did that for a few months and then started working for the state of Kansas in Topeka as a water engineer in their Bureau of Water Protection. And we were developing policies and programs for wellhead protection strategies, where a municipality has a groundwater supply and so you're looking at land use around those wellheads to make sure that you're protecting the groundwater quality.

Joanie Mahoney: And I would imagine that experience has been very valuable to your current students because you have put an emphasis along the way on opportunities for your current students to network. You never know who you're going to meet or where you're going to land in these, professional relationships can pay dividends long down the road.

Doug Daley: Those opportunities pay dividends in terms of tracking down your employer, but they also expose you to opportunities that you don't know even exist.

Joanie Mahoney: I just could not agree with that more. I never heard of most of the things that I interact with people now, what they're doing, and I think you are so lucky that you found this path. But it's not just luck, it's keeping your mind open to it, it's putting yourself in a position to seize an opportunity and when the opportunity comes, you were pretty well educated. It's pretty good [inaudible 00:06:45].

Doug Daley: I don't think I could have said it better.

Joanie Mahoney: Good. So then Kansas Water, what was next?

Doug Daley: Well, fiancée and I were both from Central New York and so there was a desire to get back to the Northeast. There is water in Kansas, most of it's underground and the surface water bodies are a little too thick to drink and a little too thin to plow. So I started looking for a job in the Northeast, I ended up working at a consulting firm in the Buffalo area. And one of my first assignments was related to doing some analysis of sediments that had been collected from the sewer system around Love Canal. So I was looking at Dioxin concentrations and transport.

Joanie Mahoney: Is that one of the first Superfund sites?

Doug Daley: That is, Love Canal.

Joanie Mahoney: It was the first?

Doug Daley: Yeah, and our first rental house was just a half a mile downstream from Love Canal. But then we ended up in the South Town's area and from there things

just took off because that was the mid 80s. There was more work than there were people to do the work. And a lot of my early work was in hazardous waste remediation and solid waste management, as well as slowly transitioning into some wastewater, mostly on the solids end. So most of my professional activities have been on the downstream end of society.

Joanie Mahoney: Well said. I have a lot more experience with that than you might guess because in my previous role as county executive, charged with fixing our combined sewer system and preventing these overflows into our lake, I had a quick lesson in what it was the engineers like you were telling us needed to happen to make sure that we were protecting our waterways. I could have had a conversation like this and understood what they were talking about with the combined sewer overflows that were designed and they open up and when there's a big storm event or melt or whatever they open up and buy design that combined sewer spills into the creek, which makes its way into the lake. But somebody had this bright idea that I should actually get in a canoe and get in the creek and go look at this for myself.

I did that and we started, I don't know, a mile and a half or so upstream, and then headed toward the lake. And as you know, you go past more and more of these overflows, the quality of the water quickly deteriorates. And I waited until I was only probably 100 yards from the lake when I tipped my canoe and went into the water. And one of the first things I saw when I popped my head out was a photographer from the Post-Standard, and I ended up with my picture. It was not pleasant, I called my husband and I said, I just fell in that creek that we have spent our entire life avoiding, I just submerged.

Doug Daley: Hopefully, you kept your mouth closed.

Joanie Mahoney: Yeah, it was not pleasant. Anyhow, I digress and I just want you to know that-

Doug Daley: No, that's okay.

Joanie Mahoney: ... I know what you're talking about.

Doug Daley: Because you went out on a limb as county executive, you implemented that green infrastructure program, Save the Rain, my students benefited from that because we worked with your consultants on a lot of real-world design experiences for the students.

Joanie Mahoney: That benefit was mutual. I tell people all the time, Doug, when we went to the federal court to change that consent order and ask for permission to use green infrastructure, I wholeheartedly believe that the expertise that ESF was providing at the time was what convinced that judge to take a chance on us. And then I remember looking out my window on the 14th floor of the Civic

Center and seeing ESF students on the roof of the convention center after we put the green roof on there. ESF was deeply involved in that and it was just unbelievable stroke of luck that this job was available when I left there. So then you went to Buffalo as a consultant and then what brought you back to Syracuse?

Doug Daley:

There was an opportunity about three years into my consulting experience to go to a small office in Rochester, gave me a little more responsibility and authority, a lot more flexibility. And I did a lot of work with Monroe County on the solid waste side and on the wastewater bio-solids management side of things. So a lot of classic environmental engineering work. But about three years into that experience, I started thinking that I was at a point in my career where I might be able to do something to give back a little bit.

I was already involved in professional societies and I knew somebody who was developing, I think it was called Environmental Health Program or Environmental Waste Management program at RIT. And I contacted John and said, if you need an adjunct instructor for a course, let me know. So I ended up teaching for about three years at RIT in the evenings, a course in hazardous waste management. I had the expertise, there was demand and it gave me a little variety in my life. But I also started to develop that philosophy where I wanted to get in a little more on the ground floor so I could influence some of the decision making. And I was starting to feel like, there's a lot of things that are being overlooked that we should be training, educating our new engineers to be looking at.

Joanie Mahoney:

I never really thought about that, but it must be frustrating for you to be an expert and to be a consultant for a municipality and then take direction from people who aren't experts. And you know if I was in charge, I would be making sure that this was happening or that was happening.

Doug Daley:

And so I had a very early lesson from our bureau director in Kansas, because we had spent a lot of time doing analysis of different policies and do this and do that and everything and evaluating things from feasibility and cost. And so we sent our recommendations up to the secretary of the department in a report and we prioritized actions and then the secretary made their decision and it was the inverse of what we had recommended.

Joanie Mahoney:

Nice.

Doug Daley:

And one day, I was in the office and I was like, what the heck? And my bureau director, who was also an engineer, and awesome, sat me down and was like, look, we're engineers, we were told to do the engineering feasibility, look at all these things, we did our jobs. The secretary has their job and they have to consider a lot of other factors besides what engineers say. And that opened my

eyes a little bit more than they'd been, that there are other factors that are beyond the can of just the engineers.

Joanie Mahoney: I think that's true, but I also think that there's a natural short-term vision of people that need to be elected. And a lot of the work that you're doing is really long term and so you get that push and pull from people who know outside the funny world of politics and election cycles, you would take this path. But the person who's making the decisions is like, I have constituents complaining about flooding and I need to do something quick.

Doug Daley: And I had a similar experience later on. We had a municipal/organization that built a landfill.

Joanie Mahoney: Was not me.

Doug Daley: And just the way things were going at that particular time, tipping fees were actually coming down back in the day. We did a quick proforma analysis on it and said, well, the lowest cost option for you going forward in time is to not open the gates of the landfill. You still have to pay off your bond, but don't open the gates. They opened the gates, because politically you can't build something and tell people you're borrowing money and then say, and by the way, we're not actually going to operate it, that's not politically good.

Joanie Mahoney: No, I can totally imagine that scenario and trying to explain to voters why you have this bond that you have to pay off. And it's like you didn't know what you were doing, but really the truth is the market changed.

Doug Daley: And just to wrap that up, they've been successful.

Joanie Mahoney: Good. Then you must have discovered in that stint as a visiting adjunct faculty member that you like teaching, which I think teaching has got to be one of the most difficult jobs. You have to be on at that time all the time.

Doug Daley: It's a constant set of deadlines, regular deadlines-

Joanie Mahoney: It's a hard job.

Doug Daley: ... And you have to produce on those deadlines, in my case, three times a week or a three credit class. In particular, my engineering students are constantly challenging me to stay on point, to stay on the game, and to keep challenging them along the way.

Joanie Mahoney: That'll be exhausting.

Doug Daley: It is.

Joanie Mahoney: You must have liked it.

Doug Daley: I do like it, that's the one part of the job that I think a lot of people have probably reflected on here. And I'll reinforce that it's exciting and the challenge is something that I look forward to. Because if I just got into a routine where I was doing the same thing all the time, I would've been looking for other places to express my creativity, but also to have an impact.

Joanie Mahoney: And that's the thing, the impact, because what you described as having drawn you to it was teaching the next generation. And it must be so satisfying to you at this point to see where some of your students have gone. So I want to just finish up the path here by asking you, was this your first full-time faculty position here at ESF?

Doug Daley: Yeah, first and only. It was fortuitous that one day I got a letter in the mail with a position description in it that said there was an opening here at ESF. And quite frankly, I was on a good career track. At that point, I didn't happen to be looking for a shift or anything and I was like, okay, faculty, but I had some really good things going on professionally.

And we don't do that anymore, we don't send letters directly to alumni, we post things. And I think in those days, they tried to reach out, and I read the position description, it was frankly almost written for me. And my wife, at the time, encouraged me to apply. I said, all right, I got nothing to lose by applying.

Joanie Mahoney: You've taken a lot of leaps of faith in your career path.

Doug Daley: Yeah, but as you said earlier, the fact that I was developing professionally, that I started to adjunct instruction, created an opportunity for me to even be considered for this position in the first place. And so I applied, got invited to an interview, and then experienced the classic academic decision making process, which is, we'll let you know-

Joanie Mahoney: Sometime next year.

Doug Daley: ... Well, in terms of academic decision-making, it only took about three months. But at the same time, I was being heavily courted internally to transfer offices with a heavy promotion, big salary bump, and expense account and everything to work on projects in Birmingham, Alabama. Which had hundreds of millions of dollars of capital projects and we were the exclusive engineer. I would've made the rest of my career building infrastructure for the city of Birmingham, Alabama.

Joanie Mahoney: Interesting. And you're in a position because you're a candidate for the job, you don't want to call and poke people and say, I need a decision. But we are aware

of that now, we're trying very hard to have a diverse pool of candidates. And like every institute of higher education, I think every company, everybody is cognizant of the value of diversity.

Doug Daley: I took the position that was offered, I actually had several of my colleagues at the consulting firm say they were envious because I was doing something they'd always thought about doing. And I was also at a point where I had been looking at, what are the formulas for success? And I realized that failure is a part of the formula for success.

Joanie Mahoney: My goodness.

Doug Daley: You learn from failure and taking risks. So failure is an outcome of taking a risk, doing something that's a little beyond your comfort zone. And I never intended to fail obviously, I've been here 26 years, so I clearly haven't failed. But I didn't want to have regrets later in my life to say-

Joanie Mahoney: Of what could have been.

Doug Daley: ... What if I had done that? What if I had tried that? And I was supremely confident, I won't say overconfident, but I was supremely confident that if this didn't work out for me, there were other opportunities out there. And so I came at it with, let's see what the first year brings, the second year brings, the third year, and I've done that 25 times.

Joanie Mahoney: That's great. And I know, again, that foundation that you had with the education that you got here at ESF, including your masters, and then all of that real world experience, it does give you a little bit of latitude to take those risks. Because, as you said, you knew there would be opportunities if you made this giant career change and you didn't like it for some reason. You had a lot of doors, I imagine, that you could walk through.

Doug Daley: And on the flip side, when I got here, I did things in my first few years that I had faculty members say to me, why are you doing that? I'm like, because I enjoy doing it and or somebody's got to do this. And they said, but you got to focus on getting tenure. And I was like, in my previous employment, I worked at the discretion of my boss and my tenure was two weeks.

It's like I'm taking, not calculated risks, but I'm taking acceptable risks to do things because I think it contributes to the general community welfare challenging students. I'm doing things and I continue to do things because I was told at the beginning, just keep doing what you're doing, you're doing great. And I'm like, I'm doing great, I was told bring the professional experience into the engineering program, that's what I did. It was not a conventional academic

approach, but we're an engineering program, we are training professionals, educating professionals, and that's what I bring to the program.

Joanie Mahoney: And the proof's in the pudding with the recent success of your teams at WEFTEC, why don't you tell people about what just happened in New Orleans?

Doug Daley: I've been advising the student chapter of the New York Water Environment Association for at least 12 years. I lose track of when I actually started doing it, it may be more than 14 years. But I work closely with the executive director, Patricia Cerro-Reehil and the idea when I took over was, it was going to be more than just a social organization that I was going to get students involved. I was involved as a graduate student, so I'm paying it forward. My mentor, my major professor, took me to annual meeting in New York City in the middle of February in 1985, never forget that particular experience. So I was paying it forward, it's a great organization and I said to Patricia, I'm just going to take small steps, incremental growth and development. And for the last several years, the students are the ones that keep pushing to higher and higher levels.

This year, 13 students went to the National/International Conference, there was about 18 to 19,000 people at this conference, large exhibition hall and everything, technical concessions. And I had 13 students the last two years, we went into double digits prior to that, four to six students. And we started doing the student design competition four years ago. I thought I would never be able to put together a team to compete, but we started doing it four years ago. They've enjoyed the blast out of it, it's just such an uplifting experience for them.

And this year, the popularity has grown, the state association had to actually have a competition to decide which two teams went. And as things turned out, we sent two teams from ESF, one in the water environment division, and one in the wastewater division. And euphemism, you got to keep pinching yourself like, is this really happening? And of course, the students work hard to both raise funds, but because of their activities, they also are awarded travel stipends and grants from our local central New York chapter, a lot of professionals who are also connected in some way to ESF. So we had two teams compete and I think I've finally figured out the formula for the water environment division. One of the teams got second place out of maybe 10 or 12 competitors from across the United States, big name schools too, big schools.

Joanie Mahoney: In that phrase, we punch above our weight, ESF, this small specialized college in central New York is competing with these national programs.

Doug Daley: And the other thing for me too, is just to be clear that the New York Water Environment Association is about the water environment, it's not just about the engineering aspects. So this year, we had students who were either supporting

or participating in the design competition that were not strictly engineering students. So I say that to all those people out there listening, the association has members that are policy oriented, legal oriented, basic sciences, ecologists. So anybody out there, any students listening that are in the water environment, there's a place for you in a professional association like that.

Joanie Mahoney: How do you fit a robust research program into all that you're doing with the teaching and advising and traveling with students to win these competitions? What is your research program?

Doug Daley: That's evolved over time or shifted focus. One of my big long term projects started in 2003 working with Honeywell on the upland areas around Onondaga Lake and working with their consultants. And we were doing proof of concept, which led to field demonstration of using short rotation woody crops, that is the willow biomass as an alternative landfill cover system.

I was part of a team here at ESF that was interdisciplinary. I was responsible for the water movement side of things, Tim Volk managed the willow side, Don Leopold was involved with wetland restoration. And so we were trying to integrate all of these pieces together and truly integrate them as opposed to standalone individual projects. We started in the greenhouse with little teeny tiny pots and within three years, we were planting on small scale plots on the settling basins. And then eventually, I think we've ended up with about 125 to 140 acres of willow.

Joanie Mahoney: I was actually up there on the shore when the machine came to put the willows in the ground. And I remember you could barely see them, they were just sticks.

Doug Daley: Yeah, they're just little 10 inch cuttings that go in and within three years, they're 20 feet tall.

Joanie Mahoney: I went back and it was amazing, and that is an engineered solution.

Doug Daley: And just to show you an example of how the approach to environmental problems changed. When we went there in 2003, the gates were locked and it was virtually impossible prior to 2003 to gain access to those settling basins because they were under regulatory oversight. And it was more like, let's not tell our story to anybody, was the approach.

And we went out there to the site and they literally handed us the key and said, go for it, go ahead. And I credit Honeywell, John McCullough in particular with shifting the philosophy to, and you alluded to this earlier, bring in all the experts that the experts just aren't resident within Honeywell, but bring in experts from across the country. And John recognized, I had known John for a number of

years prior to that, that ESF had creative talent that could develop an innovative approach.

Joanie Mahoney: John McCullough is one of those people who you'll never see his name up on the billboard running for office and taking credit for all of this. But what happened out there at Onondaga Lake is due in large part to his willingness to do what you just said, open the gates and bring in the experts.

Doug Daley: And the other shift was on our regulatory agency, our DEC and Ken Lynch was an important part of embracing the innovativeness as opposed to just, no, we're not even going to consider doing this.

Joanie Mahoney: And as an attorney, I can tell you, it was just such a breath of fresh air to have the lawyer at the table. He wasn't acting as the lawyer, he was the Region 7-

Doug Daley: Region 7 director.

Joanie Mahoney: ... Director. But he is an attorney and for him to have that can do attitude was terrific. And just as an aside, ESF just honored Ken Lynch alongside Steve Breen at our annual Feinstone Awards. And so for people who are out on the lake and you see the DEC public boat launch and you see the name Ken Lynch on the boat launch, we've named it after him, now you'll know who Doug's talking about.

Doug Daley: The project involved a lot of cooperation and a lot of people who could see the vision further down the road, so I was involved in that for 12 years, 13 years, something like that. And then in the meantime, other things were spinning up for me as well. So most recently, a little bit going back to my roots, no pun intended there, but I'm working with the DEC.

My particular focus is to look at the feasibility of composting papers that are not otherwise marketable. A lot of paper products don't actually go into your blue bin because there's no market for them. And then there's other papers that do go in the blue bin, but because of wet conditions, snowy conditions, or cross-contamination from broken glass, they don't end up being sold as paper, they end up in the waste stream. So a lot of these paper products are ending up in land disposal facilities across the state and so DEC is interested in seeing if we can divert some of those paper products further up the waste management hierarchy, get them away from the landfills and see if we can compost them for beneficial use.

Joanie Mahoney: And how's it going?

Doug Daley: It's going. So with all these projects, there's a research element in there, I've been able to fund graduate students. And same with this particular project, I've

already put two master students out on the streets that worked on the project. I currently have a PhD and a master's student working on the project. That's me and that's my part of this larger umbrella that's the Center for Sustainable Materials Management.

And so a big chunk of the money is going into programs that are focused on developing the markets for some of these materials, educating. Recycle New York is now one of the products that the center is producing in cooperation with our partners at Syracuse University, the Center for Sustainable Community Solutions. And so there's a lot of policy programming that's going on, on that side. I've got the composting and then ROM in our chemical engineering department, and I hesitated there for a second, formally paper engineering, bio process engineering. They're looking at making bio plastics from the fines recovered from the paper recycling process.

Joanie Mahoney: So two different raw materials?

Doug Daley: Yes. I'm taking-

Joanie Mahoney: Trash.

Doug Daley: ... Literally the raw material, not quite trash, but looking at things like wax coated corrugated cardboard, the underlying-

Joanie Mahoney: Well, things that are ending up now in a landfill.

Doug Daley: ... The underlying cardboard itself is recyclable many times over until the fibers break down so much that you limit the use for that particular product.

Joanie Mahoney: Then you send them to ROM.

Doug Daley: Then you send them to ROM and make plastics.

Joanie Mahoney: Bioplastics.

Doug Daley: But the wax coating basically prevents this wax coated cardboard from being recycled and it ends up in the landfill. And that's a common product that we could potentially manage because there's points where like at orchards, food service, and retail grocery stores where it's a common waste product and so it's concentrated, those areas.

Joanie Mahoney: You can take it out of the waste stream pretty easily.

Doug Daley: Yeah.

Joanie Mahoney: What are those items? What is a wax coded corrugated-

Doug Daley: Cardboard box look like?

Joanie Mahoney: ... Yeah, that I might have at my house. They're not pizza boxes.

Doug Daley: No, pizza boxes are recyclable, but different counties have different programs that tell you, yes, put them in, or no, don't put them in your blue bin. You probably would not have wax coated corrugated at your house, but if you go grocery shopping and you're in the produce section when they're unloading broccoli, for example, and the broccoli's packed with ice. So it keeps the cardboard from soaking up the water.

Joanie Mahoney: Is wax compostable?

Doug Daley: Well, wax is fundamentally carbon as the primary element there and our microbes and our fungi that are in composting systems feast on carbon, so the answer is, yes. It has come in incidental with source separated food scraps and disappears in the, again, industrial scale, commercial scale, large composting facilities.

And so we did this in small scale for my first two master students to set the parameters. And then right now, we started in August with a full scale demonstration project with our partners over at Onondaga County Resource Recovery Agency, OCRRA. And we stressed the system by putting 20 tons of wax coated corrugated cardboard into one of their bays, blended it in, and we're tracking that for probably about 180 days by the time we get to the end.

Joanie Mahoney: That's cool. So when I saw you down at the Lafayette station a couple years ago, this was one of the smaller scale experiments?

Doug Daley: No, the Lafayette station is a different one, that's the stormwater one. And so building off from a lot of what I learned from the green infrastructure program, we got some funding from NYSERDA with DEC cooperation to see if we could improve the design specifications for bio-filtration systems so that we could reliably remove nutrients from storm water.

We do get removal of nutrients through filtration because those nutrients are part of the suspended matter that comes in, so that's part of the storm water. But about 50% of the nitrogen and phosphorus is in the aqueous form so it pretty much passes through the system. I was focused only on the aqueous side of things to see if we could come up with a filtration medium that would adsorb or absorb either the d or the b of phosphorus and nitrogen in particular. And through repeated measures and repeated trials, we irrigated those columns over a period of three summers, generated thousands of samples to see if we

could demonstrate that, if you followed our spec, this is the performance for nitrogen and phosphorus removal that you could expect to see.

Joanie Mahoney: I'm very curious because it was a huge price tag for Onondaga County to get the phosphorus out. Were you able to find a medium that would have some effect?

Doug Daley: Yeah, we're able to adsorb the phosphorus. And the heavy metals we're able to adsorb that. There's a lot of other factors besides the soil medium that are affecting nitrogen transport through the columns.

Joanie Mahoney: It's just so interesting in everything that you're talking about that we can see a real-world application for that. And then you gather your students up and go demonstrate some of these real world applications.

Doug Daley: And the hopeful outcome from that is that our work has been informing DEC as they rewrite their stormwater design manual.

Joanie Mahoney: And I'm sure it is. And people coming through here, students, faculty are literally changing the world.

Doug Daley: That's the impact that we hope for.

Joanie Mahoney: And that takes you back to the beginning of the story about why you dipped your toe in the visiting teacher role, was you wanted to have that impact.

Doug Daley: Hard to measure sometimes, but having an impact, it's been a fun journey and as long as it keeps being fun, I'll see what the next several years brings.

Joanie Mahoney: Well, I hope we can do this again and find out and see what you discovered about getting rid of nitrogen for us, so more to come on that. But thank you very much for taking time out of your day to talk to us and to tell us about the work you're doing here at ESF. You're one of the faculty here that, as I said, is literally changing the world.

Doug Daley: Thanks, glad I could share it with a little bit broader audience too.

Joanie Mahoney: Good. Nice to see you, Doug.

Doug Daley: Nice to see you.